Environmental Protection Authority

# Guidance for the Assessment of Environmental Factors

(in accordance with the Environmental Protection Act 1986)

## Guidance Statement for protection of tropical arid zone mangroves along the Pilbara coastline

No. 1

April 2001

Western Australia

# Guidance Statement No. 1

# Guidance Statement for Protection of Tropical Arid Zone Mangroves Along the Pilbara Coastline

**Key Words: mangroves, primary producers, arid zone mangroves, Pilbara coastline, environmental impact assessment (EIA)**

## 1 PURPOSE

**1.1** Guidance Statements generally are developed by the EPA to provide advice to proponents, and the public generally, about the minimum requirements for environmental management which the EPA would expect to be met when the Authority considers a proposal during the assessment process. The generic process is set out in Appendix 1.

This Guidance Statement is termed "Final", and thus the EPA expects that proponents will give full attention to the information provided when they submit proposals for assessment.

**1.2** This Guidance Statement specifically addresses the protection of tropical arid zone mangroves, habitats and dependent habitats along the Pilbara coastline from Cape Keraudren at the southern end of the Eighty Mile Beach to Exmouth Gulf (see Appendix 2: Figures 1-8). The State and National State of the Environment Reports indicate that mangroves are an important part of the coastal ecosystem, are likely to come under pressure from development and that management of impacts would be required. This Guidance Statement will provide the basis for managing that pressure. The Guidance provides information which the EPA will consider when assessing proposals where tropical arid zone mangroves, habitats and dependent habitats along the Pilbara coastline are relevant environmental factor(s) in an assessment. It takes into account:

(a) protection of the environment as defined by the *Environmental Protection Act 1986 (WA*) with a focus on protecting the tropical arid zone mangroves environment along the Pilbara coastline; and

(b) the factor of tropical arid zone mangroves, habitats and dependent habitats along the Pilbara coastline.

Semeniuk (1997) has assessed the global significance of these mangroves. The assessment was based on species richness of various regions and variability of coastal types (habitat setting) where mangroves are located. He noted:

- 'This region represents the most arid coast in Australia, and. from a global perspective presents a heterogeneous mix of coastal types in a generally depositional system'; and
- that Western Australia does not support any unusual endemic or restricted mangrove species. All mangrove species within Western Australia are common and widespread elsewhere, either in northern

Australia, or in the Indo-Pacific region proximal to northern Australia, and so in this sense, the mangroves in Western Australia are not globally significant.

Notwithstanding the above, the EPA acknowledges that mangroves are important functionally as well as structurally.

The EPA notes that whilst this guidance is restricted to guidance on arid zone mangroves, EPA recognises that other environmental factors overlap with mangrove protection in this area. Amongst other, they include salt marsh protection, dust control, landfill management and catchment management. However, whilst linked, these factors fall outside the scope of this guidance statement.

The EPA also notes that other environmental protection processes offer environmental protection guidance for this area. Examples are the Marine Reserve Planning processes for the Dampier Archipelago and the Monte Bello Islands.

**1.3** This is a Guidance Statement and proponents are encouraged to consider proposals in the light of the guidance given. A proponent who wishes to deviate from the minimum level of performance set out in this Guidance Statement would be expected to put a well researched and clear justification to the EPA arguing the need for that deviation.

# 2 THE ISSUE

The EPA recognises the intrinsic value of these tropical arid zone mangroves and the need to protect distribution and function along the Pilbara coastline. The EPA has prepared this Guidance Statement in response to the need to protect mangroves from the potential impacts associated with further industrial or other development of the region.

The mangroves along the Pilbara coastline are the largest single unit of relatively undisturbed tropical arid zone habitats in the world. As with most arid zone mangroves, Pilbara mangroves are characterised by open woodlands and shrublands that are of relatively lower productivity than the mangrove communities of the wet tropics because of the extreme water and salinity stresses which affect the intertidal zone in the Pilbara. Typically the average tree height is smaller, species diversity relatively lower and the associated flora and fauna communities less complex when compared with the mangrove communities of the wet tropics.

The EPA recognises that within the area covered by the Guidance Statement certain land uses, either existing or proposed, have been accepted prior to the preparation of this Statement. These landuses include ports, town sites and urban areas, industrial developments, easements, marinas, ramps, jetties, recreational areas, airports, roads, railways and other facilities. In addition, significant future developments have been proposed, following extensive public consultation and review, by local and State planning authorities such as in the Pilbara Land Use Plan, the Burrup Peninsula Land Use Plan and Management Strategy, the Karratha Area Development Strategy and Shire Town Planning Schemes. Many of the land uses proposed in these plans can have an impact on mangroves.

The EPA has reviewed all of this information and has identified, for the purposes of the Guidance Statement, areas where intensive industrial development and the associated port infrastructure and waters currently exist, and also those areas that have been identified as suitable locations for future development. These are referred to in the Guidance Statement as "designated industrial areas and associated port areas" and approximate boundaries are shown in Appendix 2 (Figures 2-8). Designated industrial areas marked on the maps provided with this document are intended to be indicative of where development has already or is expected to take place, taking into account regional and local planning strategies. It is not intended for the areas shown to strictly reflect current land use zoning but rather to identify areas where industrial and port developments may have an impact on mangrove communities.

The guidelines contained in this Guidance Statement are based on the Semeniuk report entitled *Selection of Mangrove Stands for Conservation in the Pilbara Region of Western Australia – A Discussion* (Semeniuk, 1997 (unpublished)) which identifies areas of regionally significant mangrove formations. Semeniuk, in selecting mangrove areas for conservation, noted that it is important to establish values. Accordingly Semeniuk gave three reasons for preservation:

- ecological reasons pertaining to productivity, feeding grounds, and fish nurseries;
- scientific reasons of heritage, research and education; and
- preservation of biodiversity.

The designation of mangrove areas for representation and conservation in the Pilbara Region are based on a number of criteria that address significance. The significance may be international, national, or regional. Accordingly the significance of mangroves is dependent on:

- the extent or rarity of the habitat;
- the internal diversity of the habitat;
- the ecological significance of a given stand; and
- the nationally to internationally significant features of a given site.

Semeniuk determined these significant areas on the basis of coastal type, habitat, species diversity and plant form. "Regionally significant" mangroves are considered to be of very high conservation value. The remaining mangroves along this part of the Pilbara coast, although not "regionally significant", are also regarded as important and considered to be of high conservation value. When the two mangrove categories are considered in relation to areas along the Pilbara coast that are already identified as where intensive industrial developments and associated port areas and related developments are likely to occur, they give rise to four types of management areas for which guidelines have been prepared (see Table 1 and Figures 1 to 8).

