Extensions to Exmouth Marina Harbour

LandCorp

Report and recommendations of the
Environmental Protection Authority

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Summary and recommendations

This report is to provide the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment, about the proposal to construct a marina, resort and residential/ canal development as a land backed extension to the Exmouth Boat Harbour immediately south of the Exmouth township.

Relevant environmental factors

Although a number of environmental factors were considered by the EPA in the assessment, it is the EPA's opinion, that the following are the environmental factors relevant to the proposal, and these are evaluated in this report:

(a) groundwater - impact of drawdown;

(b) subterranean fauna - impact on the subterranean fauna and its habitat;

(c) dunes - impact on the coastal dunes and the foreshore reserve;

(d) surface water - impact of high flow events;

(e) marine water and sediment - the potential for contamination; and

(f) site contamination.

Conclusion

The EPA has concluded that the proposal by LandCorp to develop an inner marina, resort, and canal/residential development as a land backed extension to the Exmouth Boat Harbour can be managed in a manner such that the proposal does not impose an unacceptable impact on the environment, provided that the conditions recommended in the report are imposed.

Particular attention will need to be given to the construction and dewatering plan for the marina and canals to avoid excessive impacts on the groundwater resource and risks to subterranean fauna.

Conditions

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal, and following discussion with the proponent the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for and commitment to continuous improvement in environmental performance. The commitments then form part of the conditions to which the proposal should be subject if it is to be implemented.

The EPA may, of course, also recommend conditions additional to that relating to the proponent's commitments.

The EPA recommends that the conditions set out in Section 4 of the report and summarised below be imposed if the proposal by LandCorp to construct an "Extension To Exmouth Marina Harbour" is approved for implementation:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;

(b) in order to manage the relevant environmental factors and EPA objectives contained in this bulletin, and subsequent conditions and procedures authorised by the Minister for the Environment, the proponent shall be required to prepare, prior to implementation of the proposal, environmental management system documentation with components such as those adopted in Australian Standards AS/NZS ISO 14 000 series;

(c) prior to commencement of construction of the development, the proponent shall prepare and implement an Environmental Management Plan, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection;

(d) prior to finalisation of marina and canal design the proponent shall carry out adequate stratified sampling for stygofauna within and in proximity to the development site to determine the array and distribution of stygofauna inhabiting the area; and

(e) based on the findings of the sampling program referred to in (d) and, prior to commencement of construction of the marina and canals, the proponent shall prepare a design for the marina and canals and a construction plan to ensure that stygofauna are protected in accordance with the provisions and intent of the Wildlife Conservation Act 1950.

The final marina and canal design and construction plan should be made available for public review.

Other advice

The Health Department and Shire of Exmouth have both expressed concerns regarding potential public health and nuisance problems for the proposed development due to mosquitoes and midges. The Government needs to take appropriate action to address this matter if the proposal proceeds.

In reporting on a number of recent development proposals in the Exmouth - Cape Range area (EPA Bulletins 843 and 846), the EPA has provided advice on the need for an integrated approach to land use planning and environmental management for the Cape Range peninsula, and for priority to be given to consideration of extensions to the Cape Range National Park. The EPA maintains these views. The EPA is now preparing an environmental policy on development within the Exmouth - Cape Range area to assist in the assessment of development proposals.

Recommendations

Section 44 of the Environmental Protection Act 1986 requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister for the Environment consider the report on the relevant environmental factors and the EPA objectives set for each factor;
2. The Minister for the Environment notes that the EPA has concluded that the work to date has not identified an environmental factor where, with appropriate management, the EPA's objective in relation to that factor cannot be achieved;
3. That the Minister for the Environment imposes the conditions and procedures consistent with Section 4 of this report.
4. That the Minister for the Environment notes the advice of the Health Department of Western Australia reported in Section 5 of the report concerning potential public health and nuisance problems for the development from mosquitos and midges. The EPA recommends that the Government take appropriate action to ensure that adequate mosquito and midge control measures are put in place if the proposal is implemented.
5. That the Minister for the Environment notes that there has been a number of previous planning and scientific studies which have recommended extension of the Cape Range National Park. The EPA recommends that the Government give priority to consideration of the proposals in these various reports to the extend the Cape Range National Park and to consider other extensions which may be relevant in light of additional information particularly covering the coastal plains and foothills.

6. That the Minister for the Environment notes the EPA's views on the need for an integrated approach to planning and environment for the Cape Range peninsula referred to in Section 5 of the report, and takes appropriate action to address the EPA's proposals.

7. That the Minister for the Environment notes the EPA preparing an environmental policy on development within the Exmouth - Cape Range area to assist in the management of the area and the assessment of development proposals.

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1. Introduction

This report is to provide the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment in relation to the proposal by LandCorp to construct a marina, resort and residential/canal development as a land-backed extension to the Exmouth Boat Harbour immediately south of Exmouth township.

In March 1991, the EPA formally assessed a proposal by the Department of Transport (formerly the Department of Marine and Harbours) for an inland marina, a residential subdivision and a quarry. The proposal was found to be environmentally acceptable subject to a number of Environmental Conditions, and environmental approval for this project was issued on 20 January 1992.

In 1995, the Department of Transport proposed some changes to the project as construction had not yet commenced and the EPA assessed the changes to the proposal under Section 46 of the *Environmental Protection Act 1986*. The changes to the proposal included re-designing the marina from an inshore harbour basin to a smaller offshore harbour basin; retention of the floodway; removal of sections of dune either side of the floodway; deferral of the residential component, and identification of an alternative quarry. Environmental approval was issued by the Minister on 11 March 1996.

On 3 December 1996, a further proposal was referred to the EPA by the consultant Bowman Bishaw and Gorham, on behalf of the proponent, LandCorp, to construct an inland marina, resort and residential/ canal development as a land-backed extension to the Exmouth Boat Harbour. This was treated as a new proposal and a Public Environmental Review (PER) level of assessment was set by the EPA.

The Public Environmental Review report, 'Exmouth Marina, Resort and Residential Development (Extension to Exmouth Boat Harbour)' (Bowman Bishaw and Gorham, 1997), referred to here as the PER, was made available for public review between 4 March 1997 and 1 April 1997.

In compiling this report, the EPA has considered:

(a) information provided in the Public Environmental Review;

(b) issues raised by the public and specialist advice from government agencies;

(c) the proponent's response to issues raised; and

(d) the EPA's own research and, in some cases, research provided by other expert agencies.

The report provides a brief summary of the proposal under consideration (Section 2) and discusses the environmental factors that the EPA considers are relevant to the proposal (Section 3). Section 4 sets out the conditions and procedures which should be applied if it is to be implemented while other advice on issues relevant to the assessment of the proposal are provided in Section 5. Section 6 contains the EPA's conclusion and Section 7, the recommendations.

Appendix 1 provides the Figures relating to the proposal. A list of people and organisations that made submissions is included in Appendix 2, published information is listed in Appendix 3 and Recommended Environmental Conditions and the proponent's Consolidated Commitments are included as Appendix 4.

The DEP's summary of submissions and the proponent's response to those submissions has been published separately and are available in conjunction with this report.

2. The proposal

The proposal is to develop an inland marina, resort and residential development immediately south of Exmouth township, as a land-backed extension of the "Exmouth Boat Harbour", currently being developed by the Department of Transport. LandCorp is the proponent for the proposal. The proposal is the culmination of a number of investigations and proposals for the development of marina facilities at Exmouth during the past decade.

The proposal is effectively a re-design of the originally proposed project and includes an inner harbour marina, resort, tourism and commercial facilities, a residential/ canal component and an extension to the waterway.

The inner harbour marina precinct for commercial fishing boats and associated marine industry occupies an area of 42.5 ha, a resort precinct including resort hotel and convention centre of 25 ha, and a residential canal precinct of 431 lots (62.5 ha). In total the project area covers an area of 141 ha of the Cape Range peninsula coastal plain.

The development will involve deviation and reconstruction of Murat Road, the main southern road entry into Exmouth townsite, filling and stabilising development sites, construction of public roads and drainage infrastructure, construction of sewage and reticulated water supplies and connection to existing treatment and supply services, and the provision of underground power and telecommunication services.

During construction of the canals, dewatering will be required which will result in localised temporary drawdown of the shallow aquifer. On-site construction of temporary stilling basins to treat dewatering spoil will also be required.

Bridged pedestrian access will be provided over the dunes to the beach from the Resort Hotel. Other access over the dunes to the beach will be formalised to manage potential dune damage.

Any quarrying of materials for use in construction of the canal walls will be subject to separate environmental impact assessment.

Supply of power to service the proposed development is the subject of on-going negotiations. If the construction of a supplementary power generator is required it will be subject to separate environment impact assessment.

A location map of the project area and conceptual master plan for the proposed development are shown in Figure 1 and Figure 2 in Appendix 1.

The proposal is not within any proposed extension to the Cape Range National Park.

The proposal characteristics are summarised in Table 1.

3. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Having considered public and government submissions (Appendix 2) and appropriate references (Appendix 3), in the EPA's opinion the following are the environmental factors relevant to the proposal:

(a) groundwater - impact of drawdown;
(b) subterranean fauna - impact on the subterranean fauna and its habitat;

(c) dunes - impact on the coastal dunes and the foreshore reserve;
(d) surface water - impact of high flow events;
(e) marine water and sediment - the potential for contamination; and
(f) site contamination.

TABLE 1: SUMMARY OF PROPOSAL CHARACTERISTICS

Aspect	Characteristic
Size of project area	Inner harbour marina precinct - 42.5 ha Resort precinct - 25 ha Residential canal precinct - 67.2 ha Canal area - 6 ha Total 140.7 ha
Land tenure and ownership	Crown land with exception of small area of privately owned land
Water Supply	Water Corporation Exmouth borefields
Potable water usage	Estimated annual total demand per resident equivalent of 820 kL
Wastewater discharge	250,000 kL per annum, approximately 12.5 tonnes nitrogen and 3.7 tonnes phosphorous
Drainage	Stormwater from higher intensity storms will discharge via two detention basins to the canal waterway.
Nutrient management	Stormwater run-off from roads and lot frontage will be directed to settlement / infiltration basins
Fuel storage	Fuel storage facilities in marina will be above ground and contained within sealed bund capable of holding entire tank contents
Construction components	Dewatering of site to an elevation between -3.9m and 4.4m AHD On-site disposal of excavated material: approximately 1,100,000m^3 Road transport of construction material, approximately 83,500m^3 Limestone to be quarried: 83,000m^3

Details on the environmental factors and their assessment are contained in Sections 3.1 to 3.6 below.

The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal.

The assessment of each factor is where the EPA decides whether the proposal meets the environmental objective set for that factor.

Other environmental factors that have been considered by the EPA are shown in Table 2. Environmental factors were not considered relevant if they could be either managed through other statutory processes or the potential environmental impacts were not considered significant.

3.1 Groundwater — impact of drawdown

Description

Groundwater is an important environmental factor in the Cape Range peninsula region because it is a critical resource for water supply and to support subterranean fauna. This section deals with the impacts of the proposal on the groundwater resource as a source of water supply. Potential impacts on subterranean fauna are addressed in Section 3.2.

The Cape Range peninsula is underlain by an unconfined groundwater aquifer which is recharged directly by rainfall infiltration and by storm water runoff from the Cape Range. The groundwater discharges into the Exmouth Gulf and its level is influenced not only by the effects of seasonal recharge but also the effects of tidal fluctuations in the Exmouth Gulf (Water Corporation, 1996).

In general, the unconfined aquifer has a layer of fresh groundwater (less than 1,000 mg/L varying in thickness from a few metres to several hundred metres thick in the karst limestone of the Cape Range. This fresh groundwater overlies salt water (more than 35,000 mg/L) and there is transition zone between these with gradually increasing salinity with depth. The transition zone can vary from a few metres to more than 20 metres (Appendix 1 Figure 3). The fresh water is thinnest at the coast, and in some areas is absent.

Drilling has been carried out to determine a reasonable understanding of the hydrogeology of the site. The regional hydrogeology is also reasonably well known from previous investigation by the Water and Rivers Commission (WRC) and Water Corporation.

The depth of the groundwater beneath the proposal site ranges from 2 m adjacent to the coast to approximately 6 m on the western boundary of the site. In contrast to other areas along the eastern coastal plain of the Cape Range peninsula, the majority of the proposal site does not contain fresh groundwater. The salinity of the shallow groundwater beneath the site generally varies in the range 20,000 mg/L to 60,000 mg/L. This is principally due to the low permeability of the superficial sediments at the site and relatively shallow water table. Fresher groundwater exists to the west and north of the site (PER Appendix C). No large cavities were intersected during the hydrogeology field study for the proposal site and only minor vuggy (porous) zones were encountered.

The proposal will cause temporary effects on water levels and salinity of the groundwater resource during dewatering for construction of the marina and canals, and permanent effects due to movement of seawater into the marina and canals following their establishment.

