OIL SPILLS AND THE WEST AUSTRALIAN MARINE ENVIRONMENT

OCTOBER 1979

DEPARTMENT OF
CONSERVATION & ENVIRONMENT
WESTERN AUSTRALIA

BULLETIN No 71

OIL SPILLS AND THE WEST AUSTRALIAN MARINE ENVIRONMENT

by

D.A. Hancock, H.E. Jones
Department of Fisheries and Wildlife

R.A. Field
Department of Conservation and Environment

BULLETIN NO. 71

Department of Conservation
and Environment
October, 1979

CONTENTS

OIL SPILLS AND THE WESTERN AUSTRALIAN MARINE ENVIRONMENT

This Bulletin describes current procedures in Western Australia made in response to possible adverse effects of spilt oil on the W.A. marine environment. In addition to the necessity for contingency arrangements for spills from marine transport there exists in W.A. the potential threat of oil pollution from offshore petroleum exploration activities. Marine resources have been identified and forty six environmentally sensitive localities nominated. Procedures for protection of these localities during offshore oil exploration have been formulated.

1. W.A. organisations concerned with oil spills policies

The body directly concerned in the event of an oil spill is the State Committee for Combating Marine Oil Pollution. This consists of 3 members : the Superintendent Nautical and Pilotage from the W.A. Harbour and Light Department who acts as co-ordinator and chairman, the Harbour Master of the Fremantle Port Authority and the Marine Surveyor from the Commonwealth Department of Transport in W.A.

The Combat Committee is assisted by a Technical Advisory Committee which has 6 members : the Chief Research Officer of the Department of Fisheries and Wildlife, a representative from the Department of Conservation and Environment, the 2 W.A. Industry Controllers of the petroleum organisation PIECE, the Director of the W.A. State Emergency Service and a representative from the W.A. Mines Department.

Both committees thus contain representatives from a number of organisations concerned with oil spills. The two committees work closely together and meetings are held at irregular intervals every few months. They are concerned with aspects of oil pollution from all sources, tankers, refineries and offshore exploration activities.

Exploration for and exploitation of petroleum resources of submerged lands adjacent to the Western Australian coast is undertaken subject to :

i) The Commonwealth Petroleum (Submerged Lands) Act 1967-74, and

ii) The State Petroleum (Submerged Lands) Act 1967-70.

The exercise of powers and performance of functions of these two acts is by means of an administrative agreement between the Commonwealth and State Governments. Under the State legislation the State Minister for Mines is nominated as the "Designated Authority" and is responsible for administering the above arrangements. The advice of the State Combat Committee is sought by the Mines Department with respect to operator's oil spill contingency plans, and for any spills which may eventuate from offshore petroleum exploration activities.

Under the National Oil Spill Plan arrangements the Commonwealth has accepted the responsibility for controlling oil spills in both territorial and Commonwealth waters off all States except Victoria and Tasmania. In practice Commonwealth representation on the State Combat Committee will ensure uniformity of approach and compatibility of State and Commonwealth attitudes to oil spills in W.A. The State Combat Committee has no jurisdiction over oil spills in ports and harbours although these are subject to the National Oil Spill Plan when the Harbour Authority considers that its resources for clean-up are insufficient.

2. Possible sources of marine oil pollution off W.A.

(a) Refineries: Only one refinery exists in W.A., at Kwinana, 20 km south of Fremantle. Oil spillage can only be envisaged during loading and unloading of tankers and during bunkering operations.

(b) Marine Transport: Figures obtained from oil companies for 1977 showed that approximately 560,000 tonnes (3.9 million barrels) of oil were carried to and from W.A. ports per month in about 20 boatloads. The quantity per boat varied from 3,000 to 85,000 tonnes and 80% of the oil was transported to and from the refinery at Kwinana in approximately 14 boatloads per month. The oil varied from crude to refined with densities ranging from 0.66 to 1.03. The highest proportion for a single oil type, 43% or 238,000 tonnes, consisted of crude oil, density 0.86, transported per month from the Middle East to Kwinana. Second to this was 13% or 73,000 tonnes per month of crude oil, density 0.84, carried from Barrow Island to Kwinana.

Nearly 80% of the 452 world oil spillage incidents from tankers over 3,000 d.w.t. during 1969-1973 occurred within coastal waters.[1] This fact, and the considerable oil transport to and from Kwinana, suggests that the sea just south of Perth is the most likely area for an oil spillage to occur. The oil would probably have a density of 0.84 or 0.86 and combative measures should be organised to treat such an oil.