The four types of management areas are:

**Guideline 1** Regionally significant mangroves - Outside designated industrial areas and associated port areas.

**Guideline 2** Other mangrove areas - Outside designated industrial areas and associated port areas.

**Guideline 3** Regionally significant mangroves - Inside designated industrial areas and associated port areas.

**Guideline 4** Other mangrove areas - Inside designated industrial areas and associated port areas.

**Table . Areas within each guideline category and area names**

| | **Mangrove areas of very high conservation value (designated "regionally significant")** | **Mangrove areas of high conservation value** |
|---|---|---|
| **Mangrove areas outside designated industrial and associated port areas** | Areas:<br>1, 2, 3, 4, 6, 7, 8, 12 13, 14, 16, 17, 18, 19, 20, 21, 22<br><br>(Guideline 1) | All other mangrove areas outside designated industrial and associated port areas<br><br>(Guideline 2) |
| **Mangrove areas inside designated industrial and associated port areas** | Areas:<br>5, 9, 10, 11, 15<br><br>(Guideline 3) | All other mangrove areas inside designated industrial and associated port areas<br><br>(Guideline 4) |

**Note:** Reference to a port refers to the physical infrastructure and associated waters within the industrial zone.

**NAMES OF AREAS OF MANGROVES DESIGNATED "REGIONALLY SIGNIFICANT" IN THIS GUIDANCE (reference numbers as above, in text and on maps (Figures 2 - 8))**

1 Bay of Rest
2 Giralia Bay to Yanrey Flats, Exmouth East Shore
3 Monte Bello Islands
4 Ashburton River Delta
5 Coolgra Point
6 Yardie Landing, Yammadery Island, Mangrove Islands
7 Robe River Delta
8 Fortescue River Delta
9 Cape Preston area
10 Maitland River Delta
11 West Intercourse Island, Dampier Archipelago
12 Enderby Island Complex, Dampier Archipelago
13 Searipple Passage/Conzinc Bay, Dampier Archipelago
14 Nickol River Embayment
15 Dixon Island Complex
16 Cossack to Harding Delta Complex
17 Sherlock Bay Sector
18 Ronsard Island area
19 Yule River Delta
20 Turner River Delta
21 Oyster Passage Barrier
22 De Grey River Delta

# 3 THE GUIDANCE

## 3.1 Application of the Guidance to Assessment

The EPA's environmental objective for the tropical arid zone mangroves of the Pilbara coastline (Pilbara mangroves), habitats and dependent habitats, is to maintain ecological function and sustainability. To this end, proposals which, if implemented, would potentially impact on Pilbara mangroves by:

- reducing the geographic distribution, ecological function and/or productivity of mangroves in the region; and/or
- reducing the biodiversity of mangroves, habitats and/or dependent habitats; and/or
- causing a significant loss of individual mangroves and/or disturbance to habitats or life support systems and dependent habitats in areas along the Pilbara coastline,

will be subject to formal environmental impact assessment (EIA) under the EP Act 1986. Guidance for determining the environmental acceptability of proposals requiring assessment is set out below.

### 3.1.1 Guidelines in relation to environmental acceptability

The following guidelines will be used by the EPA in judging environmental acceptability of proposals which potentially impact on Pilbara mangroves and are subject to the environmental impact assessment process.

*It should be noted that the EPA considers that development proposals in all areas covered by the four guidelines below may have a significant effect on the environment. Accordingly, the EPA advises that such proposals should be referred in writing to the EPA. The EPA will determine whether or not the proposal should be subject to environmental impact assessment and, if assessed, at what level such an assessment should take place.*

## Guideline 1

**Areas that contain regionally significant mangroves that occur outside areas that have been designated for industrial areas, associated ports or related development. (These areas are indicated in Table 1 and shown on the maps (Figures 2 to 8) and consist of areas numbered 1, 2, 3, 4, 6, 7, 8, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22).**

Objective

*The EPA's operational objective for Guideline 1 areas is that no development should take place that would adversely affect the mangrove habitat, the ecological function of these areas and the maintenance of ecological processes which sustain the mangrove habitats.*

The EPA will give these mangrove formations the highest degree of protection with respect to geographical distribution, biodiversity, productivity and ecological function.

Proponents should be aware that where developments are proposed in these areas the EPA will adopt a presumption against finding the proposals environmentally acceptable.

## Guideline 2

**All other mangrove areas that occur outside areas that have been designated for industrial areas, associated ports or related development and not covered by Guideline 1 above.**

Objective

*The EPA's operational objective for Guideline 2 areas is that no development should take place which would cause unacceptable impacts on the mangrove habitat, the ecological function of these areas and the maintenance of ecological processes which sustain the mangrove habitats.*

Although development proposals in these areas are outside designated areas of regionally significant mangroves, proponents should be aware the EPA still places a high priority on protecting tropical arid zone mangroves, habitats and dependent habitats in the Pilbara region. The EPA will give these mangrove areas a high level of protection with respect to geographical distribution, biodiversity, productivity and ecological function.

Proposals will be subject to a presumption against finding the proposal environmentally acceptable unless the proponent can demonstrate that there are no unacceptable impacts, based on the following performance objectives:

- demonstrate a significant understanding in relation to the scale and nature of potential environmental impacts on the mangrove systems;
- evaluate how the mangrove system (the mangroves, habitats, dependent habitats, ecological function and ecological processes which sustain the mangrove habitats) would be affected by the proposed development and the environmental significance of any such impacts, including cumulative impacts; and
- demonstrate that the proposed development adopts good engineering design and 'best practice' processes for

minimising potential environmental impacts and maintains the ecological function and overall biological value and environmental quality of the area.

**Guideline 3**

**Areas that contain regionally significant mangroves that occur inside areas that have been designated as industrial areas, associated ports or related development. (These areas are indicated in Table 1 and shown on the maps (Figures 4 to 6) and consist of areas numbered 5, 9, 10, 11, 15). Proponents will need to include justification for site location of proposed development in these areas.**

Objective

*The EPA's operational objective for Guideline 3 areas is that no development should take place that would significantly reduce the mangrove habitat or ecological function of the mangroves in these areas.*

Proposals will be expected to meet the following performance objectives for an assessment of acceptability by the EPA:

- demonstrate a significant understanding of the mangrove systems, in terms of habitats, dependent habitats and ecological functions, which are likely to be affected if development is implemented;

- with the above understanding, evaluate how the mangrove system (the mangroves, habitats, dependent habitats, ecological function and ecological processes which sustain the mangrove habitats) would be affected and the environmental significance of any such impacts, including cumulative impacts;

- demonstrate that the proposed development adopts good engineering design and 'best practice' processes for minimising potential environmental impacts and maintains the ecological function and overall biological value and environmental quality of the area; and

- demonstrate that all feasible and prudent alternative (industry siting) to impacting detrimentally on mangroves have been considered.

**Guideline 4**

**All other mangrove areas that occur inside areas that have been designated as industrial areas, associated ports or other development and not covered by Guideline 3 above.**

Objective

*The EPA's operational objective for Guideline 4 areas is that the impacts of development on mangrove habitat and ecological function of the mangroves in these areas should be reduced to the minimum practicable level.*

The EPA's would consider the significance of the environmental impacts but would expect that the proposal in these zones are likely to be capable of being made environmentally acceptable. Accordingly, proposals in these areas will not be subject to a presumption against finding the proposal environmental acceptable provided that:

- a high priority being placed on protecting tropical arid zone mangroves, habitat and dependent habitats; and
- any development being planned and designed to keep impacts on mangroves, habitats and dependent habitats to a minimum practical level.

## 3.2 Guidance for Achieving Desired Outcomes

### 3.2.1 Measures/methods

Where development proposals may impact on mangroves, proponents should minimise, ameliorate and manage those impacts, including re-establishing mangroves where appropriate.

