

H & B DEVELOPMENTS PTY LTD

GOLDEN BAY

**AMENDMENT TO THE
METROPOLITAN REGION SCHEME
(AFFECTING PART OF THE SYSTEM 6 AREA M107)**

PUBLIC ENVIRONMENTAL REVIEW

**ALAN TINGAY & ASSOCIATES
&
MARTIN GOFF & ASSOCIATES**

MAY 1992

REPORT NO: 91/19

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AN INVITATION TO COMMENT ON THIS PER

The Environmental Protection Authority (EPA) invites people to make a submission on this Public Environmental Review (PER).

H&B Developments Pty Ltd have proposed to develop a parcel of land to the north and east of the township of Golden Bay in the City of Rockingham. The proponent wishes to rezone this land and this is the subject of the PER. In accordance with the Environmental Protection Act 1986, a Public Environmental Review (PER) has been prepared which describes these proposals and their likely effects on the environment. The PER is available for public review for 8 weeks from Monday 4 May, 1992 to Monday 29 June, 1992.

Comments from Government Agencies and from the public will assist the EPA to prepare an Assessment Report in which it will make recommendations to Government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated confidentially unless it is stated that they can be used publicly, then they may be quoted either in full or in part in each report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining with a group or other groups interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal environmentally more acceptable.

When making comments on specific proposals in the PER:

- o clearly state your point of view;
- o indicate the source of your information or argument if this is applicable; and
- o suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- o attempt to list points so that the issues raised are clear. A summary of your submission is helpful;
- o refer each point to the appropriate section, chapter or recommendation in the PER;
- o if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- o attach any factual information you wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- o your name;
- o address; and
- o date.

The closing date for submissions is:

29 June, 1992

Submissions should be addressed to:

The Chairman,
Environmental Protection Authority
Westralia Square
38 Mounts Bay Road
PERTH WA 6000

Attention: Ms J Boyer

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SUMMARY

1. Introduction

The proponent, H&B Developments Pty Ltd owns land to the north and east of the Township of Golden Bay in the City of Rockingham. The owners wish to develop the land in the near future. A section of the subject land is affected by part of the System 6 Area M107. The proponent proposes to apply for rezoning of the land from mostly Urban Deferred to Urban as the first step of development and this rezoning and its effect on System 6 recommendations M107 is the subject of this Public Environmental Review (PER).

2. The Proposal

Land Uses

The proposal involves the rezoning of land to the north and east of the township of Golden Bay to Urban and Parks and Recreation. Major uses will be residential, Region Open Space, Local Open Space, a primary school, important regional roads, a neighbourhood centre, community uses, tourist uses, and a service station. Of particular importance is the effect of the provision of these uses on the System 6 Area M107.

3. The Existing Environment

Physical Features

The Golden Bay property features several distinct landforms. A single geomorphic unit, the Quindalup Dune System, covers most of the property. In the eastern section, however, this system overlies a second geomorphic unit, the Spearwood Dune System.

Five distinct geomorphic components of the Quindalup Dune System are readily recognisable at Golden Bay. In sequence from the coast inland these are as follows; a recent shore parallel ridge plain; a linear deflation basin; an association of relatively tall sand dunes; an older shore parallel ridge plain; a series of fretted parabolic dunes.

Groundwater

A shallow unconfined aquifer occurs beneath the Golden Bay property. The water table ranges from 1 to 20 metres below ground level.

Wetlands

The only wetlands on the property are situated in a depression immediately behind the recent dune ridge plain adjacent to the beach and in the dunes to the east of this area.

Here the water table rises to ground level during winter and spring and then falls again causing the area to dry out during summer.

Vegetation and Flora

The vegetation of Golden Bay includes two vegetation complexes. Most of the area includes the Quindalup Complex while the easternmost section consists of the Cottesloe Complex (Central and South). Within both vegetation complexes is an array of vegetation associations depending on soil type and geomorphology.

A total of 142 plant species were recorded from Golden Bay including 32 introduced species and 110 native species. Two species are included on the CALM Declared Rare and Priority Flora List.

4. Analysis Of Environmental Issues

Regional Implications of the Proposal

Three proposed reserves are relevant to the evaluation of the proposal for residential development at Golden Bay. These are the proposed Regional Open Space at Port Kennedy, the proposed coastal reservation at Secret Harbour, and the reserve for the Stakehill Suite of wetlands. These reserves include landform, vegetation and fauna habitat similar to those at Golden Bay. In this context, it may be concluded that the physical and biological features of the Golden Bay property do not have regional environmental significance.

System 6 Area M107

Part of the property is the subject of EPA recommendations relating to System 6 Area M107. This area comprises a series of narrow strips of land at Golden Bay, Singleton and Madora which extend from the coast inland where they connect with a north/south strip of land to the west and paralleling Mandurah Road. The most significant of the EPA recommendations relating to Area M107 states that planning procedures should be developed to generally protect the areas recreation and landscape values. It is noteworthy that reservation for conservation purposes is not specifically recommended.

In the contemporary planning context of 1992 the value of preserving Area M107 as buffer for development can be questioned. At the regional planning level the emphasis for protection of environmental features has shifted as a result of better information on the regions asset, to Port Kennedy, the Stakehill Suite of wetlands and a large area of remnant Banksia Woodland near the Serpentine River.

The recent Special Rural subdivisions in Area M107 along Mandurah Road, adjacent to Golden Bay suggest that DPUD, the City of Rockingham and the EPA have provided for the protection of landscape values associated with the land. Whilst the landscape values have been protected the recreation aspect of the recommendation is no longer as

relevant, therefore the requirement to provide links from parts of Area M107 adjacent to Mandurah Road to the coast in a recreational sense needs to be re-evaluated.

The analysis presented in this PER suggests that the component of Area M107 on the Golden Bay property does not contain landforms or support vegetation of exceptional quality or interest in the regional context and as such it is not justified that it remain in the location as proposed by the System 6 Study. With regard to the remainder of the System 6 Recommendation M107 the area, which covers not only Golden Bay but also Singleton and Madora, is discussed as a whole in Appendix 2 of this PER.

Exchange for System 6 Area M107

As discussed in the previous section the proponent considers that the area originally recommended for protection by the System 6 Recommendation M107 can be developed, and in return other land with greater recreational and landscape value will be reserved for the public.

Open Space and the Coastal Reserve

It is proposed that additional Open Space along the foreshore will be provided as an alternative to that proposed by the System 6 recommendations relating to Area M107.

Coastal protection procedures appropriate for the Perth Metropolitan Region are described in the Draft Statement of Planning Policy No. 2 published by the State Planning Commission. The recommended width of the actual Coastal Reserve on coasts such as at Golden Bay is 100m. The proposed Structure Plan for Golden Bay complies with the recommendations of Planning Policy No. 2 and considerably exceeds the width requirement for the Coastal Reserve which is more than 150m wide and in some places 300m wide. It is proposed that as an alternative to reserving the area recommended as System 6 Area M107 that the foreshore reserve be considerably expanded by the addition of adjoining land. This additional area will be in excess of 7.13ha of prime coastal land.

DPUD and Local Authorities generally require an area equivalent to 10% of the area proposed for subdivision to be set aside as POS. Approximately 25.7ha of land as POS is required at Golden Bay of which 14.03 has been provided. It is proposed that 0.9ha of land be provided in excess to the requirements for further Open Space as coastal reserve.

The additional ROS and POS is provided to achieve the objectives of System 6 recommendations that apply to the land. This extra land is along the coast and the boundary of the area is based on landform features. In the south, the inland or eastern boundary of the reserve is aligned along the eastern edge of the linear swale which separates the coastal Beach Ridge dune system from the inland tall Quindalup Dunes. The reserve here includes all of the near coastal Beach Ridge system and a relatively large area of the swale with representative areas of all of the swale vegetation types examples of damplands.

Groundwater and Drainage

The proposed development at Golden Bay is not expected to have any significant implications for local groundwater or groundwater utilisation.

Wetlands

The eastern extension of the Coastal Reserve at Golden Bay has primarily been designed to incorporate examples of the Peelhurst Suite of wetlands. Specific protection and management measures will be defined in the Coastal Reserve Management Plan.

Vegetation and Flora

The vegetation and flora at Golden Bay is typical of the near coastal areas between Rockingham and Mandurah. Representative examples of this vegetation will be protected in the relatively large reserve proposed for Port Kennedy and within the coastal reserve of Secret Harbour, Port Kennedy and Golden Bay. Typical vegetation of tall near coastal Quindalup Dunes will be protected within Secret Harbour. In general, therefore, it is not considered that there should be any specific requirement for vegetation retention at Golden Bay.

5. Conclusions

The analysis of environmental issues presented in this PER concludes that the proposed development of Golden Bay for urban purposes is typical of that of urban subdivision. At the regional level, land has been set aside for conservation purposes at a number of locations which incorporate the major landforms and vegetation types which occur at Golden Bay. It is concluded then that the development has no significant environmental implications at the regional level.

With regard to the System 6 recommendations for Area M107, the proponent recognises their importance and has evaluated both the existing recommendations and a number of alternatives in addressing this issue. The proponent believes that in this regard the community of Golden Bay will be better served by the alternative proposed in this PER, that is a considerably expanded coastal reserve. This coastal reserve will contain areas that have conservation, landscape and recreational value. In addition, the Coastal Reserve would be more easily managed than the area originally proposed as part of System 6 Area M107.

1. INTRODUCTION

1.1 Background

H&B Developments Pty Ltd own land to the north and east of the Township of Golden Bay in the City of Rockingham. The land is currently zoned Urban Deferred although a section along the coast is zoned Parks and Recreation and some land in the east is zoned Rural. The location of the property is shown in Figure 1.

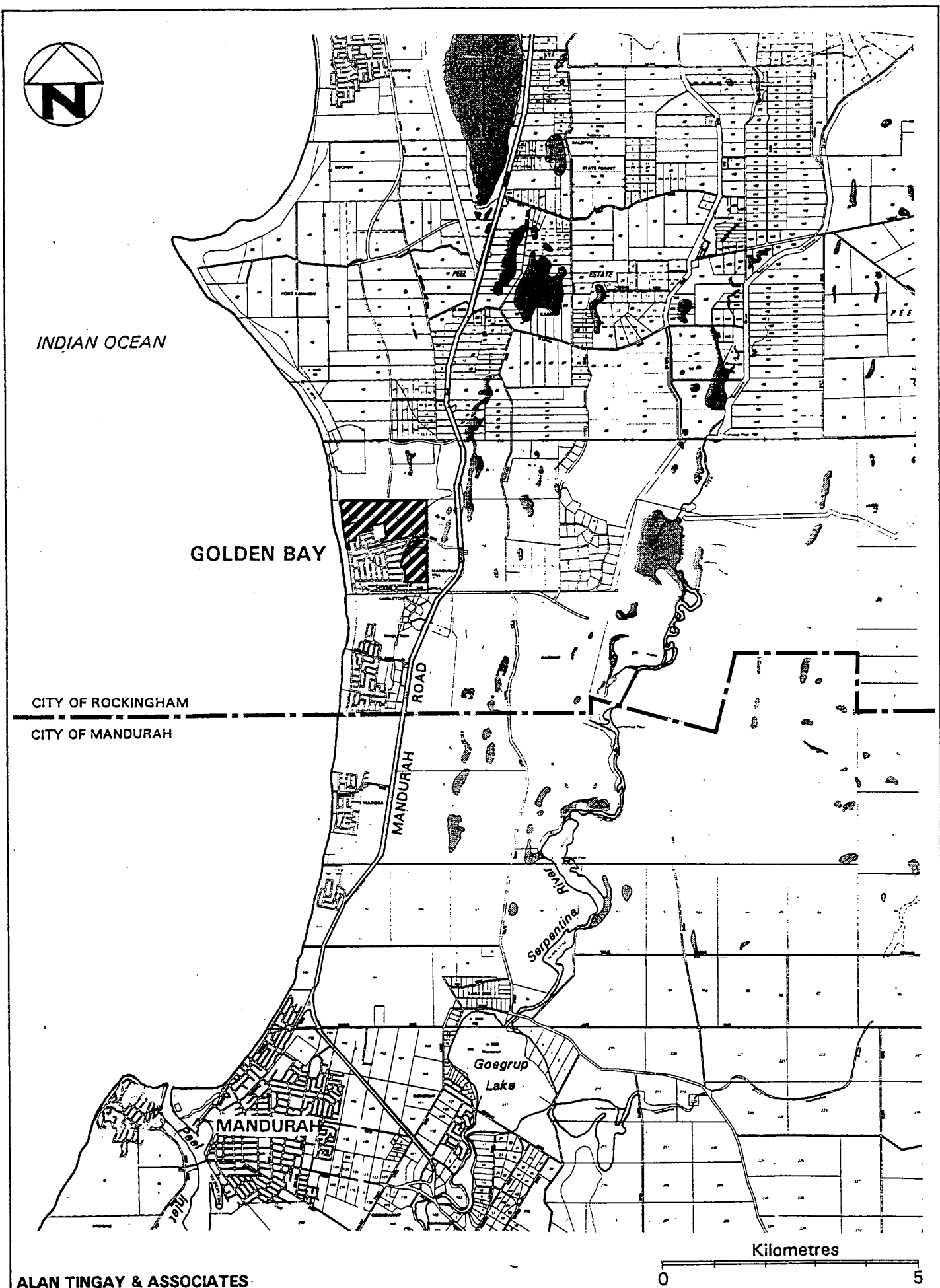
The owners wish to develop the land in the near future principally for residential areas and associated community and recreation facilities. As the first step in this process, H&B Developments Pty Ltd intend to apply for rezoning of the majority of the land to Urban. They also propose to provide additional land for Parks and Recreation adjacent to the coast.

A section of the land is affected by part of a System 6 Area. In 1983, the Environmental Protection Authority (EPA) recommended that "ways and means of protecting the recreational and landscape values" of this section "be sought through planning procedures to be developed". Since 1983 some parts of the System 6 Area, which are not part of the Golden Bay property owned by H&B Developments Pty Ltd, have been rezoned from Rural to Special Rural and have been subdivided. This was done with the approval of the EPA in a manner that protected the landscape values of the land in accordance with EPA advice.

H&B Developments Pty Ltd consider that allocation of the section of the System 6 Area on their property to Parks and Recreation is not justified in terms of the recreational, and natural values of the area and would not accord with the planning priorities of the Department of Planning & Urban Development (DPUD) or the City of Rockingham. Instead, the owners believe that a larger Coastal Reserve will contribute a greater benefit to the present and future community at Golden Bay. To achieve this the proponent has allocated a significant portion of high value coastal land for recreation and conservation purposes.

A Structure Plan has been prepared which shows the proposed rezonings and also provides a conceptual indication of the future Urban development. An earlier version of this Structure Plan was submitted to DPUD for its consideration. DPUD referred this proposal to the EPA as required under the provisions of the Environmental Protection Act, 1986. After due consideration, the EPA decided that as the rezoning application would affect part of a System 6 Area, the proposal should be subject to formal assessment by means of a Public Environmental Review (PER) as this would provide an opportunity for comments from other interested parties. This PER has been prepared to meet this requirement.

Guidelines for the PER were issued to the proponent by the EPA and are included in Appendix 1. In general, these require the proponent to describe the proposal in some detail, to discuss any potential environmental impacts and to describe how such impacts will be avoided, ameliorated or managed so that the environment is protected.



REGIONAL LOCATION OF GOLDEN BAY PROPERTY

FIGURE 1

1.2 The PER Process

The Western Australian environmental impact assessment process is outlined in the Guide to the Environmental Protection Act (Environmental Protection Authority, 1987) and is illustrated in Figure 2. Essentially, the proponent is required to notify the EPA of the proposal. The EPA then determines the need for a more detailed document such as a Public Environmental Review (PER) and provides the proponent with a set of Guidelines for the preparation of that document. The Guidelines for the present PER are provided in Appendix 1.

After the PER has been prepared, it is reviewed by the EPA to ensure that it provides sufficient detail and a comprehensive coverage of issues. When this has been established, the PER is released for the public review period. At the end of this, a summary of submissions is supplied to the proponent and a response is sought. The EPA then undertakes to assess the development proposal.

The results of the assessment are published in the form of an Assessment Report which includes recommendations made to the Minister for Environment. Interested parties can appeal against the level of assessment set by the EPA, and against the content of the EPA Assessment Report, or any of its recommendations.

Ultimately the Minister for the Environment decides whether the proposal is acceptable and what conditions will be imposed upon it.

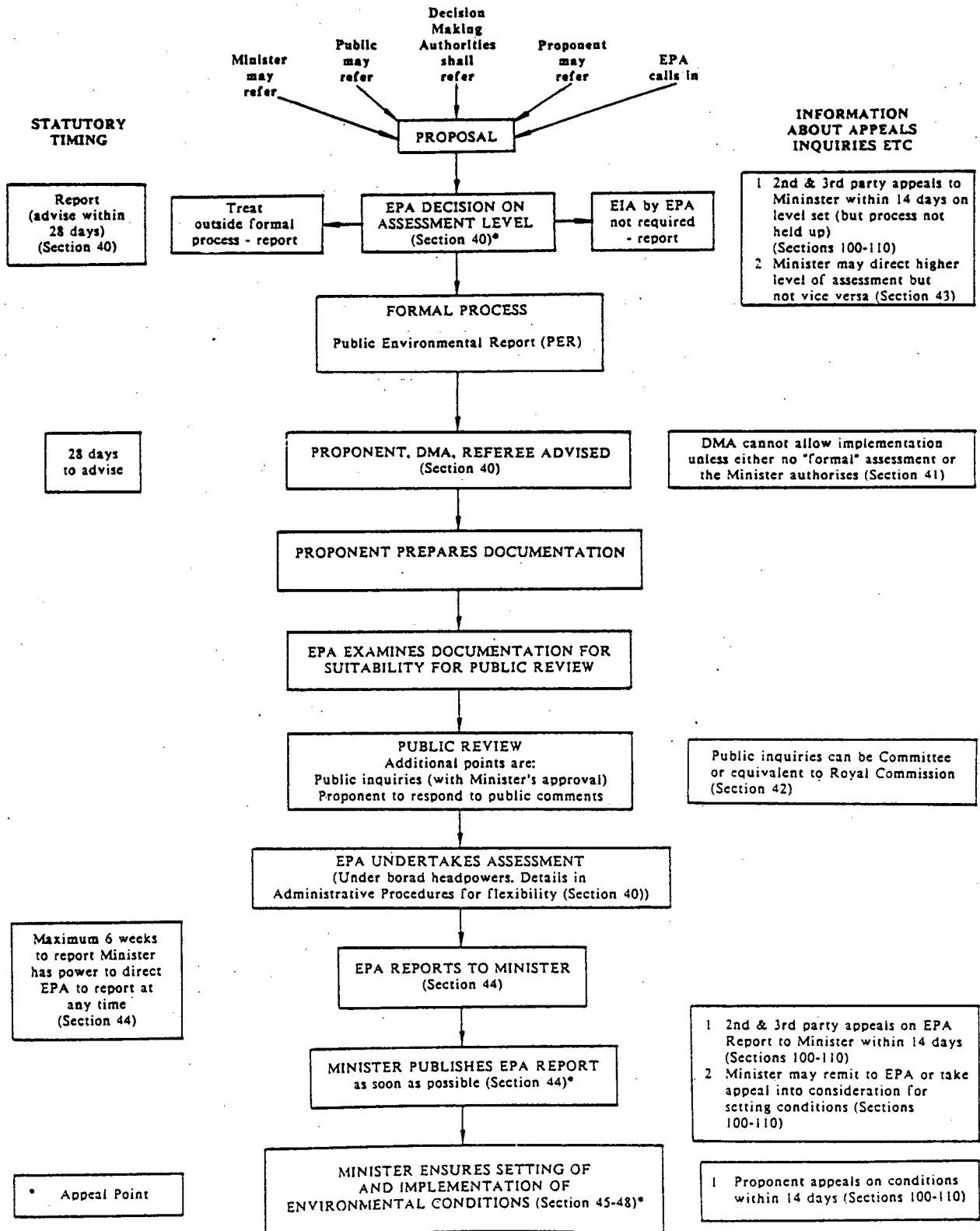
The environmental assessment process is designed to enable State authorities to consider in detail the environmental and social implications of development proposals. These considerations are based on technical assessments of the nature and extent of changes to the existing natural and social environments, on proposed management strategies to control or limit adverse changes, and on monitoring programmes designed to document and analyse the effectiveness of such strategies.

The environmental assessment process also enables members of the public to obtain details of the proposal and to formally comment on any matters of interest to them. These inputs are required within specified public review periods and are considered together with the technical assessments. The public is encouraged to provide written comments to the EPA as part of the environmental review process. Details of the public review period and advice on how to make a submission are provided at the start of this PER.

1.3 The Proponent

The proponent is H and B Developments Pty Ltd of 26 St George's Terrace, Perth. The company is solely involved in real estate development and currently has various projects within the Perth Metropolitan Region. It owns the freehold title for the land involved in this proposal at Golden Bay.

