SHARK BAY
WORLD HERITAGE PROPERTY LANDSCAPE STUDY

Managing Community Enjoyment
Recreation, Tourism and Development

RESOURCE DOCUMENT

Midwest Region and Recreation and Landscape, Planning and Design Section
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DEPARTMENT OF
Conservation
AND LAND MANAGEMENT
Conserving the nature of WA

World Heritage

FOREWORD

The Shark Bay region is well known for its rich marine life, spectacular coastline, sheltered waters, extensive acacia shrublands, sand plains and dunes, early pastoral and settlement history, and the opportunity for interaction with the dolphins. It has a vast array of places with unique character and identity, it contains a high concentration of significant natural and cultural features, many of state, national and international significance, and offers a range of opportunities for people wishing to experience the special nature of the area. The area is becoming one of the best known tourist destinations in the state.

People are attracted to the region for a variety of reasons and similarly they respond to the natural and cultural features in a variety of ways, which is reflected in the activities that they undertake and the different types and patterns of existing development. This interplay between existing natural and cultural characteristics, and the perceptions, experience and enjoyment people derive from them creates the 'landscapes' of the Shark Bay region.

These landscapes are a vital component of people's enjoyment of the environment. They represent the setting for all people's activities and are a strong influence on their sense of well-being and quality of life. Aesthetic landscapes add to property values and form the settings, and often the attractions, for tourism. This economic value of landscapes is increasingly being determined by environmental economists as part of the planning process. Landscapes are now regarded as a resource, partly because of this economic value and partly because they are an accepted component of resource assessment programs (regardless of economic value). The aesthetic values of Shark Bay landscapes have been formally recognised through inscription on the World Heritage List.

For Shark Bay, for the future, there is a clear need for a consistent, comprehensive and systematic approach to landscape assessment and management across the entire Shark Bay region. It is vital that landscape values are identified, understood, assessed and mapped, that impacts on them are identified, and that methods are defined for determining and sensitively managing both the values and impacts, keeping in mind other resource values of the region. These are the objectives of landscape management and the basis for this study. It is envisaged that this study will be an important tool in the future management of community enjoyment, recreation and tourism, and the development and prosperity of the Shark Bay region.

EXECUTIVE SUMMARY

This study identifies aesthetic values in the Shark Bay World Heritage Property and establishes objectives and guidelines for management of these values. A number of recommendations have been made in relation to the study results, their implementation and further work.

The results of this study are presented as two documents. The summary document provides a concise overview of the study process and management recommendations. The resource document provides detailed information about the study process and management guidelines.

Underlying this study is the recognition that aesthetic values are a vital component of people's enjoyment of the environment and are a strong influence on their sense of well-being and quality of life. It is also recognised that these values are a major component of recreation and tourism, and as such are a major contributor to the prosperity of the region. These aesthetic values of Shark Bay landscapes have been formally recognised through inscription on the World Heritage List.

This is the first systematic study of World Heritage aesthetic values in Western Australia. It also the largest landscape study undertaken outside forest areas and the most comprehensive study of its kind yet undertaken in this State. The methodology is a culmination of development over a number of previous studies, most notably the Leeuwin Naturaliste Landscape Study (CALM 1997). Following the example of that work, it is envisaged that this study will play an important role in the future planning and management of the Shark Bay Property.

PROCESS

The study process consists of two parts, one dealing with assessment of values, the other dealing with management of those values. The assessment consisted of seven main components:

- **Inventory** of data relevant for the assessment was undertaken and mainly involved identifying and mapping of environmental characteristics.
- **Landscape Character** was identified and described broad patterns of environmental characteristics, classifying them into units and sub-units according to their relevance to human interaction.
- **Community Perception and Values** were researched to identify or validate appropriate criteria for determining the environmental characteristics that are most important to people's experience and enjoyment. Public perceptions and attitudes of the wider community from other research were compared with the local survey.
- **Significant Features** were identified and mapped, representing the characteristics or features in the study area that are most important to the experience and enjoyment of people. It involved the assessment of places using established criteria, and the identification of significant places or features through other assessments and lists.
- **Community Use** was identified and mapped based on the location, type and degree of community use of the area. It included spot (localised) use areas

and travel routes (air, ground, water), types of recreational and non-recreational (including industrial or residential) use, ground travel route physical characteristics (such as class, surface, markings and intended traffic type), and existing and expected volume of users. Sensitivity zones were delineated based on the level and type of use and the distance of areas from that use.

- **Sensory Characteristics** were identified for substantial parts of the study area, providing an indication of people's sensory interaction with the environment. It largely focussed on visual characteristics such as views but included other sensory types where relevant (eg. sound, wind, smell).
- **Landscape Classes** were mapped to provide a synthesis of the assessment results most relevant to management of aesthetic values.

The management of these values has been dealt with in five main components:

- **The Management Context** has been discussed, covering some of the broad management issues, regional issues, specific local landscape issues, and management responsibilities and commitments.
- **Landscape planning** covers a general guide for using the assessment results, analysis of the results, a strategy for management, objectives for management by area and value, and a series of guidelines that demonstrate management techniques.
- **Planning community use and recreation** is discussed and objectives are provided for planning in this area, as this is vital to the management of landscape values (and vice versa).
- **Management recommendations** are made.
- Finally, a brief guide for **evaluating proposals** is provided.

OUTCOMES

Visitor Survey

A visitor survey was undertaken as part of this study to investigate community perceptions of Shark Bay landscapes.

People indicated that the features that they enjoyed the most were the most significant features of Shark Bay, which would indicate a low recognition of important natural values. This correlated with three other findings: that very few conservation features were mentioned as being important, that the beauty of the area was listed as being extremely important and that the 'other features' people wanted to see can be more closely linked with experience and aesthetics than natural values. People seemed resistant to listing places as important, enjoyable or beautiful unless they had first hand experience of those places. This is highlighted by the number of additional places listed in the 'other features people wanted to see' responses.

The finding that the most beautiful places were natural and the least beautiful were human-modified is consistent with other research, as is the finding that water and the coast are relatively consistent attributes of beautiful places. The naturalness variable may correlate with the most common comment for future management in the 1993 survey when people said 'leave it as it is'. That

comment was reinforced in this survey when people expressed a desire for a low level of development. The desirable length of stay (of 1 week) was consistent with the 1993 survey. Overall, the results of this simple survey are consistent with similar research conducted in other places (see the bibliography).

Character Units

Four landscape character units with twenty sub-units were identified for the study area (see Map 5). A description of each of these is provided in the main body of the report.

Most landscape character sub-units are well represented in protected areas. Less represented are the coastal sub-units and of these, the bay cliffs sub-unit is the least represented. This appears to be the most used area to access the better 'bay' views. All the coastal sub-units are narrow (by definition), attract a high proportion of the use in the region, and are highly visible.

The terrestrial sub-units are generally represented in both pastoral lease and protected areas. The reticulate dunes sub-unit has only a minor portion of its area protected. A long length of the sea cliffs sub-unit is also outside existing or proposed protected area.

All marine sub units are well represented, including within the Marine Nature Reserve or Marine Park.

Community use extends across many of the sub-units. Apart from pastoral use, much of this use is access route use only. The highest use areas are the gentle transition sub-unit and the cliff sub-units, both bay and sea. Sub-units that receive little or no use are the tree heath, reticulate dune and Tamala sub-units.

Suitability for development is also indicated, with the most suitable being the coastal, gentle transition sub-unit.

Significance

There is a high occurrence of significant features (see Maps 6-10) in the study area, with most of the visual aesthetic features lying within the coastal unit. There are some areas of visual aesthetic significance in the hinterland, associated with vegetation diversity, steep slopes and high points. A number of historic features, such as the homesteads, also lie in the hinterland.

Most areas of World Heritage aesthetic value lie within protected areas. The notable exceptions are the Heirisson/Useless Loop Prong and the long length of Zuytdorp Cliffs, south of Zuytdorp Point. There is a variety of other aesthetic features both within and outside protected areas. The mangrove banks of the Wooramel coast and Faure Island are not well represented within protected areas.

Access to significant features varies across the study area, with use tending to be polarised between no access at all and good access with use spreading into adjoining significant features.

Sensitivity Zones

Three sensitivity zones have been delineated for the Property based on the level and type of use and the distance of areas from that use (see Map 11).

Objectives

Objectives have been provided for the different types of significance and sensitivity zones and character sub-units. In summary, significant features are to be protected, with minor or temporary changes permitted where visual aesthetics are well represented and specialist advice has been followed. Landscape character is to be protected according to the sensitivity zones. 'A' zone is to retain existing character, 'B' zone minor change, and 'C' zone can include more substantial change, providing these changes are not seen from important travel routes.

Guidelines

Guidelines are provided (see appendices) to assist in the management of development. The guidelines include suggestions the siting and design of roads and access, activity areas, towers, aquaculture and buildings .

RECOMMENDATIONS

The following recommendations are made in relation to management of aesthetic landscape values in the Shark Bay World Heritage area.

1. The landscape management objectives and recommendations detailed in this study be adopted by the World Heritage Committees, and key State and Local Government agencies.
2. A coordinating mechanism should be established to ensure consistency in the evaluation and approval of development proposals, and landscape management principles and objectives should be included in the EPA Guidance Statement No.49 (Guidance for the Assessment of Environmental Factors - Assessment of Development Proposals in Shark Bay World Heritage Property).
3. Specialist advice relevant to the value be included as part of any development proposal relating to significant values or 'A' sensitivity zone.
4. An integrated community use and recreation plan should be developed, incorporating the results of this study for the whole Shark Bay region.
5. Strategic development plans should be prepared for Denham and Monkey Mia, incorporating the results of this study.
6. The number of aesthetic features affected by physical development should be restricted, decided through the preparation of a community use/recreation study.
7. Natural areas, free of any physical development, should be designated in a plan and should incorporate the principles and results of this study and a community use/recreation study.
8. Maintaining the general undeveloped nature of the Property should be given high priority in planning and design decisions.

9. A variety of access types should be promoted to provide different experiences and to minimise environmental impact. The benefit of aerial views to the appreciation of the visual aesthetic characteristics of the Property should be highlighted.

10. Further work should be undertaken in relation to this study, including to improve the definition for the subcoastal units.

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PART ONE - INTRODUCTION

Part One of the report describes how the study was initiated, provides an initial introduction to the meaning of aesthetic values and the criteria for assessment, outlines the study's objectives and scope, and provides a description of the study area. The structure of the report is also briefly outlined.

1.1 STUDY BACKGROUND

Shark Bay was added to the World Heritage List in 1991 on the basis of its natural heritage values. The Shark Bay World Heritage Property, as it is known, meets all four criteria for listing based on natural heritage. One of these criteria (criterion (iii)) aims to establish whether there are outstanding universal values relating to aesthetics and natural beauty. A brief, qualitative description of the 'features' meeting this criterion was provided in the nomination document for the World Heritage List. Other than this description there is little management-related information to assist in the protection and conservation of these aesthetic values. With this problem in mind, CALM applied for, and was granted, World Heritage funding to undertake a formal, systematic assessment of the aesthetic values in the Shark Bay region to provide information for management purposes. A short description of the project was provided in the grant application and this report provides further detail of the project method and outcomes, including a landscape management plan.

1.2 DEFINING LANDSCAPE AND AESTHETIC VALUES

The unique and complex sets of values people create when they respond to natural and cultural environments are commonly termed 'landscapes' (see Glossary). These landscapes have aesthetic values, which are the primary interest of this study.

A simple explanation is as follows. People receive environmental information by a variety of sensory paths. This information is combined with a person's existing knowledge, emotional response and values in a process of perception. This perception process produces that person's 'landscape', their 'image' of that environment. In doing so, they attach values to parts of that environment. Existing values are used in the perception process to produce new values. Thus, each experience adds to a person's values. While it can be difficult to measure elements of perception, it is relatively easy to measure people's values (Itami 1993).

One component of these values is aesthetic value. While the term aesthetic has been often in relation to the study of beauty, it is apparent that its definition in human-environment interaction is very complex and that it has much in common with other values that have often been considered separately, usually because of legislative requirements (see Blair and Truscott 1989). Beauty may result from many things: the sight of a unique creature; the age of an object; the sound of water; an understanding of the science of an ecosystem; the smell of a cooked meal; a spiritual connection with a place; the taste of a fine wine; or the reaping of produce. The study of aesthetics in this context is complex, and in this study

has been reduced in scope to a number of well recognised components: scientific, historic, social and visual.

Aesthetic value in this study, put simply, reflects the personal appreciation and enjoyment stemming from these components.

1.3 CRITERIA FOR ASSESSMENT

Sites of World Heritage aesthetic value have to be of *outstanding universal value* and meet a *condition of integrity*. There are a number of documented versions of the criterion that determines *outstanding universal value* (Criterion (iii)) (see references below). These versions state that the site is to:

- 'contain unique, rare or superlative natural phenomena, formations of outstanding natural beauty.' (Nomination document(DASETT (1990)));
- 'contain superlative natural phenomena, formations or features, for instance, outstanding examples of the most important ecosystems, areas of exceptional natural beauty or exceptional combinations of natural and cultural elements' (SB Regional Strategy);
- 'contain superlative natural phenomena or features of exceptional natural beauty and aesthetic importance' (current World Heritage Operational Guidelines).

Some interpretations of this criterion list separately superlative natural features and features of exceptional natural beauty (see DASETT (1990). The condition of integrity (see WH Operational Guidelines) makes it clear that the object of criterion (iii) is aesthetic value.

The condition of integrity requires (in the case of Criterion (iii)) that the elements necessary to maintain the aesthetic qualities of the site, and that may exist beyond the immediate setting of the site, should be included as part of the site. (It also requires that the area should have a management plan and long-term legislative, regulatory or institutional protection.)

Regardless of the variations in wording, there is little in the criterion for determining 'outstanding universal value'. Despite this, there is an established list of features which satisfy this criterion (iii) (see later in this text) and these are generally accepted as the WH aesthetic values.

The focus of this study then turns to identifying aesthetic values in the WHP, and providing additional detail of the WH aesthetic values. In this case, there is well established, detailed criteria for assessing aesthetic or natural beauty values based on extensive human perception research (see Section 2.4 later in this text).

1.4 STUDY PURPOSE

The purpose of the *Shark Bay Landscape Study* was to provide the information necessary to manage landscape values, particularly aesthetic values, in the Shark Bay World Heritage Property (WHP).

Objectives for the study were:

- identify and assess aesthetic values;

- analyse the assessment results to determine relevant management implications;
- determine the management context, an overall strategy for managing values, and establish zones and objectives for the management of values;
- explore development opportunities and constraints relating to identified values;
- provide a framework for assessing and evaluating impacts;
- provide recommendations, action statements, and guidelines to assist in future management.

1.5 STUDY AREA DESCRIPTION

(Taken from DASETT (1990) and WCMC Description (1998). Further detail is provided in these documents).

Situated over 800km north of Perth, on the westernmost point of the coast of Australia, Shark Bay is bounded by the town of Carnarvon to the north, and extends westwards to include the outer chain of Bernier, Dorre and Dirk Hartog islands, then over 200km southwards joining up with Edel Land and extending southwards to Zuytdorp Nature Reserve. The western boundary is three nautical miles off the coast. The eastern boundary is adjacent to the coast south from Carnarvon to Hamelin Pool, then continuing southwards approximately 70-30km inland from the west coast. The township of Denham and the areas around Useless Loop and Useless Inlet, although within the main boundary are specifically excluded from the World Heritage property.

Of the 2,197,300ha area, protected areas, such as marine parks, marine nature reserves, terrestrial nature reserves and national parks, cover about 1,240,500ha. In addition, land in public ownership is divided into: pastoral land 213,500ha; marine environment 687,750ha; land in private ownership 750ha; other reserves 2,500ha; and vacant Crown Land 55,000ha. These areas are current as at January 2001.

Shark Bay comprises a series of north-south facing peninsulas and islands which separate inlets and bays from each other and the Indian ocean. The coastline is 1,500km long and includes the 200m high Zuytdorp cliffs, which are amongst the highest of the Australian coastline. There are three distinct landscape types: Gascoyne-Wooramel province which comprises the coastal strip along the eastern coast of the bay and consists of a low-lying plain backed by a limestone escarpment; Peron province which comprises the Nanga/Peron peninsulas; Faure Island/sill comprising undulating sandy plains with gypsum pans or birridas, and ancient interdune depressions filled with gypsum. The seaward margin of this province terminates in a scarp 3-30m high and narrow sand beaches; Edel province which comprises Edel Land peninsula and Dirk Hartog, Bernier and Dorre Islands, is a landscape of elongated north-trending dunes cemented to loose limestone. The province terminates to the west as a series of spectacular cliffs.

The basement rock in the area is Late Cretaceous Toolonga limestone and chalk. The most extensive younger rocks are Peron sandstones and Tamala limestones

(the offshore islands are composed of the latter). These rocks are often overlaid by a series of longitudinal fossil dunes accumulated during the Middle to Late Pleistocene. The extensive supratidal flats of Gladstone Embayment, Hutchison Embayment and Nilemah Embayment are comparable to the coastal 'Sabkhas' of the coast of the Arabian Gulf. Gypsum has been formed as a result of evaporation of saline groundwaters within the sediments of broad tidal flats adjacent to areas such as Hamelin Pool. Shell beaches occur at the southern end of Lharidon. The inland terrestrial landscape of Shark Bay is predominantly one of low rolling hills interspersed with birridas (inland saltpans that are at sea-level). Shark Bay itself is a large shallow embayment, approximately 13,000 sq. km in area, with an average depth of 9m (maximum of 29m). The bay is enclosed by a series of islands. Influx of oceanic water is through the wide northern channel, the Naturaliste channel, between Dorre and Dirk Hartog islands and South Passage between Dirk Hartog Island and Steep Point.

The outstanding feature of the bay is the steep gradient in salinities. The salinity gradient ranges from oceanic (salinity 35-40 ppt) in the northern and western parts of the bay through metahaline (salinity 40-56 ppt) to hypersaline in Hamelin pool and Lharidon bight (salinity 456-470 ppt). The salinity gradient has created three biotic zones that have a marked influence on the distribution of marine organisms within the Bay. Tides vary with a spring range of 1.7m and a neap range of 0.6m. The Leeuwin current sweeps past Shark Bay, an intrusion of warm low-salinity tropical water of great zoological significance. The interaction of wind drift with tidal currents leads to a Bay circulation in which overall movement is anticlockwise from west to south-east, then east and finally north-west. Two rivers drain into Shark Bay, including the intermittent flows of the Gascoyne and Wooramel River into the eastern part of the Bay. There is very little surface run-off because of the low rainfall, high evaporation and permeable soils. There is active regional saline groundwater flow, however, and some freshwater springs, such as in the intertidal zone north of Monkey Mia. There is a large quantity of artesian water approximately 300m below the ground surface.

The flora consists of a transition of the South-west Botanical Province to the Eremaean Botanical Province and more than 620 species have been recorded for the entire Shark Bay region, 145 at the northern limit of their range, 39 at their southern limit and 25 considered rare or threatened at the national level.

The South-west Botanical Province consists of vegetation that is rich in Eucalyptus species, forming woodland with diverse, shrubby understories and heathlands poor in grasses. The Eremaean province is correspondingly rich in Acacia species but has large areas dominated by grasses, especially prickly hummock grasses of the genera *Triodia* and *Plectrachne*. The Province includes shrublands of *Acacia ligulata*, *Pimelea microcephala* and *Stylobasium spathulatum*. Vegetation on the older dunes includes *Melaleuca cardiophylla*, *Thryptomene baeckeacea* and *Plectrachne bromoides*. Mangroves occur in small, relatively isolated areas in southern and western Bay, only becoming abundant towards Carnarvon. The southernmost extensive stand of white mangrove *Avicennia marina* occurs on the Peron Peninsula.

The marine flora is dominated by seagrass beds covering 4,000 sq. km. Twelve species of seagrass occur in the Bay: the most abundant species is *Amphibolis*

antarctica, covering 90% of the seagrass bed area, providing a substratum for 66 species of algal epiphyte. Halodule seagrass beds occupy an area of approximately 500 sq. km.

Shark Bay is notable for benthic 'living fossil' microbial communities, forming an expansive and wide variety of microbial mats, which are best developed in Hamelin pool, giving the area the most significant assembly of phototropic microbial ecosystems in the world. These *photosynthetic prokaryotes* and *analogous eukaryotic* microalgae, which commenced growing in the Pool when it first formed about 4000 years BP, trap and bind detrital sediment and thereby create organo-sedimentary microbialites or microbial mats, which have mineralised to form stromatolites in Hamelin Pool.

The Shark Bay region is an area of major zoological importance, primarily due to the isolation of the marine and terrestrial ecosystems over significant periods of time. The Bay is located near the northern limit of a transition between temperate and tropical. For example, of the marine fish species 83% are tropical, 11% warm temperate and 6% cool temperate. Of the 26 species of threatened Australian mammals, 5 are found on Bernier and Dorre islands; burrowing bettong *Bettongia lesueur*, rufous hare-wallaby *Lagorchestes hirsutus*, banded hare-wallaby *L. fasciatus*, Shark Bay mouse *Pseudomys praeconis* and western barred bandicoot *Perameles bougainville*. Greater stick-nest rat *Leporilus conditor* and bettong was introduced on Heirisson Prong, and was followed with the release of Shark Bay mice in June 1994.

Shark Bay is renowned for its marine fauna, with 14,000 dugong *Dugong dugon* (V). Humpback whale *Megaptera novaeangliae* (V) and southern right whales use the bay as a migratory staging post. Bottle-nosed dolphin *Tursiops truncatus* can be seen at Monkey Mia. A minke whale was stranded on shore in 1981 and killer whales *Orchinus orca* were sighted attacking dugongs at Sandy Point in May 1983.

The rich avifauna includes over 230 species, with 11 breeding marine birds including osprey *Pandion haliaetus* and Caspian tern *Sterna caspia*, for which Failure Island is a key breeding area. Over 35 Asian migratory species occur in the region and four of these breed in Shark Bay. A number of birds reach their northern limit in the Bay including regent parrot *Polytelis anthropeplus westralis* and western yellow robin *Eopsaltria australis griseogularis*.

Shark Bay is noted for the diversity of its herpetofauna, and supports nearly 100 species. It is rich in 'old Australian elements' with 12 species of diplodactyline geckos and 12 species of pygopodid lizards. Several characteristic species include leptodactylid *Neobatrachus wilsmorei*, hylid *Cyclorani maini*, gecko *Diplodactylus squarrosus*, skinks *Egernia depressa*, *Lerista muelleri* and *Morethia butleri*, and the monitors *Varanus brevicauda*, *V. caudolineatus*, *V. eremius* and *V. giganteus*. Green turtle *Chelonia mydas* (E) and loggerhead turtle *Caretta caretta* (V) occur in the bay, nesting on the beaches at Dirk Hartog Island and Peron peninsula. The islands, peninsulas and gulfs provide a refuge for nine relict or endemic species: pygopodids *Aclys concinna major*, *Aprasia haroldi* and *Pletholax gracilis edelensis*, skinks *Ctenotus youngsoni*, *C. zastictus*, *Egernia stokessi aethiops*, *Lerista maculosa* and *Menetia amaura*. Shark Bay supports populations of at least six sea snake species including the endemic

Aipysurus pooleorum. Shark Bay is also an important nursery ground for crustaceans, fishes and coelenterates.

The marine flora is dominated by seagrass beds providing a substratum for 100 species of zoophytes, juvenile fish and sea snakes. There are 323 fish species. Large numbers of sharks including bay whalers, tiger shark and hammerheads are readily observed in Shark Bay. There is also an abundant population of rays, including manta ray. Because of the high organic productivity and development of seagrass beds and carbonate sand flats, the shallows of Shark Bay support a benthic invertebrate fauna of exceptional abundance, diversity and zoological significance.

The invertebrate communities of Shark Bay remain essentially unstudied. Coral reefs are present, although they are not abundant, with over 80 coral species. Hermatypic or reef building corals are found in South Passage and there are large patches along the east coast of Dirk Hartog, Bernier and Dorre Islands. The initiation of the Leeuwin current coincides with the mass spawning of hermatypic corals and is believed to be a major factor in the distribution and maintenance of coral communities in the region. In addition, of the 218 species of bivalve in the region, 75% have a tropical range, 10% a southern Australian range and 15% are west coast endemics.

The record of aboriginal occupation of Shark Bay extends to 22,000 years BP. At that time most of the area was dry land, rising sea levels flooding Shark Bay between 8,000-6,000 years BP. A considerable number of aboriginal midden sites have been found, especially on Peron Peninsula and Dirk Hartog Island which provide evidence of some of the foods gathered from the waters and nearby land areas. The mild climate favoured permanent residence.

Shark Bay was named by the English buccaneer William Dampier in the late 17th century. It is the site of the first recorded European landing in Western Australia, with the visit of Dirk Hartog in 1616, followed by William Dampier in 1699. The landing of Dirk Hartog on 25 October 1616 was commemorated by a pewter plate nailed to a post on the northern tip of Dirk Hartog Island, Cape Inscription. By virtue of its position, the area was a key navigation aid for navigators and explorers at this time. In 1712 the ship Zuytdorp of the Dutch East India Company was wrecked offshore and the French ships Uranie and Physicienne, commanded by Captain Freycinet, visited and studied Shark Bay in 1818.

After 1850, the Shark Bay region was variously occupied by guano miners, pearlers, fishermen and pastoralists. Pearling was the biggest industry from 1850 until its decline in the 1940s to be replaced by fishing. The fishing industry peaked in the 1960s and has declined over the last two decades with the introduction of regulations introduced to prevent over-exploitation of fish stocks. In 1904, until abandoned in 1911, quarantine hospitals were set up for aborigines with leprosy and venereal disease on Bernier and Dorre islands. After World War Two, a whaling station was located at Carnarvon, and between 1950 and 1962 up to 7,852 humpback whales were killed. The station collapsed in 1963 due to a lack of whales. Since the 1960s human interaction with wild dolphin groups has occurred regularly at Monkey Mia on Shark Bay's Peron Peninsula, the only known interaction on a regular basis in the world.

Shark Bay has a population of approximately 750, principally located at Denham (population of 450) and Useless Loop. Some of the local residents are of aboriginal descent (Anderson, n.d.). The economy of the region now includes tourism, fishing, and pastoralism. The residents of Carnarvon (located just outside of the bay area) are partially reliant on the fishing industry established in Shark Bay. The area is fished by 27 boats of the prawn fleet with a harvest reported to have stabilised at 2,000 tonnes over the last 20 years. Scallop fishery catches average at 3,500 tonnes per year from the 14 boats based at Carnarvon. The Shark Bay fisheries have a capital investment of approximately $80 million, employing 500 people in the region. The fisheries harvest approximately $35 million per year. In the 1960s salt evaporation works were established at Useless Loop, and a gypsum mine (now defunct) on Edel Land.

Tourism is important and more than 160,000 visitors per year are estimated to visit Shark Bay. The figure is increasing as a consequence of easier access with the construction of new roads, motels and hotels. One of the greatest tourist attractions of the region is fishing for which a number of fishing tours and charter vessels exist. Nearly all visitors (100,000 per year) come to see a group of wild bottle-nose dolphins which has been coming regularly to feed and interact with people at Monkey Mia beach for more than 30 years (Edwards, 1988). In 1986 an information centre was constructed at Monkey Mia in conjunction with the Shire of Shark Bay, and in 2001 a new visitors centre was developed. The Department of Conservation and Land Management (CALM) has developed visitor facilities at Hamelin Pool, Shell Beach, Eagle Bluff and Francois Peron National Park and provides a wide range of interpretive literature about the World Heritage Property.

1.6 SCOPE OF STUDY

The study, although originally intended to cover only the Peron Peninsular, was broadened to cover the entire Shark Bay World Heritage Property, including the marine areas. It is hoped that this will allow or encourage better integration of planning across the Property.

The outcomes of the study are aimed at community enjoyment, recreation, tourism and development and, while the study is a valuable model for dealing with these aspects of the Property, it is recognised that there is other work that can provide more detailed information on individual topics. It is hoped one of the strengths of this study is that provides a basis for an integrated approach to management of these aspects of the Property.

This is a broadscale study aimed at providing an overall context for managing landscape and aesthetic values. Detailed plans will need to be prepared for new developments and these should aim to be consistent with the findings of this study.

1.7 REPORT STRUCTURE

The report is divided into four parts:

- Part 1 is introductory and describes the context and nature of the study and report.

- Part 2 briefly explains the study process and presents the assessment results.
- Part 3 deals with the management of values, and lists issues, policies and actions.
- Part 4 contains a number of appendices, a glossary and a bibliography.

PART TWO - LANDSCAPE ASSESSMENT

Aesthetic values in this study have been identified by a procedure that is commonly referred to as landscape assessment. This part of the report outlines the landscape assessment process and then describes each step of the process, covering inventory of data and then the main assessment components of landscape character, community values, significance, community use and sensory characteristics. Results are summarised in each section.

The methodology is based on similar studies undertaken by CALM in WA .

2.1 PROCESS

Landscape assessment, put simply, is a process aimed at gaining understanding of how people interact with the environment and which characteristics contribute most to their experience and enjoyment. The methodology for this study has seven main components in the process and these are listed below with a brief description of each. Further discussion of these is in corresponding sections in this part of the report.

- **Inventory**, which involves identifying and mapping of environmental characteristics data relevant for the assessment.
- **Landscape Character**, which identifies and describes broad patterns of environmental characteristics (classifying them into types, units or sub-units) according to their relevance to human interaction.
- **Community Perception and Values,** which involves local research to identify or validate appropriate criteria for determining the environmental characteristics that are most important to people's experience and enjoyment. A literature review of relevant research should also be undertaken to determine public perceptions and attitudes of the wider community and to validate or add to any local research.
- **Significance**, which identifies and maps the characteristics or features in the study area that are most important to the experience and enjoyment of people. It involves the assessment of places using established criteria, and the identification of significant places or features through other assessments and lists.
- **Community Use**, which identifies and maps the location, type and degree of community use of the area. It includes spot (localised) use areas and travel routes (air, ground, water), types of recreational and non-recreational (including industrial or residential) use, ground travel route physical characteristics (such as class, surface, markings and intended traffic type), and existing and expected volume of users.
- **Sensory Characteristics**, which provides an indication of people's sensory interaction with the environment. It usually focuses on visual characteristics such as views but can include other sensory types where relevant (eg. sound, wind, smell).
- **Landscape Classes,** which is a synthesis of the assessment results to show spatially the areas or types of values that are most relevant to the management of human-environment interaction.

This process is illustrated below (Figure 1). These components fit into an overall landscape management structure that is illustrated in Figure 2.

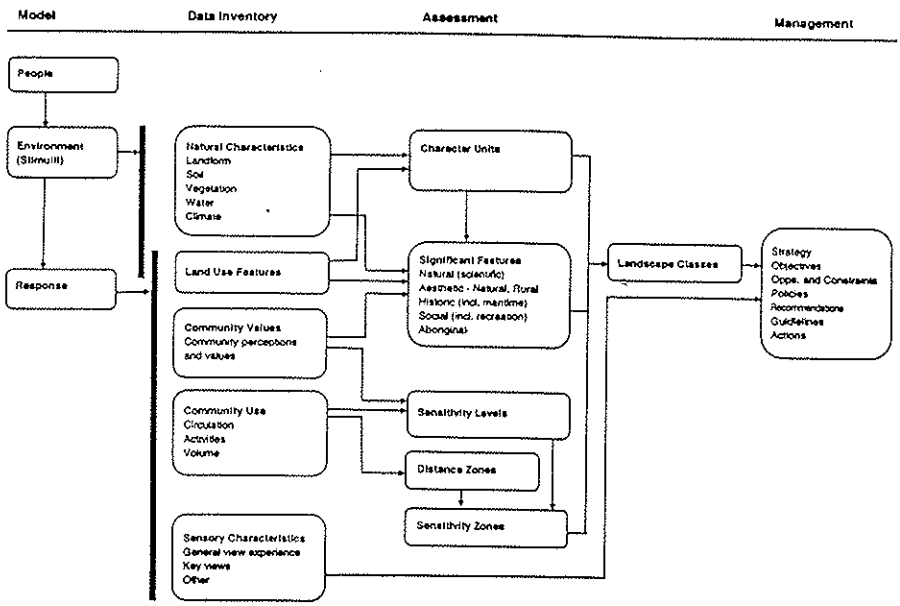


Figure 1 – *Landscape assessment process*

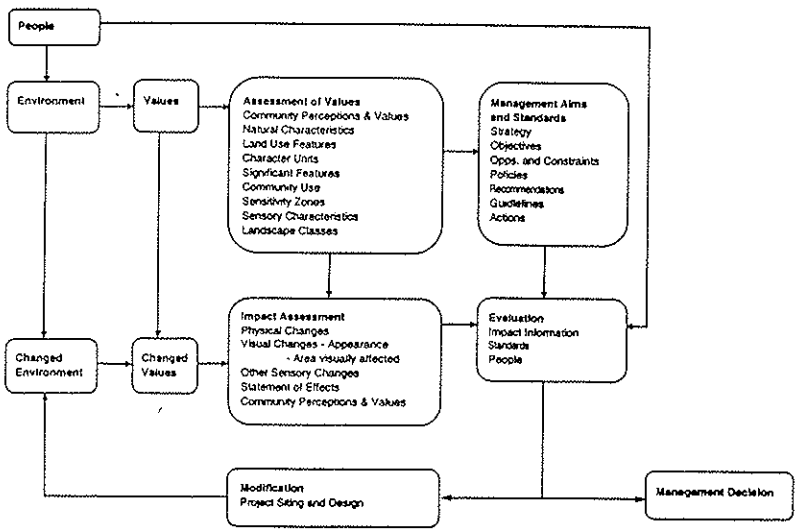


Figure 2 - *Management system for landscape values – process chart*

2.2 INVENTORY

A large inventory of characteristics was created from existing data (reports and maps), field surveys and aerial photograph interpretation. This inventory was designed to provide data for specific components of the assessment. It is listed below as either natural or human-related characteristics. Where characteristics were already largely mapped, sources are noted.

Natural characteristics:

- Landform
  - contours and land features (eg. cliffs, beaches and birridas)(from Auslig topographic maps); geomorphologic districts (Payne, Curry and Spence 1987);
  - high points, prominent ridges, valleys and gullies;
- Vegetation
  - vegetation communities (Beard 1976); vegetation patterns (from Auslig topographic maps); botanical province boundaries (Shark Bay Region Plan, 1988);
- Soil
  - soil types (from Payne, Curry and Spence, 1987);
- Waterform
  - depth contours from topographic maps, water features (from Landsat imagery, CALM);
- Special Features
  - unusual formations such as outcrops, cliffs, caves, and dunes;
- Climate
  - exposure to ocean influences;
- Marine Habitat
  - marine habitats (CALM).

Human-related characteristics:

- Land Use
  - existing and proposed tenure (CALM);
  - town planning scheme zones (simplified, from Town Planning Scheme, Ministry for Planning);
  - existing land use;
  - aquatic leases;
- Recreation Use
  - tourist nodes and recreational sites (CALM);
- Access Routes
  - location, class, surface, markings, intended traffic type, user volume, user type;
- General View Experience
  - position, side filtering, side view distance;
- Key Views
  - position, angle of view, direction of view, distance seen, filtering, viewer position, subject;

- Settlement Patterns - roads, buildings, plantings, disturbance;
- Aboriginal Sites - middens, caves and other sites listed on the Aboriginal Sites Register (AAD);
- Historic Features - buildings and sites registered on the Municipal Inventory, Register of Heritage Places and Register of National Estate;
- Social Features - recreation sites and places identified in visitor surveys and published material;
- Landmarks - outstanding or notable features which help identify places;

2.3 LANDSCAPE CHARACTER CLASSIFICATION & DESCRIPTION

Many of the natural characteristics identified during the inventory phase (see above) were used to classify the study area into landscape character units. This classification is based on similar patterns of clearly identifiable characteristics.

A previous broadscale study has classified most of the Shark Bay area as the Shark Bay Peninsulas Landscape Character Type with two sub types: Edel and Peron (see CALM 1994). The eastern edge of the study area includes the southern part of the Carnarvon Coastal Plain Landscape Character Type. The southern edge of the study area includes the northern part of the Kalbarri Sandplain Landscape Character Type. Description of the two Shark Bay Types is provided in Appendix 2.

The process of landscape character classification was extended beyond these broadscale types, to produce units and sub-units of sufficient detail to be useful for regional and site planning. This classification process identified natural character units and general land use units as separate components, before combining them to form composite landscape character units. This process of analysing and deriving data is illustrated in Appendix 3. The study includes a simple classification of the marine areas to allow consideration of these areas in an integrated manner.

The layers of information used to define natural landscape character in this study were (in order of priority):

- Landform - elevation, landform features
- Vegetation - remnant vegetation
  - communities, structural class
- Water - strong influence of water, enclosure of water, water depth

Maps of landform and vegetation are included at the end of this section (see Map 1 and Map 2). These layers were analysed and natural character units (and sub-units) were defined based on the most dominant characteristics.

Land use was also classified into broad categories (see Map 4). The layers of information used for this mapping were:

- land tenure
- town planning scheme zones (simplified)
- existing land uses based on local knowledge, aerial photographs and field observations
- remnant vegetation

Land tenure was a major determinant in the land use mapping. Rural land use, which in other areas is often a major component of land use, was largely pastoral and in most areas characteristics were similar to natural environments. There were only small areas where highly modified land use dominated the character. Consequently, land use had only localised effect so natural and land use units were combined to form the final landscape character units.

Four landscape character units with twenty sub-units were identified for the study area. These are listed below. Detailed descriptions are provided on the following pages. Unit and sub units have been mapped (see Map 5).

Coastal Unit

- Sea Cliffs Sub-Unit
- Bay Cliffs Sub-Unit
- Gentle Transition Sub-Unit
- Flats Sub-Unit

Hinterland Unit

- Parabolic Dunes Sub-Unit
- Reticulate Dunes Sub-Unit
- Desert Sub-Unit
- Birrida Sub-Unit
- Tamala Sub-Unit
- Edel Shrublands Sub-Unit
- Peron Shrublands Sub-Unit
- Tree Heath Sub-Unit
- Grasslands Sub-Unit

Modified Unit

- Settlement Sub-Unit
- Extraction Sub-Unit

Marine Unit

- Deep Waters Sub-Unit
- Shallows Sub-Unit
- Bank Sub-Unit
- Sill Sub-Unit

2.3.1 COASTAL UNIT

SEA CLIFFS SUB-UNIT

The Zuytdorp Cliffs, Edel Land.

Location	This sub-unit lies along most of the western edge of Edel Land and Dirk Hartog Island, adjacent to the Indian Ocean and is the western most sub-unit. The sub-unit includes the denuded rock pavement at the top.
Size	A 200 km long, narrow strip, broken by Crayfish Bay and False Entrance. 20-250 height.
Landform	The cliffs form an abrupt and rugged land/water edge and rise to an elevation of 250 metres above the sea level. They vary in form, from overhanging or vertical to sloped or shelved. There are wave-cut platforms at the foot of the cliff in some areas, such as at the site of the Zuytdorp wreck..
Soils	Limestone cliffs, slopes with limestone boulders, thin sandy soils above the cliffs. The cliffs typically drop away from a deep brown rock pavement.
Weather exposure	Strong wave and wind action, responsible for the cliff erosion and the form and lack/scarcity of vegetation.
Vegetation	There is no vegetation on the cliffs, except

	in the south where the slope is less severe and low heath, spinifex and acacia occur.
Waterform	The ocean is a very dominant part of this sub-unit and under a large swell produces spectacular waves and blow hole spouts.
Special features	Zuytdorp Wreck, Steep Point, some of the highest cliffs on the Australian coastline.
Tenure	Pastoral lease, a large part of which is proposed to convert to national park and nature reserve in the future.
Land use	Pastoral, ranger's residence, recreation, abalone fishing.
Settlement areas	None.
Recreation use	Fishing and sight seeing focussing on Steep Point
Access	4WD and air. Some boating to nearby areas.
Sensory Characteristics/Views	Very open, expansive and spectacular views, persistent wind and sounds of wave action.
General experience	Wild, exposed, remote, persistent nature of the cliffs. Experientially, this is the most wild of the character units, with the sheer ruggedness of the terrain being exacerbated by the often highly windy, exposed conditions and the turbulence of the ocean crashing against the cliff base.
Most Distinctive Features	Extended line of large cliffs, exposure to the ocean.