As a part of project approval, a proponent may be required to use engineering solutions (eg. use of trestles instead of solid structures in order to maintain littoral processes) to minimise the loss and disturbance of mangroves and develop a management program which provides for:

- monitoring to detect changes in mangrove biodiversity, coverage and productivity based on performance indicators of environmental acceptability which include as appropriate:
  - water quality;
  - water circulation and exchange;
  - mangrove health, productivity, abundance and density;
  - tidal inundation;
  - sedimentation rates; and
  - productivity and biodiversity of dependent biota such as fish and invertebrates;
- minimising the avoidable loss of mangroves by:

  - avoiding the impacts of dredging, In particular, channel dredging should not cause instability of adjacent mangrove flats/sediments;
  - avoiding the direct removal of mangroves or filling of mangrove habitat wherever possible;
  - the disposal of dredge spoil onto mangroves should be minimised and would only be allowed if no other reasonable alternative is available; and
  - avoiding wherever possible significant disturbance of supporting processes (such as fresh water inflows) on which mangroves depend;

- auditing to ensure compliance with operational environmental performance objectives, Ministerial Conditions and Works Approval and Licence Conditions is being achieved;

- identifying remediation works or rehabilitation measures, if required where performance objectives have not been met;

- preparing appropriate decommissioning plans; and

- research (see 3.2.3).

### 3.2.2 Important outcomes

The proponent's ability to deliver the following outcomes will be important when evaluating the environmental impacts of a proposed development on a mangrove area:

- mangroves should not decline because of altered water flow or salinity (no significant alteration of tidal flow to mangroves with the key objective being to maintain existing tidal patterns);

- water quality in undisturbed mangrove areas adjacent to the development should meet the ANZECC Water Quality Guidelines, unless there is ecological justification for it not doing so;

- existing groundwater flow, freshwater inflows and quality should be maintained in undisturbed mangrove areas;

- mangrove decline should not occur through secondary effects such as shading or dust settlement;

- mangrove decline should not occur as a result of wastewater, coolant water or runoff water discharge or irrigation, or from pollution;

- mangrove decline should not occur as a result of recontouring any land;

- sedimentation patterns should be maintained so that erosion and deposition within mangrove habitats is within natural variations;

- there should be no significant loss of algal mats associated with mangrove areas; and

- any unavoidable mangrove loss should not adversely affect the general amenity and recreational facilities nor interfere with fisheries in the area (breeding grounds, protection habitats for juveniles or adult fish or shellfish).

### 3.2.3 Alternative approaches for proponents

Where the destruction of mangroves is likely, proponents should minimise losses and impacts through appropriate planning and engineering design. For example, alternative approaches to planning and engineering could involve investigating available options for the alignment and constriction of roads, conveyor belts, railways, buildings and revetments which minimise direct or indirect mangrove destruction while achieving development objectives. Creating or leaving intertidal flats adjacent to the development so that natural or artificial regrowth can occur may also be appropriate. Other compensatory options, where mangrove losses cannot be avoided, could include the replacement of mangroves at nearby locations or conducting mangrove-related research to improve environmental management.

- ***Replacement***

  In cases where it may be impossible or unreasonable for a developer to avoid impacting mangroves, the EPA would consider the replacement of mangroves as a suitable outcome. As a guide, the EPA would not generally expect a replacement strategy if the area of loss of mangroves was to be less than 1,000 square metres. However, the EPA would not discourage a proponent from proposing one for an area less than 1,000 square metres. Preferable replacement areas should be on already disturbed or degraded areas or, where this is not possible, on newly created mangrove habitats. Where replacement is not practicable in the immediate vicinity, then replacement further from the area disturbed by a development may be considered acceptable.

- ***Research***

  The Western Australian State of the Environment Report points out that relatively little is known about mangrove ecology and that more research should be undertaken. Where the EPA accepts that a development cannot avoid impacts on mangroves, the EPA may consider a commitment from the proponent to carry out relevant research into mangrove ecology as an acceptable means of off-setting a minor loss of mangroves. Such research could involve:

  - data collection;
  - determining the relative ecological value of the various mangroves species, habitats and dependent habits for the purposes of improving EIA for future proposals;
  - measuring the impacts from the destruction of mangroves during and after the development; and
  - regeneration of mangroves including propagation or transplanting mangroves.

### 3.2.4 Implementation action and plan

The EPA expects the proponent to exercise all care and due diligence in managing the proposal to ensure the protection of mangroves. Proponents should outline the detail of relevant safeguards in an Environmental Management Programme (EMP). An EMP should address the objectives specified in this guidance statement by detailing the appropriate monitoring and reporting required to ensure compliance with the conditions of development approval. The EMP should include provisions for implementing a rehabilitation program if required. In the case of a short-term proposal, a site rehabilitation plan should be included. For a long-term proposal, reference should be made to the acceptance that the site will be decommissioned and rehabilitated, with a rehabilitation plan to be developed before the proposed activity ceases.

### 3.2.5 Management system

Where appropriate, the proponent should demonstrate that there is in place an environmental management system which includes the following elements:

1. An environmental policy and corporate commitment to it;

2. Mechanisms and processes to ensure:

   2.1 planning to meet environmental requirements;
   2.2 implementation and operation of actions to meet environmental requirements; and
   2.3 measurement and evaluation of environmental performance; and

3. Review and improvement of environmental outcomes.

# 4 APPLICATION

### 4.1 Area

This Guidance Statement applies to all applications for all development sites with the potential to impact upon mangroves in the tropical arid zone along the Pilbara coastline from Cape Keraudren at the southern end of the Eighty Mile Beach in the north to Exmouth Gulf in the south including State coastal waters (Figures 1-8). This area takes in the significant industrial development areas of Onslow, Cape Preston, Maitland, Burrup Peninsula, Cape Lambert, Boodarie and Port Hedland.

### 4.2 Duration and Review

The duration of this Guidance Statement is for five years unless some unforseen circumstances require it to be revised earlier.

## 5 RESPONSIBILITIES

### 5.1 Environmental Protection Authority Responsibilities

The EPA will apply this Guidance Statement during the assessment of proposals under Part IV of the *Environmental Protection Act 1986* where tropical arid mangroves along the Pilbara Coastline are an environmental factor.

### 5.2 Department of Environmental Protection Responsibilities

The DEP will assist the EPA in applying this Guidance Statement in environmental impact assessment and in conducting its functions under Part V of the *Environmental Protection Act 1986.*

### 5.3 Proponent Responsibilities

Where proponents demonstrate to the EPA that the requirements of this Guidance Statement are incorporated into proposals, in a manner which ensures that they are enforced and audited, the assessment of such proposals is likely to be assisted.

## 6 DEFINITIONS

**assemblage:** recognisable grouping or collections of individuals or organisms.

**best practice:** occurs when a comprehensive, integrated and cooperative approach to the continuous improvement of all facets of an organisation's operations. It is the way leading edge companies manage organisations to deliver world class standards of performance.

**biodiversity:** the variety of organisms, including species themselves, genetic diversity and the assemblages they form (communities and ecosystems). Sometimes includes the variety of ecological processes within those communities and ecosystems (SOE WA, 1992).

**ecological community:** an assemblage of organisms characterised by a distinctive combination of two or more ecologically interacting species.

**development:** means the erection, construction, demolition, alteration or carrying out of any building, excavation, clearing or other works in, on, over, or under land or waters, or a material change in the use of land or waters or any other act or activity in relation to land or water declared by regulation to constitute development, but not including any work, act, or activity declared by regulation not to constitute development.

**ecological function:** the biological and physical processes and services of an ecosystem, including photosynthesis, nutrient generation and recycling and reproduction.

**ecological integrity:** means the state of an ecosystem being the whole and unimpaired and which is usually determined by reference to appropriate ecosystem indicators and criteria.

**ecosystem:** a community or an assemblage of communities of organisms, interacting with one another, plus the environment in which they live and with which they also interact (SOE WA, 1992).