(c) Oil Exploration: From 1968, when the first W.A. offshore well was drilled, up to 1978, a total of 104 wells have been drilled offshore.

[1]. Card, J.C., Ponce, P.V. and Snider, W.D. 1975. Tankership accidents and resulting oil outflows, 1969-1973. Conf. on Prevention and Control of Oil Pollution. Amer. Petrol. Inst., Washington, D.C. pp.205-213.

The rate of offshore drilling is now increasing. In 1978-79 the minimum drilling commitment is 17 wells and in 1979-80 the minimum is 20 wells. Between 1978-79 and 1982-83 a total of 82 wells will be drilled. If encouraging results are found the numbers could conceivably increase.

In addition to exploration activities, gas and condensate production may be in existence by 1985 from the Woodside North Rankin field in the North West Shelf. This will involve construction of a 132 km pipeline from the 2 production platforms to the Burrup Peninsula.

3. Environmental concerns from offshore drilling

In view of the remote possibility of a blow-out, harmful effects from accompanying oil spill clean-up procedures, drilling muds and cuttings, and temporary alienation of fishing areas, companies proposing to drill in environmentally sensitive areas (see later) are asked to provide the following information through the W.A. Mines Department.

1. The expected radius from the rig within which entry of other vessels would not be encouraged.

2. Approximate volume, nature and size of cuttings and procedures for their disposal.

3. Quantitative composition of drilling fluid and an estimation of what quantity will reach the sea, at what rate and by what manner, both during and after drilling.

4. Suspected grade of oil likely to be encountered, assessed from previous drilling results in the area.

5. Four copies of the company's oil-spill contingency plan which must include the type and quantity of dispersant carried and a flow chart indicating the order in which personnel and Government bodies would be informed of an oil spill.

6. Details of local winds and currents in relation to the most probable direction and speed of flow of a hypothetical oil spill from the well.

During 1977-78 in excess of 22 drilling applications were approved by the Designated Authority. Six of these applications, namely

- Bundegi No. 1 well in the prawn fishery of Exmouth Gulf.

- Peel No. 1 well in the vicinity of Garden Island, Rottnest Island and metropolitan beaches.

- Houtman No. 1, Batavia No. 1, Geelvink No. 1 and Indoon No. 1 wells in the vicinity of the Houtman-Abrolhos reserve and the Geraldton-Dongara rock lobster fishery,

were assessed in detail because of their proximity to environmentally sensitive localities (see Table 1, Fig. 1). As a result of such assessments and discussions with the Mines Department and respective companies, additional safeguards to protect the environment were agreed to, and in the case of Bundegi No. 1 well the operator agreed to drill during the off season for prawning.

4. Resource maps and delineation of environmentally sensitive localities

The marine resources of W.A. are being mapped by the Department of Fisheries and Wildlife in order to define environmentally sensitive localities (ESL) and as an aid to rapidly decide measures to be taken in the likelihood of events, such as oil pollution, which could cause detriment to the marine environment. The resources considered are wet fish, crustaceans, molluscs, dugongs, seals, sea birds, crocodiles, turtles, corals, sea grasses, mangroves, algae, stromatolites, shells, bathing beaches, boat anchorages, leisure areas, national parks and reserves. The condition of the resource throughout the year is included, e.g. different stages in the life-cycle of an organism, time of entry of young sea birds into the sea.

In addition to the resources, limited details of hydrological, meteorological and coastline characteristics will be incorporated into the map and areas designated where, on the basis of current knowledge, dispersant application will be recommended or advised against.

Information from the resources map has been used by the Departments of Conservation and Environment and Fisheries and Wildlife for a classification of ESL's as they pertain to offshore exploratory drilling and production operations. This will allow prospective drilling companies to know well beforehand which areas are considered to be "high risk" in terms of the resources present.

In this classification five broad criteria were used each of which is sufficient for assessment of a locality as a "high risk" area from oil exploration and production accidents. These are:

A. Areas considered to have global ecological significance. This category to include internationally protected species.

B. National ecological significance - to include "A" class and aquatic reserves.

C. High economic value - fisheries (to be at least 10% of an important commercial fishery; also to include nursery areas, embayments and estuaries), aboriginal fisheries, ports, marinas, tourism.

D. Areas of high recreation utilisation.

E. Scientific research areas.

Localities thus classified are given in Table 1 and shown in Figure 1.