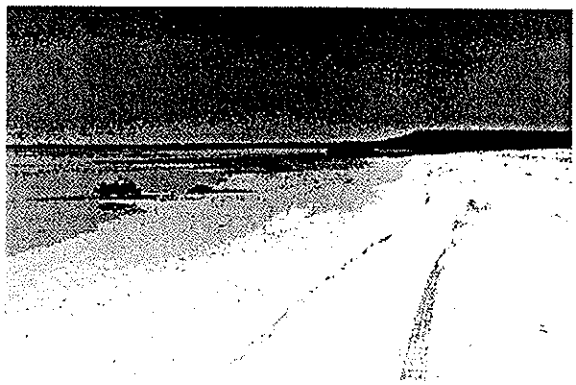
BAY CLIFFS SUB-UNIT

View north from Eagle Bluff, Peron Peninsula

Location	This sub-unit covers a number of stretches of coastline within the bays with

	substantial but sometimes intermittent cliffs. Greatest occurrence is on Peron Peninsular.
Size	A series of long, narrow strips sometimes extending to several kilometres and a height of 10-50m.
Landform-	Abrupt but not as rugged as the sea cliffs, frequently with 30 degree slopes. There is often a beach at the base of the cliffs with a narrow ledge and shallow soils at the top.
Soils	Limestone based, some with red sands over the top. The contrast of red and white sands is clearly visible in some places (eg. Cape Peron).
Weather exposure	More sheltered than the sea cliffs but still quite exposed on the south west-facing cliffs.
Vegetation	Sparse low shrublands.
Waterform	Gentle bay waters abut this sub-unit.
Special features	Cape Peron, Eagle and Goulet Bluffs.
Tenure	Edel Land – pastoral lease, North Peron – national park, South Peron – vacant crown land.
Land use	Conservation, burn buffers, pastoral, recreation, aquaculture/tourism.
Settlement areas	None.
Recreation use	Sight seeing (Eagle Bluff, Herald Bluff, Goulet Bluff, Cape Lesueur), marine life observation, camping (Cape Peron).
Access	4WD in Peron North with easy 2WD to Eagle and Goulet Bluffs.
Sensory Characteristics/Views	Spectacular views, wind.
General experience	Elevated and exposed with limestone rocky cliffs of South Peron and red sandy cliffs of North Peron.
Most distinctive features	Bay coast, large cliffs.

GENTLE TRANSITION SUB-UNIT



Herald Bight, view toward Guichenault Point

Location	All coastal and bayside areas where cliffs end and the land slopes gently into the bay or sea, not including the flats. Generally within the bay area, although there are small areas adjacent to the ocean.
Size	Occupies a large portion of the bay coast and varies in width, with wide beaches as at Crayfish Bay, or narrow as at Herald Bight.
Landform-	Gentle slopes and sandy beaches (or shell beaches as at Hamelin Pool and Lharidon Bight). Includes straight or sweeping beaches, enclosed bays, and protruding spits.
Soils	Sand and coquinite deposits. Small limestone shelves exist in some places.
Weather exposure	Varied exposure to the weather according to the aspect, ranging from high at Crayfish Bay and False Entrance, moderate to high on the west and south-west facing areas and low on the east facing areas. The lagoons are relatively protected.
Vegetation	Acacia shrublands, mangrove(as at Guichenault Point) and intertidal halophytes.
Waterform	Abuts ocean and the calmer waters of the bay. Tidal changes are more obvious in this sub-unit.
Special features	Bays and beaches, Monkey Mia.
Tenure	Vacant crown land, national park, pastoral lease.

Land use	Pastoral, marine access, settlement, recreation
Settlement areas	Denham, Monkey Mia, Useless Loop
Recreation use	Boating, fishing, camping, swimming, sightseeing. The most used sub-unit.
Access	2WD via the Useless Loop Road and access off the Denham Hamelin Road. 4WD in the Steep Point and Cape Peron areas.
Sensory Characteristics/Views	Water and coast views, wind in the westerly areas, sounds of the surf at Crayfish Bay and False Entrance, dolphin interaction.
General experience	Varies with the location but are generally gentle 'friendly' places, less spectacular than the cliffed coast, although Crayfish Bay and False Entrance are more exposed and wild. Away from the settlement areas there is a sense of remoteness.
Most Distinctive Features	Coast, beaches, gentle backdrop.

FLATS SUB-UNIT

Location	Along the Wooramel coast between Hamelin and Carnarvon and varying between 10-30km inland, south end of Hamelin Pool, Petit Point and north of Tamala Station.
Size	The Wooramel flats are large.
Landform-	Low flats adjacent to the bay. Some low limestone mesas.
Soils	Depositional sands.
Weather exposure	Mild coastal influence, strong tidal influence. Some wind and water erosion.
Vegetation	Largely halophytic plants dominated by *Maireana* and *Atriplex* along the Wooramel coast, and *Halosarcia* (samphire) in the other areas. The northern section of the Wooramel coast is fringed by extensive mangrove. Acacia shrublands are associated with low limestone mesas.

Waterform	Adjacent to the bay. Soils sometimes waterlogged.
Special features	Gladstone (jetty and microbial communities), Blue Holes .
Tenure	Pastoral lease, marine park, conservation reserve.
Land use	Pastoral, recreation.
Settlement areas	None
Recreation use	Low use.
Access	2WD from North West Coastal Highway to Wooramel Coast. 2WD and 4WD from Useless Loop Road.
Sensory Characteristics/Views	Long views across the flats.
General experience	Red/purple colours of samphire.
Most Distinctive Features	Low-lying, depositional saline flats sparsely vegetated with samphire, saltbush and bluebush.

2.3.2 HINTERLAND UNIT

PARABOLIC DUNES SUB-UNIT

Parabolic dunes on Edel Land.

Location	Western side of Edel Land and Dirk Hartog Island and extending to just south of Tamala Station.
Size	Size dominates the west coast. Dunes rise to a height of 30-60m above the swales, with a length to 3km
Landform	Series of large, parallel long-walled parabolic dunes running north-south, with inter-dunal swales
Soils	Dunes - non-coherent sands, light brown to pink greater then 1metre deep. Often with a limestone gravel mantle. Swales - brown or reddish-brown mainly calcareous sands.
Weather exposure	Strong coastal winds, especially in summer. Dunes unstable where vegetation is disturbed.
Vegetation	Low shrublands, scattered to close, dominated by acacia and heath-like thickets. Low heath (*Melalueca and Thriptomene)* and spinifex, with some patches of shrubs in the depressions.
Waterform	None within the sub-unit. Abuts the Coastal Unit and the southern end of the Useless Loop extraction area.
Special features	None.
Tenure	Pastoral lease
Land use	Recreation.

Settlement areas	None.
Recreation use	Sight seeing, camping, fishing.
Access	Via Useless Loop Road and Steep Point Road, mainly 4WD.
Sensory Characteristics/Views	Long views along deep swales and across the top of ridges. Views to the bay and the ocean from elevated positions. Strong enclosure in the swales.
General experience	Hilly terrain, large scale and rhythmic pattern of the dunes, sense of access to the water.
Most Distinctive Features	Large, vegetated parabolic dunes.

RETICULATE DUNES SUB-UNIT

Location	Inland, to the north-east of Zuytdorp Nature Reserve.
Size	600 km2 and up to 50metres ASL.
Landform-	Sand ridges rise 10-15m above the surrounding plains in a confused pattern with slopes generally greater that 8%.
Soils	Depositional (aeolian) sand.
Weather exposure	Inland location reduces the exposure to high energy winds. Relatively stable but susceptible to fire.
Vegetation	Diverse SW Botanical Province vegetation, mostly Proteaceous and Myrtaceous shrub heath. The reticulate dunes support the shrub or tree heath of the surrounding plains, though with more local variety in form due to the microcosm created by the sand ridges.
Waterform	None.
Special features	None.
Tenure	Pastoral lease, nature reserve.
Land use	Pastoral, mining tenements.
Settlement areas	None.
Recreation use	None.
Access	Not easily accessed.

Sensory Characteristics/Views	Long views across the top of ridges. Strong enclosure in the swales.
General experience	Remote, inland dunes with varied vegetation.
Most Distinctive Features	Vegetated reticulate dunes.

DESERT SUB-UNIT

Location	Inland on Edel Land and Dirk Hartog Island.
Size	Approximately 20 km long and3 km wide on Edel Land with ridges to 30m height.
Landform-	Steep north-facing slopes and bare deflation bases, often on exposed limestone.
Soils	Accumulation of loose sand from the parabolic dunes.
Weather exposure	Product of wind exposure.
Vegetation	Mostly unvegetated except where stabilizers *Frankenia and Acacia* spp occur on the deflated areas.
Waterform	None.
Special features	North of Zuytdorp point where the desert meets the sea. Similar feature on Dirk Hartog at Tetradon Loop.
Tenure	Pastoral.
Land use	None.
Settlement areas	None.
Recreation use	4WD access to adjacent areas.
Access	4WD.
Sensory Characteristics/Views	Open views largely due to the lack of vegetation.
General experience	Rugged, remote, barren, white sand dunes.
Most Distinctive Features	Unvegetated desert dunes.

BIRRIDA UNIT SUB-UNIT

Location	This unit includes the highly saline and gypsiferous claypans, and surrounding country where they are very numerous, making up at least 30% of the landscape. Scattered through Peron Peninsular and Edel Land. Most dense in 3 bands in north, central and southern Peron.
Size	Typically around 400m across, but up to several kilometres across as at North Peron.
Landform-	Nearly flat claypan often elliptical and with peripheral moat
Soils	Gypsum, clay silt and sand
Weather exposure	Usually low, interdunal so reasonably sheltered
Vegetation	Fringing areas usually saltbush (Atriplex, Mireana spp.), outer ring of *Scaevola crassifolia* and *Acacia rostellifera*, clay pans have scattered low halophytes especially. *Halosarcia pruinosa* (samphire).
Waterform	Some display a moatlike seepage and a few

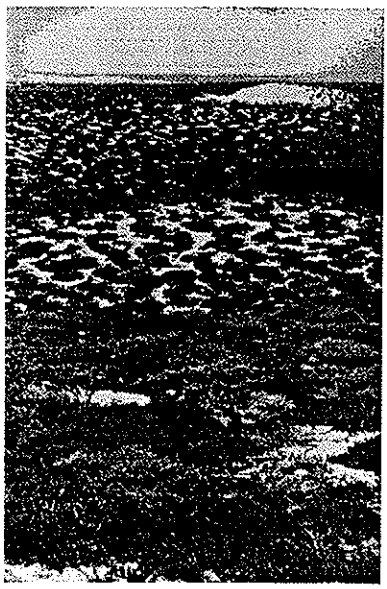
	receive influxes of seawater. (Big and Little Lagoons are examples of permanently inundated birridas.
Special features	Contrasting colours.
Tenure	Pastoral lease, national park, vacant crown land.
Land use	Conservation, pastoral, gypsum extraction, airstrips.
Settlement areas	None.
Recreation use	None.
Access	There is some access from adjacent roads.
Sensory Characteristics/Views	Open views across birridas, usually enclosed by surrounding landform.
General experience	Protected. Colour and form contrasting with the surrounding environment.
Most Distinctive Features	Birridas.

TAMALA SUB-UNIT

Location	Adjacent to the southern end of the sea cliffs sub-unit.
Size	About 100km2.
Landform-	Elevated, gently undulating sandy plains on a limestone base with some limestone outcropping. Rising to 287 metres above sea level at Woomerangee Hill, the highest in the study area.
Soils	Shallow brown or yellow sands with limestone fragments.

Weather exposure	Exposed to coastal winds.
Vegetation	Intermediate Botanical Province. Diversity of vegetation with low heaths, mallee shrublands and paper bark thickets.
Waterform	None.
Special features	Woomerangee Hill.
Tenure	Pastoral lease, nature reserve.
Land use	Pastoral.
Settlement areas	None
Recreation use	Some 4WD travel.
Access	4WD tracks, very isolated.
Sensory Characteristics/Views	Panoramic views, wind.
General experience	Sense of elevation, easterly aspect, remote, focus in the north on Woomerangee Hill, views to the ocean from the western side.
Most Distinctive Features	Elevation, Woomerangee Hill, limestone ridge, diverse vegetation.

EDEL SHRUBLANDS SUB-UNIT



Location	Along the eastern edges of Dirk Hartog, Bernier and Dorre Islands and Edel Land, extending south to include Boorabugatta Peninsula.

Size	Covers nearly half of Dirk Hartog Island and Edel Land.
Landform-	Mildly undulating sandy plains with occasional sand dunes, limestone rises and saline flats.
Soils	Pale grey to white, mixed supra-tidal deposits with calcareous sand.
Weather exposure	Moderately protected, buffered from the ocean weather by the parabolic dunes sub-unit.
Vegetation	The vegetation is generally low acacia shrubland, typically featuring the rounded *Acacia ligulata* with some saltbush and heath communities. Lies within the Intermediate Botanical Province.
Waterform	Adjacent to the Coastal Unit within the bay.
Special features	None.
Tenure	Pastoral lease, nature reserve.
Land use	Pastoral, salt works, conservation.
Settlement areas	Useless Loop
Recreation use	Camping and fishing, especially on Tamala and Carrarang Peninsulas and Dirk Hartog Island.
Access	2WD and 4WD via Useless Loop Road. Boat and 4WD to access Dirk Hartog.
Sensory Characteristics/Views	Good views adjacent to the Coastal Unit.
General experience	Gentle terrain, scrubby vegetation, and good views adjacent to the Coastal Unit Low, vast coastal Dunes
Most Distinctive Features	Soils, low acacia shrubland, gentle terrain, adjacency to Coastal Unit.

PERON SHRUBLANDS SUB-UNIT

Location	Most of Peron Peninsula, Faure Island and Hamelin Station.
Size	Dominates the above locations.
Landform-	Gently undulating sandplains, with birridas dotted sparsely throughout.
Soils	Red to reddish-brown.
Weather exposure	Susceptible to wind exposure where vegetation is sparse.
Vegetation	Low acacia shrublands becoming taller toward the east and interspersed with small Eucalyptus species. Generally the cover is relatively dense and contains woody species of *Lamarchea* and *Acacia* which resist degradation. Lies within the Eremaean Botanical Province.
Waterform	Encloses Big Lagoon and Little Lagoon. Abuts much of the Coastal Unit on Peron.
Special features	Peron Station, Project Eden.
Tenure	National park (north of the Denham to Monkey Mia Road), pastoral lease, vacant crown land.
Land use	Conservation, pastoral, basic raw material extraction, recreation.
Settlement areas	Denham, Monkey Mia, Hamelin.
Recreation use	Carries a high volume of people seeking recreation at adjacent coastal areas.
Access	Mainly 2WD access with 4WD in North.
Sensory Characteristics/Views	A mix of views, including long distance views to the bay, enclosed views in the

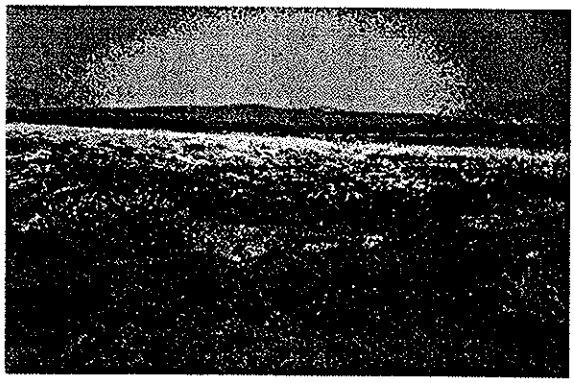
	hollows, and sweeping views from high points over the rolling terrain and acacia shrublands.
General experience	Not as remote, good access, close to settlement areas.
Most Distinctive Features	Red to reddish-brown soils, low acacia shrubland, gentle terrain, adjacency to Coastal Unit, Eremaean Botanical Province.

TREE HEATH SUB-UNIT

Location	Lies between Tamala and Peron South sub-units and covers much of Nanga Station.
Size	This is the largest sub-unit.
Landform-	Gently undulating sandplains.
Soils	Vary from red loamy sands to pale depositional sands.
Weather exposure	Relatively protected, assisted by taller vegetation. More exposed in the north where it abuts Henri Freycinet Harbour.
Vegetation	Diverse and varied associations of South-West Botanical Province vegetation, mostly in the form of shrub heath and tree heath, dominated by proteaceous and myrtaceous species. The Eucalypts are evidence of the cooler south-west Mediterranean climate,
Waterform	Abuts the coast of Henri Freycinet Harbour in the north.
Special features	"Gigantism" in plant form.
Tenure	Pastoral lease, nature reserve.
Land use	Pastoral, conservation.
Settlement areas	Nanga Resort.
Recreation use	Boating, fishing, focussing on Nanga Resort
Access	2WD on Useless Loop Road and minor 4WD access.
Sensory Characteristics/Views	A mix of views, including sweeping views from high points over the rolling terrain and acacia shrublands.

General experience	Attractive, vegetation of good height, largely remote setting, red soils.
Most Distinctive Features	Vegetation.

GRASSLANDS SUB-UNIT



Location	Just north of the Peron Isthmus and surrounding Tamala Station homestead.
Size	Dominates the above locations
Landform-	Gently undulating sandplains.
Soils	Red to reddish-brown.
Weather exposure	Susceptible to wind exposure where vegetation is sparse.
Vegetation	Introduced pasture species, on Peron resulting from the burning of spinifex and the introduction of buffel grass as a pasture.
Waterform	Abuts the Coastal Unit.
Special features	Tamala Station homestead.
Tenure	Vacant crown land, pastoral lease.
Land use	Pastoral.
Settlement areas	None.
Recreation use	Carries a high volume of people seeking recreation at coastal areas to the north-west.
Access	Easy 2WD via the Denham Road and the Useless Loop Road.
Sensory Characteristics/Views	Open panoramic views, including long

	distance views to the bay and the high points on the southern side of the Peron Isthmus.
General experience	Open rolling grassland country with good views. Usually experienced in transit.
Most Distinctive Features	Grasslands.

2.3.3 MODIFIED UNIT

SETTLEMENT SUB-UNIT

Location	Denham, Monkey Mia, Useless Loop, Hamelin, Nanga Resort.
Size	Ranges in size from the primary township of Denham to smaller tourism developments such as Monkey Mia.
Landform-	Includes the gentle slopes of the coastal Gentle Transition Sub-Unit, often backed by higher, rolling ridges.
Soils	Sand and coquinite deposits. Small limestone shelves exist in some places.
Weather exposure	Varied exposure to the weather according to the aspect, ranging from moderate to high on the west and south-west facing areas and low on the east facing areas.
Vegetation	Predominately introduced species (eg. Palms and Kikuyu).
Waterform	Bay waters form a strong focus.
Special features	Dolphin interaction at Monkey Mia, boat anchorage at Denham, Little Lagoon adjacent to Denham, history and historic buildings.
Tenure	Various, freehold, leasehold.
Land use	Residential, commercial, industrial recreation.
Settlement areas	This sub-unit.
Recreation use	Boat launching, swimming, dolphin interaction at Monkey Mia, restaurants, caravan parks, hotels, etc.
Access	2WD.
Sensory Characteristics/Views	Good views to the bay. Visual appeal of the built form varies.
General experience	Typical small 'northern' settlement character. All have a sense of destination. Water forms the main natural feature.
Most Distinctive Features	Settlement/built form.

INDUSTRIAL/EXTRACTION SUB-UNIT

Location	Useless Loop and Useless Inlet, Edel Land between Capes Bellefin and Heirison.
Size	Most of Useless Inlet.
Landform-	Flat.
Soils	As for Edel Shrublands Sub-Unit.
Weather exposure	As for Edel Shrublands Sub-Unit.
Vegetation	None.
Waterform	Evaporation ponds.
Special features	Colour of the evaporation ponds.
Tenure	Leasehold.
Land use	Salt Extraction.
Settlement areas	Useless Loop.
Recreation use	None.
Access	Useless Loop Road
Sensory Characteristics/Views	Open, panoramic views.
General experience	Highly modified places but few buildings.
Most Distinctive Features	Evaporation ponds.

2.3.4 MARINE UNIT

DEEP WATERS SUB-UNIT

Location	Throughout the bay and to the western boundary where water depth exceeds 10m.
Size	A large portion of the bay.
Weather exposure	Open and exposed.
Vegetation	Generally too deep for sea grasses.
Waterform	This sub-unit.
Special features	Coral.
Tenure	Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve.
Land use	Fishing.
Recreation use	Recreational boating
Access	Primary access points are Denham and Carnarvon, with lesser points scattered around the bay. Travel routes are flexible, although there are several routes that are used regularly.
Sensory Characteristics/Views	Open, panoramic views.
General experience	Isolated and exposed, water dependent, flexible movement. Varied experience depending on weather conditions.
Most Distinctive Features	Water with the sea floor not visible.

SHALLOWS SUB-UNIT

Location	The perimeter of much of the bay, particularly the western side of Peron Peninsular, north of the Faure Sill, the Wooramel coast, the eastern side of Bernier and Dorre Island, and the eastern side of Hamelin Pool, where the water depth is 5-10m.
Size	A large portion of the bay perimeter.
Weather exposure	Open and exposed.
Vegetation	Extensive seagrass meadows.
Waterform	This sub-unit.

Special features	Seagrass meadows.
Tenure	Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve.
Land use	Pearl farms, fishing.
Recreation use	Recreational boating
Access	Primary access points are Denham and Carnarvon, with lesser points scattered around the bay. Travel routes are flexible, although there are several routes that are used regularly.
Sensory Characteristics/Views	Open, panoramic views.
General experience	Exposed but within sight of land, water dependent, flexible movement. Varied experience depending on weather conditions.
Most Distinctive Features	Water with the sea floor and seagrass visible.

BANK SUB-UNIT

Location	The perimeter of much of the bay where the water depth is 1-5m.
Size	A large portion of the bay perimeter.
Weather exposure	Open and exposed.
Vegetation	Includes the upper depth limit of seagrass extending into shallow areas relatively devoid of vegetation. Cyanobacteria grow in hypersaline environments to produce stromatolites.
Waterform	This sub-unit.
Special features	Big Lagoon, stromatolites, shell and coquinite deposits.
Tenure	Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve.
Land use	Pearl farms, fishing.
Recreation use	Recreational boating, swimming.
Access	Primary access points are Denham and Carnarvon, with lesser points scattered around the bay. Travel routes are flexible,

	although there are several routes that are used regularly.
Sensory Characteristics/Views	Open, panoramic views.
General experience	Exposed but close to land, water dependent, flexible movement. Varied experience depending on weather conditions.
Most Distinctive Features	Water with the sea floor and seagrass clearly visible.

SILL SUB-UNIT

Location	Shallows which restrict the openings of inlets and bays, including the Useless Inlet, South Passage, Boat Haven Loop, Depuch Loop, and most notably Hamelin Pool (Faure Sill).
Size	Relatively small areas with the exception of Faure Sill.
Weather exposure	Open and exposed.
Vegetation	Includes the upper depth limit of seagrass extending into shallow areas relatively devoid of vegetation.
Waterform	This sub-unit. Strong currents.
Special features	Faure Sill.
Tenure	Shark Bay Marine Park, Hamelin Pool Marine Nature Reserve.
Land use	Fishing.
Recreation use	Recreational boating.
Access	Primary access points are Denham and Carnarvon, with lesser points scattered around the bay. Travel routes are flexible, although there are several routes that are used regularly.
Sensory Characteristics/Views	Open, panoramic views.
General experience	Exposed but close to land, water dependent, flexible movement. Varied experience depending on weather conditions.
Most Distinctive Features	Water with the sea floor and seagrass

	clearly visible.

SMALL ISLANDS SUB-UNIT

Location	Largely within the Henri Freycinet Harbour.
Size	Generally quite small, the largest being Salutation Island at slightly more than 160ha.
Landform	Generally there are low perimeter cliffs with limestone rubble slopes and a central plateau.
Soil	Shallow soils, guano, limestone based.
Weather exposure	Open and exposed.
Vegetation	Shallow soils support shrubland dominated by *Nitraria billardierei*. Low heath in other areas. Weeds on mined islands.
Waterform	Bay waters surround the islands.
Special features	.
Tenure	Shark Bay Marine Park.
Land use	Pearl farms, fishing.
Recreation use	Recreational boating, swimming, diving.
Access	Primary access points are Denham, Nanga, Tamala, Carrarang Carnarvon. Travel routes are flexible, although there are several routes that are used regularly.
Sensory Characteristics/Views	Open, panoramic views.
General experience	Exposed but close to land, water dependent, flexible movement. Varied experience depending on weather conditions.
Most Distinctive Features	Water with the sea floor clearly visible.

2.4 COMMUNITY PERCEPTIONS AND VALUES

Formal assessment of aesthetic values needs to be based on knowledge of community perceptions and values. This knowledge can be gained from various sources, including:

- the large body of general perception research that already exists,
- perception testing of the local community,
- surveys, workshops and discussions with visitors, neighbours and the local community,
- review of publications relating to the study area (to identify the values promoted, and any feedback from the community), and
- formal aesthetic theory.

These avenues of knowledge are discussed further in the following sections.

2.4.1 GENERAL PERCEPTION RESEARCH

There is a large body of existing research that allows us to draw assumptions about aesthetic values. Much of this research focusses on visual aesthetic values and uses a psycho-physical approach to identify the relationships between environment characteristics and a person's response. While it is recognised that other, non-visual aesthetic values often play an important role in people's experience, the research relating to landscape values does not consider these to the same extent as visual values.

Key research (see Anderson et al 1976, Zube et al 1974, Williamson and Chalmers 1982) allows us to assume that visual aesthetic significance increases with:

- increased topographic ruggedness
- increased naturalism
- increased land use compatibility
- increased presence of water forms and extent of water area and edge
- increased presence of outstanding natural features
- increased legibility of features
- increased spatial definition
- increased sympathy in land use response to natural features
- increased pattern and texture in rural uses

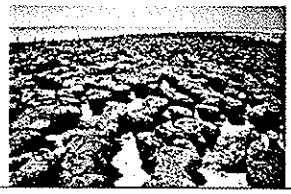
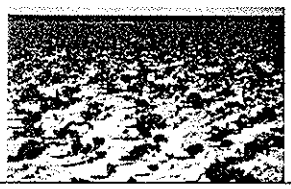
These assumptions formed the basis for criteria to assess significance. Aesthetic significance in this study was based on natural characteristics. Rural use in the region is largely pastoral and lacks the characteristics that normally contribute to rural significance. Built form and towns were not assessed for aesthetic significance in this study.

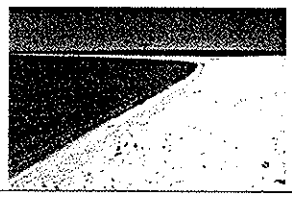
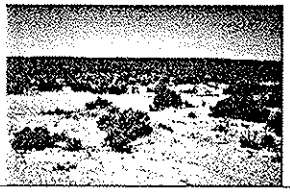
2.4.2 VISITOR SURVEY

A visitor survey was undertaken at Monkey Mia as part of this study to gain a better understanding of visitor characteristics, preferences and values, and to establish or validate criteria for the assessment of significance. Perception testing, using a range of photographs of Shark Bay scenes, was included in this survey. The survey form can be found in Appendix 4. A summary table of results is provided in Appendix 5. Key points to emerge from this survey are as follows:

- Respondents generally listed the main tourist destinations as the most important features. Monkey Mia and the dolphins were the most frequent responses, then Shell Beach and the stromatolites. Very few respondents listed seagrass, dugongs, Project Eden or other conservation features.
- Monkey Mia and the dolphins were also the most frequent responses for the most enjoyed features. The most frequent reasons given for enjoyment were the interaction with the dolphins and the relaxing and pleasant environment.
- The vast majority of respondents listed the beauty of the area as extremely important.
- A variety of places were listed as the most beautiful in the area, including Monkey Mia, the coastline, ocean and lagoons. Virtually all places listed were related to water.
- A variety of places were listed as the least beautiful in the area, including Denham, boating areas, litter and structures. The vast majority of places listed were related to human modification. Non human modified features listed included seaweed and roadside vegetation.
- A majority of respondents rated the beauty of Shark Bay as similar to other areas they had been in WA, with a lesser number saying it was better. Almost none said it was worse.
- The vast majority of respondents came to see the dolphins and indicated they were satisfied with this aspect of this trip.
- Most people wanted to see other features, with a large range of features listed. The islands were frequently listed.
- The desirable improvements to the area listed featured low level of development, shelter/shade and clean environment.
- One week was the most frequently listed desirable length of stay.
- Two thirds of respondents liked the scene with the windmill, largely because it was typically Australian.
- The feature that was most frequently disliked in the scenes shown to respondents was the 'boring', 'sameness'.
- The 25-39 age group was the most common.
- Approximately 40 percent of visitors were international.
- The vast majority of visitors traveled to the area by private vehicle, irrespective of their place of origin.

Participants were also asked to sort a total of 17 photographs according to the degree that they liked them. The photographs are listed as follows:

A	Stromatolites (dry) waters of Hamelin Pool (background)	
B	Cloud, Sunset and Little Lagoon (from Monkey Mia Road)	
C	Windmill, wide road, structures, scrubland (Peron Homestead)	
D	Acacia scrub, verge, straight stretch of road (Denham Hamelin Road)	
E	Saltbush, saline flats, road, Telegraph Station buildings	
F	Birrida, samphire, shrubland covered background ridge (near 16 mile tank)	
G	Mobile dunes, 'desert', calcerous hillocks (Edel land)	
H	Bay, beach, cliffs and red and white sand (western side of Cape Peron)	

I	Wildflowers, open shrubland, flat topography (Denham Hamelin Road)	
J	Acacia Shrublands, flat topography (Denham Hamelin Road)	
K	Coastal heath, gentle gradient, shallow water (close up)	
L	Grassland, limestone rocks, wind-formed shrubs, birrida	
M	Shell Beach, bay, extraction shed, shrubland covered background ridge	
N	Coastal heath, gentle gradient, shallow water (distant)	
O	Spinifex, scrub and Little Lagoon (from Monkey Mia Road)	
P	Low coastal heath, mobile dunes, bay, ocean, headland, track (Edel land, Crayfish Bay)	
Q	Saltbush and saline flats (south-east of the Telegraph Station)	

The results of this part of the survey are shown in the table below as frequency of ratings for each photograph.

	Photograph																
Rating	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Like a lot-High	35	51	16	3	0	1	13	51	42	6	7	5	27	7	28	17	4
Like a lot-Mod.	14	14	19	7	3	9	15	8	15	11	21	15	23	15	28	23	11
Like a lot-Low	10	4	6	12	8	9	19	10	7	12	14	12	13	16	8	16	13
Nothing Special	13	3	31	50	61	53	25	3	8	43	30	40	9	34	7	16	43

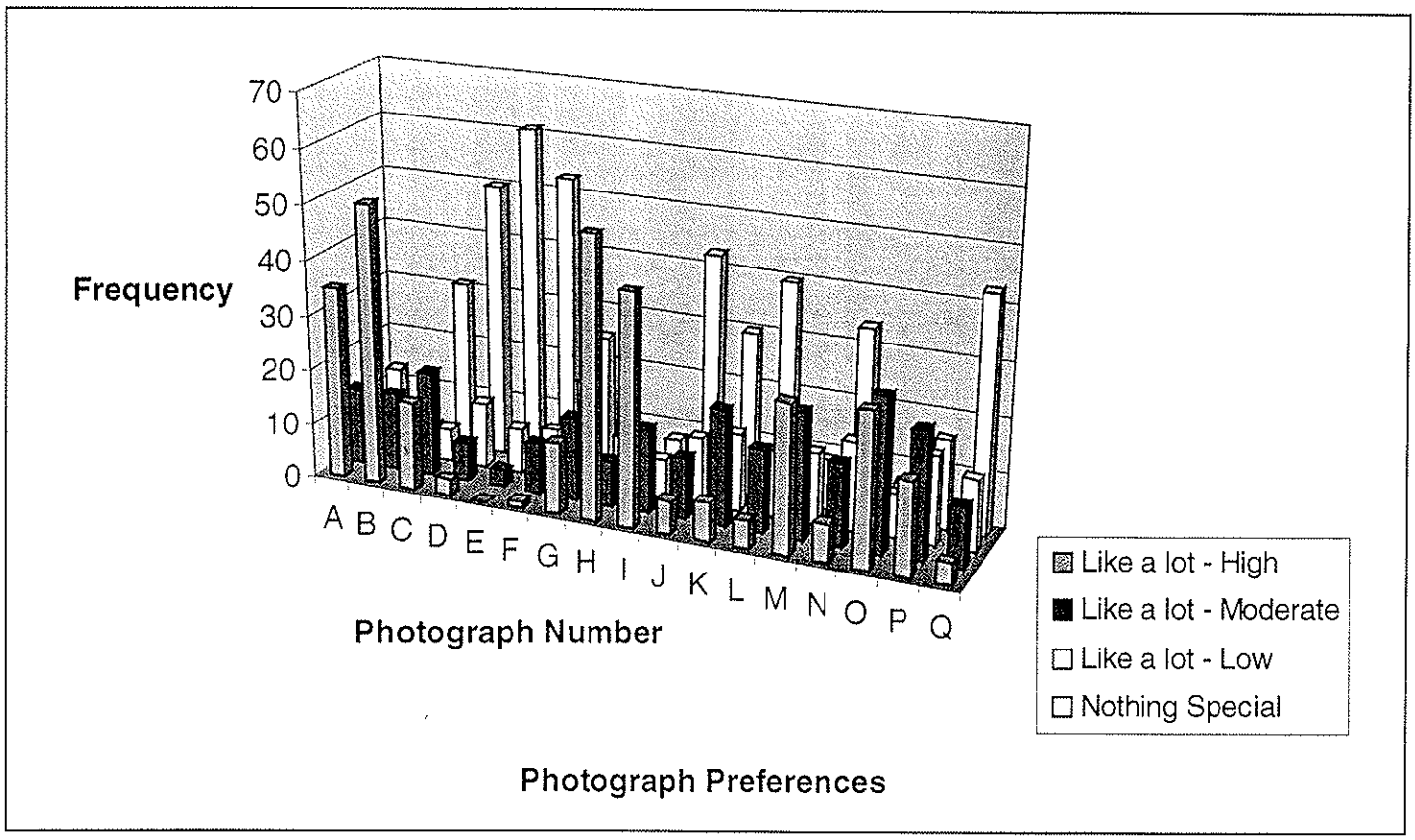


Figure 3 Visitor Survey - Frequency of ratings for each photograph

There was a clear overall preference rating for most of the photographs and these are listed below

Like a lot-High	A, B, H, I
Like a lot-High-Mod	M, O, P
Like a lot-Mod.	
Like a lot-Low	
Nothing Special	D, E, F, J, L, Q

The responses for C, G, K (few High), N (few High) were polarised, with similar response for both 'Like a lot' and 'Nothing Special'.

Other points to emerge from this photograph sorting are as follows:

- All the photographs that were liked a lot contained water in the scenes, except the scene with wildflowers (although the water in the sunset scene may not have been identifiable to some people).
- The presence of wildflowers changed the rating of similar scenes (I and J) from 'nothing special' to 'like a lot'.
- Both photographs with low shrublands, gentle gradient and water (K and N) received polarised responses.
- The photograph of Little Lagoon, which is similar to K and N except that the water is an enclosed lagoon rather than open water, was rated as 'like a lot'.
- All photographs that were rated as 'nothing special' did not contain any identifiable water.
- The stromatolites were rated as 'like a lot', which may indicate their unusualness, their scientific interest, or their beauty.
- The cliffs of Cape Peron, the sunset scene and the coastal scene near Crayfish Bay were predictably rated as 'like a lot'.
- The scene of Shell Beach was also rated as 'liked a lot'. It would seem that the extraction shed was probably not identified by most respondents. Other research indicates that if it was identified, then the scene would have rated lower.

Conclusions

The results were interesting in a number of respects. People indicated that the features that they enjoyed the most were the most important significant features of Shark Bay, which would indicate a low recognition of important natural values. This correlates with three other findings: that very few conservation features were mentioned as being important, that the beauty of the area was listed as being extremely important and that the 'other features' people wanted to see can be more closely linked with experience and aesthetics than natural values. People seemed resistant to listing places as important, enjoyable or beautiful unless they had first hand experience of those places. This is highlighted by the number of additional places listed in the 'other features people wanted to see' responses.

The finding that the most beautiful places were natural and the least beautiful were human-modified is consistent with other research, as is the fact that water

and the coast are relatively consistent attributes of beautiful places. The naturalness variable may correlate with the most common comment for future management in the 1993 survey when people said 'leave it as it is'. This comment was reinforced in this survey when people expressed a desire for a low level of development. The desirable length of stay (of 1 week) was consistent with the 1993 survey. Overall, the results of this simple survey are consistent with similar research conducted in other places (see the bibliography).

2.4.3 1993 VISITOR SURVEY

A visitor survey undertaken between June-November 1993(Shark Bay World Heritage Area User Survey) has a number of interesting results that are relevant to this study. These are summarised as follows.

- Residents engaged in a lot of 4WDing and picnicking compared to visitors who did more dolphin viewing, photography and sightseeing.
- Residents undertook a lot more water-based activities then visitors (eg. swimming, fishing, powerboating).
- A high proportion of first time visitors visited the obvious, signposted destinations.
- There was a strong emphasis on sightseeing as an activity by visitors.
- Approximately half the visitors travel to the area by 4WD, with a lesser number by car/van, and a much low number by aircraft.
- 5 days was the average stay.
- Most visitors would visit again, with the main reason being to see more places.
- The undeveloped and unspoiled natural environment were considered to be very important by visitors.
- All the special features listed by visitors were natural features, except fishing.
- Ephemeral features were included in special features, particularly wildflowers and fauna.
- The most common comment (by far) directed at future management was to 'leave it as it is'.
- More people indicated a desire for improvement in walking tracks than an upgrade of roads.
- Sightseeing 'hot spots' were South Passage, the Steep Point area, Monkey Mia, the coast north of Monkey Mia, Denham, the coast between Denham and Big Lagoon, Useless Loop and Crayfish Bay (see Appendix 6).
- Many of these survey respondents were bused/on coach tours.
- Line fishing 'hot spots' were South Passage, the Steep Point area, the northern ends of Bernier and Dorre Islands, Big Lagoon entrance and Guichenault Point, and the Bellefin and Heiresson Prongs (see Appendix 6).

2.5 ASSESSMENT OF SIGNIFICANCE

The assessment of landscape and aesthetic values is a complex area of study. One of the most difficult components of the assessment involves identifying characteristics that have the most value, that contribute most to people's experience and enjoyment. This is termed the assessment of significance. Whereas landscape character study is based on the premise that all places offer an experience (and consequently have value) and are relatively free from value judgements, assessment of significance endeavors to identify the degree of value.

As highlighted in the introduction, while aesthetic significance was the primary focus of this study given the requirement to address management of values associated with criterion (iii) *('unique, rare or superlative natural phenomena, formations or features of exceptional natural beauty')*, the assessment includes a range of other values that reflect the complexity of human-environment interaction, that play an important role in the development of aesthetic values. There are also important similarities in the management approaches to these values, which suggests benefits in adopting an integrated approach in this study.

The values that form the focus for the assessment of significance in this study have been categorised by others for a range of assessment, management and legislative requirements. There is a degree of commonality in these categorisations and these common categories are listed in Figure 4 as sub-themes, together with the sources of data.

		Data									
		Lists								Assessment	
		World Heritage List	Register of National Estate	Register of Heritage Places	Municipal Inventory	Classification List	Register of Aboriginal Sites	Maritime Archaeology Database	CALM	CALM	Other
	Source	UNESCO WH Committee (Nomination doc.)	AHC	Heritage Council	Heritage Council, LGA	National Trust	AAD	WA Maritime Museum	Various informal, in documents		
Significance Sub-theme	Natural	T	T						T	NA	
	Natural Aesthetic	T	Nil							Visual – M,T	
	Cultural – Historic			T	T	T			T	NA	
	Cultural – Social (Non Aboriginal)								T, M	Social – T, M Recreation – T, M	
	Aboriginal						T, M			NA	
	Maritime (Historic)			T	T			T		NA	

T=Text
M=Map
NA=Not Applicable

Figure 4 - Significance sub-themes and sources of data

These sub-themes of significance are discussed in the following sections.