**environmental management system:** provides a management, administrative and monitoring framework for ensuring that an organisation's environmental risk is minimised and that its environmental policy together with associated objectives and targets are achieved. See EPA Guidance Statement No 43.

**good engineering design:** occurs when environmental, safety, community and economic considerations are incorporated into the engineering design in an effective and comprehensive manner.

**habitat:** the place or type of site where a plant or animal naturally and normally lives and grows (SOE WA, 1992).

**mangrove:** (i) a plant (belonging to any of a wide range of species, mainly trees and shrubs) that grow in sediments regularly inundated by seawater (ii) a community (forest, woodland, shrubland) of such plants (SOE Advisory Council, 1996. Australia: State of the Environment 1996. Department of the Environment, Sport and Territories, Canberra).

**operational environmental performance action:** means an action that relates to the desired environmental outcome, or guides the formulation of strategies for the management of human activities that may affect the environment.

**primary production:** the conversion (usually in kg/day) of organic matter by autotrophs within an ecosystem, reflected as an increase in plant biomass (D Meagher 1991. The Macmillan Dictionary of The Australian Environment, Melbourne, p 257).

**productivity (biological):** the rate of accumulation of organic material in an ecosystem (SOE Advisory Council, 1996. Australia: State of the Environment 1996. Department of the Environment, Sport and Territories, Canberra).

**proponent:** in relation to a proposal, means person who or which is nominated under section 38 of the WA EP Act 1986 as being responsible for the proposal (WA EP Act, 1986).

**regionally significant:** those areas defined as 'regionally significant' in this guidance statement. These areas may in addition be of national and international significance, as identified in Semeniuk (1997)

# 7 LIMITATIONS

This Guidance Statement has been prepared by the Environmental Protection Authority to assist proponents and the public. While it represents the contemporary views of the Environmental Protection Authority, each proposal which comes before the Environmental Protection Authority for environmental impact assessment will be judged on its merits. Proponents who wish to deviate from the Guidance provided in this document should provide robust justification for the proposed departure.

# 8 REFERENCES

Anon. 1992. State of the Environment Report. WA Government, Perth.

Anon. 1997. Draft State of the Environment Report. WA Government, Perth.

EPA, 1999. Environmental Management Systems. Guidance Statement No. 43. EPA, Perth.

Meagher, D. 1991. The Macmillan Dictionary of The Australian Environment, Melbourne, p 257.

'Murdoch University and Conservation Council of WA. Pilbara Mangrove Study: Final Report to the Institute for Environmental Science'.

Semeniuk, V (1997). Selection of Mangrove Stands for Conservation in the Pilbara Region of Western Australia – A Discussion (Unpublished).

SOE Advisory Council, 1996. Australia: State of the Environment 1996. Department of the Environment, Sport and Territories, Canberra.

# 9 ACKNOWLEDGMENTS

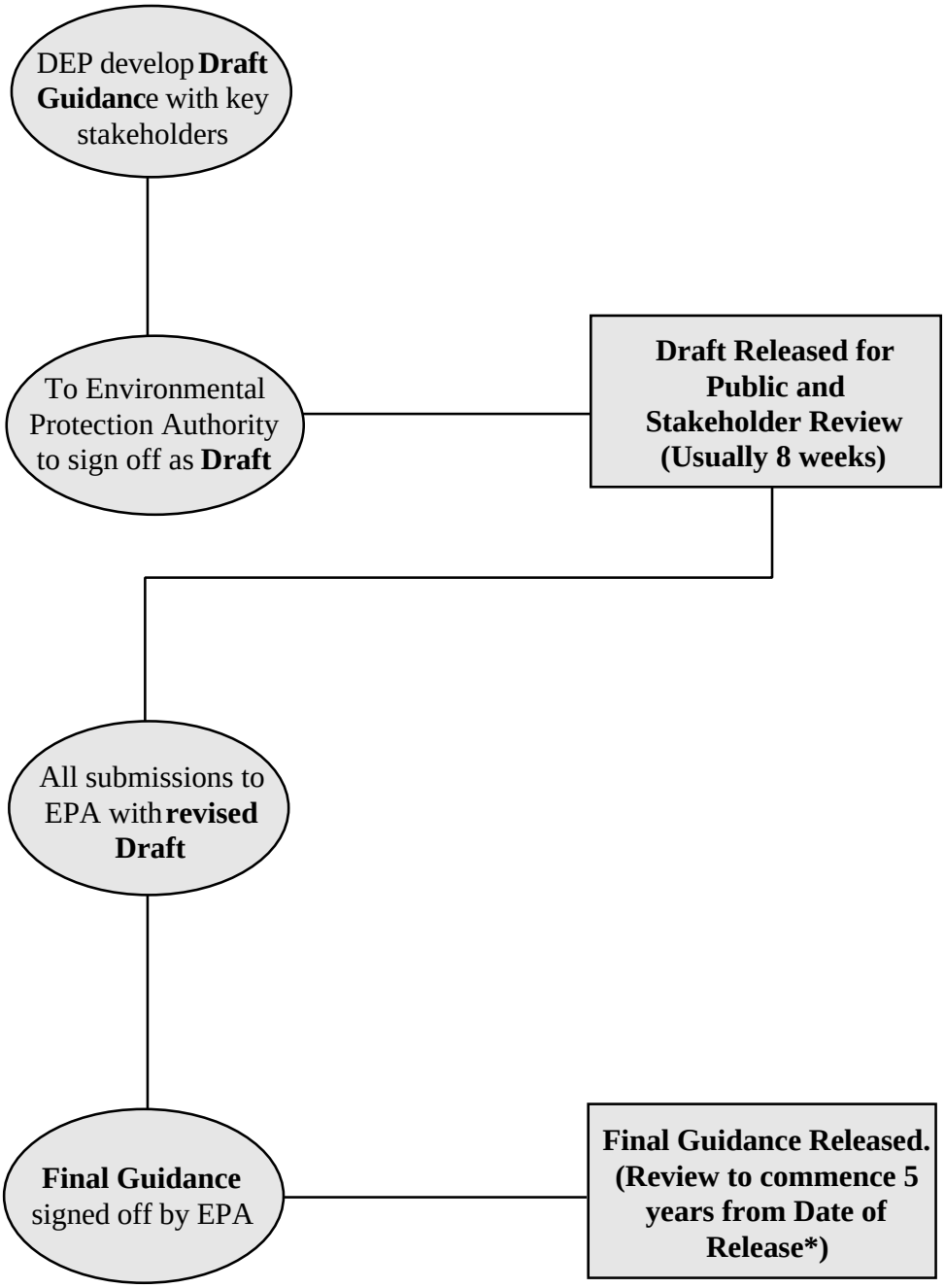
The EPA acknowledges the contributions of the following in the preparation of this Guidance Statement:

- Ms S J Robinson (Consultant and former Deputy Chairman of the EPA);
- officers of the Department of Resources Development; and
- officers of the Department of Environmental Protection.

| | |
|---|---|
| **Index** | Final Guidance April 2001 |
| **Status** | Signed-off by the EPA. |
| **Citation** | This document can be cited as the Guidance Statement for Protection of Tropical arid Zone Mangroves Along the Pilbara Coastline |
| **Contact officer** | (Dr) Victor Talbot<br>email: victor.talbot@environ.wa.gov.au |

# Appendix 1

## Generic Flow Diagram for the Guidance Statement Process




*Guidance may be reviewed earlier if circumstances require it.

