

**A Strategic Assessment of the
Compatibility of Petroleum Industry Activities
with the Environmental Values and Cultural Uses
of the Shark Bay World Heritage Area**

**Section 16(e) report and recommendations
of the Environmental Protection Authority**

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EXECUTIVE SUMMARY

Introduction

The EPA has been requested by the Western Australian Minister for the Environment to provide advice under section 16(e) of the *Environmental Protection Act 1986* on a policy framework for petroleum exploration and development within the Shark Bay World Heritage Property. The request arises out of the 1997 agreement between the State and Commonwealth governments on the administrative arrangements for the Shark Bay World Heritage Property.

The EPA notes that, having received the advice of the EPA set out in this report, the Ministerial Council will decide whether petroleum exploration and development activities are compatible with the protection, conservation and presentation of the Shark Bay World Heritage Property.

For the purposes of providing advice, the EPA report

- i) sets out the World Heritage values of the Shark Bay World Heritage Property (Table 1);
- ii) divides the Shark Bay World Heritage Area into three:
 - Southern Marine Area;
 - Northern Marine Area; and
 - Terrestrial Area; and
- iii) distinguishes between
 - petroleum exploration activities (preliminary exploration, seismic survey and exploration drilling), and
 - petroleum development activities (development drilling, production, processing, storage and product transport).

Advice

The EPA's overarching advice is that there be a presumption against petroleum development activities within the Shark Bay World Heritage Property on the basis that these activities could not be carried out without significantly affecting the values for which the Property has been credited World Heritage status. This would not preclude the assessment of a petroleum proposal under Part IV of the *Environmental Protection Act 1986*, but the circumstances associated with the proposal would need to have been designated by the State to be of exceptional importance and of a strategic nature.

Given the presumption against petroleum development activities within the Shark Bay World Heritage Property, there could be little justification for allowing the pre-requisites to development, that is, activities such as preliminary exploration, seismic survey and exploration drilling, to be carried out on targets within the Shark Bay World Heritage Property.

However, the EPA recognises that there may be scenarios where some petroleum exploration activity may be permissible within the Shark Bay World Heritage Property. These are:

Scenario 1

Where there is an area of petroleum interest immediately outside the boundary of the Shark Bay World Heritage Property.

If an area outside the Property is identified as being of interest for petroleum exploration and potential production, it would be reasonable for a proposal to be submitted to the EPA for approval to gather data from within the Property.

Scenario 2

Where there is a need to obtain broad-based information using low impact instrumentation associated with preliminary exploration techniques, such as aerial surveys and ship-towed devices.

It would be reasonable for a proposal to be submitted to the EPA for approval to gather from within the Property data of a general geophysical nature using aerial surveys or ship-towed devices, where the environmental impact of these activities can be demonstrated to be negligible. (Conventional seismic surveys are considered to be of a more intensive and intrusive nature and are recommended against).

Scenario 3

Where there is a need to cross the Property with a pipeline carrying gas from an offshore gas field to another area.

The gas would need to be dry, that is, have had any condensates removed, and traverse less sensitive marine and terrestrial parts of the Property.

In the case of a proposal for petroleum exploration and development in or adjacent to the Shark Bay World Heritage Property, there continues to be a requirement for its referral to the EPA for assessment under Part IV of the *Environmental Protection Act 1986*. Formal assessment would be likely to follow. Consideration of such a proposal would be guided by the advice in this 16(e) report. The process would include community input and facilitate the application of environmental conditions to individual proposals, if approval to proceed were granted.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment for transmittal to the Commonwealth Minister for the Environment and Heritage, in accordance with Section 5.4 of the *Agreement between the State of Western Australia and the Commonwealth of Australia on the Administrative Arrangements for the Shark Bay World Heritage Property in Western Australia*:

- that the Ministers note that this strategic advice addresses the environmental compatibility of petroleum exploration and development with the protection, conservation and presentation of the Shark Bay World Heritage Property;
- that the Ministers note the level of protection provided by the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) and the *Environmental Protection Act 1986* (Western Australia). Under the *Western Australian Conservation and Land Management Act 1984* and the *New Horizons* policy there are classes of marine reserves in which petroleum drilling and

production are not permitted, and there are terrestrial areas which, under the current State Australian Labor Party policy, are not available for exploration and production activities;

- that the Ministers note that the EPA is of the view that maintenance of the natural and cultural heritage values of the Shark Bay World Heritage Property is incompatible with some petroleum activities. In these situations the EPA holds the view that these activities should not be permitted;
- that, because drilling and production activities are considered incompatible with the values of the Shark Bay World Heritage Property and should not be permitted, there is little justification for allowing the pre-requisites to petroleum production on targets within the area, with the following qualification;
- that there may be justification to allow some exploration activity where the target is largely outside the Shark Bay World Heritage Property.

Contents

	Page
EXECUTIVE SUMMARY.....	i
Introduction.....	i
Advice.....	i
Recommendations.....	ii
1 FRAMEWORK FOR EPA ADVICE.....	1
1.1 Background and approach.....	1
1.2 World Heritage Values of the Area.....	2
1.3 Current Legislative and Policy framework on petroleum activities.....	4
1.4 Geographic sectors of Area.....	5
1.5 Petroleum activities.....	6
2. COMPATIBILITY OF NOMINATED SHARK BAY WORLD HERITAGE VALUES WITH PETROLEUM ACTIVITIES.....	6
2.1 Southern Marine Area.....	7
2.1.1 Preliminary exploration techniques.....	11
2.1.2 Seismic surveys.....	12
2.1.3 Drilling.....	12
2.1.4 Production, processing, storage and transport of petroleum product.....	13
2.2 Northern Marine Area.....	13
2.2.1 Preliminary exploration techniques.....	14
2.2.2 Seismic surveys.....	15
2.2.3 Drilling.....	15
2.2.4 Production, processing, storage and transport of petroleum product.....	17
2.3 Terrestrial Areas.....	18
2.3.1 Preliminary exploration techniques.....	19
2.3.2 Seismic surveys.....	19
2.3.4 Drilling.....	20
2.3.5 Production, processing, storage and transport of petroleum product.....	20
3 CONCLUSIONS.....	21
4 RECOMMENDATIONS.....	22
5 REFERENCES.....	22

Tables

1. Shark Bay's world heritage values
2. Key petroleum industry activities
3. Summary of EPA advice on petroleum activities, by geographic sector

Figures

1. Location, land and water uses of Shark Bay World Heritage Area
2. Distribution of the marine habitats in Shark Bay World Heritage Area
3. Zoning within Shark Bay Marine Park
4. Petroleum exploration leases and wells drilled in and near the Shark Bay World Heritage Area
5. Bathymetry of Shark Bay World Heritage Area

Appendix

1. Ministerial request to the EPA to provide advice

1 FRAMEWORK FOR EPA ADVICE

The Shark Bay World Heritage Property was inscribed on the World Heritage List, established under the Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention), on 13 December 1991 on the basis of its 'natural heritage' values. The definition of 'natural heritage' is set out in Article 2 of the World Heritage Convention and describes sites considered to be of outstanding universal value.

Shark Bay is located approximately 800km north of Perth and is the only large marine embayment on the Western Australian coast between Exmouth Gulf and Cockburn Sound (Figure 1). It is protected from the open ocean by a line of islands and is characterized by two long peninsulas. The bay is open to the Indian Ocean at the northern end and, for its size, is predominantly shallow. These attributes underpin its unique characteristics.

1.1 Background and approach

On 12 September 1997, the Western Australian and Commonwealth governments signed the *Agreement between the State of Western Australia and the Commonwealth of Australia on Administrative Arrangements for the Shark Bay World Heritage Property in Western Australia* (the Agreement) (Commonwealth of Australia, 1997). Clause 5.4 of the Agreement requires the Western Australian Minister for the Environment to:

seek advice from the EPA under s16(e) of the Environmental Protection Act 1986 (WA) regarding environmental aspects of petroleum exploration and development activities within the Shark Bay World Heritage Property. Having received advice from the EPA, the Western Australian Minister will refer this advice to the Commonwealth Minister. The Ministerial Council will then decide whether petroleum exploration and development activities are compatible with the protection, conservation and presentation of the Property and, if so, will agree on a framework for the administration and regulation of these activities.

On 17 September 1997 the Western Australian Minister for the Environment formally requested the Environmental Protection Authority (EPA) to provide advice under section 16(e) of the *Environmental Protection Act 1986* (EP Act) on a policy framework for petroleum activities in the Shark Bay World Heritage Property. The Minister's request included the following terms of reference, as specified by the Agreement (Appendix 1):

The advice should:

- *encompass the whole of the Shark Bay World Heritage area, including marine and terrestrial areas;*
- *provide a strategic policy framework within which to make decisions on environmental aspects of petroleum activities in Shark Bay;*

The advice should include consideration of:

- *all petroleum exploration and development activities, including seismic surveys, drilling, and production testing;*
- *standards, criteria and management practices for environmental protection and prevention of pollution;*
- *direct and potential environmental impacts from oil spills, seismic operations, drilling, and from introduction of exotic organisms;*

- possible impacts on fisheries and aquaculture potential;
- possible impacts on visual amenity, tourism potential, and on social and heritage values;
- possible impacts on ecosystem function and nature conservation values; and
- possible impacts on conservation and environmental values, with particular regard to the outstanding universal values for which Shark Bay was inscribed on the World Heritage List.

In mid-1998, the Western Australian Department of Environmental Protection (DEP), in consultation with Environment Australia (EA), appointed a consultant to assist with a study to address the terms of reference. The outcome of the study is the report titled *Shark Bay World Heritage Property - Draft Working Paper on Environmental Values, Cultural Uses and Petroleum Industry Impacts* (EPA, 2000), which was released in November 2000 for a three month public review and comment period. Nineteen submissions from stakeholders, the community and government agencies were taken into account and the final document was released on 20 August 2001 as *Shark Bay World Heritage Property - Environmental Values, Cultural Uses and Potential Petroleum Industry Impacts* (EPA, 2001), hereafter referred to as the 'Working Paper'. It is available at www.epa.wa.gov.au, the Shire libraries at Denham and Carnarvon and the Alexander Library in Perth.

This s16(e) report is based on the Working Paper and public comments, and contains the EPA advice and recommendations on a broad policy framework, within which to consider individual proposals for petroleum activities in the Shark Bay World Heritage Property.