The proponent carried out modelling to assess the expected extent of impacts on groundwater levels and salinity and this was reported in the PER (Appendix 1: Figure 6). The proponent adopted a conservative approach in model parameters for this work. In response to queries raised in submissions by the WRC and Museum of WA, further modelling was carried out by the proponent using more realistic parameters. The result of this modelling addressed in the proponent's response to submissions indicated that impacts on groundwater levels and salinity would be less than predicted in the PER.

The revised modelling is considered to be acceptable by the WRC.

There are three licensed groundwater users within 1 km of the proposed development and a further 10 licensed users within 2 km. The dewatering proposed for construction of the marina and canals could temporarily affect salinity in these bores.

Concerns were expressed in the public submissions on the potential impact of groundwater drawdown on the groundwater resource and the increased groundwater demand that would be needed to service the development.

Assessment

The area considered for assessment of this environmental factor is the groundwater aquifer beneath and surrounding the proposal site and defined by the drawdown zone associated with the dewatering operations.

The EPA's environmental objective in regard to this factor is "to maintain groundwater to ensure existing and potential groundwater uses, including ecosystem maintenance, are protected".

The potential impacts of groundwater changes on ecosystem maintenance are addressed in the following section on subterranean fauna.

Temporary impacts from dewatering

The EPA notes that the dewatering proposed for the development will temporarily affect water levels and salinity in the vicinity of the project. While the impacts will be temporary, there is potential that salinity in bores within about 2 km of development site may be affected by the dewatering.

The proponent has a made a commitment to monitor salinity in these bores and if they become unsuitable for existing use, to pay the affected owners to use scheme water for the period of effect.

The WRC support this action and consider that the impacts of the proposal are manageable with this commitment.

Potential permanent effects due to establishment of the marina and canals

The EPA also notes that the proposed development will result in some permanent changes in salinity of the aquifer within the site due to seawater moving into the marina and canals. The groundwater modelling indicates that seawater will only extend about 120 m from the marina and canals (ie about 500 metres inland). The salinity of groundwater at the site is already high and exceeds the salinity of seawater in parts. The movement of seawater into the aquifer due to establishment of the marina and canals will therefore have limited effect on use of the aquifer.

The Water Corporation draw groundwater for public water supply for the Town of Exmouth from a wellfield to the north of the proposed development site. The WRC has advised that the wellfield is sufficiently far away that it will not be affected by either the temporary or permanent effects of the development.

The environmental impacts of providing water supply for the development have been addressed in the Water Corporation proposal to extend the Exmouth borefields. The EPA has recommended that the proposal to extend the Exmouth borefields is environmentally acceptable and its recommendations were published in EPA Bulletin 843, March 1997.

The Water Corporation has advised that capital projects currently in place in the Cape Range peninsula will be able to meet future water supply demand for the proposed marina development hence groundwater extraction for the development should not pose an issue.

Having particular regard to:

(a) the understanding that the effect of groundwater drawdown during dewatering will be only temporary during marina harbour and canal construction and the area impacted is relatively small;

(b) the commitment to monitor existing private bore users and pay for the use of scheme water or other arrangements as negotiated by the owner should water quality from their bores be made unacceptable; and

(c) the knowledge that proposal site does not contain fresh groundwater and therefore that the permanent changes on the groundwater resources will not be markedly impacted by seawater movement into the marina and canals; and

(d) the advice of the WRC and Water Corporation that Exmouth public water supply borefield is adequate to supply domestic water supply for the proposed development and the town of Exmouth, and will not be affected by the development,

it is the EPA's opinion that the proposal can be managed to meet its objective for this factor with respect to existing and potential future uses of the resource for groundwater supplies. Furthermore, the EPA believes that the Water Corporation's ongoing research, investigation and monitoring of the Cape Range peninsula aquifers should continue.

3.2 Subterranean fauna - impact on the subterranean fauna and its habitat

Description

The Cape Range peninsula contains one of the world's most diverse fauna which are specially adapted to a subterranean environment. Two types of subterranean fauna live in the region - troglobitic (terrestrial) and stygofauna (aquatic) faunas. Both of these are important because of their species richness, evolutionary history and adaptations, and the evidence they can provide for continental drift. Hence they are significant in terms of Australian fauna biodiversity.

Troglobitic fauna are terrestrial animals which are specially adapted to living underground in air-filled, high humidity caves. However, the troglobites are not only found in moist caves but also in interstitial fissures and crevices in rocks (Humphreys, 1993).

Stygofauna are aquatic subterranean animals and most recorded species of stygofauna are found living in fresh-to-brackish groundwater lens which overlies the deeper saline groundwater of the Cape Range peninsula coastal plains although some species have been recorded below the salt water interface of inland caves connected at depth to the sea. The stygofauna found on the coastal plains are more likely to be widely distributed than the troglobitic fauna because of the high degree of interconnectedness of the cavernous coastal plain limestone. However the degree of connection between the eastern and western coastal plains of the Cape Range peninsula is likely to be limited hence there is evidence of genetic differences between the east and west populations. This is important is terms of biodiversity.

There are nine stygofauna and troglobitic fauna species declared as Specially Protected (Threatened) Fauna under the *Wildlife Conservation Act 1950*. Species declared as Specially Protected (Threatened) cannot be taken without authorisation pursuant to the Act.

The nearest recorded site containing significant subterranean fauna is at Cameron's Cave, located 1.9 km southwest of the proposal site (ie outside the proposal site area). The cave supports a moderately rich troglobitic fauna (W F Humphreys, *pers.comm*) and the species recorded are listed in the PER.

The proposal has the potential to impact on subterranean fauna by:

(i) direct destruction of habitat for construction of the marina and canals;

(iii) impedance of genetic interchange due to seawater movement into the marina and canals; and

(iv) groundwater drawdown affecting relative humidity in caves.

These were also issues which were raised by the WA Museum in their submission.

The proponent has not presently undertaken any sampling for subterranean fauna on or in proximity to the site. However the proponent has undertaken drilling to determine the geology and groundwater salinities within the site. The proponent has also carried out groundwater modelling to determine the extent of groundwater drawdown, the area within which groundwater will be extracted, and the area within which groundwater salinity may be affected. The initial modelling reported in the PER adopted conservative parameters for the groundwater aquifer. In response to queries raised in submissions by the WRC and Museum of WA, further modelling was carried out by the proponent using more realistic parameters. The results of this modelling which are referred to the proponent's response to submissions indicated that the impacts on groundwater levels and salinity would be less than predicted in the PER.

Assessment

The area considered for assessment of this relevant environmental factor is Cape Range peninsula (Figure 1 Appendix 1). The proposal site is the land immediately south of the Exmouth township on the coast, an area of approximately 141 ha.

The EPA's environmental objective in regard to this factor is "to ensure that subterranean fauna are adequately protected, consistent with the *Wildlife Conservation Act 1950*, and to maintain the abundance, diversity, geographical distribution and productivity of subterranean fauna".

As part of meeting this objective, the EPA expects that:

(i) information is obtained through research and development on the species of subterranean fauna in the area;

(ii) measures are implemented to maintain the subterranean fauna habitats and populations in the long term; and

(iii) sampling of dewatering bores for evidence of stygofauna and appropriate contingency plans will be prepared.

1. Direct impact through excavation

The construction of the marina and canals will involve excavation to a depth of approximately 8 metres over an area of approximately 20 ha. The typical geology of the site with respect to the marina and canal excavations shown in Figure 4: Appendix 1.

The sediments to be excavated above the water table are sand, clay or silty clay with low permeability. The excavation is therefore unlikely to affect troglobitic fauna habitat.

The excavation will extend a few metres into the Bundera Calcarenite. Testing on the site has shown that this is also of low permeability in the area of construction. The salinity of the groundwater is generally greater than 20,000 mg/L (Figure 5, Appendix 1).

The Blind Gudgeon, a fish, is the only stygofaunal vertebrate species able to tolerate relatively higher salinity habitat (up to a maximum of 26,000 mg/L as reported in Humphreys, 1994). However, the low transmissivity over most of the proposal site implies the absence of habitat type.

However, this should be confirmed by adequate sampling prior to finalisation of the design of the marina and canals.

2. Groundwater drawn into the excavation

It is proposed to carry out dewatering for 6 months to allow for excavation of the marina and canals. This will result in groundwater within approximately 400 m of the excavation being drawn into it. Stygofauna could be drawn in with this flow.

The EPA has recently assessed the impact of Water Corporation groundwater extraction on stygofauna (EPA Bulletin 843). The Water Corporation has been extracting groundwater from the Cape Range for more than 20 years. The assessment concluded that the extraction was not excessively impacting the abundance of stygofauna in the aquifer. The area of the Water Corporation's wellfield is considerably more extensive than the area of groundwater capture for the marina proposal.

In assessment of the Water Corporation's wellfield it was also noted that pumped water will be drawn along paths of least resistance, with little impact within boundary layers in which most stygofauna is known to reside. This will reduce the opportunity for any stygofauna to be drawn into the excavation through groundwater.

The EPA therefore considers that the dewatering is unlikely to significantly impact on stygofauna population. However, the EPA considers that prior to finalisation of the marina and canal design, the proponent should carry out adequate stratified sampling for stygofauna within, and in proximity to the development site, to determine the array and abundance of stygofauna inhabiting the area.

Based on the findings of this sampling, and prior to the commencement of construction of the marina and canals, the proponent should be required to prepare a final design, and construction plan to ensure that stygofauna are protected consistent with the provisions of the Wildlife Conservation Act 1950.

Should the sampling program indicate that the dewatering may have an unacceptable impact on stygofauna, then this would need to be addressed in the final design and construction plan. This could include consideration of the feasibility of constructing the marina and canals without dewatering.

3. Impedance of genetic interchange due to seawater movement into the marina and canal

Humphreys and Adams (1991) suggested that there is a narrow corridor of reduced salinity close to or at the foothills of Cape Range which provides freshwater connections and hence gene flow between the stygofauna along the coasts. As the Blind Gudgeon is able to live in brackish to saline groundwater the estimated width of the corridor is up to 2 km for this species (ie. the distance from the coast to the foothills). The corridor width for the Blind Eel is narrower than for the Blind Gudgeon as the Blind Eel has not been recorded in salinities greater than 7,700 mg/L based on salinity values measured for the region.

Construction of the marina and canals will result in the seawater interface moving about 500 m inland (approximately to where Murat Road is currently located).

The salinity of groundwater beneath the site is already high, approaching that of seawater over much of the site. The inland movement of seawater due to construction of the canal will therefore only reduce the corridor of suitable salinity groundwater for the Blind Gudgeon by a few hundred metres.

As the salinity of groundwater at Murat Road is already around 20,000 mg/L (ie well in excess of the highest salinity recorded for the Blind Eel 7,700 mg/L) the corridor of suitable salinity groundwater for the Blind Eel is not expected to be significantly affected by seawater moving into the marina and canals.

4. Reduction of the relative humidity in caverns which support troglobites

The nearest recorded site containing significant troglobitic fauna is at Cameron's Cave located 1.9 km southwest of the proposal site. The cave supports a moderately rich troglobitic fauna.

The initial modelling predicted a drawdown of about 0.1 m at Cameron's Cave. The re-calibrated modelling using more realistic parameters indicates that there will be no measurable drawdown in the vicinity of Cameron's Cave, and therefore relative humidity is not expected to be affected. This conclusion correlates with the findings of the Exmouth borefield studies conducted by Water Corporation (1996) which showed that the thickness of the freshwater lens in the vicinity of the borefield is expected to remain relatively unchanged as a consequence of abstraction due to karst features and the extensive mixing zone of 10 - 20 m at those locations. The Water and Rivers Commission is also satisfied with the above revised groundwater modelling and conclusion (Water and Rivers Commission *pers. comm.*).

Water level monitoring should be carried out in the vicinity of the cave during dewatering to confirm this.

The EPA is of the opinion that the proposal has a low potential to directly impact upon the subterranean fauna because the proposal site has a low probability of supporting subterranean fauna in either the superficial aquifer or the underlying Bundera Calcarenite. The EPA further believes that the temporary impact on potential stygofauna or troglobite habitat from drawdown during dewatering will not compromise the abundance, diversity, geographic distribution and productivity of subterranean fauna in the region.

Having particular regard to:

(a) the low probability of occurrence of subterranean fauna at the proposal site due to the low permeability of sediments and high salinity of groundwater;

(b) the limited area of capture zone for the proposed dewatering;

(c) the limited impact on the fresh to brackish groundwater corridor of the coastal plain; and

(d) the limited groundwater drawdown away from the site due to the high transmissivity of the karst aquifer,

it is the EPA's opinion that the proposal can be managed to meet its objective for this factor provided that:

(i) prior to finalisation of marina and canal design the proponent carry out adequate stratified sampling for stygofauna within and in proximity to the development site to determine the array and distribution of stygofauna inhabiting the area; and

(ii) based on the finding of this sampling and prior to commencement of construction of the marina and canals, the proponent prepare a final design for the marina and canals, and construction plan to ensure that stygofauna are protected consistent with the provisions and intent of *the Wildlife Conservation Act 1950.*

The construction plan should include details of the dewatering strategy, the predicted impacts on groundwater levels and salinity off the site, and groundwater monitoring. The plan should also include contingency measures to be adopted if monitoring indicates that excessive drawdowns may occur. This should include the feasibility of constructing the canals without dewatering, that is, in a wet condition.

