

Shire of Roebourne Environmental Strategy

Prepared for the Shire of Roebourne

By Essential Environmental

August 2013



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1 INTRODUCTION

The Shire of Roebourne Environmental Strategy provides a framework for the achievement of better environmental management outcomes, consistent with the overall vision and objectives of the Shire. The priority environmental themes for action in the Shire of Roebourne are water, biodiversity, coasts and built environments.

The Shire of Roebourne Environmental Strategy also contains a summary of the current environmental context, identifying key issues across the municipality, which will be used to inform the Local Planning Strategy and Scheme in relation to the natural environment.

1.1 The strategy area

The Shire of Roebourne forms the central coastal part of the Pilbara region. With an area just over 15,000 square kilometres, it is bounded by the Indian Ocean in the north and west, the Town of Port Hedland in the east, and the Shire of Ashburton in the south (Figure 1). Settlement is largely confined to a string of towns along the coastal strip and the North West Coastal Highway.

Land use in the Shire comprises mostly pastoralism, with only two active mine sites in operation - Sino Cape Preston Iron and Dampier Salt. Karratha is the major town site and provides administrative and service support to a substantial part of the booming resources industry in the Pilbara, including Woodside's North West Shelf gas fields. Cape Lambert and Dampier provide the port infrastructure for the iron ore operations of Rio Tinto supported by their settlement at Wickham, while tourism opportunities are provided by Point Samson as well as Roebourne and Cossack, which also have recognised heritage significance.

The Shire has a rapidly growing population, largely due to natural resource projects in the region which include the mining of iron ore and other minerals, and oil and gas operations. Continuing expansion of these operations, new projects and investment in infrastructure are expected to drive further population growth in the region.

The potential for growth in the Shire has been recognised by the State Government and it forms a key component of the Government's Pilbara Cities Vision. Under this vision, the State Government aims to deliver sustainable regional centres by 'normalising' land and housing supply, improving infrastructure and community facilities, while supporting the health and well-being of the resident population (Government of Western Australia, 2010).