THE ENVIRONMENTAL ASSESSMENT (EIA) PROCESS
(Under the Environmental Protection Act, 1986)



ALAN TINGAY & ASSOCIATES

THE PUBLIC ENVIRONMENTAL REVIEW PROCESS

FIGURE 2

1.4 Location and Landholdings

The locality affected by this proposal is in the City of Rockingham adjacent to the existing subdivision of Golden Bay/Crystaluna (Figure 1).

In terms of landholdings, the proposal involves mostly freehold title Part Lot 12 contained within Certificate Title Vol 1521 Fol 679 which has an area of 161.1955ha, and Public Recreation Reserve 34664 which is not vested and has an area of 2.4306ha (Figure 3). The total area of land involved in the Structure Plan is therefore 163.6261ha.

1.5 Prior Development at Golden Bay

Subdivision of Golden Bay commenced in the early 1960's. Initially the development was intended as a holiday estate following the establishment of industry on the Kwinana strip in the 1950's and Rockingham's change in character from a seaside resort to a dormitory suburb. However, over time Golden Bay has changed from a sparsely developed holiday estate comprised of lower standard timber frame and asbestos cement housing to a locality used more as a dormitory suburb for the more southern industrial areas and for Perth. Consequently newer buildings are higher quality masonry dwellings.

An increasing proportion of these dwellings is being used for permanent residential occupation and the 1986 Census established that a total of 500 persons live at Golden Bay. To date approximately 800 lots have been created at Golden Bay and a further 180 lots at Crystaluna to the south. At 30th June, 1990 Golden Bay/Crystaluna contained a total of 498 dwellings.

As Golden Bay started as a holiday subdivision, at present the only services provided are sealed roads, power and telephone connections. Reticulated water and deep sewerage are not available. Lot sizes are commonly in the range of 800 to 1000m² in order to accommodate septic effluent disposal systems as well as bores for the provision of domestic water. Lots with 20m frontages and 40m depths enable septic tanks to be sited a minimum of 30m from bores.

1.6 Zoning

1.6.1 Metropolitan Region Scheme

The 1963 Metropolitan Region Scheme showed Golden Bay as Rural notwithstanding the subdivision and housing development taking place on the land. This situation was corrected by the Omnibus Amendment to the Region Scheme which was gazetted in November 1975 and which zoned the subdivided area Urban.

In 1974, TS Martin and Associates completed the South-West Corridor Study, recommending Urban zoning generally south of Dampier Drive. The Metropolitan



A27066
2030

A34664
2483

Aboriginal
Heritage Site

A32492
2264

LOT 12

Dampier

Drive

LOT 12

LANDSCAPE PROTECTION AREA

LOT 11

WETLANDS
PROTECTION
AREA

LANDSCAPE BUFFER

MANDURAH ROAD

LANDSCAPE PROTECTION
AREA

LOT 10

LANDSCAPE BUFFER

▲ Mandurah Hill

Crystaluna

Drive

metres

500

GOLDEN BAY PROPERTY DETAILS

FIGURE 3

LEGEND

PROPERTY BOUNDARY

Region Planning Authority (now State Planning Commission) reviewed the 1974 recommendations and published "A Planning Strategy for the South-West Corridor" in April 1980. This proposed a belt of Urban land south of Port Kennedy to Mandurah and including Golden Bay.

Amendment 310/33 to the Metropolitan Region Scheme rezoning land between Secret Harbour (Lark Hill) and Singleton (including Golden Bay) from Rural to Urban Deferred was gazetted on 8 May 1981. The final alignment of Warnbro Sound Avenue was also established by Amendment 574/33A, gazetted on 18 January 1985. This was the last amendment affecting Golden Bay. Current Region Scheme Zoning and reservation patterns for the locality are shown on Figure 4.

Most of the Secret Harbour property immediately north of Golden Bay has recently been rezoned from Urban Deferred to Urban.

1.6.2 City of Rockingham Town Planning Scheme

The City of Rockingham Town Planning Scheme No. 1 was gazetted on 24 July, 1975. Residential SR3 zoning covers the existing urban area of Golden Bay with provision for shopping at the corner of Dampier Drive and Yuin Street. There are various other sites zoned for special uses.

Land to the north of the existing settlement is zoned Rural including public recreation reserve 34664. The larger recreation reserve 32492 (8.1089ha) is included in the Scheme as Public Open Space.

Land immediately to the east of the Structure Plan area is generally zoned Special Rural. This zoning has not been extended to include those portions of Pt Lot 12 along the eastern boundary which are zoned Rural in the Region Scheme.

1.7 Need for the Proposal

In December 1990, DPUD released a report entitled "Metroplan". This report emphasises the potential future population growth within the Perth Metropolitan Region and the need for urban planning to adjust in order to accommodate that growth. The projected population is expected to reach 1.4 million by the late 1990's and two million by about the year 2020.

The report also indicated that the north-west, south-west and south-east corridors would continue to provide the focus for much of this growth despite efforts to redevelop and infill established areas elsewhere. In particular, the corridors are expected to accommodate more than 100,000 new homes by the year 2000 a significant proportion of which will be purchased by first home buyers.

In the south-west corridor, Rockingham is considered to be the most important regional commercial centre and urban expansion is expected to focus there especially. In addition, DPUD has recently recognised that the overall availability of urban land in



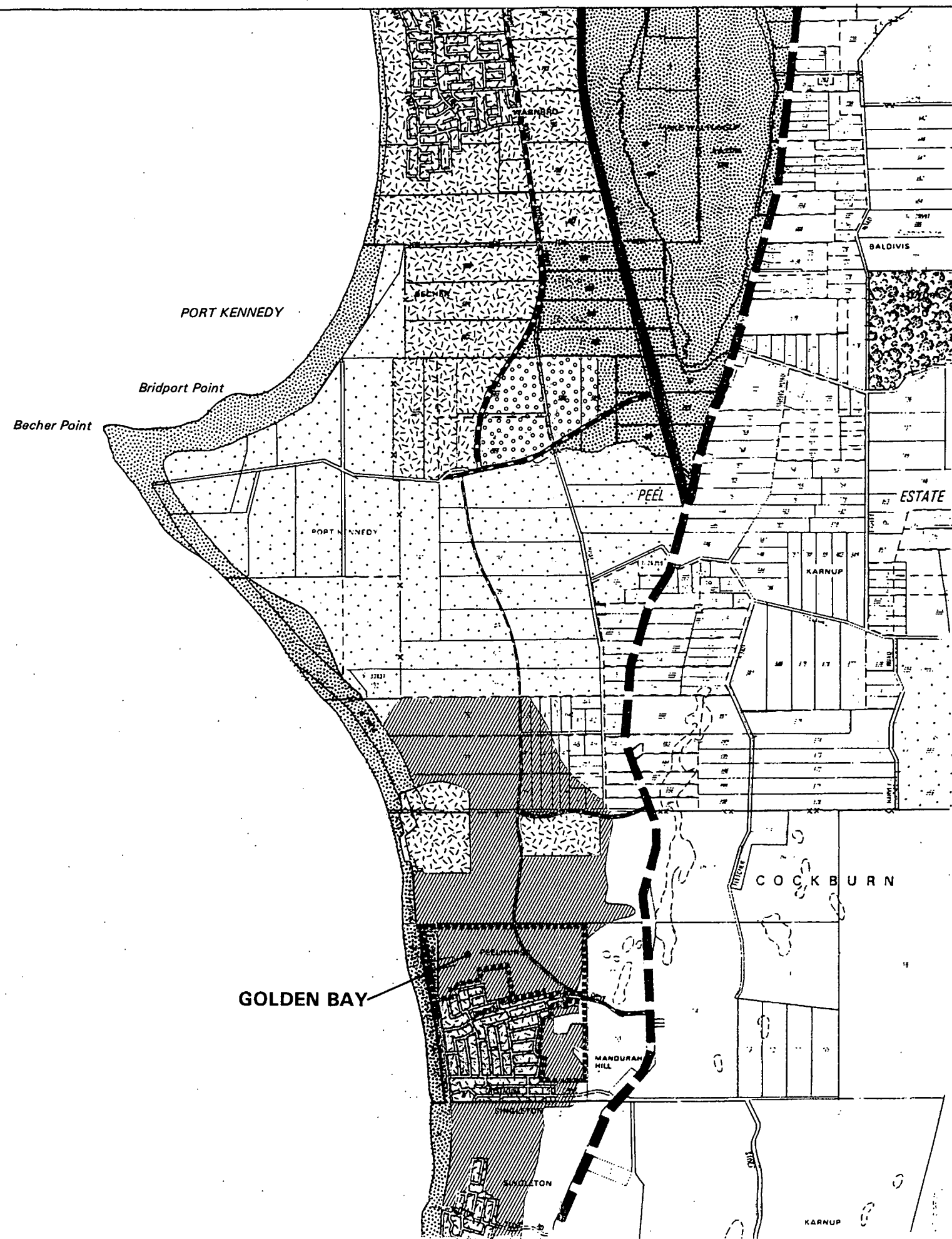
LEGEND

RESERVED LANDS

- Parks & Recreation
- State Forest
- Public Purposes
- Controlled Access Highways
- Other Major Highways
- Important Regional Roads

ZONES

- Urban
- Urban Deferred
- Industrial
- Rural



GOLDEN BAY CURRENT LAND ZONINGS

FIGURE 4

the south-west corridor will be significantly limited due to the allocation of large areas of wetlands and sections of Port Kennedy to conservation and parks and recreation purposes and also because of the amount of rural and special rural land in the corridor.

The need for development at Golden Bay should be considered in terms of the planning issues outlined above. Considerable growth is currently occurring in the south-west corridor immediately to the south of Rockingham and inland from Port Kennedy and rapid growth is also occurring at Mandurah. There is clear evidence therefore that DPUD predictions of population growth are being fulfilled and that there is a strong demand for new housing in this region which is likely to continue for some years. There is therefore a need to provide significant areas of urban land.

The focus of this urban development in the south-west corridor is likely to be the near coastal strip between Port Kennedy and Mandurah and particularly close to existing development where some services are available. Development of Secret Harbour to the north of Golden Bay has been proposed recently and amendments to the MRS and Town Planning Scheme of the City of Rockingham are currently proceeding. A proposal is also being developed for land adjacent to Singleton immediately to the south of Golden Bay/Crystaluna.


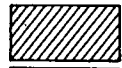
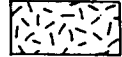



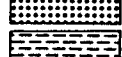
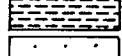
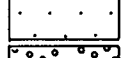
In this context, Golden Bay is obviously an area where further urban development should logically be given priority consideration.

Integration of the proposals for Secret Harbour, Golden Bay and Singleton would optimise the planning and ultimately the supply of services, the planning for open space and the coastal reserve, and similar important factors for this sub-regional area.



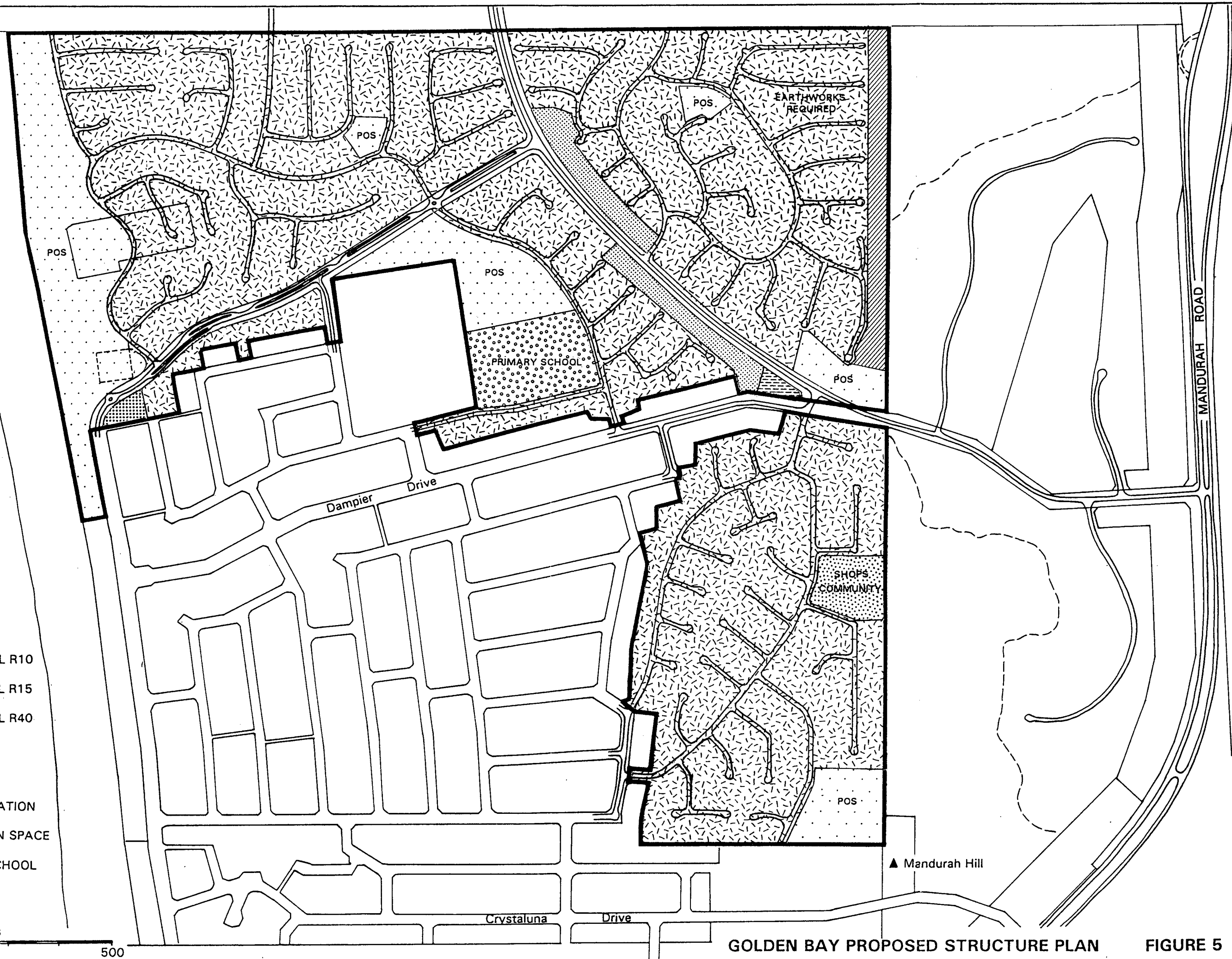
INDIAN OCEAN

LEGEND

-  PROPERTY BOUNDARY
-  RESIDENTIAL R10
-  RESIDENTIAL R15
-  RESIDENTIAL R40
-  SHOPS
-  TOURIST
-  SERVICE STATION
-  PUBLIC OPEN SPACE
-  PRIMARY SCHOOL

metres

500



GOLDEN BAY PROPOSED STRUCTURE PLAN

FIGURE 5

2. THE PROPOSAL

2.1 Introduction

This proposal involves the rezoning of land to the north and east of the existing township of Golden Bay to Urban and Parks and Recreation purposes. The proposed rezonings are reflected in a Structure Plan which has been prepared by Martin Goff & Associates on behalf of H&B Developments Pty Ltd. The details of this Structure Plan are described in this section so that the reader can appreciate the nature of the intended development. It should be noted that the matter addressed in this PER is the proposed rezoning and its affect on System 6 Area M107 and not the specific subdivision shown in the Structure Plan.

A central issue addressed in this PER is the provision of Open Space within the development in view of the System 6 recommendations that apply to part of the land. The proponent recognises these recommendations but proposes alternative land allocations for recreation and landscape purposes than that found in System 6. This involves providing a greater area of land for Open Space adjacent to the coast than would normally be required. A full discussion of the System 6 recommendations and the proposed alternatives is given in Section 4 and in a discussion paper provided in Appendix 2.

2.2 The Structure Plan

2.2.1 Development Areas

The Structure Plan for Golden Bay is shown in Figure 5. Major uses and land allocations are as follows:

Residential R15	126.4ha
Residential R40	1.8ha
Residential R10	5.6ha
Primary School	4.0ha
Important Regional Road	4.3ha
Neighbourhood Centre	1.2ha
Shopping Community Uses	0.5ha
Tourist	0.44ha
Service Station	0.3ha

The 126.4ha of Residential R15 land proposed is expected to yield approximately 1200 homes, 1.8ha of R40 land approximately 50 homes and 5.6ha of R10 land is expected to create around 40 homesites. Total yield is therefore 1300 home sites with a population potential of approximately 4000-4500 persons.

Currently 980 lots exist within Golden Bay/Crystaluna of which about half are already developed. Provision of services will encourage development of the remainder of the lots. Public facilities such as the proposed primary school, neighbourhood centre and

other facilities such as roads will be designed to service existing residents and those that will move to the area as a result of the subdivision.

2.2.2 Open Space Provisions

Typically, a subdivision of the type proposed at Golden Bay would include two types of Open Space, Regional Open Space (ROS) and Public Open Space (POS). As its name suggests, ROS is important in a regional context and may contain features such as coastlines, lakes and water courses. These areas are typically the responsibility of DPUD and the Local Authority. Areas of local significance such as those used for passive and active recreation are POS and are the responsibility of the Local Authority.

The proposed provisions of POS and ROS in the Structure Plan for Golden Bay is in excess of that which would normally be required for a typical subdivision adjacent to the coast. This additional Open Space is proposed as a consequence of System 6 recommendations which relate primarily to the allocation of land for recreation and landscape protection.

o Regional Open Space

Regional Open Space is provided at Golden Bay through the Coastal Reserve. The DPUD policy for coastal protection in the Perth Metropolitan Regions generally requires this reserve to be 100m wide from the vegetation line when the beach is an accreting one, i.e. growing in width through time. Golden Bay has an accreting beach thus DPUD requires a 100m Coastal Reserve. This Coastal Reserve is shown in Figure 6. An expanded area of ROS greater than 100m is proposed so that additional land is allocated for landscape protection, conservation and recreation. The additional ROS has a total area of 7.13ha.

o Public Open Space

DPUD and Local Authorities generally require an area equivalent to 10% of the proposed for subdivision to be set aside as POS. Generally, this Open Space is intended to provide for community facilities such as parks, playing fields and may also be used for conservation purposes. In some cases, the required percentage may be reduced in return for a payment to the Local Authority. Typically, this POS is dispersed throughout a subdivision so that facilities are easily accessible to the local population.

To satisfy DPUD and the Local Authority requirements for POS, areas have been allocated for this use throughout the development area (Figure 6). At Golden Bay the area of land used to calculate the required 10% allocation for POS includes the existing Township. This area is approximately 274.54ha. However, DPUD allows certain areas to be deducted from this total for the purposes of calculating the POS requirement. These deducted areas include the provision for existing ROS, ROS to be provided, the primary school and important regional roads. The total deduction for these areas is 17.5ha and thus the total subdivisible area on which the POS is calculated is 257.041ha. This gives a 10% POS requirement equal to 25.704ha.

Various POS areas have already been provided at Golden Bay and make up a part of this 10% requirement. These involve areas totalling 14.029ha. Consequently, an area of 12.905ha needs to be provided. This area includes an equivalent area of 1.230ha for Reserve 34664 (see Figure 5) which will be re-allocated since it partially occupies steeply undulating land with minimal utility as POS.

The Structure Plan shows approximately 13.81ha of land as POS and this area is as follows:

- a) An area of 3.41ha which borders the Coastal Reserve and whose eastern boundary has been aligned in the south to correspond with an environmental boundary at the base of relatively steep dunes further east (see Section 4.4). An aboriginal camping site contained within a reserve of 1.18ha adjacent to the Coastal Reserve.
- b) A 2.32ha extension is proposed to a reserve encompassing Mandurah Hill which is located towards the south east corner of the Golden Bay property. The hill provides a scenic outlook and it is proposed that the reserve area be preserved in its natural condition.
- c) An area approximately 4.6ha is adjoined to existing Reserve 32492 (8.1089ha) and adjacent to the proposed primary school (4.0000ha). This land will provide opportunity for a substantial active recreation area as well as preserving elements of the existing landscape. Some joint use of the recreation area with the primary school is also possible. The proposed reserve has frontage to Warnbro Sound Avenue as well as an important distributor road providing access to the coast.
- d) Local open spaces ranging from 0.5ha to 1.35ha in area, scattered throughout the development to provide for recreation. The total area of these spaces will be 2.3ha.