2.5.1 NATURAL (SCIENTIFIC) SIGNIFICANCE

This study assumes that an understanding of natural, scientific significance will affect people's aesthetic values (it can also be argued that aesthetic value exists *within* the science of natural features and systems). The stromatolites are a good example of a feature that has visual aesthetic value (they are visually distinctive and people indicated they 'liked them a lot' in the perception testing) and scientific aesthetic value (knowledge of their role in natural processes enhances people's experience, or their *science* alone may be considered to be of high aesthetic value).

Natural (Scientific) Significance was derived from existing lists, including the World Heritage List, the Register of National Estate, and informal listings in various reports. Of the other formal lists there are no places of natural heritage value.

The World Heritage List nomination document (DASETT 1990) lists many significant natural features (see Appendix 7), of which the following 7 are the most visually evident and spatially distinct:

- Faure sill.
- Fragum eragatum shell deposits.
- Seagrass meadows.
- Wooramel seagrass bank.
- Botanical province transition zone, most pronounced in the southern parts of Nanga and Tamala Stations.
- Isolation of fauna habitats on islands and peninsulas – 5 threatened mammals on Bernier and Dorre Islands.
- Stromatolites and microbial mats of Hamelin Pool.

The Register of National Estate lists 9 places for natural values, which in total cover all of the Shark Bay WHP except the outer marine area and the Zuytdorp Nature Reserve and proposed extension. The entire Shark Bay WHP has been placed on the Interim List of the National Estate to allow the Register to reflect the WH listing. As the AHC notes explain, although some places may be legally registered because they are within a larger registered area they may not necessarily posses intrinsic significance. For this reason consideration of natural significance in this study is based on WH values.

Various reports (see bibliography) discuss a wide range of natural values. For the purposes of this it is assumed that, of the values discussed in these reports, the significant values are covered by the World Heritage Listing.

Natural, scientific significance as defined above has been mapped (see Maps 6-10).

2.5.2 NATURAL AESTHETIC SIGNIFICANCE

Natural aesthetic significance was derived from the World Heritage List, assessment as part of this study, and informal listings in various reports. For the

purposes of this it is assumed that the values listed informally in reports will be covered by the WH list and the assessment within this study.

The World Heritage List nomination document (DASETT 1990) lists 10 features under Criterion (iii), 4 of which appear to be listed as natural phenomena or formations, and 6 as aesthetic features, of which 2 are not spatially distinct.

Natural phenomena or formations

- Stromatolites.
- Hypersaline environment of Hamelin Pool.
- Faure sill.
- Wooramel seagrass bank.

Aesthetic features

- Coastal scenery of Zuytdorp Cliffs, Dirk Hartog Island, Peron Peninsula and Heirisson and Bellefin Prongs.
- Shell beaches of Lharidon Bight.
- Inundated birridas and lagoons such as Big Lagoon.
- Strongly contrasting colours of the dunes/cliffs.
- Beaches and adjacent sea of Peron Peninsula.

Aesthetic features not spatially distinct

- Abundance of marine fauna (dugongs, dolphins, sharks, rays, turtles and fish).
- Annual wildflower season display.

The later two groupings can be described as the World Heritage aesthetic values (ie. those specific values that formed the basis for World Heritage inscription). These World Heritage aesthetic values have been mapped (see Map 6).

In addition to this list, a systematic and comprehensive assessment of visual aesthetic values was undertaken as a major component of this study. The purpose of this assessment was to provide further detail of the World Heritage aesthetic values as well as identifying other aesthetic values across the World Heritage Property. Section 2.4.1 lists a number of assumptions derived from perception research, which form the basis for detailed assessment criteria. The assessment criteria used to identify natural aesthetic significance in this study are listed below according to the main bio-physical components:

Vegetation	-	Diversity - obvious transitions between contrasting structures or species (eg. small areas of mangroves), riparian
	-	Features - species or specimens of impressive size, colour (eg. samphire) or form (eg. 'gigantism')
Landform	-	High points and prominent ridge crests
	-	Steep slopes (> 10 percent)
	-	Pronounced gullies

	-	Features - very flat plains or plateaux, rock outcrops, cliffs (>20metres), distinctively coloured rock or soils, caves and distinctive dune formations and bare dunes (large (>1km2?))
Water	-	Major permanent or rocky, semi-permanent water features, rivers, estuaries, lagoons, waterfalls, water-formed features
Coast	-	Indented shoreline, coves, short beaches with rock ends or headlands, spits
	-	Gently curved shoreline with steep natural slopes as backdrop or very wide tidal zone
Special Features	-	Wildlife sightings

Areas identified using these criteria have been mapped (see Map 6, p66). The assessment was restricted to current aerial photography coverage (see Appendix 8). Summary comments are provided below.

- There was a low occurrence of significant features in hinterland areas. Notable exceptions were:
  - the pronounced parabolic (Edel Land) and reticulate dunes (Zuytdorp NR),
  - the desert dunes (Edel Land, Dirk Hartog, Bernier and Dorre Islands),
  - the steep slopes of the parabolic dunes (Edel Land and Woomerangee Hill area),
  - the lagoons (north Peron (Big and Little and Guichenault Point), Brown Inlet, Boorabuggatta), and
  - the distinctive vegetation (central Nanga).
- There was a high occurrence of significant features in coastal areas. Of particular note are:
  - the ocean facing cliffs (on most of Edel Land, Dirk Hartog, and Bernier and Dorre Islands).,
  - the bay facing cliffs (north Peron and central Peron (Eagle Bluff area)),
  - the concentrations of small bays, beaches and headlands on the prongs,
  - the pronounced capes, points and spits,
  - the mangroves of Peron (at the lagoons, including the small lagoons of Guichenault Point), Faure Island, and the Wooramel coast,
  - the coquinite beaches of L'Haridon bight,
  - the stromatolites of Hamelin Pool,
  - the long, curving beaches of Peron south and Freycinet Estuary,
  - the dark red sands of Peron north,
  - the lagoons, narrow inlets and sills, and
  - Crayfish Bay and False Entrance.

2.5.3 SOCIAL SIGNIFICANCE

Social significance is based on the associations between community and place and recognises those places that hold the most value. The assessment of social significance in this study was confined to the identification of places which met the following criterion:

- Places that are a recognised recreation site (based on CALM inventory).
- Places listed frequently by respondents in the visitor survey and for reasons other than visual attractiveness or interest.
- Places that demonstrate an obvious association between community and place.

These have been mapped (see Maps 6-10).

Aboriginal values have been discussed in a separate section of the report (Section 2.5.5).

Significance in this study means simply that values exist - no comparative analysis has been undertaken to weight the significance. Some of the recreation sites are supported by Sensitivity Level assessment (see later in this report). The assessment of social significance would benefit from further work based on community participation and more detailed assessment may need to be undertaken if the listed significance will be affected by management decisions.

Recognised recreation sites were as follows:

Peron north - Cape Peron (3 sites), Bottle Bay, Gregories (2 sites), Cattle Well, Herald Bight, Guichenault, Herald Bluff, Cape Lesueur, Big Lagoon, Red Cliff, Little Lagoon, Peron Station homestead, Monkey Mia, Denham.

Peron south - Eagle Bluff, Goulet Bluff, Nanga, Stromatolites, Hamelin Pool Telegraph Station.

Carrarang - Caves Beach, North Bartholemew, Bartholemew Bay, Brown Inlet Ledge, Carrarang Homestead, Kangaroo Campsite, Boat Haven Outcrop, The Point, Kangaroo Island, Sand Spit, North East Landing, Clives, Small East Landing, Large East Landing.

Tamala - Turtle Ledge, Tea Tree West, Boorabuggatta Creek Mouth, Giraud Point, Spit Beach, Double Beach, Nanna's Beach, Shell Beach, Three Bays North, Three Bays, Keeny Campsite, North Keeny Campsite, Tent Landing, Snapper Rocks, Snapper Bay, Baba Head, Camp Seven, The Huts, Picket Beach, Tamala Homestead.

Edel Land - Crayfish Bay and False Entrance, Steep Point, bay side locations along South Passage.

Carnarvon

Coast - Gladstone

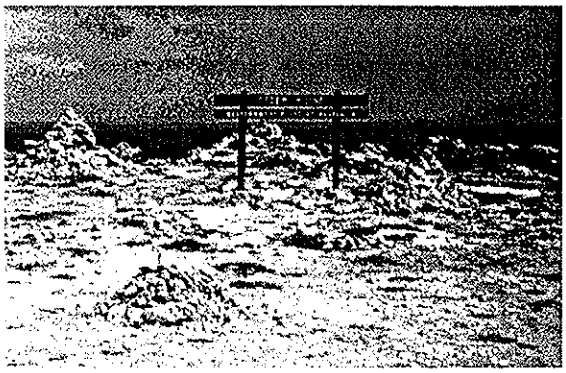
Places listed frequently by respondents in the visitor survey and for reasons rather than visual attractiveness or interest were as follows:

- Monkey Mia (including the dolphins)

- Cape Peron North
- False Entrance
- Beach (generic, not spatially distinct)

Places that demonstrate an obvious and strong association between community and place (not including the above) were as follows:

- Steep Point



Steep Point - the western-most point of the Australian mainland. Social significance is evident by the numerous cairns built by visitors to the site.

2.5.4 HISTORIC SIGNIFICANCE

Historic significance was identified using lists sourced from the Shire of Shark Bay, the Heritage Council of WA, and the National Trust. Historic significance was not listed in any of the other lists (see Figure 4).

The Shire of Shark Bay Municipal Inventory lists 39 places, 16 of which are in, or close to, the town of Denham (including the jetty and cemetery). The remaining 23 are as follows:

Place	Location
Carrarang Homestead.	Carrarang Peninsula.
Carrarang Lifeboat.	
Tamala Homestead, Outbuildings and Cottage.	Off Useless Loop Road.
Dirk Hartog Island Station (Buildings).	Dirk Hartog Island.
Cape Inscription Landing Site.	
Cape Inscription Lighthouse and Outbuildings.	
Peron No.1 Bore.	Francois Peron National Park.
Canning Factory Site (Herald Bight).	Francois Peron National Park.
Monkey Mia Grave Site.	Monkey Mia Reserve.
Point Petit Bore.	Point Petit.
L'Haridon Bight Shell Spits.	

Hamelin Station Homestead and Outbuildings.	Off Denham-Overlander Road.
40 Mile Water Shed.	
Denham- Hamelin Pool Telegraph Line.	
Wolgedda Pioneer Station (cottage).	Nanga Station.
Nanga No.1 Bore.	
Former Hamelin Pool Post and Telegraph Station, Flint Cliff Telegraph Station.	Hamelin Pool.
Former Post Master's Quarters.	
Grave of Thomas Carmody.	
Flagpole.	
Shell Quarry.	
Shipwrecks.	Shark Bay.
Pearl Camps.	

Some of these places are categorised to warrant further investigation for possible inclusion in the State Register of Historic Places. They are:

- Former Hamelin Pool Post and Telegraph Station, Flint Cliff Telegraph Station;
- Tamala Homestead, Outbuildings and Cottage;
- Cape Inscription Lighthouse and Outbuildings; and
- Cape Inscription Landing Site.

The Heritage Council of WA lists (not registered) another two places:

Place	**Location**
Peron Homestead.	Francois Peron National Park.
Gladstone Jetty.	Gladstone, Hamelin Pool.

The Heritage Council of WA also lists the Wolgedda Pioneer Station (cottage), the Denham buildings, and has a general listing for the Shark Bay area.

The National Trust has recorded the Wolgedda Pioneer Station (cottage) and classified the Cape Inscription Lighthouse Keepers' Quarters.

All these historic places have been mapped (see Map 6).

2.5.5 ABORIGINAL SIGNIFICANCE

Places of Aboriginal Significance were identified using the Register of Aboriginal Sites kept by the Aboriginal Affairs Department. The 149 sites registered do not necessarily represent a complete record. These sites are concentrated around the following locations:

- Monkey Mia;
- Peron Peninsula between Big Lagoon and Nanga;
- Cape Peron North;
- The northern end of Dirk Hartog Island;
- Heirisson Prong;
- Tamala/Nanga south;
- Bernier and Dorre Islands.

Most of these sites have artefacts and middens, with a small number listed as quarries and ethnographic sites.

The Aboriginal significance of Bernier and Dorre Islands (mainly relating to their use as 'hospitals' early this century) has also been recognised by the Register of National Estate.

These sites have not been mapped for this study.

2.5.6 MARITIME HERITAGE SIGNIFICANCE

The WA Maritime Museum's Shipwrecks database lists 58 maritime archeology sites in the Shark Bay area and a further 47 in the Abrolhos area (covers the Zuytdorp wreck). Not all of these wrecks have known locations and many are outside the World Heritage Property. Notable examples of maritime heritage include:

- Zuytdorp and Gudrun wrecks and Perseverant survivors' camp;
- Guano mining (Island Nature Reserves);
- Pearling camps (Denham, Monkey Mia, Useless Loop/Heirisson Prong).

These sites have not been mapped at this stage, pending further investigation.

2.6 COMMUNITY USE

The assessment of community use identifies and maps the location, type and degree of community use of the area. It includes spot (localised) use areas and access routes (air, ground, water), types of recreational and non-recreational (including industrial or residential) use, ground travel route physical characteristics (such as class, surface, markings and intended traffic type), and existing and expected volume of users. The assessment also includes the classification of use areas (sensitivity levels), distance zones from these areas, and combines these to form sensitivity zones. These components are detailed below.

2.6.1 CIRCULATION

The main movements of people in the Shark Bay area were identified, categorised as travel route or localised use movements.

Access routes

Access routes were identified by name, location, and travel mode (eg. pedestrian, 2WD or4WD vehicles, boats), and mapped (see Figure 5 below and Map 11). Physical characteristics were also identified for ground access routes, including:

- Class (eg. pedestrian path, single vehicle lane, double vehicle lane, dual carriage way);
- Surface (eg. paved, gravel, local soil);
- Markings(eg. lines, no lines);

Localised Use Areas

Localised use areas were identified by name and location (see Figure 5). Of these recreation and tourist nodes were mapped (see Map 6).

2.6.2 ACTIVITIES

The activities undertaken in use areas were listed (see Figure 5).

2.6.3 VOLUME OF USE

The volume of use was estimated for is estimated for some areas and is listed in Figure 5.

2.6.4 SENSITIVITY LEVELS

Sensitivity levels were assigned to use areas based on established criteria (see Appendix 9). These sensitivity level criteria are based on the volume of use and the type of use. High sensitivity level may be the result of either high volumes of use or high 'sensitivity' user types. There are four classification levels (1, 2, 3, 4) with Level 1 being the highest.

Sensitivity Levels for all the use areas identified are listed in Figure 5 and are shown on Map 11.

Name	**Type of Use** AR = Access Route R&T = Recreation and Tourism Node Res = Residential R = Rural I = Industrial	**Location** (See Numbers on Map)	**Travel Mode** 2 =2WD 4 = WD P = Pedestrian B = Boat A = Air	**Ground Access Route Characteristics** P = Pedestrian V = Single Vehicle VV = Double Vehicle V-V = Dual Carriageway B = Bituminous Pavement G = Gravel S = Local Soil L = Line Marking	**Recreation Activities** D = Day Use C = Camping B = Boat Launch F = Fishing W = Water Sports ST = Sightseeing/Travel 4 = 4WDing I = Interpretation	**Volume of Users**	**Sensitivity Level**
NW Highway	AR		2	VV, B, L	ST		1
NW Highway – Denham	AR		2	VV, B, L	ST		1
Denham – Monkey Mia	AR		2	VV, B, L	ST		1
Denham – Peron Station	AR		2/4	VV, B, S	ST		2
Useless Loop Road	AR		2	VV, G	ST		2
Steep Point Road	AR		4	V, S	ST		2
Road to Hamelin Telegraph Station/ Stromatolites	AR		2	VV, B	ST		2
Francois Peron NP 4WD tracks	AR		4	V, S	ST, 4	2000	3
Peron south 4WD tracks to recreation sites	AR		4	V, S	ST, 4		3

Edel Land 4WD tracks to recreation sites	AR		4	V, S	ST, 4		3
Prongs 4WD tracks to recreation sites	AR		4	V, S	ST, 4		3
Dirk Hartog 4WD tracks to recreation sites	AR		4	V, S	ST, 4		3
Other 4WD tracks	AR		4	V, S	ST, 4		4
Carnarvon – Bernier/Dorre	AR		B		ST, F		2
Monkey Mia – L'Haridon Bight	AR		B		ST, F		2
Monkey Mia – Disappointment Reach	AR		B		ST, F		2
Monkey Mia – Cape Peron North	AR		B		ST, F		2
Denham – Cape Lesueur - Cape Peron North	AR		B		ST, F		2
Denham – South Passage	AR		B		ST, F		2
Denham – Useless Loop	AR		B		ST, F		2
Nanga – Henri Freycinet	AR		B		ST, F		2
Monkey Mia – Point Petit	AR		B		ST, F		3
Useless Inlet	AR		B		ST, F		3
Denham – Cape Inscription	AR		B		ST, F		3
Denham – Dirk Hartog	AR		B		ST, F		

Perth/Shark Bay/Exmouth air route	AR		A		ST		1
Shark Bay scenic flight route	AR		A		ST		1
Denham	R&T, Res, I		2, B, A	VV, B, L	D, C, B, F, W, ST		1
Monkey Mia	R&T		2, B, A	VV, B, L	D, C, B, W,ST	100,000	1
Useless Loop	I, Res		2, B, A	VV, G	ST, B, F		2
Tamala and Carrarang Stations recreation sites	R, Res		2	V, G	ST, C		3
Peron Station homestead	R&T		2/4	VV, S	ST, I	22,000	
Nanga Station Resort	R&T		2	VV, B	D, C, B, F, W, ST		1
Hamelin Telegraph Station	R&T		2	VV, B	D, C, ST		1
Stromatolites	R&T		2	VV, G	D, ST, I	59,000	1
Shell Beach	R&T, I		2	VV, G	D, ST, I	135,000	1
Gladstone	R&T		2	VV, G	D, ST, I		2
Steep Point	R&T		4	V, S	D, C, F, ST, 4		2
Francois Peron NP coastal recreation sites	R&T		4	V, S	D, C, B, F, ST, 4, T		2
Eagle Bluff – Goulet Bluff recreation sites	R&T		2	VV, G	D, B, ST, T		
Peron south recreation sites	R&T		4	V, S	B, F, ST, 4		3
Edel Land recreation sites	R&T		4	V, S	B, F, ST, 4		3

Tamala and Carrarang recreation sites	R&T		2/4	V, S	B, F, ST, 4		3
Dirk Hartog recreation sites	R&T		4	V,S	B, F, ST, 4		3

Figure 5 - Community use inventory

Francois Peron recreation sites include:

- Cape Peron (3 sites), Bottle Bay, Gregories (2 sites), Cattle Well, Herald Bight, Guichenault, Herald Bluff, Cape Lesueur, Big Lagoon, Red Cliff.

Carrarang recreation sites include:

- Caves Beach, North Bartholemew, Bartholemew Bay, Brown Inlet Ledge, Carrarang Homestead, Kangaroo Campsite, Boat Haven Outcrop, The Point, Kangaroo Island, Sand Spit, North East Landing, Clives, Small East Landing, Large East Landing.

Tamala recreation sites include:

- Turtle Ledge, Tea Tree West, Boorabuggatta Creek Mouth, Giraud Point, Spit Beach, Double Beach, Nanna's Beach, Shell Beach, Three Bays North, Three Bays, Keeny Campsite, North Keeny Campsite, Tent Landing, Snapper Rocks, Snapper Bay, Baba Head, Camp Seven, The Huts, Picket Beach.

Edel Land recreation sites include:

- Crayfish Bay and False Entrance, bay side locations (not specified).

2.6.5 DISTANCE ZONES

Distance zones were identified and mapped based on three categories of distance from travel routes and other use areas (see Map 11). The distance zones used were:

- foreground (fg) (0-300m);
- middleground (mg) (300m-3km);
- background (bg) (3-9km).

Distance zones provide an indication of an area's spatial relationship to community use.

2.6.6 SENSITIVITY ZONES

Sensitivity Zones were determined by combining distance zones with use area sensitivity level. The rules of combination for A and B zone are indicated in the matrix below in Figure 6. All other areas are classed as C zone.

Use Area Sensitivity Level	Distance Zone		
	Fg	Mg	Bg
1	A	A	B
2	A	B	
3	B		
4			

Figure 6 - Sensitivity Zones - Rules of combination

Public sensitivity zones give a measure of an area's relevance to community use (regardless of visibility). These zones have been mapped (see Map 11).

2.7 SENSORY CHARACTERISTICS

People receive environmental information in a number of ways, the most important way for most people being sight. Consequently, this part of the study focusses on view characteristics. It is recognised that other sensory characteristics play an important role in some areas and for some people. For example, the experience of people at the Zuytdorp Cliffs is influenced by the feeling of wind and the sound of waves crashing at the foot of the cliffs. Sensory characteristics other than sight/views were not assessed but have been noted where relevant.

Sections 2.7.1 and 2.7.2 following describe the view assessment process. Assessment was undertaken for:

- the Denham-Hamelin Road from the NW Highway to Denham;
- the Denham-Monkey Mia Road from Denham to Monkey Mia;
- The Peron Homestead Road;

- The Useless Loop Road and Steep Point Road from the Denham-Hamelin Road to Steep Point.

Section 2.7.3 is a summary description of the assessment of the first three road sections.

2.7.1 General View Experience

The assessment of views included mapping of a number of variables relating to side views. These variables were considered to provide a good indication of the ability of people to read (see and identify) areas adjacent to the travel routes as well as providing information on the nature of the immediate road environment. The field survey identified data for the following variables:

- Position - distance along the access route;
- Side filtering - blocked, heavy filtered, light filtered, open;
- Side view distance - immediate foreground (0-50m), foreground (50-300m), middleground (300m-3km), background (3-9km).

2.7.2 Key Views

In addition to the mapping of side views as described above, the assessment of views also included an assessment to determine the most important views in the region. The variables and alternatives recorded and mapped for general views were:

- position - distance along the access route;
- angle of view - degrees;
- direction of view - to the nearest 22.5 degrees;
- distance seen - foreground (0-300m), middleground (300m-3km), background (>3km);
- filtering - percentage of total panorama;
- viewer position - superior, normal, inferior;
- subject - landmark, focus, other.

Given that the assessment aim was to identify views of greatest importance (key views), the criteria for the latter were used in the field to ensure that the survey work was focussed on the target category. The criteria for key views were:

- Where both middleground and background distances are seen -
  - view contains at least 90 degrees, with the angle encompassing the direction of travel; or
  - view is at least 30 degree angle of view and contains a focal point, significant feature or landmark;
- Where both foreground and middleground distance are seen -
  - view contains at least 90 degree angle of view, with the angle encompassing the direction of travel and contains a focal point, significant feature or landmark.

2.7.3 VIEWS FROM KEY ROADS

A summary description of results from the assessment of the Denham-Hamelin Road, the Denham-Monkey Mia Road and the Peron Homestead Road are provided below by road sections. These results have also been mapped (see Map 12).

- North-West Highway to Hamelin Road - Lightly filtered views to the foreground with some background views, including one north to Hamelin Pool.
- Hamelin Road - Foreground views opening to middleground and background toward Hamelin, culminating in foreground views west of the settlement and background to the east.
- Hamelin Road to Useless Loop Road - Background views north over saline flats and mainly foreground views south towards the taller vegetation. Views are generally open, except where lightly filtered.
- Useless Loop Road to Number 3 Bore – Mostly immediate foreground alternating with foreground views. Taller vegetation creates light to heavy filtering and some blocked views. Several filtered key views exist to Hamelin Pool.
- Number 3 Bore to Goulet Bluff – Almost all open views. Diversity of view distance from immediate foreground to background. Many middleground views, and background views to north-east including into L'Haridon Bight.
- Goulet Bluff to Denham – Diversity of open views, mainly from foreground to background. Stretch includes views west to the bay and east into the peninsular.
- Denham to Monkey Mia – Alternating open foreground and middleground views with one area of background views south across the peninsular and one north east across the bay from Monkey Mia.
- Peron Homestead Road – Background views west towards the bay with middleground views east, followed by immediate foreground views as vegetation becomes taller

2.8 LANDSCAPE CLASSES

To assist the interpretation and use of the assessment results, significance, public sensitivity, and key landscape character units/sub-units have been added to one map to form landscape classes (see Map 13).

The classes are:

- Significance
  - World Heritage
  - Not Well Represented
  - Well Represented
- Sensitivity Zones
  - 'A'

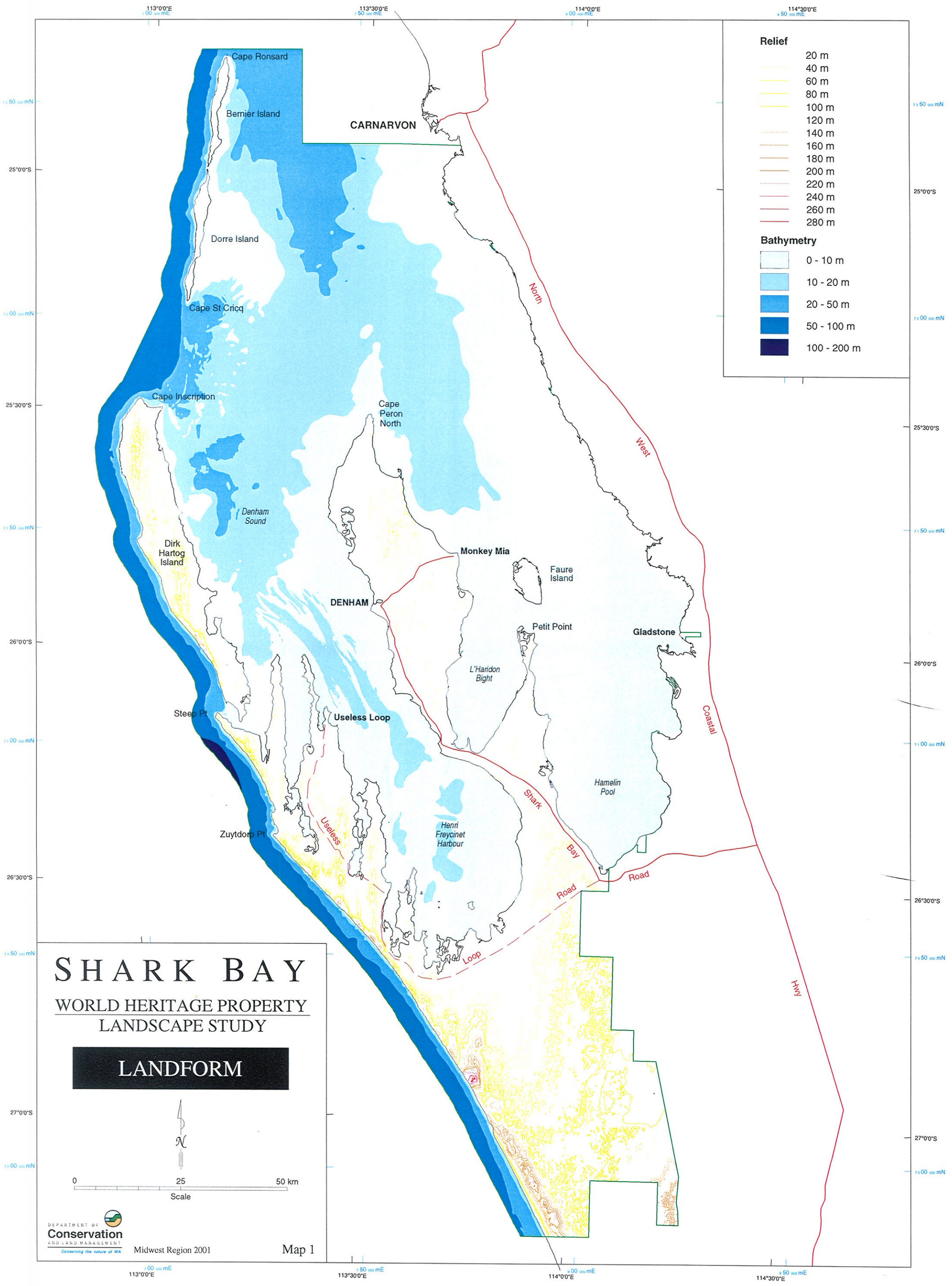
- 'B'
- 'C'

- Landscape Character Units/Sub-Units -
  - Sea Cliffs
  - Bay Cliffs
  - Gentle Transition
  - Flats
  - Parabolic Dunes
  - Reticulate Dunes
  - Desert
  - Tamala
  - Grasslands
  - Birrida

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

LANDFORM



SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

VEGETATION

Scale 0 25 50 km

Department of Conservation and Land Management — Conserving the nature of WA

Midwest Region 2001

Map 2

113°0'0"E (700 000 mE) · 113°30'0"E (750 000 mE) · 114°0'0"E (800 000 mE) · 114°30'0"E (850 000 mE)

25°0'0"S (7 250 000 mN) · 25°30'0"S (7 250 000 mN) · 26°0'0"S (7 200 000 mN) · 26°30'0"S (7 150 000 mN) · 27°0'0"S (7 100 000 mN)

Cape Ronsard
Bernier Island
Dorre Island
Cape St Cricq
Cape Inscription
Dirk Hartog Island
Denham Sound
Steep Pt
Zuytdorp Pt
Useless Loop
Cape Peron North
DENHAM
Monkey Mia
Faure Island
Petit Point
L'Haridon Bight
Henri Freycinet Harbour
CARNARVON
Gladstone
Hamelin Pool
North West Coastal Hwy
Shark Bay Road
Useless Loop Road

1	a8Sp/k1,2Ci	33	ace70b4xSc
2	a8,9Si/k1,2Ci	34	a1Lr a9Si
3	a9,16Li	35	cLr a9Si
4	a3Zi	36	ds
5	a11Si	37	e43,47Lr t9Hi
6	a8,9Si	38	e46Lr
7	a10,11Li	39	e6,22Mr a9,19Si
8	a22Sc	40	e6Li
9	a3Li/a8,10,16Si	41	e22,42Lr a9Si
10	a9,10Si	42	k3Ci
11	a9Si/a8,9,10Si	43	k2Ci/a8,10,11Sp
12	a3Li/a8,9Si	44	k1Ci
13	a8,11Si	45	m3Sc
14	a8,10,11Si/xZp	46	r
15	a9Si	47	sl
16	a|Sc	48	t9Hi
17	a22Si xZHi	49	xZi
18	a8,9,10Si	50	xZHc
19	a8, 10,11Si	51	xLSi
20	a8,9Si/a9gSi	52	xZc/aSp
21	a9,17Si	53	xSZc/aSi
22	a22Sr t9Hi	54	x1Zc
23	a8,17Si	55	x3SZc
24	a3,10Si	56	xZc
25	axSZc	57	x2SZc/aSp
26	amSi/k1Ci	58	xSZc/a23m3Sc
27	a8,10Si	59	xLSi/xSZc
28	a10,11Si	60	ceLr a9Si
29	a9,17Si/k1,2Ci	61	a11Si k1Ci
30	a23Sc	100	clay
31	a21SZi	101	mangrove
32	acSc	102	mud

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

SEAGRASS AND CORAL FEATURES

Cape Ronsard
Bernier Island
Dorre Island
Cape St Cricq
Cape Inscription
Cape Peron North
Denham Sound
Dirk Hartog Island
Steep Pt
Zuytdorp Pt
Useless Loop
DENHAM
Monkey Mia
Faure Island
Petit Point
L'Haridon Bight
Gladstone
Hamelin Pool
Henri Freycinet Harbour
CARNARVON
North West Coastal Hwy
Shark Bay Road
Useless Loop Road

Ephemeral Seagrass (sparse)
Perennial Seagrass (sparse)
Perennial Seagrass (meduim)
Perennial Seagrass (dense)
Sand
Location of Coral Features
World Heritage Boundary

Theme	Source	Date	Custodian
Seagrass	CALM (MCB)	2000	CALM
Coral Features	CALM (MCB)	2000	CALM
Hydro	DOLA	1995	DOLA

N

0 25 50 km
Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 3

113°0'0"E 700 000 mE
113°30'0"E 750 000 mE
114°0'0"E 800 000 mE
114°30'0"E 850 000 mE
25°0'0"S 7250 000 mN
25°30'0"S 7150 000 mN
26°0'0"S 7100 000 mN
26°30'0"S 7050 000 mN
27°0'0"S 7000 000 mN

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

LAND USE

Cape Ronsard
Bernier Island Nature Reserve
Dorre Island Nature Reserve
Cape St Cricq
Cape Inscription
DIRK HARTOG
Dirk Hartog Island
Denham Sound
Cape Peron North
Francois Peron National Park
Marine Reserve No 7 Shark Bay Marine Park
Monkey Mia
FAURE
Faure Island
DENHAM
Marine Reserve No 7 Shark Bay Marine Park
PERON
L'Haridon Bight
Steep Pt
Useless Loop
Shell Beach
Nanga
Zuytdorp Pt
Useless Loop Road
Henri Freycinet Harbour
CARRARANG
TAMALA
NANGA
Marine Reserve No.6 Hamelin Pool Marine Nature Reserve
Hamelin Pool
Shark Bay Road
Hamelin
HAMELIN
Zuytdorp Nature Reserve
MURCHISON
COBURN
CARNARVON
BOOLATHANA
BRICK HOUSE
MARDATHUNA
MOOKA
DOORAWARRAH
MEERAGOOLIA
CALLAGIDDY
ELLA VALLA
YALBALGO
EDAGGEE
MARRON
North West Coastal Hwy
WAHROONGA
WOORAMEL
MEEDO
YARINGA
Gladstone
CARBLA
WOODLEIGH

0 25 50 km
Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 4

- National Park
- Nature Reserve
- Marine Reserve
- Conservation Park
- Section 5 (g) Reserve
- UCL
- Salt Harvest
- Proposed National Park
- Proposed Nature Reserve
- World Heritage Boundary
- Pastoral Lease Boundary
- Tourism and Recreation Node
- Settlement

Theme	Source	Date	Custodian
Tenure	CALM	2000	CALM
Roading	DOLA	1998	DOLA
Hydro	DOLA	1995	DOLA
Pastoral Lease	WADA	1997	DOLA

113°0'0"E (700 000 mE) 113°30'0"E (750 000 mE) 114°0'0"E (800 000 mE) 114°30'0"E (850 000 mE)
25°0'0"S (7 250 000 mN) 25°30'0"S (7 150 000 mN) 26°0'0"S (7 100 000 mN) 26°30'0"S (7 050 000 mN) 27°0'0"S (7 000 000 mN)

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

CHARACTER UNITS

F Coastal flats sub unit
PD Parabolic dunes sub unit
RD Reticulate dunes sub unit
D Desert sub unit
Birrida sub unit
Ta Tamala sub unit
ES Edel Shrublands sub unit
PS Peron Shrublands sub unit
TH Tree - Heath sub unit
Gr Grasslands sub unit
St Settlement sub unit
Ex Extraction sub unit
0 - 10 m
10 - 20 m
20 - 50 m
50 - 100 m
100 - 200 m

Cape Ronsard
Bernier Island
Dorre Island
Cape St Cricq
CARNARVON
North
Cape Inscription
Denham Sound
Cape Peron North
Dirk Hartog Island
Monkey Mia
Faure Island
DENHAM
Petit Point
Gladstone
L'Haridon Bight
Steep Pt
Useless Loop
Hamelin Pool
Shark Bay Road
West Coast Hwy
Zuytdorp Pt
Henri Freycinet Harbour
Useless Loop Road

0 25 50 km
Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 5

SHARK BAY

WORLD HERITAGE PROPERTY
LANDSCAPE STUDY

LANDSCAPE SIGNIFICANCE

Social
Historic
Scientific

Aesthetic

Cliff
Ledged Cliff
Sloped Cliff
Bay
Beach
Beach
Lagoon
Spit
Headland
Desert
Prominent Dune System
Mangrove
Island
Steep Slope

World Heritage

Cape Ronsard
Bernier Island
Dorre Island
Cape St Cricq
CARNARVON
Cape Inscription
Cape Peron North
Denham Sound
Dirk Hartog Island
Monkey Mia
Faure Island
DENHAM
Petit Point
Gladstone
L'Haridon Bight
Steep Pt
Useless Loop
Hamelin Pool
Zuytdorp Pt
Henri Freycinet Harbour
North West Coastal Hwy
Useless Loop Road
Shark Bay Road

113°0'0"E 700 000 mE
113°30'0"E 750 000 mE
114°0'0"E 800 000 mE
114°30'0"E 850 000 mE
7 250 000 mN
25°0'0"S
7 200 000 mN
25°30'0"S
7 150 000 mN
26°0'0"S
7 100 000 mN
26°30'0"S
7 050 000 mN
27°0'0"S
7 000 000 mN

0 25 50 km
Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 6

113°30'0"E
7 50 000 mE

114°0'0"E
8 00 000 mE

25°30'0"S

7 1 50 000 mN

26°0'0"S

7 1 00 000 mN

Cape Peron North

Guichenault Point

Cape Lesueur

Denham Sound

Peron Homestead

Monkey Mia

Dubaut Point

DENHAM

Shark Bay Road

Eagle Bluff

Shell Beach

Nanga

Henri Freycinet Harbour

L'Haridon Bight

Faure Island

Petit Point

Hamelin Pool

LOCALITY

Map Area

LEGEND

- Social
- Historic
- Scientific

Aesthetic

- Cliff
- Ledged Cliff
- Sloped Cliff
- Bay
- Beach
- Beach
- Lagoon
- Spit
- Headland
- Desert
- Prominent Dune System
- Mangrove
- Island
- Steep Slope

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

LANDSCAPE SIGNIFICANCE

N

0 10 20 km

Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 7

112°30'0"E
650 000 mE

113°0'0"E
700 000 mE

113°30'0"E
750 000 mE

7250 000 mN

7200 000 mN

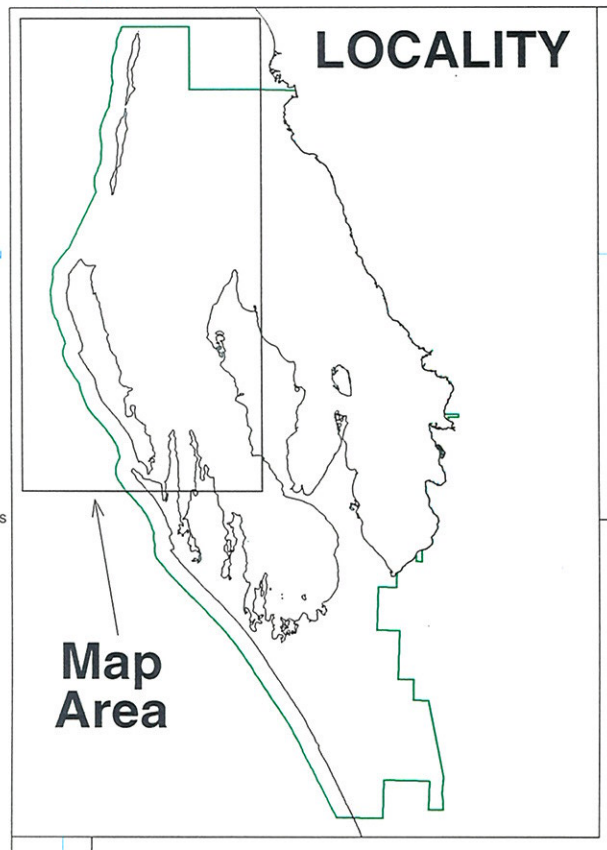
7150 000 mN

25°0'0"S

25°30'0"S

26°0'0"S

LOCALITY



Map Area

Cape Ronsard

Bernier Island

Dorre Island

Cape St Cricq

Cape Inscription

Cape Peron North

Denham Sound

Dirk Hartog Island

DENHAM

Steep Pt

Useless Loop

LEGEND

- Social
- Historic
- Scientific

Aesthetic

- Cliff
- Ledged Cliff
- Sloped Cliff
- Bay
- Beach
- Beach
- Lagoon
- Spit
- Headland
- Desert
- Prominent Dune System
- Mangrove
- Island
- Steep Slope