5. Protection of environmentally sensitive localities

In order to afford protection to the ESL's during oil exploration two categories of buffer zones have been designated, an inner nominal 8 km immediate protection zone (IPZ) and an outer nominal 50 km special conditions zone (SCZ) (see Figure 1).

8 km immediate protection zone (IPZ)

Within the 8 km zone, it would be preferable to avoid the use of dispersants, especially as it is often a shallow body of water. This zone should allow a sufficient distance and water volume for considerable dilution of oil chemically-dispersed outside its boundary, thereby minimising any toxic effects of oil/dispersant mixtures on the ESL.

50 km special conditions zone (SCZ)

Within this zone drilling operators must show that they, in conjunction with the marine oil spills action plan (MOSAP) of the Petroleum Institute Environment Conservation Executive (PIECE), have the capacity to fully disperse an oil slick as big as 2,000 barrels per day before the oil is 12 hours old and prior to it reaching the 8 km zone. Chemical dispersant applied to oil that is more than 12 hours old is often much less effective, especially if a water in oil or "chocolate mousse" emulsion has formed. The rationale for selecting a 50 km zone is based on the following two factors:

i) Oil at sea is generally considered to move at about 3% of the wind speed and thus, if local water currents are ignored, an oil slick under extreme weather conditions of a 30 knot continuous wind would travel from the outer edge of the 50 km zone to the outer edge of the 8 km zone in about 24 hours.

ii) Although the National Plan does not cover accidents arising from oil exploration and production activities, it is presumed that if required, its resources would be on-site within 24 hours.

6. Environmental assessment status of sensitive localities and buffer zones

It is not proposed that any offshore areas be withheld from exploration activities. The assessment status of sensitive localities and buffer zones can be summarized as follows:

(a) ESL and IPZ - In some areas there may be a requirement for an Environmental Review and Management Programme (ERMP). It is expected that at least the first exploration well within a particular ESL or IPZ will be subject to an ERMP.

(b) SCZ - Subject to special conditions suggested by the State Combat Committee, Department of Fisheries and Wildlife and Department of Conservation and Environment. Naturally, these conditions will vary with each drilling application. Factors such as time of drilling and associated biological and human utilisation of a nominated ESL will be important considerations. However, after 1 May 1979, in most situations, the Department of Conservation and Environment would only recommend approval for drilling on the basis of the operator providing:

i) Adequate mechanical diversion equipment at the nearest regional centre to cope with a spill for the first 24 hours.

ii) Sufficient approved chemical dispersant at the drilling site or nearest regional centre to cope with a spill for the first 24 hours. The operator would also be required to demonstrate a capacity to effectively apply dispersant to a large spill.

However, within the 30-50 km sector of the SCZ, if prospective drillers are able to demonstrate to the satisfaction of the Department of Conservation and Environment that oil will not reach the ESL within 24 hours of a blow-out then it will be recommended that they be exempt from the above conditions.

(c) All other areas - as for the ESL, IPZ and SCZ, operators' oil contingency plans to be approved by the State Combat Committee. Applications for these areas will also be referred to the Department of Fisheries and Wildlife and the Department of Conservation and Environment.

7. Clean-up procedures

It should be emphasised that, as in the National Oil Spill Plan, the preferred method for treatment of oil spills is by mechanical removal at sea. It has been argued that

containment booms currently available are ineffective in offshore weather conditions, but their provision in W.A. contingency planning will be made mandatory for offshore drilling activities in ESL's, IPZ's and SCZ's on the grounds that :

1. conditions are by no means always unsuitable for their use,

2. booms may be used to divert oil from specially sensitive coastal situations, and

3. concentration of oil by booms may facilitate successful dispersion or recovery.

Currently a Troilboom Giant Containment and Recovery System is available from the Fremantle Port Authority; in addition as part of the National Plan a Vikoma Sea Pack Boom and a self-propelled oil skimmer will shortly be located at Fremantle.

However, there will be circumstances where containment is clearly impracticable. In such circumstances, depending on the resource at risk, on the position and direction of movement of the oil slick and on the environmental and practical feasibility of later clean-up on land, the approach will be to do nothing or to use dispersants sufficiently distant from the shore to ensure considerable dilution. Where the use of dispersants is regarded as a preferable alternative to fouling by oil of an important environmental resource the following procedures are recommended in W.A. for both tanker and offshore drilling accidents.

1. Within the ESL and IPZ dispersants are not to be applied unless authorised by the Designated Authority after advice from the Department of Conservation and Environment.