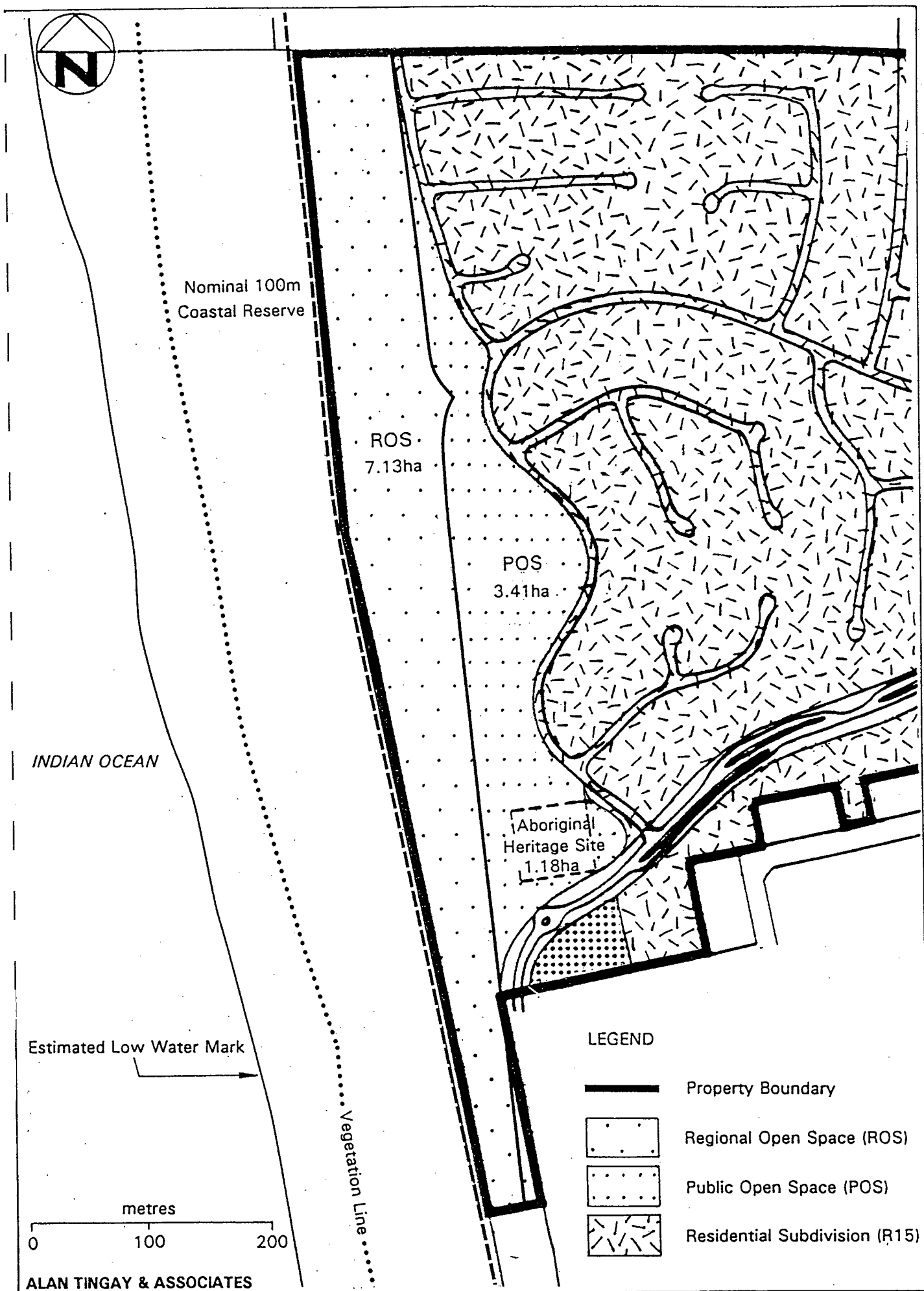
It should be noted that 0.9ha more POS has been provided than is normally required. This, with the additional ROS of 7.13ha, has been allocated to achieve the objectives of the recommendations relating to System 6 Area M107.

o Coastal Open Space Boundary

The boundary of the area of POS and ROS with the proposed subdivision area has been defined along a landform boundary. This boundary is to be defined by the coastal road which will run along the foot of a system elevated dunes to the east. Further to the north the boundary is set further westward so that it meets up with the coastal Open Space area for Secret Harbour. Thus here the boundary takes into account planning considerations.

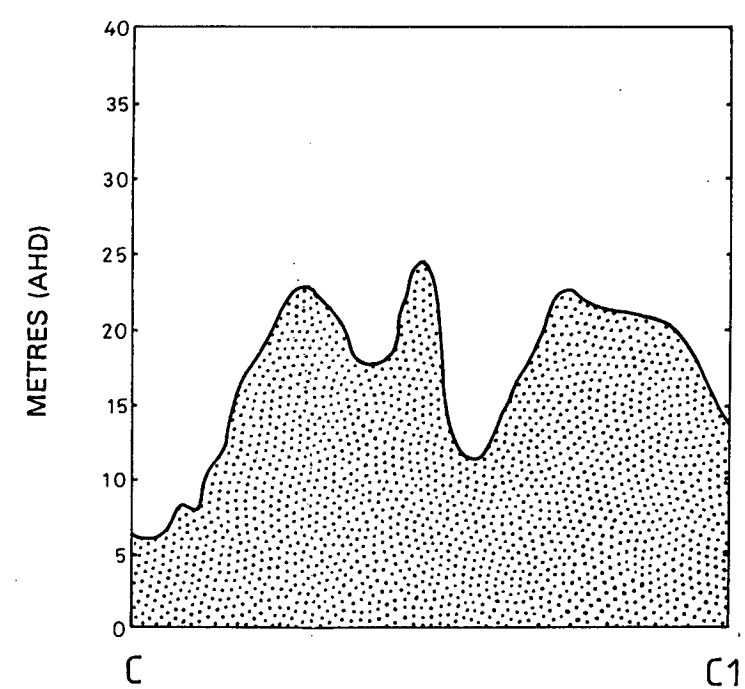
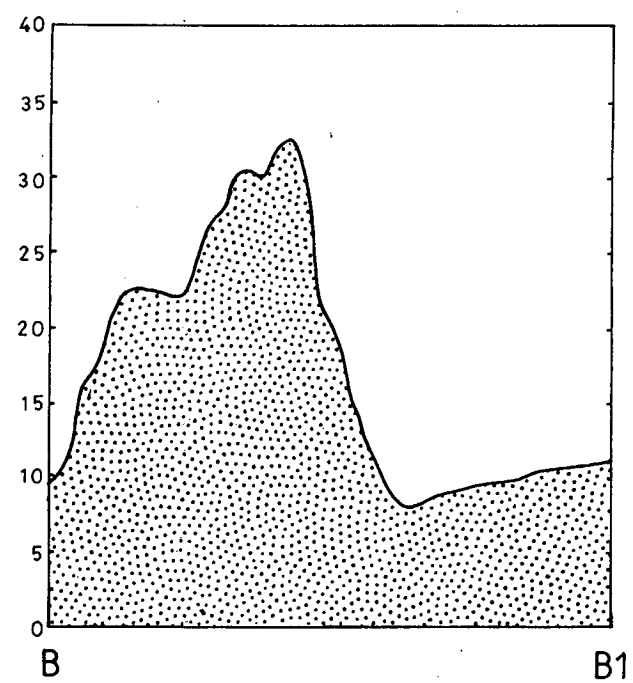
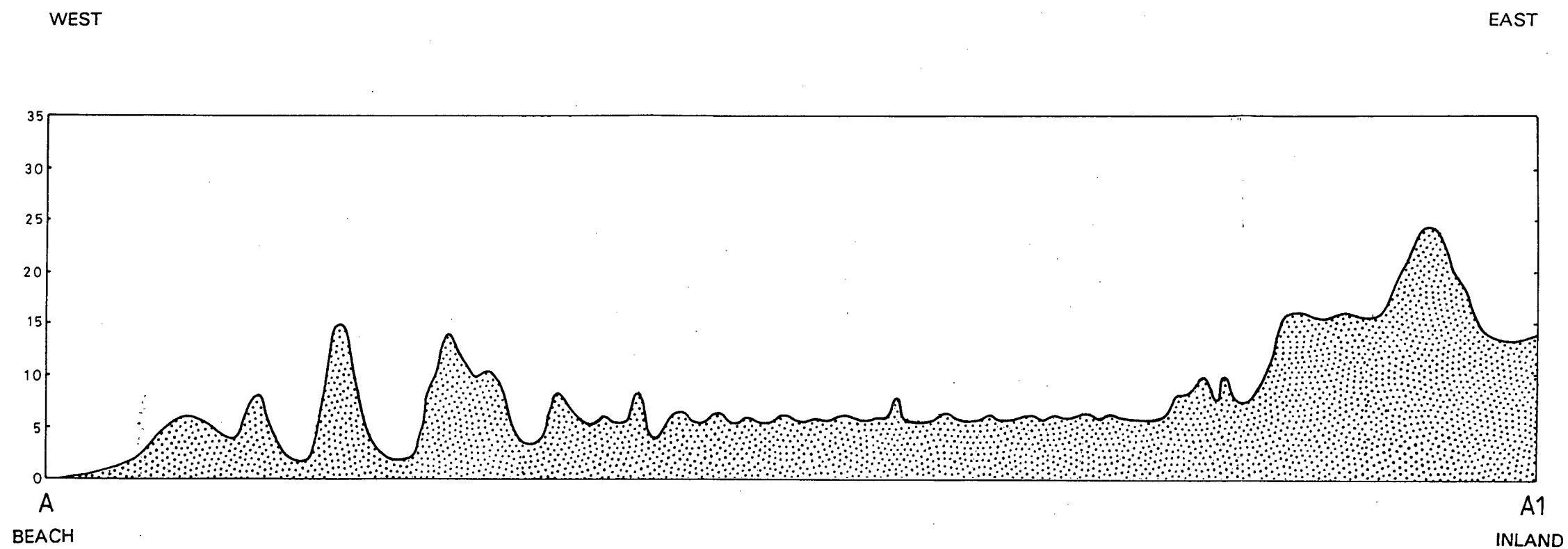
The proposed extension of Open Space allows the inclusion of a linear depression or dune swale that contains wetlands of the Stakehill Suite. These are directly behind the recent dune plain of the accreting beach. In addition, a considerable area of Open

Space will be provided for passive recreation and this will provide for a degree of landscape protection. The environmental features of this land are described fully in Section 3 while the rationale for the Open Space boundary is more fully discussed in Section 4.

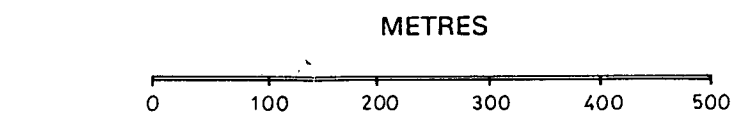


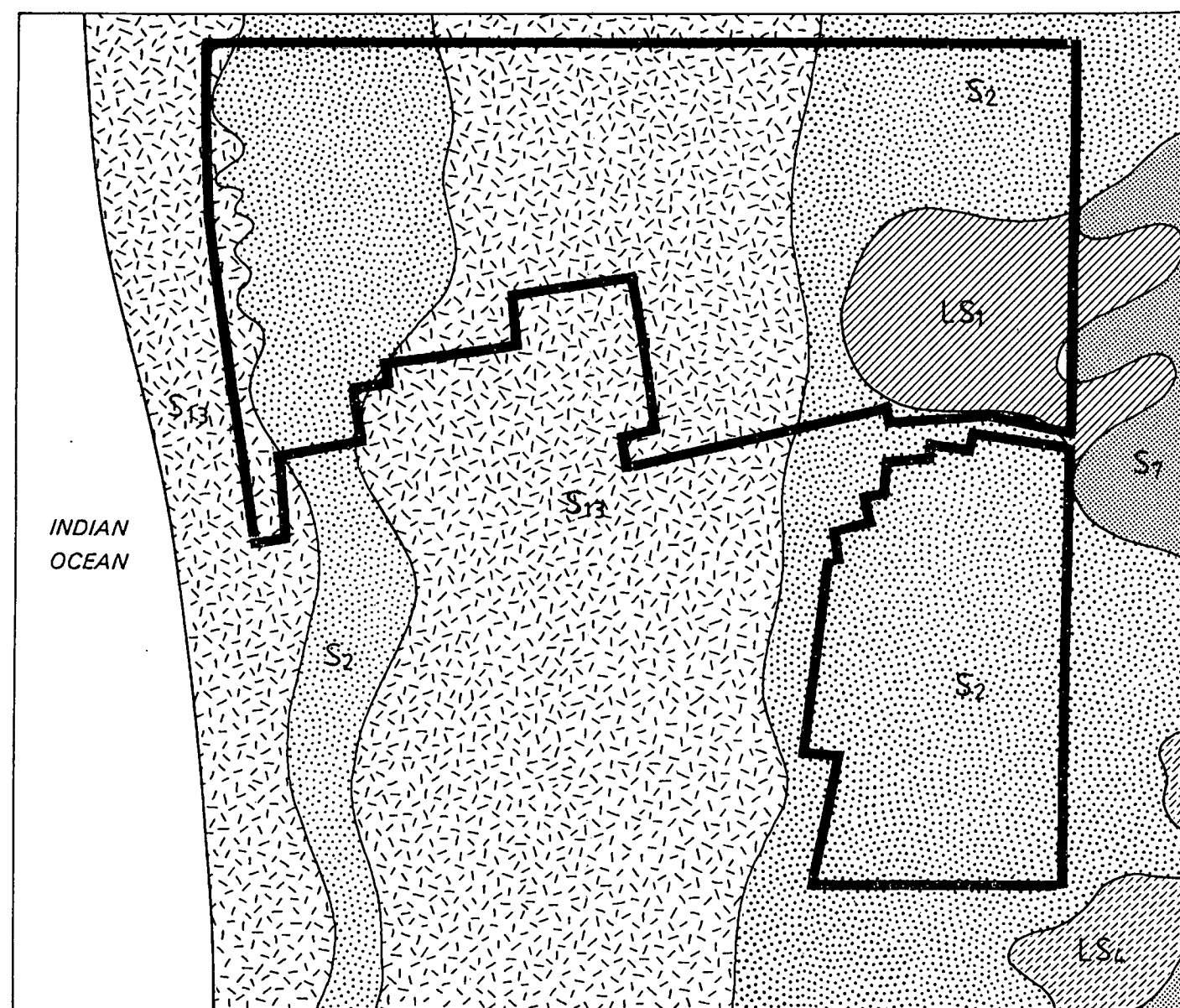
PROPOSED REGIONAL & PUBLIC OPEN
SPACE AREAS NEAR COAST

FIGURE 6

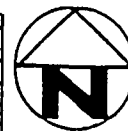


THE LOCATIONS OF THE CROSS-SECTIONS ARE SHOWN IN FIGURE 9





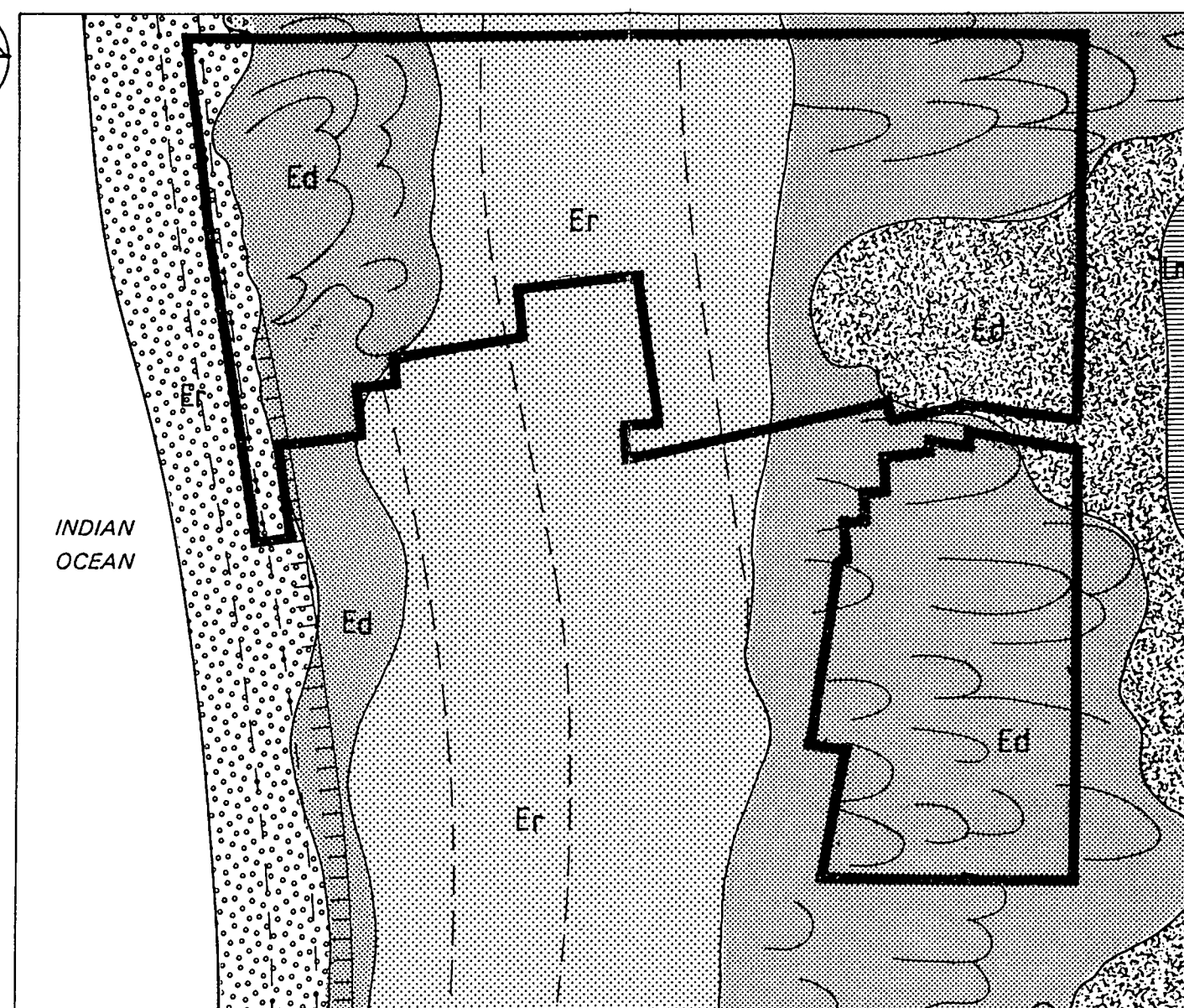
ENVIRONMENTAL GEOLOGY



0 500 metres

LEGEND

- S₂ Calcareous Sand (steep dunes)
- S₁₃ Calcareous Sand (relic foredunes)
- S₇ Sand (derived from Tamala Limestone)
- LS₄ Limestone (cemented Safety Bay sand)
- LS₁ Limestone (Tamala Limestone)



GEOMORPHOLOGY

LEGEND

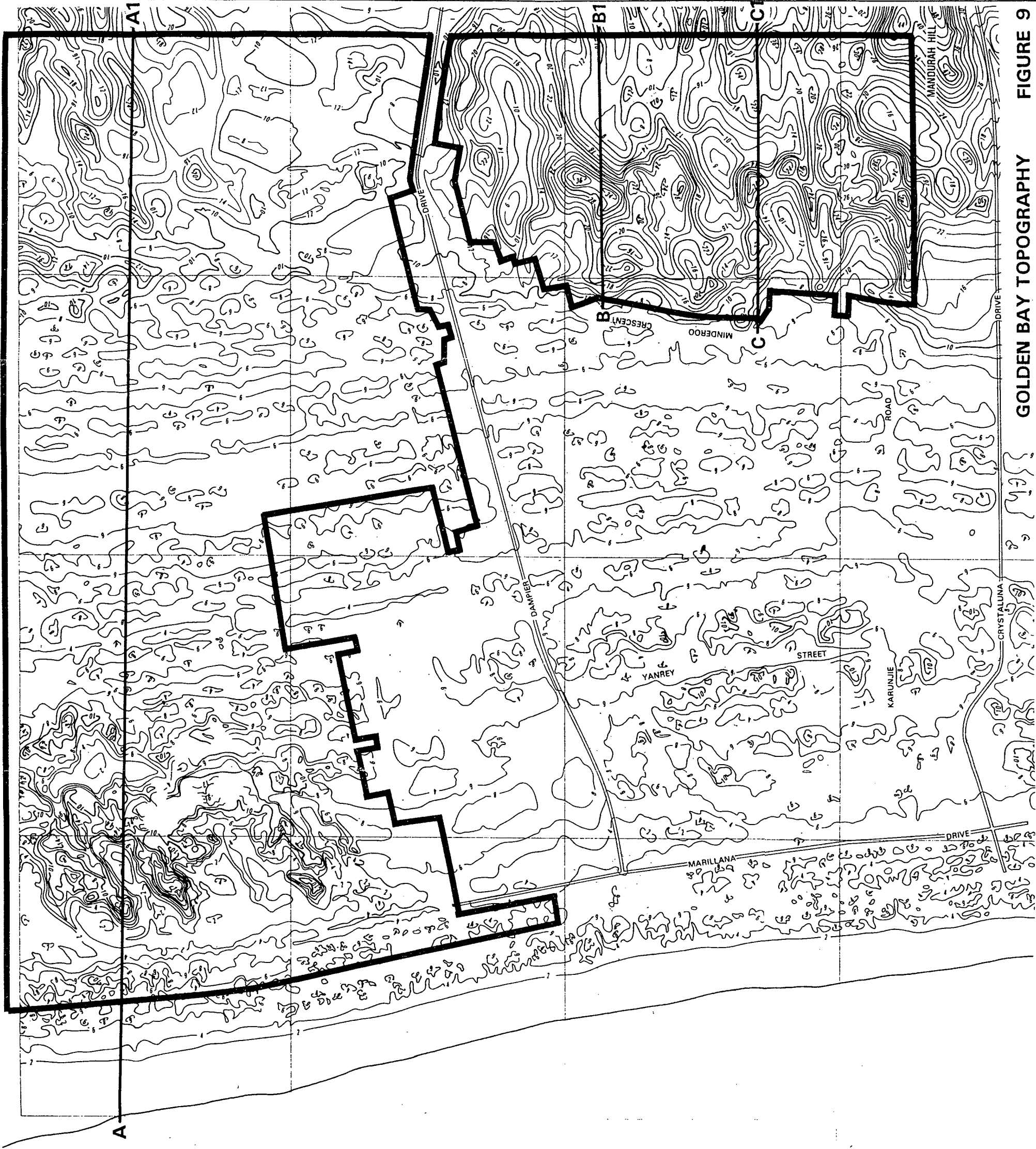
- Ed Parabolic & nested parabolic dunes, Quindalup Dunes
- Er Relic foredune plain, high level, Holocene
- Er Relic foredune plain, low level, Holocene
- Ed Degraded surface of eolian origin, Spearwood Dunes
- Lm Marsh in interbarrier depression, low level
- Prominent ridge
- Relic foredune trend lines
- Erosional scarp