For the purposes of the EPA advice, this report:

- i) sets out the world heritage values of the Shark Bay World Heritage Property (section 2.2),
- ii) divides the Shark Bay World Heritage Property into three discrete broad geographic regions (Figure 1) (section 2.3), and
- iii) identifies the key petroleum industry activities associated with exploration and production (section 2.4).

Within each region, the EPA advice examines the interaction between the values of the Shark Bay World Heritage Property and the key petroleum industry activities, taking into account the different use zones and sensitivities of the particular parts of the Shark Bay World Heritage Property at critical times of the year.

Hereafter the SBWHP shall be referred to as 'the Area'.

1.2 World Heritage Values of the Area

Shark Bay has been recognised as an area of world heritage significance because its natural and cultural heritage values meet four of the criteria set out in the Operational Guidelines for the Implementation of the World Heritage Convention. Table 1 summarises the values as listed in the 1990 Nomination Document (DASETT, 1990).

Table 1 Shark Bay world heritage values

(adapted from Shark Bay World Heritage Nomination Document and pers. comm. R. Shepherd, CALM)

*Key to Regions: S=Southern Marine; N=Northern Marine; T=Terrestrial.

World Heritage Convention Criteria and Shark Bay Values	*Region
"..outstanding examples representing the major stages of the earth's evolutionary history"	
<ul style="list-style-type: none"> • Stromatolites and microbial mats of Hamelin Pool 	S
<ul style="list-style-type: none"> • Hamelin Pool and L'haridon Bight 	S
<ul style="list-style-type: none"> • Holocene fossil shell deposits adjacent to Hamelin Pool and L'haridon Bight 	S
"..outstanding examples representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment"; distinct from the periods of the earth's development, this focuses upon ongoing processes in the development of communities of plants and animals, landforms and marine areas and fresh water bodies.	
MARINE ENVIRONMENT	
<ul style="list-style-type: none"> • Unique hydrologic structure, banks/sill-eg. Fauré Sill, steep saline gradients, 3 biotic zones 	S
<ul style="list-style-type: none"> • Hypersaline environment of Hamelin Pool 	S
<ul style="list-style-type: none"> • High genetic biodiversity due to steep environmental gradients, e.g. Snapper, venerid clams, bivalves 	S
<ul style="list-style-type: none"> • Seagrass meadows, their species diversity and their role in the evolution of the marine environment, eg Wooramel Seagrass Bank 	N, S
<ul style="list-style-type: none"> • Carbonate deposits and sediments, including <i>Fragum erugatum</i> shell deposits 	S
<ul style="list-style-type: none"> • Northern limit of transition between temperate and tropical marine environments resulting in high species diversity, e.g. 323 fish species, 218 bivalve species and 80 coral species 	N, S
TERRESTRIAL ENVIRONMENT	
<ul style="list-style-type: none"> • Botanical province transition zone, especially southern parts of Nanga and Tamala Stations 	
<ul style="list-style-type: none"> • Floral range limits, eg. 229 at their northern limit, 56 at their southern limit, 53 endemic vascular plant species 	
<ul style="list-style-type: none"> • Fauna isolated on islands / peninsulas eg. 5 threatened mammals on Bernier and Dorre Is. 	
<ul style="list-style-type: none"> • Range limits and fauna species richness, eg. 100 species of herpetofauna (9 endemics), 230 species of birds representing 35% of Australia's total species 	
<ul style="list-style-type: none"> • Species evolution illustrated in Rufous Hare Wallaby and Banded Hare Wallaby 	
"Contain 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	
<ul style="list-style-type: none"> • Stromatolites 	S
<ul style="list-style-type: none"> • Abundance of marine fauna (Dugongs, whales, dolphins, sharks, rays, turtles and fish) 	N, S
<ul style="list-style-type: none"> • Hypersaline environment of Hamelin Pool 	S
<ul style="list-style-type: none"> • Fauré Sill, Wooramel seagrass bank 	S
<ul style="list-style-type: none"> • Coastal scenery of Zuytdorp cliffs, Dirk Hartog Island, Peron Peninsula and Heirisson and Bellefin Prongs 	N, S
<ul style="list-style-type: none"> • Strongly contrasting colours of dunes/cliffs, beaches and adjacent sea of Peron Peninsula 	S
<ul style="list-style-type: none"> • <i>Fragum</i> beaches of L'haridon Bight 	T
<ul style="list-style-type: none"> • Inundated birridas and lagoons such as Big Lagoon 	S
<ul style="list-style-type: none"> • Seasonal wildflower display 	T
"Contain the most important and significant natural habitats where threatened species of animals or plants of outstanding universal value from the point of view of science and conservation still survive."	
<ul style="list-style-type: none"> • 5 out of Australia's 26 species of endangered mammals, i.e. Shark Bay Mouse, Banded Hare Wallaby, Rufous Hare Wallaby, Western Barred Bandicoot and Boodie 	T
<ul style="list-style-type: none"> • 12 threatened reptiles, e.g. Baudin Island Skink and Woma 	T
<ul style="list-style-type: none"> • 35 migratory bird species; 2 threatened species - Thick-Billed Grasswren and Mallee Fowl 	T
<ul style="list-style-type: none"> • Endemic Dirk Hartog subspecies of the Southern Emu-wren 	T
<ul style="list-style-type: none"> • Dugongs (approx. 1/8 world pop'n) Humpback Whales, Loggerhead and Green Turtles 	N, S
<ul style="list-style-type: none"> • Two threatened flora species (<i>Eucalyptus beardiana</i> and <i>Plectrachne bromoides</i>) 	T

Shark Bay is a complete and complex marine ecosystem surrounded by some very important terrestrial communities (Figure 2). Its natural heritage contains many physical and biological formations of outstanding universal value to conservation, science and aesthetics. The values derive from the formations, habitats and ongoing processes of its terrestrial and marine environments. The diversity of terrestrial habitats and overlap between the South West Botanical and the Eremaean Botanical Provinces has led to the diversity of flora and fauna species, many of which are at the limits of their geographical distributions. A more detailed account of these values and their encompassing environments can be found in the Working Paper (EPA, 2001).

1.3 Current Legislative and Policy framework on petroleum activities

The World Heritage values of the Area are currently subject to various legislative and policy protection mechanisms, some of which pay particular attention to petroleum activities.

Development proposals within the Area are liable to come under the provisions of the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act specifies a declared World Heritage property as a matter of national environmental significance, and any activity that will have or is likely to have a significant impact on its world heritage values requires Ministerial approval (section 12). That approval needs to be consistent with Australia's obligations under the World Heritage Convention (section 137).

Under the Agreement on administrative arrangements for the Area, Western Australia is responsible for ensuring that *actions which are inconsistent with the protection, conservation and presentation of the Property's outstanding universal values are not permitted. ... any decisions made, or approvals given, under management plans will be consistent with the protection, conservation and presentation of the Property's outstanding universal values* (clause 7.5). Nevertheless, *Management of the Property will provide for both the continuation of commercial activities and new developments, provided they comply with State legislation and Local Government by-laws and do not threaten the outstanding universal values for which the Property is included on the World Heritage List* (clause 7.7) (Commonwealth of Australia, 1997).

The Agreement thus allows for petroleum exploration and development to proceed in the Property:

- subject to strategic and management plans arising out of the Agreement;
- subject to the provisions of the *Conservation and Land Management Act 1984* (CALM Act);
- subject to the provisions of the EP Act; and
- providing the petroleum activities do not threaten the Property's outstanding universal values.

The CALM Act excludes petroleum drilling and production in marine nature reserves and specified zones in marine parks. The CALM Act is supported by the State Government *New Horizons* policy (Government of WA, 1997) which sets out that:

1. petroleum drilling and production are prohibited in:
 - marine nature reserves, and
 - both sanctuary and recreation zones of marine parks and in those special purpose zones of marine parks where such activity would be incompatible with the conservation purpose of the zone;
2. petroleum drilling and production are permitted in parts of general use and special purpose zones of marine parks subject to assessment through the EP Act process; and
3. petroleum drilling and production can be undertaken in marine management areas subject to the EP Act process.

All marine conservation reserves in WA extend to a depth of 200 metres below the seabed. The airspace above is not height-limited.

Under the EP Act, proposals that appear likely, if implemented, to have a significant effect on the environment will be referred to the EPA under s38 for determination of whether or not to assess, and, if so, at what level. Petroleum exploration or production proposals in the SBWHP are required to be referred to the EPA for formal environmental impact assessment (EIA), in accordance with the draft Memorandum of Understanding (MoU) between the EPA and the Department of Industry and Resources (DoIR) regarding petroleum activities. The EIA process enables the EPA to consider applications on a case-by-case basis, provides an opportunity for interested parties to comment on specific proposals and, if a proposal is approved, to tailor any recommended conditions of approval to reflect the specifics of each proposal.

The draft inter-departmental MoU between the DoE and DoIR relating to petroleum activities in marine and terrestrial areas does not specifically mention world heritage areas.

The State Australian Labor Party's published policy is *to prohibit mineral and petroleum exploration and mining in national parks and nature reserves (terrestrial areas)* (Australian Labor Party, 2000).

1.4 Geographic sectors of the Area

Shark Bay world heritage values are characteristic of different areas with different environmental sensitivities. For the purposes of examining the interaction between the values of the Area and potential petroleum industry activities, the Area has been divided into three geographic sectors, based primarily upon the land and water uses of the Area (Figure 1), the distribution of the marine habitats of Shark Bay (Figure 2) and the zoning of the Shark Bay Marine Park (Figure 3). The sectors are:

- Southern Marine Area;
- Northern Marine Area; and
- Terrestrial Area.

The Southern Marine Area is predominantly the Shark Bay Marine Park. The dividing line between the Southern and Northern Marine Areas is the east-west line passing through the north ends of Dirk Hartog Island and Cape Peron. Both Southern and Northern Marine Areas contain a mixture of Shark Bay Marine Park and non-marine park waters. The Terrestrial Area includes the islands and the mainland.

1.5 Petroleum activities

Four main petroleum industry activities (undertaken during the exploration and/or development phases of a project) have been considered within each of the three geographic sectors:

- preliminary exploration (exploration);
- seismic surveys (exploration);
- drilling (exploration and development); and
- production, processing, storage and transport (development).

Table 2 Key petroleum industry activities

EXPLORATION	DEVELOPMENT
Preliminary exploration	Development drilling
Seismic survey	Production (oil and gas)
Exploration drilling	Processing and storage
	Product transport (pipelines, ships, dredged channels)

The scope of this strategic assessment is to consider all facets of petroleum exploration and development, including production, processing and transporting the product.