2. Within the SCZ dispersants will be immediately and effectively applied, irrespective of the direction of flow of the slick, unless exemption has been recognised for the 30-50 km zone as indicated in the previous section. Changes in wind direction which may push the slick towards the ESL are thus accounted for.

3. Outside the SCZ dispersants will be applied on the recommendation of the State Combat Committee after it has taken into account meteorological, hydrological and environmental advice.

In assessing drilling operators' oil slick contingency plans, particular attention is paid to the type and quantity of dispersant carried and the methods proposed for its rapid use. As far as practicable, any dispersant

equipment should be compatible for use with the National Plan dispersant. Similarly, informal discussions on dispersant stocks and methods of application have been started with Port and Harbour authorities.

Very little testing of dispersants has been done on Australian marine species and there is no National list of approved dispersants. In W.A. only dispersants which have passed the toxicity and efficiency tests of either the U.K. government, the US Environmental Protection Agency or an authority recognised by the Department of Conservation and Environment will be recommended by the State Combat Committee.

8. Acknowledgements

We wish to thank Capt. W. Spencer, Co-ordinator of the State Committee for Combating Marine Oil Pollution, Capt. M. Coleman, Harbour Master, Fremantle Port Authority and Mr. A. Pippet, W.A. Mines Department for their review of the manuscript. We are also grateful to Mr. M. Cull and Mr. B. Stewart for drafting assistance.

TABLE 1: ENVIRONMENTALLY SENSITIVE LOCALITIES WITH REFERENCE TO OFFSHORE PETROLEUM EXPLORATION OR PRODUCTION ACTIVITIES

	LOCALITIES		BASIS OF CLASSIFICATION
1.	Cape Londonderry Area - Beauty Point to Curren Point	B.	Proposed "A" Class reserve. CTRC System 7 Report.
2.	Port Warrender - Warrender Hill to opposite headland.	B.E.	WA Museum Study area for mangroves. Proposed System 7 Reserve.
3.	Prince Frederick Harbour - Cape Torrens to opposite headland.	B.	Proposed Aquatic Reserve. System 7.
4.	Coronation Islands - Prince Regent River Reserve, Bat Island.	B.	"A" Class reserve.
5.	Saint George Basin - Unwins Island to Cape Wellington.	B.E.	Proposed Aquatic reserve, System 7. Crocodile research.
6.	Kuri Bay - Port George IV Bay. North Entrance to Wilson Point.	C.	Commercial pearl culture.
7.	Cygnet Bay - Skeleton Point - Willie Point	C.	Commercial pearl culture.
8.	Lacepede Islands and immediate surrounding reefs.	B.	System 7. "B" Class Reserve. Green turtles, corals, seabirds and shallow environs.
9.	Broome. Red Hill Point - Station Hill.	D.	Broome beaches and boating areas.
10.	Roebuck Bay - Beacon Hill to Sandy Point.	C.	Pearl culture.
11.	Bedout Island.	B.	"A" Class reserve for Conservation of Flora and Fauna. Important seabird colonies.
12.	North Turtle Island.	B.	Outstanding seabird breeding site. Pelican breeding.
13.	Port Hedland.	C.	Port.
*14.	Dampier Archipelago. To include boundary at West Intercourse Island - Enderby Island, Kendrew Island, Brigadier Island, Cape Legendre, northern point Dolphin Island, Sloping Point on mainland.	A.B. D.E.	Dugongs. Islands recommended as "A" Class reserves. Kendrew Island - Museum research area. Sand flats support rich intertidal fauna. Seabird colonies, coral reefs, mangroves. A number of islands important for recreation.
*15.	Exmouth Gulf - Rowley Shelf includes the following islands - Weld, Little Rocky, Thevenard, Serrurier, Round, Tent, Simpson and Whalebone. Mary Anne Island group. To encompass area North West Cape - Tubridgi Point to mainland point 116°E. Offshore to 10 fathom contour.	A.B.C.	Dugongs near Port Weld. Very shallow area. Seabird colonies, coral reefs. Source of nutrients for surrounding eco-system. Fish nursery area. Tourism. Offshore fishing. Mangrove and tidal flats.