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

LANDSCAPE SIGNIFICANCE

N

0 15 30 km

Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 8

650 000 mE
112°30'0"E

700 000 mE
113°0'0"E

750 000 mE
113°30'0"E

113°30'0"E
750 000 mE

26°0'0"S

7100 000 mN

26°30'0"S

7050 000 mN

Dirk Hartog Island

Cape Bellefin

Cape Heirisson

Steep Pt

Useless Inlet

Useless Loop

Zuytdorp Pt

Useless

Loop

Road

Brown Inlet

Henri Freycinet Harbour

Depuch Loop

Salutation Island

LOCALITY

Map Area

LEGEND

- Social
- Historic
- Scientific

Aesthetic

- Cliff
- Ledged Cliff
- Sloped Cliff
- Bay
- Beach
- Beach
- Lagoon
- Spit
- Headland
- Desert
- Prominent Dune System
- Mangrove
- Island
- Steep Slope

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

LANDSCAPE SIGNIFICANCE

N

0 10 20 km

Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 9

750 000 mE
113°30'0"E

114°0'0"E
8 00 000 mE

26°30'0"S

7 0 50 000 mN

27°0'0"S

7 0 00 000 mN

Shark Bay

Hamelin Pool

Henri Freycinet Harbour

Hamelin

Road

Road

Loop

Useless Loop

LEGEND

- Social
- Historic
- Scientific

Aesthetic

- Cliff
- Ledged Cliff
- Sloped Cliff
- Bay
- Beach
- Beach
- Lagoon
- Spit
- Headland
- Desert
- Prominent Dune System
- Mangrove
- Island
- Steep Slope

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

LANDSCAPE SIGNIFICANCE

N

0 10 20 km

Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 10

LOCALITY

Map Area

114°0'0"E 8 00 000 mE

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

PUBLIC SENSITIVITY

0 25 50 km

Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 11

Cape Ronsard
Bernier Island
CARNARVON
Dorre Island
Cape St Cricq
Cape Inscription
Cape Peron North
Denham Sound
Dirk Hartog Island
Monkey Mia
Faure Island
DENHAM
Petit Point
Gladstone
L'Haridon Bight
Steep Pt
Useless Loop
Hamelin Pool
Zuytdorp Pt
Henri Freycinet Harbour
North West Coastal Highway
Useless Loop Road
Shark Bay Road

LEGEND

Travel Routes

- Level 1
- Level 2
- Level 3
- Boat Route - Level 1
- Boat Route - Level 2
- World Heritage Boundary

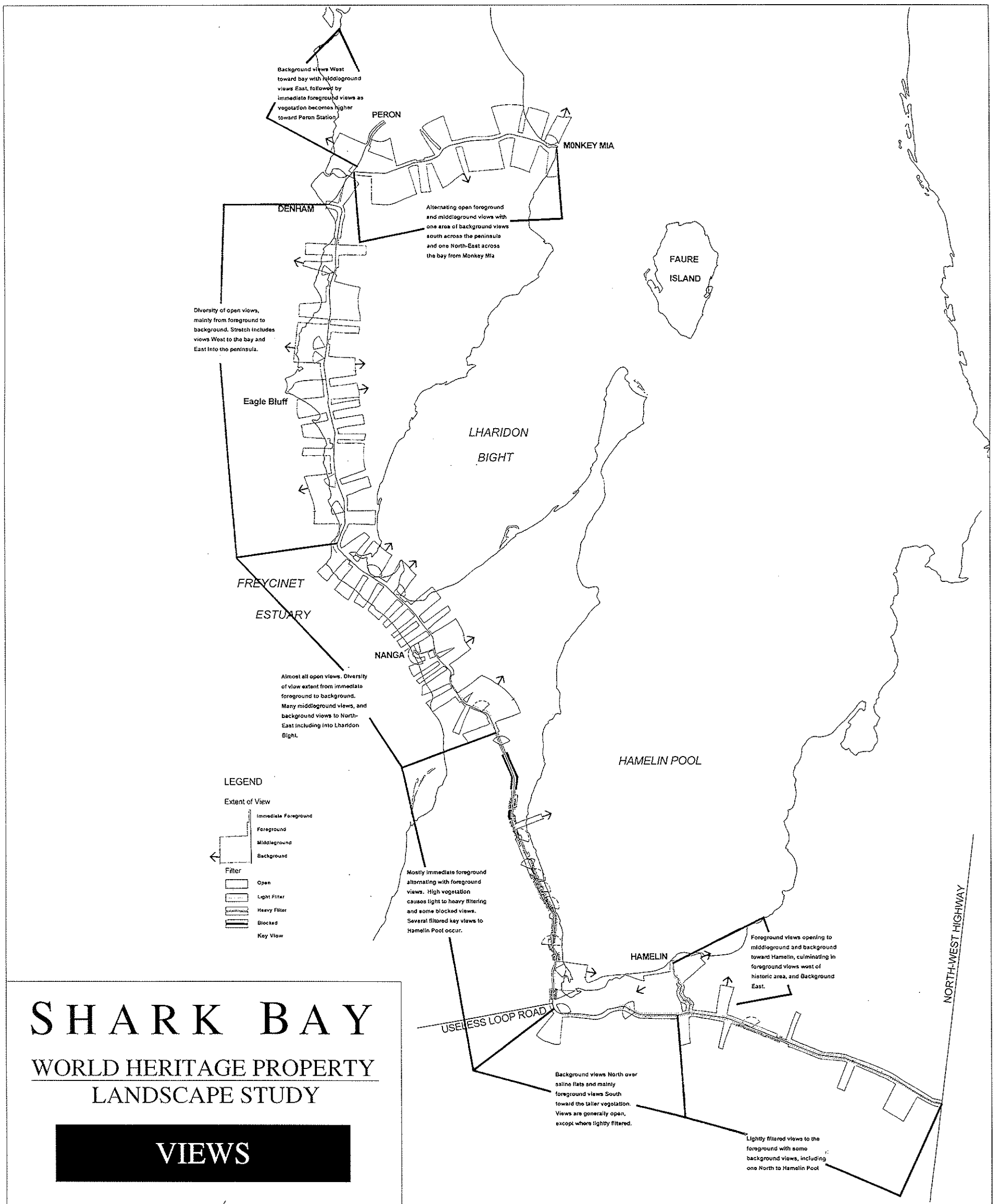
Public Sensitivity Zones

- A Zone
- B Zone
- C Zone

SHARK BAY

WORLD HERITAGE PROPERTY
LANDSCAPE STUDY

VIEWS



N

0 25 50 km

Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 12

SHARK BAY

WORLD HERITAGE PROPERTY LANDSCAPE STUDY

LANDSCAPE CLASSES

Cape Ronsard
Bernier Island
Dorre Island
Cape St Cricq
CARNARVON
Cape Inscription
Dirk Hartog Island
Denham Sound
Cape Peron North
DENHAM
Monkey Mia
Faure Island
Petit Point
L'Haridon Bight
Gladstone
Steep Pt
Useless Loop
Zuytdorp Pt
Henri Freycinet Harbour
Hamelin Pool
North West Coastal Hwy
Shark Bay Road
Useless Loop Road

Landscape Significance

- Social
- Historic
- Scientific

Aesthetic

- Cliff
- Ledged Cliff
- Sloped Cliff
- Bay
- Beach (B1)
- Beach (B2)
- Lagoon
- Spit
- Headland
- Desert
- Prominent Dune System
- Mangrove
- Island
- Steep Slope

Public Sensitivity Zones

- A Zone
- B Zone
- C Zone

113°0'0"E (700 000 mE) · 113°30'0"E (750 000 mE) · 114°0'0"E (800 000 mE) · 114°30'0"E (850 000 mE)

25°0'0"S (7 250 000 mN) · 25°30'0"S (7 250 000 mN) · 26°0'0"S (7 200 000 mN) · 26°30'0"S (7 150 000 mN) · 27°0'0"S (7 100 000 mN) · 27°30'0"S (7 050 000 mN)

0 25 50 km
Scale

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Midwest Region 2001

Map 13

PART THREE - LANDSCAPE MANAGEMENT PLAN

This part of the report deals with the management of landscape values given that there is a good knowledge base regarding values resulting from the assessment. The management context is discussed, including the main threats to values and management commitments. A strategy and objectives are outlined, management techniques are provided, and a number of recommendations are detailed. A procedure for planning and evaluating development proposals is also provided.

3.1 MANAGEMENT CONTEXT

3.1.1 BACKGROUND

There is considerable debate in literature regarding appropriate models for managing areas such as Shark Bay which consist of a range of land uses, including industrial, residential, rural and protected areas. One approach can be called the 'conservation' approach, which focuses on the physical resources and then determines ways of conserving them, protecting them from impacts, and providing for other 'secondary' uses. Another approach is the 'regional development' approach, which aims to improve the profile and prosperity of an area by identifying and developing assets. This approach tends to focus on various industries, infrastructure, marketing, and economic return. A component of this approach can be called the 'tourism' approach, which is a market-driven approach focused on understanding and satisfying customer demand for visiting areas, with success measured by numbers of customers, 'satisfaction', and expenditure. Another approach can be called the 'issue' approach, which uses the status quo as a base and deals with various issues as they arise.

The issues that often arise in the 'issue' approach highlight a major deficiency in these approaches if they are used in isolation: that conflicts often arise and remain unresolved between competing objectives. A good example of this conflict lies in the pressure on natural resources caused by increasing recreation and tourism use. There has been a trend in contemporary management of protected areas to embrace market-driven approaches. This has been partly due to changes in public sector management such as reduced budgets, greater financial accountability and greater customer focus. The 'tourism' approach, when applied to protected areas, neatly addresses many of these issues. This approach also recognises the dependency of 'nature-based tourism' (as it is often termed) on environmental features and often includes various guidelines to assist with protection of these features. Despite this, most tourism initiatives operate without the benefit of a broadscale 'stocktake' of environmental assets and tend to adopt an 'opportunistic' approach which, by inference, views the environment as a limitless resource to utilise. Without this knowledge of the resource, the 'product' if you like, it very difficult to judge whether this approach is satisfying conservation objectives. This lack of product knowledge will also make it difficult to tailor tourism ventures to capitalise on the 'sense of place' of an area, their environmental niche and subsequently their niche for promotion.

In addition, few tourism programs are actively involved in monitoring of environmental conditions. It is difficult to argue that recreation and tourism developments protect the environment when many, by necessity, introduce major

change to local environments, and often displace some features (which is true of most kinds of built development).

There are other conflicts as well. Tourism developments usually create a precedence in use that often dominates or dictates subsequent use of areas, often creating a degree of exclusivity. The focus is on quantity of uses rather than the range of uses. Many nature-based tourism ventures use quantity of customers and economic return as major determinants of core activities, and quality where it contributes to these. This highlights fundamental differences in the driving forces of tourism and conservation. Tourism success is predicated in the market principle of growth, while conservation is based on sustaining or restoring existing natural systems or features where 'growth' is hopefully relatively minor and 'natural'.

Given these difficulties, there are serious implications for land management agencies that attempt to balance nature-based tourism and conservation. In the case of the public sector, these agencies need to develop a business philosophy that addresses their community service obligations and determines an appropriate tourism role that conserves natural assets. Expressed in simple economic terms, if these agencies are to embrace the current trend to market principles, then they need to be clear about how they will deal with demand (be it create demand, satisfy demand or manage demand), recognise the potential conflicts that different approaches to dealing with demand may create, and determine the appropriate products to supply.

Two things should be apparent from this discussion: that management of the various competing demands in land use is highly complex; and, that, if a management approach is to have any chance of success, it should attempt to integrate these demands.

This part of the report discusses key components of management. *Environmental assets and landscape values* identified in the assessment are analysed and *conservation measures* are detailed that protect these assets while providing for *recreation and tourism* and *general development* of the region. In doing so, many *regional issues* are addressed and a *management model* is defined. (Further discussion of management approaches is provided under Landscape Management Strategy, Section 3.2.3)

3.1.2 REGIONAL ISSUES

A number of documents have highlighted regional management issues (see the Shark Bay Regional Strategy (1997) the Draft Terrestrial Reserves Management Plan (1998) and public submissions, and the WCMC Description (1998)). Key management issues for the Shark Bay WHP that form the context for this plan include:

- Increasing recreation and tourism use and consequent pressure on natural values;
- Providing for future development of the area while conserving the natural and cultural values;
- Detailed direction for management of existing values;
- Implications of the World Heritage status on use of the area;

- Management commitments for the World Heritage Property;
- The integration of decision-making levels;
- Responsibility for the provision of services, particularly tourism services;
- Choice of development nodes;
- The development of Denham as the major centre for the area and improving its facilities and attractions;
- Overall integration of planning for the WHP, including the integration of marine and terrestrial areas and pastoral leases;
- Depleted fishery;
- The development of mining and extraction industries and related facilities;
- Provision of security for conservation through estate management;
- Conflicts between uses and users;
- Pressure to expand Monkey Mia;
- Increasing pressure on Peron Peninsula for different uses and the impact on natural values of those uses; and
- The opportunity to develop attractions that are currently under-utilised.

There is much in common between the main themes of these issues (such as planning, decision-making, protecting natural assets, and development) and the focus of this study. These themes have been discussed in the preceding parts of this report, and this part provides recommended solutions based on an understanding of the natural and cultural assets, and the values the community places on those assets.

3.1.3 LOCAL CHANGES TO LANDSCAPE VALUES

Planning, by nature, deals with future events (although it should use wisdom gained from the past) and. in the case of land management, these events usually involve changes on the ground. The issues highlighted above have change as a common theme and management often focuses on change, either instigating, influencing, or preventing it.

Landscape values are complex, and changes to them can take many forms. The components that can be easily influenced by management can be categorised as physical changes, changes in use and changes in knowledge and understanding.

Physical changes to the environment can have a dramatic effect on landscape values. These physical changes are largely the result of land use activities or developments that include:

- pastoral and agricultural use;
- aquaculture;
- boat mooring, ramps;
- buildings, structures, fencing;
- communication towers;
- dams;

- fire;
- mining and extractive industries;
- recreation facilities;
- roads, paths, parking;
- services (electricity, gas, water, sewerage, telephone);
- signs;
- vegetation clearing;
- vegetation planting;
- weeds; and
- rubbish.

Changes in the use patterns of the community affects their interaction with the environment and consequently their landscape values. Changes in use includes changes to access and activities. Changes to sensory characteristics can also be included in this category. As highlighted in the survey, people generally place a higher value on places that they have personally visited. Regardless of whether these changes in use are community or management initiated, they need to be fully considered by managers, including their implications on landscape values.

Changes in community and visitor knowledge and understanding can also stem from many causes, but there is an important role for managers in this area, in terms of influencing values and behaviour. Changes in knowledge and understanding can be induced by access and activities, but are largely brought about by delivering or receiving messages in various forms. This is the focus of the information, promotion and interpretative activities of managers.

All these changes are the subject of further discussion later in this report where management objectives and techniques are detailed.

3.1.4 MANAGEMENT RESPONSIBILITIES AND COMMITMENTS

The will to protect landscape values has stemmed from a number of areas, including:

- management agencies and individuals recognising the long term benefits of good resource management;
- lobbying by interest groups to protect the resource and to have their sentiments included in the decision making process; and
- legislation, formal commitments and related legal cases requiring that landscape values be protected.

The World Heritage Convention requires that the State takes 'effective and active measures....for the protection, conservation and presentation' of the heritage. A number of measures are outlined, including: giving the heritage a function in the life of the community; integrating protection into planning programs; setting up a management service; developing studies and research to equip management; taking appropriate legal, scientific, technical, administrative and financial measures necessary for the identification, protection, conservation,

presentation and rehabilitation of heritage; fostering development of centres for training heritage management and encouraging research.

The convention also requires that the State undertakes not to take any deliberate measures which might directly or indirectly damage the heritage.

CALM has been nominated as the lead agency for management of the World Heritage Property and has specific management responsibilities for substantial areas of lands and waters within the World Heritage Property. In addition to the requirements outlined above, CALM operates under its own legislation and policies relating to land management. These require CALM to 'conserve WA's wildlife and manage lands and waters entrusted to the department for present and future generations' and 'fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna, and the preservation of any feature of archaeological, historic or scientific interest'.

The CALM Act also requires the department to prepare management plans for areas under its management. There is also a large number of CALM policies that are relevant to the Shark Bay World Heritage Property, the most relevant to this study being Policy 34 (*Visual Resource Management on Lands and Waters Managed by CALM, 1989*) which relates to the identification and management of landscape values.

All other State and Local Government agencies and landholders share management responsibilities for the protection of World Heritage values.

3.2 LANDSCAPE PLANNING

3.2.1 USING THE ASSESSMENT RESULTS

The assessment results can be described as a *stocktake of environmental and landscape assets*. Like a business, there is some satisfaction in knowing what we have, but the real benefit of a stocktake is in monitoring how we are going as managers and facilitating planning for future development or change. The application of the main components of the assessment to planning and management is summarised below and is discussed further in the sections that follow. One of the applications of the results that is not specifically listed below is the analysis of themes (including intersecting themes) which is described in 3.2.2.

Landscape Character

Landscape character identification and classification is a process for 'getting a handle' on a vast and complex array of landscape characteristics. Although one of the most understood and universally applied assessment procedures, landscape character description and classification is often lost in the formulation of management approaches. The outcomes of this process have many uses and these are listed below. They:

- provide an inventory or 'stocktake' of assets;
- introduce people to the landscapes of the area and, through knowledge and understanding, add appreciation and value;
- highlight the characteristics most pertinent to human experience;
- by identifying areas with common patterns of characteristics, allow us to come to terms with large areas of infinite variety;
- provide an indication of the range and extent of different character types and consequent experiences;
- highlight the 'identity' of the whole region and areas within the region;
- identify the spatial relationship between different character types;
- provide the basis for identifying the most distinctive or significant features;
- broadly indicate appropriate land use;
- provide important clues for sensitive, 'best practice' development;
- provide the basis for management standards;
- help predict the ability of areas to visually absorb change;
- allows us to plan community use of areas to capitalise on the experiences offered.

Community Perceptions and Values

Landscapes and landscape values are essentially a human construct. It is vital that research is undertaken to better understand how people interact with, and perceive places, and the values they attach to those places. This research is the heart of landscape management work, and the results form the basis, and allow

us to develop criteria and assumptions, for other assessment components and management of community use, including:

- highlighting environmental characteristics important to human experience and providing a basis for defining landscape character;
- enhancing the experience gained through human use by identifying key features that can be utilised ;
- protecting the experience gained through human use by identifying negative impacts;
- determining the most significant characteristics;
- providing an understanding of how values change with user groups;
- providing an indication of the degree of value people place on features and consequently appropriate levels of protection.

Significance

The assessment of significance allows us to:

- highlight those places or features that have the most influence or value in human experience;
- prepare plans to conserve identified features;
- plan community use of an area to include features that will enhance experience;
- exclude features that will not withstand use and need to be protected;
- meet management commitments to protect the 'best of';
- more generally set priorities for protection and use.

Community Use

An understanding of community use allows us to:

- identify which landscape character types or significant features are being utilised;
- determine value based on the level of use;
- set management standards based on the level of use;
- identify the range, extent, and spatial arrangement of access types and activities;
- highlight the deficiencies or opportunities in access types and activities;
- plan use that recognises the impact of other uses;
- develop zones based on the level of use;
- plan information and interpretative activities that will enhance values and influence behaviour;
- plan for new community use based on existing access characteristics, activities, character types, significant features and sensory factors.

Sensory Characteristics

The assessment of sensory characteristics allows us to:

- identify the methods by which people receive environmental information;
- highlight the most important receiving methods for different areas and identify these as part of the 'sense of place' of those areas;
- identify impacts.

Information on views is intended to be used at a local level by planners to:

- manage the composition of roadside vegetation and the views that it provides;
- provide the basis for identifying and managing 'lookouts' or scenic views;
- gauge the likely visibility of roadside development; and
- provide the basis for seen area mapping when detailed impact assessment is required for developments.

Landscape Classes

Landscape classes are a way of simplifying a complex array of landscape values into areas for which management standards and guidelines can be provided. They allow us to see (on a map) at a glance, the most important values, or values that are most easily spatially defined.

3.2.2 ANALYSING THE ASSESSMENT RESULTS

Landscape Character

Most character sub-units are well represented in protected areas. Less represented are the coastal sub-units and of these, the bay cliffs sub-unit is the least represented. This appears to be the most used area for the more spectacular 'bay' views. All the coastal sub-units are narrow (by definition), attract a high proportion of the use in the region, and are highly visible.

The terrestrial sub-units are generally represented in both pastoral lease and protected areas. The reticulate dunes sub-unit has only a minor portion of its area protected. A long length of the sea cliffs sub-unit is also outside existing or proposed protected area.

All marine sub units are well represented, including within the Marine Nature Reserve or Marine Park.

Community use extends across many of the sub-units. Much of this use is access route use only. The highest use areas are the gentle transition sub-unit and the cliff sub-units, both bay and sea. Sub-units that receive little or no use are the tree heath, reticulate dune and Tamala sub-units.

Significance

There is a high occurrence of significant features in the study area, with most of the visual aesthetic features lying within the coastal unit. There are some areas of visual aesthetic significance in the hinterland, associated with vegetation diversity, steep slopes and high points. A number of historic features, such as the homesteads, also lie in the hinterland.

Most areas of World Heritage aesthetic value lie within protected areas. The notable exceptions are the Heirisson/Useless Loop Prong and the long length of Zuytdorp Cliffs, south of Zuytdorp Point. There is a variety of other aesthetic features both within and outside protected areas. The mangrove banks of the Wooramel coast and Faure Island are not well represented within protected areas.

Access to significant feature varies across the study area, with use tending to be polarised between no access at all and good access with use spreading into adjoining significant features.

3.2.3 LANDSCAPE MANAGEMENT STRATEGY

The Shark Bay region has a vast array of aesthetic values, which have been recognised at the highest level by World Heritage inscription. There are various legislative and policy commitments directed at the management of aesthetic values and there is a clear mandate for their protection of these values. Protection will be largely achieved through the management of development. The measures for protection are outlined in the following sections according to area, value and techniques. Underlying these measures are a number of assumptions and principles, some of which are listed below.

The management provisions can be classed as four different treatments of landscape values: enhancement; protection; impact minimisation and rehabilitation. While these levels are not specifically discussed in the management objectives and standards, they are a useful way of describing treatments in specific cases.

There is a general assumption that management can most influence landscape values through physical changes to the environment, changes in community use and changes in the community's knowledge and understanding of places. Changes in community use are the focus of land use planning and recreation planning (see Section 3.3) and changes in the community's knowledge and understanding of places are the focus of promotion and interpretation planning. Landscape management focuses on physical changes to the environment. All three areas of work need to be integrated to achieve community and management aims.

Landscape management can influence physical changes to the environment in three main ways:

1. by providing a high level of protection for significant features (regardless of their location);
2. by controlling environmental change adjacent to use areas according to the nature of the use and the distance of the change from use areas;
3. by encouraging the use in all areas of planning and design principles that enhance, protect or minimise impact on landscape values.

Existing use (or known future use) plays an important role in the management of landscape values. It is a useful basis for managing change (see point 2 above), and it is also the main method for taking up opportunities to enhance landscape values highlighted in landscape assessment. In addition, it provides for development that may impact on landscape values, highlighting suitable areas that will minimise the impact. These latter two situations are relatively dynamic in terms of planning and setting standards. Taking up opportunities to enhance landscape values by, for example, providing new access or other development may not satisfy existing standards. Development of all kinds in areas where standards allow it will, by changing the use, often require adjustments (increasing) to the standards. The latter situation is a relatively simple progression in management and highlights how landscape management responds to changes in use. It also highlights the importance of point three above, given that changes in use may bring many people past development that was previously unexposed. The former situation is considerably more complex. Decisions regarding new development that may contravene existing standards should:

- involve the appropriate levels of planning, such as broad land use planning, area management planning, and recreation planning;
- integrate the various levels of planning with landscape planning;
- have a 'theoretical' or 'planning model' basis;
- be spatially defined;
- ensure that protection of the mosaic of landscape values is comprehensive, adequate and representative;

- balance current needs with those of future generations;
- consider the issues of precedence and incremental change.

Precedence and incremental change, where one small change defines and leads to future change, are important issues in landscape management (and any land management). A long term plan setting out the vision for an area with some absolute standards is one effective tool for dealing with these issues.

The Strategy for managing landscape values in the Shark Bay area involves five main components:

1. Identification of values;
2. Establishment of management principles;
3. Setting of objectives for areas and types of values;
4. Use of a range of planning and design techniques to ensure that objectives are met; and
5. Consideration of other resource needs.

The assessment process for identifying values has been discussed in Part 2 of this report. The following sections cover points 2 to 4.

Landscape Management Principles or Assumptions

- The natural environment is an appropriate base on which we can evaluate human-induced change.
- The existing conditions are the most appropriate secondary base on which we can evaluate human-induced change.
- There is a general trend of development replacing natural environments (ie. natural environments are a diminishing resource).
- Landscape assessment, by necessity, represents a 'snap shot' in time and it is recognised that values will change, particularly with changes in use.
- There are varying degrees of value applying to different places and management provisions should reflect these by levels of protection.
- Planning and design principles that protect natural and landscape values should be applied to all development.
- Representative samples of landscape character sub units, and the most important of the area's landscape and natural values should be adequately protected in a conservation estate of sufficient size and distribution.
- Development should be guided by the provision of objectives, standards and guidelines.
- As a precautionary measure, the conservation of the natural environment should be given more weight than development.
- Landscape management objectives, standards and guidelines are influenced by land use decisions or 'trade-offs' with other resources but these decisions should be based on full consideration of landscape values.
- There are a number of design precedents, traditions and approaches that have clearly demonstrated that change can: meet landscape, environmental,

and the functional, cost and personal preference requirements of development; reinforce the unique regional character; and respect the sense of place of individual sites.

General planning principles

In addition to the principles highlighted above there are a number of general land use planning principles that provide a broad basis for landscape planning. These include that development should:

- be an efficient, suitable, and sustainable use of the land;
- contribute to the prosperity of the area;
- adequately protect natural and cultural values;
- balance the needs of the individual with the needs of the wider community; and
- provide for continuing enjoyment of the area.

3.2.4 MANAGEMENT OBJECTIVES BY AREAS AND VALUES

Significance - World Heritage

Opportunities	These are the 'World Heritage' features, formally recognised at the highest level, and may become the most promoted. They are a key ingredient in the 'World Heritage' experience and can be the focus for information and interpretation services.
Constraints	There is a high level commitment to conservation of these features, which may restrict the level of community use. Some of these features are particularly sensitive to human intrusion/modification.
Objectives	• World Heritage features should be protected. • The visual and physical integrity of these features and their settings should be maintained or restored. • Development should generally be excluded.

Significance - Not Well Represented

Opportunities	These are the most distinctive features of the area and in many cases are 'one-offs'. They may include some 'World Heritage' features. Their uniqueness is usually

	apparent and may attract people.
Constraints	These features are not well represented and will need high level of control of community use to protect their values.
Objectives	• The visual and physical integrity of these features and their settings should be maintained or restored. • Development should generally be excluded.

Significance - Well Represented

Opportunities	These features are distinctive within the setting of each character unit and are identified by people as having the most value. They are relatively well represented and generally should accommodate community use without affecting the broad value.
Constraints	These (together with other significance listed above) are the 'attractions' of the area and community use will need to be carefully planned to ensure that they remain the attractions.
Objectives	• The visual and physical integrity of these features and their settings should be maintained or restored. • Development should be of a temporary or minor nature and should be inevident from defining travel routes and use areas (Level 1 and 2).

Sensitivity Zone 'A'

Opportunities	These areas are the most critical areas to existing community use. There is potential for offering variety and quality in experiences knowing that these will benefit a large number of people or appeal to a particular type of user.
Constraints	Development or change will need to be carefully controlled to protect the existing experience. The potential for new access may pose threats to adjacent significant features.
Objectives	In natural areas: • The natural landscape character should be protected in the long term. • Development should be inevident from defining travel routes and use areas. Exceptions are:

	• Recreation and safety facilities, which may be seen in the foreground; • Changes that are evident for a short period and are of minor impact In rural areas: • The rural landscape character should be protected. • Development which is of non-rural character should be inevident from travel routes. Access and Views: • Existing positive experiences should be maintained through the access network. • Access routes should be maintained to a high aesthetic standard. • Road side-view patterns should be broadly maintained. • Key views should be actively managed.

Sensitivity Zone 'B'

Opportunities	These areas are moderately important to existing community use. There is potential for development without compromising the variety and quality of experiences.
Constraints	Development or change will need to be carefully controlled to protect the existing experience. The potential for new access may pose threats to adjacent significant features.
Objectives	In natural areas: • Permanent changes should be of minor, localised impact with adequate setback (min. 100m) from travel routes and use areas, except recreation and safety facilities, which may have reduced setback. • Temporary changes may be evident from defining travel routes and use areas but every effort should be made to ensure they are not dominant. Siting and design techniques should be used to minimise impacts and landscape design principles should be employed where possible to create 'sensitive' changes. In rural areas: • The rural landscape character should be protected. • Development which is of non-rural character should be inevident from travel routes. Access and Views:

	• Existing positive experiences should be maintained through the access network.

Sensitivity Zone 'C'

Opportunities	These areas are the least important to existing community use. There is a high potential for development without compromising the variety and quality of existing experiences.
Constraints	Development or change may lead to higher use, which will in turn require more care in planning and design.
Objectives	Natural areas • Permanent changes should be of localised impact and every effort should be made to reduce their dominance. • Temporary changes can be dominant but should employ landscape design principles to reduce their impact. In rural areas: • Changes can be dominant but should be of localised impact and employ landscape design principles where possible. Access and Views: • Temporary changes can be dominant but should employ landscape design principles where possible.

Coastal Cliffs and Bay Cliffs Landscape Character Sub-Units

Opportunities	Offer some of the most spectacular views of the region. Ocean, hinterland and marine wildlife views. Mix of sensory characteristics (eg. wind, wave sound).
Constraints	Often poor soils, susceptible to erosion, and fragile vegetation. Highly exposed to the weather. Access to cliff edge only. High visitor risk - access will need to be carefully controlled. Development and tracks will be highly visible. Low suitability for development.
Objectives	As for the Sensitivity Zone or Significance

Gentle Transition Landscape Character Sub-Unit

Opportunities	Contains the most desirable and suitable areas for development (ie. scenic and gentle slopes). Good access to the water.
Constraints	Easy for users to stray from tracks. High suitability for development.
Objectives	As for the Sensitivity Zone or Significance

Flats Landscape Character Sub-Unit

Opportunities	Expansive views.
Constraints	Waterlogging will restrict use. No topographic and little vegetation screening. Low suitability for development.
Objectives	As for the Sensitivity Zone or Significance

Parabolic Dunes Landscape Character Sub-Unit

Opportunities	Impressive valleys and ridges with long views along the valleys and panoramic views from the ridge tops.
Constraints	Erodible soils, some steep slopes, low vegetation, prone to high wind forces. High visibility. Low suitability for development.
Objectives	As for the Sensitivity Zone or Significance

Reticulate Dunes Landscape Character Sub-Unit

Opportunities	An array of ridge forms with good views, particularly from the high points.
Constraints	Erodible soils, some steep slopes, low vegetation. Low suitability for development.
Objectives	As for the Sensitivity Zone or Significance

Desert Landscape Character Sub-Unit

Opportunities	Spectacular sand forms.
Constraints	Unsuitable for development. Need to discourage vehicle use beyond defined access.
Objectives	As for the Sensitivity Zone or Significance

Tamala Landscape Character Sub-Unit

Opportunities	Elevated with panoramic views and limestone outcrops.
Constraints	High visibility. Shallow soils and low vegetation adjacent to the coast. Low suitability for development near coast.
Objectives	As for the Sensitivity Zone or Significance

Grasslands Landscape Character Sub-Unit

Opportunities	Expansive views across rolling terrain.
Constraints	Low vegetation and limited topographic screening. Tendency for any development to be highly visible. Low suitability for development.
Objectives	As for the Sensitivity Zone or Significance

Birrida Landscape Character Sub-Unit

Opportunities	Impressive, often enclosed views with high colour contrasts.
Constraints	Subject to waterlogging or flooding. No topographic or vegetation screening. Low suitability for development.
Objectives	As for the Sensitivity Zone or Significance

3.3 PLANNING COMMUNITY USE AND RECREATION

Landscape management is not a process for directly determining appropriate recreation use, although it does to a certain extent control use by setting development and management standards for areas. It also highlights many aspects of use, including opportunities and constraints. On its own, it tends to either consolidate existing patterns of development or force development into 'unused' areas. As a result a large development could be located in an undeveloped area, given that such a site will not affect existing experience. It then sets a precedent for that area and will inevitably exclude some recreation opportunities.

It is vital to the management of landscape values in the Shark Bay World Heritage Property that community use and recreation be planned and managed in conjunction with this plan. There are a number of levels of community use planning relevant to the World Heritage Property:

- Land use planning
- Area management planning
- 'Visitor' planning
- Project level design

All these levels should be used to develop an integrated approach to community use planning. This planning should address the following objectives:

- Provide for a range of appropriate activities (ie. land use and recreation);
- Provide a range of experiences based on:
    - different social/cultural settings (ie. Recreation Opportunity Spectrum) (key considerations/variables being level of development and remoteness);
    - different natural and cultural features (ie. landscape significance);
    - different environmental settings (ie. landscape character);
    - type of activities;
    - level of knowledge and understanding;
- Provide for community use based on the capability of different environmental settings to physically sustain community use;
- Respond to demand, existing and future, whether community or management induced;
- Consider management objectives relating to other resources;
- Ensure adequate protection for existing physical and experiential settings;
- Where possible maintain existing activities and experiences, while providing for new ones, whether based on trends or opportunities;
- Ensure that adequate settings and features are left undeveloped;
- Ensure compatibility between activities, experiences and settings;

- Consider relative availability, reproducibility and reversibility, spatial distribution, precedence and incremental development.

3.4 MANAGEMENT RECOMMENDATIONS

The following recommendations are made in relation to management of aesthetic landscape values in the Shark Bay World Heritage area.

11. The landscape management objectives and guidelines detailed in this study be adopted for management of the Property by the World Heritage Committees, and key State and Local Government land and marine managers and land owners.
12. A coordinating mechanism should be established to ensure consistency in the evaluation and approval of development proposals in accordance with EPA Guidance Statement No.49.
13. Specialist advice relevant to the value be included as part of any development proposal relating to significant values or 'A' sensitivity zone
14. An integrated community use and recreation plan should be developed, incorporating the results of this study for the whole Shark Bay region.
15. Strategic development plans should be prepared for Denham and Monkey Mia, incorporating the results of this study.
16. The number of aesthetic features affected by physical development should be restricted, decided through the preparation of a community use/recreation study.
17. Natural areas, free of any physical development, should be designated in a plan and should incorporate the principles and results of this study and a community use/recreation study.
18. The general undeveloped nature of the Property should be given high priority in planning and design decisions.
19. A variety of access types should be promoted to provide different experiences and to minimise environmental impact. The benefit of aerial views to the appreciation of the visual aesthetic characteristics of the Property should be highlighted.
20. Further work should be undertaken in relation to this study, including:
    - further definition should be provided for coastal sub-units;
    - Mapping should be converted to digital form.

3.5 PLANNING AND EVALUATING PROPOSALS

The assessment maps, guidelines and policies in this report are intended to be used in the planning of new developments and the rehabilitation of existing impacts. The following guidelines outline how this information is used in the procedure for planning and evaluating development proposals.

IMPACT ASSESSMENT

Physical and Sensory Changes

- Determine the degree of physical changes to the site (eg. area and location of vegetation removal, addition of development elements).
- Determine the degree of visibility of the development area and any development elements from community use areas, particularly Level 1 and 2. This should consist of two components. One component determines the area surrounding the development that has direct line of sight to the development (seen area mapping). This is an indication of what can be termed the spread of influence (or effect) of the development. For a large site, seen area mapping should include a number of key points on the site. These should also be overlaid to produce a composite map showing 'seen area density'. The other component determines the actual visibility of the development from key vantage points in community use areas, particularly Level 1 and 2. The best tools for this purpose are representations of the development on photographs from the nominated viewpoints (including those representing 'continuous' viewpoints), transacts, and 3D modelling. The degree of visibility can be determined and described in terms of magnitude, contrast and duration.
- Determine the degree of change in any other sensory characteristics, particularly sound and smell.

Statement of Effects

- Determine the impact physical, visual and any other sensory changes will have on the values of the area. This should be discussed in terms of the values identified in the assessment (ie. landscape character, significance, community use and sensory characteristics). Include a description of any factors that might mitigate or exacerbate the effects (eg. an impact seen as either close to a view focal point or at right angles).

Community Perceptions and Values

- Local community perceptions and values relating to the type of development proposed should be identified, including those of current users of the area. A literature review of relevant research should also be undertaken to determine public perceptions and attitudes of the wider community and to validate or add to any local research.

EVALUATION

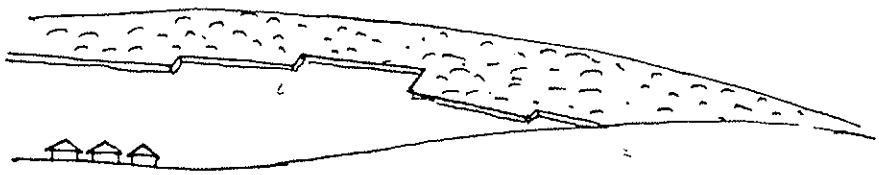
- Determine whether the assessed impacts (as in the Statement of Effects) of the development or use as proposed comply with the standards or objectives relevant to the assessed values.

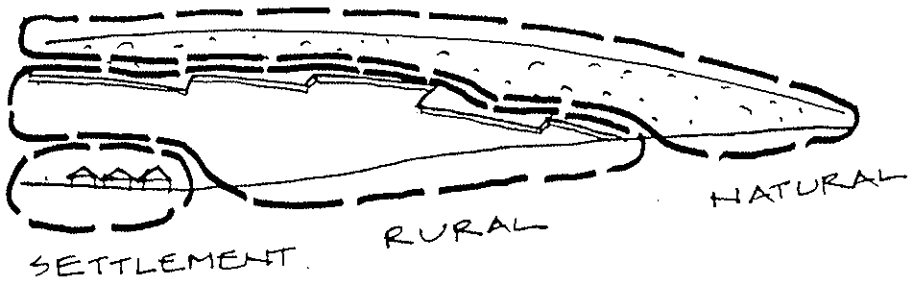
- If the relevant standards are not met, detail possible proposal options, including:
  - That the development be modified to comply, with details of the modifications. Modification should focus firstly on location (to take advantage of topography, aspect, vegetation and areas of lesser landscape value), and secondly on low impact design of the development's elements.
  - That the development be modified to reduce impact but not comply, with details of the modifications.
  - That the development remains as proposed.

APPENDICES

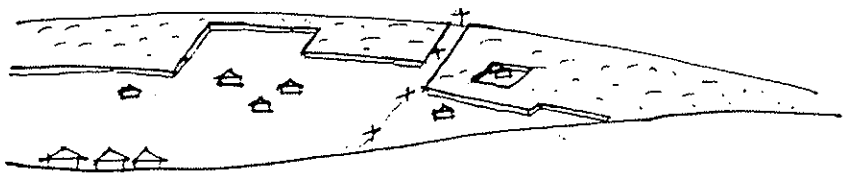
APPENDIX 1 - MANAGEMENT BY TECHNIQUE - LANDSCAPE MANAGEMENT GUIDELINES

Manage Landscape Character....