In 1997 the Western Australian Department of Minerals and Energy granted Exploration Permit (EP) 406. It was held until 28 November 2002 and then relinquished. EP406 straddled the northern boundary of the SBWHP from immediately offshore of Carnarvon to west of Bernier and Dorre Islands (Figure 4). It was the view of the former permit holders that the most prospective area for economic reserves of petroleum in the Shark Bay area is the northern and western sector, particularly in the vicinity of Bernier, Dorre and Koks Islands.

Pending the outcome of this strategic study, no formal proposal for petroleum exploration or development has been referred by DoIR to the EPA for assessment although the EPA understands that an application for former permit area EP406 has been lodged with the DoIR. DoIR is awaiting the outcome of the EPA's report before responding to that application.

2. COMPATIBILITY OF NOMINATED SHARK BAY WORLD HERITAGE VALUES WITH PETROLEUM ACTIVITIES

Underpinning the EPA's advice on the compatibility of Shark Bay's world heritage values with petroleum activities is an assessment of the potential impacts of those activities on the values. The EPA has based its advice on technical information contained in the Working Paper on the routine and potential environmental impacts of petroleum activities. Where insufficient information on the impacts of a particular activity is available, the EPA has adopted a precautionary approach. Increased potential for significant impacts is generally linked to the more advanced stages of petroleum activity.

Table 3 provides a summary of the EPA advice on the petroleum activities by geographic sector and by reference to Figures 1, 2 and 3. The context for the EPA's advice is more fully explained in sections 2.1, 2.2 and 2.3.

2.1 Southern Marine Area

This region of the Area (Figure 3) comprises most of the area of the Shark Bay Marine Park. It occupies the southern two thirds of Shark Bay on both sides of Peron Peninsula southwards of Cape Peron and includes the highly sensitive areas of Hamelin Pool (a marine nature reserve), Fauré Sill, L'haridon Bight (incorporating Shell Beach Sanctuary Zone) and the southern half of the Wooramel Seagrass Bank. An approximately 15km wide portion of the area adjacent to the coastline from Carnarvon to Gladstone comprises a 'special purpose zone' (covering the Wooramel Bank seagrasses and the Gladstone Dugong lek site) and Disappointment Reach Sanctuary Zone.

On the west arm of Shark Bay the Freycinet and Boorabuggatta Special Purpose Zones are designated for habitat protection of seagrasses and fish stocks respectively. The former is important to Dugongs in the warmer months. The 18 Mile Sanctuary Zone within Henri Freycinet Harbour and the Big Lagoon Sanctuary Zone protect Dugong nursery habitats. The Sandy Point and Surf Point Sanctuary Zones off Dirk Hartog Island preserve fragile benthic communities including corals and fish, while the remainder of the southern portion of Shark Bay forms part of the 'general use zone' of the Shark Bay Marine Park. The Shark Bay Salt operation in the Useless Loop area of Shark Bay's western arm is excluded from the World Heritage Area but adjoins the 'general use zone' of the marine park.

The listed Shark Bay world heritage values that relate to this region are:

- banks and sills, including Fauré Sill, Wooramel Seagrass Bank;
- stromatolites and microbial mats of Hamelin Pool;
- carbonate deposits and sediments, including *Fragum erugatum* shell deposits;
- unique hydrological structure, including the steep salinity gradient and the hypersaline environment of Hamelin Pool;
- three biotic zones and high genetic biodiversity due to the steep environmental gradients;
- northern limit of transition between temperate and tropical marine environments resulting in high species diversity (323 fish species, 218 bivalve species and 80 coral species) and abundance of marine fauna (Dugongs, whales, dolphins, sharks, rays, turtles); and
- inundated birridas and lagoons.

Mangroves and algal mats are not a listed world heritage value but the EPA regards them as important and sensitive environments, as food sources, roosting habitat and nursery areas to many marine, avian and terrestrial species. They are an integral part of the ecosystems which support many of the listed world heritage values and are extremely vulnerable to oilspills. They occupy much of the eastern coastline shorewards of the Wooramel Seagrass Bank.

Table 3. Summary of EPA advice on petroleum activities, by geographic sector

SOUTHERN MARINE AREA – Shark Bay Marine Park			
Preliminary exploration	Seismic	Drilling	Production, processing, storage and transport
<p>The CALM Act 1984 includes the airspace above marine conservation reserves as a part of them. Reserves include: Disappointment Reach, 18 Mile, Shell Beach, Sandy Point, Big Lagoon, Mary Anne Island, and L'haridon Bight Sanctuary Zones; Wooramel, Gladstone, Freycinet, Boorabuggata; and Big Lagoon Special Purpose Zones; and Hamelin Pool Nature Reserve.</p>	<p><u>New Horizons Policy</u>: marine parks are accessible, subject to EIA processes. Seismic may, in some cases, be permitted to extend into conservation reserve areas that are not accessible to drilling to complete data acquisition for targets either outside or accessible from outside the reserve.</p>	<p>The CALM Act 1984 precludes exploratory drilling from sanctuary areas, recreational areas or special purpose areas within which the activity would be incompatible. <u>New Horizons Policy</u>: prohibited in marine nature reserves, both sanctuary and recreation zones of marine parks and in those special-purpose zones of marine parks where incompatible with the conservation purpose of the zone.</p>	<p>The CALM Act 1984 precludes production from sanctuary areas, recreational areas or special purpose areas within which the activity would be incompatible. <u>New Horizons Policy</u>: prohibited in marine nature reserves, both sanctuary and recreation zones of marine parks and in those special-purpose zones of marine parks where incompatible with the conservation purpose of the zone.</p>
<p>Infrequent broad-spaced aerial surveys OK over general use zones where the environmental impact of these activities can be demonstrated to be negligible. Close-spaced low flying surveys, as in aeromagnetics, incompatible when coincident with whales in the northern portion of the area for feeding, calving, resting or mating purposes.</p> <p>Ship-towed devices not acceptable in marine nature reserves, sanctuary zones and special purpose zones where the activity proposed is incompatible with their conservation purpose.</p> <p>Geotechnical drill core sampling-generally not incompatible with listed values, but, as a precursor to drilling see comments under 'Drilling'</p>	<p>General presumption against seismic surveys, but may be permitted in some general-purpose areas to complete data acquisition for a target largely outside of the Area.</p> <p>Not in recreational and sanctuary zones of Shark Bay Marine Park or marine nature reserves; and special purpose zones where their purpose is incompatible with the proposed seismic.</p> <p>To prevent undue disturbance to migrating whales in the period (typically June to October) when whales are known to be resting, calving, feeding or passing through the deeper, northern part of this area, seismic should be avoided at this time, subject to the above provisos.</p> <p>No use of explosives in marine setting.</p>	<p>Presumption against drilling in this area because the potential and perceived consequences of a spill are too great to be compatible with the nominated world heritage values.</p> <p>Drilling at locations outside the World Heritage boundary requires referral of proposals and formal assessment, evaluation of oilspill trajectory modelling and site-specific, rigorously prepared spill management plans</p> <p>Use of dispersants on an oilspill is the least preferred option. Avoid unless there is a greater threat to the environment if not used.</p>	<p>No production, processing of the crude product, storage or transport, with one possible exception: -transport of dry gas via pipeline through parts of the World Heritage Area may be considered for assessment depending on the route and timing of construction.</p>

NORTHERN MARINE AREA			
Preliminary exploration	Seismic	Drilling	Production, processing, storage and transport
Marine conservation reserves include: Wooramel and Cape Range Special Purpose Zones and the Gudrun Wreck Sanctuary Zone.	<u>New Horizons Policy</u> : marine parks are accessible, subject to EIA processes. Seismic may, in some cases, be permitted to extend into conservation reserve areas that are not accessible to drilling to complete data acquisition for targets either outside or accessible from outside the reserve.	<u>The CALM Act 1984</u> precludes exploratory drilling from sanctuary areas, recreational areas or special purpose areas within which the activity would be incompatible. <u>New Horizons Policy</u> : prohibited in marine nature reserves, both sanctuary and recreation zones of marine parks and in those special purpose zones of marine parks where incompatible with the conservation purpose of the zone.	<u>The CALM Act 1984</u> precludes production from sanctuary areas, recreational areas or special purpose areas within which the activity would be incompatible. <u>New Horizons Policy</u> : prohibited in marine nature reserves, both sanctuary and recreation zones of marine parks and in those special purpose zones of marine parks where incompatible with the conservation purpose of the zone.
<p>Infrequent broad-spaced aerial surveys OK over general use zones where the environmental impact of these activities can be demonstrated to be negligible. Close-spaced low flying surveys, as in aeromagnetics, incompatible when coincident with whales in the area for feeding, calving, resting or mating purposes.</p> <p>Appropriately timed and located ship-towed surveys which avoid coral and seagrass areas could be compatible with the nominated values, where the environmental impact of these activities can be demonstrated to be negligible.</p> <p>Geotechnical drill core sampling may be compatible with listed values, but, as a precursor to drilling refer to 'Drilling'</p>	<p>General presumption against seismic surveys, but may be permitted in some general-purpose areas to complete data acquisition for a target largely outside of the Property. Seismic proposals to demonstrate they will avoid damage to seagrasses and corals by maintaining an appropriate separation between them, the airgun array and the towed microphone streamers.</p> <p>Seismic surveys incompatible with the values in sanctuary zones of Shark Bay Marine Park or marine nature reserves; and some special purpose zones. Surveys should avoid the times of the year (typically June to October) when whales and Dugongs are known to be resting or passing through the area.</p> <p>To avoid disturbance to the breeding and nesting routines of turtles requires close consultation with CALM to determine where and when proposals can take place.</p>	<p>Presumption against drilling in this area because the potential and perceived consequences of a spill accident are too great to be compatible with the nominated world heritage values.</p> <p>Drilling at locations outside the World Heritage boundary requires referral of proposals and formal assessment, evaluation of oilspill trajectory modelling and site-specific, rigorously prepared spill management plans</p> <p>Use of dispersants on an oilspill is the least preferred option. Avoid unless there is a greater threat to the environment if not used.</p>	<p>No production, processing of the crude product, its storage and transport, with one possible exception: -transport of dry gas via pipeline through parts of the World Heritage Area may be considered for assessment depending on the route and timing of construction.</p>