# Appendix 2

# Figures

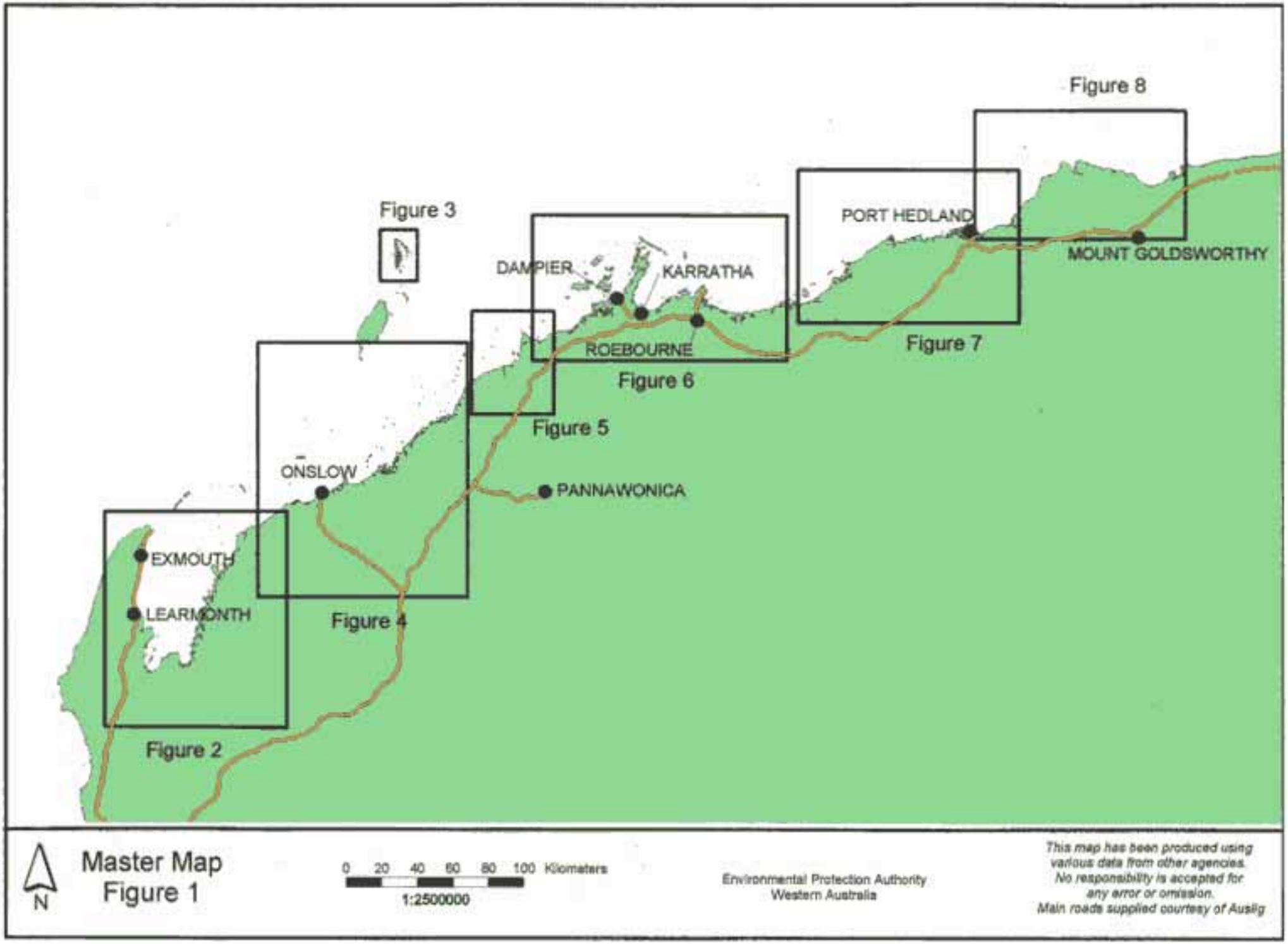
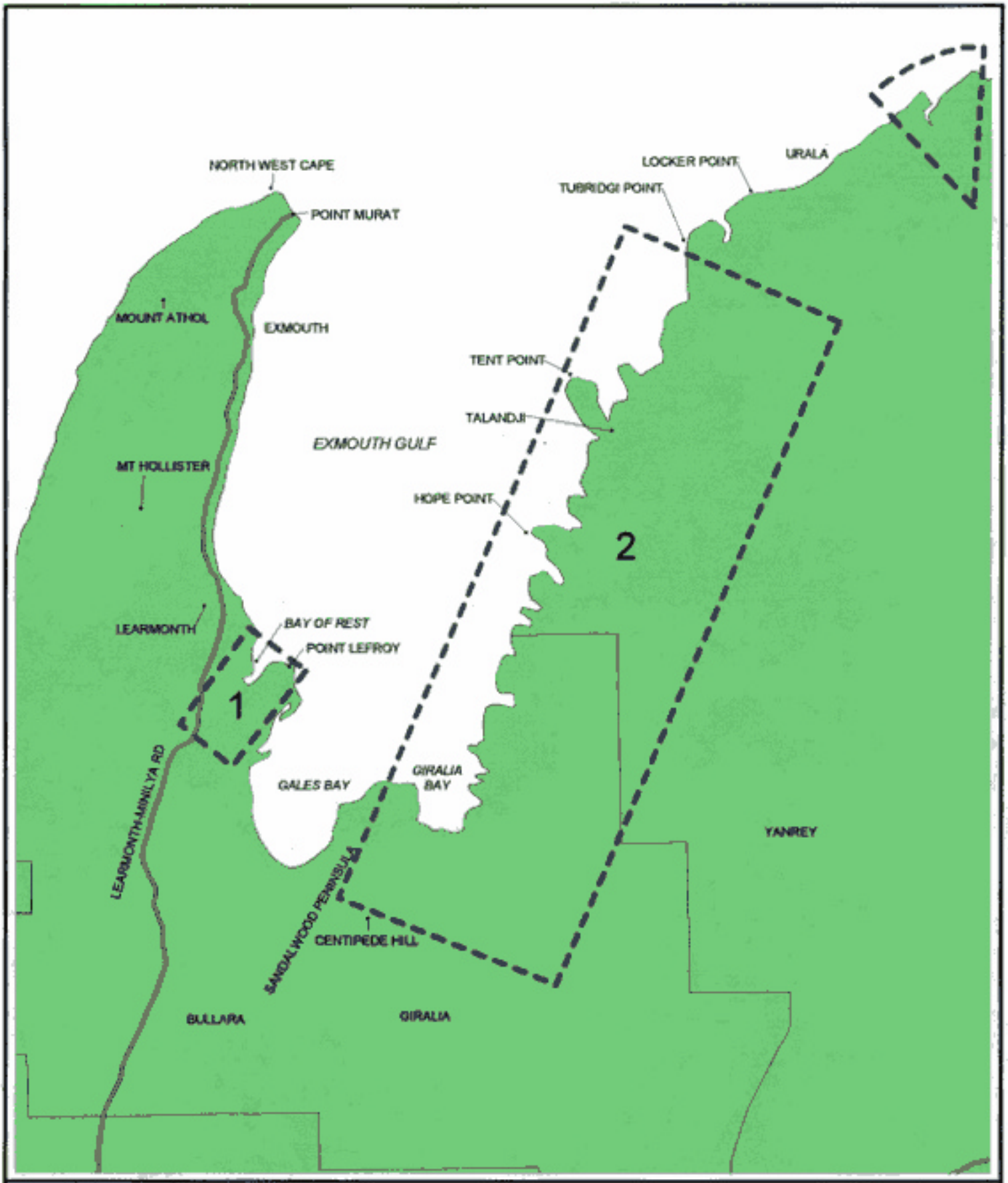