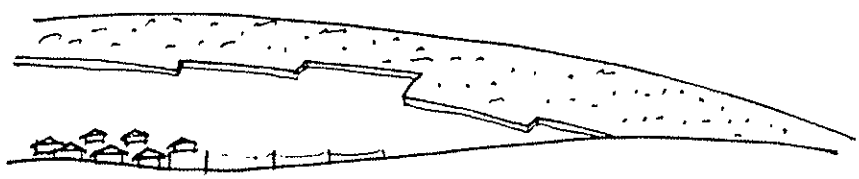




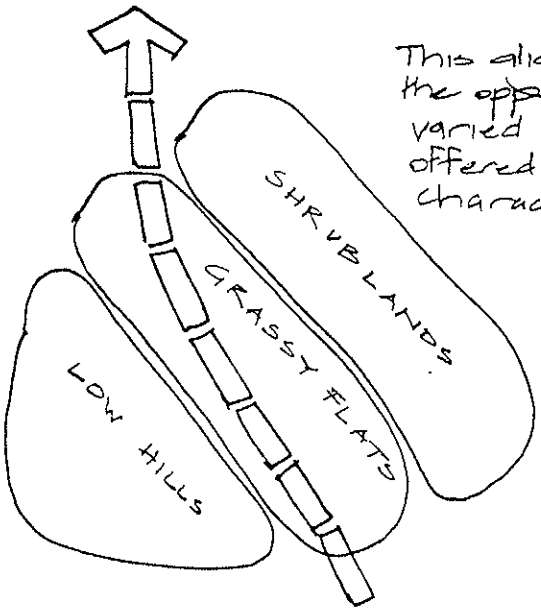
Identify character types....

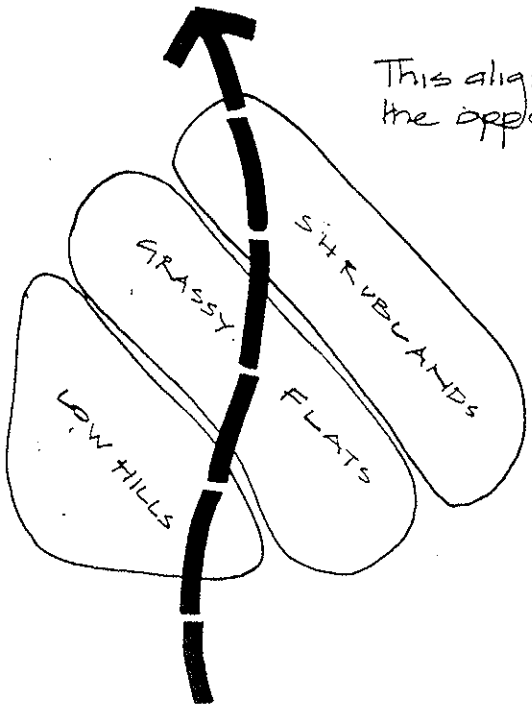


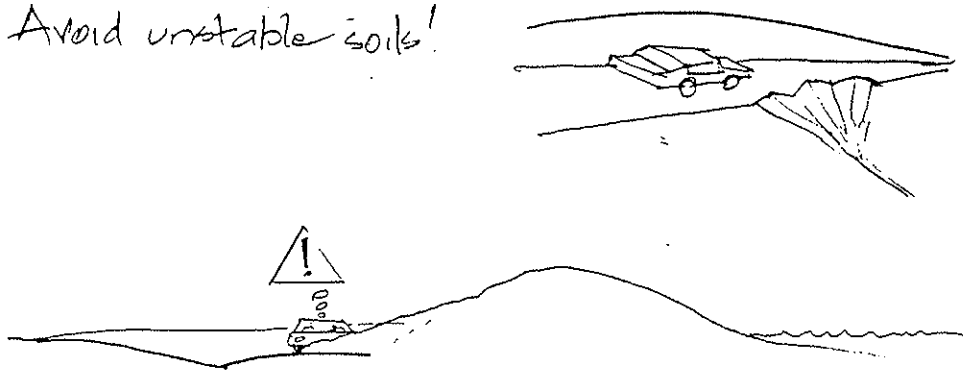
Avoid 'succession' from one character type to another. eg natural to rural or rural to settlement (or rural residential)....

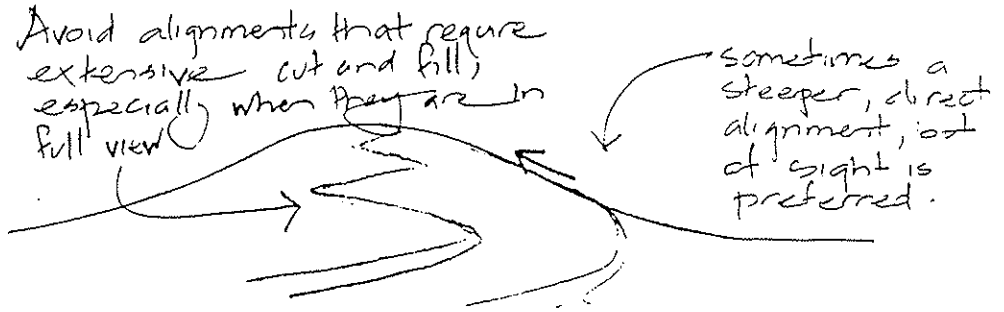


And, consolidate settlement and visual change, avoiding loss of natural character.


This aligment misses the opportunity for varied experiences offered by adjacent characted units.
SHRUBLANDS
GRASSY FLATS
LOW HILLS

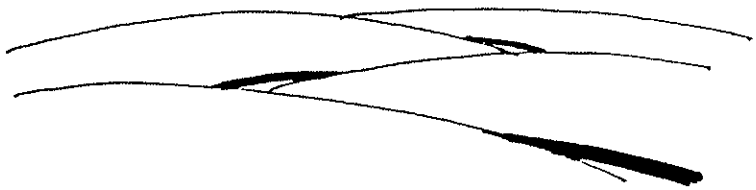

This aligment uses the opportunity....
SHRUBLANDS
GRASSY
FLATS
LOW HILLS


Avoid unstable soils!

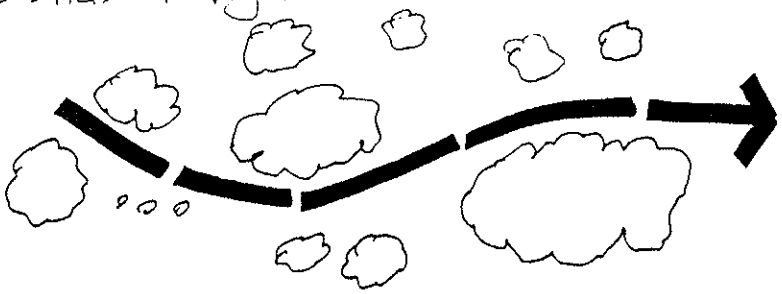

Avoid alignments that require extensive cut and fill, especially when they are in full view
sometimes a steeper, direct alignment, out of sight is preferred.


Choose alignments that avoid breaching skyline canopies
Avoid this..

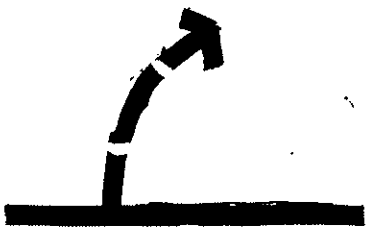
In natural areas protect the character by setting roads low in the topography to screen the road as much as possible.

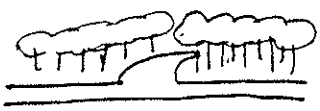


Roads should avoid scattered small stands of vegetation

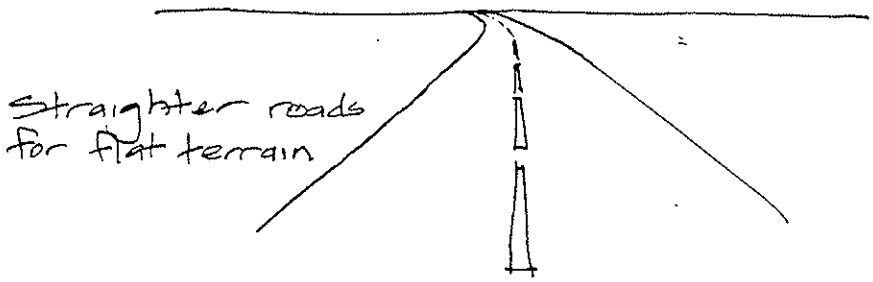


In natural areas, side roads should curve out of sight near intersections to help maintain the 'natural' character of the main road.

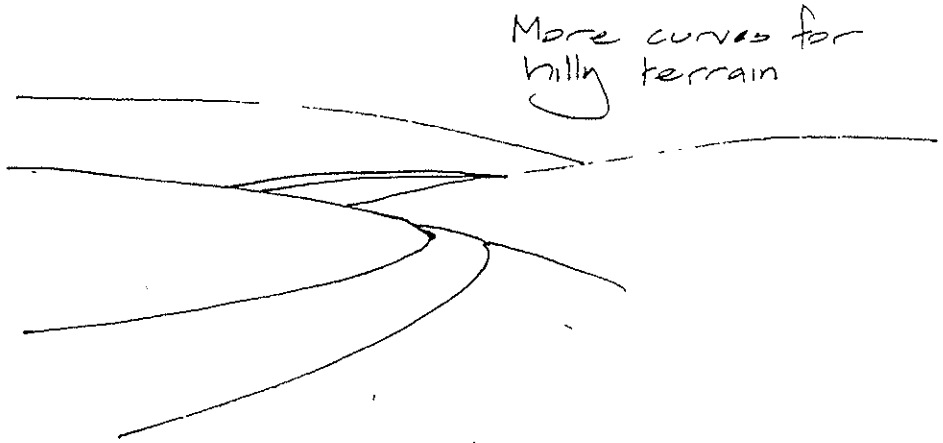




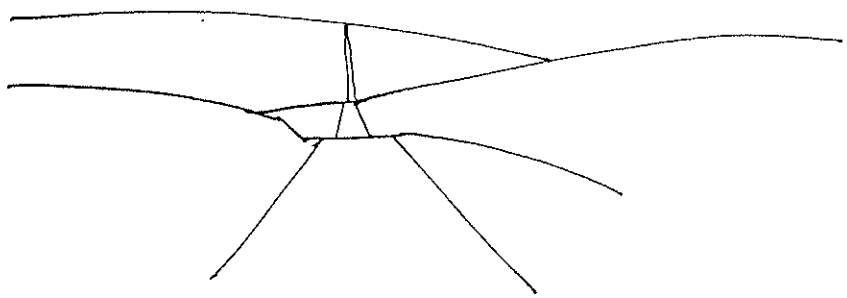
Road alignment should reflect (and accentuate) the topography....



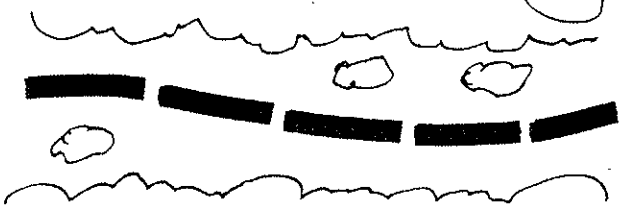
RLJ



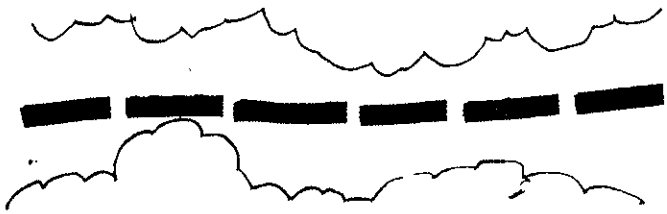
AVOID....!



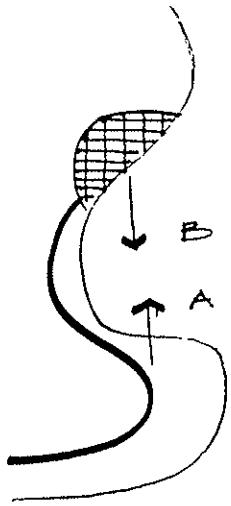
The relationship between the road alignment and road easement can be varied to add variety and interest.....

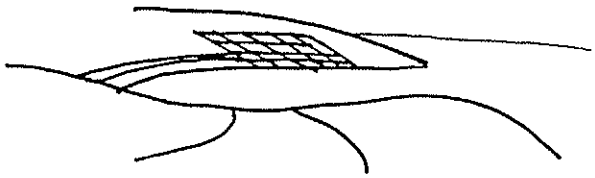


Regular ~~easement~~ with the road swinging off the ~~easement~~ centreline.

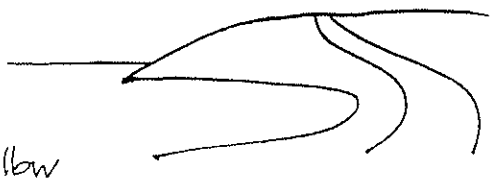


Irregular clearing on road ~~easement~~ with almost straight road.



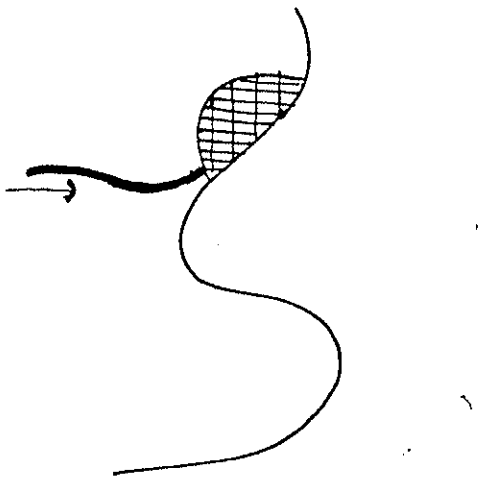


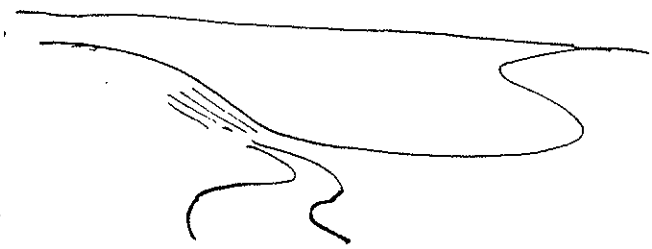
View A



View B

Avoid alignments that allow the road to dominate natural character and views





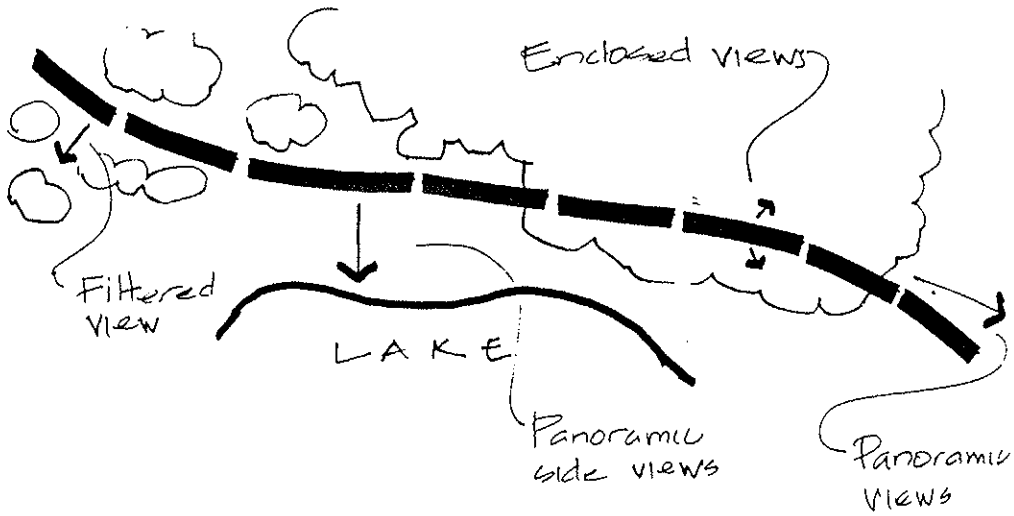
This aligment 'drops in' to the development area, with the development being a minor part of the view and the road relatively unseen upon arrival.

Manage Views.....

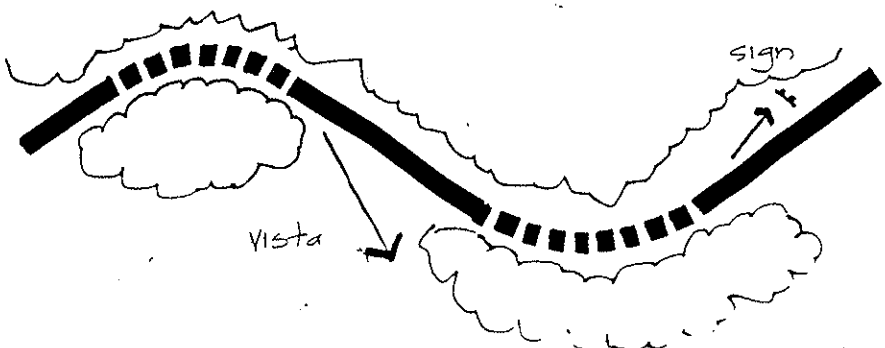
Views to distant hill across agricultural land add to the travel experience

Avoid blocking views with new development

Locating development to the side of main sightlines, taking advantage of veg. or topo screening, and using setbacks, will all help protect views.

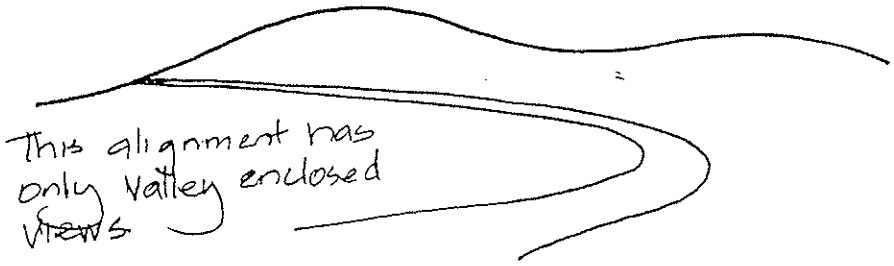


Provide a range of view experiences.

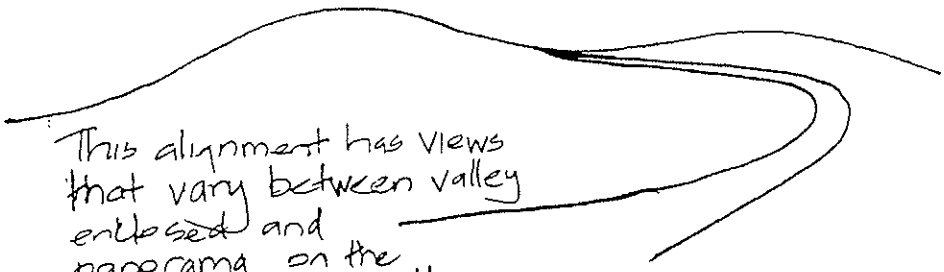


Views to scenery and signs are safest if kept close to the road axis and away from bends.

The experience provided by views should be considered in road design.....



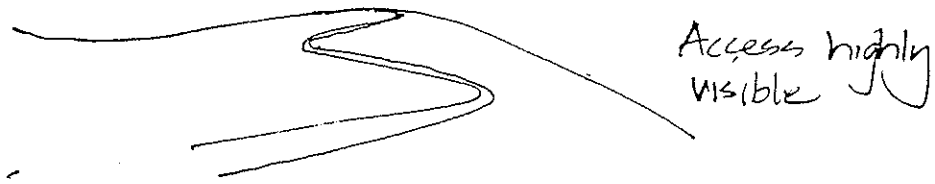
This alignment has only valley enclosed views

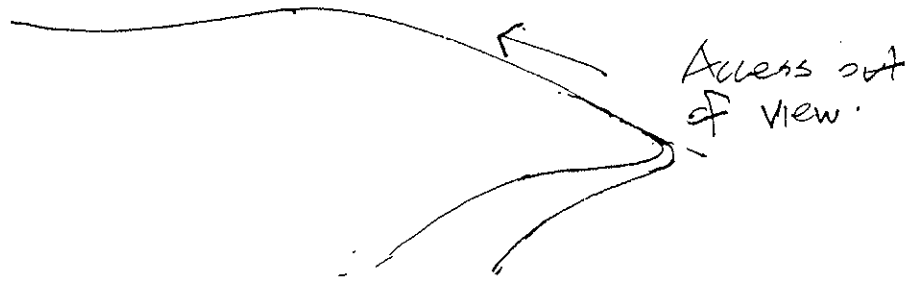


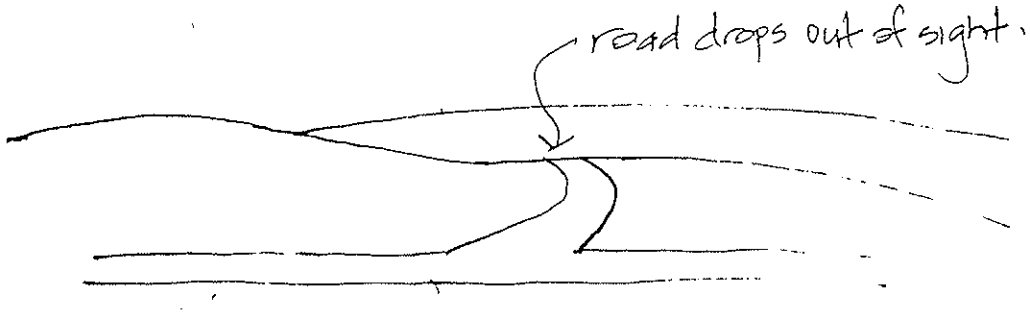
This alignment has views that vary between valley enclosed and panorama on the crest of the saddle.

This alignment has alternative experiences: a valley enclosed alignment; and a side road to the hill top for panoramic views.

When access is required on steep slopes avoid highly visible slopes

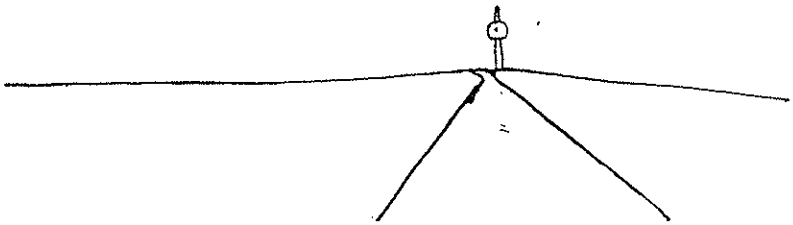


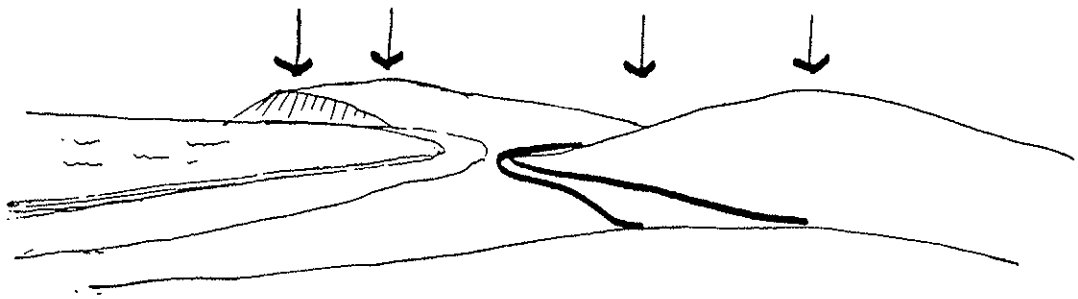




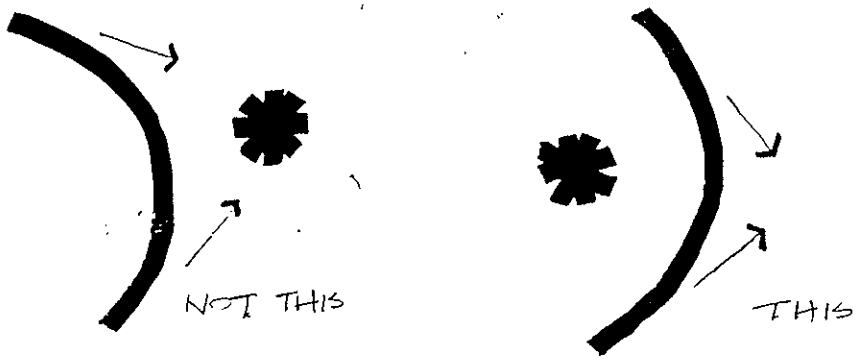
Use the topography to reduce the length of roads visible.

Avoid aligning roads with negative features.

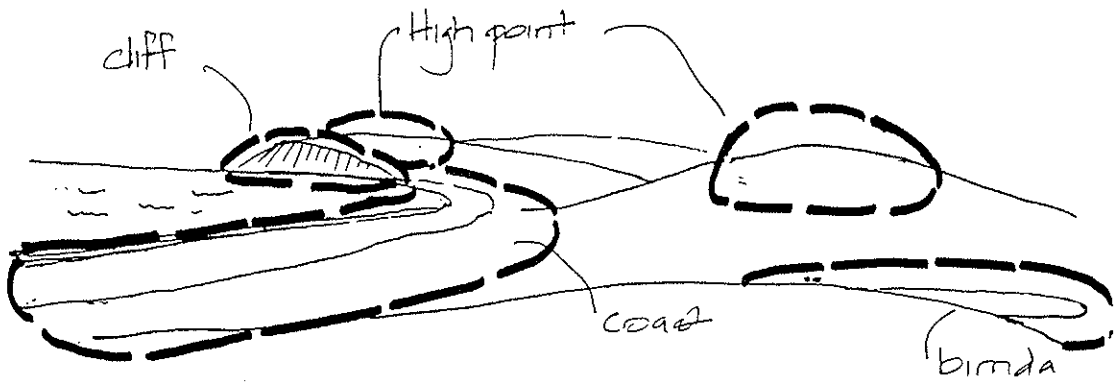




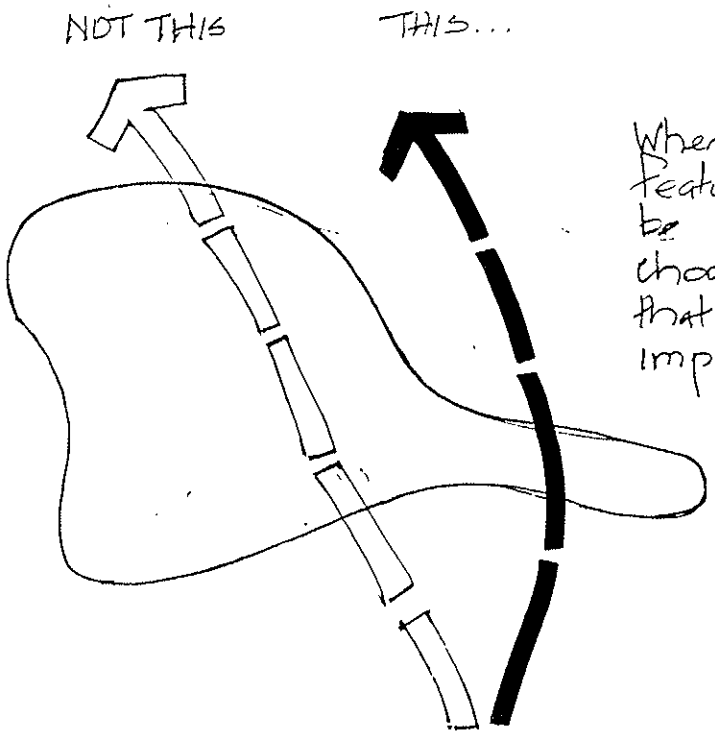
Avoid siting roads on focal points



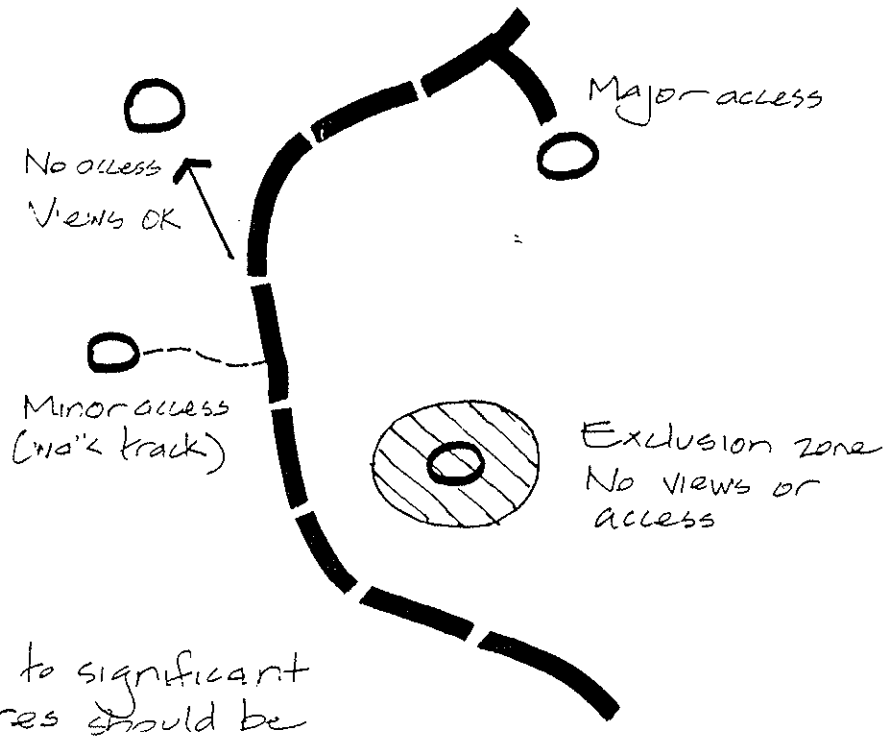
Align roads to minimise views of negative features.



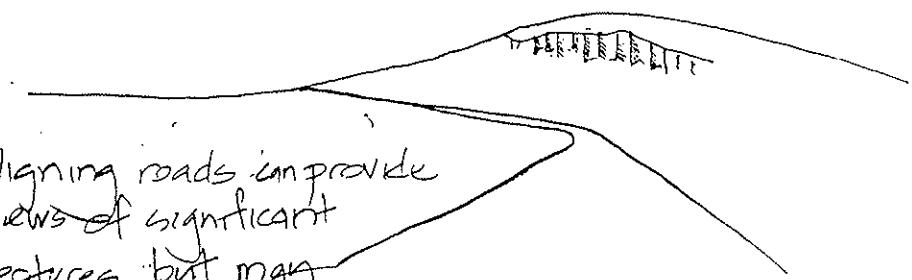
Avoid siting roads through significant features, leaving an adequate buffer.



Where significant features cannot be avoided choose an alignment that minimises impact.

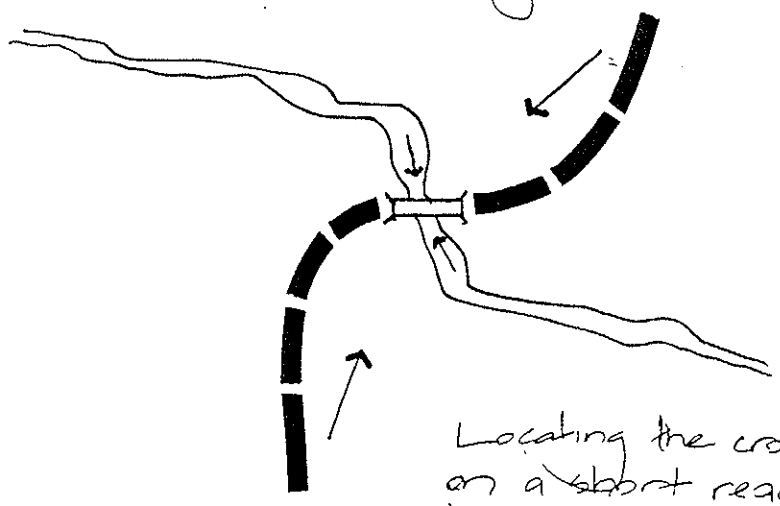


Access to significant features should be according to a management prescription for each feature

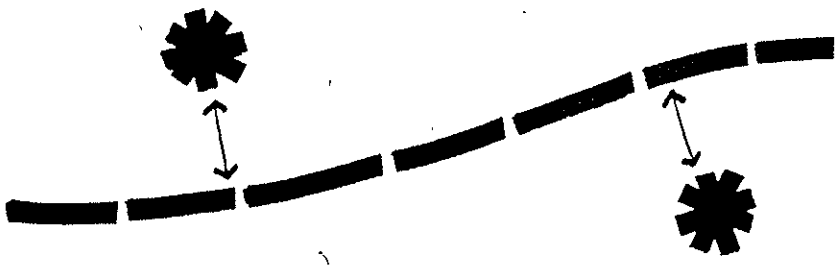


Aligning roads can provide views of significant features but may tempt use when use is not desired by management

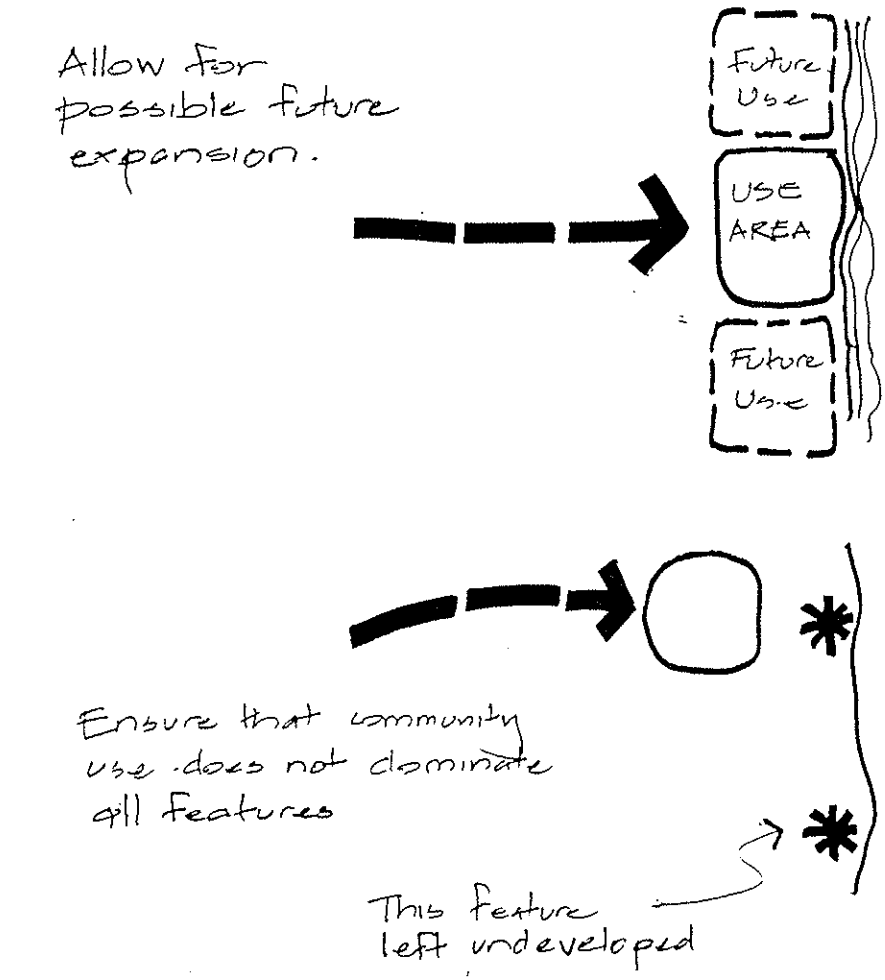
Crossings of major natural Features such as rivers can be enjoyed better if roads are aligned to allow better views of the crossing

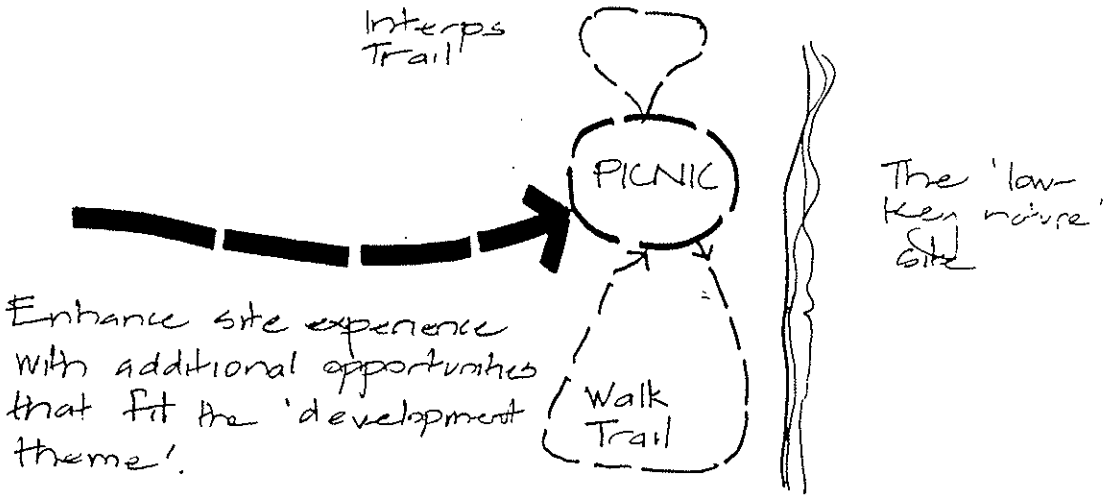


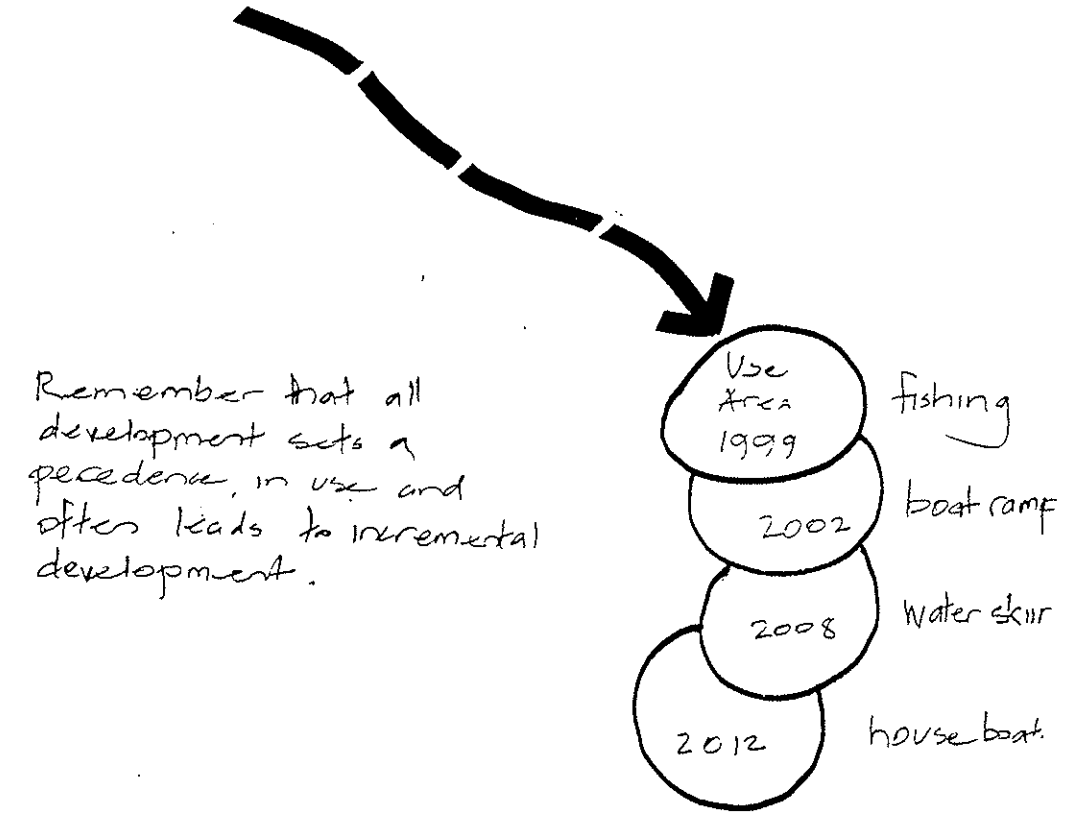
Locating the crossing on a short reach of the river avoids long views from slow moving river traffic.

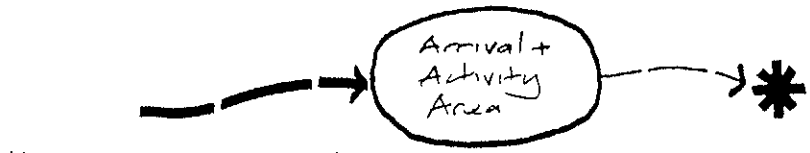


Allow generous buffers between roads and significant features. This will protect the visual and environmental integrity of the feature and will enhance future options if a feature is to be 'developed'.