TERRESTRIAL AREAS			
Preliminary exploration	Seismic	Drilling	Production, processing, storage and transport
	<u>Under current Government policy:</u> areas of national park, such as François Peron National Park, are protected from exploration activities.	<u>Under current Government policy:</u> areas of national park, such as François Peron National Park, are protected from exploration activities.	<u>Under current Government policy:</u> areas of national park, such as François Peron National Park, are protected from production activities.
Aerial surveys are not expected to significantly affect terrestrial fauna, but surveys which also overfly marine areas need to take into account restrictions to access in the Northern and Southern Marine areas-see above	<p>General presumption against seismic surveys, but may be permitted in some general-purpose areas to complete data acquisition for a target largely outside of the Property.</p> <p>Conventional (Vibrosey truck) seismic survey activities not compatible with areas with nominated world heritage values, such as the fossil shell deposits around Hamelin Pool and L'haridon Bight, the inundated birridas and lagoons, and the dunes, cliffs and beaches.</p> <p>Seismic on island nature reserves is incompatible with the nominated world heritage faunal values.</p> <p>Seismic is incompatible in areas where particular flora have been recognised for their conservation values.</p>	Drilling activities not compatible with areas with nominated world heritage values (relating to fauna, scenery and visual amenity) including the fossil shell deposits around Hamelin Pool and L'haridon Bight; the inundated birridas and lagoons; and the dunes, cliffs and beaches.	No production, processing of the crude product, its storage and transport, with one possible exception: -transport of dry gas via pipeline through parts of the World Heritage Area may be considered for assessment

The EPA holds the view that many of the abovementioned areas have values which would be susceptible to impacts from some petroleum activities. These are discussed below.

2.1.1 Preliminary exploration techniques

Preliminary exploration techniques (Section 8.1.1, Working Paper) can be divided into two groups:

- techniques for detecting hydrocarbons under, on or in the ocean, including aeromagnetics, airborne laser fluorosensor, and ship-mounted 'sniffer' surveys. Many of these techniques have little effect on the environment, other than those normally associated with aircraft and ships;
- techniques for developing an understanding of the seafloor in the immediate vicinity of a proposed drilling location for the purpose of safely siting a jack-up drill rig.

Potentially affected creatures such as Dugongs and dolphins inhabit some of these areas at certain times of the year, although the distribution of dolphins in Shark Bay is not well understood. Whales are not typically found in the more confined internal waters of Shark Bay. This area contains the only known Dugong lek, which is recognised and protected from petroleum activities under the *New Horizons* policy as the Gladstone Special Purpose Zone. The area around Gladstone is occupied by Dugongs, which mate there during summer. Being tropical animals, they favour the shallower, warmer waters in summer, rather than the deeper, cooler, more open waters to the north at that time of the year. The Dugongs feed on the plentiful seagrasses in the area. The hypersaline waters of Hamelin Pool and L'haridon Bight are not frequented by large marine animals.

Infrequent, broad-spaced aerial reconnaissance surveys over Shark Bay are unlikely to cause impacts to the fauna present, apart perhaps from a momentary response to the noise and shadow of the infrequent passing of an aircraft. However, closer-spaced aeromagnetic surveys, where aircraft typically fly repeated low passes at 80-150m above the sea on traverses 400-800m apart, may disrupt the activities of whales, dolphins or Dugongs which are feeding, mating, calving or resting.

The critical time for Dugongs in the Gladstone lek area is during summer when they court, mate and rear calves. Large numbers of parents and calves are found during summer on Fauré Sill and the Wooramel Seagrass Bank. The EPA considers that close-spaced, low-level aerial surveys above these shallow waters would be potentially disruptive to Dugongs and that they are not appropriate activities.

Ship-mounted sniffer surveys, where a device is towed in the water, carry some risk of snagging of the towed device, or of physical contact with marine fauna. There is also a chance of oilspills from boats, and the spread of exotic organisms from their hulls. Accordingly, the EPA recommends that the highly sensitive marine conservation reserves should remain free of such activities. In the context of Scenario 1 set out in the Executive Summary, it may be possible to achieve limited data collection for targets that are outside or accessible from outside the reserves.

Techniques for developing an understanding of the seafloor in the immediate vicinity of a proposed drilling location for the purpose of locating a drilling rig include ship-borne sonar, drop-core and graph surveys and geotechnical core drilling. As these surveys are only carried out as a precursor to drilling full-sized exploration wells, any assessment of their compatibility with the nominated world heritage values should consider the likely impacts of the proposed exploration drilling programme. Accordingly, further discussion of the compatibility of these techniques with the nominated world heritage criteria is included in section 2.1.3 (Drilling).

2.1.2 Seismic surveys

The New Horizons policy states that marine management areas and marine parks are accessible for seismic surveys subject to environmental impact assessment processes agreed by the Environmental Protection Authority in consultation with CALM and the Fisheries Department. Seismic surveys may be permitted, subject to environmental impact assessment processes, to extend into marine conservation reserve areas that are not available for drilling, to complete data collection for resource targets that are either outside or accessible from outside the reserve.

In general, the EPA is of the view that seismic activity is incompatible with several of the listed values of the Area and that the recreation zones, sanctuary zones, marine nature reserves and special purpose zones (where the purpose is incompatible with seismic activity) of the Shark Bay Marine Park are inappropriate locations for seismic surveys. This is discussed more fully in Section 8.1.2 of the Working Paper. Accordingly, the EPA considers that seismic survey work should not be undertaken within these waters.

However, where a target is largely outside the Area and seismic data from within is required to complete data acquisition, appropriately timed and located seismic surveys might be considered to be environmentally compatible with the values of this area, subject to formal assessment. They would have to avoid recreation and sanctuary areas of marine parks, marine nature reserves, and significant seagrass banks, coral reefs and the times and locations when resting whales, breeding turtles and aggregating Dugongs are present.

2.1.3 Drilling

Under the New Horizons policy drilling is prohibited in marine nature reserves, both sanctuary and recreation zones of marine parks and in those special purpose zones of marine parks where such activity would be incompatible with the conservation purpose of the zone. Accordingly, Hamelin Pool Nature Reserve, the Sanctuary Zones of Disappointment Reach, 18 Mile and Shell Beach, and Gladstone, Freycinet and Boorabuggatta Special Purpose Zones (Figure 3) are excluded from drilling.

Preliminary exploration surveys, usually undertaken prior to the drilling of exploration wells, test the strength of the seafloor at the site of proposed wells using jackup drilling rigs. These rigs can negotiate waters as shallow as 5 metres, making much of the southern portion of Shark Bay physically accessible. The EPA considers that drilling activities, because of the equipment required, the level of support services, the time taken to complete each well and the actual and potential environmental impacts, are

generally incompatible with the listed world heritage values of the area. Sections 8.1.3. and 9 of the Working Paper discuss the reasons.

Accordingly, the EPA recommends that there be a presumption against drilling in the Southern Marine Area of Shark Bay because the actual environmental impacts and the potential consequences of an accident are too great to be compatible with the nominated world heritage values.

2.1.4 Production, processing, storage and transport of petroleum product

It is current government policy to prohibit petroleum exploration and production in terrestrial national parks and nature reserves. Under the *New Horizons* policy, petroleum production is *prohibited in marine nature reserves, both sanctuary and recreation zones of marine parks and in those special purpose zones of marine parks where such activity would be incompatible with the conservation purpose of the zone.*

Production, processing and storage of product impose commensurately higher routine impacts and greater risks of accident than those for drilling, and over a much longer timeframe (Sections 8.1.4 and 9 of the Working Paper). The transport of liquid petroleum product from within the Area could be expected to require the construction of a dedicated deepwater port. Deepwater access would most likely require the dredging of a channel and the dumping of dredge spoil. Ships bring with them the risk of introducing exotic organisms, either from jettisoned ballast water or directly from their hulls. The results of such an episode could be devastating, as has been the case in Tasmanian waters.

Given the potentially significant consequences, even if the risk of such occurrences were low, the EPA considers that production proposals within the Southern Marine Area are incompatible with its nominated values.

The transfer of gas by pipeline would usually pose a lesser risk of accidental consequences than does the transmission of oil. A gas pipeline laid through some of the sandy marine parts of Shark Bay to the mainland may be environmentally acceptable, provided that the gas has had the condensate fraction stripped from it, in a processing facility outside of the Area. Under these circumstances the expected impacts within the Area would be those arising from the presence of the ship and the laying and maintenance of such a pipeline. If, for example, it were to avoid corals, seagrass beds, mangroves and stromatolites, the impacts associated with its emplacement are likely to be slight, relatively short term and could be offset by the environmental benefits attached to the use of natural gas as opposed to dirtier fuels. The EPA would give due consideration to the merits of such a proposal (Scenario 3).

2.2 Northern Marine Area

The EPA understands that the offshore portion of the Area, particularly the northern and western sector in the vicinity of Bernier, Dorre and Koks Islands, is the most likely area to be prospective for petroleum (section 2.3). Notwithstanding this, it is possible that, depending on the interpretation of geophysical data, prospecting interest could move its focus to other parts of the Area.

The listed world heritage values which relate to this region are:

- seagrass meadows, their species diversity and their role in the evolution of the marine environment;
- northern limit of transition between temperate and tropical marine environments, resulting in high species diversity (323 fish species, 218 bivalve species and 80 coral species) and abundance of marine fauna (Dugongs, whales, dolphins, sharks, rays, turtles); and
- coastal scenery.

Seagrass is widely distributed throughout Shark Bay (Figure 2). It is at its most extensive and species-diverse on the Wooramel Seagrass Bank, which occupies the eastern shallows southward from Carnarvon almost to Gladstone. Areas to the north and west of Shark Bay Marine Park contain the deeper portions of the Area (Figure 5).

The western sides of Dirk Hartog, Dorre, Bernier and Koks Islands comprise cliffs and exposed beaches, while their eastern shores offer more protected, lower energy environments. The resulting coastal scenery reflects these differences.

2.2.1 Preliminary exploration techniques

The nature of these activities was described in Section 2.1.1.

Dugongs, whales, and dolphins inhabit these northern waters at certain times of the year. In winter, Dugongs move north into these deeper, relatively warmer parts of Shark Bay and migrating whales use this area as a resting ground (Working Paper Section 8.1.2). Infrequent, broad-spaced aerial reconnaissance surveys over Shark Bay are considered unlikely to cause impacts to the resident fauna. For closer-spaced surveys, the repeated low passes over areas where whales, dolphins and Dugongs are feeding, calving or resting may disrupt those activities.