3.3 Dunes — impact on the coastal dunes and the foreshore reserve

Description

The development of the proposed Exmouth marina, resort and residential development has the potential to impact on the foreshore reserve and coastal dune areas during construction.

It has been widely recognised that coastal dunes are important for protecting the coast against storm surges and wind erosion. The coastal dunes also reduce the aesthetic impact of the proposed development by reducing the visual impact of the development from the Exmouth Gulf or the foreshore.

The coastal dunes between the proposed marina site and the Exmouth Gulf form a distinct vegetation zone. A number of pioneer species as *Spinifex longifolius, Salsola kali, Cakile maritima, Ipomea brasiliensis* and *Tetragonia decumbens* occur in the foredune/primary dune with *Ptilotus spp., Atriplex isatidea, Olearia axillaris, Scaevola crassifolia* and *Euphorbia sp.* in the swales. These plants are important as they trap sediments and protect the dunes from wind erosion. Existing foredunes are badly degraded in places due to uncontrolled access. Weed invasion has also occurred in a number of areas.

Concerns were expressed in the public submissions regarding the foreshore reserve and coastal dune erosion during the construction and operation of the proposed development.

Assessment

The area considered for assessment of this environmental factor is the foreshore reserve and coastal dunes within the proposal site.

The EPA's environmental objective in regard to this factor is "to maintain the integrity, function and environmental values of the dune system".

In contrast with the coastal areas of the Cape Range peninsula, the coastal dunes within the site are in moderate to very poor condition due to disturbance of the vegetation by activities such as pony/horse riding, camel rides, 4-wheel driving and uncontrolled pedestrian access to the beach. Weeds such as Buffel grass have also been introduced to the coastal dunes, and the weeds are now common on the coastal plain.

A Coastal and Marine Engineering Study was conducted for the proposed development (Appendix D PER). This included an assessment of the coastal stability and recommended a set-back for development from the line of permanent dune vegetation. The recommended distance was 90 metres which included accretion/erosion trend, severe storm (1 in 100 year) erosion, climate change allowance and a factor of safety. This set-back will assist in the maintenance of the integrity and function of the dune system and is in accordance with the Western Australian Planning Commission's policy DC 6.1 "Country Coastal Planning Policy".

During the construction period, contractors may encroach upon the dune areas resulting in further spread of weed species, degradation of vegetation cover and dune erosion. The proponent has made a commitment to preparing a Foreshore Reserve Management Plan prior to construction in consultation with the Ministry of Planning (MfP), CALM and the Shire of Exmouth to protect the foreshore reserve and coastal dunes from erosion, ensure rehabilitation is carried out and manage public access to the beach. Upon completion of the construction phase there will be ongoing maintenance and monitoring for an specified period of time. It is anticipated that the Foreshore Reserve will eventually be vested with the Shire of Exmouth for management.

Having particular regard to:

(a) the coastal dunes already being in a moderate to very poor condition in contrast to other foreshore coastal dunes on the east coast due to uncontrolled access and weed invasion;

(b) the dunes will remain following the development; and

(c) the proponent's commitment to implementing a foreshore reserve management plan which will include fencing, formalising access tracks across and through the dunes and identifying and carrying out rehabilitation as necessary to stabilise dunes in the vicinity of the development and conduct regular monitoring and maintenance following completion of the marina development,

it is the EPA's opinion that the proposal can be managed to meet its objective for this factor provided that the proponent's commitments are complied with.

3.4 Surface water — impact of high flow events

Description

The proposal site is located in an extensive "floodplain" depression between the coastal dunes and Murat Road, and receives surface drainage from two catchments (PER, Figure 7).

Significant storm water can flow towards the proposal site because of the high intensity rainfall of the region and the relatively low absorption capabilities of the upstream parts of the drainage catchment at the foot of Cape Range.

The proposal site is located at the eastern (or coastal) end of the Cape Range peninsula coastal "floodplain". The plain is relatively flat with numerous creeks and drainage lines which may flood during high rainfall events. The stormwater runoff drains into the Exmouth Gulf.

Concerns were expressed in the public submission regarding the potential impact of contaminants which may be present in the stormwater from the development infiltrating into the groundwater and flowing to the adjacent marine environment.

Analysis of groundwater quality has been undertaken around the Exmouth town site and in the vicinity of the golfcourse which uses recycled sewage effluent for watering (Humphreys, 1994). Currently there is no obvious nutrient enrichment of the groundwater that could be caused by human activities.

Assessment

The area considered for assessment of this environmental factor is the flood plain immediately south of the Exmouth township.

The EPA's environmental objective in regard to this factor is "to protect the hydrological role of the flood plain so that any changes do not result in unacceptable environmental impact".

Although the proposal site is located within the "floodplain" catchments there is no permanent surface flow. Significant stormwater flow will only occur during high intensity rainfall events. However, the stormwater reportedly does not often drain directly to the ocean through the breakout in the dune identified in the proposal site but is generally absorbed behind coastal dunes within dissipation and infiltration areas.

The proponent in the PER has indicated that it will implement appropriate culverts and floodways within the proposed project layout based on the Flood Channel Investigation for the Exmouth Boat Harbour (Evangelisti and Associates, 1996). The culverts should have a 1 in 10 year design flow and the floodways a 1 in 100 year design flow. The proponent will also be required to comply with Main Roads of Western Australia (MRWA) and the Shire of Exmouth requirements for detailed subdivision design and floodway requirements prior to planning approval.

Two detention basins (settlement/absorption areas) for dispersing stormwater from high intensity storms will be constructed, and it is anticipated that the majority of stormwater flow (ie. all but extreme cyclonic events) would dissipate within these two areas. In extreme cyclonic events, the capacity of these basins would be exceeded and overflow to the canal water body via the culvert system and overland floodways.

Having detention basins to retain stormwater on site is best management practice and a policy requirement of the Western Australian Planning Commission (WAPC), the EPA and the WRC, and it is commonly adopted for foreshore stormwater management throughout the State.

Detailed design of the detention basins (eg sizing, etc.) will be formalised prior to construction with the DEP, the WRC and the Shire of Exmouth.

The development area outside the detention basins would be designed so that runoff from low intensity storms can infiltrate on site.

Having particular regard to:

(a) the stormwater from high intensity rainfall being able to be dissipated on site;

(b) stormwater overflowing from detention basins being able to drain to the canal water body;

(c) there being no alteration of permanent surface flow (as there is none);

(d) WAPC requirements for the development of artificial waterways and canal estates (Policy No. DC 1.8);

(e) the proponent's commitment to develop a Drainage Design and Management Plan; and

(f) floodway management requirements of MRWA and the Shire of Exmouth,

it is the EPA's opinion that the proposal can be managed to meet its objective for this factor provided that the proponent's commitments are complied with.

3.5 Marine water and sediment - potential for contamination

Description

The development of the proposed Exmouth marina, resort and residential development has the potential to impact on the marine water quality of the Exmouth Gulf during construction and operation of the marina, resort and residential estate.

Potential contamination of the marine water quality includes discharge of turbid dewatering water, dispersion of residual sediment from dredging of the connection channel, inappropriate disposal of dredge spoil and accidental discharge of contaminants (eg oil spills, chemicals, liquid waste, etc) into the Exmouth Boat Harbour and Exmouth Gulf. Overflow discharge to the canal from the detention basins during high flow events may also occur.

The proposal site is located approximately 12 km south of the Bundegi Reef which has a rich coral and marine fauna community. However the Exmouth Gulf ecosystem is highly dynamic and the turbidity in the Gulf can vary markedly in response to tidal and storm conditions.

Concerns were expressed in the public submissions regarding potential contamination of the water body in the Exmouth Gulf from pollutants such oil spills, liquid waste water, anti-fouling paint containing TBT (tributyl tin) and discharges from the marina operation.

Assessment

The area considered for assessment of this environmental factor is nearshore marine waters and sediment in the entrance to the inner boat harbour, existing boat harbour and immediate area surrounding the boat existing boat harbour.

The EPA's environmental objective in regard to this factor is to "maintain or improve the quality of marine water consistent with the draft WA Guidelines for Fresh and Marine Waters (EPA 1993)" and to "maintain or improve marine water and sediment consistent with Environmental

Quality Objectives (EQO's) and Environmental Quality Criteria (EQC's) identified in the Southern Metropolitan Coastal Waters Study (DEP 1996)".

The water quality of the marina waterways could be impacted by the turbidity caused by the dredging operation. However the dredging operation is only limited to the opening of the canals to the outer Boat Harbour and turbidity from the dredging operation should only be short term. It is not expected to impact on the biota community and would be unlikely to exceed naturally occurring turbidity fluctuation in the Exmouth Gulf. Furthermore the dredge spoil will be used for landfill on the site. The proponent has made a commitment to have a dredge spoil management plan to be prepared in accordance to WRC guidelines (Waterways Commission Guidelines No. 9, 1995).

Water from dewatering operations is expected to be saline and to contain silt and sediment from the excavation operations. This water will be directed to detention basins so that only treated water returns to the ocean. A specially designed geofabric silt curtain will be used within part of the harbour for controlling sediment during excavation operations. The discharge of dewatering fluids will be subject to a dewatering management plan and be in accordance with WRC requirements and EPA's draft Environmental Water Quality Objectives.

The proponent has also recognised that nutrients and pollutants could be introduced via stormwater runoff to the canal waterways. Stormwater will be directed to detention basins to filter out nutrients, pollutants and entrained sediments.

The development will be serviced with a reticulated sewerage system and no sewage or liquid waste will be discharged into the waterways. The Water Corporation has advised that the existing wastewater treatment plant has the capacity to accept the increased volume from the proposed development. Treated effluent from the plant is used to irrigate public open space.

A sewage pumpout facility will be provided in the Department of Transport boat harbour or the marina for vessel sullage. The discharge of sewage, hydrocarbons or litter from boats into the marina is illegal under existing legislation. The use of anti-fouling paints containing TBT would be prohibited as a condition of the lease of all boat repair facilities. The potential for accidental oil spills will be reduced by requiring boat refuelling hoses to have manually operated nozzle valves with automatic shut-off.

TBT contamination from the anti-fouling of boats is unlikely to have a significant impact. Since 1991 the use of TBT as an anti-fouling agent in boats less than 25 m has been banned. Since these regulations have come into force TBT concentrations in sediments predominantly visited by recreational boats have either remained the same or decreased (Department of Environmental Protection, 1996).

From studies of four marinas near Brisbane by the Australian Environmental Council (1988) on the impact of petroleum hydrocarbon and heavy metals on the marine environment, it was concluded that although there was accumulation of petroleum hydrocarbons and metals in the marina sediments and biota, the levels were not considered indicative of significant water pollution. In an extensive study of the southern metropolitan waters of Perth the concentrations of heavy metals in sediments and mussels in most cases, did not exceed the criterion of the draft Environmental Quality Objective (EQO) for the Maintenance of Ecosystem Integrity (Department of Environmental Protection, 1996). However the criterion of the EQO for the Maintenance of Aquatic Life for Human Consumption were exceeded in a number of sites, especially near outfalls, boat harbours and heavy industry.

Monitoring data from other canal estates in Western Australia has shown that, with proper canal estate design and management, the risk of significant contamination from inputs to the canal can be kept within acceptable levels. At this stage it is not possible to predict the extent of accumulation of petroleum hydrocarbons and heavy metals but the proponent intends to instigate appropriate monitoring to determine the need for ameliorative measures.

The waterways of the canal and the inner harbour are 'created' or 'artificial' waterbodies. The water quality within the canals should be consistent with the draft WA Water Quality Guidelines for Fresh and Marine Waters (EPA, 1993) for their intended use (eg primary or secondary recreation).

The EQO for the waters of the Exmouth Gulf in the vicinity of the proposal is for the Maintenance of Ecosystem Integrity. The Environmental Quality Criteria (EQC) by which this can be measured is detailed in Table 2.2 of EPA (1993). Due to the proximity of the canal waters and the hydrology of the waterbody effective management of the inner-harbour and canal waters is required to ensure the EQO for the adjacent waters of the Exmouth Gulf are met. The proponent has committed to the preparation of a Water and Sediment Quality Monitoring Program (WSQMP). It is envisaged that this WSQMP will specifically monitor water and sediment quality immediately adjacent to the entrance to the inner harbour and at control sites within Exmouth Gulf. Also included will be mitigation measures to be implemented if identified EQOs for the relevant area are not being met. The WSQMP will be prepared in consultation with the DOT and the DEP and will also include a comprehensive fuel and oil spill response plan.