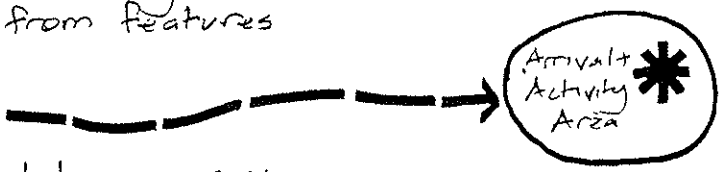

Allow for possible future expansion.
Future Use
USE AREA
Future Use
Ensure that community use does not dominate all features
This feature left undeveloped
Semi-natural
Natural
In 'natural areas' ensure that there are substantial natural areas free of development. The ratio of natural to development should be high.


Interps Trail
PICNIC
The 'low-key nature' site
Enhance site experience with additional opportunities that fit the 'development theme'.
Walk Trail

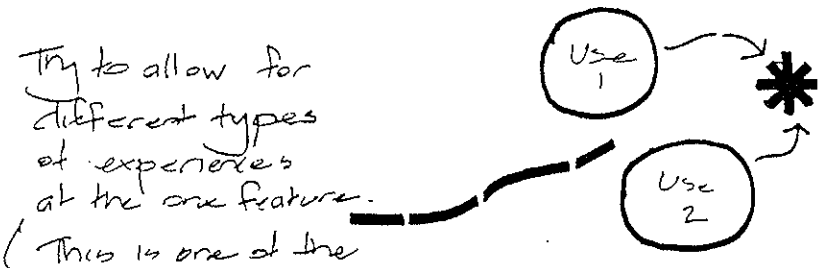

Remember that all development sets a precedence in use and often leads to incremental development.
Use Area 1999
fishing
2002
boat ramp
2008
water skiir
2012
house boat



Keep arrival and general activity areas back from features

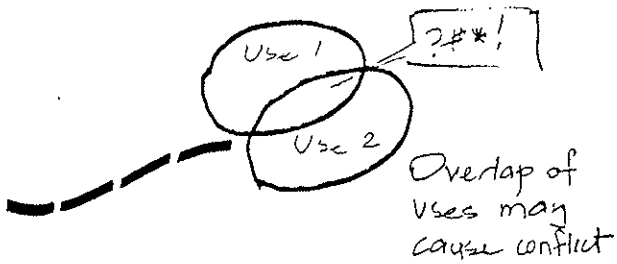


Don't let use areas dominate features.



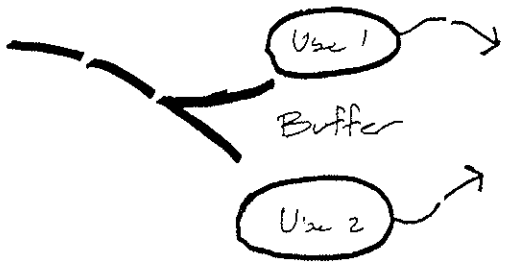
Try to allow for different types of experiences at the one feature.

(This is one of the great challenges of community use planning)

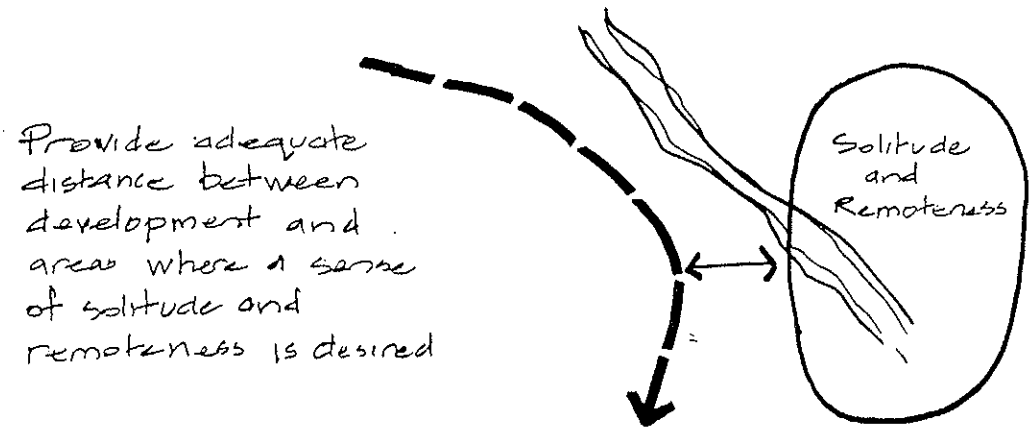


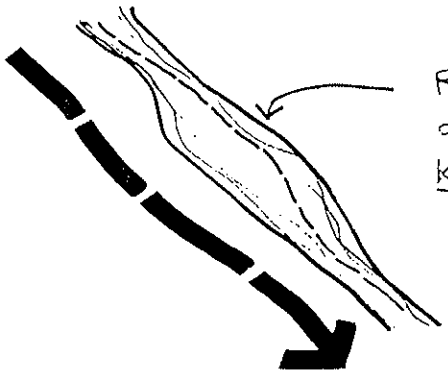
Avoid potential conflicts between use areas.

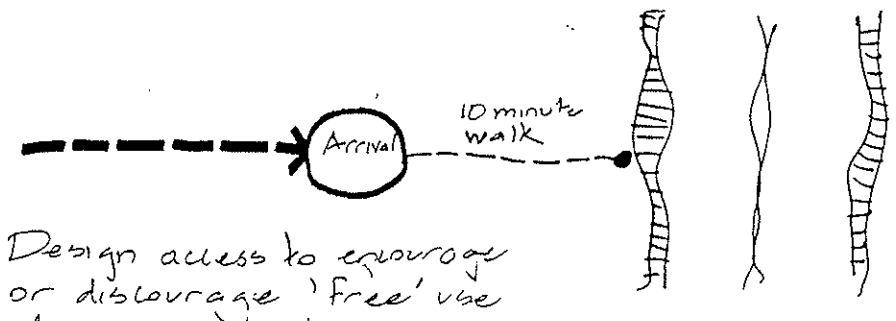
Overlap of uses may cause conflict

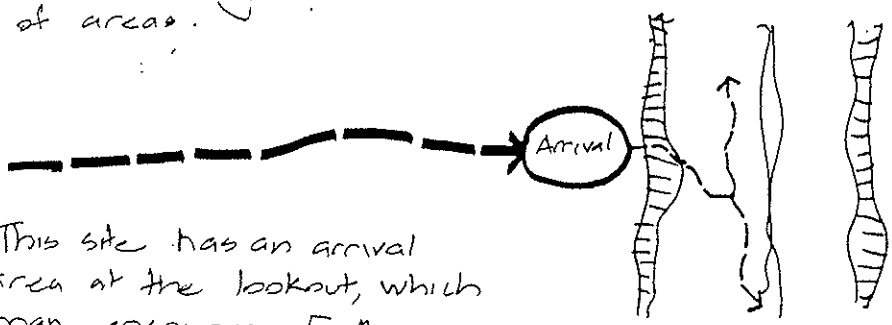


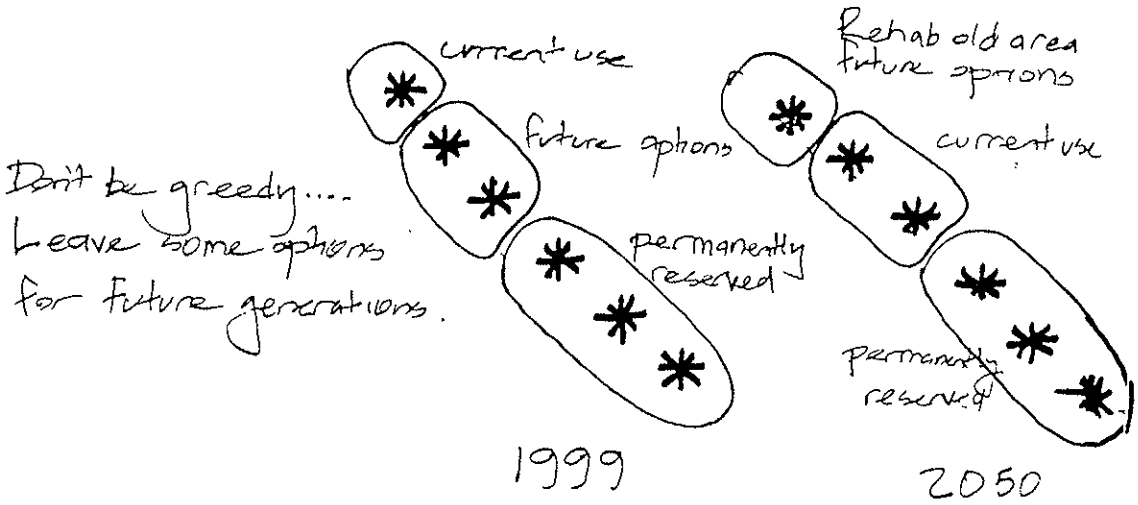
In some cases a substantial buffer may be required

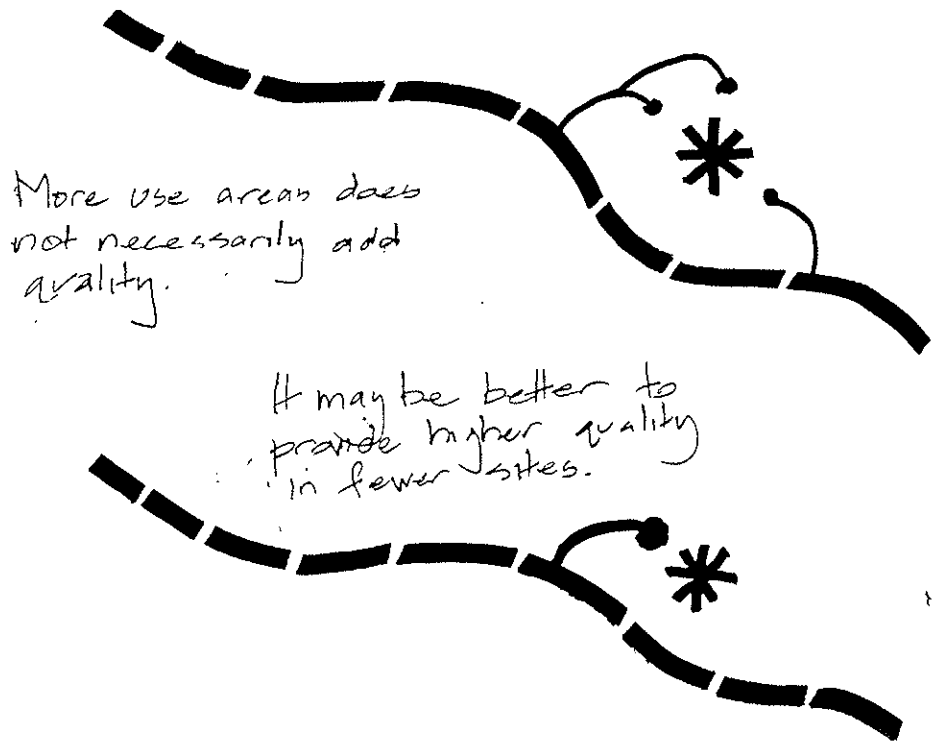

Provide adequate distance between development and areas where a sense of solitude and remoteness is desired
Solitude and Remoteness


River walk has little sense of remoteness – people know that the road is not far away. They may also hear or see it.


Arrival
10 minute walk
Design access to encourage or discourage 'free' use of areas.


Arrival
This site has an arrival area at the lookout, which may encourage further exploration.


Don't be greedy....
Leave some options
for future generations.
current use
future options
permanently
reserved
1999
Rehab old area
future options
current use
permanently
reserved
2050

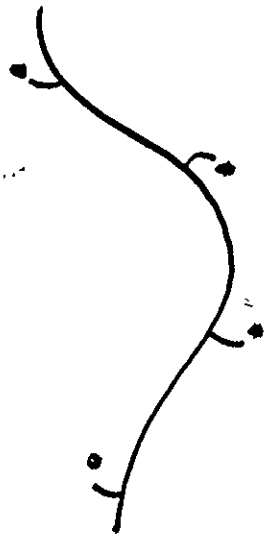

More use areas does
not necessarily add
quality.
It may be better to
provide higher quality
in fewer sites.

Consider the benefits of providing different classes of travel routes.....

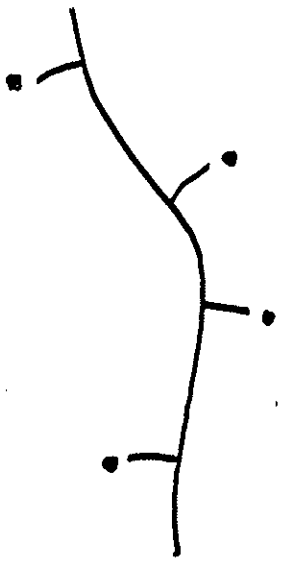
And whether they should be 'hierarchical' in sequence....

OR, 'non-hierarchical'

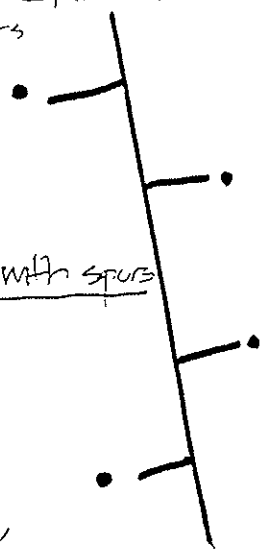
Consider how road alignment relates to community use...



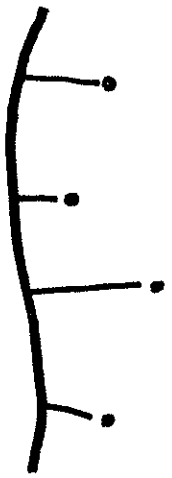
'Link' Road.
- Little effort required to visit side features
- Focus on local landscape.
- High effort for 'through' travellers



'Responsive Through' Road with spurs
- Moderate effort required to visit side features.
- Balance between focus on local landscape and 'getting from A to B'
- Moderate effort for 'through' travellers



'Through' Road with spurs
- High effort required to visit side features
- Focus on 'getting from A to B'.
- Little effort for 'through' travellers.



Through Road with spurs

Spur roads force people to make a choice. Repitition and longer length of spurs will make people more discerning about which features they will visit. Multiple decision points on a main through road may be undesirable.

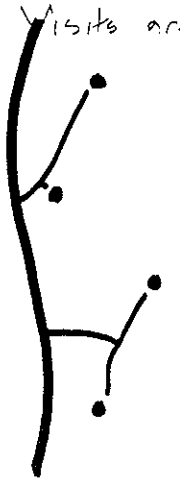
Main road/spur intersections can be reduced.

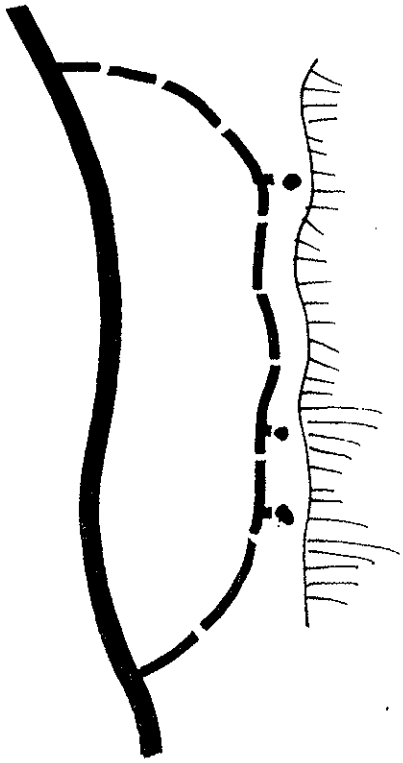
Visits are likely to be longer than for visits to features on a drive through loop.

Scenic loop with through road

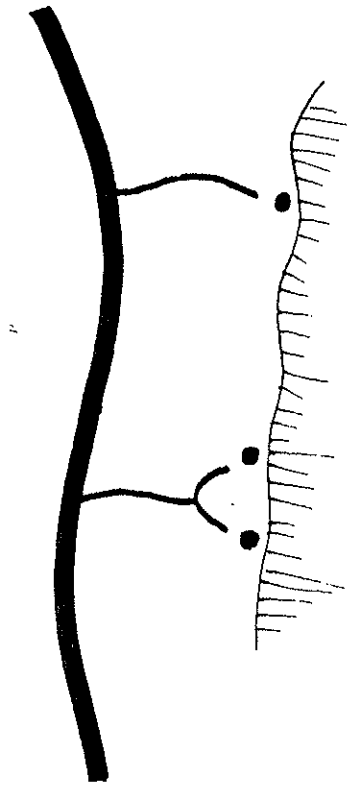
Designated road with a number of signposted features creates a tempting package. Likely that most features will be visited, especially if the road experience is a little 'featureless'.

Visits are likely to be shorter than for visits to features off a spur



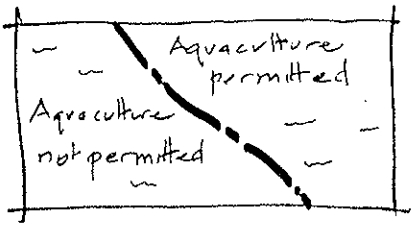


Avoid locating roads along major natural edges (such as cliffs, rivers and the coast) and edges of other environmentally sensitive areas. These locations often have important vegetation transitions, poor erodable soils, are visually exposed, and are usually aesthetically significant. Roads running along the edge maximise the risk in all these respects and will also dominate community use and eliminate the possibility of any sense of remoteness along the edge.

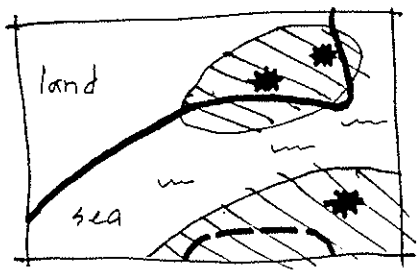


Through roads with adequate setback together with spur roads to features will minimise the env. risk in sensitive 'edge' areas. This configuration avoids the env. problems created by a 'loop' road, allowing for a range of uses and a sense of remoteness.

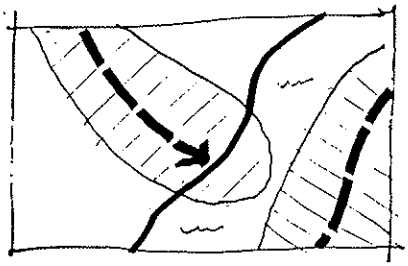
AQUACULTURE



Check and comply with management standards for the area.

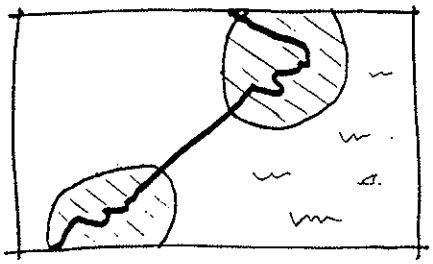


Avoid marine conservation areas and significant terrestrial features

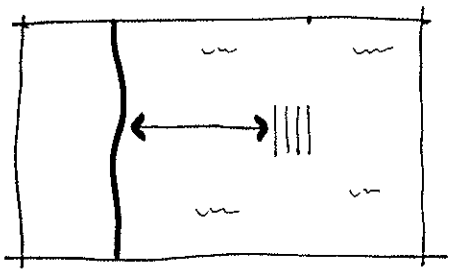


Avoid main travel routes and use areas.

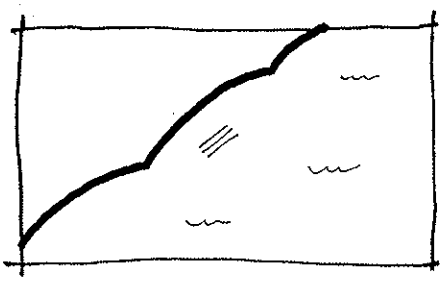
ACQUACULTURE



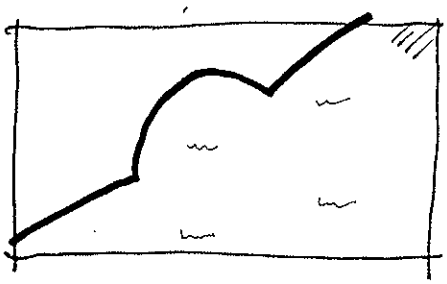
Avoid focal areas or areas of interest, including points or capes (which are often way markes for access routes



Increasing the distance from shore and use areas will lessen impact.

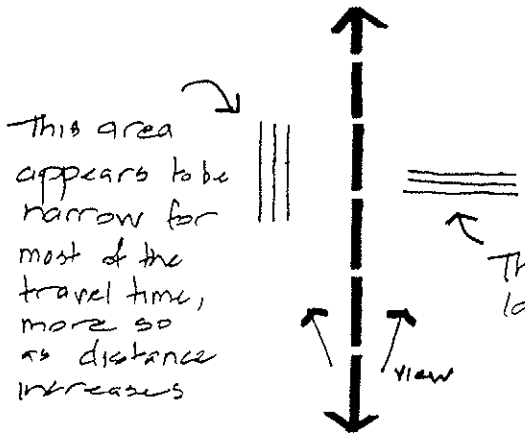


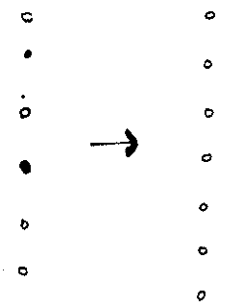
Where locations close to shore are required and bays are common on the coastline, siting within the confines of the bay will lessen the impact as seen from areas outside the bay.



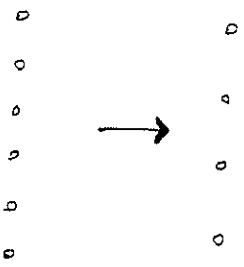
Where bays are not common they become an important feature of the coast and aquaculture sites should be located well away.

AQUACULTURE



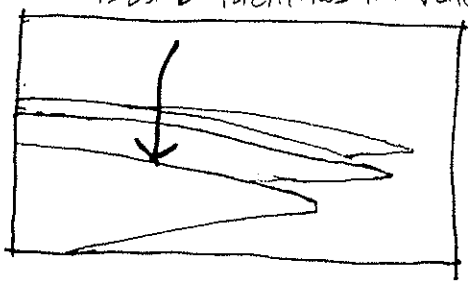


Use buoys of consistent shape and colour and at even spacing.



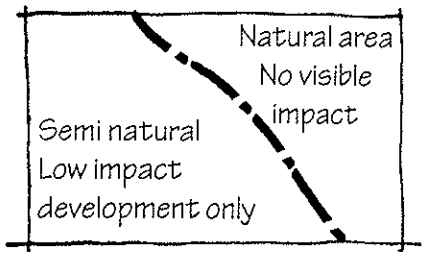
Minimise the number of buoys

Locate facilities in valleys or low areas (behind ridges)

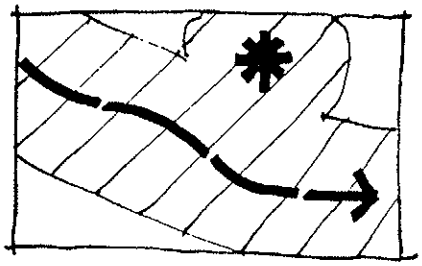


The coastal landform should be used to constrict the impact of onshore facilities.

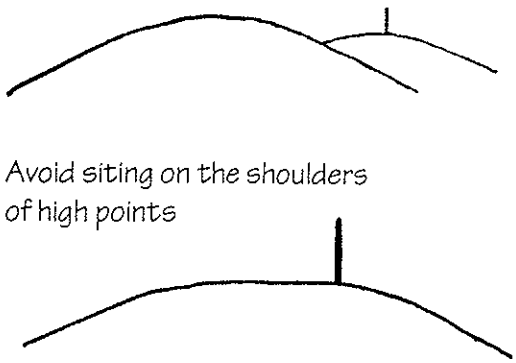
TOWERS ...



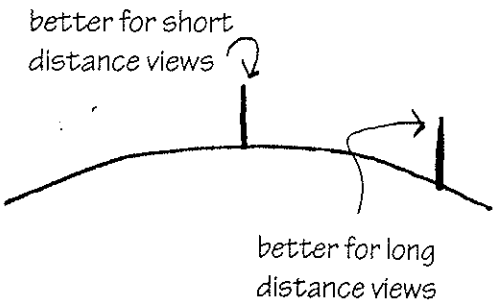
Check and comply with management standards for the area.



Avoid significant features, travel route zones and recreation areas.



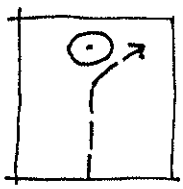
High points vary in their prominence as seen from different places. Where possible, choose high points that appear less prominent from key view points or travel routes.

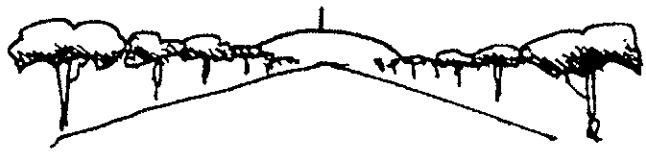


Choose locations back from shoulder or down the slope

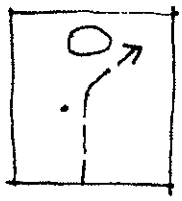
Towers 1 of 4

TOWERS ...

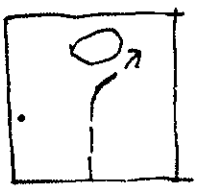




Avoid siting towers on focal areas, particularly where they line up with road sightlines.



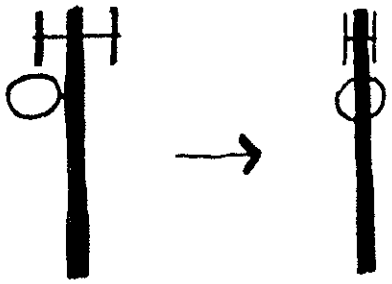
Keeping towers away from focal areas will reduce their impact.



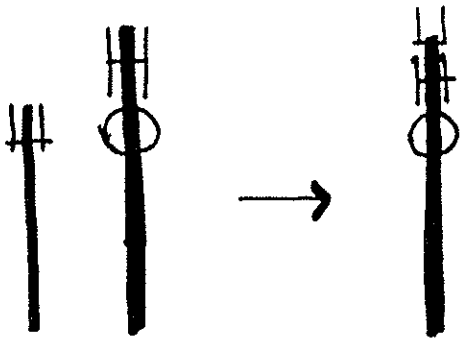
In many cases it is possible (and desirable) to keep towers sufficient distance from travel routes so that they are not detected.

Towers 2 of 4

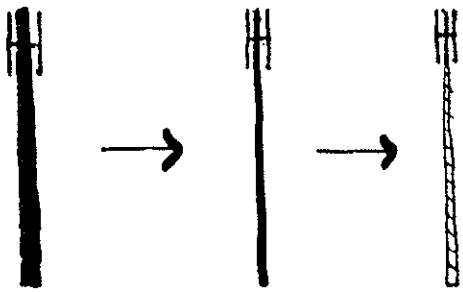
TOWERS ...



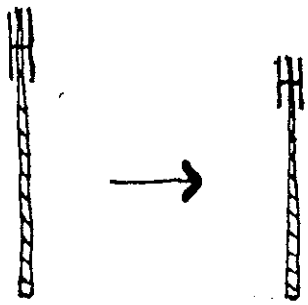
Avoid 'clutter' on towers. Consolidate elements into the smallest space possible.



Avoid duplicating towers. Consolidate facilities onto one tower.



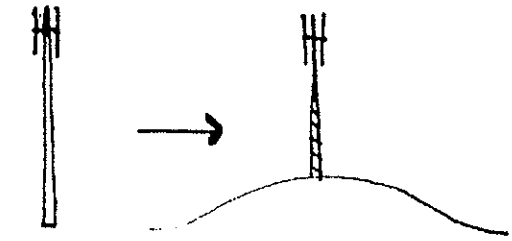
Reduce the visible bulk of the structure. Lattice web towers are usually better than solid towers, even slim towers.



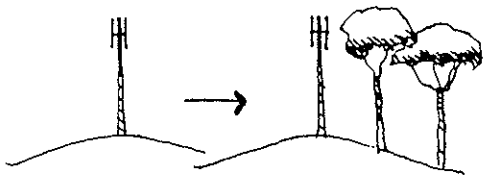
Check height requirements. Towers often come in standard sizes and may be significantly taller than necessary. Minimise height.

Towers 3 of 4

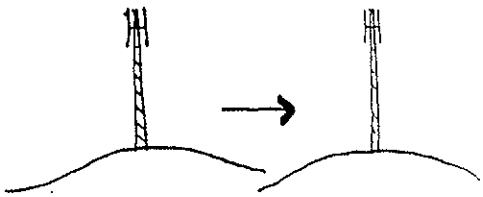
TOWERS ...



Choose a site that uses local topography to minimise the visible height.



Siting tower close to objects of similar scale usually reduces their prominence.



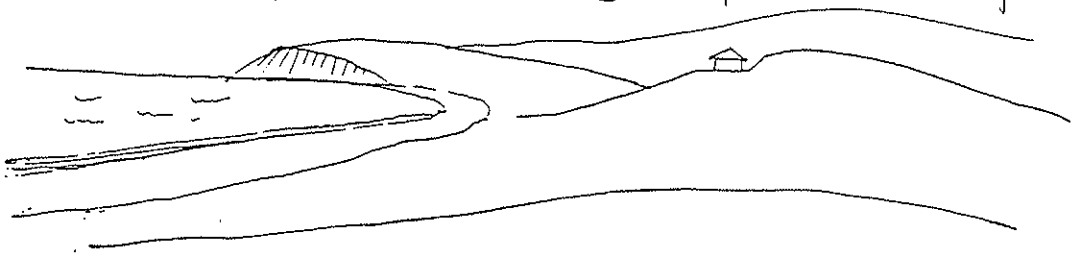
Use colour to reduce the impact of the structure in any situation.

Towers 4 of 4

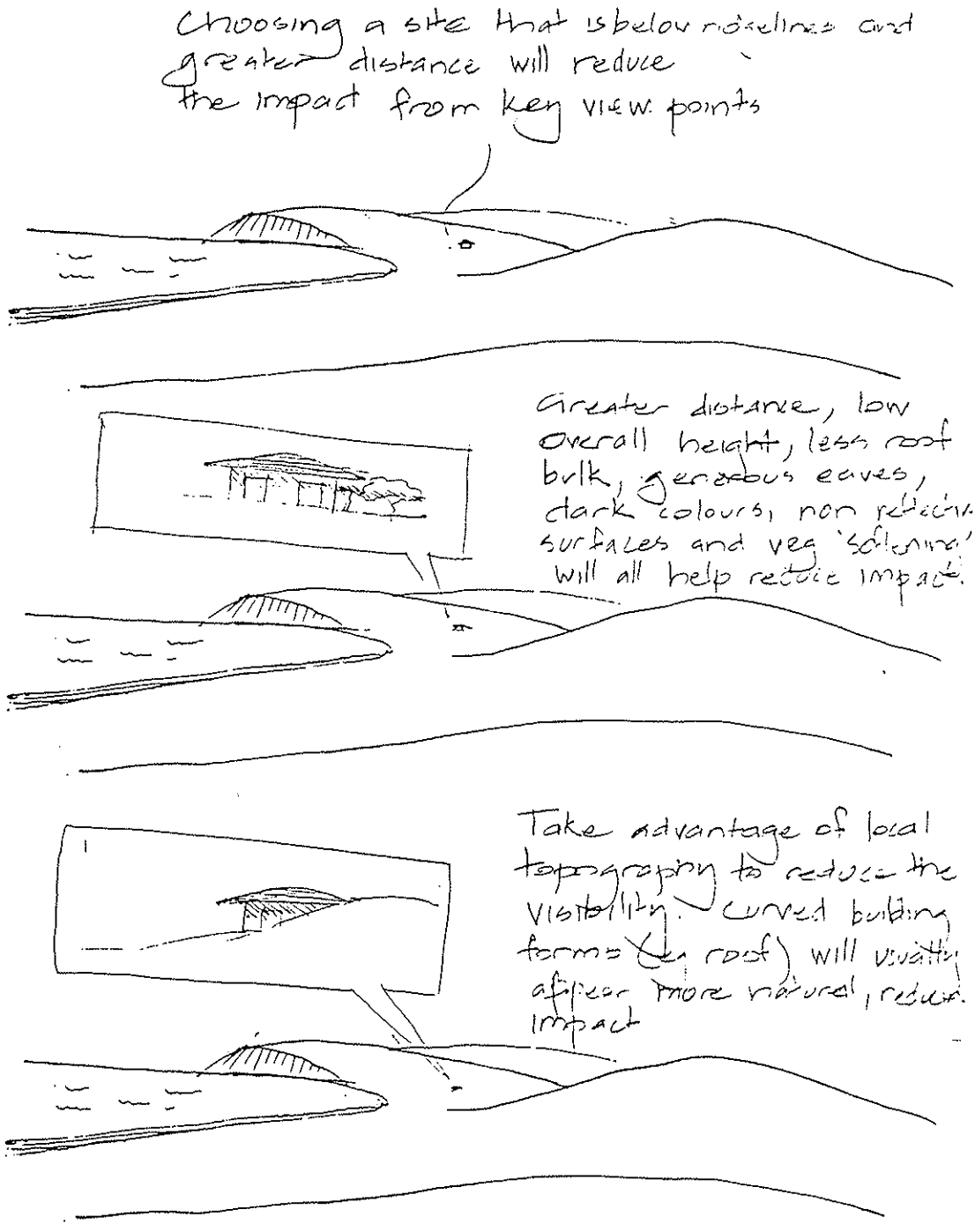
Siting development in natural or relatively natural areas should protect the natural character.

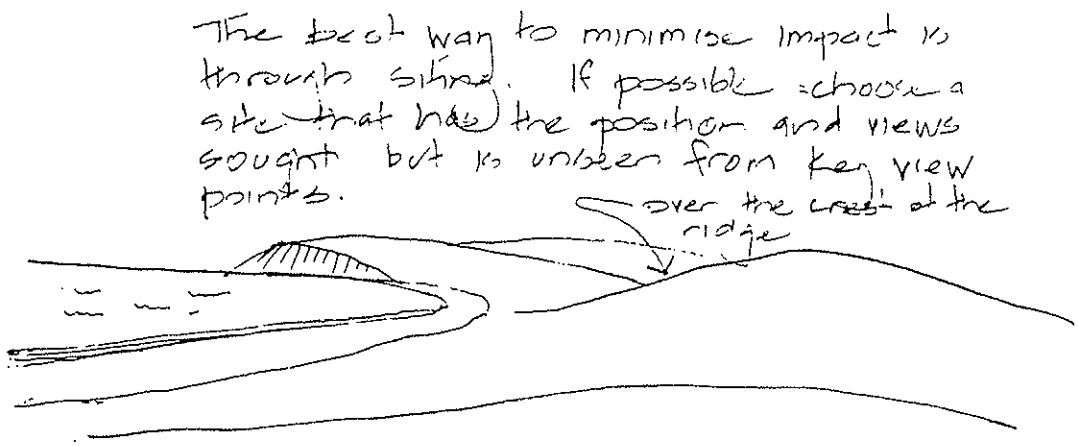
Avoid siting houses on the top of hills. These sites are visually focal points, aesthetically significant visually prominent and are often on the skyline, Impact will be very high.

Even
Avoid breaching ridgelines. A Non skyline ridgelines are visually prominent and help define the natural make up of the landscape



Choose a site that is off ridge lines and focal areas


Choosing a site that is below ridgelines and greater distance will reduce the impact from key view points
Greater distance, low overall height, less roof bulk, generous eaves, dark colours, non reflective surfaces and veg 'softening' will all help reduce impact.
Take advantage of local topography to reduce the visibility. Curved building forms (eg roof) will visually appear more natural, reduce impact


The best way to minimise impact is through siting. If possible choose a site that hides the position and views sought but is unseen from key view points.
over the crest of the ridge

APPENDIX 2 - LANDSCAPE CHARACTER TYPES

The following Landscape Character descriptions of the Shark Bay Peninsulas Landscape Character Type, including the Edel and Peron Sub-types, are taken from Reading the Remote, Landscape Character Types of Western Australia (CALM, 1994).

Shark Bay Peninsulas Landscape Character Type

To the south of Carnarvon and emerging north of the Kalbarri Sandplain Landscape Character Type, the paired peninsulas and elongated islands which form the Shark Bay Landscape Character Type are an easily identifiable landmark on the western coastline. Two distinct Landscape Character Sub Types occur within the realm of Shark Bay: the Edel Sub Type which consists of the western peninsula, and the Peron Sub Type, the eastern peninsula dividing Shark Bay.

Distinguishing Features

Reaching into the encompassing mosaic of royal blue and turquoise waters of the Bay, the peninsulas feature a very gently inclined, subdued terrain overlain with low domed, windswept dunes of pale cream and rich terracotta shaded sands. The abrupt western coastal fringe of Shark Bay features the northern-most extension of the rugged, pale grey limestone of the Zuytdorp Cliffs.

Covering this low, open terrain in a rich green, olive and pale khaki medley of shades is a low, dense bushy heath, interspersed with many areas of, pale tufted grasses. Contrasting distinctly with this olive blanket are rounded or irregularly shaped salt pans, or birridas as they are known here, surrounded by an enclosure of low, domed dunes, and covered in a patchy cover of red-brown Samphire. A feature of southern fringe of this Character Type is a unique tree heath vegetation, and a predominance of remnant grey twigs and sinuous branches is scattered over the entire area.

Shark Bay is a major transitionary zone, divided both botanically and climatically by a visual demarcation known as the 'Mulga-Eucalypt Line'. The division dissects the area in two, denoting the place where the cooler, moist influences of the south-west of the State meet those of the arid north, and where the Eucalypts give way to the Wattles.

Pastoralism is the dominant land use of this region, with many extensive stations stocking sheep and cattle occurring over the entire area. Tourism is also prevalent, with the many unique natural features such as the Hamelin Pool stromatolites, as well as the wild dolphins at Monkey Mia, attracting a great number of local, interstate and international visitors. A large network of professional fishermen and numerous amateurs, work in and around the precincts of the transparent Shark Bay waters, attracted by a yield which varies from king prawns to marlin.

The Nanda people, the indigenous population of this area, worked with early pioneers and pastoralists, and in the pearling industry which once thrived here. Today they have integrated into the Shark Bay community while maintaining a close bond with the area.

Shark Bay was inscribed into the World Heritage List in 1991, including an area which stretches from the vicinity of the Zuytdorp Nature Reserve to south of Carnarvon, in the recognition of this areas outstanding universal value, and for the protection and conservation of its internationally significant natural heritage.

Climate

The Shark Bay Peninsulas Landscape Character Type is straddled by two climatic zones. The western half of the region reflects the influence of the south-west mediterranean climate, while the eastern half more closely follows an arid climatic pattern. As a result, the eastern region is marginally warmer and drier.

Overall, however, this area is characterised by a hot, dry climate with the gently inclined, exposed landscape offering little relief or protection from the unrelenting glare of the summertime heat and prevailing southerly sea breezes which help to moderate the warmth. The summertime temperatures in this region range from 36°C maximum to a 20°C minimum at Hamelin Pool, with a 31°C maximum and a 21°C minimum in Denham. The dry, glaring heat of summer is tempered by daily sea breezes and strong southerlies which can prevail for several days, and occasional summer cyclones can generate gale force winds.

Winter in Shark Bay is mildly temperate, attracting an exodus of visitors from cooler parts of the State. Many calm, clear days and cool nights are a feature, interrupted occasionally by brisk north-easterly winds. Hamelin Pool Station and Denham both experience a winter maximum of 21°C and a 10°C minimum.

The fine winter days are interrupted by rain from May to September although less than forty days of rain are generally experienced throughout the year. The annual precipitation levels decrease from west to east across the Character Type, with Carrarang Station receiving 278mm, Denham 225mm, and Hamelin Pool Station 210mm. The annual precipitation levels are deceiving in this region, however, as their benefits are generally counteracted by the evaporation rate which, at 2000mm per annum, is almost ten times greater than the regular rainfall received. Erratic storms and scattered falls of rain also occur in summertime associated with the occasional fierce cyclones which sweep over the area at sporadic intervals.