The potential for some disturbance to cetaceans is recognised by the Australian guidelines for cetacean observation (Commonwealth of Australia, 2000). They stipulate a minimum distance of 300m for aircraft other than helicopters. The guidelines prohibit the use of helicopters for cetacean-watching activities and the recommended minimum separation to be observed by pilots of these aircraft is 1000m.

The EPA considers that aerial surveys which avoid times when whales and Dugongs are present could be environmentally compatible with the values of this area and recommends that, if aerial surveys are proposed (Scenario 2) for the Northern Marine Area, they should be done during seasons other than winter in order to avoid disturbing resting whales (often nursing mothers) and Dugongs.

Coral reefs are scattered along the eastern flanks of Bernier, Dorre and Dirk Hartog Islands and boat-based surveys which tow sensing devices may snag and damage the corals. Towed devices may have similar impacts on seagrasses along the eastern side of the Bay (Wooramel Seagrass Bank) because of the shallowness of much of the water.

The EPA considers that ship-based surveys are generally incompatible with the listed values of this area. However, surveys to supplement data on petroleum targets outside the boundaries of the SBWHP (Scenario 1) or within (Scenario 2) may be considered

for formal assessment, provided that it can be demonstrated that no damage would result to areas of coral or seagrasses or other listed values.

Whilst the EPA considers geotechnical drill core sampling from boats to be not incompatible with the values of the area due to the small affected area (approximately 1m² for each sample point), the subsequent use of a jackup drill rig in nearshore areas creates impacts and risks which are problematic. These are discussed more fully below in Section 2.2.3.

2.2.2 Seismic surveys

Conventional seismic surveys need water at least 10m deep to operate effectively. Towing the airgun arrays, which may be up to 7.5km long, requires considerable space for turning and general manoeuvring. Airgun arrays are typically filled with kerosene for buoyancy. Breakages of the lines and spillages of up to 10,080L of kerosene arising from normal operations offshore WA have been recorded in the DoIR's database (Working Paper Section 9.2.2).

Killer Whales, Dugong and migrating Humpback Whales use the northern areas of Shark Bay to rest, feed and calve at certain times of the year. Research (Working Paper Section 8.1.2; McCauley, 2000) indicates that Humpback Whales would exhibit significant avoidance behaviours at distances up to 12km from the seismic source and that cow-calf pairs possibly exhibit greater avoidance responses than migrating whales. Turtles' hearing capabilities correspond closely to the sound spectrum of seismic shots. Studies have shown that their behaviour becomes more erratic and behavioural changes can be expected at closer than 2km to a seismic survey.

Where seismic surveys are close-spaced the potential for disturbance of these creatures is increased because the amount of potentially conflicting survey time in the area is increased.

The *New Horizons* policy permits seismic activity in marine management areas and marine parks, subject to environmental impact assessment processes agreed by the EPA in consultation with CALM and the Department of Fisheries.

In general the EPA considers that the listed world heritage values are not compatible with seismic surveys, but would consider specific proposals where there is a demonstrated requirement to complete data acquisition for a target outside the Area. Appropriately timed and located surveys would be expected to avoid seagrass banks and coral reefs and the times and locations when resting whales, breeding turtles and calving Dugongs are present in order to be environmentally compatible with the values of this area, subject to formal environmental impact assessment (Scenario 1).

2.2.3 Drilling

Under the *New Horizons* policy, drilling may be permitted in special purpose zones of marine parks, such as the Wooramel Seagrass Bank, subject to assessment under the provisions of the EP Act.

Section 8.1.3 of the Working Paper details the activities and impacts associated with exploration drilling in the marine environment.

The EPA considers that there should be a presumption against drilling in the Area for the following reasons:

- the high visibility of drill rig platforms is not compatible with the listed world heritage value of coastal scenery;
- the bright lighting of drill rig platforms could disorient turtles;
- routine and accidental discharges from drill rigs could have unacceptable consequences on listed marine environmental values, such as the seagrass meadows and mangroves. The treatment most likely to be used for an oilspill is the application of dispersants, which may be equally incompatible with the area's listed values. Studies have shown that marine organisms vary widely in their response to dispersants, which are, in essence, another pollutant. Dispersants distribute the oil mixture through the water column to a depth of up to 10 metres;
- in Shark Bay the most productive and sensitive environments are those supporting seagrasses, as well as the unlisted but equally sensitive corals and coastal mangroves.

Seagrasses could therefore be affected in water shallower than about 10-15m. If, in a spill event, dispersant were used because, for example, oil is being driven by winds and tides towards the eastern mangrove-fringed coastline, shallow-water seagrasses could suffer adverse effects from the dispersed oil / dispersant mixture in the water column. Alternatively, if dispersant were not used and the oil lodged in the mangroves, it could cause severe damage lasting for decades.

In general the EPA regards the use of dispersant to break up an oilspill as the least preferred option, to be avoided unless its non-use poses a greater threat to the environment. In the above scenario, use of dispersants is not an acceptable environmental management option. Drilling has greater potential for significant environmental impacts on seagrasses in shallower areas of the Bay, close to the mangroves on the eastern shore.

Given the likelihood of ineffective oilspill responses, the time taken for spilt oil to naturally weather and disperse, the distances it might travel in that time under the influence of winds and tidal surges, the listed sensitive values potentially in its path, and the inability to predict and influence the movements of fauna with any degree of certainty, the EPA is of the view that there should be a presumption against offshore drilling anywhere within the Area.

The region around the northern islands is understood to be of particular interest for petroleum exploration (Working Paper Section 6.3). If drill targets are centred under Dirk Hartog, Dorre, Bernier or Koks Islands where terrestrial drilling is currently prohibited under government policy, directional drilling from offshore to below the 200m limit may be an option. Accordingly, the EPA considered drilling scenarios at sites seaward of the western island chain and potentially outside the world heritage boundary.

The west flanks of these islands are important for rock lobster fishing and the waters west of the island chain are at certain times of the year the major north-south migratory route for fish and whales. There may be serious impacts on whales if they surface to breathe in an oil slick.

Dorre, Bernier and Koks Islands are 'A' class nature reserves. The first two are breeding sites for nine marine bird species. Dirk Hartog Island is a nesting ground for a number of birds including Ospreys and Sea Eagles. Turtle Bay, at its northern tip, is a very important nesting site for Loggerhead and Green Turtles.

One of the nominated values for the Area is the abundant marine fauna of Shark Bay. In any assessment of an offshore drilling proposal, the EPA would consider whether this environmental value can be protected from the routine impacts of the drilling and from an accident involving spilt crude oil or fuel from the drill rig or its attendant tender vessel. In an area where the prevailing winds are strong and frequently from the south to southwest, much of the western flanks of these islands would be at risk from a spill and under such prevailing winds in open waters a spill could not be physically contained. The degree of risk would depend on the size of the spill and the distance offshore, weather conditions and the type of oil.

Light oil coming to shore along cliffs and exposed beaches would be expected to evaporate relatively quickly without leaving a lasting residue and without the use of dispersants. There would, however, be a toll on organisms and fauna directly in its path because of the toxic nature of the oil's component fractions. Heavier oils, while typically less toxic, leave a smothering coating on contact, unless they are broken up by the timely use of a dispersant. As there has been relatively little drilling in the Shark Bay region, the type of oil likely to be encountered is not confidently known. In any assessment of a proposal to drill offshore from the island chain the EPA would consider the size of buffer zone separating the islands from a proposed drill site outside the world heritage boundary so as to adequately protect the nominated conservation values. Wind direction and strength depend on the time of the year, and these factors have a fundamental bearing on the distance and direction that spilt oil would travel. Were drilling to be proposed from outside the world heritage boundary, this would dictate the size of the buffer zone necessary to surround any particular drill site.

With the number of time-related weather variables and faunal movements that must be considered, and the limited current and spill modelling data available to support any drilling proposal, the EPA favours a presumption against drilling until meaningful spill trajectory data from modelling of the area can show that a credible spill is unlikely to have a significant impact on sensitive natural resources within the Area.

Formal assessment should be required for all drill proposals bordering the Area, enabling drill locations to be considered with meaningful trajectory modelling and specific, rigorously prepared spill management plans.

2.2.4 Production, processing, storage and transport of petroleum product

The risks and consequences of production, storage and transport scenarios are typically higher than those for exploration drilling because production scenarios are more complicated, require higher levels of support over years or decades and involve much

larger volumes of oil. Production platforms are large and visually prominent, more so if separating and processing takes place on board. The EPA considers that these activities, because of their long-term nature and correspondingly higher routine impacts (visual, dredging for shipping channels, ports, etc) and the potential for accidental impacts over the lifetime of the producing field, are inappropriate within the Area.

The risks and consequences associated with the production, storage or transport of dry gas are different from those associated with liquid petroleum. Gas generally poses fewer threats to the environment because the threat from spillage of a liquid product is removed. As discussed in Section 2.1.4, there may be specific scenarios associated with the pipeline transport of gas (Scenario 3) which present fewer overall environmental impacts to the Shark Bay area and offer environmental benefits. The EPA would consider individual proposals on their merits.

2.3 Terrestrial Areas

In the context of petroleum exploration permit EP406, the EPA notes that Dorre, Bernier and Koks Islands (where petroleum interest was focussed) are designated Class 'A' nature reserves, Nos. 24869 and 33901 (proclaimed in 1957 and 1976 respectively), and accordingly, no onshore petroleum exploration or development activities are permitted. The EPA supports this position, noting the following listed world heritage values relating particularly to these areas:

- isolation of fauna on islands and peninsulas – 5 species of threatened mammals on Bernier and Dorre Islands, including Bernier Island subspecies of Shark Bay Mouse, Boodie, Western Barred Bandicoot, Rufous Hare-wallaby, Banded Hare-wallaby;
- range limits and fauna species richness; and
- species evolution illustrated in Rufous Hare-wallaby and Banded Hare-wallaby.

Other class 'A' nature reserves are Friday Island and Charlie Island. Fifteen of the total of 30 or so islands in Shark Bay are nature reserves of a lower category.

In terms of the operation of the CALM Act, the airspace above terrestrial national parks and reserves is not explicitly considered to be a part of those reserves.

While the mainland terrestrial parts of the Area are thought to be less prospective for hydrocarbons, the potential still exists. Terrestrial exploration techniques differ from their marine counterparts in the tools used and their impacts. The routine impacts of terrestrial seismic surveys leave a greater visual legacy than in the marine environment, although accidental production spills on land may be more readily contained.