The proponent has made a commitment to prepare and implement a detailed drainage design and management plan (to include the necessary sizing of the major detention basins and other flood and stormwater control measures), to the satisfaction of the Shire of Exmouth, on advice from the DEP, prior to commencement of the construction.

Having particular regard to:

(a) turbidity impact caused by dredging being temporary and within the natural variation of the Exmouth Gulf;

(b) the infrastructure (such as detention basins, stormwater drainage, etc) and management system to be implemented to mitigate and prevent contamination of the Exmouth Gulf waters;

(c) the prohibition of the discharge of pollutants such as petroleum products, sewage, litter, chemicals, etc. into the Exmouth Gulf waters and the use of anti-fouling paint containing TBT; and

(d) the proponent having a commitment to prepare and implementing management plans for dredge spoil, dewatering, nutrient control and drainage, and water and sediment quality monitoring,

it is the EPA's opinion that the proposal can be managed to meet its objective for this factor provided that the proponent's commitments are complied with and the recommendations in Section 4 are implemented.

3.6 Site contamination

Description

Two disused rubbish dumps exist within the proposal site, one immediately landward of the coastal dunes at the proposed marina site and the other is located in the northwestern part of the proposed residential development. Soil containing residual oil and hydrocarbons was used for stabilising the Exmouth Racecourse.

The disused rubbish tips and the racecourse need to be cleaned-up and assessed for possible site contamination prior to commencement of the proposed development.

Contaminated sites in Western Australia need to be assessed and managed in accordance to the ANZECC & NHMRC (1992) guidelines for the assessment and management of contaminated sites.

Concerns were expressed in the public submissions for the PER regarding the potential site contamination impact due to the removal of the two disused rubbish tips and disposal of the contaminated materials.

Assessment

The area considered for assessment of this environmental factor is the proposal site immediately south of the Exmouth township.

The EPA's environmental objective in regard to this factor is "to ensure that the site is cleaned up to an acceptable level for the proposed land use, in accordance with the ANZECC & NHMRC guidelines for the assessment and management of contaminated sites".

The proponent has made a commitment that prior to commencement of the marina construction, it will conduct a contaminated site assessment of the two disused rubbish tip sites and the race course in accordance with the ANZECC & NHMRC (1992) guidelines for the assessment and management of contaminated sites, in consultation with the DEP. Should investigations indicate a level of residual contamination, the sites will be cleaned-up to the standard and requirements of the above guidelines.

Having particular regard to:

(a) The proposal site containing two disused rubbish tips and other possibly contaminated soil; and

(b) the proponent's commitment to conduct a contaminated site assessment and clean-up of the site in accordance with the ANZECC & NHMRC (1992) guidelines for the assessment and management of contaminated sites prior to commencement of the marina construction, with advice from the DEP,

it is the EPA's opinion that the proposal can be managed to meet the EPA's objective provided that if contamination is detected, a satisfactory clean-up strategy is devised and implemented with verification of remediation. If remediation is required this should be referred to the EPA to determine whether formal assessment is required.

4. Conditions

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal, and following discussion with the proponent the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for and commitment to continuous improvement in environmental performance. The commitments then form part of the conditions to which the proposal should be subject if it is to be implemented.

The EPA may, of course, also recommend conditions additional to that relating to the proponent's commitments.

The EPA recommends that the conditions set out in formal detail in Appendix 4 and summarised below, be imposed if the proposal by LandCorp to construct an "Extension To Exmouth Marina Harbour" at Exmouth is approved for implementation:

(a) the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;

(b) in order to manage the relevant environmental factors and EPA objectives contained in this bulletin, and subsequent conditions and procedures authorised by the Minister for the Environment, the proponent shall be required to prepare, prior to implementation of the proposal, environmental management system documentation with components such as those adopted in Australian Standards AS/NZS ISO 14 000 series;

(c) prior to commencement of construction of the development, the proponent shall prepare and implement an Environmental Management Plan, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

(d) prior to finalisation of marina and canal design the proponent shall carry out adequate stratified sampling for stygofauna within and in proximity to the development site to determine the array and distribution of stygofauna inhabiting the area.

(e) based on the findings of the sampling program referred to in (d) and, prior to commencement of construction of the marina and canals, the proponent shall prepare a design for the marina and canals, and a construction plan to ensure that stygofauna are protected in accordance with the provisions and intent of the Wildlife Conservation Act 1950. The sampling program and marina and canal design and construction plan be to the satisfaction of the Minister for the Environment on advice from the Environmental Protection Authority and the Department of Conservation and Land Management.

The final marina and canal design and construction plan should be made available for public review.

5. Other advice

The following issues are also relevant to assessment of the proposal.

5.1 Mosquito and midge control strategy

The Health Department and the Shire of Exmouth both expressed significant concerns in their submissions regarding potential public health and nuisance problems for the proposed development due to mosquitos and midges.

Mosquitos are principally of concern in relation to Ross River virus. This virus is very active in the Exmouth area from May to July whenever heavy late autumn and early winter rains occur. The Health Department advised that the mosquito and Ross River virus problem at Exmouth could be addressed, however, this was not a simple matter and would require the availability of adequate financial resources and skilled personnel necessary to carry out an effective control program.

Knowledge of the potential midge problem is limited. The Health Department advised that the control of biting midges is extremely difficult if not impossible. Further investigation will therefore be required on this matter.

In relation to this proposal, the EPA recommends that the Ministry for Planning, the Health Department and the Shire of Exmouth take action to ensure that adequate mosquito and midge control measures are put in place if the proposal is implemented.

This raises the question as to the part which the proponent should play in contributing towards the cost of the required management measures for mosquitoes and midges. It would be open for the government to determine a position on this matter.

This raises the question as to the part which the proponent should play in contributing towards the cost of the required management measures for mosquitoes and midges. It would be open for the government to determine a position on this matter.

5.2 Integrated approach to management of the Cape Range peninsula and establishment of an environmental policy.

The Cape Range peninsula is an area of special environmental importance for a number of reasons.

In reporting on a number of recent development proposals in the Exmouth - Cape Range area, (EPA Bulletins 843 and 846) the EPA has provided advice on the need for an integrated approach to land use planning and environmental management for the Cape Range peninsula, and for priority to be given to consideration of extensions to the Cape Range National Park. The EPA maintains these views.

The EPA is now preparing an environmental policy on development within the Exmouth - Cape Range area to assist in the assessment of development proposals.

The need for protection of subterranean fauna has been recognised as an important environmental factor in assessment of this and recent proposals in the Cape Range area. However there is limited scientific information available on these species. The EPA proposes the Government take action to ensure resources are directed into research of subterranean fauna, in particular:

(i) species diversity;

(ii) population sizes and distribution (including areas outside Cape Range);

(iii) biology; and

(iv) ecology

6. Conclusion

The EPA has concluded that the proposal by LandCorp to develop an inner marina, resort, and canal/residential development as a land backed extension to the Exmouth Boat Harbour can be managed in a manner such that the proposal does not impose an unacceptable impact on the environment, provided that the conditions recommended in this report are imposed.

Particular attention will need to be given to the construction and dewatering plan for the marina and canals to avoid excessive impacts on the groundwater resource and risks to subterranean fauna.

7. Recommendations

Section 44 of the Environmental Protection Act 1986 requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as is sees fit.

The EPA submits the following recommendations to the Minister for the Environment:

1. That the Minister for the Environment consider the report on the relevant environmental factors and the EPA objectives set for each factor;

4. That the Minister for the Environment notes the advice of the Health Department of Western Australia reported in Section 5 of the report concerning potential public health and nuisance problems for the development from mosquitos and midges. The EPA recommends that the Government take appropriate action to ensure that adequate mosquito and midge control measures are put in place if the proposal is implemented.

5. That the Minister for the Environment notes that there has been a number of previous planning and scientific studies which have recommended extension of the Cape Range National Park. The EPA recommends that the Government give priority to consideration of the proposals in these various reports to the extend the Cape Range National Park and to consider other extensions which may be relevant in light of additional information particularly covering the coastal plains and foothills.

6. That the Minister for the Environment notes the EPA's views on the need for an integrated approach to planning and environment for the Cape Range peninsula referred to in Section 5 of the report, and takes appropriate action to address the EPA's proposals.

7. That the Minister for the Environment notes the EPA preparing an environmental policy on development within the Exmouth - Cape Range area to assist in the management of the area and the assessment of development proposals.

TABLE 2: IDENTIFICATION OF FACTORS

FACTOR	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Biophysical				
Subterranean fauna	Dewatering will result in localised temporary drawdown of the shallow aquifer and may impact on subterranean fauna. Increase in area of saltwater intrusion.	**WA Museum:** • The project will potentially impact on at least four protected species (Schedule 1: Wildlife Conservation Act 1950), including two vertebrates. The potential impact on *Ophisternon candidum* is especially notable as the canal development may fragment its small range - unlike other taxa it is not known to occupy more inland sites. Such fragmentation may be important as there is some evidence that species have restricted genetic interchange with those populations inhabiting the west side of the peninsula (Humphreys and Adams, 1991: Adams and Humphreys, 1993). • The permanent lowering of the water table will reduce the thickness of the brackish water layer by an order of a magnitude greater than stated in the report. Loss of the brackish water overlying sea water will reduce the relative humidity of the air in cavernous areas and may affect cave fauna dependent on high humidity. This layer may be vital to both aquatic and terrestrial subterranean fauna. • The stated salinity of the groundwater is suitable habitat for stygofauna • The long term effects of a drawdown are critically understated. A 0.1m fall in groundwater level could reduce the thickness of the brackish water by about 4m (NOT 0.4m as stated) according to the Ghyben-Herzberg relationship (Ford and Williams, 1989). It is the thickness of this fresh to brackish water layer that is considered important to many stygofauna, and it is according to the document, initially only 2 metres thick near the coast. Not only would this affect stygofauna, but loss of the brackish water overlying sea water will reduce the relative humidity of the air in cavernous areas over a wide area which may affect cave fauna dependent on high humidity. • No serious examination has been conducted of the likely contamination of the groundwater from run-off (eg nutrients, heavy metals, petrochemicals) or irrigation with treated effluent, or the potential effect of this on subterranean fauna. • Will stygofauna sampling be conducted within the 44 boreholes drilled specifically for the project? **DEP:** The DEP notes that Cameron's Cave (C-452) supports a moderately rich fauna of cave restricted (troglobitic) animals and that Cameron's Cave is the only known location for: *Stygiochiropus peculiarism, Hyella sp.nov (Pseudoscorpionidia: Hyidae), Phaconura sp.nov (Hemiptera: Meenoplidae).* Undescribed species of blind harvestman *(Opilionida: Phalngodida).* It is also one of two known locations on Cape Range for *Draculoides bramstokeri* and is location for several undescribed species of spiders of several families. The DEP also notes that the EPA's assessment of the original proposal in March 1991 concluded that *"dewatering to construct the marina could affect species of unique subterranean aquatic fauna comprising two species of fishes and shrimps which may occur at the marina site"* Consequently the EPA recommended that *"the potential impacts of dewatering on private bores around the marina site and on the rare troglobitic fauna are unacceptable and recommends that de-watering should not take place unless the impacts can be confined to within 300m of the marine basin. The EPA further recommends that dewatering should cease when monitoring detects de-watering effects 300m from the marina basin. If de-watering criteria cannot be met then the proponent could construct the marina in an environmentally acceptable manner "in the wet" using either a land based hydraulic excavator or a cutter suction dredge. The EPA recommends that settling ponds be constructed to the east of the westernmost edge of the marina as near as practicable to the ocean".*	• The PER fails to consider the fate of stygofauna contained within the water removed during dewatering operations. • Concern expressed in relation to impact on subterranean fauna, particularly at Cameroon's Cave.	EPA evaluation required.
Terrestrial fauna	Direct disturbance (clearing) associated with construction of inner boat harbour, resort and residential development.	**DEP:** The DEP notes that several species of reptiles are endemic to the North West Cape, including the gecko *Diplodactylus rankini*, the skink *Lerista haroldi* and the legless lizard *Aprasia rostrata.* It is also noted that the project area contains fauna species which are generally widespread and abundant in similar habitats throughout the region.		Terrestrial surface fauna is represented in similar areas on Cape Range which are not subject to development pressure. EPA evaluation not required.
Declared Rare or endangered fauna	Direct disturbance associated with construction of inner boat harbour, resort and residential development.	**DEP:** The DEP notes that under the Wildlife Conservation Act 1950, Schedule 3 and Schedule the vertebrate taxa Grey Falcon (*Falco hypoleucos.)* and Peregrine Falcon (*Falco peregrinus*) potentially occur in the area. It is also noted that both species are mobile and do not rely on the habitat of the site for survival.		As fauna is mobile and does not rely on habitat for survival, EPA evaluation not required.