Edel Landscape Character Sub Type

The elongated Edel Peninsula which forms this Sub Type emerges from the western coastline and stretches north across the blue water to three islands, collectively forming the barrier which protects the calm, clear waters of Shark Bay from the punishing swells of the Indian Ocean. Dirk Hartog Island is separated from the northern tip of the Edel Peninsula by Blind Strait and adjoining South Passage, and from the slender Bernier and Dorre Islands to the north by the broad waters of the Naturaliste Channel.

Influenced by the dominant limestone geology underlying this Sub Type, Edel Peninsula and the islands consist of gently inclined to near level terrain which is overlain in the northern half of the region by a series of pale windswept dunes. Shaped by the prevailing southerly winds into forming semi-parallel ridges, the dunes are generally oriented in a north-south direction. This arrangement is imitated by the tapered Bellefin and Heirisson Prongs and the Cararang Peninsula, the ragged extensions of the Edel Peninsula, which reflect the same orientation as the desolate, windswept dunes.

Occurring in isolated areas over the peninsula and surrounded by an enclosing amphitheatre of domed dunes, are highly saline depressions known locally as birridas. These rounded and elongated gypsum filled pans can vary from a few metres to a few hundred metres in length, and generally feature a low, raised platform which is ringed by a pale, moat-like depression. Birridas are often made conspicuous amongst the olive heath, with the bright gypsum

encircling the centre platform and the concentration of the red-brown salt tolerant Samphires (*Halosarcia spp.*) growing over their surface.

Bordered on the western margin by the abrupt, rugged northerly extension of the imposing Zuytdorp Cliffs, the peninsula slopes down gently to the eastern fringe, to meet the smooth, open waters of Henri Freycinet Harbour and quiet turquoise waters enclosed within the loops and inlets. The sheer to steeply angled pale grey rocky slopes of the Zuytdorp Cliffs meet the white foaming breakers of the Indian Ocean which surge around the boulder-strewn cliff base. Continuing north in a near straight unbroken line from the mouth of the Murchison River at Kalbarri, the horizontally striated cliffs are unexpectedly interrupted at Zuytdorp Point. This prominent headland protects the long, smooth beaches and steeply sloping frontal dunes of Dulverton Bay (or False Entrance), at Epineux (or Crayfish) Bay, and at Thunder Bay, before continuing on northwards to the rocky headland and boulder strewn beaches of Steep Point, the westernmost extension of the Australian mainland.

These rugged grey limestone cliffs also form the western edge of Dirk Hartog Island, gradually increasing in height from north to south. Bernier and Dorre Islands feature the cliffs as low wave-cut platforms fringing the western edge of their shores. A low, abrupt limestone platform also fringes the eastern perimeters of the islands, marking the extent of these low, desolate fragments of land.

The sensitive nature of this wind buffeted, exposed coastline is exhibited by the extensive, elongated blowouts of bright, pale sand which are scattered along the length of the western border of the Sub Type. Again reflecting the characteristic north-south orientation, a large, pale blowout occurs at Dulverton Bay, extending a great distance up Bellefin Prong, and another, which completely dissects Dirk Hartog Island, from the south of Herald Heights reaching north across the island to spill into the clear blue waters of Tetrodon Loop. In some areas, eroding blowouts leave formerly geometric lines of upright wooden fences to subside drunkenly down encroaching dunes, and encourage localised areas of barren, desert-like landscapes with pale, crescent dunes such as near Sand Hill Well on Bellefin Prong and inland from Epineux (Crayfish) Bay.

In scattered places along the eastern margin of the Edel Peninsula Sub Type are isolated patches of burnt terracotta shaded sands, often overlain by large fragments of brightly contrasting angular cream limestone rubble. These areas exhibit tracts of underlying sandstone which have broken through the surface capping of limestone to reveal distinct, warm shades, such as east of Disappointment Loop near Nambathana Well.

Reaching into the smooth waters of Henri Freycinet Harbour and Freycinet Reach are the prongs and peninsulas of the eastern shore of the Edel Peninsula. The elongated extensions of land are separated by long, shallow bodies of calm waters including Useless Inlet, Brown Inlet, Depuch Loop and Disappointment Loop. These inlets are generally bordered by bright, low sandy beaches interrupted by abrupt rough limestone headlands, steeply domed, olive heath cloaked sand dunes such as at Brown Inlet, and prominent horizontal limestone bench platforms which rim many of the inlets above the present shore levels. The southern ends of the inlets feature broad intertidal flats which appear as wide expanses of pale, bright sand exposed at low tide, often moulded into rippled indentations accentuated by discarded, brown strands of seagrass. This pattern continues around the sweeping shores of Henri Freycinet Harbour to the limitations of the Sub Type Boundary.

Once mined for the large deposits of guano, small, low limestone islands including Salutation and Baudin Island are scattered in the southern reaches of the quiet harbour waters, playing host to the thousands of agile seabirds which inhabit this region.

Cloaking this gently inclined, windswept terrain under broad, encompassing, cloud-streaked skies are extensive areas of low heath, dominated by the domed shapes of the dark, rich green Umbrella Bush (*Acacia ligulata*). Almost appearing prostrate in areas over the low-lying terrain, the heath varies in height due to exposure to the buffeting winds. The vegetation varies from the low, dense mats and pincushion-like plants clinging steadfastly to the exposed, rugged cliff faces, to the taller areas of the northern remnants of a unique vegetation formation known as tree heath, occurs along the south eastern fringes of Henri Freycinet Harbour, extending around the sweeping shores to part of the western edge of the Peron Peninsula to Nanga Station.

The low, pale olive vegetation which is scattered over the rubble strewn edge of the abrupt Zuytdorp Cliffs includes the mat-like Seaheath (*Frankenia pauciflora*) and Variable Groundsel (*Senecio lautus*). These small cushion plants merge gradually into a taller, denser area of vegetation occurring in more protected areas away from the cliff face, including the succulent bright green creeper Angular Pigface, (*Carpobrotus aequilaterus*), Southern Diplolaena (*D. dampieri*), soft grey Coastal Daisy Bush (*Olearia axillaris*), Thick-leaved Fan Flower (*Scaevola crassifolia*), and Saltbush (*Rhagodia sp.*).

The bright green domed shape of the Umbrella Bush features in many areas over the Sub Type, varying from low dense bushes, to tall thickets which enclose the long views over the gentle terrain. It appears in some areas as a dense, almost homogenous cover over the pale yellow-pink sand, while in others they are conspicuous as isolated domes of bright green with other low shrubs and grasses of pale olive and khaki yellow shades which are also common. Present everywhere is a scattered cover of dead twigs and sinuous grey branches strewn over the pale sandy soils. Bare grey stems beneath bushes tipped with green foliage also add to the grey shades which form part of this landscape.

Other shrubs scattered over the gently inclined land include the fuzzy leaved Sand Hibiscus (*Alyogyne pinonianus*) which is decorated with red hearted mauve blooms over most of the area, except on the islands where they produce bright white flowers. Bushy Coastal Coppercups (*Pileanthus limacis*) with pale pink flowers, and low, dense bushes of Tangling Melaleuca (*M. cardiophylla*), with bushy Jams (*Acacia acuminata*), Horse Mulga (*A. ramulosa*), spreading Kurara (*A. tetragonophylla*), and Summer Scented Wattles (*A. rostellifera*) also found amongst the heath.

Some areas over this Sub Type are quite open and seeming almost bare of vegetation but for a few isolated dark green domed bushes and a cover of brown khaki tufted grasses, and soft, pale yellow-khaki shaded shrubs. Broad areas of introduced grasses such as Wild Oats (*Avena fatua*) occur in scattered locations such as on the western shore of Brown Inlet and encompassing Tamala Station. These occur in large patches and contrast distinctly with the olive heath vegetation on the fringing edges. Other grasses scattered over this area include Buffel Grass (*Cenchrus ciliarus*) and pale green hummocks of Spinifex (*Triodia sp.*).

The windswept areas of pale mobile sands and blowouts feature very little forms of vegetation, mostly seen as isolated islands of growth in a sea of pale sand. Low, rounded bushes, dried grey grasses and small shrubs cling steadfastly to the shifting sands. Bushes on the blowout fringes send out long thin root fingerlings, searching for a stable hold.

The protected coastal fringes of the peninsulas see a continuation of the green domes of Umbrella Bush, mixed with Jam, Silver Saltbush (*Atriplex bunburyana*) and Green Cassia (*C. chatelainiana*). Low, scrubby Saltbush and Samphire are found commonly over the low-lying areas around the heads of inlets and occasionally, stilted, lush White Mangroves (*Avicenna marina*) are seen fringing broad tidal flats.

From east of Tamala Station and extending around the fringing edge of Freycinet Harbour to Nanga Station is a unique form of heath vegetation. In this area, the heath appears taller than elsewhere and is known as tree heath, enclosing the normally open, distant views over the near level terrain. Umbrella Bush is again predominant, seen as dense sprays of grey stems, shaded by the thin canopy of leaves which sprout on their tips. Combined with these are the dark, serrated leaves of the spreading Ashby's Banksia (*B. ashbyi*), Horse Mulga (*Acacia ramulosa*), bushy Chenille Honeymyrtle (*Melaleuca huegelii*), Gordon's Grevillea (*G. gordoniana*) and wispy mallees (many-trunked Eucalypts) which are often dominant on sand hills, including the ribbony trunk of the Dongara Mallee (*E. dongarraensis*), lustrous leaved Mallalie (*E. eudesmoides*), and the Narrow-leaved Red Mallee (*E. foecunda*).

The raised platform in the centre of the depressed birridas scattered over this Sub Type are often dotted with sparse, isolated shrubs and patches of brittle, dead vegetation. Grey Saltbush (*Atriplex cinerea*) and red-brown shaded Samphires (*Halosarcia spp.*) dominate here, with the pale Grey Saltbush featuring around the higher edges with a predominance of bushy Sandalwood trees (*Santalum spicatum*) amongst the olive vegetation on the fringing dunes.

Birridas are the only terrestrial waterform in this region, due to the high porosity of the pale yellow sandy soils and the extreme evaporation rate experienced in this area. Water pools in the birridas after good falls of rain and remain filled for several months.

The marine environment surrounding the ragged, elongated peninsulas and islands is a dominant factor in the landscape, featuring in many views. The tranquil, limpid waters of the protected inlets and harbour reflect a mosaic of rich royal blue and turquoise. Scattered areas of dark shades belie clumps of seagrass concealed in the shallow, clear water. The dynamic, surging swells of the Indian Ocean on the western perimeter send pounding breakers against the rugged, steadfast slopes of the Zuytdorp Cliffs, fringing the boulder-strewn bases with a border of white foam.

The pastoral industry forms the most widespread land use in this Sub Type, including Dirk Hartog Island, predominantly for grazing of sheep for wool production, with only Tamala Station stocking cattle. The stations were established in this region before the turn of the century and today, signs of their activities form a common part of this landscape, from the localised, open patches of exotic grasses to the upright, steel windmills. The geometric windmills are a familiar sight scattered over this region, and are often situated in birridas, standing guard over wells and corrugated iron or stone water tanks. Numerous linear tracks radiate from the wells, often eroding the land in their near vicinity from the trampling of sheep and the many feral goats which have become a problem in the region.

Linear rows of grey wooden posts denote the fence lines which dissect the low-lying terrain. The effect which grazing has had upon the native vegetation in some areas is made obvious along fence lines which divide stocked and unstocked areas of land, leaving a noticeable, linear division known as the fence-line effect.

An extensive solar salt project has been established at the northern region of Heirisson Prong, utilising the calm, highly saline waters of the southern region of Useless Inlet and Useless Loop. The small township at Useless Loop is associated with this industry for the extraction of sea salt by evaporation, leaving vast, flat areas of dazzling white salt crystals remaining in the evaporite pans, separated from the contrasting shimmering blue waters of Freycinet Reach and Useless Inlet by long, linear barrages. A loading facility for the salt occurs at Slope Island, near Useless Loop. It is joined to the mainland by an elongated causeway, featuring a large, domed stockpile of bright white salt which is visible from a great

distance. Gypsum, previously mined from birridas near Bibby Giddy, was also stockpiled here.

The calm, clear waters of the protected bay, and the surging swells of the Indian Ocean produce an abundance of fish, and is one of the best prawn fisheries in the state, resulting in a large fishing industry in this area. A large number of amateur fishermen are also attracted to this area, and the well-used track which snakes over the dunes amongst the olive heath to Steep Point exhibits its popularity for good recreational fishing from the rugged limestone headlands and beaches.

The cultural and natural significance of this region is reflected by the amount of conservation zones and reserves occurring within its boundaries. The Edel Sub Type features many special areas within its realms. Encompassing and protecting much of the glassy, turquoise waters of the Freycinet Reach and Henri Freycinet Harbour is the Shark Bay Marine Park, including the eastern shores of Dirk Hartog Island. Several small islands enclosed within Henri Freycinet Harbour, including North and South Guano Islands, Salutation Island and Egg Island are reserves for the conservation of fauna and flora. Guano mining was formerly a widespread activity in this region, including these islands, but today the source is all but depleted.

The residents of Useless Loop have created a special conservation reserve on the tip of Heirisson Prong for the protection of the native animals and plants of this region, dissecting this elongated projection of land with a special anti-vermin fence.

The historical significance of Cape Inscription at the northern tip of Dirk Hartog Island has been protected within a reserve. It was here in 1616 that Dirk Hartog became the first recorded European to set foot upon Australian soil, noting the occasion with an inscribed platter on a post.

Marking the broad waters of the Naturaliste Channel are two erect lighthouses, one on the southern tip of Dorre Island and the other at Cape Inscription, flanked by the abandoned stone buildings of the keepers' residence. The hospital building remnants which were once the hosts to contagiously diseased Aboriginies early this century still remain on Dorre and Bernier Islands, which are now nature reserves, protecting rare and endangered faunal species.

Peron Landscape Character Sub Type

To the east of the Edel Sub Type, dividing the quiet waters of Shark Bay and creating a series of broad, shallow, almost landlocked bodies of water, is the Peron Peninsula which forms this Sub Type. The Peron Peninsula, together with the smaller, tapered Nanga Peninsula, and Faure and Pelican Islands, are dominated by a gentle, subdued sandplain of rich terracotta sandy soils overlain with low, scattered dunes under broad, blue skies with long, open views.

The rich terracotta shaded sandy soils originate from the red sandstone underlying most of this region, becoming slightly paler to the south of the narrow arm of the Taillefer Isthmus below Lharidon Bight. An area of limestone on the western margin stretches from near Nanga Station northwards to Denham, and broadening between Eagle and Goulet Bluffs. This area also features paler, creamy grey to pink soils overlying the subdued terrain, interrupted by a few rough limestone outcrops and pale scattered rubble in isolated patches.

Encircled by an enclosure of terracotta dunes are numerous flat-floored sea-level depressions or birridas which are predominant in this Sub Type. Varying in size from a few metres to a

few hundred metres, the large flat-floored salt pans are generally quite irregular in size, such as Lake Montbazin at the northern tip of Peron Peninsula, and the smaller birridas are regularly oval or round. All are surfaced with a hard crust of fine, bright white ring of gypsum which encircles a slightly raised platform in the centre. A few of the elongated birridas feature narrow channels to link with others along the dune depressions, or in the case of Big Lagoon near Cape Lesueur and Little Lagoon near Denham, unite with the extensive waters of Freycinet Reach.

The placid, crystalline waters within Shark Bay reflect rich aqua greens and blues under clear, open skies, often merging as one with the hazy horizon. Contrasting abruptly with the shades of the encompassing marine environment, the terracotta terrestrial land of the peninsulas slopes gently toward the shores of the bay. Fringed in many places by long, low curved beaches of bright, bleached sands, such as at Monkey Mia, the beaches often take on the aspect of a long, thin, horizontal slice of dazzling white which extends to the far distance, sandwiched between mirrored blue waters and wide azure skies.

Sharply distinct from the smooth, pale beaches and the limpid waters are the abrupt horizontally bedded, red sandstone cliffs which fringe parts of the peninsula, such as Red Cliff Bay, adding another element to the definite horizontal layering of colours. Abrupt, rough grey limestone cliffs feature on the western margin of the Peron Peninsula south of Denham, including Eagle Bluff, named for the predominance of these majestic sea birds in this area.

Lining the southern shores of Lharidon Bight is a unique area of beach which is comprised entirely of small, white *Fragum* shells. Known for this reason as Shell Beach, these dazzling shores trace a long, thin horizontal line around the gently curved beach of the embayment.

Shallow, submerged bars of sand known as the Faura Sill extending from Faure Island and Petit Point westward to the mainland, create a hypersaline environment within the quiet, shallow waters of Hamelin Pool. Thriving in these harsh conditions are Stromatolites, ancient life forms which vary in appearance from bulbous grey domes to spongy black streaks to mud-like mats, revealed by the receding water at low tide. These unique structures, formed by colonies of cyanobacteria (species of algae), are an internationally significant collection, also appear as an uneven grey 'rock platforms' dusted with golden brown shades on their upper surfaces.

The shores of Hamelin Pool also feature patches of beaches composed of the same small, bright white *Fragum* shells interspersed with areas of grey, gravelly sand and the mud-like algal mats which often occur in the vicinity of the Stromatolites.

Fringing many areas around the peninsulas are broad tidal flats with the receding waters of low tide revealing bare expanses of sand. Waterformed ripples of sculpted sand often texture the broad, exposed beaches, littered with brown strands of discarded seagrass and accentuated by the golden light of evening.

Interrupted by the pockmarked indentations of the low-lying gypsum filled birridas, the Peron Sub Type is cloaked in a mantle of a low olive shrublands, dominated by the spreading Horse Mulga (*Acacia ramulosa*) or Wanyu, as it is known locally. These low shrublands blanket the gently undulating terrain almost evenly, with few apparent emergents, but appearing open enough to reveal contrasting shades of the underlying rich terracotta soils. Low, patchy thickets occur in isolated, more protected areas, featuring Wanyu with False Paperbark (*Lamarchea hakeifolia*). Growing amongst the Wanyu are other Wattles, including the darker green low domed shapes of Umbrella Bush (*Acacia ligulata*), stiff, spreading Kurara

(*A. tetragonophylla*), with Limestone Wattle (*A. sclerosperma*), and scrambling over these low bushes in a tangled green vine is the bright purple and yellow Shark Bay Daisy (*Brachycombe latisquamea*).

Umbrella Bush is more predominant in the southern region of the Sub Type interspersed with scattered areas of slightly taller shrubland, including Ashby's Banksia (*B. ashbyi*), Beard's Mallee (*Eucalyptus beardiana*), Dongara Mallee (*E. dongarraensis*), and False Paperbarks, all northern remnants of the unique tree heath vegetation formation occurring more predominantly to the south of the Sub Type.

Pale domes of Spinifex hummock grassland (*Triodia plurinervata*) with patches of Buffel Grass (*Cenchrus ciliarus*), and sparse areas of Wanderri (*Eragrostis sp.*), are scattered over the sandy terracotta soils amongst the spreading Wanyu and low, domed Umbrella Bush.

The limestone areas in the southern region of the Peron Sub Type are dominated by Spinifex, interrupted by small, contrasting shrubs scattered over the gentle terrain, including Umbrella Bush, Limestone Wattle and Broom Ballart (*Exocarpus sparteus*).

The bright, gypsum filled birridas scattered over many areas of this Sub Type are highly conspicuous amongst the olive shrubland and sandy terracotta soils. These saline depressions are covered with a brown-red shaded blanket of Samphires (*Halosarcia sp.*) and Sea Heath (*Frankenia pauciflora*), or occasionally appear denuded of vegetation, with a dusty ring of Grey Saltbush (*Atriplex cinerea*) featured around the edges, with bushy olive Sandalwood (*Santalum spicatum*) amongst the low heath on the fringing gypsum dunes.

At Petit Point, the low-lying, broad tip of the Nanga Peninsula, is an isolated area of Bluebush (*Maireana sp.*). More of these salt tolerant vegetation species continue around the coast to cloak the fringes of the hypersaline Hamelin Pool. These low shrubs growing amongst sparse, scattered Samphire flats, include silvery Cotton Bush (*Ptilotus obovatus*), Tall Saltbush (*Rhagodia eremaea*), Currant Bush (*Scaevola spinescens*) and Earlobe Saltbush (*Chenopodium gaudichaudianum*). Many of the regularly inundated tidal flats fringing these shores feature scattered thickets of the spindly, stilt-like White Mangrove (*Avicenna marina*).

Much activity has taken place in this region since the middle of last century when a guano mining industry was established, closely followed by Sandalwood cutters, chasing the valuable aromatic wood for export. When it was discovered that pearl oysters were bountiful in the blue green waters, a small village called Freshwater Point (later to be called Denham) was established to cater for the influx of population to the area. Chinese, Malays and Aboriginies were involved with the hunt for the oysters, often as the divers from the numerous small pearl luggers which proliferated.

With the decline of the pearling industry this century, the professional fishing industry took its place, profiting from the bountiful waters around the peninsulas and the special fish and prawn nursery area amongst the extensive sea grass beds in the Bay. Today, fishing is still one of the largest industries and recreational pastimes of the region, with numerous bright craft dotted over the Bay, leaving long stripes of reflected colour across the smooth, mirrored waters. Pearling still exists in this Sub Type, in the form of several oyster leases which are scattered over the region, such as in Red Cliff Bay.

All the land in this region, including Faure Island, was taken up for pastoral leases before the end of last century and is still extensive today, mostly stocked with sheep for wool, a few cattle and numerous feral goats, which are utilised for their fleeces. Long, geometric lines of upright grey wooden fence posts delineate paddock and property boundaries. Differences to

the native vegetation and land between the stocked and unstocked paddocks are often obvious along the fenced boundary, known as the fence-line effect. Some areas of degradation especially around the watering points are apparent in this Sub Type, such as south-east of Eagle Bluff. These are seen as patches of exposed, trampled sandy soils, generally bare of vegetation except for a few isolated remnant domed shrubs, overshadowed by the geometric steel windmills which stand erect over the corrugated iron and stone water tanks.

Tourism is the most predominant land use in this area, with thousands of visitors arriving annually, drawn by the unique attraction of the opportunity to experience the special interaction with the party of wild dolphins at Monkey Mia.

Several special conservation zones occur over this Sub Type, protecting its unique features. The northern half of Peron Peninsula between Denham and Monkey Mia was formerly grazing land, but is now preserved as the Francois Peron National Park. The unique Stromatolites are protected up to the high water mark inside the Hamelin Pool Marine Nature Reserve, and the royal blue and turquoise mosaic of the waters surrounding the peninsulas are encompassed within the extensive Shark Bay Marine Park.

Denham is the only town in the Sub Type, with many of the original buildings remaining here constructed from a unique rough, creamy grey shell block material taken from a special shell block quarry at Hamelin Pool, where the *Fragum* shells deposited over time have compacted into a solid mass to a depth of up to ten metres. Smaller tourist centres are established at Hamelin Pool and Monkey Mia to cater for the expanding industry.

Edel Sub Type - Aesthetic Character Summary

LANDFORM

Form: gently inclined, near level terrain; domed dunes; abrupt Zuytdorp Cliffs; tapered Bellefin and Heirisson Prongs; ragged peninsulas; rounded birridas; sheer to steeply angled slopes of cliffs; prominent headland of Zuytdorp Point; steeply sloping frontal dunes; low, wavecut limestone platforms; low fragments of land; abrupt limestone headlands; broad intertidal flats; small, low limestone islands; flat-floored birridas;

Line: semi-parallel dune ridges and peninsulas oriented north-south; elongated birridas; near straight, unbroken like of Zuytdorp Cliffs; horizontally striated cliffs; long beaches; elongated blowouts; crescent dunes; prominent horizontal limestone bench platforms; sweeping shores of Henri Freycinet Harbour; elongated peninsulas; parallel ripples of sand;

Colour: pale grey limestone; horizontally striated cliffs; bright, pale sand; burnt terracotta shaded sands; cream limestone rubble; bright beaches; pale yellow-pink sand; pale yellow sandy soils;

Texture: rugged Zuytdorp Cliffs; rocky slopes; boulder strewn cliff base; smooth beaches; rocky headland of Steep Point; boulder strewn beaches; large fragments of angular limestone rubble; sandy beaches; rippled indentations in intertidal flats;

Scale: enclosing amphitheatre of dunes surrounding birridas; wide expanses of pale, bright sand of tidal flats; broad, encompassing, cloud-streaked skies; broad, long, open views over landscape sometimes interrupted at mid to background by low domed dunes;

VEGETATION

Form: low heath; domed Umbrella Bush; low, dense mat plants; pincushion-like plants; tree heath; tall thickets; spreading Kurara; spinifex hummocks; isolated islands of vegetation on mobile dunes; low, rounded bushes; spreading Ashby's Banksia;

Line: dead twigs and sinuous branches scattered over ground; bare vertical and diagonal sprays of stems; long root fingerlings on blowouts; stilted mangroves; thin canopy of leaves; wispy mallees; ribbony trunk of Dongara Mallees;

Colour: red-brown Samphires; brown strands of seagrass; dark, rich green Umbrella Bushes; pale olive vegetation; bright green Pigface; soft grey Coastal Daisy Bush; khaki yellow shades; grey stems tipped with green foliage; red hearted mauve or white blooms of Sand Hibiscus; pale pink Coastal Coppercups; brown-khaki shaded shrubs; contrasting shades of introduced grasses and heath; pale green Spinifex hummocks;

Texture: succulent Pigface; grey twigs and dead branches; fuzzy leaved Sand Hibiscus; tufted grasses; scrubby Saltbush; serrated leaves of Ashby's Banksia; lustrous leaved Mallalie; scattered patches of dead vegetation scattered over birridas;

Scale: taller thickets and tree heath enclose views in some areas, otherwise views only limited by landform; vegetation in many areas appears prostrate over the gently inclined landform;

WATERFORM

Form: broad waters of Naturalist Channel; shallow waters of Shark Bay; broad, tidal flats; tranquil waters; dynamic, surging swells; rounded birridas;

Line: elongated birridas; long shallow fingers of water; border of white foam at base of cliffs;

Colour: blue waters; clear, turquoise waters of the Bay; white, foaming breakers; turquoise fingers of water; limpid waters; royal blue and turquoise mosaic; shimmering blue waters; dark shades denoting seagrass;

Texture: calm; punishing swells of Indian Ocean; smooth, open waters of Henri Freycinet Harbour; foaming breakers at base of cliffs; glassy surface of Bay;

LAND USE

Form: broad, open areas of introduced grasses; corrugated iron tanks; flat evaporite pans; large, domed stockpiles of salt and guano on Slope Island; building remnants on Bernier and Dorre Islands;

Line: upright windmills; geometric windmills; horizontal line of corrugated iron tanks; linear tracks radiating from wells; linear rows of wooden posts; geometric fencelines; drunkenly subsiding fencelines; fence-line effect; long, linear barrages across evaporation pans; elongated causeway; tracks snaking over dunes; line of anti-vermin fence; erect lighthouses;

Colour: grey wooden fence posts; dazzling white salt crystals in evaporite pans and stockpiles;

Texture: wooden fences; steel windmills; corrugated iron tanks; stone water tanks; stone buildings of keepers' residences;

Edel Sub Type - Aesthetic Character Summary

LANDFORM

Form: gently inclined, near level terrain; domed dunes; abrupt Zuytdorp Cliffs; tapered Bellefin and Heirisson Prongs; ragged peninsulas; rounded birridas; sheer to steeply angled slopes of cliffs; prominent headland of Zuytdorp Point; steeply sloping frontal dunes; low, wavecut limestone platforms; low fragments of land; abrupt limestone headlands; broad intertidal flats; small, low limestone islands; flat-floored birridas;

Line: semi-parallel dune ridges and peninsulas oriented north-south; elongated birridas; near straight, unbroken like of Zuytdorp Cliffs; horizontally striated cliffs; long beaches; elongated blowouts; crescent dunes; prominent horizontal limestone bench platforms; sweeping shores of Henri Freycinet Harbour; elongated peninsulas; parallel ripples of sand;

Colour: pale grey limestone; horizontally striated cliffs; bright, pale sand; burnt terracotta shaded sands; cream limestone rubble; bright beaches; pale yellow-pink sand; pale yellow sandy soils;

Texture: rugged Zuytdorp Cliffs; rocky slopes; boulder strewn cliff base; smooth beaches; rocky headland of Steep Point; boulder strewn beaches; large fragments of angular limestone rubble; sandy beaches; rippled indentations in intertidal flats;

Scale: enclosing amphitheatre of dunes surrounding birridas; wide expanses of pale, bright sand of tidal flats; broad, encompassing, cloud-streaked skies; broad, long, open views over landscape sometimes interrupted at mid to background by low domed dunes;

VEGETATION

Form: low heath; domed Umbrella Bush; low, dense mat plants; pincushion-like plants; tree heath; tall thickets; spreading Kurara; spinifex hummocks; isolated islands of vegetation on mobile dunes; low, rounded bushes; spreading Ashby's Banksia;

Line: dead twigs and sinuous branches scattered over ground; bare vertical and diagonal sprays of stems; long root fingerlings on blowouts; stilted mangroves; thin canopy of leaves; wispy mallees; ribbony trunk of Dongara Mallees;

Colour: red-brown Samphires; brown strands of seagrass; dark, rich green Umbrella Bushes; pale olive vegetation; bright green Pigface; soft grey Coastal Daisy Bush; khaki yellow shades; grey stems tipped with green foliage; red hearted mauve or white blooms of Sand Hibiscus; pale pink Coastal Coppercups; brown-khaki shaded shrubs; contrasting shades of introduced grasses and heath; pale green Spinifex hummocks;

Texture: succulent Pigface; grey twigs and dead branches; fuzzy leaved Sand Hibiscus; tufted grasses; scrubby Saltbush; serrated leaves of Ashby's Banksia; lustrous leaved Mallalie; scattered patches of dead vegetation scattered over birridas;

Scale: taller thickets and tree heath enclose views in some areas, otherwise views only limited by landform; vegetation in many areas appears prostrate over the gently inclined landform;

WATERFORM

Form: broad waters of Naturalist Channel; shallow waters of Shark Bay; broad, tidal flats; tranquil waters; dynamic, surging swells; rounded birridas;

Line: elongated birridas; long shallow fingers of water; border of white foam at base of cliffs;

Colour: blue waters; clear, turquoise waters of the Bay; white, foaming breakers; turquoise fingers of water; limpid waters; royal blue and turquoise mosaic; shimmering blue waters; dark shades denoting seagrass;

Texture: calm; punishing swells of Indian Ocean; smooth, open waters of Henri Freycinet Harbour; foaming breakers at base of cliffs; glassy surface of Bay;

LAND USE

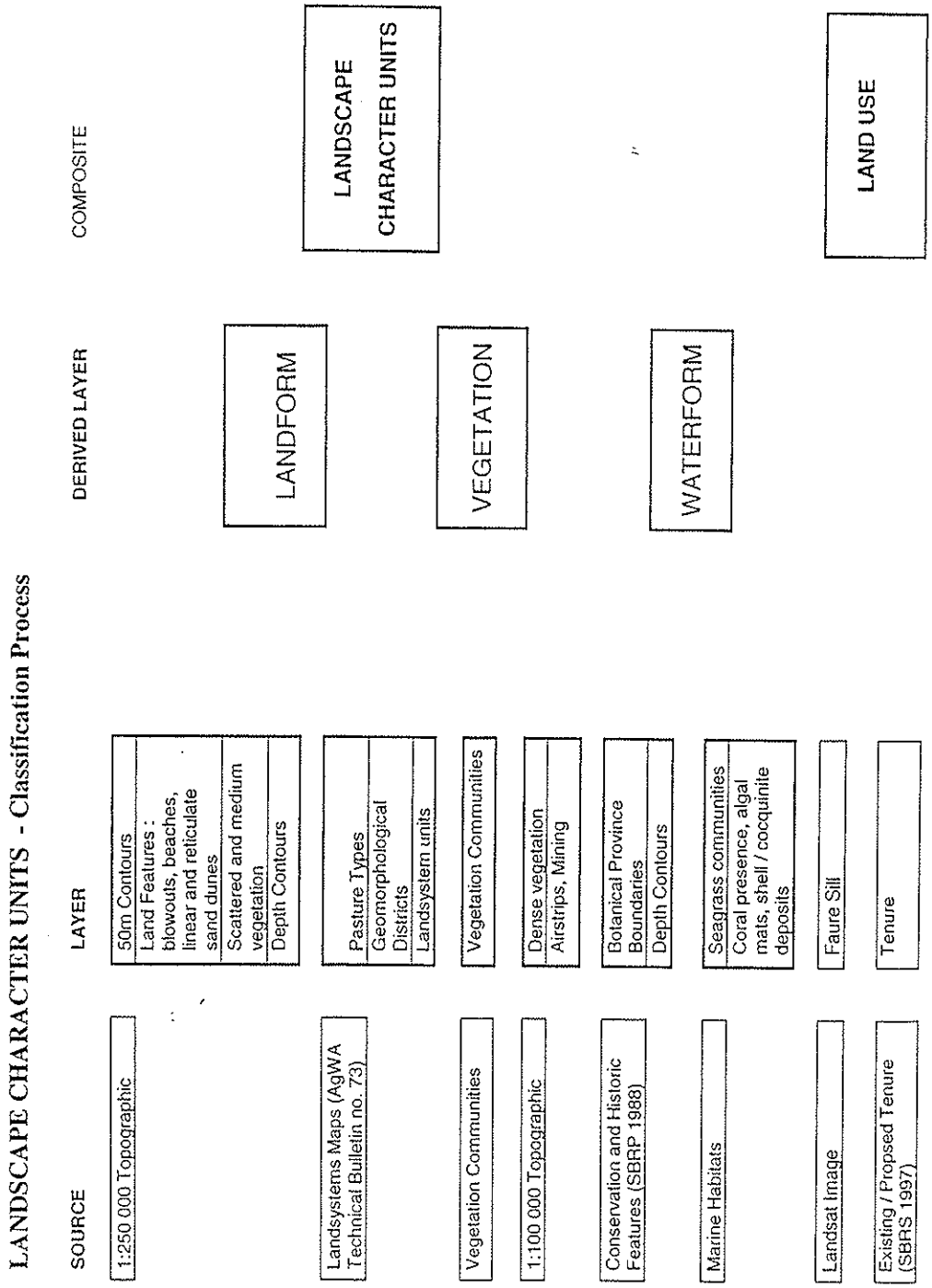
Form: broad, open areas of introduced grasses; corrugated iron tanks; flat evaporite pans; large, domed stockpiles of salt and guano on Slope Island; building remnants on Bernier and Dorre Islands;

Line: upright windmills; geometric windmills; horizontal line of corrugated iron tanks; linear tracks radiating from wells; linear rows of wooden posts; geometric fencelines; drunkenly subsiding fencelines; fence-line effect; long, linear barrages across evaporation pans; elongated causeway; tracks snaking over dunes; line of anti-vermin fence; erect lighthouses;

Colour: grey wooden fence posts; dazzling white salt crystals in evaporite pans and stockpiles;

Texture: wooden fences; steel windmills; corrugated iron tanks; stone water tanks; stone buildings of keepers' residences;

APPENDIX 3 – LANDSCAPE CHARACTER CLASSIFICATION PROCESS



APPENDIX 4 – VISITOR SURVEY FORM

DEPARTMENT OF CONSERVATION AND LAND MANAGEMNET
Shark Bay Landscape Assessment
Visitor Survey

[It is very important NOT to say more than this introduction at the start of the interview]

Hello/Good Morning/Good Afternoon

My name is [NAME] *and I work for the Department of Conservation and Land Management. We are currently conducting a survey of visitors to Shark Bay and wondered if you have a few spare minutes and would like to participate.*
[RESPONSE]

Thanks - we appreciate your interest.

The survey consists of two parts. First I want to ask you some questions about Shark Bay. Then I would like you to look at some photographs. If you want to know more about the survey there will be an opportunity after we have finished the survey.

OK, I'll now ask the questions.
[QUESTIONS]

1a. *Which do you think are the most important places or features of the Shark Bay area? You can name up to 3.* [LIST IN LEFT HAND BOX]

1b. *Can you please explain why you chose these.* [LIST IN RIGHT HAND BOX]

1c. *Which places in the Shark Bay area have you visited?*

2a. *Which places or features have you enjoyed the most? You can name up to 3.*
[LIST IN LEFT HAND BOX]

2b. *Can you please explain why you chose these.* [LIST IN RIGHT HAND BOX]

3. *How important to your enjoyment of Shark Bay is the natural beauty of the area?* [TICK]

Extremely important ❒
Important ❒
Not Important ❒

4. *Which places or features of the Shark Bay area do you think are the most beautiful?*

5. *Which places or features of the Shark Bay area do you think are the least beautiful?*

6. **How would you rate the beauty of the Shark Bay area compared to other places you have visited in Western Australia?** [TICK]

Better ❒
Similar ❒
Not as good ❒

7a. *What was your main purpose in coming to the Shark Bay area?*

7b. *Are you satisfied now that you are here?*

7c. *Why do you say that you are satisfied*/dissatisfied*?* [*WORD AS FOR 7b RESPONSE]

8. *If you had all the time you wanted, which features of the Shark Bay area would you like to see or visit?*

9. *What improvements would you like to see made to the area?*

10. *How much time will you spend in the Shark Bay area?*

Okay, thanks for those answers.

[PHOTOGRAPHS] [MAKE SURE PHOTOS ARE IN ORDER STARTING AT A]

I have here some photographs of the area. I would like you to look through them and as you do sort then into two piles: one for scenes you really like and another for scenes you think are 'nothing special'.

[SORTING TAKES PLACE]

Great. I'll hang onto the ones you think are 'nothing special'.

Now taking the scenes you really like, could you sort then into 3 groups according to how much you like them.

[SORTING TAKES PLACE]

11. If the scene with the windmill is in any of these groups, ask *"why did you pick the scene with the windmill?"*

12. Record the numbers on the backs of the scenes for the 3 groups.

HIGHEST		LOWEST

[REMOVE THESE GROUPS AND REPLACE WITH THE 'NOTHING SPECIAL' SCENES].

13. *Now taking the scenes you thought were 'nothing special', could you look through them and within each scene tell me if there is anything in particular that you dislike.*

OK, that's the main part of the survey done, thanks. I just wanted a few basic details about you if that's all right.

14. *Male* ☐
Female ☐

15. *Age* *Under 15* ☐ *15-24* ☐
25-39 ☐ *40-59* ☐
60 and over ☐

16. *Occupation* _____

17. *Place Of Residence* _____

18. *How did you travel to the Shark Bay Area?*

Private Vehicle ❑ *Commercial Tour* ❑
Public Transport ❑ *Other*_____

19. *Location of Interview* _____

Time _____

Date _____/_____/_____

Interviewer _____

OK, that's all our questions!
Just to let you know about the Survey:

This survey is being conducted by CALM to get a better understanding of which places or features are most important to visitors of the Shark Bay area. CALM is particularly interested in the features of natural beauty which contribute to the World Heritage Area.

The results of the survey will be used as a basis for a landscape assessment of environmental features right across the World Heritage area. The assessment will guide planning and future management of the World Heritage area.

Do you have any questions?

THANKS for your input!

ENJOY YOU STAY!!