The listed nominated values for Shark Bay terrestrial environments are:

- transition between South Western and Eremaean Botanical provinces (most evident in the southern parts of Nanga and Tamala Stations) giving rise to floral range limits and species richness (229 flora at their northern limits, 56 at their southern limits, and 53 endemic vascular plant species);
- range limits and fauna species richness (100 species of herpetofauna - 9 endemic, 230 species of birds);
- isolation of fauna on islands and peninsulas;
- species evolution (e.g. Rufous Hare Wallaby and Banded Hare Wallaby);
- seasonal wildflower display; and

- coastal scenery, including the Holocene fossil shell deposits flanking Hamelin Pool and L'haridon Bight, inundated birridas and lagoons, strongly contrasting colours of dunes, cliffs, beaches and adjacent sea off Peron Peninsula.

2.3.1 Preliminary exploration techniques

Details of these techniques are described in Section 2.1.1. Of those listed, only the airborne surveys are applicable to the terrestrial environment. These are not expected to unduly affect fauna, or other values on land but, because of the narrow shape of the islands and peninsulas in the Area, the probability that survey aircraft would overfly some adjacent marine areas is high. The same comments made in Section 2.1.1 would therefore apply to any terrestrial airborne surveys which encroach into marine areas.

2.3.2 Seismic surveys

The main environmental impacts associated with land-directed seismic work relate to the possibility of vegetation clearing and the passage of heavy vehicles along the survey traverse. In open grasslands, clearing of the survey line is unlikely to be required, but in shrublands it is possible that clearing may be required for access. The seismic (Vibroseis) trucks are large and heavy and would leave tyre tracks which may take some years to erase naturally, hence the potential for visual values to be affected. Some vegetation types are particularly sensitive. For example, spinifex dies when driven over, and the tracks of those vehicles may still be seen years later as lines of dead spinifex. Attendant risks are the introduction of imported weeds, litter, and fires (off hot exhausts and other sources).

The EPA considers that, because of their generally small size and isolation, the islands in the Area have higher conservation values than mainland areas and are more vulnerable to influence from exploration activities. Dirk Hartog Island is larger than the other islands but has sensitive sand dunes covering large parts. Sections 3.4 to 3.6 of the Working Paper detail the island values and their underpinning ecosystem processes. Apart from the difficulty in gaining access to these islands with conventional seismic equipment, many have never been used for pastoral purposes and have intact remnant endemic populations of fauna with extremely high conservation values.

Many of these islands provide protected habitats for birds and animals, and their burrows and nests could be at physical risk of damage from seismic equipment and the vibrations associated with survey data acquisition. There is a significant risk of introduction of exotic flora and fauna to islands where there is currently little or none.

The EPA believes that the potential for significant environmental impact varies considerably depending on the nature of the island and the habitats it contains but that proposals for seismic exploration on the islands would generally be inappropriate and incompatible with the nominated world heritage values.

The northern half of Peron Peninsula is designated national park and is therefore protected from exploration (and production) activities under current Government policy.

Accordingly, the EPA recommends a general presumption against seismic exploration in terrestrial areas of the Area.

Where a target exists outside the boundary of the Area and supplementary data is sought from adjacent areas within the Area to provide a better interpretation of the structure (Scenario 2), the EPA would consider access on a case-by-case basis, depending on the particular sensitivities of the area in question. However, seismic activities where particular flora have been recognised, where the coastal scenic values are high (the fossil shell deposits around the shores of Hamelin Pool and L'haridon Bight, islands in general, the inundated birridas and lagoons, the dunes, cliffs and beaches of the Peron Peninsula) and are visited by many people, may be incompatible with the world heritage values of the area.

2.3.4 Drilling

Under the Australian Labor Party policy François Peron National Park and Zuytdorp Nature Reserve are not open to exploration drilling activities. Shell Beach Conservation Park is an unclassified reserve which has been recommended for upgrading to a class 'A' reserve in order to protect its fauna and landscape values. The EPA considers that drilling in the area would be an activity incompatible with the nominated scenic coastal values and the Holocene fossil shell deposits.

More generally the EPA considers that there should be a presumption against drilling in the terrestrial parts of the Area for the following reasons:

- given that the EPA has recommended a general presumption against seismic exploration, the EPA believes that it is difficult to sustain a case for drilling, which normally follows on from a seismic programme;
- drill rigs are generally large and heavy pieces of equipment requiring considerable logistical support;
- rigs work night and day, are noisy, and are brightly lit for safety reasons. Consequently they are visually prominent, particularly in a topographically subdued landscape. This aspect is likely to be incompatible with the listed visual values of the coastal terrain;
- in certain coastal or near-coastal locations it is possible that the lights may also affect navigating turtles at certain times of the year;
- slow passive rehabilitation of drill pads and access tracks, and the potential for the introduction of weeds, especially opportunistic species which favour disturbed or cleared areas;
- spills of fuel or chemicals could give rise to gully and/or soil contamination, leading to damaged vegetation, or impacts on subterranean fauna; and
- areas with karstic limestone and other types of environments which are likely to host subterranean fauna may sustain potentially significant impacts associated with drilling contaminating the subsurface with drilling muds, additives and fluids.

2.3.5 Production, processing, storage and transport of petroleum product

Production drilling attracts greater concern than exploration drilling because activities are focussed on the site for a longer period, much larger volumes of oil or other products are involved, more materials are required and more routine and potential impacts are expected. Production implies a long-term installation on site, most likely connected to several wells by above-ground pipelines feeding into a central separation

and processing plant. Above-ground tanks for the storage of liquid petroleum product would be required, prior to transport by pipeline of the product to a market or a shipping port.

Over and above the expected range of conservation values in a nature reserve the Area has an even wider range of values, which would need to be taken into account (for example, coastal scenery and aesthetics). Fires and spills could be expected to occur over the longer term and would leave scars on the landscape which often take years to grow out. The lights from a production complex would be difficult to shield in the otherwise dark landscape.

The EPA considers that the presence of a producing oil or gas field and associated activities is incompatible with the array of nominated world heritage values of the area.

A possible exception is a proposal to route a gas pipeline through parts of the Area, between a source and a destination external to the Area. Generally the transfer of gas by pipeline poses a lesser risk of accident than does the transmission of oil. If the gas were to be separated from the condensate fraction by a processing facility outside the Area, the only impacts within the Area are likely to be those arising from the laying and maintenance of the pipeline. If, for example, it avoided national parks and nature reserves, mangroves and other sensitive areas, the impacts associated with its underground emplacement are likely to be slight and relatively short term. The EPA would give due consideration to the merits of such a proposal.

3 CONCLUSIONS

The natural and cultural values of the Shark Bay area are of national and international environmental significance and are recognised by the listing of Shark Bay as a World Heritage Property.

Were petroleum exploration or production to be permitted within the Area, many of the world heritage values would be adversely affected by the routine impacts of those activities, and there would be the risk of further impacts resulting from accidents. In many cases, especially in marine areas, there are insufficient data to confidently state that a proposal would not have the potential to create a significant impact, particularly with regard to the more intensive and long-term activities such as drilling and production, processing, storage and transport of the product. The EPA considers petroleum exploration and production activities to be incompatible with the listed conservation values and recommends that there should be a general presumption against these activities within the Area.

Preliminary exploration techniques and seismic surveys, as precursors to drilling and production activities, are usually more transient and less intrusive. However, if drilling and production are considered to be incompatible with the nominated world heritage values, there can be little justification for permitting their precursor activities.

In specific cases, the EPA considers that there may be scenarios where survey proposals focussing on targets adjacent to the Area would benefit from infill data obtained from inside the boundary to close off the survey and enable a more complete interpretation of

the target. Such proposals could be referred to the EPA for assessment on a case-by-case basis.

Whilst there is a general presumption against transport of petroleum products within the Area, the EPA considers that, in the case of gas stripped of any condensates, it may be environmentally acceptable for a proposal to route a pipeline through the Area, from offshore, provided that its route avoided especially sensitive marine and terrestrial areas.

4 RECOMMENDATIONS

The EPA recommends that:

- the Minister notes that the EPA has concluded that, generally, petroleum activities are considered to be incompatible with the listed world heritage values of the Area; and
- there be a presumption against petroleum exploration and development activities in the Area, except in the cases of the specific Scenarios outlined.

5 REFERENCES

Australian Labor Party Environment Policy (2000).

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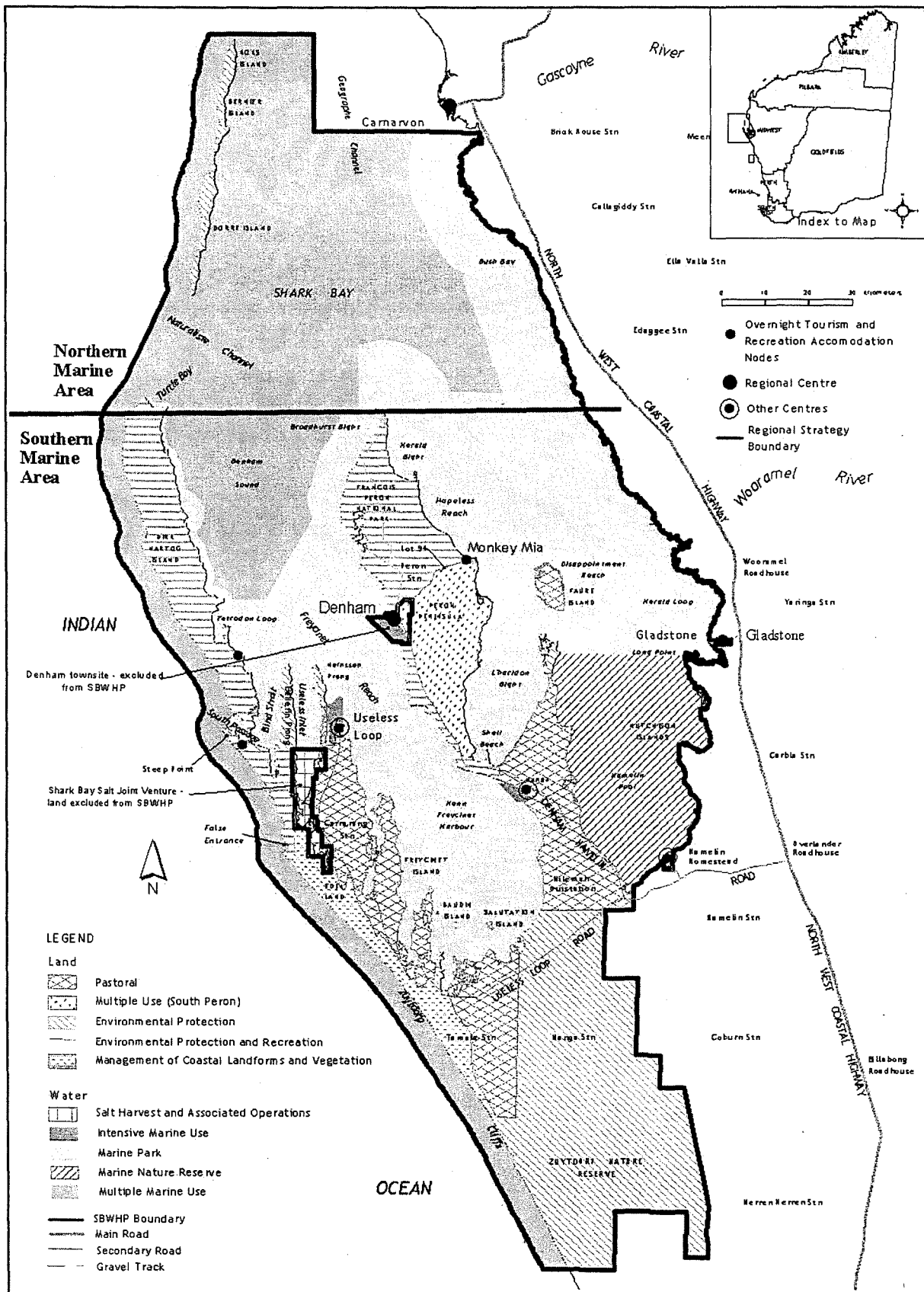