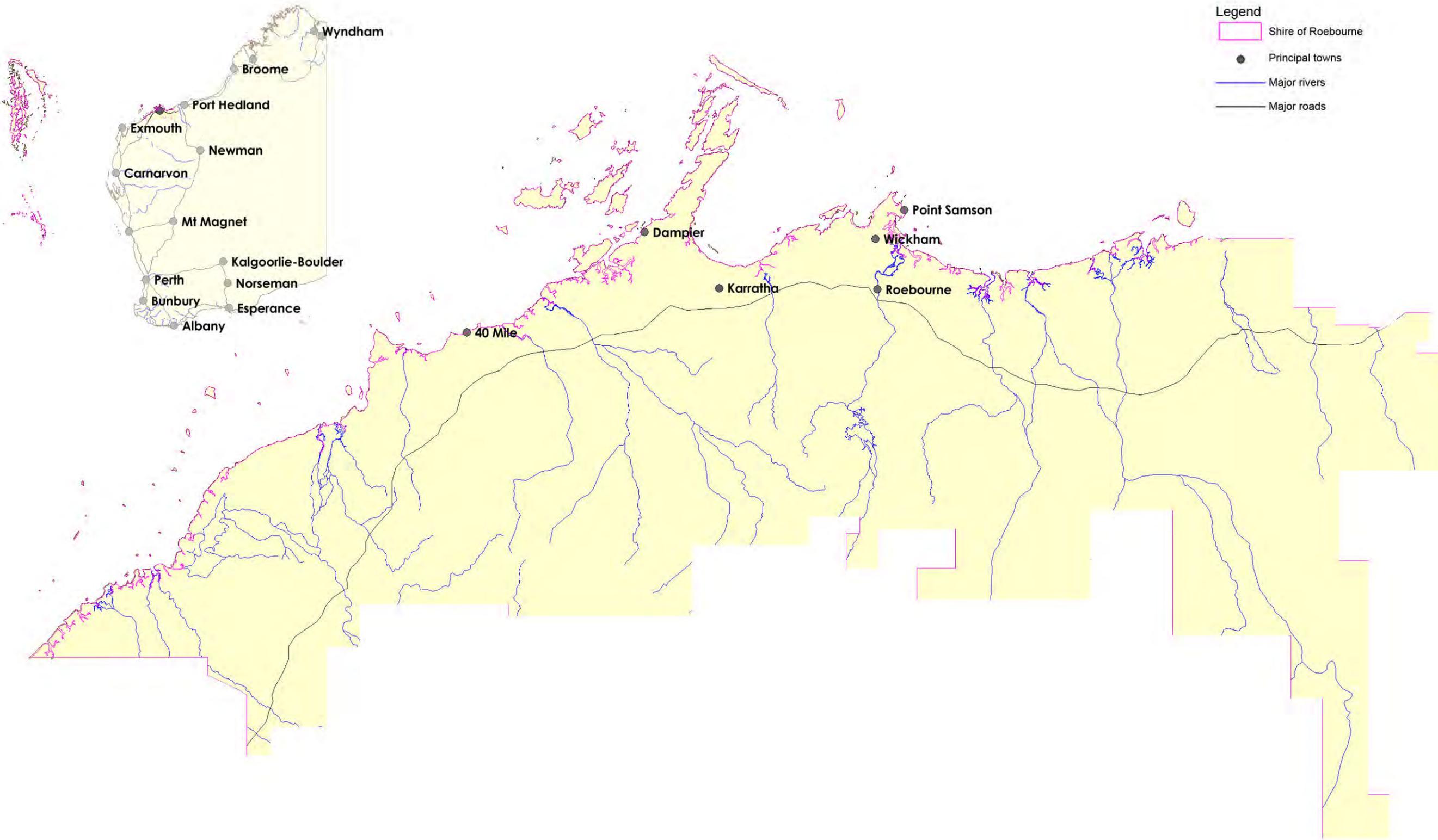
1.2 Implementation

It is recognised that direct responsibility for decision-making and management of a large proportion of environmental issues and impacts within the Shire of Roebourne lies with many State Government agencies or land managers, rather than the Shire itself, particularly in relation to mining operations and pastoral activities. Accordingly, this strategy focuses on the decisions and activities of the Shire that influence the protection and management of the environment.

Advocacy opportunities (i.e. where local government's main role is to provide a voice for the community and work in partnerships to deliver outcomes) are also highlighted where possible.

Shire of Roebourne - Environmental Strategy

Figure 1 - Location

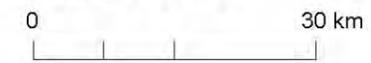


- Legend
- Shire of Roebourne
 - Principal towns
 - Major rivers
 - Major roads

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Scale 1: 750,000



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Implementation of the Shire of Roebourne Environmental Strategy will be primarily through the Shire's core functions associated with development and infrastructure services, including planning and development decision-making, asset management, management of public and Shire lands and waste management.

1.3 Shire of Roebourne strategic policy context

There are a number of policies, plans, strategies and legislation that guide environmental management in Western Australia and in the Pilbara region. A brief explanation of these is provided in Appendix 1.

The Shire of Roebourne is in the process of developing a local planning strategy. Planning guidance is currently provided by Shire of Roebourne Town Planning Scheme No 8 and local policy. Some strategic direction is also provided by the Strategic Community Plan.

The strategies and reports that are most relevant to the protection and management of the environment within the Shire are outlined below.

1.3.1 Shire of Roebourne Town Planning Scheme No 8

Shire of Roebourne Town Planning Scheme No 8 (hereafter referred to as "the Scheme") was gazetted on 23rd August 2000. One of the objectives of the Scheme is broadly relevant to this strategy. It is outlined in Clause 1.6 as:

- (a) facilitate community input into planning for the appropriate balance between economic and social development, conservation of the natural environment, and improvements in lifestyle and amenity

Part V of the Scheme also defines objectives for the Burrup Peninsula under Clause 5.4. The first being relevant to this strategy is to:

- "Retain and appropriate balance between the Burrup's recreational, industrial, environmental and heritage assets"

Similar objectives referring to due regard of the natural environment are also defined for:

- Cape Lambert
- Cossack
- Islands (Dampier Archipelago)
- Maitland (Miaree Pool)
- pastoral stations (specifically coastal areas including Gnoorea and Cleaverville recreational nodes)
- Point Samson

Under the Scheme, all development plans are expected to address:

- "public open space and recreation provision, environmental protection areas, and relationships to natural features"; and
- "assessment of the impact of the proposal on the natural environment, including management of potential effluent, emissions and other forms of pollution"

1.3.2 Strategic Community Plan

The community's aspirations for the Shire have been recently outlined in the Shire of Roebourne *Strategic Community Plan 2012 – 2022*. The plan outlines the outcomes that the Council will be achieving through strategies provided in the Corporate Business Plan over the next five years. The Strategic Community Plan also incorporates state and regional plans including *Pilbara Planning and Infrastructure Framework 2012, Karratha - City of The North Plan'* and the *Pilbara Regional Council Strategic Plan 2012-2014*. These linkages help position the Shire's planning within a much broader context and considers current and emerging community needs and identifies key stakeholders and interdependencies which may affect delivery of appropriate services to the community over time.