[illegible]

APPENDIX 5 - VISITOR SURVEY RESULTS

Record No.	1a. Most important			1b. Why		
	1	2	3	1	2	3
1	mm	dolphins		nice camping		
2	beaches			swim	beauty	
3	beaches			water		
4	pennisulas	mm area		water	old towns	
5	mm			fishing		
6	mm	dolphins		remote, beaches		
7	mm			dolphins		
8	dolphins	sharks	beaches	close up	ecosystem	aesthetic
9	beaches	dolphins	café	relaxing		
10	sea	pelicans	dolphins	enjoyment		
11	mm			dolphins		
12	mm			not too developed		
13	dolphins			playful		
14	mm	shell beach		experience	shells	
15	stromatalites	shell beach	dolphins	living fossils	amazing	
16	mm	dolphins		dolphins		
17	mm	dolphins		protection		
18	mm	stomatalites	shell beach			
19	ocean	shell beach	stromatalites	protected		
20	dolphins			to see		
21	stromatolites			attraction		
22	shell beach	mm				
23	coastline			attraction		
24	mm	denham				
25	fishing	water	beaches	fishing		
26	dolphins			interaction		
27	mm	stromatalites		interaction	geologically important	
28	mm			unique		
29	stromatalites	ocean	shell beach			
30	mm			unique		
31	sharks	dolphins		large popn	interaction	
32	dolphin			why they came		
33	stromatalites	point peron	dh island mm	natural	history, colour, landscape	interaction
34	dolphins			interaction		
35	conservation					
36	dolphins	dugongs	fish	protection		
37	dolphins			like		
38	dirk hartog is			peaceful	diverse coast	breeding grounds
39	stromatalites	dolphins		old fossil	wild animals	
40	stromatalites	sea grass	cape peron NP	significance	sustain area	project eden
41	mm					
42	mm			nice		
43	mm			dolphins		
44	dolphins	dugongs	stromatalites	interaction	large population	unique
45	beach			lovely		
46	stromatalites	pt peron	dolphins	oldest fossils	like area	unique
47	stromatalites	mm	shell beach	oldest fossils	protection, research	shells
48	dolphins			spiritual		
49	dolphins			unique		
50	beach			nice		
51	tidiness	dolphins	beach	management	experience	not too developed
52	strom.	dolphins	dugong	oldest fossils	interesting	special
53	mm			nice	dolphins	
54	national park	atmosphere		protecting animals	reaxing in nature	
55	mm			dolphins		
56	mm	shell beach	denham	wildlife	remarkable site	good base
57	dolphins	diving mammals	sromatalites	unique	interaction	protection
58	mm	bays	conservation	scenery on way in	undeveloped	uncommercial
59	natural features	dolphins		interactions	like them	
60	mm			dolphins	controls	
61	mm			dolphins		
62	mm	hamelin pool		heard about them		
63	strom	shell beach	seagrass	nat sig	unique	wide scale
64	strom	shell beach	mm	unique	amazing spot	experience
65	mm			beautiful		
66	all			diversity		
67	ocean	mm		dolphins		
68	mm			only place visited		
69	blow holes	mm	peron penn	best in world	interaction	unique flora/fauna
70	mm			dolphins		
71	mm	DH island		remote	swimming	
72	mm	strom		dolphins	dugongs	unique

1c. Which visited			2a. Enjoy most			2b. Why		
1	2	3	1	2	3	1	2	3
XXXXXXX	XXXXXXX	XXXXXXX	dolphins	beach				
XXXXXXX	XXXXXXX	XXXXXXX	beaches					
XXXXXXX	XXXXXXX	XXXXXXX	beaches					
XXXXXXX	XXXXXXX	XXXXXXX	bush	sea		water		
XXXXXXX	XXXXXXX	XXXXXXX	mm			love them		
XXXXXXX	XXXXXXX	XXXXXXX	mm			weather		
XXXXXXX	XXXXXXX	XXXXXXX	mm			dolphins		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins	beaches		dolphins		
XXXXXXX	XXXXXXX	XXXXXXX	fishing	massage	nature trail	close/natural	good beach	
XXXXXXX	XXXXXXX	XXXXXXX	beaches			relaxing		
XXXXXXX	XXXXXXX	XXXXXXX	mm			favourite area		
XXXXXXX	XXXXXXX	XXXXXXX	mm			dolphins		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins			dolphins		
XXXXXXX	XXXXXXX	XXXXXXX	water	scenery		enjoyed feeding		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins	cruises	ocean	activities	different	
XXXXXXX	XXXXXXX	XXXXXXX	shell beach	little lagoon		cool	enjoyable	pretty
XXXXXXX	XXXXXXX	XXXXXXX	stromadalites	dolphins		nice		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins			nice		
XXXXXXX	XXXXXXX	XXXXXXX	mm					
XXXXXXX	XXXXXXX	XXXXXXX	dolphins			recreation		
XXXXXXX	XXXXXXX	XXXXXXX	ocean					
XXXXXXX	XXXXXXX	XXXXXXX	mm					
XXXXXXX	XXXXXXX	XXXXXXX	environment			nice		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins			natural		
XXXXXXX	XXXXXXX	XXXXXXX	islands	water	bay	interaction		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins			attraction		
XXXXXXX	XXXXXXX	XXXXXXX	beach	dolphin area				
XXXXXXX	XXXXXXX	XXXXXXX	mm	cape peron		enjoyment	special	
XXXXXXX	XXXXXXX	XXXXXXX	beach	coastline	bush	nice	nice	
XXXXXXX	XXXXXXX	XXXXXXX	dolphins	beaches	coastline	enjoyment		
XXXXXXX	XXXXXXX	XXXXXXX	beach	water	dolphins	unique	special	beautiful
XXXXXXX	XXXXXXX	XXXXXXX	beach			swimming	beautiful animals	not lounsly
XXXXXXX	XXXXXXX	XXXXXXX	beach	trails	zytdorf cliffs	nice		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins			close to nature		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins					
XXXXXXX	XXXXXXX	XXXXXXX	dolphins			reason for trip		
						wild animals		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins					
XXXXXXX	XXXXXXX	XXXXXXX	coast	sea life		different forms	marine animals	
XXXXXXX	XXXXXXX	XXXXXXX	beach	bush		beautiful	diversity	
XXXXXXX	XXXXXXX	XXXXXXX	cape peron NP	ocean		camping fishing	changing	
XXXXXXX	XXXXXXX	XXXXXXX	mm	dolphins		dolphins	interaction	
XXXXXXX	XXXXXXX	XXXXXXX	beach	dolphins		like		
XXXXXXX	XXXXXXX	XXXXXXX	mm			weather		
XXXXXXX	XXXXXXX	XXXXXXX	dolphins			interaction		
			beach			enjoyment		
			pt peron	mm		like area	unique	
			dolphins	mm		interaction	relaxing	beautiul
			weather	ocean	hospitality	good		
			ocean			fishing	relaxing	
			beach			good for kids		
			good facilities			ease of use		
			strom	dolphins		old fossils	intersesting	special
			mm			dolphins	relaxing	
			relaxing atmosphere	wildlife				
			mm			dolphins		
			mm			relaxation		
			dolphins			interaction		
			mm			only place seen		
			big lagoon	duboits ck	mm	view	scenery	beach
			mm			beautiful		
			ocean			beautiful		
			mm			good resort	natural features	
			mm			interaction		
			mm			only place visited		
			false entrance			remote		
			mm			sea life	dolphins	beach
			mm	DH island		remote	swimming	
			resort			beach	dolphins	facilities

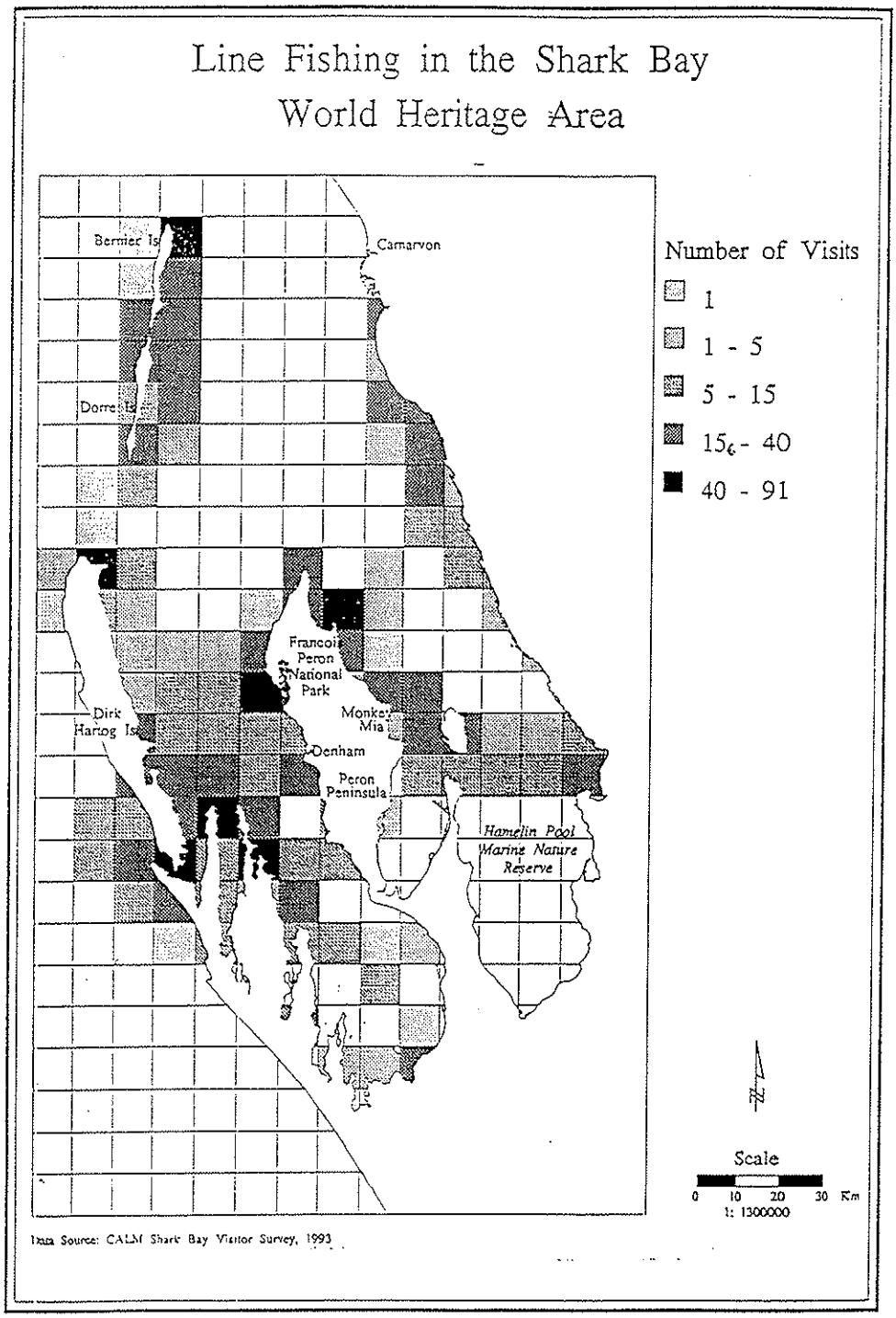
3. Beauty important			4. Most beautiful			5. Least beautiful			6. Shark Bay rating		
Extremely	Important	Not Imp.	1	2	3	1	2	3	Better	Similar	Worse
x			coastline							x	
	x		fishing spots			dead animals			x		
x			lookouts						x		
x			between Denham and mm			boating areas				x	
	x		mm			CALM (?)					x
x			coastline			toilets					
	x		ocean	bush						x	
x			RHS of jetty			Boating areas			x		
x			little lagoon						x		
x			beach							x	
x			mm			Denham				x	
x			mm beach						x		
x			mm			Denham			x		
x			mm	nanga		litter on roads				x	
x			dolphins							x	
x			Lagoon	mm		Denham					x
x			mm			litter					
	x		coastline			Denham				x	
x			mm								
	x		mm			Denham			x		
x			undeveloped areas			Bay Lodge					
x			coastline			mm resort				x	
x			ocean			litter in Denham				x	
x			lagoon			denham				x	
x			scenic drive			sewerage works in denham			x		
x			coastline mm						x		
	x		mm							x	
x			coastline			denham				x	
x			mm							x	
x			general landscape, coastline			powerlines				x	
x			clear waters			beaches			x		
x			beach			caravans			x		
x			mm			canoe shed				x	
x			coastline			seaweed				x	
x			mm							x	
x			lagoons water						x		
x			mm			seaweed					
x			all							x	
x			ocean			denham				x	
x			all			salt mines				x	
x			beach						x		
x			ocean							x	
x			shell beach			roadworks				x	
x										x	
x			coastline							x	
x			ocean	pt peron		denham				x	
x			shell beach			denham			x		
x			ocean			none				x	
x			untouched areas			denham				x	
x			beach							x	
	x		coastline			bland countryside				x	
	x					denham			x		
			mm			same scenery				x	
x			national park	no houses						x	
x			mm beach						x		
x			mm							x	
x			mm							x	
x			mm	coastline	natural areas	rubbish on hwy			x		
x			dont know			dont know			x		
x			mm						x		
x			mm			none				x	
	x		beaches,	little lagoon		roadside veg				x	
x			lagoons	cliffs		stromatalites			x		
x			mm							x	
x			mm			denham				x	
x			mm			denham			x		
	x		mm						x		
x			mm			channel at denham			x		
x			mm	false entrance	Zut cliffs	shell beach				x	
x			mm			denham			x		
x			eagle bluff	shell beach	peron penn	denham				x	
x			mm	denham beach	hamelin pool				x		

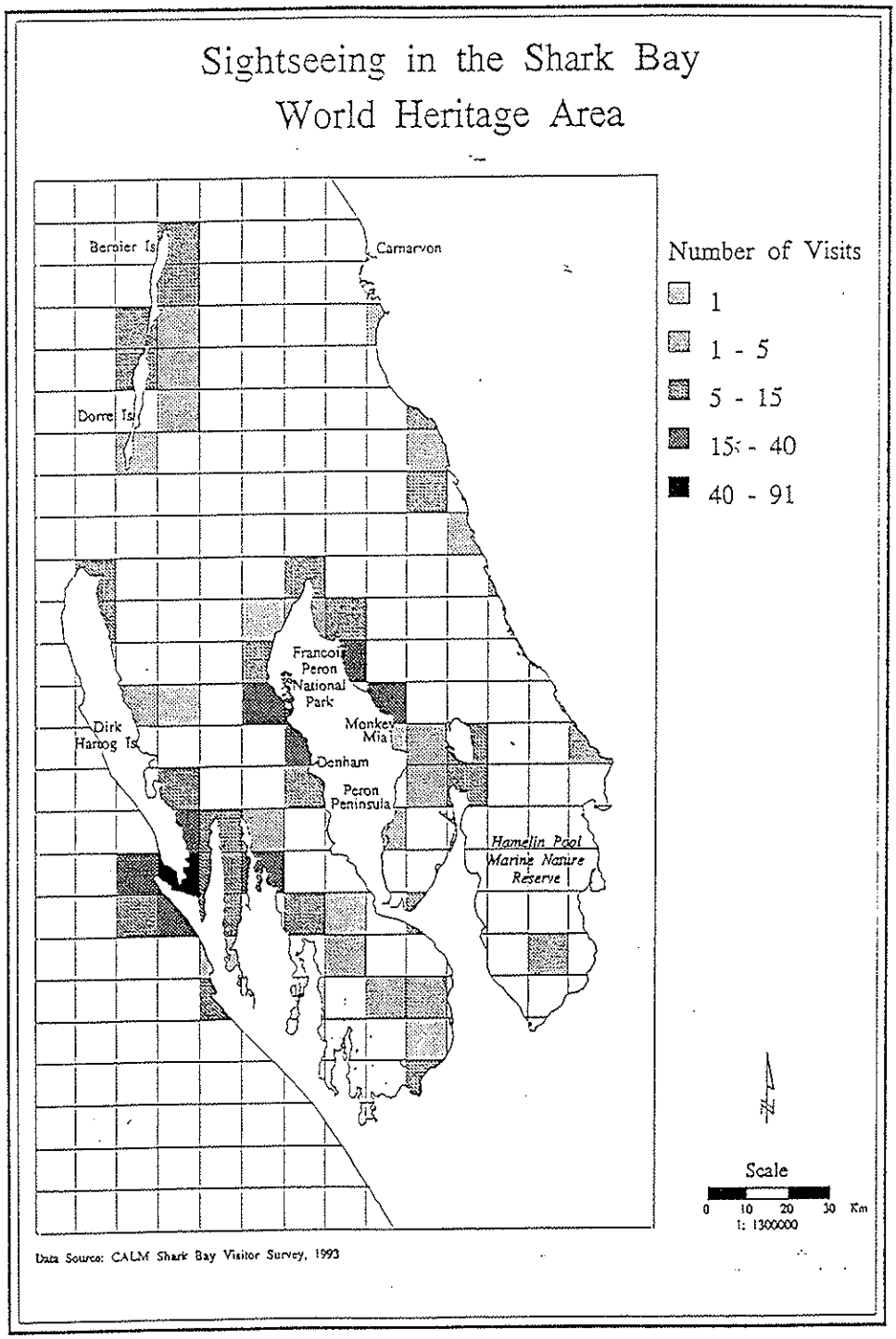
7a. Main purpose	7b. Satisfaction y or n	7c. Why	8. Like to see	9. Improvements
dolphins	y	saw features	islands	information on activities
dolphins	y	saw features	mm	softer water in showers
to see the sites	y	beauty	all of SB	Denham
holiday	y	clean water, good temp	NP, shell beach	cleanliness, history
holiday	y	holiday on beach	Dory Island	no fees, fishing from jetty
dolphins	y	saw features	fly/sail	cheap shops
dolphins	y	saw dolphins	shell beach	rain shelter
dolphins	y	saw features		update caravans
friends / dolphins	y	saw features	Eagle Bluff	more seating
coastline	y	love it	Fishing	more shelter
dolphins	y	saw features	stromadalites	remove crows
dolphins	y	saw features	cape peron	transport
dolphins	y	saw features	shell beach stromadalites	more recycling
holiday	y	fishing, good scenery	everything	no commercialisation
holiday	y	saw features	Dirk Hartog Is	no commercialisation
dolphins	y	saw features	islands	Denham beach
dolphins	y	Project Eden	everything	free camping no facilities
dolphins	not yet		stromadalites	lower fees
environment	y	not over populated	Faure Island	fees
dolphins	y	saw features	National Park, laggons, scenic drive	shops
dolphins / stromatalites	n	to touristy	everything	no more development
travelling	y	relaxing	dirk hartog is steep point	leave as is
dugons	y	surrounding environment	salt mines	recycling
dolphins	n	commercialism	Peron National Park	project eden waste of time
fishing	y	caught fish	dirk hartog is	disabled access
dolphins	y	saw attractions	shell beach	
dolphins	y	attractive	boat cruise	
holiday	y	better than expected	remote areas	none
dolphins	y	as expected	cruise	none
dolphins and landscape	y	saw features	dirk hartog is	none
dolphins	y	saw features		
dolphins	y	nice place	cruise stromatalites shell beach	none
mm	y	been before	dirk hartog is	n
dolphins	y	saw features	cruise shell beach stromatalites	
dolphins	y	saw features	mm	
dolphins	y	relaxing	dirk hartog is	not so touristy
dolphins	y	interaction	everything	less seaweed
dolphins	y	beautiful, remote	zuytdorp cliffs	depastoralisation
dolphins	y	relaxing	dirk hartog is	keep clean and natural
enjoyment	y	diverse beautiful	dirk hartog is	control boating & fishing
dolphins	y	interactioon	mm	leave
dolphins	y	pretty, relaxing	islands shell beach	none
dolphins	y	nice	boat to sail	none
dolphins	y	saw features	shell beach	
holiday	y	relaxing	mm	no more commercialism
friends, dolphins	y	peaceful	isalands	
dolphins	y	saw features	islands, national park	no more development
dolphins	y	saw features	stromatalites	leave as is
friends	y	lifestyle	useless loop, islands	none
dolphins	y	saw features	shell beach	
dolphins	y	good features	cruise	more interactive activities
dolphins, national park	y		all	
to see the area	y		dont know	dont know
dolphins	y	saw features	shell beacg, more wildlife	n
dolphins, relax	y		wildlife park, camel ride	cheaper food/drink
dolphins	y	everything is good	boat cruise	banking
dolphins	y	as expected	islands	more info on other places
holiday	y	better than expected	coastline, heritage areas	clean rubbish
dolphins		haven't seen	dolphins	
dolphins	y		don't know	none
dolphins	y	saw features	peron penn	don't overcommercialise
exploring	y	uniqueness	islands, marine park	visitor facilities
dolphins	y		useless loop	it's already damaged
work	y	great spot, pristine water	not aware	
dolphins	y	saw features	cruise, strom	limit development
dolphins	y	saw features	steep point	shade trees
dolphins	y	interaction	cape peron	no more development
work	y	great living	blue holes	controlled access
dolphins	y	lots to see	not sure	improve denham, more shelter, more info
holiday/fishing	y	lots to see	wrecks, dugongs	boat launching, denham, facilities
dolphins, holiday	y		pearl farm, exploring	more info on other features

10. Stay	11. Why windmill	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	13. Why dislike	
		M	H	L	N															
	2 resourceful	n	h	h	n	n	n	n	h	m	n	n	l	n	n	h	n	m	barren	indistinctive
	2 australian	n	h	h	n	n	n	l	h	h	n	h	n	h	m	m	m	n	barren	desolate
	2 outback	n	h	h	m	n	n	n	m	h	n	n	l	h	n	m	m	n	barren	no colour
	3 oasis like	h	h	m	l	n	n	l	m	h	h	m	n	h	m	h	m	l	barren, no water	
6weeks	life	m	h	h	l	l	l	m	h	m	m	m	m	h	h	h	h	l		
	2 not seen before	m	m	h	h	n	n	m	h	n	m	n	h	m	m	h	m	m	boring	colour
	2 australian	l	h	m	h	n	n	n	n	m	m	n	h	n	l	m	n	n	no colour	
	3	h	h	n	n	n	n	n	n	l	n	n	n	m	n	n	n	n	seen before	
3 weeks		m	h	n	n	n	n	n	l	m	n	n	n	h	n	l	n	n	nothing	
	2 australian	h	h	l	m	l	m	h	h	l	l	m	m	h	l	m	l	h		
	2 australian	h	h	m	n	n	n	n	h	m	n	l	l	l	l	m	n	l	barren	
	3	h	m	n	l	n	n	l	h	h	n	l	l	m	n	m	n	n	houses	
	2 different	l	h	h	n	n	n	n	m	h	n	n	n	l	l	m	n	n	barren	
1 week	australian	h	h	m	n	n	n	n	h	h	n	n	n	n	n	m	l	n	nothing special	
	4	h	h	n	n	n	n	l	h	h	n	l	l	m	n	m	l	n	dont look good	
	1	l	h	n	n	n	n	n	h	h	n	m	n	m	m	h	m	n	boring	
	2 australian	h	l	m	l	m	l	h	h	h	m	l	m	m	l	h	h	l		
	3	h	h	n	n	n	n	h	h	h	n	n	n	l	n	m	m		barren	
6 yrs	an attraction	h	h	m	m	l	l	l	h	h	h	m	h	h	m	h	h	l		
	3	n	n	n	n	n	l	m	h	l	n	n	m	n	l	h	m	h	boring	
	2 australian	h	h	l	n	n	l	n	h	h	n	m	n	m	m	h	m	l	scrubby, road	
	2 unique	h	h	m	n	n	n	l	h	h	m	n	n	m	m	h	n	l	boring	
1 week	dependence upon the environment	h	h	m	l	n	m	h	h	h	l	m	n	h	l	l	h	m	barren, road	
	2 australian	h	n	m	n	n	n	h	h	l	n	n	l	n	n		l	n	boring	
1week	australian	l	h	n	n	n	n	l	h	h	n	n	n	m	n	l	h	m	sameness	
	2 different from germany	m	m	h	n	n	n	l	h	m	n	n	n	l	n	h	n	n		
	2 interesting	m	h	h	n	n	n	m	n	h	n	n	n	l	n	l	l	n	sameness	
1 week	history	h	h	m	n	n	h	h	h	h	m	l	m	m	l	h	n	m		
	1 australian	h	h	h	l	l	n	m	h	h	h	m	m	h	h	h	m	n	not good photo's	
4 hrs	natural	m	h	m	n	l	n	m	h	h	l	m	n	h	l	l	n	m		
	3	n	h	n	n	n	n	n	l	n	n	n	n	m	n	n	n	n	sameness	
	3 interesting	h	h	l	n	n	n	n	h	m	n	m	n	h	n	h	m	n	boring	
2 weeks	remote, water shortage	m	h	h	n	n	n	l	h	h	n	n	m	n	n	m	m	l	boring	
	2	h	h	n	n	n	n	m	h	n	n	l	l	m	l	m	n	n	barren, dull	
	1	n	m	n	n	n	n	h	h	h	n	l	m	h	l	m	m	n	sameness, road	
	3 relaxing scene	m	h	h	n	n	l	m	h	h	l	l	m	m	m	n	h	m	boring man made	
	3 liked it	h	h	n	l	n	l	h	m	m	n	m	l	m	n	l	m	l	not picturesque	
	5 nice	m	h	h	m	n	m	m	h	h	m	m	n	h	h	h	l	l	barren overgrazed	
3 weeks	australian	m	h	l	n	n	l	m	h	h	n	n	n	h	m	l	m	n	sameness	
months	history	h	h	l	l	l	m	m	h	h	m	h	m	m	m	m	m	m		
	1	n	m	n	n	n	n	n	l	m	n	n	n	h	n	h	n	n	sameness	
4 hrs		n	h	n	n	n	m	n	h	h	n	m	n	h	m	h	h	l	no coast, barren	
	3 different, nice colours	h	h	m	n	n	n	l	l	n	n	l	n	m	l	h	m	n	sameness, road	
1week		h	m	n	n	l	l	n	m	m	m	h	l	h	h	m	h	l	featureless, human activity	
	6 australian	n	m	m	n	n	n	n	h	h	l	m	n	h	l	h	l	n	sameness	
4weeks		h	l	n	n	n	n	h	h	m	n	n	l	l	n	m	h	m	scrubby, indistictive	
	2 like	l	h	h	n	n	n	l	h	m	n	n	l	h	m	m	h	n	arid, uniteresting	
	2 australian	h	m	m	n	n	n	l	h	n	n	l	n	h	n	m	l	m	indistinctive	
5 weeks		l	n	n	n	n	n	n	h	m	n	n	n	n	n	n	n	n	dont tell much	
1 week	nice	m	m	m	l	n	n	l	h	h	l	h	n	h	h	l	l	n	arid	
	1	n	l	n	h	n	n	l	l	h	m	n	n	m	n	h	h	n	arid uninteresting	
	4	h	h	n	n	n	n	h	h	h	l	m	l	h	n	m	m	n		
	1	m	l	n	n	n	n	n	h	m	n	n	n	h	n	h	l	n		
2weeks		h	h	n	n	n	m	h	h	m	m	n	h	m	l	n	h	h	boring town	windmill dominates
	4	l	h	h	l	n	n	n	h	l	n	n	n	m	m	m	n	n	arid	
1week	australian	h	h	m	l	n	m	m	h	h	n	n	n	l	n	h	m	n	arid, boring	
	3	h	h	n	m	n	n	n	h	h	l	l	m	n	n	m	h	n	arid	
	3	l	h	n	n	n	n	n	h	h	n	m	n	n	l	m	m	n		
2weeks	history, sense of place	h	m	h	n	n	n	l	l	h	h	h	n	l	h	h	l	n	arid, barren sameness	
2days	looks good	n	m	l	n	n	m	n	m	h	h	n	h	l	n	h	m	n	boring	
	1	l	h	n	n	n	n	m	l	h	l	m	n	m	n	h	l	m	not special	
	3 farming scene	h	h	m	n	n	n	n	l	h	l	l	m	m	l	m	l	n	not special to region	
2years		l	m	n	n	n	n	n	h	l	n	n	n	l	n	m	h	n	scrubby bush	settlement
	4 history	h	m	m	n	l	n	n	m	n	n	l	n	m	n	h	l	n	sameness	
2days	history	m	h	h	m	m	n	m	h	h	n	m	m	h	n	n	l	h	indistinctive	
5days		h	h	n	m	m	m	m	h	h	h	h	m	h	h	h	h	l	just a windmill	
	1	h	h	n	n	n	n	l	h	n	n	n	n	l	m	m	m	n	boring, sameness	
1day		h	h	n	n	n	n	h	m	l	n	m	n	l	m	h	l	n	prefer coast scenes	
5years		n	h	n	n	n	n	l	l	h	l	m	n	h	n	m	m	n		
	5	n	h	n	n	n	n	l	l	h	l	m	n	h	n	m	m	n	barren, sameness	
1week	good homestead	h	m	m	l	n	n	h	h	n	n	l	m	l	n	n	h	n	indistinctive	
	4	m	h	n	n	n	n	l	h	h	n	h	n	m	n	m	n	n	typical Aust' bush	

14 Gender	15. Age					16. Occupation	17. Reside	18. Travel				19. Location
	<15	15-24	25-39	40-59	60+			Private Vehicle	Public	Commercial	Other	
f		x				shop assistant	england			x		mm
f				x		housewife	tas	x				mm
m/f				x		retired	nsw	x				mm
f				x		secretary	nt	x				mm
m/f				x		self employed	wa	x				mm
f		x				traveller	switzerland		x			mm
f		x				receptionist	holland		x			mm
f		x				nurse	nsw		x			mm
f				x		chef	nsw		x			mm
f					x	house wife	wa			x		mm
f			x			nurse	ireland		x			mm
f			x			travel agent	switzerland		x			mm
f		x				nurse	ireland		x			mm
m			x			marketing	qld	x				mm
m			x			shire worker	wa	x				mm
m			x			student	germany	x				mm
m / f					x	retired	nsw	x				mm
f			x			settlements officer	wa	x				mm
f			x			mother	mm	x				mm
f			x			social therapist	holland	x				mm
m/f		x	x			student/mechanic	great britain	x				mm
m/f		x	x			mechanic/marketing	wa	x				mm
f				x		marine researcher	nsw				yacht	mm
m			x			student	germany	x				mm
m/f			x			book keeper/navy	wa	x				mm
m/f			x			student		x				mm
f				x		market research	uk	x				mm
m/f				x		retired	vic	x				mm
f			x			nurse	wa			x		mm
f				x		retail	wa					mm
f			x			nurse	nsw		x			mm
m			x			storeman chef	uk		x			mm
f				x		traveller	nsw					mm
m/f			x			travel industry	uk		x			mm
f				x		housewife	uk					mm
m/f						panel beater mum	wa					mm
f				x		secretary	vic	x				mm
m				x		farmer	ireland	x				mm
f				x		waitress	wa	x				mm
m				x		yard person	wa	x				mm
f		x				nurse	uk	x				mm
f		x				student	uk	x				mm
m		x				boats	uk					mm
f					x	aromatherapist	south africa	x				mm
m/f					x	retired	wa	x				mm
f			x			hairdresser	cayman islands	x				mm
f			x			entertainment	uk	x				mm
m			x			traveller	uk	x				mm
f			x			chef	nsw	x				mm
f			x			mother	wa	x				mm
f			x			office admin	vic	x				mm
m				x		traveller	tas				bicycle	mm
m				x		retired	wa	x				mm
f		x				clerk	wa	x				mm
f		x				clerk	wa	x				mm
f		x				student	uk		x			mm
m			x			consultant	holland	x				mm
f				x		housewife	qa	x				mm
f			x			community education	wa					como
m/f			x			cabinet maker	germany	x				mm
m			x			gardener	uk	x				mm
m				x		marine superintendent		x				mm
f			x			mm manager	denham	x				mm
m			x			engineer	switzerland	x				mm
m				x		water corp	wa	x				mm
m			x			engineer	vic	x				mm
m		x				student	wa	x				mm
f		x				student	vic	x				mm
m			x			deck hand	mm					mm
m/f					x	retired	uk				fly	mm
m			x			fitter	wa	x				mm
m/f				x		director	nz	x				mm

APPENDIX 6 – VISITOR SURVEY – FREQUENCY OF VISITS FOR LINE FISHING AND SIGHTSEEING




Sightseeing in the Shark Bay World Heritage Area
Bernier Is
Carnarvon
Dorre Is
Francois Peron National Park
Monkey Mia
Dirk Hartog Is
Denham
Peron Peninsula
Hamelin Pool Marine Nature Reserve
Number of Visits
1
1 - 5
5 - 15
15 - 40
40 - 91
Scale
0 10 20 30 Km
1: 1300000
Data Source: CALM Shark Bay Visitor Survey, 1993

APPENDIX 7 - CHECKLIST OF SHARK BAY WORLD HERITAGE VALUES

CHECKLIST OF SHARK BAY'S WORLD HERITAGE VALUES

i) Outstanding examples representing the major stages of the earth's evolutionary history

- Stromatolites and microbial mats of Hamelin Pool.
- Hamelin Pool and Lharidon Bight.
- Holocene deposits adjacent to Hamelin Pool and Lharidon Bight.

ii) Outstanding examples representing significant ongoing geological processes, biological evolution and mans interaction with his natural environment.

Marine Environment

- Unique hydrological structure, banks and sills, steep salinity gradients, three biotic zones.
- Faure sill.
- Hypersaline environment of Hamelin Pool.
- Microbial communities.
- Fragum eragatum shell deposits.
- High genetic biodiversity due to steep environmental gradients (eg. snapper, venerid clams, bivalves).
- Seagrass meadows and their role in the evolution of the marine environment.
- Expanse of meadows and diversity of seagrass species.
- Wooramel seagrass bank.
- Carbonate deposits and sediments.
- Northern limit of transition region between temperate and tropical marine environments, resulting in high species diversity (eg. 323 fish species, 218 bivalve species, and 80 coral species).

Terrestrial Environment

- Botanical province transition zone, most pronounced in the southern parts of Nanga and Tamala Stations.
- Range limits (145 plant species at norhern limit, 39 species at southern limit, 28 vascular plant species endemic).
- Isolation of fauna habitats on islands and peninsulas – 5 threatened mammals on Bernier and Dorre Islands.

- Range limits and fauna species richness (100 species of herpetofauna – 9 endemics, 230 species of birds representing 35% of Australia's total species).
- Species evolution illustrated in rufous hare wallaby and banded hare wallaby.

iii) ***Superlative natural phenomena, formation or features, for instance, outstanding examples of the most important ecosystems, areas of exceptional natural beauty or exceptional combinations of natural and cultural elements.***

- Stromatolites.
- Hypersaline environment of Hamelin Pool.
- Faure sill.
- Wooramel seagrass bank.
- Coastal scenery of Zuytdorp Cliffs, Dirk Hartog Island, Peron Peninsula and Heirisson and Beelefin Prongs.
- Shell beaches of Lharidon Bight.
- Inundated birridas and lagoons such as Big Lagoon.
- Strongly contrasting colours of the dunes/cliffs.
- Beaches and adjacent sea of Peron Peninsula.
- Abundance of marine fauna (dugongs, dolphins, sharks, rays, turtles and fish).
- Annual wildflower season display.

iv) ***The most important and significant natural habitats where threatened species of animals or plants of outstanding universal value still survive.***

- 5 out of Australia's 26 endangered animals (Shark Bay mouse, banded hare-wallaby, rufous hare-wallaby, western barred bandicoot and burrowing bettong).
- Bernier Island subspecies of ash-grey mouse.
- 12 threatened reptiles (eg. Baudin Island skink and woma).
- Endemic soundhill frog.
- 35 migratory bird species.
- Threatened thick-billed grasswren.
- Endemic Dirk Hartog black and white winged fairy wren.
- Dirg Hartog subspecies of the southern emu-wren.
- Dugong (approx. one-eighth of the world' population).
- Humpback whale.
- Loggerhead and green turtles.
- Some threatened flora species.

APPENDIX 8 - AERIAL PHOTOGRAPH COVERAGE

APPENDIX 9 - ACCESS SENSITIVITY LEVEL CRITERIA

The sensitivity levels of travel routes are an indication of the importance of those routes to the experience of people and are established on the volume of people using the area and an understanding of their preferences. Classification of sensitivity levels is based on criteria used in the Visual Management System (VMS)(Williamson & Calder 1979). These criteria are:

Level 1 - High Sensitivity

1. Freeways and state highways with more than 500 vehicles/day.
2. Classified tourist roads.
3. Main sealed roads with more than 75 vehicles/day.
4. Recreation, cultural or scenic sites and viewpoints of national or interstate significance.
5. Walking tracks of national significance.
6. Residential areas with high degrees of scenic concern.
7. Interstate passenger rail lines with daily daylight service.
8. Rail lines of cultural, historic or scenic significance.
9. Navigable rivers, lakes and reservoirs of national recreation significance.

Level 2 - Moderate Sensitivity

1. Main sealed roads with more than 50 vehicles/day.
2. Bush access and other roads with more than 35 vehicles/day.
3. Roads with less than 35 vehicles/day, but planned for recreation promotion within 5 years.
4. Recreation, cultural or scenic sites of state significance,
5. Walking tracks of state or high local significance.
6. Residential areas with moderate degrees of scenic concern.
7. State passenger rail lines with daily rural town service.
8. Navigable rivers, lakes and reservoirs of state recreation significance.

Level 3 - Low Sensitivity

1. Utility roads with occasional recreation traffic up to 10 vehicles/day.
2. Walking tracks of low local significance.
3. State passenger rail lines with less than daily rural town service.

Leves 4 - Very Low Sensitivity

1. Bush tracks with infrequent recreation traffic less than 3 vehicles/day.

GLOSSARY

Analysis is the process by which the landscape is broken down into components.

Assessment is a process of synthesis. It is the expression of a composite value based on the value of individual components.

Character see Landscape Character.

Characteristics define distinctive or individual elements. The alternatives of variables used to measure objects.

Classification is the organisation of descriptive information so as to identify a range of homogeneous types or units.

Comparative analysis involves making judgements between places based on the components of those places.

Cultural is used to describe features or settings and is ambiguous, commonly referring to significantly human-modified features or places as well as any feature or place (including natural) which has social significance (eg. places sacred to Aboriginal people). *Human-modified features* and *social significance* can be used to describe these two usages.

Cultural landscape is most often used to describe environments with social and/or historic values. The Burra Charter (Australia ICOMOS) has a very broad definition of cultural significance: aesthetic, historic, scientific or social value for past, present and future generations. *Landscape* (see below) is essentially a cultural construct and the term *cultural landscape* could be interchanged with *landscape*.

Evaluation is the process where assessment results are examined and used to make decisions about alternative futures.

Feature is often used to describe a dominant, easily defined or significant characteristic or combination of characteristics.

Holistic Approach is based on the popular maxim that the whole is greater than the sum of the parts. Similar to intrinsic value in recognising that the environment cannot be judged by an assessment of its components.

Intrinsic value does not acknowledge that comparisons can be made or the environment fragmented in order to make judgements of its value. For example, wilderness exists on the basis of its intrinsic value.

Inventory refers to the identification and collection of data such as land use, slope or topography. Inventory is without value judgements.

Landscape is used by many different people for a variety of purposes, making it a rather ambiguous term. There are three main usages of the term: the first refers to a scene (as in a landscape painting); the second refers to an area which has a common pattern of bio-physical features (as in a landscape ecology); and the third usage refers to the perception of places by people based on their interaction and experience of the physical and biological features of the environment (the environment that becomes our 'landscape'). Landscape management, to a certain extent uses all definitions but specialises on an understanding of the latter.

Landscape Approach delineates homogeneous land units based on similarities of landform, soil, and vegetation characteristics (Brown et al 1979).

Landscape Class is a synthesis of assessment results which provides broad categories of landscapes usually based on differences in importance and management approach.

Landscape Character is the combination of natural and cultural characteristics which allow people to differentiate one place from another.

Natural Landscape Significance is significance based on natural landscape characteristics.

Parametric assessment involves measuring or rating the parameters of a landscape component (ie. measuring slope for landform)

Public value can involve direct input from the public into decision making or can be indirect by including research findings on public preferences into assessment procedures.

Qualitative judgements normally express results using criteria which are not themselves readily reduced to simple or precise numerical values. Most landscape assessment requiring judgement is qualitative even if results are expressed numerically (Litton 1979).

Quality, used with words such as landscape, visual or scenic, can refer to either the characteristics (qualities) of a place or the degree of excellence.

Quantitative procedures measure such things as relative relief, areas of vegetation types, or numbers and coverage of water bodies. The results of such measurement are most useful in drawing systematic comparisons between different landscape components, but their rating to visual value still calls for qualitative judgement (Litton 1979).

Relative value results from making judgements between places on the basis of some shared criteria.

Rural Landscape Significance is significance based on rural landscape characteristics.

Sensitivity Level of use areas is a measure of how important that area is to people's experience.

Valuation is providing a value based on professional judgement, public preference, economics etc.

Values are derived from the process of valuation.

Visual Absorption Capability is a term and concept which describes and index of an area's ability to visually absorb or sustain change based on variables such as landform, vegetation pattern and height, and existing land use.

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