Figure 1 Location, land and water uses of Shark Bay World Heritage Area
 Source: Shark Bay Regional strategy, a review of the 1988 Shark Bay Region Plan

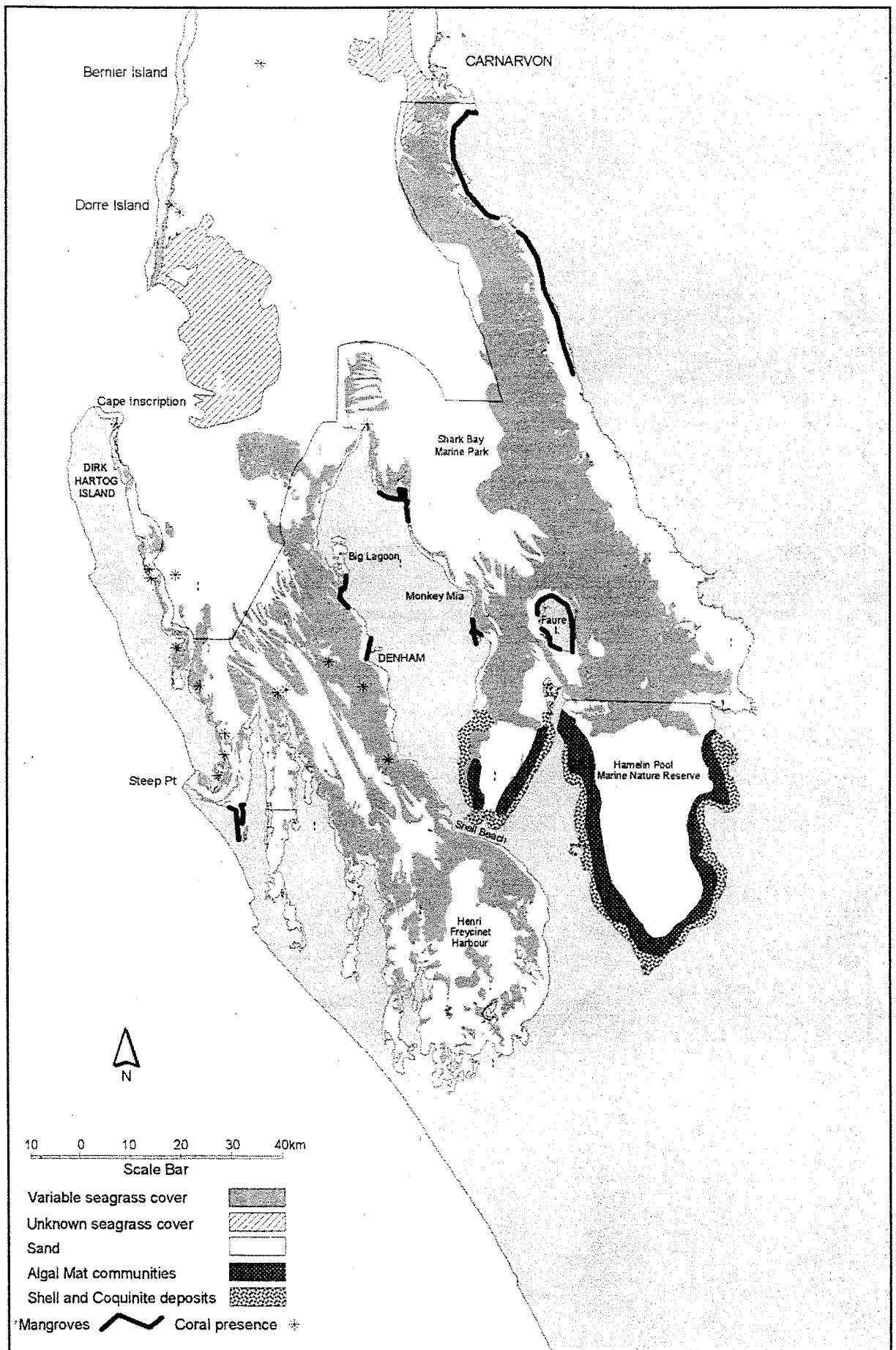


Figure 2 *Distribution of the marine habitats in Shark Bay World Heritage Area*
Source: CALM/NPNCA Management Plan 1996

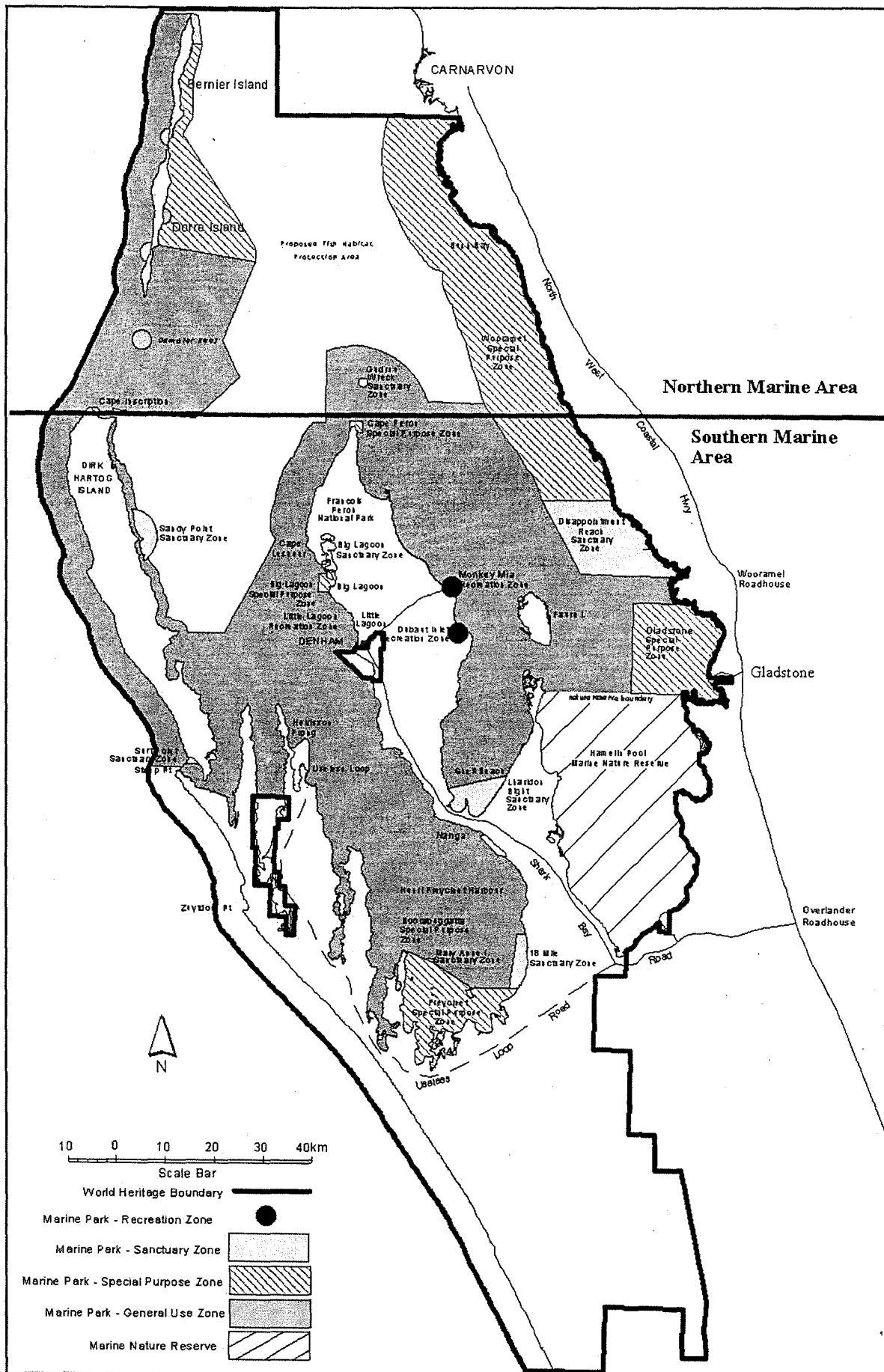


Figure 3 Zoning within Shark Bay Marine Park Source: Shark Bay Regional strategy, a review of the 1988 Shark Bay Region Plan