	LOCALITIES		BASIS OF CLASSIFICATION
16.	Exmouth Gulf. (North West Cape to Tubridgi Point.)	A.C.	Dugongs. Commercial prawn and wet fishery. Fish nursery areas. Pelican feeding areas. Tourism.
*17.	Ningaloo Reef Tract, North West Cape - Pt Anderson to 100 m isobath.	A.B.C.	Proposed aquatic reserve. Recreation.
*18.	Shark Bay region - Denham Sound, Freycinet Reach, Freycinet Estuary, Hopeless Reach, Lharidon Bight, Hamelin Pool, Wooramel Seagrass Bank.	A.B. C.D.	Stromatolites, Aquatic reserve. Dugongs. Commercial prawn and wet fishery. Scallops. Amateur wet fishery. Tourism.
19.	Kalbarri - Mouth of Murchison River.	B.C.	Major recreational area. Commercial fishing, lobsters.
*20.	Houtman - Abrolhos Reserve and associated coral reefs. (Wallabi, Easter and Pelsart group.)	A.B.C.	Breeding islands for Lesser Noddy. "A" Class reserves. Rock lobster fishery. Coral reefs. Tourism.
21.	Geraldton - Drummond Cove - Tarcoola (1 November - 30 April).	C.D.	Port, commercial fisheries. Recreational beaches, amateur fishing.
22.	Dongara - Irwin River to Leander Point. (1 November - 30 April). Seven Mile Beach.	D.C.	Tourism and recreation. Fishing boat harbour. Lobsters, abalone.
23.	Moore River.	C.	Rock lobster recruitment.
24.	Two Rocks - Yanchep. (1 November - 30 April.)	D.	Recreational beaches.
25.	Metropolitan Beaches. Burns Beach - Woodman Point (1 November - 30 April).	D.	Recreational beaches.
26.	Cockburn Sound - enclosed by Woodman Point - Carnac Island, Garden Island, Point Peron.	C.D.E.	Major fish nursery area. High recreational use. Sheltered harbour, naval base. Fishing. Industrial. Research area.
27.	South Metropolitan Beaches - Point Peron - Becher Point. (1 November - 30 April).	D.	Beach recreation.
28.	Rottnest Island and associated reefs (1 November - 30 April).	C.D.E.	Recreation, Tourism. Research area.
29.	Peelhurst - Falcon Bay. Includes mouth of Peel Inlet.	C.D.E.	Recreation, Research area. Commercial fishery in inlet.
30.	Bunbury - from cut Leschenault Inlet to Back Beach. (1 November - 30 April.)	D.	Recreation. Wet fishery.
31.	Geographe Bay. To 10 fathom isobath, from Wonnerup Estuary to Dunsborough.	C.D.	Importance to commercial fishery. Populated beaches. Fish nursery area.

	LOCALITIES	BASIS OF CLASSIFICATION	
32.	Hamelin Bay area - to include off-shore islands.	B.D.	Seabirds, seals. Recreation.
33.	Augusta (mouth of Blackwood River).	C.D.	Recreation, tourism. Fish nursery area.
34.	Windy Habour (1 November - 30 April).	B.C.D.	Part of proposed South Coast National Park. Recreational beaches.
35.	Broke Inlet (entrance) (1 July - 30 November).	B.	Proposed South Coast National Park.
36.	Nornalup Inlet (entrance).	B.C.D.	Within Walpole - Nornalup National Park. Recreational area.
37.	Peaceful Bay (Foul Bay) (1 November - 30 April).	D.	Recreational beaches.
38.	Wilson Inlet - Denmark Beach (1 July - 31 March).	C.D.	Tourism. Recreation.
39.	King George Sound, Albany. Bald Head to Cape Vancouver. Includes Princess Royal Harbour, Oyster Harbour, King George Sound and Nannarup.	C.D.	Port, Tourism, Fishing. Recreational Beaches. Seabirds.
40.	Two People Bay - South Point to North Point.	C.D.	Tourism. Recreation.
41.	Betty's Beach - North Point to coast at 118°15'E (1 February - 30 April).	C.	Salmon fishery.
42.	Hassel Beach - near Lookout Point to beach 118°30'E (1 February - 30 April).	C.	Salmon fishery.
43.	Beaufort Inlet (mouth) (1 July - 1 March).	C.D.	Estuarine fishery. Recreation.
44.	Bremer Bay - Black Point to opposite headland (1 December - 30 April).	D.	Recreation.
45.	Hopetoun (1 December - 30 April).	D.	Recreation
* 46.	The Recherche Archipelago and Esperance.		
	Boundary defined by Coastline and 34°15'S; 121°51'48"E and 123°18'E.	B.C.D.	Port. Tourism. Commercial fishery. Recreation. Islands of Archipelago have "A" Class Reserve status. Important for Seabirds

CTRC System 7 Report - Conservation Reserves in Western Australia. Report of the Conservation Through Reserves Committee on System 7 to the Environmental Protection Authority 1977.