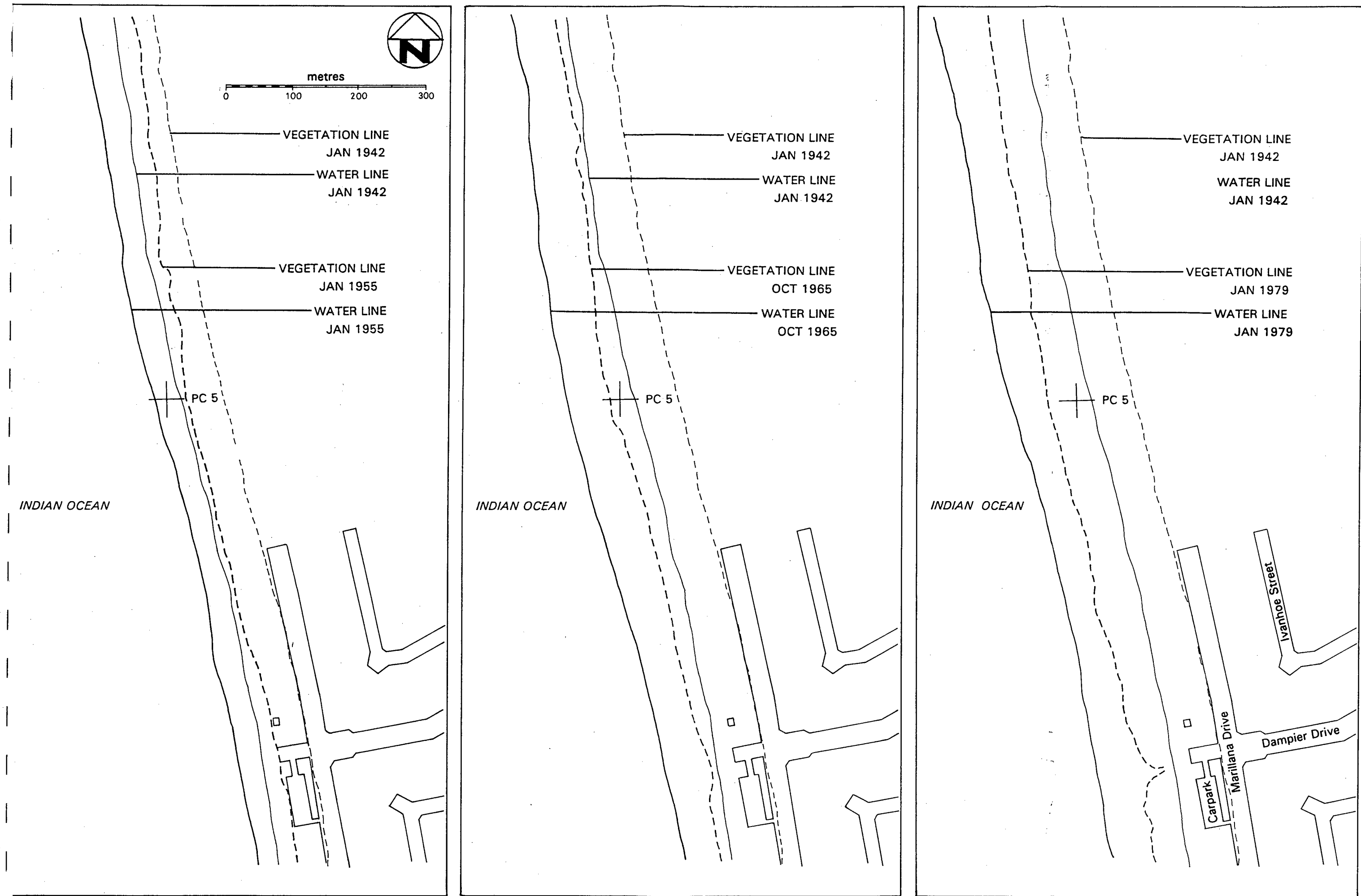
Contour interval 2 metres

INDIAN OCEAN

metres



GOLDEN BAY TOPOGRAPHY



3. THE EXISTING ENVIRONMENT

3.1 Physical Features

The Golden Bay property features several distinct landforms. These landforms are illustrated in the cross section from the beach to the inland boundary of the property shown in Figure 7 and also can be interpreted from the geology, geomorphology and topography maps shown in Figures 8 and 9.

A physical description of the property is also provided in Semeniuk et al (1989) information on sedimentology, stratigraphy and holocene history.

A single geomorphic unit, the Quindalup Dune System, covers most of the property. In the eastern section, however, this system overlies a second geomorphic unit, the Spearwood Dune System.

The sand of the Quindalup Dunes is referred to geologically as Safety Bay Sand which is a cream, calcareous quartz sand with a significant proportion of shell fragments. Near the coast the Safety Bay Sand is 20-25m thick but it becomes shallower further inland.

The geological equivalent of the Spearwood Dune System is the Tamala Limestone. The surface expression of this unit on the property is an area of shallow to moderately deep silicious yellow-brown sand with limestone outcrops.

Five distinct geomorphic components of the Quindalup Dune System are readily recognisable at Golden Bay. In sequence from the coast inland these are as follows:

- o a relatively recent shore parallel ridge plain which begins immediately behind the present beach,
- o a linear deflation basin immediately behind the beach ridge plain,
- o a complex association of relatively tall sand dunes and valleys (known as a chaot system),
- o an older shore parallel ridge plain (the Rockingham-Becher Plain), and
- o a series of fretted parabolic dunes which are superimposed onto the Spearwood Dune ridgeline in the east.

The most recent shore parallel dune ridge system behind the present beach is being actively formed by coastal processes. Information obtained from Public Works Department plans available from the Department of Marine and Harbours, which is illustrated in Figure 10, indicates that the coastline has expanded (accreted) westwards by over 100m in the 37 years between 1942 and 1979. The successive dune ridges become taller with distance from the beach and have peak elevations of 8-10m adjacent to the linear deflation basin where they stop. Only the furthest inland ridgeline is

within the boundaries of the Golden Bay property. This system itself, however, is very extensive and continues northwards to Becher Point and south to near Mandurah.

The linear deflation basin at Golden Bay is part of a system that extends northwards for about 2km into the Secret Harbour property. The basin is aligned parallel to the coastline immediately behind the recent shore parallel dune ridge system and has minimum elevations of less than 2m AHD. It is partially subject to inundation from elevated groundwater levels during winter and spring and accordingly is classified as a wetland (see Section 2.3 below).

To the immediate east of the linear deflation basin is an area of high relief chaot dunes about 250m in width from west to east. These dunes have peak elevations of about 14m and were formed during a period when unusually large quantities of sand were deposited onto the coastline and transported inland by wind. Aerial photography from the 1940's indicate that this process of dune formation began to slow only a few years before and was followed by the subsequent rapid development of the recent shore parallel dune ridge system.

At their eastern edge, the chaot dunes extend over and provide a western boundary to, a second shore parallel dune ridge system known as the Rockingham-Becher Plain. This plain extends from near Rockingham southwards to near Mandurah and at Golden Bay is about 750m wide from west to east. The ridgelines themselves have peak elevations of about 6mAHD and were formed in the same way as the recent ridgelines closer to the coast as the sea level fell. They therefore reflect the successive alignments of the coastline and the oldest date from about 3,500 years BP (before present).

At its eastern limit the Rockingham-Becher Plain is bounded by a prominent Spearwood Dune ridgeline but only a small portion of this has a surface expression at Golden Bay immediately to the north of Dampier Drive. Here it has peak elevations of about 10-14mAHD. Superimposed over this Spearwood Dune system in the north easternmost sector of the Golden Bay property and over all of the southernmost sector, are a series of parabolic Quindalup Dunes. These again originate from periods when large quantities of sands were deposited on the coastline and were driven inland by wind. The wind transport has created the characteristic horseshoe shape dunes around internal deflation basins. In the north eastern corner of the property the ridgelines attain 24mAHD or about 10m above the Spearwood Dune level on which they are superimposed. However, they are more prominent in the southern section of the property south of Dampier Drive. Here the parabolic dunes generally have elevations of about 20-25mAHD but there are three smaller ridge areas with peak elevations of 36m, 38m and 48mAHD. The tallest of these is a prominent landmark and is known as Mandurah Hill. This is located just outside the south eastern corner of the property.

3.2 Groundwater

The information on the hydrogeology of the Golden Bay property is available in an assessment of Secret Harbour immediately to the north prepared by Rockwater Pty. Ltd. in 1981. Of most relevance to the present report is the shallow unconfined aquifer

in the Safety Bay Sand and Tamala Limestone which is tapped by some present residents of Golden Bay/Crystaluna and which also gives rise to the wetland which occurs in the linear deflation basin amongst the dunes near the coast.

The water table within these superficial deposits is at a relatively shallow depth and ranges from 1 to 20 metres below ground level depending on the elevation of the overlying land form. Indicative contours of the water table during winter (July 1980) and summer (January 1981) are shown in Figure 11. This figure shows that there is a localised groundwater mound centred on Mandurah Road during winter which includes the Spearwood Dune ridge lying to the west of the road and Anstey Swamp to its east. In summer the mound shifts to the west and is centred on the Spearwood dune ridge. In both seasons the direction of ground water flow across Golden Bay is effectively due west towards the ocean and the maximum groundwater levels, which occur during winter, are 2.2 metres AHD in the north-eastern corner of the property to 0.2 metres AHD at the western boundary. Near the coastline the groundwater interfaces with salt water from the ocean.

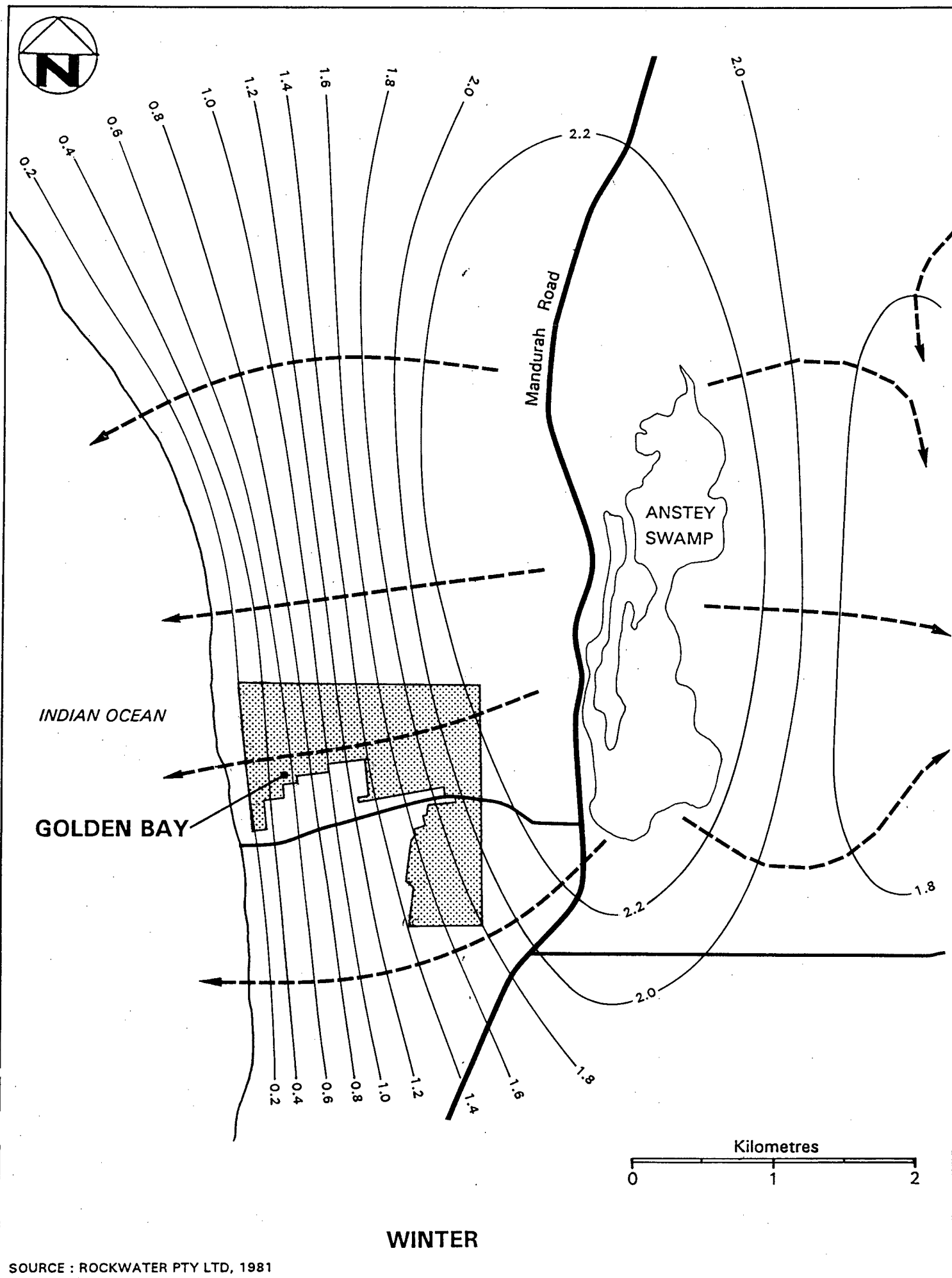
The superficial aquifer is recharged by rainfall with about 10% of annual rainfall entering groundwater storage. The salinity of the groundwater is about 360mg/L TDS and the rate of groundwater flow is relatively rapid (the hydraulic conductivity of the Safety Bay sands is about 20 metres per day while that of the Tamala limestone is about 100-300 metres per day).

3.3 Wetlands

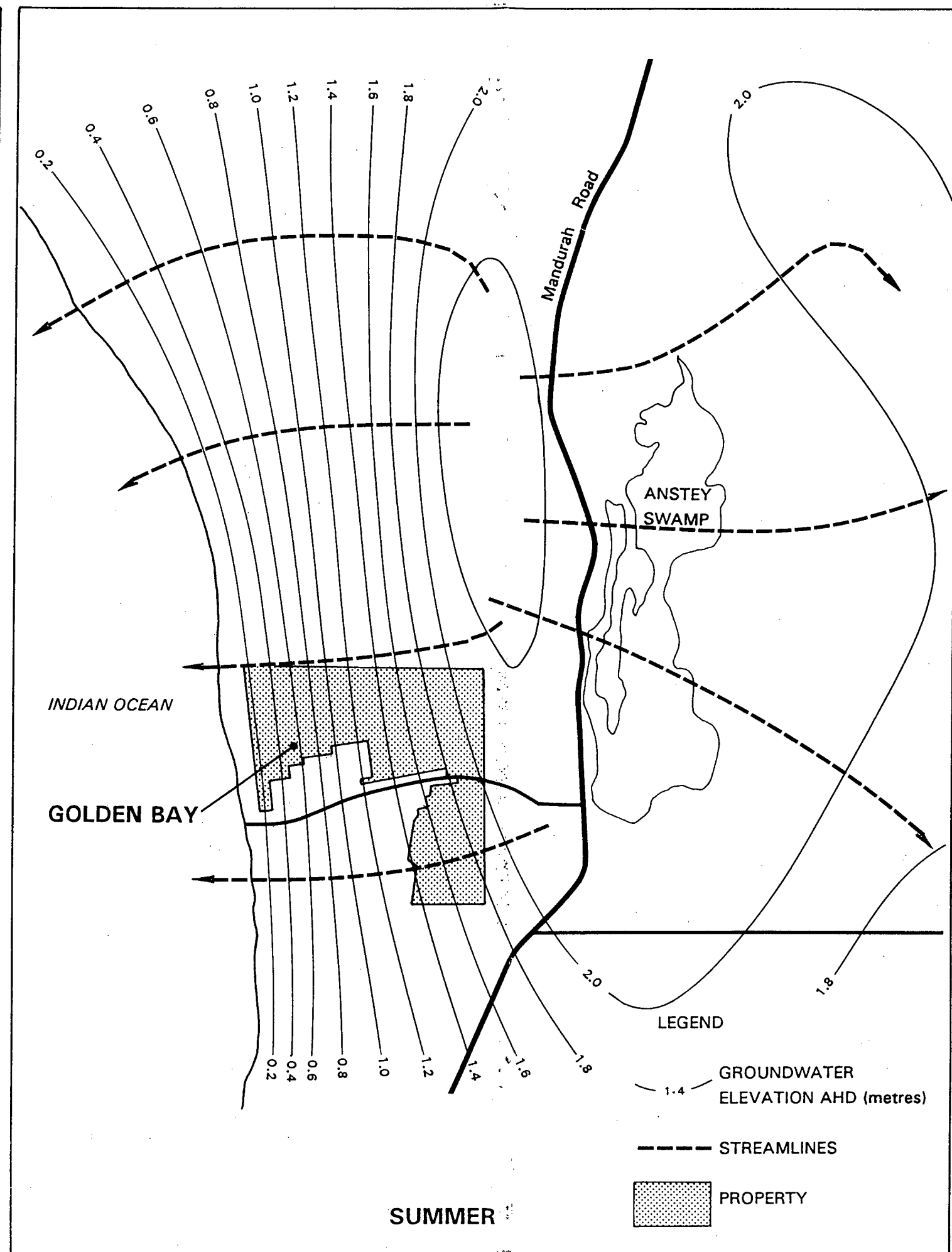
The only wetlands on the Golden Bay property are situated in the linear deflation basin immediately behind the recent parallel dune ridge plain adjacent to the beach and in the dunes to the east of the basin. The water table rises to ground level in small areas in this location during winter and spring and then falls again causing the area to dry out during summer.

The wetlands are separated by slightly more elevated areas of land, and are members of the Peelhurst Suite as defined by Semeniuk (1988). The Peelhurst suite of wetlands occurs in a narrow strip 3 kilometres long near the coast south of Becher Point, along the west shore of Lake Walyungup and in isolated areas such as the Whitfords Cusp. They are formed in low-lying depressions within the Quindalup Dunes which have intercepted the water table and are typically small, seasonally inundated sumplands or seasonally water damplands.

On Golden Bay the wetlands can be classified as linear and linear-oval damplands. Their location is indicated on the vegetation map by *Juncus kraussii* Sedgeland and *Isolepis nodosus* Sedgeland (vegetation types G and I) on Figure 12.