Figure 8
Figure 3
PORT HEDLAND
MOUNT GOLDSWORTHY
DAMPIER
KARRATHA
ROEBOURNE
Figure 7
Figure 6
Figure 5
ONSLOW
PANNAWONICA
EXMOUTH
LEARMONTH
Figure 4
Figure 2
N
Master Map
Figure 1
0 20 40 60 80 100 Kilometers
1:2500000
Environmental Protection Authority
Western Australia
This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission.
Main roads supplied courtesy of Ausig




Exmouth Gulf
Figure 2

N

0 5 10 15 20 Kilometers

1:600000

Mangrove Management Boundaries
Main Roads
Local Government Authority Boundaries

*This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission. Main roads supplied courtesy of Auslig LGA boundaries supplied courtesy of DOLA.*

Environmental Protection Authority
Western Australia


# Montebello Islands
## Figure 3

N

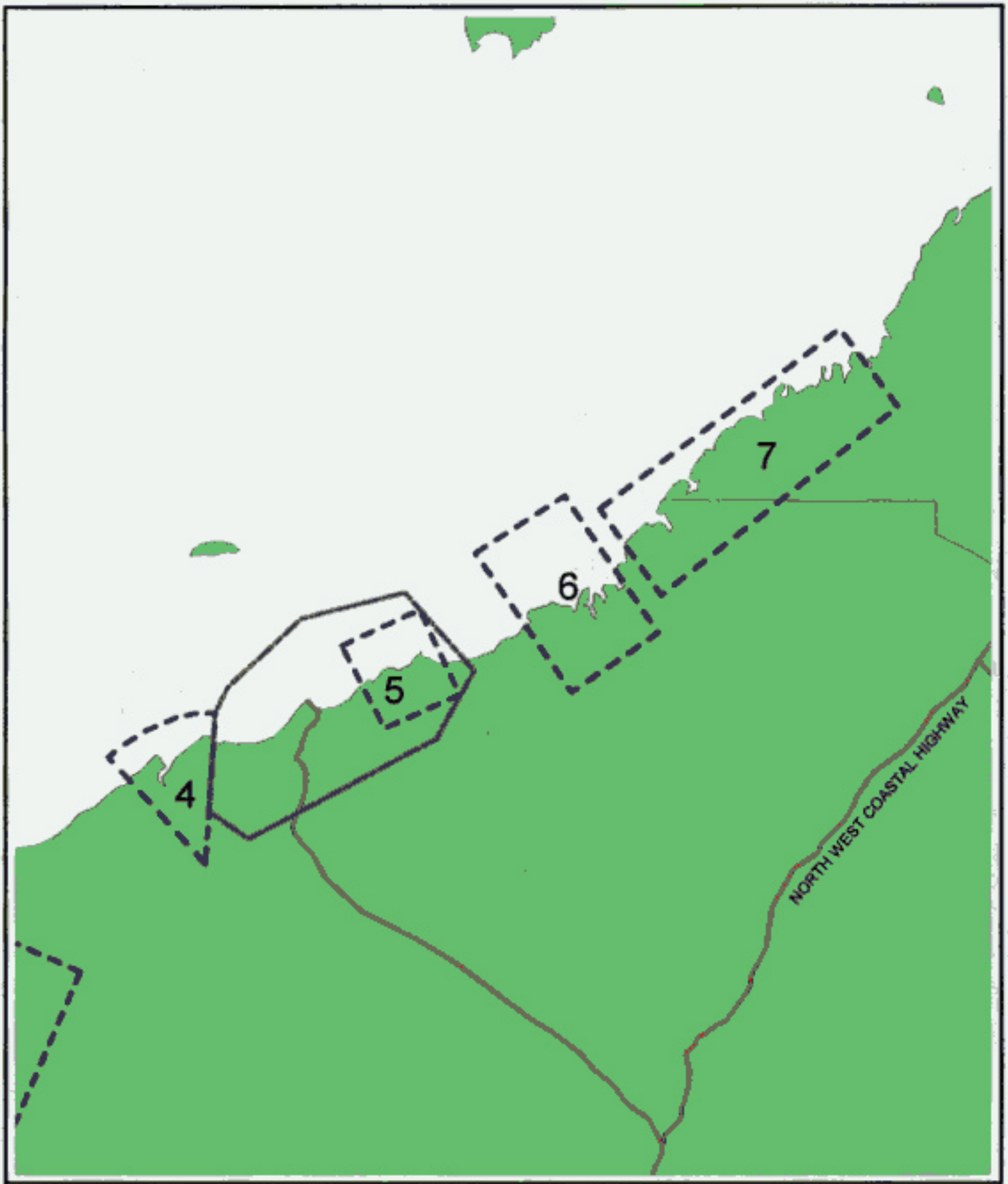
Coastline of Western Australia
Mangrove Management Boundaries

0 1 2 3 4 5 Kilometers

1:120000

*This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission. Coastline supplied courtesy of DOLA.*