Shire of Roebourne Strategic Community Plan strategic theme 3: *Our Natural and Built Environment – Thriving and Sustainable* has an associated goal to "strive to ensure our community lives sustainably in a thriving natural environment". The Shire of Roebourne is dedicated to achieving the following outcomes as part of their own activities:

- An environmentally responsible and sustainable organisation – through the protection and enhancement of the natural environment, open spaces, beaches and waterways
- A sustainable and thriving natural environment – by exploring options to reduce, reuse or recycle our waste and minimize our carbon footprint
- Environment that promotes healthy lifestyle – by providing shading in meeting places

The Shire will review its progress towards meeting the objectives of the Strategic Community Plan and identifies the following outcomes and measures.

Outcomes	Strategic indicators
Community Volunteer Groups	Number of active voluntary groups working for cleaning beaches Number of Environmental education programs conducted Number of participants attended
Reduction in Waste and Improvement in water conservation	Developing and implementing Energy Savings Action Plan Developing and implementing a water savings plan
New Cycle ways and Cycling Trails Developed	Number of new cycleways constructed
Initiatives on Recycling	Number of new initiatives for developing partnerships with recycling agencies

The Shire of Roebourne will report on the progress of the Strategic Community Plan annually as part of the Annual Report and will monitor progress internally against the projects and services outlined in the accompanying Operational Plan. The quarterly reviews of the Operational Plan will be available through the council website.

1.3.3 Local environmental policy context

Policy and strategy documents have been prepared by the Shire of Roebourne for a range of areas in the municipality, including codes of conduct, financial management, environmental health, development requirements, landscaping, transient worker accommodation, and waste management. These policies guide how Council operates or puts in place long term strategies in partnership with the community (Shire of Roebourne website).

The local policies which provide guidance for environmental management are limited and include:

- DP6 Landscaping requirements for industrial and commercial areas (2009)
- Acid Sulphate Soil Assessment (obtained from WAPC, 2009)

1.4 Other guiding documents

1.4.1 *Pilbara Planning and Infrastructure Framework (WAPC, 2012)*

The *Pilbara Planning and Infrastructure Framework* defines a strategic direction for the future development of the Pilbara region over the next 25 years. It seeks to ensure that development and change in the Pilbara is achieved in a way that improves people's lives and enhances the character and environment of the region.

The *Pilbara Planning and Infrastructure Framework* notes that if growth and development are poorly managed there would be unacceptable impacts on the region's natural environment and a reduction in the desirability of living in the Pilbara. It highlights the need for strategic regional planning to recognise the issues as early in the planning process as possible and identify measures for protection in order to ensure that future development will avoid unacceptable damage to the natural environment.

1.4.2 *Pilbara State of the Environment Report 2013 (RDA Pilbara, 2013)*

This report provides information on the Pilbara's environmental and cultural systems with the purpose of improving the understanding of future risks, and facilitates effective management of important aspects of these systems.

It contains indicators for monitoring changes over time which can be used to evaluate impacts on the environment that may result from future growth and development in the Pilbara region. This in turn will allow future adaptive management responses and/or mitigation actions to be identified to assist in the achievement of objectives and long term goals.

The report also provides a platform for community action by raising awareness and understanding of key environmental issues which will, in turn, help people and organisations make informed decisions regarding future management actions to reduce negative impacts on the environment.

1.4.3 *Natural Resource Management Report for the Protection of Priority Natural Resources in the Pilbara Strategic Regional Land Use Plans (Essential Environmental for the Department of Planning, 2010)*

This report provides guidance for the protection of priority natural resources in the Pilbara as part of strategic regional land use planning, particularly in consideration of the *Pilbara Planning and Infrastructure Framework*. The report identifies priority natural resource assets and recommends general measures for the protection and enhancement of these assets through the land use planning framework for the Pilbara region, as well as specific measures for key Pilbara townsites including Karratha.

1.5 Report preparation

This report has been prepared for the Shire of Roebourne on the basis of publically available information, as well as that supplied by key stakeholders as part of limited stakeholder consultation during development of the *Pilbara State of the Environment Report 2013*. No action has been made to check the validity of this information.