TABLE 2: IDENTIFICATION OF FACTORS

FACTOR	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Terrestrial vegetation	Direct disturbance (clearing) associated with construction of inner boat harbour, resort and residential development.	**DEP:** The DEP notes that there is no regionally significant vegetation communities, plant taxa endemic or nearly endemic to the Cape Range Peninsula on or in the vicinity of the project area.		EPA evaluation not required as that there is no regionally significant vegetation communities, plant taxa endemic or nearly endemic to the Cape Range Peninsula identified on or in the vicinity of the project area.
Declared rare and Priority flora	Direct disturbance (clearing) associated with construction of inner boat harbour, resort and residential development.	**DEP:** The DEP notes that there is no declared rare or priority flora that occur on or in the vicinity of the project area.		EPA evaluation not required as there is no declared rare or priority flora identified that occur on or in the vicinity of the project area
Dunes	Disturbance associated with construction of inner boat harbour, resort and residential development.	**MfP:** Dune protection requires the preparation of a foreshore management plan which addresses protection of dunes during construction and remediation of existing damage at conclusion of works.	The dune system running parallel to the development requires extensive rehabilitation and beach access works, to ensure the dunes are not eroded and degraded through human activity.	EPA evaluation required
Surface water quality	Site is located in an extensive floodplain depression behind the dunes and to the east of Murat Road, and receives surface drainage from two catchments. Existing floodway will be intersected.	**MfP** The parkland depicted at the northern end of the canal residential estate should not be used for the disposal of stormwater because of the risk of contamination of the canal water quality with storm water. The design of the storm water system should ensure that road drainage spills onto vegetated areas, especially run-off from major events.	Will the retention of stormwater and resultant infiltration into the groundwater and adjacent marine environment result in a reduction of contaminant present in the stormwater? What is the likely contaminant in the stormwater?	EPA evaluation required.
Sea level	Filling, contouring and stabilising development site.	**MfP** The Gascoyne Coast Regional Strategy emphasises the need to take into account cyclones, climate change, flooding and storm surge when considering development along the coast, and states that "it is likely that an allowance ranging from 3.0-4.2m above AHD for development near the coast may be appropriate to accommodate flooding during extreme storm events with wave action". The assessment of building levels provided by the PER recommends a lowest floor level of 3.7m AHD. As the lots are to be constructed of fill, the detailed design should be such as to ensure that erosion of fill off the lots during high water events is minimised. The impact of climate change should be discussed in relation to increased cyclonic activity and sea level rise. **DEP:** DEP notes that development will need to meet requirements of Western Australian Planning Commission Policy DC 1.8 - Procedures for approval of artificial waterways and canal estates. Considered to be manageable under planning process.		EPA evaluation not required as this factor is considered to be manageable under planning process.

TABLE 2: IDENTIFICATION OF FACTORS

FACTOR	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Pollution				
Marine water quality	Construction of an inner boat harbour immediately inland of the Exmouth Boat Harbour (42.5ha).	**Department of Transport:** • The design needs to be flexible to the extent that a canal can be extended south of the inner harbour so that either marine industry or future residential development can be provided with canal frontage. • A lift bridge for greater flexibility is favoured to reduce the impact of the structure on the amenity of the development. • Costs associated with the provision of speed limit and canal navigation signage will need to be met by the proponent, not the DOT as specified in Table 8. **DEP:** What measures will the manager take to encourage waterway vessels to use sewage pumpout facilities? The managers of the waterway should either ban the taking of fish and other aquatic organisms from the waterway, or conduct regular ongoing monitoring in the waterway of edible biota (fish as well as molluscs) to determine which edible species are within the health limits and suitable for human consumption. An initial sediment quality baseline survey (sediment characteristics, toxicants (including TBT), relevant heavy metals and pesticides) should be undertaken, and repeated at 3 year intervals. **MfP** The PER does not consider the impact of nearshore processes on the development and vice versa. It appears that the DOT boat harbour will be fairly well flushed during spring tides, but the residential and tourist precinct will receive very little flushing, as acknowledged. This is a major concern.	The proposal to provide commercial fishing boat service facilities and associated marine service industries means that there will be vessels of over 25 metres using the facilities and therefore vessels likely to be using TBT based anti-fouling paints. Current management of commercial fishing boat maintenance is less than satisfactory, including such practices as 'bagging' vessels with chlorine based chemicals to remove fouling species. The boat servicing facilities should be managed as licence facilities and subject to stricter water quality controls than is proposed in the PER. Refuelling should be carried out in an area enclosed by suitable absorbent booms. The boat harbour has the potential to create some eutrophic conditions. What waste water management will be put in place from the proposed marine industrial facilities?	EPA evaluation required.
Groundwater quality	Increase in area of saltwater intrusion.	**Water and Rivers Commission:** • The proposal is downgradient of the Exmouth Water Reserve. • The hydrological study has touched on all the relevant groundwater issues. • Groundwater monitoring has been correctly recommended in Section 7.4 • The following points do not appear to be adequately covered in the modelling exercise: - there is a small groundwater flow component towards the site from the west (PER pg 71) - currently groundwater abstraction in the 'north' is already resulting in increased salinity in some bores (PER pg 26). This development is expected to result in an increase of 50% in water supply requirements (PER pg 60). Can the proponent state why these factors were not adequately covered in the modelling? It is suggested that the modelling may provide a slight under estimation of the impact that the introduction of more saline water could have on the area west of Murat Road (a predicated 120m (Section 3.3). With reference to Appendix C, the report by Rockwater Pty Ltd utilises hydrological data attained from the exploratory drilling undertaken for the project. However, other publicly available hydrological data from the area surrounding the Town of Exmouth has not been utilised. Can the proponent state why available hydrological data has not been utilised? An increase in salinity due to water abstraction could affect private bores in the area. How many monitoring wells will be established to observe any changes? **DEP:** The DEP notes that the EPA's assessment of the original proposal in March 1991 concluded that "dewatering to construct the marina is likely to affect private bore water supplies"	What is the impact of a large increase in water abstraction and what is the cumulative impact of water abstraction given the other proposed developments currently under investigation for the North West Cape, all of which will place additional demands on the limited groundwater of this area? What is the estimated water usage from the resort and marina facilities? Has the proponent considered alternative methods of supplying water to the development such as desalinisation plants? The PER has treated the expected demands on underground water supply generated by the project in isolation. Concern is expressed that ongoing water requirements of the proposed development will outstrip available underground water supplies which will lead to salinisation of the water supply. Can the proponent provide more detailed information in relation to this issue? The PER has proposed methods of waste management which may result in a number of pollutants, such as nutrients from domestic waste water eventually leach into the underground water system. It is unacceptable that the PER says that monitoring and management of potential nutrient contamination of the groundwater is the responsibility of the Water Corporation and outside the control of the proponent. What impact will an increased nutrient load anticipated from irrigation have on the groundwater and the adjacent marine environment? Can the proponent quantify the increased nutrient loading?	EPA evaluation required.
Noise and vibration	Construction of inner boat harbour, resort and residential development immediately south of Exmouth township, backing the Exmouth Boat Harbour (130 ha).	**DEP:** Considered to be manageable under Part V of the *Environmental Protection Act 1986* by ensuring proposal meets criteria in the Noise Abatement (Neighbourhood Annoyance) Regulations 1979 and the proposed Environmental Protection (Noise) Regulations (when promulgated) and any policies covering noise or vibration which have been endorsed by the EPA.		EPA evaluation not required as issue can be dealt with under Part V of the EP Act.

TABLE 2: IDENTIFICATION OF FACTORS

FACTOR	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Dust	Construction of inner boat harbour, resort and residential development immediately south of Exmouth township, backing the Exmouth Boat Harbour (130 ha).	**DEP:** Manageable under Part V of the *Environmental Protection Act 1986* by ensuring proposal meets EPA guidelines for Assessment and Control of dust and windborne Material from Land Development Sites, updated 1995.		EPA evaluation not required as the issue can be dealt with under Part V of the EP Act.
Soil contamination	Removal of two disused rubbish tips	**DEP:** Notes that there may be potential for soil contamination in disused rubbish tips.	The PER does not adequately address the impact of relocation of contaminated soil. Can the proponent describe the nature of the contaminants and the proposed disposal method and site. The PER refers to the plan for a site investigation to be carried out on the decommissioned tip site near the project area and the disused tip site in the project area to determine if contaminated material is present. Where and how will any contaminate material be disposed of?	EPA evaluation required.
Solid waste/ sewage	Waste minimisation and recycling will be encouraged.	**Water Corporation:** The development can be sewered and conveyed to the existing wastewater conveyance via a new pump station. The Corporation is currently reviewing the wastewater planning for Exmouth, which will include consideration of the proposed development and its impact on wastewater treatment facilities. The review is scheduled for completion by the end of July. The Water Corporation is not committed to relocation of the existing wastewater treatment plant. Any relocation is dependent upon negotiations with the developer of the marina and several other parties such as the navy, Shire, DEP and EPA in order that funding be provided for the relocation to occur. The management and monitoring of effluent reuse schemes operated by local authorities is not the responsibility of the Corporation.	Will waste water be treated from the development be treated to primary, secondary or tertiary level? The PER fails to look at alternative methods of domestic waste treatment such as composting toilets. Can the proponent make comment on why this has not been looked at?	EPA evaluation not required as the development will be sewered and processed at the existing wastewater treatment plant. The treatment plant is licensed under Part V of the EP Act.
Social Surroundings				
Heritage	Construction of inner harbour, resort and residential development as a landbacked extension to the Exmouth Boat harbour.	**DEP:** DEP notes that virtually all of the land is currently in Crown ownership. The exceptions are a small portion of the former North Cape Lodge site which is required for a road reserve, and Lots 395 and 850, the former Drive-In theatre site which will be incorporated into the northern deviation of Murat Road. A land exchange for these private freehold lots is proposed. Application for Native Title Claims to be advertised by DOLA. The proposal will need to comply with the Aboriginal Heritage ACT.		EPA evaluation not required as proponent has committed to ongoing consultation with Aboriginal groups.

TABLE 2: IDENTIFICATION OF FACTORS

FACTOR	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF RELEVANT FACTORS
Midges and Mosquitoes	Construction of Artificial waterway.	**Health Department:** The dominant species of midge which was trapped in April 1995 (*Styloconops sp.*) has a fairly limited dispersal (to some 50m inland). Although this small flight range may appear to reduce the potential impact of this species, it is already known that midges are a significant nuisance on the existing golf course and the proposed development is no further from the beach. Other midge species such as the Cullicoides spp. trapped during April 1995, are able to travel several kilometres from their breeding sites. The potential nuisance arising from the proximity of the proposed development to biting midge breeding areas is of great concern because control of biting midges is extremely difficult if not impossible. There are no chemical larvicides registered for biting midge control largely because the same chemicals which control mosquitoes and non-biting midges will only kill biting midges at environmentally unacceptably high application rates. The use of 'fogging' or adulticiding chemicals against adult biting can reduce numbers of insects when applied in ideal conditions. However, ideal conditions are seldom encountered and there are additional difficulties such as site access and acceptance of aerosol chemicals by residents. The adulticides of choice are maldison and bioresmethrin and both of these are non-specific, killing both midges and non-target animals. Physical disturbance by sand raking for example has been used with limited success for the control of some midge species. However, the biology of the many species (including Styloconops spp.) precludes this because the larvae occur too deep in sand. In summary there are no known methods for providing long-term sustainable control of biting midges. The only solution is to avoid urban development near midge breeding areas and this may require a buffer of 100m up to 1.5km, depending on the species of midge concerned. **Shire of Exmouth:** The species most common to the area adjacent to the proposed development is the Styloconopo sp; this species is a vicious biter most active during daylight hours from early morning until darkness falls. The species breeds in the beach sand between the low and high tide levels and the biting adults have been trapped at distances from the breeding area which will severely affect the people living in and attracted to the proposed development area. Will the proponent provide financial and scientific assistance to the Shire of Exmouth to determine that the major pest species does in fact breed along the sandy beaches, and will the proponent provide ongoing funding to ensure control measures are maintained? Has the proponent made a commitment to undertake a mosquito monitoring programme? Has the proponent considered other sources of monies to establish a mosquito monitoring programme? Will the control programme be achieved through spraying, and if so what chemicals will be used and what impact will this have on the terrestrial and marine environment? Will prospective purchasers of property in the area be informed in writing of the mosquito/ Ross River virus risk in the area?	Will the proponent develop a mosquito control programme and increase awareness of the midge problem?	Issue should be addressed by the proponent with the Health Department and Shire of Exmouth. Address as other advice and recommendation.
Road trucks	Road transport of both limestone and quicklime through Exmouth townsite to storage areas to be constructed adjacent to Point Murat jetty, associated with the Whitecrest proposal.	**DEP:** DEP notes that the EPA has concluded that noise from trucking movements associated with the Whitecrest proposal are environmentally acceptable and that the proposal meets the objective to ensure that the increase in traffic activities resulting from the project does not adversely impact on the social surroundings. The EPA considers the proposal to export limestone and/ or quicklime from the Point Murat site be limited to 1Mtpa so that there is an upper limit to the number of truck movements through the town of Exmouth.		The level of activity within acceptability criteria so that EPA evaluation not required.