A, B, C, D, E - refer to broad criteria used to select sensitive locality (see page 4)

* - denotes that these localities are listed on "The Register of The National Estate".

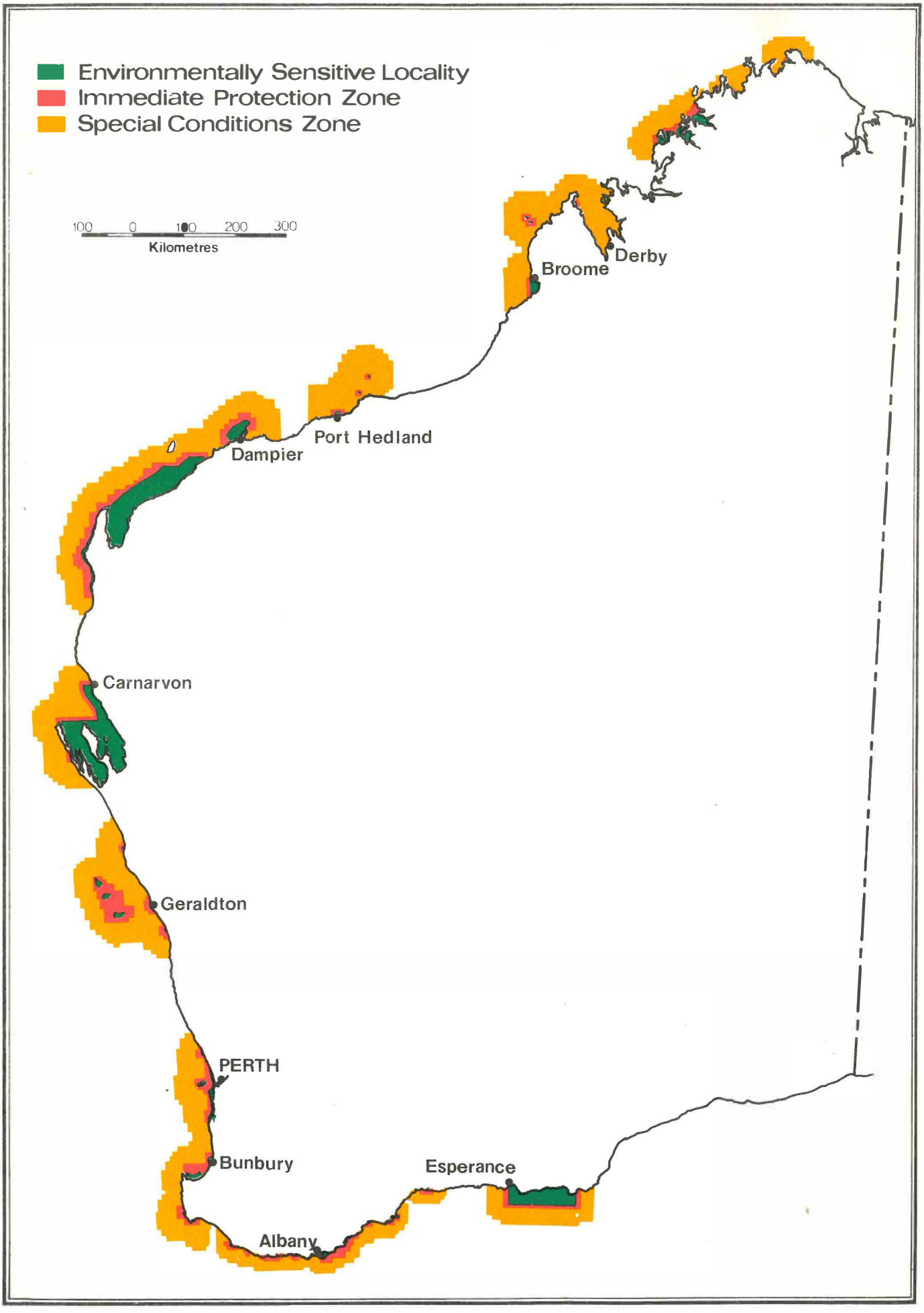

FIGURE 1 Environmentally sensitive localities and protective buffer zones as they pertain to offshore petroleum exploration and production operations.