SOURCE : ROCKWATER PTY LTD, 1981
ALAN TINGAY & ASSOCIATES



GOLDEN BAY GROUNDWATER LEVELS

FIGURE 11



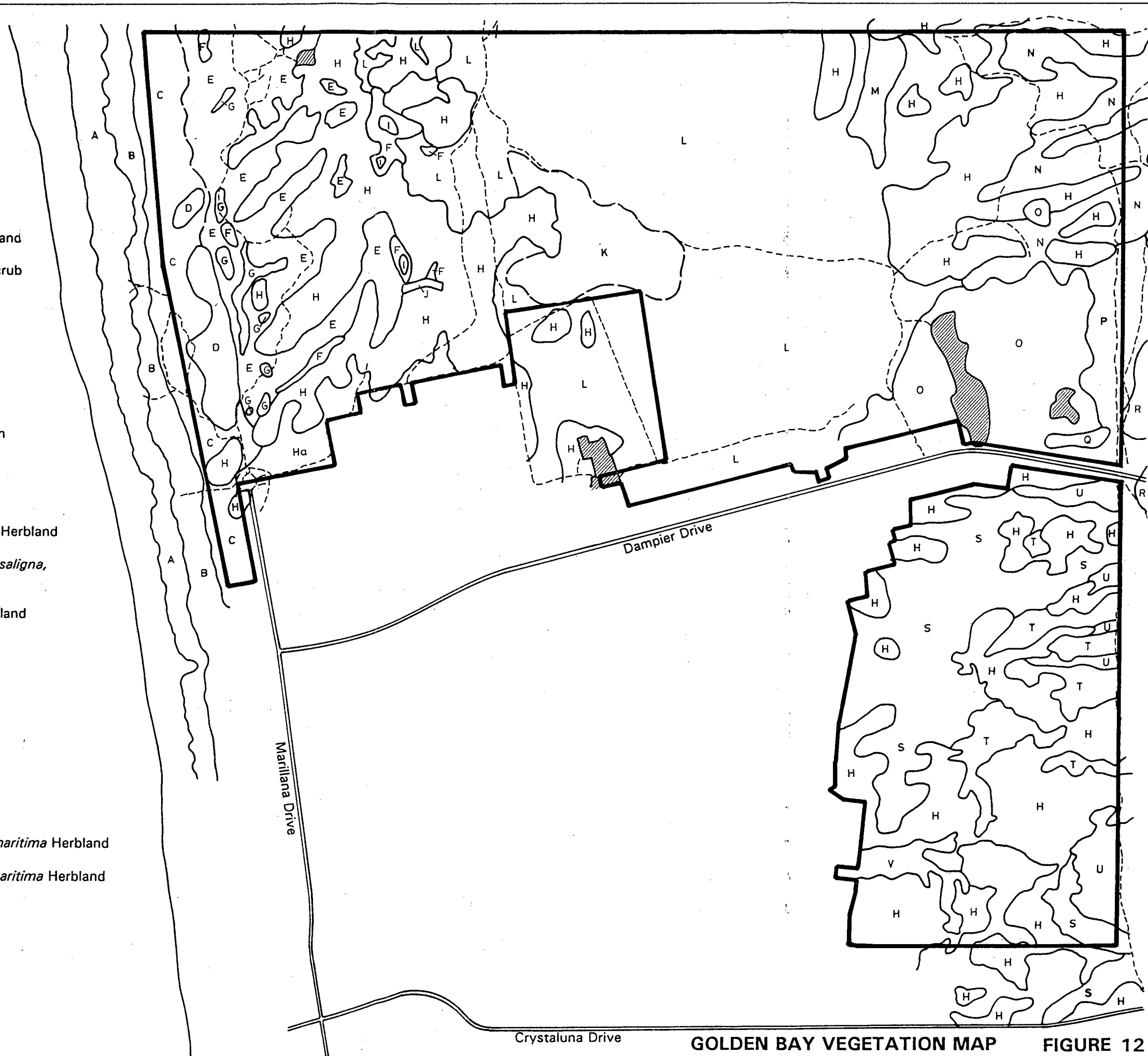
LEGEND

- A *Spinifex hirsutus* Grassland
- B *Olearia axillaris* Shrubland
- C *Spyridium globulosum*, *Acacia cyclops* Open Heathland
- D *Acacia rostellifera*, *Spyridium globulosum* Closed Scrub
- E *Spyridium globulosum* Closed Heathland
- F *Lepidosperma gladiatum* Sedgeland
- G *Juncus kraussii* Sedgeland
- H *Acacia rostellifera* Closed Scrub
- Ha *Acacia rostellifera* Closed Scrub - degraded condition
- I *Isolepis nodosus* Sedgeland
- J *Lomandra maritima* Herbland
- K *Acacia saligna* Open Scrub over *Lomandra maritima* Herbland
- L *Jacksonia furcellata*, *Spyridium globulosum*, *Acacia saligna*, *Olearia axillaris* Open Heathland to Shrubland
- M *Diplolaena dampieri*/*Jacksonia furcellata* Open Heathland
- N *Melaleuca acerosa* Open Heathland
- O *Hakea trifurcata* Closed Heathland
- P *Templetonia retusa* Open Heathland
- Q *Dryandra sessilis* Closed Scrub
- R *Eucalyptus gomphocephala* Woodland
- S *Melaleuca acerosa*, *Acacia pulchella* Open Heathland
- T *Melaleuca acerosa* Open Shrubland over *Lomandra maritima* Herbland
- U *Acacia rostellifera* Open Shrubland over *Lomandra maritima* Herbland
- V *Acacia saligna*, *Olearia axillaris* Open Shrubland



Cleared

Golden Bay Boundary



GOLDEN BAY VEGETATION MAP

FIGURE 12

3.4 Vegetation and Flora

3.4.1 Vegetation

A detailed survey of the vegetation and flora of Golden Bay was made as part of the present environmental assessment. This survey was designed to provide:

- o A map of the vegetation associations,
- o A species list for the area, and
- o Information on the location of any rare and endangered plant species.

A 1:5000 colour aerial photograph was examined to identify different vegetation types for mapping. Extensive ground transects were then made to verify the boundaries between vegetation types and to identify the vegetation associations. A set of 10m x 10m quadrats was also surveyed in each vegetation type to document the characteristic species for each association as an aid to vegetation mapping. A species list was generated from the quadrat information as well as additional species collected from outside of the quadrats.

Vegetation associations were described according to the dominant species in the tallest stratum, their height and percentage cover. The system of Specht (1981) was used to define the vegetation structural formations.

The vegetation of Golden Bay includes two vegetation complexes as mapped in the Atlas of Natural Resources (Conservation and Land Management, 1980). Most of the area includes the Quindalup Complex while the easternmost section consists of the Cottesloe Complex (Central and South). The Quindalup Complex occurs along almost the entire coastal strip between Lancelin and Bunbury but is widest in the Rockingham area. The Cottesloe Complex (Central and South) extends from Yanchep through to Lake Preston between Mandurah and Bunbury and is only represented by a thin north-south section near Golden Bay.

Within both vegetation complexes is an array of vegetation associations depending on soil type and geomorphology.

A total of sixteen major vegetation associations occur at Golden Bay. A range of sub-associations are also present as is to be expected in vegetation which changes gradually from one type to another. In some instances the boundary between vegetation types is sharp such as the change from limestone soils to Quindalup sand dunes. In other cases there is a complex mosaic of sub-associations on similar soil types e.g. Beach Ridge Plain soils. Only the major vegetation associations are shown on the vegetation map (Figure 12).

The vegetation types can be described according to the five main landforms described in Section 2.1 namely:

1. Coastal foredunes and the recent shore parallel ridge plain.
2. Linear deflation basin.

3. High relief chaot dunes near the coast and the parabolic dunes in the eastern sector of the property.
4. The Rockingham-Becher Plain.
5. Limestone soils of the Spearwood Dune.

These descriptions are given below:

1. Coastal Foredunes and Recent Shore Parallel System

A *Spinifex hirsutus* (Sh) Grassland occupies the first dune system east of the beach. The species richness of these sites is very low with few plants able to tolerate the salt spray from prevailing sea breezes. *Spinifex longifolius*, *Tetragonia decumbens*, and *Cakile maritima* are present on the seaward facing slopes of these dunes while *Isolepis nodosa* and *Carpobrotus virescens* are frequent near the crest and leeward sides. The series of low dunes immediately behind the foredune is dominated by *Olearia axillaris* (Oa) Shrubland. This association forms a wide band parallel with the coast and commonly contains *Cassytha* sp., *Pelargonium capitatum* and *Trachyandra divaricata*. It grades into a *Spyridium globulosum* (Sg) Open Heathland on lower dunes. The Sg association is equivalent to the *Spyridium globulosum*/*Acacia cyclops* (SgAc) unit found at Secret Harbour to the north but *Acacia cyclops* is not so dominant here. Other common species in the Sg Heathland are *Hibbertia cuneiformis*, *Alyxia buxifolia*, *Pelargonium capitatum* and the creeper *Hardenbergia comptoniana*. An intermediate unit, the *Acacia rostellifera*/*Spyridium globulosum* (ArSg) Closed Scrub, occurs in the southern section of these low dunes.

2. Major Depression

Between the low coastal dunes and the tall dunes further inland is a deflation basin parallel with the coast. It is 20 to 100m wide and extends the length of the study area. The depression is predominantly flat with small rises of 1-2m high. The lowest elevation soils intercept the groundwater in winter and are ephemeral shallow wetlands. The wetland vegetation consists of an extensive *Juncus kraussii* (Jk) Sedgeland. *Villarsia albiflora* is characteristic of these ephemeral wetlands while the sedges *Isolepis nodosa* and *Lepidosperma gladiatum* are also abundant. On slightly higher ground a *Spyridium globulosum* Closed Heathland dominates most of the depression. This unit contains similar species to the Sg Heathland on the adjacent low dunes except that there is a very dense ground coverage of the Sword Sedge *Lepidosperma gladiatum*.

3(a). High Relief Chaot Dunes (Coastal)

The crest of these dunes support either an *Acacia rostellifera* (Ar) Closed Scrub or a *Spyridium globulosum* (Sg) Closed Scrub. Species typical of younger dunes occur in these chaots such as *Rhagodia baccata*, *Leucopogon parviflorus*, *Alyxia buxifolia*, *Hardenbergia comptoniana* and *Acanthocarpus preissii*. The swales support either the Sg unit or a *Lepidosperma gladiatum* (Lg) Sedgeland.

3(b). Parabolic Quindalup Dunes (Inland)

The vegetation types on these dunes are very similar to the high relief dunes closer to the coast with a dominance of *Acacia rostellifera* over a large part. However there is also a predominance of *Melaleuca acerosa* Open Heathland on these inland dunes. In general, *Melaleuca acerosa* is more common on stable dunes than *Spyridium globulosum*, which itself is an indicator of less stable Quindalup Dunes.

4. The Rockingham-Becher Plain

A mosaic Shrubland dominated by *Jacksonia furcellata*, *Spyridium globulosum*, *Acacia saligna* and *Olearia axillaris* occurs on the Rockingham-Becher Plain. The understorey is mainly covered by *Lomandra maritima* and native *Stipa* species. In the swale the shrub layer is very sparse resulting in a *Lomandra-Stipa* Herbland/Grassland vegetation type.

5. Limestone Soils

The main vegetation types of the limestone soils of the Spearwood Dune System in the eastern part of the property are quite different from the other landform units described. They consist of a *Dryandra sessilis* Closed Scrub on outcropping limestone, *Hakea trifurcata* Closed Heathland on limestone and a *Templetonia retusa* Open Heathland on sand over limestone.

This unit is not well represented in the Golden Bay area or Secret Harbour and Port Kennedy to the north. However, it does occur extensively further south both west and particularly east of Mandurah Road.

3.4.2 Flora

A total of 142 plant species were recorded from Golden Bay including 33 introduced species and 109 native species (Appendix 3). The Pea family *Papilionaceae* contained the most number of native species (9) although the *Asteraceae* has the highest combined species, 8 native and 6 weed species. Other dominant families included the *Poaceae* (4 native, 7 weeds), *Proteaceae* (8 native species) and *Mimosaceae* (7 native species).

Two species are included on the CALM Declared Rare and Priority Flora List. No statutory requirements apply to these species under the Wildlife Conservation Act 1950-1979. The species are:

- o *Jacksonia sericea* (Priority 3). Priority 3 species are poorly known taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). *Jacksonia sericea* occurs in *Banksia* Woodlands and shallow sand over limestone in the Perth Region and is recorded from Joondalup, Wanneroo, Padbury, Mandurah, Fremantle and Bushmead. The species occurs in Kings Park, Star Swamp, Bold Park and Woodvale nature reserves. In the study area it occurred abundantly in

a small area of shallow sand over limestone within the *Hakea trifurcata* vegetation unit.

- o *Conostylis pauciflora* subsp. *pauciflora* (Priority 4). Priority 4 taxa are considered to be rare but not currently threatened by identifiable factors. There are relatively few individuals of this species within the study area. This species is known from near coastal areas south of Mandurah and within Yalgorup National Park. In the study area it was found only at one location on the Rockingham-Becher Plain.

4. ANALYSIS OF ENVIRONMENTAL ISSUES

4.1 Introduction

The purpose of this section is to provide an analysis of environmental issues related to the proposed rezoning and to the development which would occur if rezoning is approved. The scope of the present section is defined by the Guidelines of the PER as prepared by the EPA (see Appendix 1) and particularly by Section 5 of those Guidelines. The discussion below is, however, in a different format to that proposed by the Guidelines as related issues have been grouped together.

It is acknowledged at the outset that the proposed rezoning, if approved, would allow development of most of the Golden Bay property for residential and related purposes. The present appearance of the property therefore would be substantially altered by the development. Such development would eventually involve removal of much of the remaining natural vegetation on the property and also modification of some of the landform to provide a suitable terrain for house and road construction. The acceptability of this alteration must be evaluated at the regional and at the local (or property) levels.

At the regional level, the significance of the environmental impact (which is typical for many new residential estates in the Perth Metropolitan Region as bushland is converted to housing) can be considered within the regional planning context and in particular the allocation of land for parks and recreation purposes in the region. If there are large areas allocated for parks and recreation and these contain representative examples of important landforms, vegetation and flora, and fauna habitat, the residential development of natural land elsewhere in the region is generally considered to be reasonable (or at least an unfortunate necessity) given the need to provide new housing areas for the rapidly expanding population of the Perth Metropolitan Region. In this case, the environmental analysis can concentrate on the implications of the development at the property level. This type of analysis involves consideration of such matters as whether open space provision may be used to some extent to protect interesting features on the property and whether the development would affect any rare and endangered species.

If there are no existing or planned regional reserves, however, the overall environmental implications of property development may be considered to be relatively high particularly as more and more land is developed and less and less bushland remains.

There are many examples in the Perth Metropolitan Region where local community and conservation groups have objected to property development based on a position that inadequate provision has been made for conservation at the regional level.

The analysis presented below therefore, considers both the regional and local implications of the proposed Structure Plan. At the regional level, the proposal is considered to be acceptable as regional planning is allowing for large scale reservation elsewhere.

4.2 Regional Implications of the Proposal

The Golden Bay property is part of the South-West Corridor of the Perth Metropolitan Region. Planning for this corridor has recently become a priority for the Department of Planning & Urban Development (DPUD) as the population of the City of Rockingham is expanding rapidly and there is an identified need for new residential development in the short term future. Regional planning has now advanced to the stage where DPUD expects to publish a Draft Structure Plan for the South-West Corridor during 1992.

The Draft Structure Plan is expected to propose significant allocation of land within the South-West Corridor for parks and reserve purposes. Large reservations will incorporate parts of the Rockingham-Becher Plain at Port Kennedy, the Rockingham Lakes, the Stakehill Suite of wetlands, and a tract of Banksia Woodland to the west of the Serpentine River. Protection of other environmental features will be provided by a continuous coastal reserve, and by smaller reserves and parklands. Some of these reserves already exist or have been planned for some time but others will be established as a direct consequence of the Corridor Structure Planning process.

Two of the proposed reserves are relevant to the evaluation of the proposal for residential development at Golden Bay. These are the proposed Regional Open Space at Port Kennedy and the proposed coastal reservation at Secret Harbour.

The proposed Regional Open Space at Port Kennedy is located about 1.2km to the north of Golden Bay and extends from the coast inland to Mandurah Road. This reserve is intended to protect and preserve a representative cross-section of the Rockingham-Becher Plain and in particular the Beach Ridge dune system, Becher Suite wetlands and natural vegetation and fauna habitat of that plain. The Beach Ridge dune system extends south to Mandurah and is the most extensive landform on the Golden Bay property (see Section 3.1). The Port Kennedy reserve will therefore protect similar landform, vegetation and fauna habitat to that at Golden Bay.

The Port Kennedy reserve also includes near coastal Quindalup Dunes again with landform, vegetation and fauna habitat similar to the Quindalup Dunes at Golden Bay. This type of dune also occurs at Secret Harbour within the proposed coastal reserve and link-style golf course (Alan Tingay & Associates, 1991). The vegetation in the northern section of the coastal reserve at Secret Harbour is in a more pristine and better condition than the equivalent vegetation at Golden Bay where there has been some invasion of alien species.

The third major landform unit at Golden Bay, the inland Spearwood Dune ridgeline, does not occur at Port Kennedy, but is likely to be represented in the reserve for the Stakehill Suite of wetlands. This landform and its associated vegetation will also be partially protected within special rural subdivisions immediately to the west of Mandurah road on properties which are adjacent to Golden Bay and Singleton (to the south of Golden Bay).

On the basis of the above analysis, it can be concluded that the major landforms and vegetation types found on the Golden Bay property also occur within nearby areas likely to be designated for reservation in the forthcoming Draft South-West Corridor Structure Plan or within Special Rural Zones. In this context, it may be concluded that the physical and biological features of the Golden Bay property do not have regional environmental significance.

4.3 System 6 Area M107

4.3.1 Location and EPA Recommendations

Part of the Golden Bay property is the subject of recommendations by the EPA in its System 6 Study report (Department of Conservation and Environment, 1983). This study was designed by the EPA to identify areas on the Swan Coastal Plain and the adjacent Darling Range which were considered to have environmental significance and which should be retained by reservation and/or appropriate management. The study concentrated mainly on existing Government reserves but also included a few areas of privately owned land. The latter were generally areas considered to be significant as future Greenbelts in planning reports current at the time of preparation of the System 6 Study. The System 6 Area M107 which occurs at Golden Bay is one of this category. A further description of the System 6 Area M107 is provided in Appendix 2.

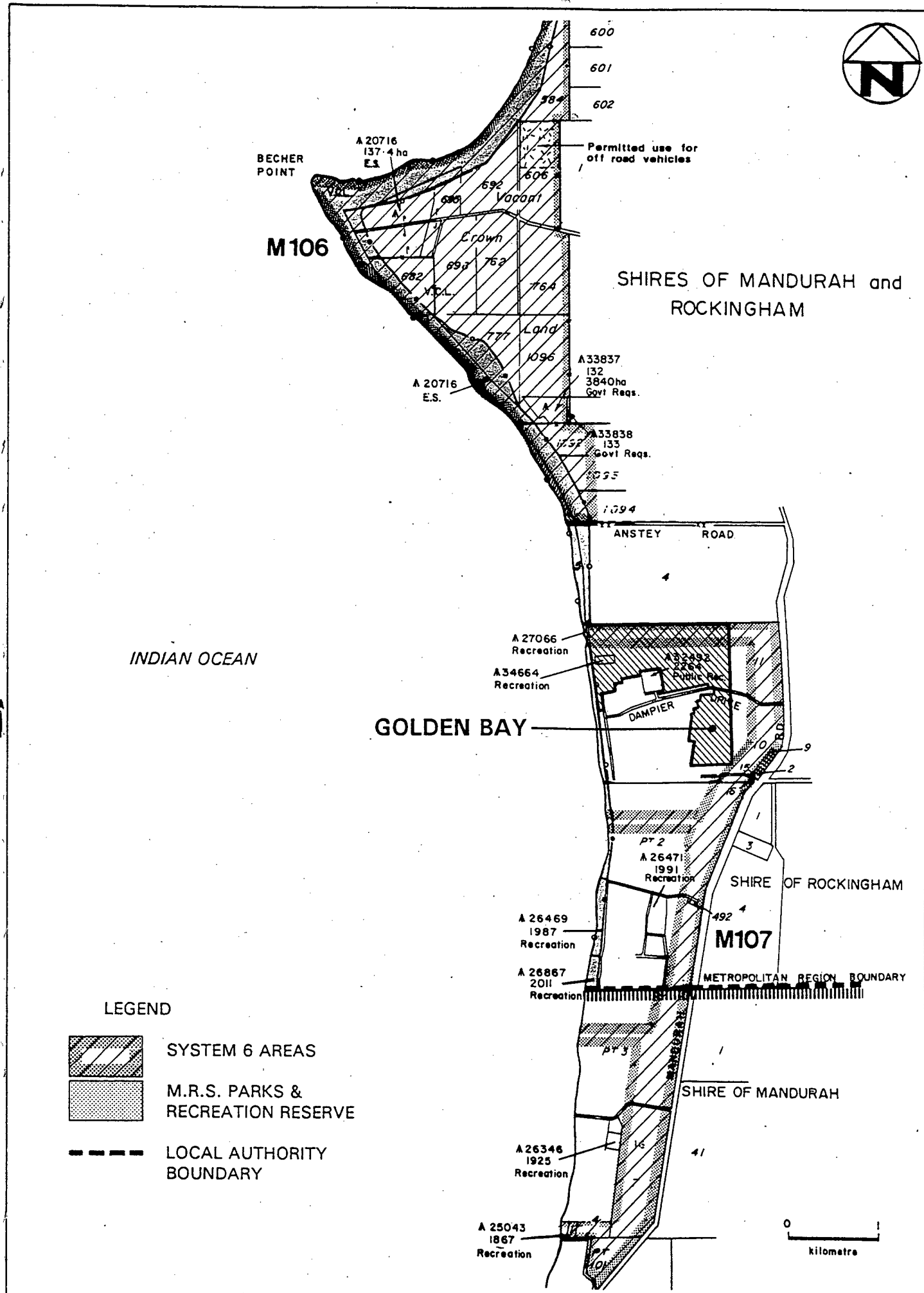
The boundaries of System 6 Area M107 are shown in Figure 13. It comprises a series of narrow strips of land at Golden Bay, Singleton and Madora which extend from the coast inland where they connect with a further north to south strip of land which runs parallel to and on the west side of Mandurah Road. The component of Area M107 between Golden Bay and Mandurah Road and between Singleton and Mandurah Road have been rezoned Special Rural within the past few years and have been subdivided. These subdivisions have occurred in accordance with EPA recommendations such as large lot sizes and defined building envelopes outside which vegetation should not be cleared. These recommendations have retained much of the landscape values of the land. The component of Area M107 adjacent to Mandurah Road at Madora at present is part of a larger property which surrounds the small coastal township of Madora.