TABLE 3: SUMMARY OF RELEVANT ENVIRONMENTAL FACTORS

Relevant Environmental Factors	EPA Objective	Evaluation Framework	Proponent's commitments	EPA Conclusion
Biophysical				
Groundwater	To maintain groundwater quality to ensure that existing and potential ground water uses are protected.	Meet requirements of the Water and Rivers Commission, Water Corporation.	Commitment to monitor private bores and pay for use of scheme water.	Given the advice of the WRC and the commitments by the proponent, the EPA believes impacts, including groundwater drawdown and salt water intrusion can be managed to ensure that existing and potential ground water uses are adequately protected.
Subterranean fauna.	To ensure that subterranean fauna are adequately protected, consistent with the *Wildlife Conservation Act 1950*, and that the abundance, diversity and geographical distribution and productivity of subterranean fauna are maintained.	Compliance with provisions of Wildlife *Conservation Act 1950.*		It is the EPA's opinion that the proposal can be managed to meet the EPA's objective provided that:: (i) prior to finalisation of marina and canal design the proponent carry out adequate stratified sampling for stygofauna within and in proximity to the development site to determine the array and distribution of stygofauna inhabiting the area; and (ii) based on the finding of this sampling and prior to commencement of construction of the marina and canals, the proponent prepare a final design for the marina and canals, and construction plan to ensure that stygofauna are protected consistent with the provisions and intent of the Wildlife Conservation Act 1950.

Dunes.	To maintain the integrity, function and environmental values of the dune system.	WAPC Policy on Development Control No. 1.6 - Consistent with Country Coastal Planning Policy	Prior to construction, the proponent will prepare a Foreshore Reserve Management Plan meeting the objectives and specifications outlined in Section 7.3 of the PER and SPC Policy DC No 6.1, the Country Coastal Planning Policy in regard to Foreshore Management, in consultation with the MfP, CALM and the Shire of Exmouth. The proponent will implement the plan during the construction phase (including demarcation of the sand dunes with temporary fencing to prevent encroachment into the dune areas) and conduct regular monitoring and maintenance of the foreshore reserve for an agreed period to be specified in the plan, prior to management by the Shire of Exmouth. The Foreshore Reserve Management Plan will include: • methods and design of foreshore protection (ie fencing); • landscape and rehabilitation design and implementation; • location of public access ways and paths; • public access and signage; and • management responsibility. The Plan will be integrated with the Sand Dune Management Plan already prepared for the outer Exmouth Boat Harbour Project.	Given the commitments by the proponent, the EPA believes impacts can be managed so that the integrity, function and environmental values of the dune system is maintained.

Surface water.	To ensure that changes to the hydrological role of the floodplain do not result in unacceptable environmental impacts.	To meet requirements of the Shire of Exmouth and the Water and Rivers Commission.	Prior to construction, the proponent will prepare and implement a detailed Drainage Design and Management Plan (to include the necessary sizings of the major dissipation basins and other flood and stormwater control measures), and meeting the objectives outlined in Section 7.2 of the PER, to the requirements of the DEP, in consultation with the WRC, MfP and the Shire of Exmouth. The objectives stated within Section 7.2 of the PER are as follows: • to divert internal stormwater runoff away from the proposed development area; • to maintain the role of the flood plain and prevent flooding of adjacent low lying areas; • to minimise the nutrient and contaminant input into the waterways; and • to ensure minimum building levels allow for episodic high storm surge events..	Given the commitments by the proponent, the EPA believes that changes to the hydrological role of the floodplain will not result in unacceptable environmental impacts.

Relevant Environ-mental Factors	EPA Objective	Evaluation Framework	Proponent's commitments	EPA Conclusion
Pollution				
Marine water quality.	To meet requirements of the EPA's Environmental Water Quality Objectives (EQO) and draft Western Australian Water Quality Guidelines for Fresh and Marine Waters (EPA Bulletin 711)	To meet requirements of • draft Western Australian Water Quality Guidelines for Fresh and Marine Waters (EPA Bulletin 711), • Water and Rivers Commission in relation to dredging. • Waterways Commission Guidelines No. 9, 1995. • WAPC Policy DC 1.8	Prior to construction, the proponent will prepare a Water and Sediment Quality Monitoring Program (WSQMP) for the inner marina and canal waterways, meeting the objectives and specifications outlined in Section 7.5.2 of the PER, in consultation with DOT and the Shire of Exmouth. The WSQMP will be implemented by a waterways manager, to be agreed with the Shire of Exmouth, during the preparation of the program. The objectives stated within Section 7.5.2 of the PER are as follows: The proposed water quality management and monitoring for the waterways will be maintained to the same standard as, and integrated with, the existing Water and Sediment Quality Monitoring Program (WSQMP) prepared for the DOT Exmouth Boat Harbour (Bowman Bishaw Gorham, 1997). The objectives and contents of the existing WSQMP are as follows: 1. to test for possible adverse impacts of the Exmouth Boat Harbour upon the adjacent waters of the Exmouth Gulf. 2. to assess the effectiveness of the management strategies in maintaining high water quality within the harbour, in order to highlight any possible need for corrective actions.	Given the commitments by the proponent, the EPA believes that marine water quality can be managed to meet requirements of the EPA's Environmental Water Quality Objectives (EQO) and draft Western Australian Water Quality Guidelines for Fresh and Marine Waters (EPA Bulletin 711).

Soil contamination.	To ensure the site is cleaned up to an acceptable level for proposed land use in accordance with ANZECC & NHMRC Guidelines for the assessment and management of contaminated sites.	Compliance with ANZECC & NHMRC Guidelines for the assessment and management of contaminated sites.	Prior to construction, the proponent will conduct a contaminated site assessment of the two disused rubbish tip sites and the racecourse, in accordance with the ANZECC & NHMRC guidelines for the assessment and management of contaminated sites, in consultation with the DEP. During construction, the proponent will implement any recommendations arising from the contaminated site assessment.	Given the commitments by the proponent, the EPA believes impacts can be managed to ensure the site is cleaned up to an acceptable level for proposed land use.

Appendix 1

Figures

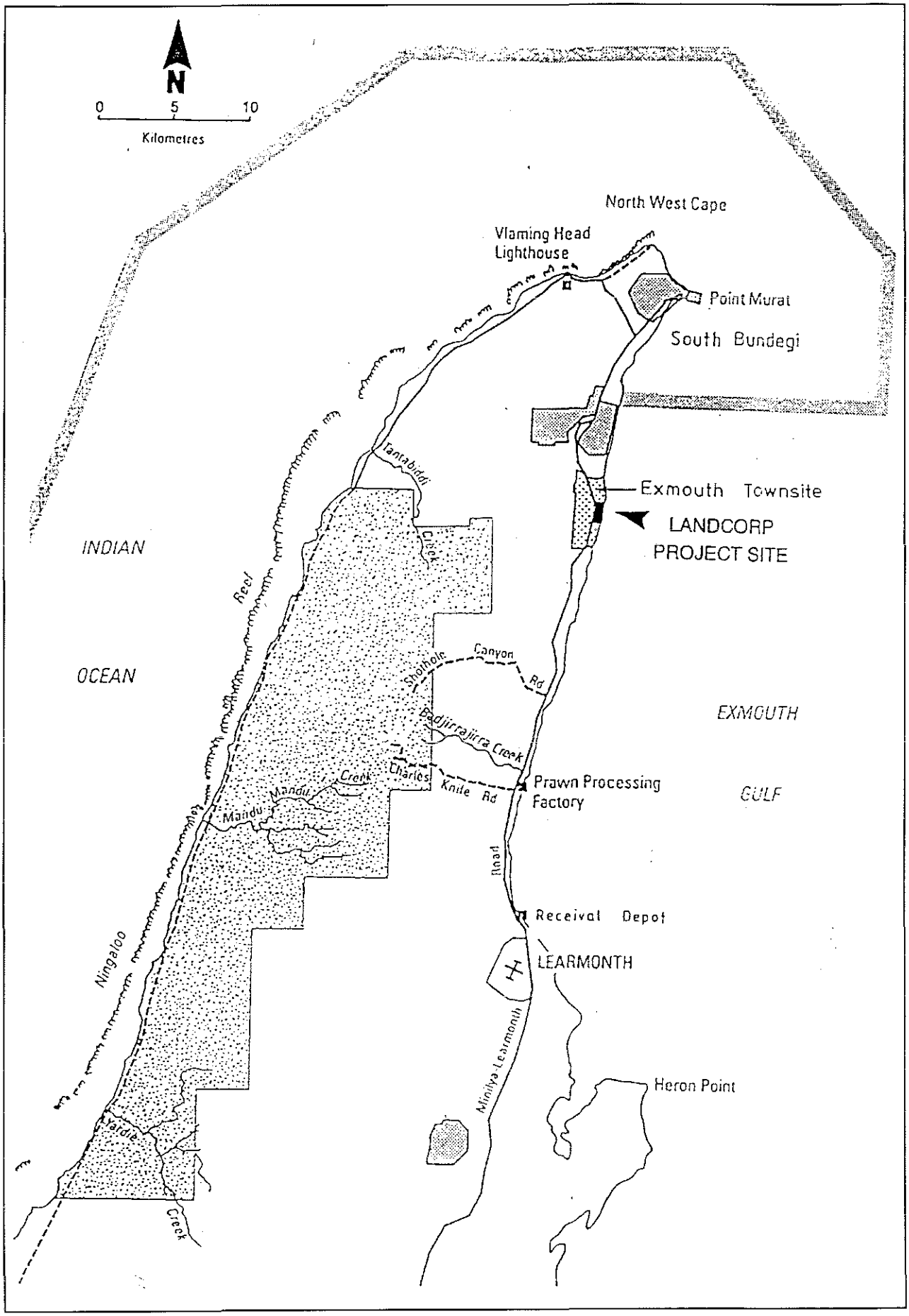

Figure 1. Location of proposed site (Source: Bowman Bishaw Gorham, 1996).

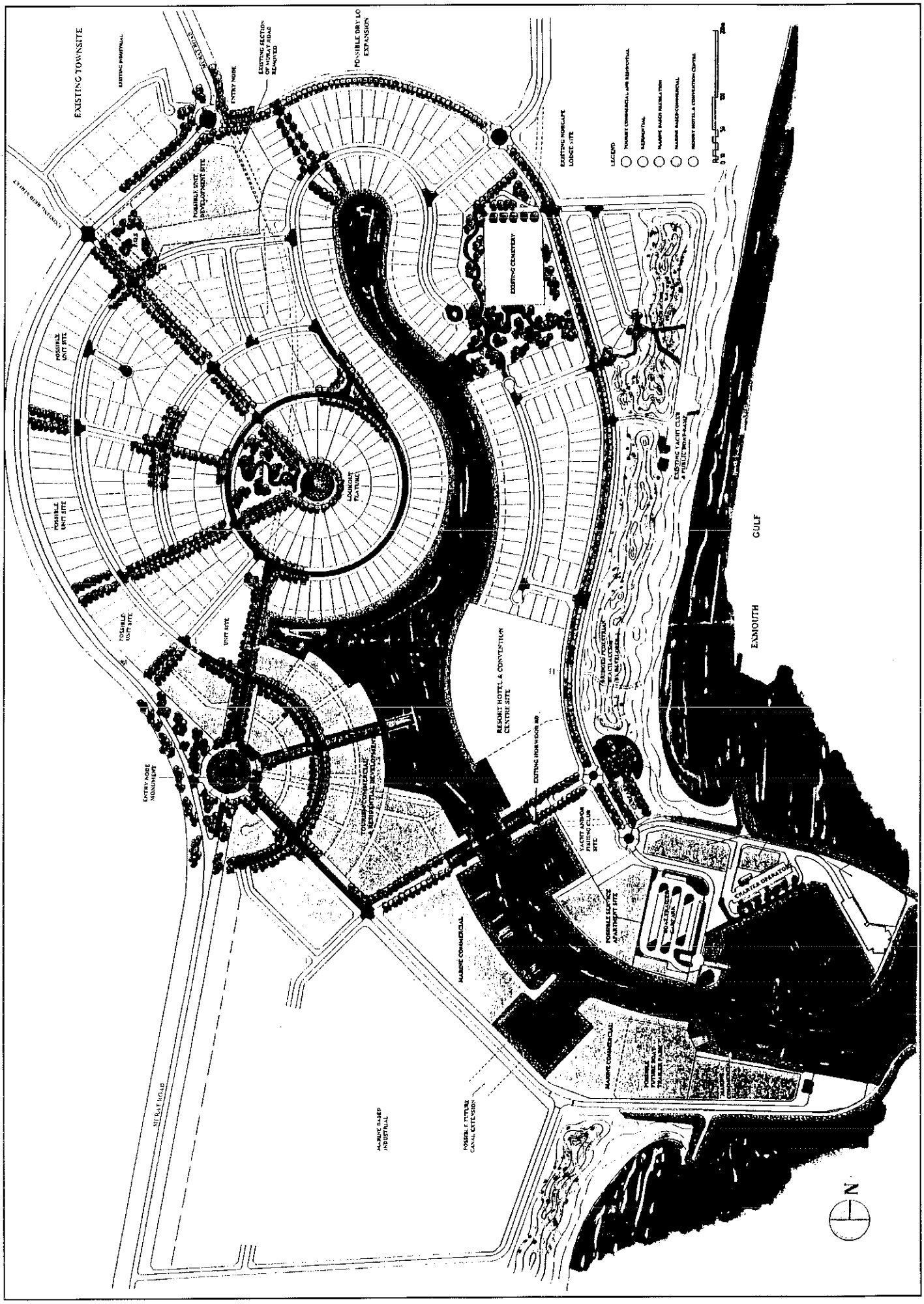

Figure 2. Conceptual Master Plan (Source: Bowman Bishaw Gorham).