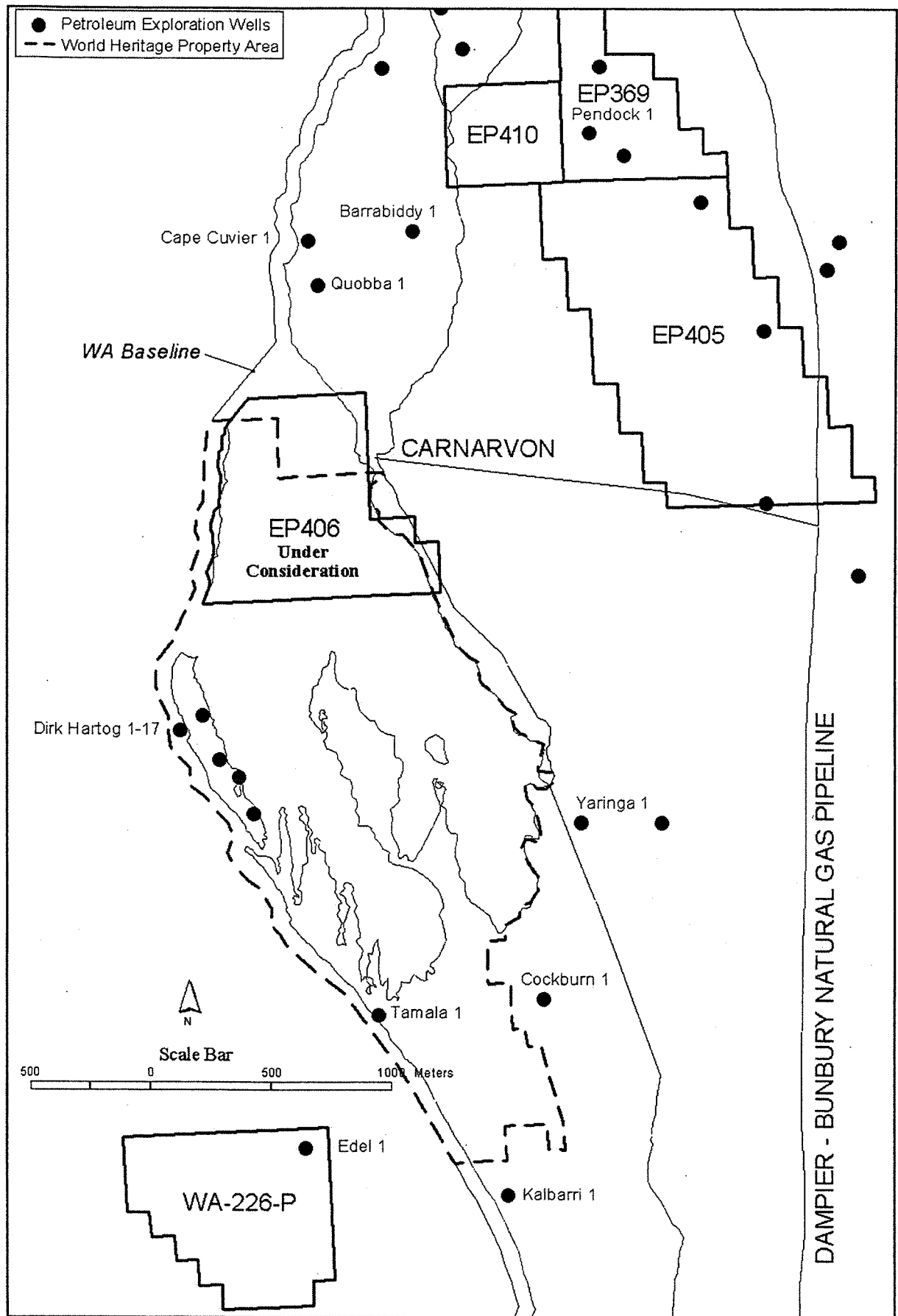


Figure 4 *Petroleum exploration leases and wells drilled in and near the Shark Bay World Heritage Area Source: DME, 1999*

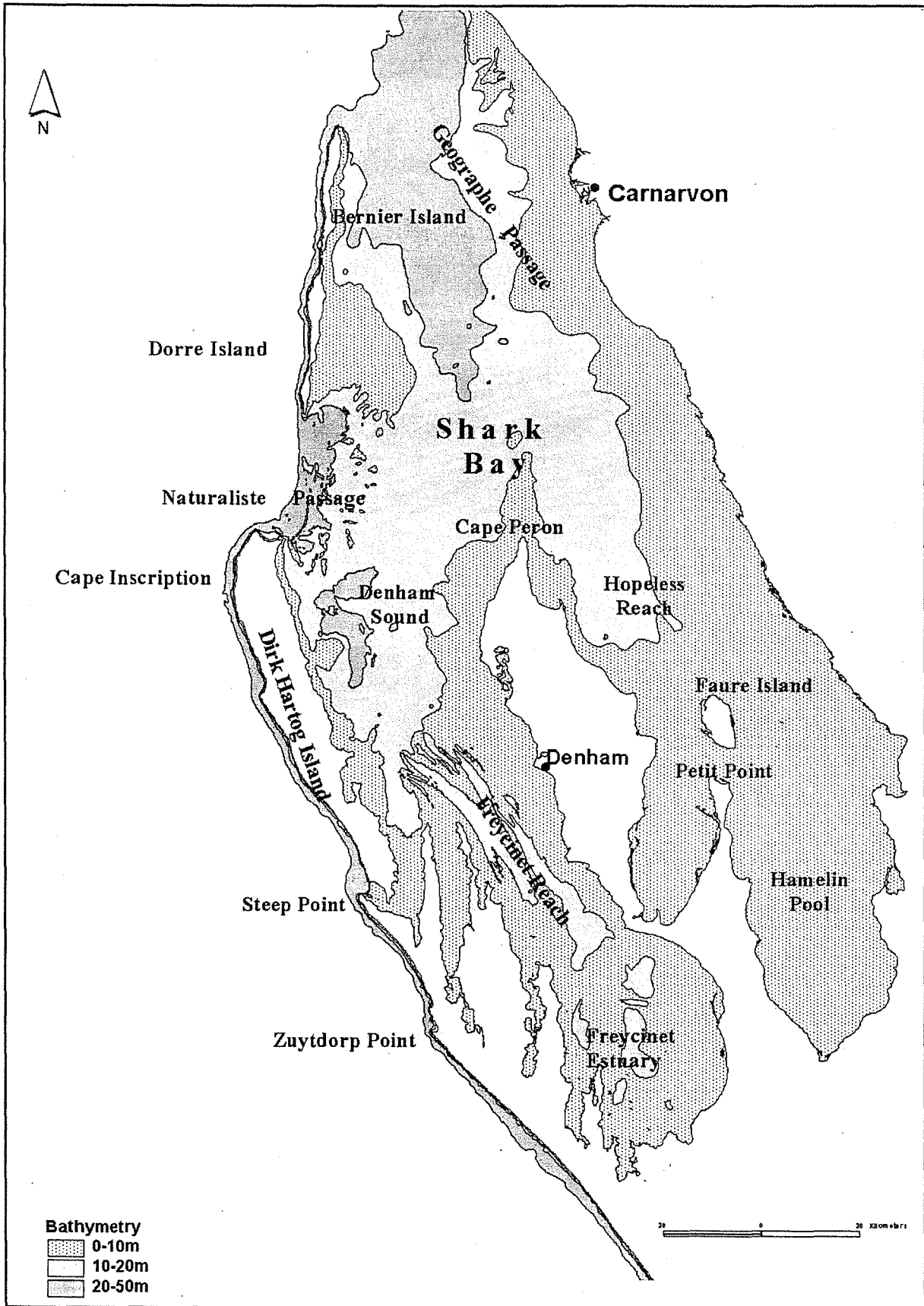


Figure 5 *Bathymetry of Shark Bay World Heritage Area*
 Source: LeProvost, Dames and Moore

Appendix 1

Ministerial request to the EPA to provide advice



MINISTER FOR THE ENVIRONMENT;
EMPLOYMENT AND TRAINING

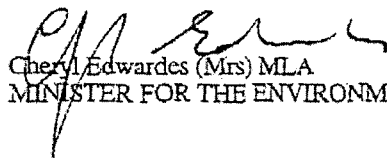
Chairman
ENVIRONMENTAL PROTECTION AUTHORITY

**POLICY ON PETROLEUM EXPLORATION AND DEVELOPMENT
WITHIN THE SHARK BAY WORLD HERITAGE PROPERTY**

This memorandum is a formal request under Section 16(e) of the Environmental Protection Act for the advice of the Environmental Protection Authority on the above matter.

The terms of reference for the Environmental Protection Authority's advice on this matter have been specified in the Agreement between the State of Western Australia and the Commonwealth of Australia on Administrative Arrangements for the Shark Bay World Heritage Property in Western Australia. A copy of the terms of reference is attached.

I would be grateful if you would provide me with a proposed schedule for development of the advice, including proposed arrangements for consultation with the Commonwealth, community, industry groups and other stakeholders, as soon as possible.


Cheryl Edwardes (Mrs) MLA
MINISTER FOR THE ENVIRONMENT

17 Sept. 97

Attachment

Policy framework for petroleum activities in Shark Bay

In view of the special character of Shark Bay, there is a need for a policy framework for making decisions on environmental aspects of petroleum activities in that area.

It is therefore proposed that the Minister for the Environment should write to the EPA asking for advice under Section 16(e) of the *Environmental Protection Act* in regard to the general issue of oil and gas exploration and development in Shark Bay.

Section 16(e) of the *Environmental Protection Act* states that one of the functions of the Authority is:

'to advise the Minister on environmental matters generally and on any matter which he [she] may refer to it for advice, including the environmental protection aspects of any proposal or scheme, and on the evaluation of information relating thereto'.

Section 16(e) therefore provides a mechanism for the EPA to provide policy advice to the Minister.

Proposed terms of reference

The proposed terms of reference for the Section 16(e) advice are as follows.

The advice should:

- encompass the whole of the Shark Bay World Heritage area, including marine and terrestrial areas;
- provide a strategic policy framework within which to make decisions on environmental aspects of petroleum activities in Shark Bay;

The advice should include consideration of:

- all petroleum exploration and development activities, including seismic surveys, drilling, and production testing;
- standards, criteria and management practices for environmental protection and prevention of pollution;
- direct and potential environmental impacts from oil spills, seismic operations, drilling, and from introduction of exotic organisms;
- possible impacts on fisheries and aquaculture potential;
- possible impacts on visual amenity, tourism potential, and on social and heritage values;
- possible impacts on ecosystem function and nature conservation values; and
- possible impacts on conservation and environmental values, with particular regard to the outstanding universal values for which Shark Bay was inscribed on the World Heritage List.