The full text of the System 6 Area Study Report relating to Area M107 is given below:

o M107 Peelhurst, Singleton and Madora

The recommended area is situated on the coast about 10km north of Mandurah, and comprises Reserve C25043, for Recreation, and part of Reserve C27066, for Recreation, both not vested; lots 2 to 9, 15 and 16 (Mandurah Road subdivision), lots 1, 7, 492 and 688 and parts of lots 2, 3, 4, 10 to 12 and 101 (Cockburn Location 16), all privately owned freehold land. A small part of the area is "reserved" for Parks and Recreation under the Metropolitan Region Scheme.

The eastern section is within an area for possible unconfined groundwater extraction. Groundwater extraction in the future may affect water levels and could involve the



ALAN TINGAY & ASSOCIATES

SYSTEM 6 AREA M107

FIGURE 13

introduction of Catchment Zone regulations to restrict public access. The area will be slightly affected by widening requirements on the west side of Mandurah Road.

The MRPA's South-West Corridor Planning Structure advocated that the Peelhurst, Singleton and Madora townsites should become one urban settlement and the development of the strip on the west side of Mandurah Road for private recreation is considered a priority for implementation. The Mandurah Shire Council has recommended that the proposed east-west link between Singleton and Madora should be relocated further north to coincide with the Rockingham-Mandurah Shire boundary.

The area has extensive coastal dunes which are very valuable for their coastal vegetation and for recreational and aesthetic reasons. Their appearance and stability have been affected by nearby housing developments. Buffer zones of uncleared land should be left to preserve some segments of the scenery and vegetation near the main Mandurah Road and between areas of housing. These buffer zones would restrict housing to west of the dune ridge, and provide east-west links of vegetation between Mandurah Road and the coast. The present practice of excluding housing from a strip adjacent to the shore should be continued. It is considered that these proposals would be to the benefit of all parties, as an enhanced residential environment has greater monetary as well as aesthetic value. In principle, public access to the reserved land would be unrestricted but, in practice, some advisory body would have to undertake development and maintenance of paths to avoid dune erosion. The onus would fall initially on the relevant local authority but might later devolve on a Residents Association. Important management considerations include: the provision and maintenance of pathways; the prevention of dune erosion; the involvement of local residents in the management of the dunes; and the prohibition of active recreation activities which might disturb and inconvenience residents.

Recommendations:

- M107.1 That reserve C25043 be vested in the Shire of Mandurah.
- M107.2 That reserve C27066 be vested in the Shire of Rockingham.
- M107.3 That ways and means of protecting the area's recreational and landscape values be sought through planning procedures to be developed.

4.3.2 Discussion of the Recommendations

The most significant of the EPA recommendations relating to Area M107 is number 3 above which states that planning procedures should be developed to generally protect the areas recreation and landscape values. It is noteworthy that reservation for conservation purposes is not specifically recommended in this case and that no mention is made in the recommendations of environmental values other than landscape.

The text refers to the various components of M107 being buffer zones of uncleared land which are intended to preserve some segments of the local scenery and vegetation. Public access to these buffer zones was intended to be unrestricted but only for passive recreation purposes.

It would appear therefore, that the primary purpose of Area M107 is to preserve small areas of landscape or vegetation within a future urban corridor principally for planning

reasons. In the contemporary planning context of 1992 the value of this objective can be questioned. At the regional planning level the emphasis for protection of environmental features has now shifted, as a result of better information on the regions assets, to Port Kennedy, the Stakehill Suite of wetlands and a large area of remnant Banksia Woodland near the Serpentine River. It is understood that all of these areas will be suggested for reservation in the forthcoming Draft South-West Corridor Structure Plan (see Section 4.2 above). However, none of these areas except for parts of Port Kennedy were considered by the System 6 Report.

Apparently there is concern about the relatively low yield of future residential land within the South-West Corridor as a result of the amount of land allocated to Parks and Reserve purposes.

The recent Special Rural subdivisions in Area M107 adjacent to Golden Bay and Singleton also suggest that DPUD, the City of Rockingham and the EPA, whilst making provision for landscape protection, no longer consider that these particular areas have future recreational potential. Therefore, there would seem to be no value in providing a recreational link from those parts of Area M107 adjacent to Mandurah Road to the coast.

Moreover, the City of Rockingham has indicated that it would be reluctant to accept management responsibility for the east-west components of Area M107 at Golden Bay and Singleton if these were to be acquired for Parks and Reserve purposes.

4.3.3 Environmental Values of Area M107

The analysis presented in this PER suggests that the component of Area M107 on the Golden Bay property does not contain landforms or support vegetation of exceptional quality or interest in the regional context.

The environmental features of Area M107 on the Golden Bay property are illustrated in Figures 8 and 12 which show the landforms and vegetation respectively. The area contains a cross section of the landforms on the property from the west to the east as follows:

- o part of the linear deflation basin,
- o some of the relatively tall Quindalup Dune System,
- o part of the Rockingham-Becher Plain, and
- o some of the fretted parabolic Quindalup Dunes on the Spearwood Ridge.

Each of these landforms is a component of a larger geomorphic unit which is aligned north to south, i.e. in the opposite direction to the alignment of area M107. This difference in alignment means that modification of the landforms by development immediately adjacent to Area M107 is likely to make it difficult to preserve the components of the landforms within the area. This is particularly the case for the relatively tall Quindalup Dunes in the western part of Area M107 and the fretted parabolic Quindalup Dunes to the east where adjacent development will involve earthworks. Indeed the configuration of Area M107 at Golden Bay and the other east-

west components further south is in contrast to reserve allocation principles which recommend that boundaries should be defined according to prominent environmental features in order to avoid continuing management difficulties.

Area M107 at Golden Bay also contains a range of vegetation types with *Spyridium globulosum*, *Acacia cyclops* and *A. rostellifera* dominant in Open Heathland and Closed Scrub in the linear deflation basin and on the adjacent tall Quindalup Dunes; *Jacksonia furcellata*, *S. globulosum*, *A. saligna* and *Olearia axillaris* Open Heathland to Shrubland on the Rockingham-Becher Plain; and *A. rostellifera* Closed Scrub and *Melaleuca acerosa* Open Heathland on the fretted parabolic Quindalup Dunes to the east.

This vegetation is generally in good condition. However, good examples of all of these vegetation types except the *Melaleuca acerosa* Open Heathland will be preserved in Regional Open Space and coastal reserves at Port Kennedy and Secret Harbour. The *M. acerosa* Open Heathland is extensive in the Special Rural area adjacent to Mandurah Road at Singleton which is also a component of Area M107. Clearing restrictions imposed by the City of Rockingham in this Special Rural area will mean that *M. acerosa* Open Heathland there will be protected in a development context.

Protection of the vegetation within Area M107 at Golden Bay is, however, likely to be difficult with residential development immediately adjacent to the northern and southern boundaries of the area. In order to achieve such protection it would almost certainly be necessary to fence the area and to permit only limited access on established pathways particularly on landforms which are prone to erosion, and where vegetation can be easily damaged. It also would be very desirable to provide a fire break around the perimeter of the area. All of these measures are not really appropriate for a reserve of this shape within a residential area with a high population. The area would also be bisected by a major road and probably by minor roads linking Golden Bay and Secret Harbour.

4.3.4 Conclusions

On the basis of the information presented above, it is concluded here that System 6 Area M107 was established primarily for planning purposes and that the area has only incidental environmental values. It is suggested that the planning considerations of the time of the System 6 Study Report are no longer relevant and that the environmental values will be preserved at the regional level by recent proposals for open space and reserves within the South-West Corridor.

It is concluded that the proposed development of Area M107 at Golden Bay as suggested by the Structure Plan for that property, will have no significant environmental implications. As an alternative to the M107 area proposed by System 6 recommendations, this Structure Plan includes the allocation of additional Open Space to Coastal Reserves which will provide for greater protection of coastal landforms, including Stakehill Suite wetlands, and for passive recreational values. Alternatives to this expanded Coastal Reserve have been considered and are discussed in full in Appendix 2.

4.3.5 Remainder of Area M107

On receiving the referral of the present proposal, the EPA informed the proponent that it would prefer to resolve the future use of System 6 Area M107 as a totality. The EPA, however recognised that it was not possible for H&B Developments Pty Ltd to make proposals for all of Area M107 as the area included land owned by other parties to the east and south of Golden Bay. The EPA therefore separately informed other owners of major landholdings at Singleton and Madora of its preference. These owners, together with H&B Developments Pty Ltd, eventually provided an informal discussion paper to the EPA which provided information on the whole of Area M107 and its potential future uses. A copy of this discussion paper is provided in Appendix 3 of this PER. The inclusion of this paper in the PER enables the public to have an input on decisions to be made regarding M107 as a whole and will also enable the EPA to provide general guidance in its assessment report to the other owners as to the nature of proposals affecting Area M107 that the EPA may consider appropriate.

In 1990, however, a proposal for rezoning of land north of Singleton was referred to the EPA and the EPA set a Consultative Environmental Review (CER) level of assessment for that proposal. It is possible that this CER may be released during the public review period of the present PER. In this case, the specific proposals made for Singleton will be assessed on their own merit.

The owners of Madora are also considering their options (as at April 1992) and may choose to refer proposals for those parts of System 6 Area M107 on their land before the assessment of the present PER has been completed.

4.4 The Coastal Reserve

The protection of the coastal zone in the Perth Metropolitan Region is recognised as an important planning priority and the allocation of Coastal Reserves is a fundamental objective of the EPA, DPUD and relevant Local Authorities. In accordance with this objective, property owners are required to make land available for Coastal Reservation in rezoning applications prior to subdivisions if such reserves have not already been allocated.

Coastal protection procedures appropriate for the Perth Metropolitan Region are described in the Draft Statement of Planning Policy No. 2 published by the State Planning Commission (1988). This Draft Policy has 3 objectives:

- o To ensure the development on and adjacent to the coast is located, designed and sited to complement and be visually compatible with the coastal landscape.
- o To ensure the development on and adjacent to the coast is compatible with the protection of coastal resources.
- o To maintain public access to the coast consistent with the protection of coastal resources.

The area to which the Policy applies is defined as a 500m strip of land and a 500m strip of coastal water on either side of the high water mark. A number of recommendations relating to the objectives are also included in the Draft Policy. These recommendations in particular, cover the protection of the visual character of the coastal zone, restrictions on building heights, land use priorities, set backs for developments to ensure coastal stability, retention of natural vegetation, soil conservation measures, drainage and water quality management, coastal development and coastal management plans and vehicular and pedestrian access.

While the policy area applies to a 500m strip of land from high water mark, the recommended width of the actual Coastal Reserve on accreting coasts such as at Golden Bay is 100m. Section 4.2.1 (iii) of the Draft Policy states

"Where landforms are determined to be stable or accreting, a set-back of 100m should be regarded as a guideline for the Coastal Reserve width for a wind erosion buffer and to ensure that recreational, public amenity, ecological and visual values are maintained."

The proposed Structure Plan for Golden Bay complies with all of the recommendations of Planning Policy No. 2.

The Coastal Reserve proposed in the Structure Plan is considerably larger than that required by DPUD (Figure 6). This extra provision is made in recognition of System 6 Area M107 recommendations relating to landscape protection and recreation. The boundary between this area and the urban area of the subdivision has been made so that it conforms where possible to natural landform boundaries.

The proposed coastal reserve is generally more than 150m wide (measured from the vegetation line behind the beach) and is some 300m at its widest. In the south, the inland or eastern boundary of the reserve is aligned along the eastern edge of the linear swale which separates the coastal Beach Ridge dune system from the inland tall Quindalup Dunes. The reserve here includes all of the near coastal Beach Ridge system and a relatively large area of the swale with representative areas of all of the swale vegetation types including examples of the damplands. The Beach Ridge dunes typically have elevations of 6 to 8m and are all well vegetated with *Spinifex hirsutus* Grassland near the coast and *Olearia axillaris* Shrubland further inland. The dune system is also expanding westwards at a relatively rapid rate due to local coastal processes.

In the north, the proposed Coastal Reserve includes all of the beach ridge dune system behind the beach. The eastern boundary here has been aligned to link in with the Coastal Reserve at Secret Harbour to the north. The coastal reserve at Golden Bay therefore has boundaries consistent with landform features and exceeds requirements for protection against foreseeable coastal erosion.

Development proposals at Golden Bay will not affect natural vegetation within the coastal reserve except for the provision of a Surf Life-Savers Club Hall, carparks, footpaths and other beach access facilities, nor will it involve soil disturbance or alterations to drainage and water quality. All carparks and ablution facilities will be

located on the eastern side of the frontal dunes so that they are not visible from the beach and access to the beach will be provided by narrow pathways located and designed so as to minimise erosion. The Guidelines of the Draft Policy relating to the design and siting of the carparks and pedestrian access will be adhered to and no building within the coastal policy area will exceed the recommended 12m in height. The elevation of the dunes within the reserve and the vegetation on those dunes will also largely prevent the Golden Bay development from being visible from the beach.

Plans for the facilities within the coastal reserve described above will be incorporated in a coastal reserve management plan which will be submitted to DPUD and the City of Rockingham for approval. The proposed Structure Plan also complies with the Coastal Management Plan for the City of Rockingham.

4.5 Physical Features and Landscape Protection

The development of the Golden Bay property will involve significant modification of the existing landscape (landform and vegetation) as explained in Section 4.1 above. This is, however, an unavoidable outcome of urban development and is consistent with planning priorities for the South-West Corridor.

In addition, the modifications to the landscape will be confined to the property itself and generally will not be visible from either the beach or from Mandurah Road. Views from the beach inland will be protected by the relatively tall beach ridge dune system in the coastal reserve and from Mandurah Road by the adjacent Special Rural areas.

Extensive earthworks will be required at Golden Bay on the Quindalup Dune system both near the coast and overlying the Spearwood Dune ridgeline in order to establish appropriate levels for urban development. The detailed design of these earthworks has not been prepared as yet and will follow approval of the Structure Plan but the overall elevations of these landforms will be maintained as far as is consistent with levelling requirements.

4.6 Groundwater and Drainage

The proposed development at Golden Bay is not expected to have any significant implications for local groundwater or groundwater utilisation. The water table in the superficial aquifer is likely to be elevated as a result of increase recharge due to urban runoff even though increased pumping from this aquifer is likely for both domestic and public usage (e.g. playing fields). The information on the local aquifer collected by Rockwater and reviewed in Section 3.2 clearly indicates that the quantity of groundwater available for extraction without depletion of the resource is large. Rockwater estimated that at Secret Harbour immediately north of Golden Bay, the throughflow of groundwater in the superficial aquifer was in the order of 1.2ML/day. They also stated that an average extraction rate of 1.7ML/day for the original proposal there would be unlikely to have any major environmental or other noticeable effects in the local region. This level of extraction is far greater than any that could be expected

at Golden Bay as the property is considerably smaller and has fewer public facilities such as golf courses than does Secret Harbour.

Nutrient levels in the superficial aquifer can also be expected to increase as a result of urbanisation but it is most unlikely that this will affect usage. As the superficial aquifer is localised, the anticipated relatively minor elevation in nutrient levels is not considered to warrant any specific management response.

Urban runoff from the Golden Bay development will be directed to infiltration into the ground rather than any major drainage system and no special provisions for drainage are considered to be necessary.

4.7 Wetlands

The eastern extension of the Coastal Reserve at Golden Bay has primarily been designed to incorporate examples of the Peelhurst Suite of wetlands. These small damplands have a limited occurrence and representations have been made to the proponents that efforts should be made to protect some examples at Golden Bay. Specific protection and management measures will be defined in the Coastal Reserve Management Plan referred to in Section 4.4 above.

There are no other wetlands at Golden Bay or nearby which may be affected by the proposed development. Groundwater at Golden Bay consistently flows towards the sea both summer and winter and there is no flow eastward towards Anstey Swamp from beneath the property which is the subject of this PER.

4.8 Vegetation and Flora

The vegetation and flora at Golden Bay is typical of the near coastal areas between Rockingham and Mandurah as discussed in Section 3.4. Representative examples of this vegetation will be protected in the relatively large reserve proposed for Port Kennedy and within the coastal reserve both at Port Kennedy and Secret Harbour as well as Golden Bay. Typical vegetation of tall near coastal Quindalup Dunes will also be protected within the link-style golf course at Secret Harbour. In general, therefore, it is not considered that there should be any specific requirement for vegetation retention at Golden Bay.

The two flora species identified as being on the CALM Declared Rare and Priority Flora List are known to occur within Reserves on the Swan Coastal Plain. *Jacksonia sericera* is particularly well represented within a number of reserves (Section 3.4.2). Only a few individuals of *Conostylis paniciflora* subsp. *paniciflora* are known to occur on the Golden Bay property and consequently it is considered that there is insufficient numbers to warrant conservation at Golden Bay. There are no statutory requirements with regard to these species under the Wildlife Conservation Act, 1950-1979.

4.9 Social Environment

4.9.1 Aboriginal Heritage

The Golden Bay property has been surveyed for archaeological and ethnographic sites by Quartermaine Consultants (in 1990) and B Machin (in 1990) respectively. These surveys identified a camping site of some importance near the coast and immediately north of the existing Golden Bay township. The coastal reserve has been expanded at this location to incorporate this heritage site. No other constraints to development as a result of Aboriginal Sites are known.

4.9.2 Local Residents

The proposed development at Golden Bay represents an expansion of the existing townsite. Current residents of the town have had the opportunity to be aware of this potential expansion for some years as it has been documented in various reports on planning for the region. Much of the land is also zoned urban deferred.

The proponents consider that the development will provide improved facilities for current residents but they also acknowledge that some residents may consider that the quality of their lifestyle will be diminished as a result of population growth. Any such concerns are properly the responsibility of the City of Rockingham which must ultimately approve the subdivision.

4.10 Management Issues

4.10.1 Coastal Reserve

As stated in Section 4.4 above, a specific management plan for the Coastal Reserve at Golden Bay will be prepared following approval of the rezoning application.

4.10.2 Invertebrates

The guidelines for the PER require discussion of midge, mosquito and insect nuisance and management strategies to control any such nuisance. No such nuisance is known, however, at Golden Bay or is expected to occur as a result of the development. Therefore no specific management provision are considered necessary.

4.10.3 Fire Management

The proponents are aware of their responsibility for fire prevention and management on the Golden Bay property and have provided a network of firebreaks and access tracks according to the requirements of the City of Rockingham. These will be maintained as the subdivision proceeds but responsibility will gradually be transferred to landowners and to the City of Rockingham. Any request from the City of Rockingham for further fire management measures will, of course, be considered by the proponents but no

special precautions against fire in addition to those that normally apply to properties in this region, are considered to be necessary.

5. CONCLUSIONS

The analysis of environmental issues presented in Section 4 of this PER concludes that the proposed development of Golden Bay for urban purposes is typical of many recent urban subdivisions which are occurring in the north-west and south-west corridors of the Perth Metropolitan Region and involves equivalent environmental issues. Land has been set aside for conservation purposes at a number of locations including large areas at Port Kennedy and elsewhere which incorporate the major landforms and vegetation types which occur at Golden Bay. Regional planning by the Department of Planning and Urban Development has therefore achieved a balance between conservation and development needs in the South-West Corridor and it is concluded that development of Golden Bay has no significant environmental implications at the regional level.

With regard to the System 6 recommendations for Area M107, the proponent recognises their importance and has evaluated both the existing recommendations and a number of alternatives in addressing this issue. The proponent believes that in this regard the community of Golden Bay will be better served by the alternative proposed in this PER, that is a considerably expanded coastal reserve. This coastal reserve will contain areas that have conservation, landscape and recreational value. In addition, the Coastal Reserve would be more easily managed than the area originally proposed as part of System 6 Area M107.

6. COMMITMENTS

Commitments represent the proponents solutions to potential environmental problems posed by the development. H&B Developments Pty Ltd commits to undertake the following commitments with respect to the Golden Bay project.

1. The proponent will provide, in exchange for the development of the currently proposed System 6 Area M107, additional Regional and Public Open Space adjacent to the Coastal Reserve as shown in the Structure Plan, in excess to that which would normally be required by DPUD. This will be done to the satisfaction of the EPA, DPUD and the Local Authority at the rezoning stage.
2. The proponent will prepare a Management Plan for the Coastal Reserve at Golden Bay prior to development commencing. This will be done to the satisfaction of DPUD and the Local Authority.
3. The proponent will include an historic aboriginal camping site within the proposed Public Open Space for the development. This will be done to the satisfaction of the Local Authority.
4. The proponent will continue to provide and maintain a network of firebreaks and access tracks to protect against bushfire until the Local Authority takes on this responsibility. This will be done to the satisfaction of the Local Authority.
5. The proponent will provide reticulated sewerage and will design the development so that stormwater drainage is disposed of on site. This will be done during the installation of services within the development to the satisfaction of DPUD and the Local Authority.

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APPENDICES

APPENDIX 1

EPA GUIDELINES FOR THIS PER

GUIDELINES FOR THE PUBLIC ENVIRONMENTAL REVIEW (PER) GOLDEN BAY

Proposal to rezone from urban deferred and parks and recreation to urban, important regional road and parks and recreation.