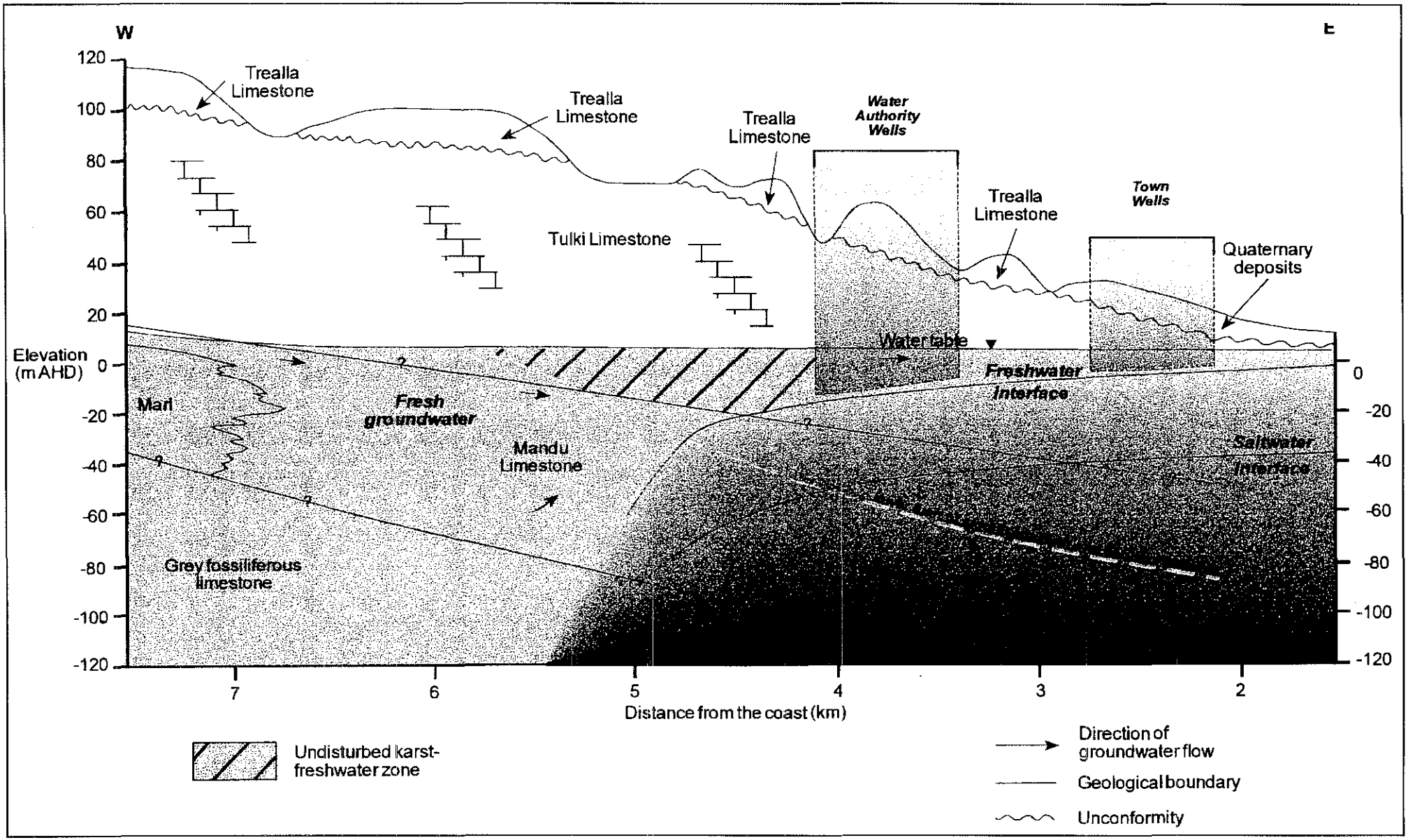

Figure 3. Generalised hydrogeological cross section of the Exmouth Groundwater Area.

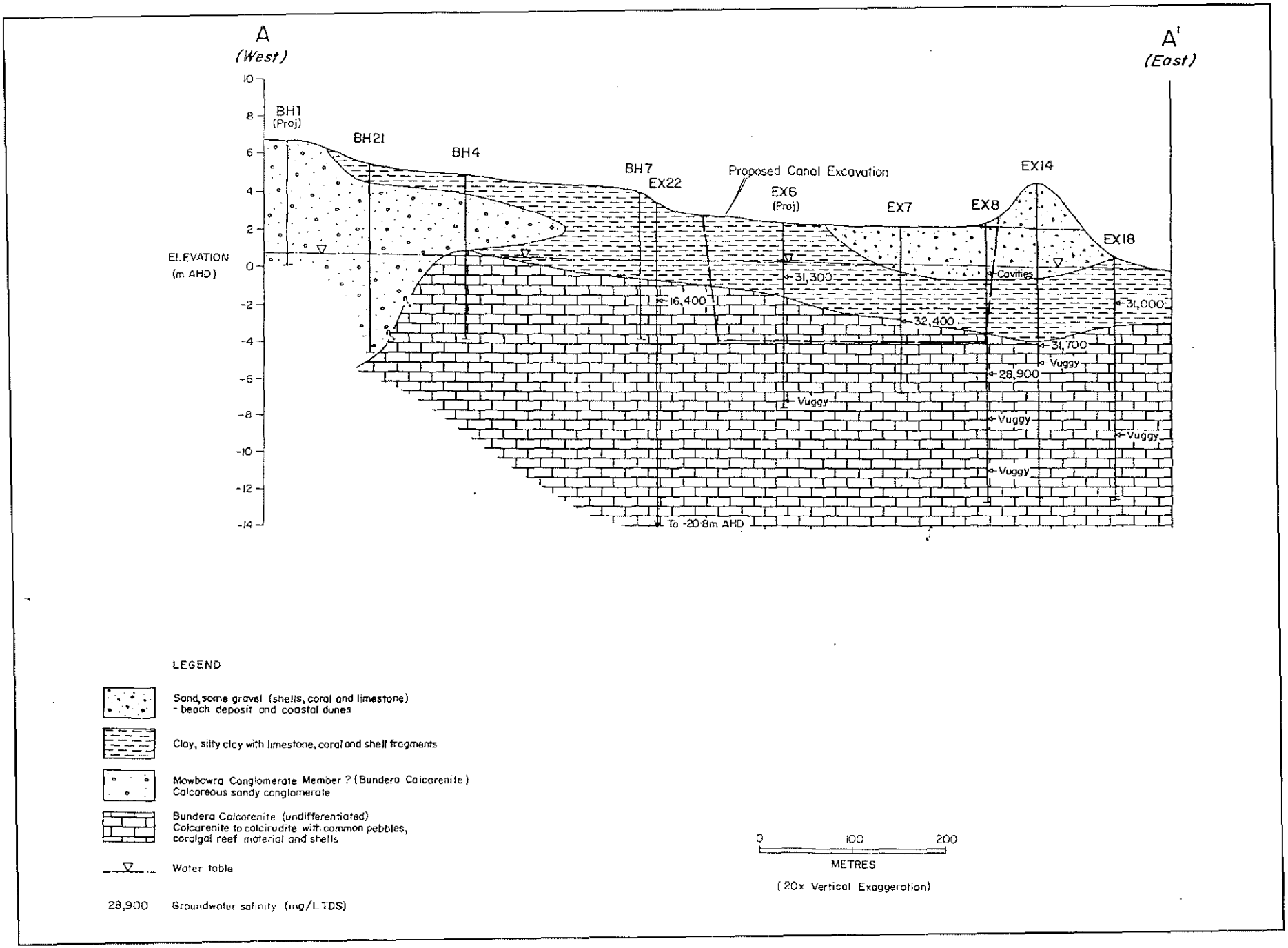

Figure 4. Hydrologeological cross-section of site (Source: Bowman Bishaw Gorham).

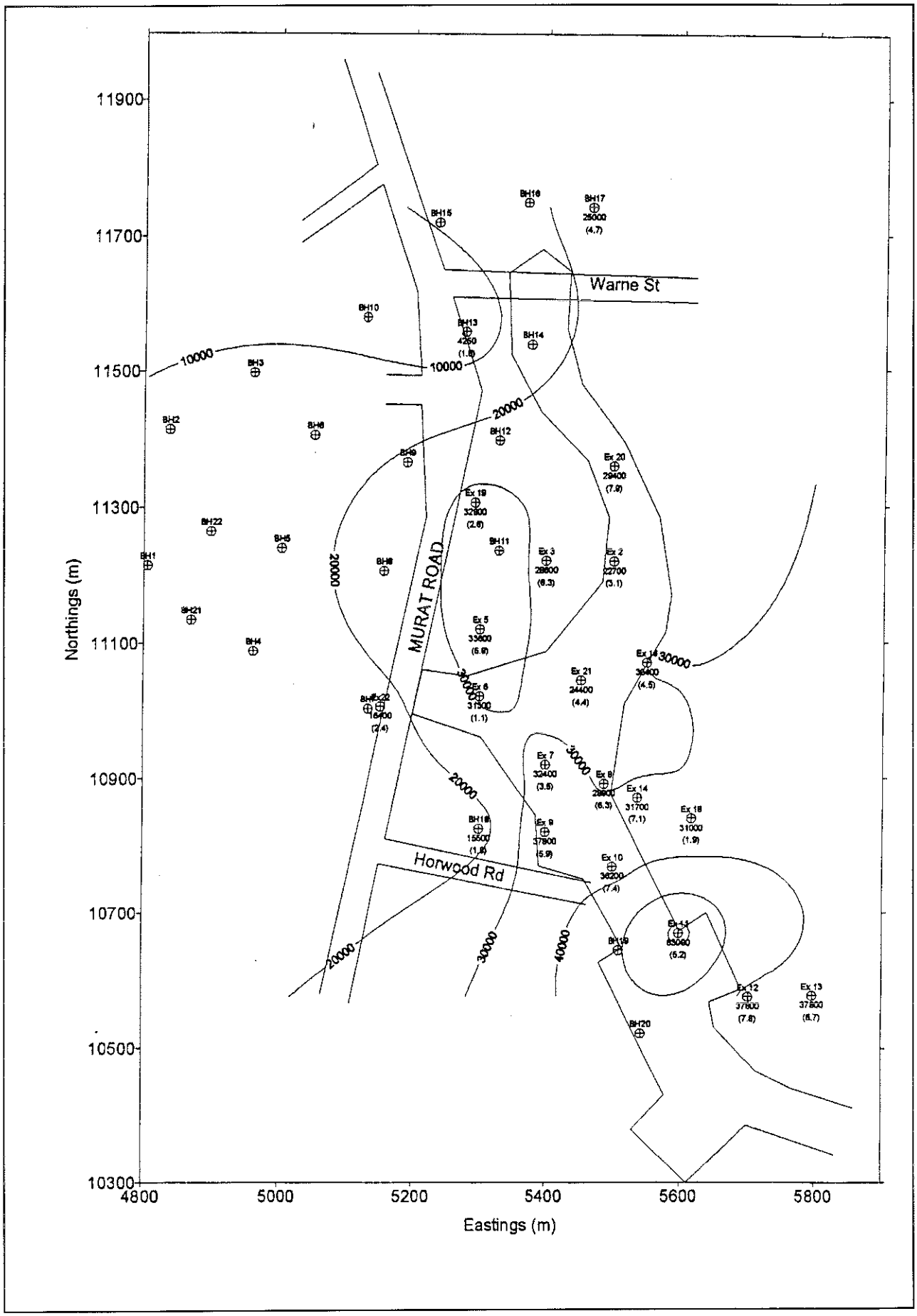

Figure 5. Groundwater salinity (mg/L TSS) near top of aquifer.