Environmental Protection Authority
Western Australia




Onslow
Figure 4

N

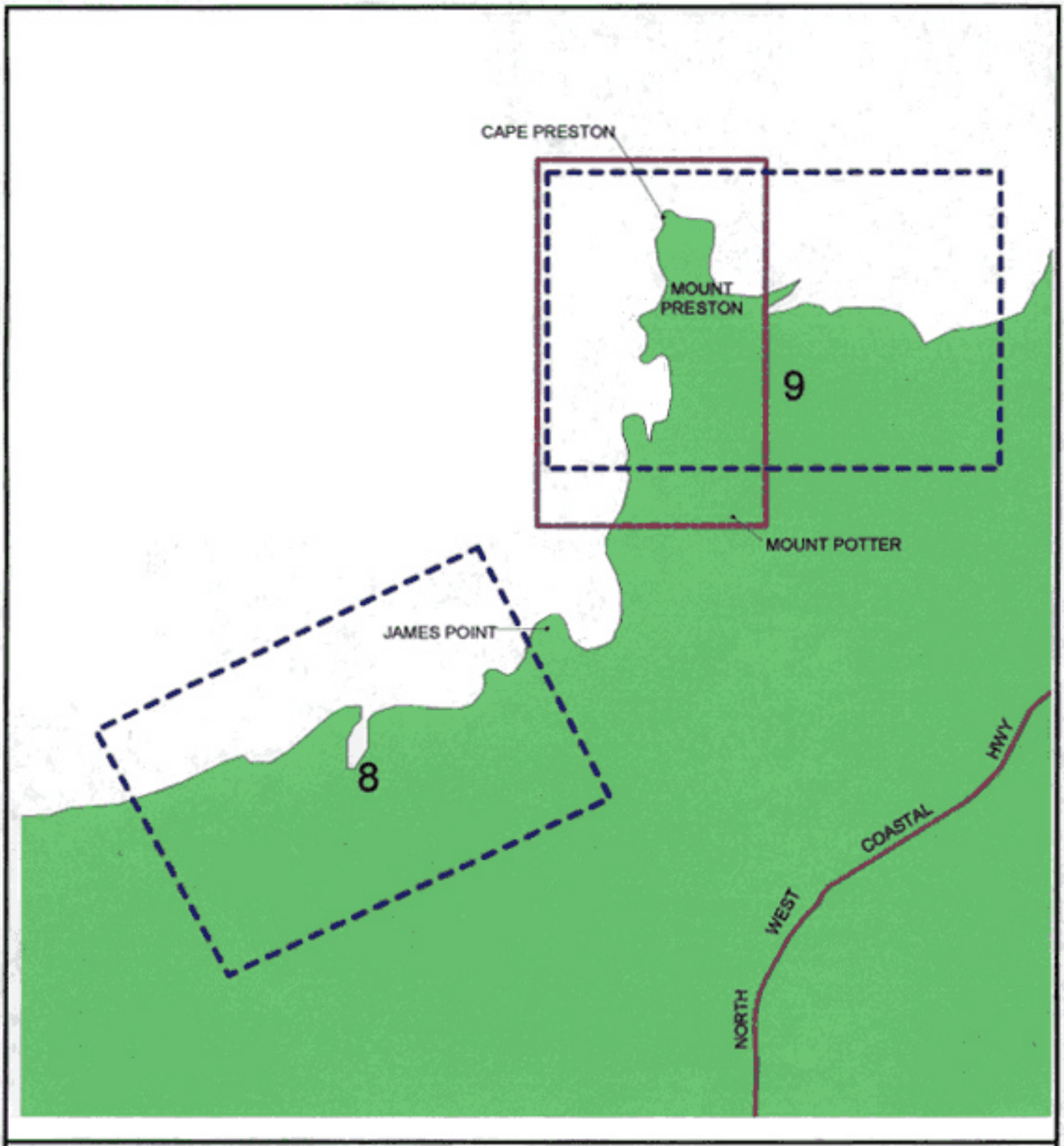
0 5 10 15 20 25 Kilometers

1:650000

Mangrove Management Boundaries
Industrial Areas & Associated Port Areas - Onslow
Main Roads
Local Government Authority Boundaries

*This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission, Main roads supplied courtesy of Auslig. LGA boundaries supplied courtesy of DOLA.*

Environmental Protection Authority
Western Australia




# Cape Preston
# Figure 5

Mangrove Management Boundaries
Industrial Areas & Associated Port Areas- Cape Preston
Main Roads
Local Government Authority Boundaries

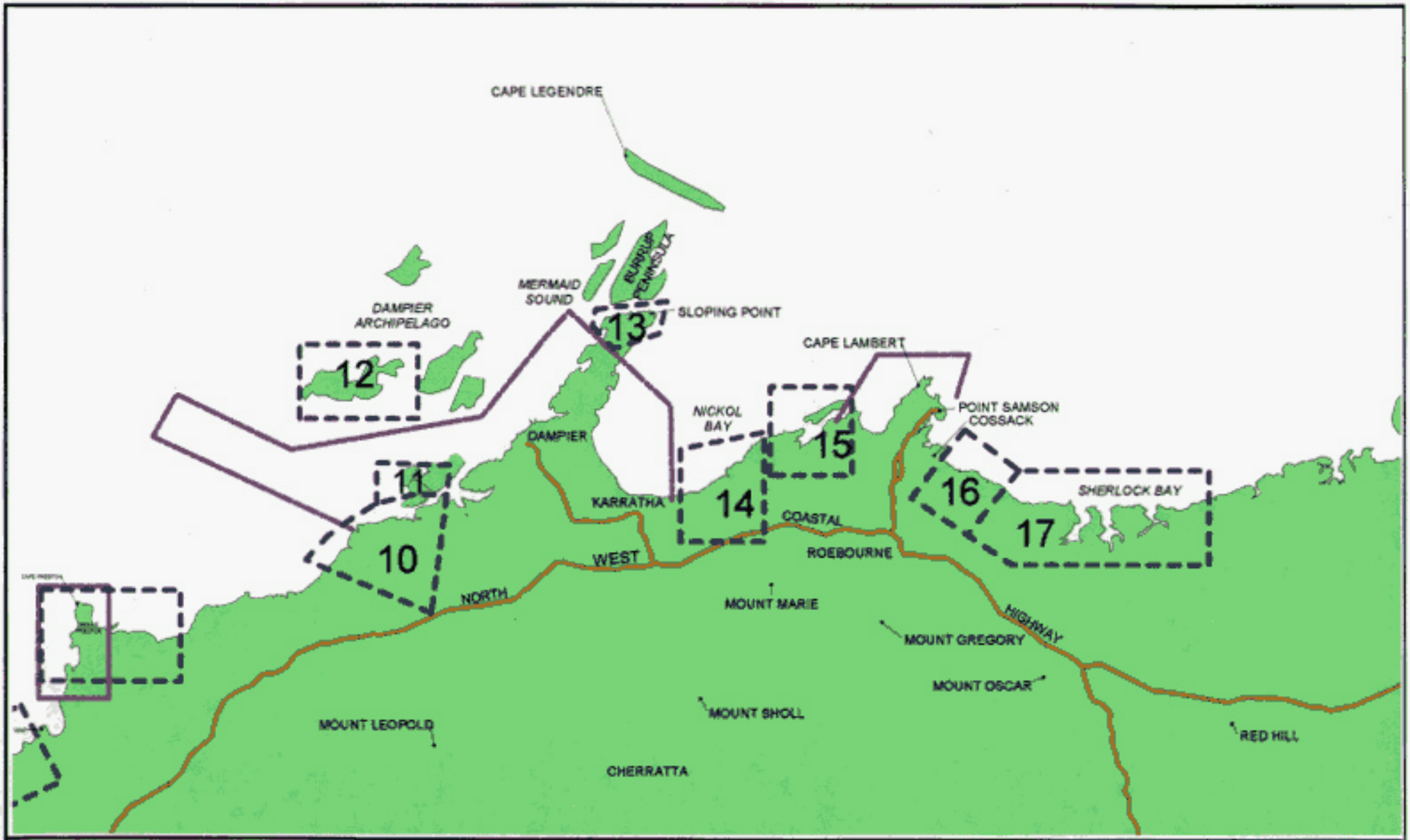
*This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission.*
*Main roads supplied courtesy of Auslig.*
*LGA boundaries supplied courtesy of DOLA.*