In Western Australia, the environmental assessment process is about protecting the environment. The fundamental requirement is for the proponent to describe the proposal in some detail, to discuss the environmental impacts and potential environmental impacts of the proposal, and then to describe how those environmental impacts are going to be avoided, ameliorated or managed so that the environment is protected.

Throughout the process, it is the aim of the Environmental Protection Authority (EPA) to advise and assist the proponent to improve or modify the proposal in such a way that the environment is protected. However, it is the responsibility of the proponent to design and implement proposals which protect the environment, and to present the design proposals for review.

These guidelines have been prepared to assist the proponent in identifying issues which should be addressed within the Public Environmental Review (PER) Golden Bay. They are not intended to be exhaustive and the proponent may consider that other issues should also be included in the document.

The PER should facilitate a review of the key environmental issues. The purpose of the PER should be explained, and the contents should be concise and accurate as well as being readily understood. Specialist information and technical description should be included only where it assists the understanding of the proposal. Where specific information has been requested by a Government Department or the Local Authority this should be included in the document.

It is not intended that the document be unduly lengthy. Rather it is intended that all relevant material should be succinctly presented in order that the key environmental issues may be assessed.

The principal function of the PER is to place this project in the context of the regional environment and progressive developments, including the cumulative impact of this development. It seeks to explain why this project is being proposed in the way it is, at this place and at this time. It should also set out the environmental impacts the project will have, and what management steps the proponent intends to use to avoid, ameliorate or mitigate any negative environmental impacts.

A copy of these guidelines should appear in the PER.

1 SUMMARY

The PER should contain an executive summary which includes

- * salient features of the proposal (including the proponent, location of the site, brief description of what is proposed)
- * description of receiving environment and analysis of potential impacts and their significance
- * proposed environmental management, safeguards, and commitments by the proponent for implementation
- * conclusions

2 INTRODUCTION

This should include a brief overview of the proposal, including what is proposed, by whom, where, and why. The rationale for the proposal should be outlined, and alternatives discussed.

3 DESCRIPTION OF THE EXISTING ENVIRONMENT

This section should include a brief description of the physical, biological and social environment of the area .

4 PROJECT DESCRIPTION

This section should include a description of the proposal itself, including specifically what is proposed, how it is to be carried out, the timing of the project, and what measures will be taken to ameliorate possible negative effects.

Detailed plans of the site should be included showing:

- existing land uses and land status
- adjacent land uses
- roads and services
- proposed land uses
- System 6 areas

These plans may be included in the text, or included as appendices to the report.

5 ENVIRONMENTAL IMPACTS AND MANAGEMENT

This section should discuss predicted environmental impacts and proposed measures to overcome or minimise these problems.

The specific environmental concerns with the Golden Bay proposal revolve around a number of issues, which include

- System 6 recommendations - it is important that this proposal be seen in the context of the whole of the system 6 area.
- Protection of groundwater
- Drainage management. Effluent disposal. Nutrient management
- Visual resource management
- Protection of the existing eastern ridgeline (minimal earthworks encouraged)
- Aboriginal heritage issues
- Landscape protection east towards Mandurah Rd
- Significant flora and fauna conservation
- Foreshore reserves and sand dunes: stabilisation and management; access and recreational use
- Linked vegetation and faunal corridors
- Midge, mosquito and insect nuisance -management
- Fire management

6 CONCLUSIONS

This section should be a synthesis of the overall environmental impact of the proposal and how it has been addressed to make the project environmentally acceptable.

7 COMMITMENTS

Specific commitments should be given to all components of the management programme.

Where appropriate, the commitments should include

- a) who is responsible for the commitment and who will do the work,
- b) what is the nature of the work
- c) when and where the work will be carried out and
- d) to whose satisfaction will the work be carried out.

A summary of commitments in numbered form should be given. A set of well written concise commitments covering the key issues of the proposal and its effects will help to expedite assessment of the proposal.

APPENDIX 2

SYSTEM 6 AREA M107
DISCUSSION PAPER

ALAN TINGAY & ASSOCIATES

FEBRUARY 1992

REPORT NO: 92/6

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1. INTRODUCTION

System 6 Area M107 is located close to the coast in the City of Rockingham and the City of Mandurah. It is entirely located on private property and consists of (1) a strip of land adjacent to and on the western side of Mandurah Road and (2) a series of east-west sections which connect this road strip to the coast.

Implementation of the recommendations relating to this area have not proceeded possibly because of the complexities presented by its private ownership, configuration, and lack of specific information relating to its environmental features. However, development of some of the properties on which area M107 is located is now proposed and the owners have independently asked the Environmental Protection Authority (EPA) to review the status of the area.

These owners have suggested that such a review should take into account the configuration of the area, the origins of the System 6 recommendations, contemporary planning and management considerations and the environmental features of the area. In response, the EPA has indicated that any such review will include a detailed evaluation of the implications of all future use options ranging from retention of the area in its present form to partial or complete residential, special rural, or other development.

This discussion paper has been prepared by Alan Tingay & Associates on behalf of the owners to provide a comprehensive description and discussion of Area M107 which it is hoped will assist the EPA in its future consideration of the area. It includes a description of:

- o the location of the area,
- o the System 6 Study text (text and recommendations of the System 6 Study Report),
- o origins of the area,
- o current status/ownership,
- o environmental features,
- o the contemporary planning context,
- o management considerations
- o options for future status and use, and
- o preferred position of the various owners.

2. LOCATION

The location of System 6 Area M107 is shown in Figure 1. This figure is from the original System 6 Study Report and indicates the boundaries and dimensions only in an indicative sense. The figure does not show any landholdings and does not provide any dimensions (apart from a small scale line) and it is difficult to precisely locate some of the boundaries. The text of the System 6 Study Report also does not provide any clear indications of the location of the boundaries (see Section 3).

Only three of the boundaries can be located with precision. These are:

- o the eastern boundary of the entire area which has a common alignment with property boundaries along Mandurah Road,
- o the northernmost boundary which is located on the boundaries between the property of Secret Harbour (to the north of the area) and those of Golden Bay and Special Rural properties adjacent to Golden Bay in the south, and
- o the southern boundary which coincides with a property boundary at Madora.

The location of some other parts of the area, however can be inferred as follows:

- o the south boundary of the east-west section at Singleton appears to coincide with the limit of residential development,
- o the western boundary of the road section at Singleton appears to coincide with property boundaries, and
- o the western boundary of the road section at Madora is straight and is aligned with a boundary of Reserve 26346.

The remaining boundaries can be determined approximately by transferring the System 6 figure to cadastral plans with appropriate adjustment of scale.

The lack of precision with respect to the boundaries of Area M107 possibly indicates that the EPA was more concerned in this case with the intent of its recommendations for the area rather than with precise features. This appears to be supported by the text of the System 6 Study Report for the area.

3. THE SYSTEM 6 STUDY REPORT AND RECOMMENDATIONS

3.1 Text of the System 6 Report

The full text of the System 6 Area Study Report relating to Area M107 is given below:

o M107 Peelhurst, Singleton and Madora

The recommended area is situated on the coast about 10km north of Mandurah, and comprises Reserve C25043, for Recreation, and part of Reserve C27066, for Recreation, both not vested; lots 2 to 9, 15 and 16 (Mandurah Road subdivision), lots 1, 7, 492 and 688 and parts of lots 2, 3, 4, 10 to 12 and 101 (Cockburn Location 16), all privately owned freehold land. A small part of the area is "reserved" for Parks and Recreation under the Metropolitan Region Scheme.

The eastern section is within an area for possible unconfined groundwater extraction. Groundwater extraction in the future may affect water levels and could involve the introduction of Catchment Zone regulations to restrict public access. The area will be slightly affected by widening requirements on the west side of Mandurah Road.

The MRPA's South-West Corridor Planning Structure advocated that the Peelhurst, Singleton and Madora townsites should become one urban settlement and the development of the strip on the west side of Mandurah Road for private recreation is considered a priority for implementation. The Mandurah Shire Council has recommended that the proposed east-west link between Singleton and Madora should be relocated further north to coincide with the Rockingham-Mandurah Shire boundary.

The area has extensive coastal dunes which are very valuable for their coastal vegetation and for recreational and aesthetic reasons. Their appearance and stability have been affected by nearby housing developments. Buffer zones of uncleared land should be left to preserve some segments of the scenery and vegetation near the main Mandurah Road and between areas of housing. These buffer zones would restrict housing to west of the dune ridge, and provide east-west links of vegetation between Mandurah Road and the coast. The present practice of excluding housing from a strip adjacent to the shore should be continued. It is considered that these proposals would be to the benefit of all parties, as an enhanced residential environment has greater monetary as well as aesthetic value. In principle, public access to the reserved land would be unrestricted but, in practice, some advisory body would have to undertake development and maintenance of paths to avoid dune erosion. The onus would fall initially on the relevant local authority but might later devolve on a Residents Association. Important management considerations include: the provision and maintenance of pathways; the prevention of dune erosion; the involvement of local residents in the management of the dunes; and the

prohibition of active recreation activities which might disturb and inconvenience residents.

Recommendations:

- M107.1 That reserve C25043 be vested in the Shire of Mandurah.
- M107.2 That reserve C27066 be vested in the Shire of Rockingham.
- M107.3 That ways and means of protecting the area's recreational and landscape values be sought through planning procedures to be developed.

3.2 Discussion of the Recommendations

The most significant of the EPA recommendations relating to Area M107 is No. 3 above which states that planning procedures should be developed to generally protect the area's recreation and landscape values. It is noteworthy that the emphasis is on planning procedures and on recreation and landscape values. There are no specific recommendations for reservation for conservation purposes or for the protection of vegetation of flora except as part of the landscape. However, the supporting text refers to important coastal vegetation on the extensive coastal dunes of the area.

The text also refers to the various sections of Area M107 being buffer zones of uncleared land which are intended to preserve some segments of the local scenery and vegetation. Public access to these buffer zones was intended to be unrestricted but only for passive recreation purposes.

It would appear therefore, that the primary intended purpose of Area M107 was to preserve small areas of landscape or vegetation within a future urban corridor principally for planning reasons.

It was suggested that housing should be restricted to the west of the ridgeline which parallels Mandurah Road as a landscape protection measure. This has not occurred, however, as Special Rural subdivision has been approved in those sections of Area M107 near Golden Bay and Madora. Development will, however, include vegetation retention designed to minimise the impact on landscape values. Near Singleton there is more opportunity for concealment of houses in the Special Rural area due to variable topography. At Madora also a house has recently been constructed on the ridgeline on a residential block of the Madora townsite and in a prominent location where it is visible from Mandurah Road.

4. PLANNING PROPOSALS FOR THE AREA

4.1 Current Zoning

The northern section of Area M107 is within the Perth Metropolitan Region and the City of Rockingham. The southern section is in the City of Mandurah.

Current planning of the South-West Corridor of the Perth Metropolitan Region currently extends to Mandurah so effectively Area M107 and the adjacent landholdings can be considered to be part of the South-West Corridor.

The Metropolitan Region Scheme of 1963 showed the northern section of Area M107 and adjacent landholdings as Rural notwithstanding the subdivision and housing development which was taking place at Golden Bay and Singleton. This situation was corrected by the Omnibus Amendment to the Region Scheme which was gazetted in November 1975 and which zoned the existing sub-divided area Urban.

In 1974, TS Martin & Associates completed the South-West Corridor Study and recommended Urban zoning generally south of Dampier Drive at Golden Bay. The Metropolitan Region Planning Authority (MRPA) reviewed these recommendations and published "A Planning Strategy for the South-West Corridor" in April 1980. This proposed a belt of urban land south of Port Kennedy to Mandurah including on the lateral west-east sections of Area M107.

Amendment 310/33 to the Metropolitan Region Scheme (MRS) rezoned land between Secret Harbour to Singleton (including the west-east components of Area M107 at these locations) from Rural to Urban Deferred and was gazetted on 8 May 1981. Those parts of Area M107 adjacent to Mandurah Road near Golden Bay and Singleton remained in Rural zoning in 1981 but subsequently were rezoned to Special Rural and have been subdivided.

At Madora all of the land surrounding the existing townsite is zoned Rural including all of those parts of Area M107 which are in the City of Mandurah. However, the Peel Regional Plan (July 1990) shows the Rural area to be future Urban land with the exception of the System 6 Area which is shown for Rural Conservation and Rural Residential Use.

An area along the entire coastline from Golden Bay to Madora is zoned for Parks and Recreation and this includes small sections of each of the west-east lateral sections of Area M107.

4.2 Regional Planning Considerations

The System 6 Study Report states that one of the objectives of Area M107 is to provide buffer strips between the urban cells at Golden Bay, Singleton and Madora. This objective is contrary to those of planning studies which have generally recommended linking the three townships as a continuous urban area. The planning perspective is

based on consideration of infrastructure costs and the integration of other community services including a road network, schools and recreation facilities.

More recently, the DPUD has indicated concern over the relatively small amount of residential land potentially available in the South-West Corridor and the implications that this will have for the provision of a cost effective public transport system. The lack of residential land arises from a significant proposed allocation of land in the South-West Corridor for Parks and Recreation purposes (including an area of Regional Open Space at Port Kennedy, reservation at the Stakehill Suite of wetlands and the establishment of Paganoni's Reserve) and for Special Rural purposes (such as Area M107 adjacent to Mandurah Road at Golden Bay and Singleton). The System 6 Study recommendations were made at the time when most of this regional allocation of land for Parks and Recreation was not being considered.

4.3 Current Status/Ownership

System 6 Area M107 has multiple ownership as follows:

- o Golden Bay - H&B Developments Pty Ltd owns most of the land to the north and east of the existing township of Golden Bay including most of the northern lateral wedge section of Area M107. However, the easternmost section of the lateral wedge and all of the sections adjacent to Mandurah Road near Golden Bay has been subdivided for Special Rural purposes and is in multiple small lot ownership.
- o Singleton - Temwood Holdings Pty Ltd have an option to purchase land immediately to the north of the existing township of Singleton. This includes the lateral wedge section of Area M107 at this location. The section of Area M107 adjacent to Mandurah Road near Singleton has been subdivided into Special Rural lots and is in multiple ownership.
- o Madora - all of the land surrounding the existing township of Madora including all of Area M107 in this location is owned by HB & JN Perry Pty Ltd.

4.4 Future Ownership

If System 6 Area M107 is to be retained exclusively for recreation and landscape protection purposes as suggested by the EPA recommendations, then it will eventually have to be acquired or restrictions will have to be placed on private use. The opportunity to achieve public ownership of the Mandurah Road sections of Area M107 near Golden Bay and Singleton has passed as these sections have been subdivided into Special Rural blocks.

Acquisition of the remaining sections would presumably have to be by purchase (probably by DPUD with funds from the Metropolitan Region Improvement Fund) or by designating the sections Public Open Space in development proposals.

The official attitude of DPUD to purchasing these sections is not known. However, officers of DPUD have stated to Alan Tingay & Associates that acquisition would have a very low priority in the Metropolitan Region and South-West Corridor due to the number and size of other very important areas which the Department believes are necessary to acquire for Regional Open Space and conservation purposes (e.g. Paganoni's Reserve and the Stakehill Suite of Wetlands). Various officers of DPUD have also stated that it would be preferable to allow residential development on all of Area M107 for the purpose of urban consolidation in the South-West Corridor.

The designation of those sections of Area M107 in the City of Rockingham as Open Space (apart from the two Special Rural sections) would also appear to present problems. The City currently requires major landowners such as H&B Developments Pty Ltd at Golden Bay and Temwood Holdings Pty Ltd at Singleton to allocate approximately 10% of their landholdings to Open Space in any development proposal. This Open Space is considered to be necessary primarily for playing fields and other developed community facilities. Such facilities would be incompatible with the objective of protecting the System 6 Area and therefore that area would either have to be additional Open Space or the requirement for community facilities would have to be significantly reduced. If the System 6 Area was additional Open Space then the City would be expected to compensate the owners accordingly. The City of Rockingham, however, is opposed to such acquisition and believes that the west-east sections of Area M107 within the City's boundaries should be developed for residential purposes.

The position of the City of Mandurah with respect to acquisition of those sections of Area M107 at Madora is not known.

The three owners of coastal property at Golden Bay, Singleton and Madora are also required to allocate relatively large areas of land as Regional Open Space for the normal Coastal Reserve in addition to the usual Open Space requirements for community needs.

5. ENVIRONMENTAL FEATURES

5.1 Physical Features

System 6 Area M107 comprises various types of Quindalup Dunes associated with the Rockingham-Becher Plain. The major dune sections of the area from the coast inland are as follows:

- o a relatively recent beach-ridge plain which begins immediately behind the present beach along the entire length of the coast,
- o irregular relatively tall chaot dunes which are located behind the beach-ridge plain at Golden Bay and Singleton,
- o an older beach-ridge plain (the Rockingham-Becher Plain) which is the major section of the lateral wedges, and which is bounded to the east by,
- o tall fretted parabolic dunes which terminate just to the west of Mandurah Road.

At Singleton and Madora there is also a further beach ridge plain to the east of the tall parabolic dunes which extends to Mandurah Road. This plain is part of the Spearwood Dune System which comprises the Tamala Limestone geological unit. A large number of small limestone rocks occur on the surface of this plain.

Areas of Tamala Limestone also occur within the tall parabolic dune system at Golden Bay. This reflects the fact that the dune system is superimposed onto a Spearwood Dune ridgeline.

5.2 Coastal Processes

The recent beach ridge dune system behind the present beach is apparently being actively formed by coastal processes along this coastline. Information obtained from Public Works Department plans indicate that the coastline north of Golden Bay has expanded (accreted) westwards by over 100m in the 37 years between 1942 and 1979. This means that the coastal reserve in the area is likely to expand westwards in the future and that the residential areas will become gradually more distant from the beach.

5.3 Wetlands

Several small examples of the Peelhurst Suite of wetlands occur at Golden Bay in a linear depression approximately 200 to 300m from the coast.

5.4 Vegetation

The vegetation of Area M107 closely corresponds with the major geomorphic units (i.e. landforms).

The recent beach-ridge dunes along the coastline support a narrow band of *Spinifex hirsutus* Grassland immediately behind the beach and further inland, various heath and shrubland associations usually dominated by *Olearia axillaris*. The adjacent high relief chaot dunes support either an *Acacia rostellifera* Closed Scrub or a *Spyridium globulosum* Closed Scrub.

The older beach-ridge dunes of the Rockingham-Becher Plain support a mosaic shrubland dominated by *Jacksonia furcellata*, *Spyridium globulosum*, *Acacia saligna* and *Olearia axillaris*.

The tall parabolic Quindalup Dunes at Golden Bay support a vegetation which is similar to the high relief chaot dunes closer to the coast with the dominance of *Acacia rostellifera* over a large part. Amongst this vegetation are areas of *Melaleuca acerosa* Open Heathland. The road component of Area M107 at Golden Bay supports a relatively large tract of Tuart Woodland (*Eucalyptus gomphocephala*).

At Singleton, the tall parabolic dunes support mostly *Melaleuca acerosa* Open Heathland with relatively small areas of *Acacia rostellifera*.

At Madora, these dunes support *Melaleuca acerosa* Open Heathland in the northern section and *Jacksonia furcellata*, *Acacia saligna* complex to the south of the entrance road.

The Tamala Limestone beach-ridge plain at the foot of the tall Quindalup Dunes adjacent to Mandurah Road at Singleton and Madora supports an *Allocasuarina humilis* Heathland.

The vegetation on the lateral wedge component of Area M107 at Golden Bay and Singleton is generally in good condition. The vegetation of the road components near Golden Bay and Singleton are also generally in good condition.

The vegetation of Madora ranges from good condition to poor. The area is currently being grazed by cattle which adversely affect areas of native vegetation by grazing, trampling, introduction and spread of weeds and nutrient enrichment. The most affected areas include the Rockingham-Becher Plain and the limestone areas adjacent to Mandurah Road. Frequent burning to encourage new shoots for grazing has also caused further degradation and weed invasion.

6. MANAGEMENT CONSIDERATIONS

If Area M107 is to fulfil a recreation and landscape potential into the future, there will be an increasing need for active management to protect the natural features of the area.

To some extent this has been achieved by the Special Rural subdivisions in the sections of Area M107 adjacent to Mandurah Road near Golden Bay and Singleton. The City of Rockingham has imposed various development conditions on the Lot owners in these subdivisions and these include a degree of tree and other vegetation retention and some restrictions on the location of building envelopes and roads.

In the other sections of Area M107 there is currently no active management for environmental purposes. The west-east sections of the area at Golden Bay and Singleton are not used at present, but most of the area at Madora is used for grazing cattle. There is also an active sand mining operation in the southern part of Area M107 adjacent to Mandurah Road at Madora.

Effective management of these sections of Area M107 can only occur if either the owners use of the land is controlled or if the sections are acquired for Open Space (see Section 4.4). If the west-east sections of Area M107 become Open Space, however, it is possible that there would be considerable difficulty in achieving effective management given that there is likely to be residential development immediately adjacent to both sides of these narrow strips.