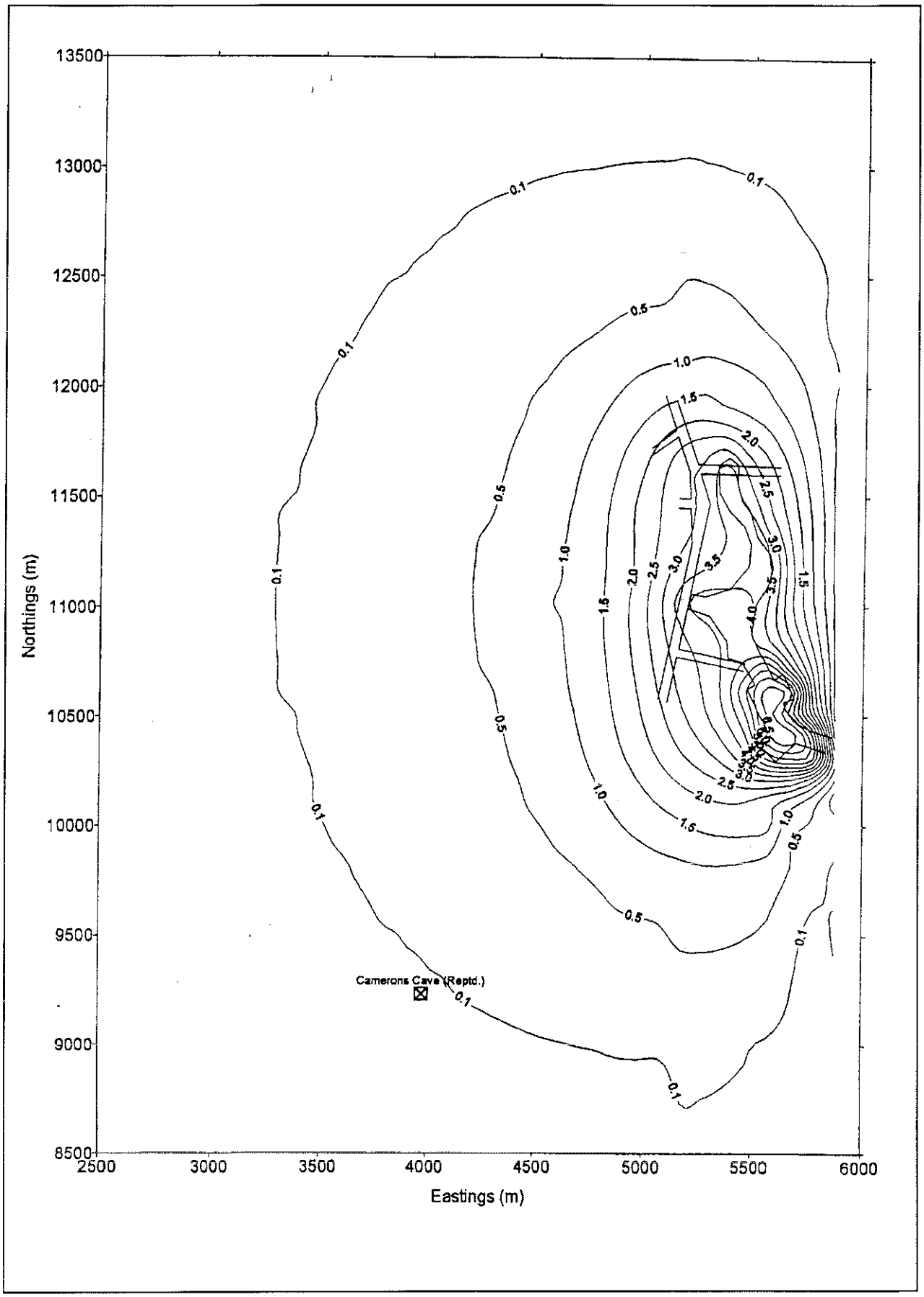

Figure 6. Model-calculated drawdowns (m) after 180 days dewatering to -3.5 to -6.4m AHD (model reported in the PER).

Appendix 2

List of submitters

State and local government agencies:

- Department of Transport
- Fisheries Department of Western Australia
- Health Department of Western Australia
- Ministry for Planning Western Australia
- Water Corporation
- Waters and Rivers Commission
- Western Australia Museum
- Western Australia Tourism Commission
- Shire of Exmouth

Organisations:

- Conservation Council of Western Australia Inc
- Ningaloo Action Group

Members of the Public:

- Mrs D A Preest

Appendix 3

References

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Appendix 4

Recommended Ministerial Conditions and Proponents Commitments for

EXTENSIONS TO EXMOUTH MARINA HARBOUR (1070)

Statement No.

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

MARINA, RESORT AND RESIDENTIAL DEVELOPMENT
- EXTENSION TO EXMOUTH BOAT HARBOUR
EXMOUTH (1070)

LANDCORP

This proposal may be implemented subject to the following conditions:

1 Proponent Commitments

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

1-1 In implementing the proposal, the proponent shall fulfil the commitments made in the Public Environmental Review (Bowman Bishaw Gorham, 1997), as subsequently modified during the environmental assessment process conducted by the Environmental Protection Authority and those made as part of the fulfilment of the requirements of conditions in this statement requiring the preparation of an environmental management programme(s); provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

In the event of any inconsistency, the conditions and procedures shall prevail to the extent of the inconsistency.

The attached consolidated environmental management commitments form the basis for consideration by the Chief Executive Officer of the Department of Environmental Protection for auditing of this proposal in conjunction with the conditions and procedures contained in this statement.

2 Implementation

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

2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal.

2-2 Where, in the course of the detailed implementation referred to in condition 2-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Proponent

These conditions legally apply to the nominated proponent.

3-1 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.

4 Environmental Management System

The proponent should exercise care and diligence in accordance with best practice environmental management principles.

4-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to construction, the proponent shall prepare environmental management system documentation with components such as those adopted in Australian Standards AS/NZS ISO 14000 series, in consultation with the Department of Environmental Protection.

4-2 The proponent shall implement the environmental management system referred to in condition 4-1.

5 Environmental Management Plans

5-1 Prior to commencement of construction, the proponent shall prepare Environmental Management Plans, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, the Department of Conservation and Land Management and the Water and Rivers Commission.

These Plans shall address, but not be limited to the following:

1 Protection of foreshore reserve and coastal dunes;

2 Dewatering of groundwater - prevention of turbid water discharge;

3 Disposal of dredge spoil and excess excavation material;

4 Water and sediment quality in the Inner Harbour Marina and canal waterways; and

5 Site and groundwater contamination.

5-2 The proponent shall implement the Environmental Management Plans required by condition 5-1.

6 Subterranean Fauna

6.1 The proponent shall design and construct the marina and canal development in a manner which ensures there is no significant risk to subterranean fauna.

6.2 Prior to finalisation of marina and canal design the proponent shall carry out adequate stratified sampling for stygofauna within and in proximity to the development site to determine the array and distribution of stygofauna inhabiting the area, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management.

6.3 Based on the findings of the sampling referred to in condition 6.2 and prior to commencement of construction of the marina and canals, the proponent shall prepare a marina and canal design and construction plan to ensure that stygofauna are protected in accordance with the Wildlife Conservation Act 1950, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority and the Department of Conservation and Land Management.

The plan shall include but not be limited to the following:

(1) the dewatering strategy;
(2) the predicted impacts on groundwater levels and salinity;
(3) groundwater monitoring; and
(4) contingency measures in the event that monitoring indicates that excessive drawdown may occur (including the feasibility of constructing the marina and canals without dewatering).

6.4 The proponent shall make the sampling program required by condition 6.2 and the marina and canal design and construction plan required by condition 6.3 available for public review.

7 Commencement

The environmental approval for the substantial commencement of the proposal is limited.

7-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced.

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

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

8 Compliance Auditing

To help determine environmental performance and compliance with the conditions, periodic reports on the implementation of the proposal are required.

8-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Procedure

1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

Note

1 The Environmental Protection Authority reported on the proposal in Environmental Protection Authority Bulletin 86X (October 1997).

Proponent's Consolidated Environmental Management Commitments

October 1997

MARINA, RESORT AND RESIDENTIAL DEVELOPMENT - EXTENSION TO EXMOUTH BOAT HARBOUR EXMOUTH (1070)

LANDCORP

AMENDED COMMITMENTS *29 October 1997*

The principal project design and environmental management commitments given by the proponent are as follows:

1. Prior to finalisation of the canal design, the proponent will undertake detailed flushing studies to ensure water quality in the waterways will be maintained to the standard as outlined in Section 7.5.2 of the PER and demonstrate that the canal design meets the requirements of SPC Policy DC 1.8, where appropriate. This commitment will be undertaken in consultation with the Ministry for Planning, Water and Rivers Commission and the Department of Transport.

2. Prior to construction, the proponent will prepare and implement a detailed Drainage Design and Management Plan (to include the necessary sizings of the major dissipation basins and other flood and stormwater control measures), and meeting the objectives outlined in Section 7.2 of the PER, to the requirements of the Department of Environmental Protection, in consultation with the Water and Rivers Commission, Ministry for Planning and the Shire of Exmouth.

   The objectives stated within Section 7.2 of the PER are as follows:

   - to divert internal stormwater runoff away from the proposed development area;
   - to maintain the role of the flood plain and prevent flooding of adjacent low lying areas;
   - to minimise the nutrient and contaminant input into the waterways; and
   - to ensure minimum building levels allow for episodic high storm surge events.

3. Prior to construction, the proponent will prepare a Foreshore Reserve Management Plan meeting the objectives and specifications outlined in Section 7.3 of the PER and Western Australian Planning Commission Policy DC No 6.1, the Country Coastal Planning Policy in regard to Foreshore Management, in consultation with the Ministry for Planning, Department of Conservation and Land Management and the Shire of Exmouth. The proponent will implement the plan during the construction phase (including demarcation of the sand dunes with temporary fencing to prevent encroachment into the dune areas) and conduct regular monitoring and

maintenance of the foreshore reserve for an agreed period to be specified in the plan, prior to management by the Shire of Exmouth.

The Foreshore Reserve Management Plan will include:

- methods and design of foreshore protection (ie fencing);
- landscape and rehabilitation design and implementation;
- location of public access ways and paths;
- public access and signage; and
- management responsibility.

The Plan will be integrated with the Sand Dune Management Plan already prepared for the outer Exmouth Boat Harbour Project.

4. Prior to construction, the proponent will prepare a Dewatering Management Plan metting the objectives and specifications outlined in Section 7.5.2 of the PER to ensure minimal turbid water discharge, in consultation with the Department of Transport and the Water and Rivers Commission. The plan will be implemented during the construction phase.

5. Should disposal of dredge spoil or excess excavation material outside of the project area be required, the proponent will prepare and implement a dredge spoil management plan in accordance with Water and Rivers Commission guidelines, in consultation with the Department of Transport and the Water and Rivers Commission.

6. Prior to construction, the proponent will prepare a Water and Sediment Quality Monitoring Program (WSQMP) for the inner marina and canal waterways, meeting the objectives and specifications outlined in Section 7.5.2 of the PER, in consultation with the Department of Transport and the Shire of Exmouth.

7. Prior to construction, the proponent will conduct a contaminated site assessment of the two disused rubbish tip sites and the racecourse, in accordance with the ANZECC & NHMRC guidelines for the assessment and management of contaminated sites, in consultation with the Department of Environmental Protection. During construction, the proponent will implement any recommendations of the Department of Environmental Protection arising from the

contaminated site assessment to ensure the proposal site and groundwater is not contaminated.

8. During construction, dust emissions from the project area during construction activities will be managed and monitored in compliance with the Environmental Protection Authority's Guidelines for Assessment and Control of Dust and Windborne Material from Land Development Sites", upon advice from the Shire of Exmouth.

9. Prior to completion of construction of the marina and waterways, the proponent will enter into an agreement with the Shire of Exmouth and the Department of Transport which clearly delineates responsibilities for the physical maintenance and management of the waterways.

10. For and initial agreed period following construction, then subject to the agreement with the Shire of Exmouth, the proponent will annually monitor the depths of the canals and the entrance channel to ensure safe navigable depths, upon advice from the Department of Transport and Shire of Exmouth. If and when required, the proponent (or the Shire of Exmouth subject to agreement) will submit plans for dredging and disposal of dredged material to the Department of Environmental Protection for approval prior to their implementation.

11. The effects of dewatering upon nearby domestic bores will be monitored by the proponent and, in the event that the bores become unsuitable for existing use, the proponent will pay the affected bore owner to use scheme water for the period of effect, or other arrangements as negotiated with the owner. This commitment will be fulfilled on advice of the Water and River Commission.

12. Prior to construction, the proponent will consult with any Aboriginal groups making Native Title Claim over the project area to establish the relationships between the environment and the Aboriginal group(s). The proponent will also consult with relevant Aboriginal groups with respect to Aboriginal Heritage, to establish the relationships between the environment and Aboriginal Heritage values. The proponent will ensure that those elements of the environment which are related to these Claims or Heritage values are protected, to the satisfaction of the Department of Environmental Protection.