N

0 2 4 6 8 10 Kilometers

1:200000

Environmental Protection Authority
Western Australia




# Dampier Archipelago
## Figure 6

N

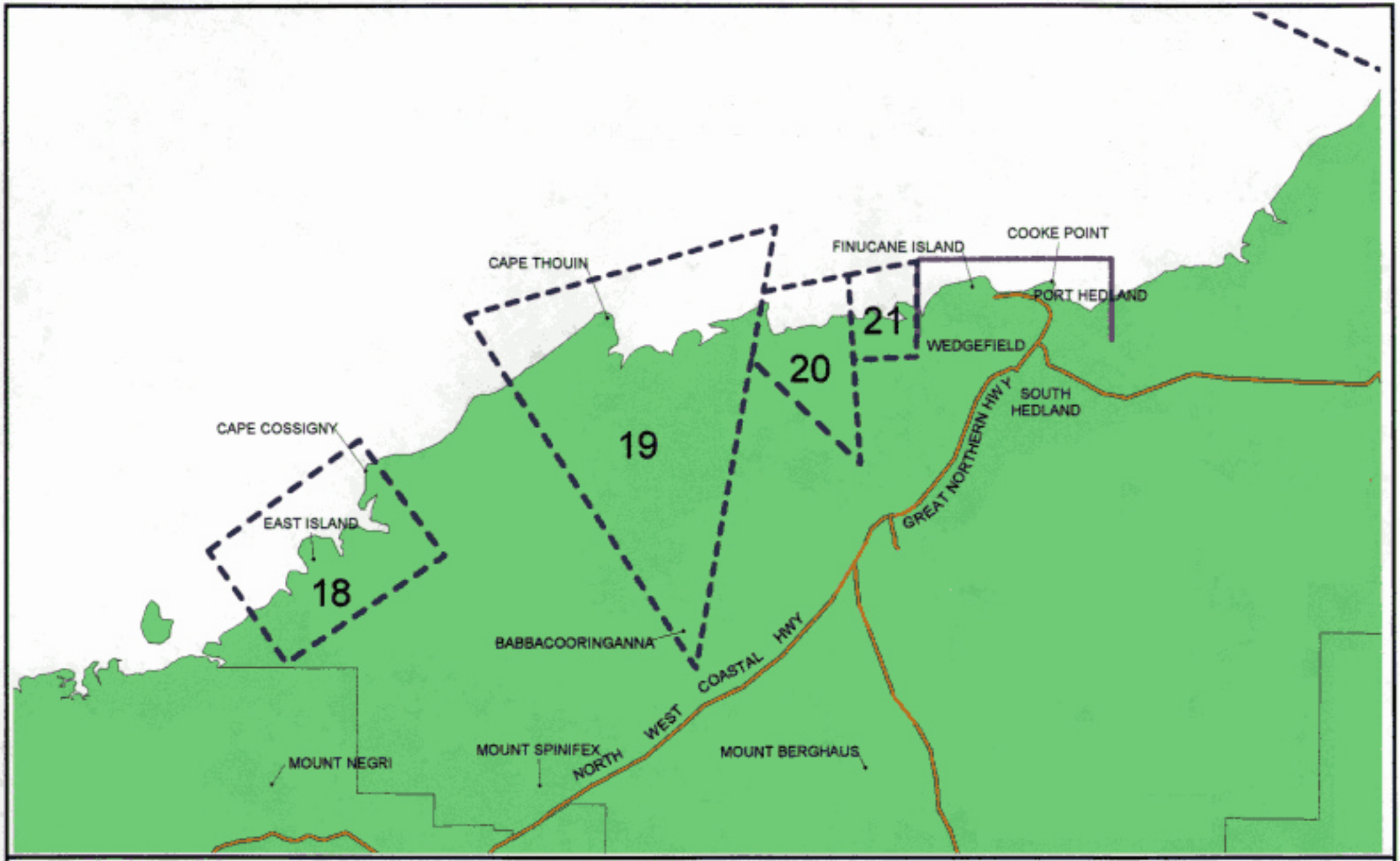
0 5 10 15 20 25 Kilometers

1:600000

Environmental Protection Authority
Western Australia

Mangrove Management Boundaries
Industrial Areas & Associated Port Areas - Dampier Arc, Cape Lambert
Main Roads
Local Government Authority Boundaries

*This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission. Main roads supplied courtesy of Ausig. LGA boundaries supplied courtesy of DOLA.*




Port Hedland
Figure 7

N

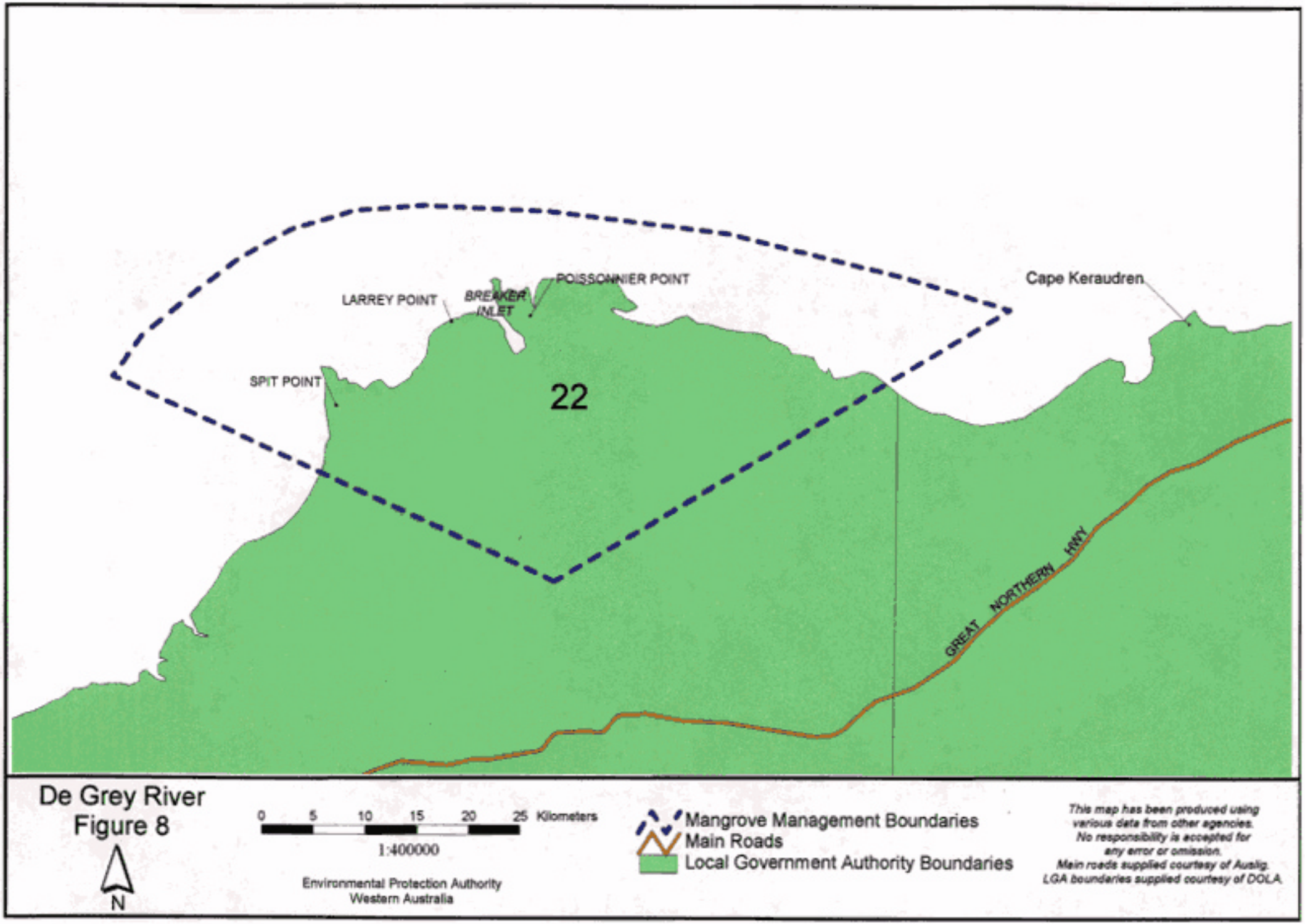
0 5 10 15 20 25 Kilometers

1:500000

Environmental Protection Authority
Western Australia

Mangrove Management Boundaries
Industrial Area - Port Hedland
Main Roads
Local Government Authority Boundaries

*This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission. Main roads supplied courtesy of Auslig. LGA boundaries supplied courtesy of DOLA.*




De Grey River
Figure 8

N

0 5 10 15 20 25 Kilometers

1:400000

Environmental Protection Authority
Western Australia

Mangrove Management Boundaries
Main Roads
Local Government Authority Boundaries

*This map has been produced using various data from other agencies. No responsibility is accepted for any error or omission. Main roads supplied courtesy of Auslig. LGA boundaries supplied courtesy of DOLA.*