These west-east sections contain a cross-section of the landforms of the Rockingham-Becher Plain from west to east. However, each of these landforms is a component of a larger geomorphic unit which is aligned north-south, i.e. in the opposite direction to the alignment of Area M107. The configuration of the west-east sections of Area M107 therefore is contradictory to reserve allocation principles which recommend that boundaries be defined according to prominent environmental features in order to avoid continuing management difficulties. This difference in alignment means that modification of the landforms by development immediately adjacent to Area M107 is likely to complicate protection of the landforms within the area. This is particularly the case for the relatively tall Quindalup Dunes in the western part of the east-west sections at Golden Bay and Singleton and for the tall parabolic dunes in the eastern part of the linear section at Golden Bay where the adjacent residential development will involve significant earthworks.

In addition, in order to achieve protection of the vegetation within these linear sections, it would almost certainly be necessary to fence the areas and to permit only limited access on established pathways particularly as the landforms are prone to erosion and the vegetation can be easily damaged. It will also be necessary to provide a firebreak around the perimeter of each of these sections. There will also be applications for road reserves across these sections in order to link the suburbs of Secret Harbour, Golden Bay and Singleton and for easements for sewage and water pipelines, and electricity. If roads and services are not permitted to be located across these areas then the development costs are likely to be prohibitive and there will be significant constraints to

the sharing of community facilities between the various populations centres. These facilities include shopping centres, schools, playing fields, etc.

It would appear that the section of Area M107 adjacent to Mandurah Road at Madora is the only section which is both sufficiently large and in an appropriate location for reasonably straightforward management if it were to be acquired for Open Space purposes. This area could also be managed through appropriate controls on development as has occurred in the sections to the north.

7. OPTIONS FOR FUTURE STATUS OF AREA M107 - MANDURAH ROAD SECTIONS

7.1 Sections Near Golden Bay and Singleton

The future status of those sections of Area M107 adjacent to Mandurah Road near Golden Bay and Singleton appears to have been determined by the relatively recent approval of special rural subdivisions at both locations. Effectively the subdivisions remove the potential for these two sections to be added to the public estate and suggests that there is really no, or at best very limited, scope for using these areas for recreation purposes. With due care by the individual land owners and some regulation by the City of Rockingham, however, these sections will continue to have landscape values. These values are a parkland estate view of Tuart Woodland from Mandurah Road near Golden Bay and a view of heath covered hills (the parabolic dunes) near Singleton.

7.2 Madora Section

A range of potential future uses are possible for the Mandurah Road section of Area M107 at Madora as all of the land is in one ownership. This land may be summarised as follows:

- o retention of the section in private ownership with present use,
- o acquisition for Parks and Recreation,
- o Special Rural subdivision,
- o development for active recreation,
- o residential/recreation development, and
- o full residential development.

These options are discussed briefly below.

- i) Private ownership with continuation of present use for grazing and sand extraction. This option would mean that the greater part of the section retained its present landscape value which is of vegetated hills (parabolic Quindalup Dunes) and areas of Tamala Limestone plain adjacent to Mandurah Road. Grazing has an impact on the vegetation in this section but does not necessarily reduce the overall landscape value. As the land is zoned Rural, this use could not be prohibited and there are no management provisions for landscape protection. Sand mining in the southern part of the section is having an impact on views from a short length of Mandurah Road and this visual impact may increase with time. There is also no potential for public recreational use.

In practical terms, however, the owners may claim that they are being denied the opportunity to develop the land for more worthwhile purposes. In this case the owners could reasonably request that the land be purchased for Parks and Recreation purposes.

- ii) Acquisition for Parks and Recreation. This option would provide for the retention of landscape values but the question of management responsibility and other compatible usage would need to be considered. It may be that DPUD or the City of Mandurah would be willing to have management responsibility. If this is not the case, however, there will be little benefit in acquisition as the reserve would be liable to deteriorate over time with increasing population pressures from surrounding developments.

In terms of other uses, we suggest that it is unlikely that there would ever be significant demand for passive recreation in the area in the sense intended by the System 6 Study Report (i.e. pathways only) even if such facilities were developed. There could be some use by Madora residents but the principal focus for recreation including walking in this area, will always be the coastline with its extensive beach. Similarly it seems unlikely that many users of Mandurah Road would stop their vehicles to use parts in this area as an alternative to going to the coast.

- iii) Special Rural Subdivision. Special Rural Subdivision of this section of Area M107 would be compatible with the existing Special Rural zoning of the other Sections of Area M107 along Mandurah Road to the north near Singleton and Golden Bay. This option would provide an opportunity for a degree of landscape protection provided that appropriate restrictions were imposed on owners by the City of Mandurah. However, there is very little opportunity for concealing houses within the landscape over much of this section because it consists of a plain of variable width which is backed by a prominent slope to a single ridgeline which roughly parallels the alignment of Mandurah Road. The houses and roads of any special rural subdivision therefore would have to be accepted as part of the landscape. It may be possible, however, to restrict housing on the prominent slope and to site it mainly on the plain by an appropriate Special Rural subdivision plan which specified the location of building envelopes. The houses could also be obscured by strategic tree planting along Mandurah Road.

This option would not provide for any recreation potential that the area may have.

- iv) Active recreation. The amount of flat land adjacent to Mandurah Road in this section of Area M107 provides the possibility of development for recreational use by retaining the prominent slope as an undeveloped background. The most appropriate recreation activity would appear to be a golf course.

This option obviously would enhance the recreational use of the area as there is a strong demand in all areas of Perth for golf facilities. A golf course would also complement the existing recreational potential at Madora which is focused on beach and ocean activities. It would also provide for the retention of landscape values albeit within a "developed" context and would provide for ongoing management.

- v) Residential/recreation development. This option is similar to (iv) above except that Special Residential development would be allowed on the slope of the ridgeline behind the golf course. The "natural" landscape values would be less than with Option (iv) but the recreational values would be similar. The financial return from the development (and therefore the incentive to finance the development) however, would be greater if some residential development was permitted.
- vi) Full residential development. This option would require a re-evaluation of this section of Area M107 by the EPA on the basis that residential development is more appropriate in the present planning context of the South-West Corridor than is the retention of the landscape in its present form. It has been suggested in Section 4.4 of this discussion paper that such a re-evaluation may be appropriate given the limited availability of future residential land in the South-West Corridor and the significant allocation of land to Parks and Recreation purposes.

If residential development were allowed, Madora would become the northern limit of Mandurah in a visual sense, as further north the land adjacent to Mandurah Road would continue to be Special Rural.

This option potentially would provide the maximum financial return to the owners.

8. OPTIONS FOR FUTURE STATUS OF THE WEST-EAST SECTIONS OF AREA M107

According to the System 6 Study Report, the west-east sections of Area M107 could provide vegetated buffer strips between the coastal residential centres of Madora, Singleton, Golden Bay and Secret Harbour. It is possible that the EPA also may have considered that the strips would provide a recreation link by a system of pathways from the coast to the Mandurah Road sections of Area M107 and vice versa although this was not actually stated in the System 6 Study Report.

In this paper it has been suggested, however, that if the objectives of the EPA are to be achieved, a number of difficult questions relating to acquisition, integration with adjacent development, easements across the sections, and future management will need to be resolved. A recreational link is also no longer a realistic option at Golden Bay and Singleton due to the Special Rural subdivisions in the Mandurah Road sections of Area M107 at these locations.

It has been suggested also that the east-west sections of Area M107 pose particular difficulties for integration of services and other facilities for the various coastal residential centres and would incur significant cost penalties and disincentives for the developers of adjacent land. At Singleton and Madora the west-east sections completely bisect the current property holdings and make it virtually impossible for the individual owners to integrate any future development.

Alternatives to retention of these sections of Area M107 may be summarised as follows:

- o for residential development except for those sections which coincide with the normal Coastal Reserve required by DPUD,
- o residential development but with other concessions to landscape protection and vegetation retention elsewhere, for example the expansion of the Coastal Reserve to an area larger than that which would normally be required, and
- o partial residential development and partial retention of the System 6 Area for landscape protection and vegetation retention.

These alternatives are discussed below.

- i) Residential development - If the EPA were to agree to residential development of the west-east sections of Area M107 at Golden Bay, Singleton and Madora they would be in agreement with current planning priorities for these areas. This agreement obviously would have to be based on a decision that contemporary planning requirements are more important than the values identified by the System 6 Study Report. Such a decision could be made in the context of regional planning and the allocation of areas for Parks and Recreation. Therefore no additional allocation of land for Open Space would occur other than what is normally required by planning authorities.

This option would mean that the townships of Secret Harbour, Golden Bay, Singleton and Madora would eventually coalesce as a coastal residential cell. This cell would be bounded to the north by Regional Open Space at Port Kennedy, to the west by a normal Coastal Reserve, to the east by a Special Rural land adjacent to Mandurah Road (at Golden Bay and Singleton), and would have only a narrow connection to the coastal parts of the City of Mandurah.

While there would be no buffer zones within this residential cell, typical landforms and the vegetation of the Rockingham-Becher Plain would be protected in the proposed Port Kennedy Regional Open Space, the Coastal Reserve and the Special Rural areas such as land adjacent to the Coastal Reserve.

- ii) Residential development with other concessions to landscape protection and vegetation retention - This option involves approval of residential use for the System 6 Area but would provide for the protection of other areas with identified landscape or vegetation values.

The selection of Area M107 does not appear to have been based on any systematic survey of the environmental values of the area. As a consequence, Area M107 does not provide for the protection of other sites which may have environmental value. At Golden Bay there would be value in expanding the width of the Coastal Reserve so that it included examples of the Peelhurst Suite of Wetlands. There is little potential for this at Golden Bay if Area M107 is also allocated for Open Space in addition to the usual requirements for Open Space for community facilities.

At Singleton, there are no landscape features of vegetation with identified significant values which may provide an alternative to the west-east section of Area M107. However, there would be benefit in establishing a relatively wide Coastal Reserve at this location so that the eastern boundary of that reserve would coincide with the limit of the recent beach-ridge plain behind the beach. Such a reserve, on average would, be from 150 to 200m wide instead of the conventional 100m.

At Madora, the owners could potentially provide concessions through Open Space in the Mandurah Road section of Area M107 or through additions to the Coastal Reserve.

- iii) Partial residential development and partial retention - Certain of the landscape features in vegetation in the east-west sections of Area M107 could be retained by partial allocation of those sections to Open Space. In effect this is similar to Option (ii) above except that the areas retained are not alternatives to the System 6 Area but are parts of that area. We suggest, however, that there is little logic in this approach unless the retained parts of the System 6 Area have particular significant values.

9. PREFERRED POSITION OF THE OWNERS

The views of the owners of the Special Rural blocks near Golden Bay and Singleton to the System 6 proposals are not known. The preferred positions of the other owners of land affected by Area M107 are as follows:

- o H&B Developments Pty Ltd (owners of part of the west-east section of Area M107 at Golden Bay) - would prefer approval to develop the section of Area M107 for residential purposes so as to enable full integration of services with those at Secret Harbour and thereby to optimise return on costs. In return for this the owners are prepared, however, to allocate Open Space for landscape purposes at Mandurah Hill and to significantly increase the width of the Coastal Reserve. This potential arrangement has been discussed with DPUD and the City of Rockingham which has agreed in principle.
- o Temwood Holdings Pty Ltd (option to purchase the west-east section of Area M107 and surrounding land at Singleton) - the System 6 Area divides the Singleton property and makes it very difficult for adjacent areas to be developed. The owners would therefore prefer to receive approval for development of this section of Area M107. They are prepared to allocate a considerably wider Coastal Reserve as an alternative.
- o HB & JN Perry Pty Ltd (owners of the two east-west sections and the Mandurah Road section of Area M107 at Madora) - would prefer approval to develop the east-west sections for residential purposes. They would prefer to develop the Mandurah Road section for either Special Rural, golf course, golf course/residential, or totally for residential purposes but would accept acquisition for Parks and Recreation provided that this occurred in the near future.

10. CONCLUSIONS

It is not the purpose of this discussion paper to present conclusions as to the best future use for System 6 Area M107. That decision rests with the EPA. The discussion presented, however, points out that Special Rural use of those sections of Area M107 adjacent to Mandurah Road near Golden Bay and Singleton, has been approved with the consent of the EPA subject to EPA advice regarding the maintenance of landscape values. It would therefore seem appropriate to consider allowing a similar use of the section of Area M107 adjacent to Mandurah Road at Madora. However, in this case a better result in terms of landscape protection and vegetation retention may potentially be achieved through approval of a golf course development or a golf course/residential development.

It has also been suggested that the west-east sections of Area M107 at Golden Bay, Singleton and Madora all present major difficulties for residential development in the coastal strip south of Port Kennedy to Mandurah. It could be maintained that these sections or buffer zones are no longer appropriate in the context of contemporary planning for the South-West Corridor. If the EPA were to support these suggestions the areas allocated for landscape protection and vegetation retention at Golden Bay, Singleton and Madora in exchange for development of the System 6 Area M107 would be as follows:

- o an expanded Coastal Reserve along the entire length of the coastline,
- o a Special Rural area along the length of Mandurah Road with potentially a golf course and perhaps some limited residential development at Madora, and
- o some discrete areas of Open Space for conservation purposes elsewhere in the region.

APPENDIX 3

LIST OF PLANTS IDENTIFIED AT GOLDEN BAY

Golden Bay Species List
GOLDEN BAY SPECIES LIST

	Low Dune/ Swale	Tall Dunes (Coastal)	Sedgelands	Plain	Tall Dunes (Inland)	Limestone
MONOCOTYLEDONS						
Anthericaceae						
<i>Thysanotus arenarius</i>			X			
<i>Thysanotus patersonii</i>				X	X	X
Asphodelaceae						
* <i>Asphodelus fistulosus</i>				X		
* <i>Trachyandra divaricata</i>	X			X	X	
Colchicaceae						
<i>Burchardia umbellata</i>						X
Cyperaceae						
<i>Isolepis cernua</i>				X		
<i>Isolepis nodosus</i>	X	X	X			
<i>Lepidosperma angustatum</i>				X	X	X
<i>Lepidosperma gladiatum</i>	X	X	X	X		
<i>Lepidosperma tenue</i>			X			
<i>Schoenus grandiflorus</i>				X	X	
Dasypogonaceae						
<i>Acanthocarpus preissii</i>	X	X		X	X	X
<i>Lomandra maritima</i>	X	X		X	X	X
Haemodoraceae						
<i>Anigozanthos humilis</i>					X	X
<i>Conostylis aculeata</i>						X
<i>Conostylis candicans</i>	X	X		X	X	X
<i>Conostylis aurea</i>					X	X
<i>Conostylis pauciflora</i> ssp. <i>pauciflora</i>				X		
<i>Haemodorum spicatum</i>						X
Orchidaceae						
<i>Caladenia flava</i>						X
<i>Lyperanthus nigricans</i>		X				
<i>Microtis unifolia</i>						X
<i>Pterostylis scabra</i> var. <i>robusta</i>						X
Poaceae						
* <i>Avena fatua</i>				X		
* <i>Bromus diandrus</i>				X		
* <i>Cynodon dactylon</i>			X	X		
* <i>Ehrharta calycina</i>				X		
* <i>Ehrharta longifolia</i>				X		
* <i>Lolium rigidum</i>						X
* <i>Poa annua</i>	X			X	X	X
<i>Spinifex hirsutus</i>	X					
<i>Spinifex longifolius</i>	X					
<i>Stipa compressa</i>				X	X	X
<i>Neurachne alopecuroides</i>	X					

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Restionaceae						
Loxocarya fasciculata				X	X	X
Loxocarya flexuosa						
Xanthorrhoeaceae						
Xanthorrhoea preissii					X	
Iridaceae						
*Romulea rosea				X		X

Golden Bay Species List

DICOTYLEDONS						
Aizoaceae						
*Carpobrotus edulis				X	X	
Carpobrotus virescens	X					
Carpobrotus sp. cg. modestus					X	
Tetragonia decumbens	X					
Apiaceae						
Daucus glochidiatus					X	
Homalosciadium homalocarpum						X
Hydrocotyle tetragonocarpa				X		
Trachymene pilosa	X			X	X	
*Foeniculum vulgare			X			
Asteraceae						
*Arctotheca calendula				X	X	
*Arctotheca populifolia	X					
Brachycome pusilla						X
*Carduus nutans			X			
*Conzya bonariensis			X			
Helichrysum cordatum					X	
Helipterum roseum				X		
*Hypochaeris glabra				X		X
Olearia axillaris	X	X		X	X	X
Podolepis lessonii						X
Senecio lautus	X			X	X	
*Sonchus oleraceus				X		X
Waitzia citrina						X
Apocynaceae						
Alyxia buxifolia	X	X		X		
Brassicaceae						
*Cakile maritima	X					
*Heliophila pusilla						X
Caryophyllaceae						
*Cerastrum glomeratum						X
Casuarinaceae						
Allocasuarina humilis					X	X
Chenopodiaceae						
Rhagodia baccata	X	X		X	X	X
Threlkeldia diffusa	X					
Crassulaceae						
Crassula colorata						X
Dilleniaceae						
Hibbertia cuneiformis	X	X			X	
Hibbertia glaberrima						X
Droseraceae						
Drosera erythrorrhiza						X
Drosera gigantea						X
Drosera macrantha						X

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Epacridaceae						
<i>Acrotriche cordata</i>		X				
<i>Astroloma pallidum</i>						
<i>Leucopogon parviflorus</i>	X	X		X	X	X
<i>Leucopogon</i> sp.						
Euphorbiaceae						
* <i>Euphorbia lathyris</i>				X		X
<i>Phyllanthus calycinus</i>					X	X
Fumariaceae						
* <i>Fumaria capreolata</i>				X		
Gentianaceae						
<i>Villarsia albiflora</i>			X			
Geraniaceae						
* <i>Erodium cicutarium</i>				X		
* <i>Geranium molle</i>				X		
* <i>Pelargonium capitatum</i>	X	X			X	
Goodeniaceae						
<i>Scaevola canescens</i>				X	X	
<i>Scaevola nitida</i>		X			X	
<i>Scaevola paludosa</i>				X	X	
Lamiaceae						
<i>Hemiandra pungens</i>				X	X	
Lauraceae						
<i>Cassytha glabella</i>	X	X			X	X
Mimosaceae						
<i>Acacia coehlearis</i>					X	X
<i>Acacia cyclops</i>	X	X				
<i>Acacia lasiocarpa</i>				X	X	X
<i>Acacia pulchella</i>				X	X	X
<i>Acacia rostellifera</i>	X	X			X	X
<i>Acacia saligna</i>				X	X	
<i>Acacia truncata</i>					X	X
Myrtaceae						
<i>Eucalyptus gomphocephala</i>					X	
* <i>Leptospermum laevigatum</i>				X		
<i>Melaleuca acerosa</i>				X	X	X
<i>Melaleuca raphiophylla</i>			X			
Myoporaceae						
<i>Eremophila glabra</i>						X
<i>Myoporum insulare</i>	X				X	

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Onagraceae			X			
<i>Epilobium billardierianum</i>						
Papilionaceae						
<i>Bossiaea eriocarpa</i>						X
<i>Gompholobium tomentosum</i>				X	X	
<i>Hardenbergia comptoniana</i>	X	X		X	X	X
<i>Jacksonia furcellata</i>	X			X	X	
<i>Jacksonia sericea</i>					X	X
* <i>Lupinus angustifolius</i>				X		
<i>Kennedia prostrata</i>				X	X	
<i>Nemcia capitata</i>	X					
<i>Sphaerolobium linophyllum</i>						X
<i>Templetonia retusa</i>					X	X
* <i>Trifolium</i> spp				X	X	
Phytolaccaeeae						
<i>Phytolacca octandra</i>				X		
Portulacaceae						
<i>Calandrinia corrigioloides</i>	X			X		
<i>Calandrinia linarioides</i>						X
Primulaceae						
* <i>Anagallis arvensis</i>				X		X
Proteaceae						
<i>Dryandra nivea</i>					X	X
<i>Dryandra sessilis</i>						X
<i>Grevillea crithmifolia</i>						X
<i>Grevillea thelemanniana</i>					X	X
<i>Hakea prostrata</i>						X
<i>Hakea trifurcata</i>						X
<i>Petrophile macrostachya</i>						X
<i>Petrophile serruriae</i>						X
Ranunculaceae						
<i>Clematis microphylla</i>					X	
Rhamnaceae						
<i>Cryptandra mutilla</i>					X	X
<i>Spyridium globulosum</i>	X	X		X	X	X
<i>Trymalium ledifolium</i>				X	X	X
Rubiaceae						
<i>Diplolaena dampieri</i>					X	
Santalaceae						
<i>Exocarpos sparteus</i>				X	X	X
<i>Santalum acuminatum</i>					X	
Scrophulariaceae						
* <i>Dichisma arenarium</i>				X		
* <i>Parentucellia latifolia</i>						X

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Solanaceae Anthocercis littorea					X	
Sterculiaceae Trymalium ledifolium						X
Stylidiaceae Stylidium brunonianum Stylidium repens						
Thymeleaceae Pimelea suaveolens					X	
Urticaceae Parietaria debilis	X	X				

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