2 ENVIRONMENTAL STRATEGY

The overall aim of this strategy is to:

Protect and enhance the environment of the Shire of Roebourne

This aim is proposed to be achieved through the delivery of a number of actions in the priority theme areas of water, biodiversity, coasts and built environments. Specific objectives and outcomes are proposed. Progress towards achievement of the strategy's objectives is to be measured against the identified indicators. Context for the environmental strategy is provided by the Environmental Profile in Section 3.

2.1 Water

Objective: Protect and enhance waterways, wetlands and the groundwater and ensure sustainable use and management of water resources.

2.1.1 Outcomes

The key outcomes with regards to the management of Water Resources are:

- Sustainably manage the water resources of the region to maintain environmental, cultural and social values and provide for the water needs of the future community
- Increase water use efficiency, recycling and reuse to provide fit-for-purpose sources
- Adequately manage the risk of flooding
- Manage discharges to ground and surface waters to avoid contamination

2.1.2 Strategies

The following key strategies are recommended to be implemented:

- Develop a water conservation plan for water use across the Shire
- Develop stormwater management plans for Karratha, Point Samson, Dampier and Roebourne that ensure appropriate levels of service will be maintained as development occurs and water quality of stormwater is addressed
- Educate the community regarding the need to use water wisely
- Optimise use of fit-for-purpose water and substitute alternative sources for drinking water where possible.
- Maximise use of treated wastewater from all wastewater treatment plants for fit-for-purpose use including dual reticulation networks, and irrigation of playing fields and streetscapes
- Ensure planning and development proposals are consistent with *State Planning Policy 2.9: Water Resources* and meet the requirements of *Better Urban Water Management* (WAPC, 2008a).
- Work with the State Government to ensure that remote Aboriginal communities have access to adequate drinking water and wastewater services
- Ensure that planning decision-making is consistent with the DoW's *Water Quality Protection Note: Land Use Compatibility within Public Drinking Water Source Areas* in

the vicinity of any drinking water borefields, including the requirements for well-head protection zones.

These strategies are to be delivered via a number of actions, as outlined in Table 1.

Table 1: Shire of Roebourne actions to achieve objectives for water resources

No	Action	Priority and timeframe	Partnerships	Indicator
1	Contact the Water Corporation and work towards becoming a Waterwise Council	Medium Immediate	Water Corporation	Waterwise Council status achieved
2	Develop stormwater management plans for Karratha, Point Samson, Dampier and Roebourne	Medium Immediate	DoW	Strategies completed
3	Where asset upgrades are proposed, ensure the outcome maximises water sensitive urban design principles.	Medium Ongoing	DoW, Water Corporation, Rio Tinto	Multiple outcomes achieved
4	Work with the Water Corporation and Rio Tinto to improve water use practices across the community and mining operations,	Medium Immediate	Water Corporation, Rio Tinto	Per capita water use reduced
5	Identify opportunities to maximise fit-for-purpose use of recycled or dewatering water	Medium 2-5 years	DoW, Water Corporation, mining companies	Opportunities identified
6	Actively support the installation of greywater systems and rainwater tanks	Low Ongoing	Dept Health	# systems installed
7	Develop a waterwise landscaping brochure to demonstrate the use of locally native plants within private gardens	Low 1-2 years	DoW, Water Corporation	Brochure published
8	Require Council purchasing decisions to consider waterwise ratings of goods and optimise performance where possible	Medium Immediate	Water Corporation	Council purchasing guidelines updated
9	Install rainwater tanks, preferentially plumbed into toilets in Council buildings	Medium 2-5 years		# RWT installed
10	Optimise the use of groundwater for irrigation through increased efficiencies and reduction in irrigated area through landscape changes	High 1-2 years	DoW	Reduction in groundwater usage

2.2 Biodiversity

Objective: Maintain, enhance and restore natural areas to protect biodiversity values across the Shire

2.2.1 Outcomes (goals)

The key outcomes with regards to the management of Biodiversity are:

- Recognise and celebrate cultural values associated with natural areas and biodiversity within the Shire
- Minimise the loss or degradation of native vegetation and habitat
- Enhance and restore areas of native vegetation and habitat
- Appropriately use and control fire to maintain biodiversity
- Manage and control introduced animals, pests and weeds to maintain biodiversity and land productivity

2.2.2 Strategies

The following key strategies are recommended to be implemented:

- Identify areas of locally significant bushland and habitat and provide appropriate protection and management
- Manage natural areas within the Shire to retain and restore biodiversity values through control of weeds, pests and introduced species, as well as uncontrolled access and rubbish dumping.
- Consider the appropriate location of cultural and environmental corridors as part of development of the local planning strategy to provide connectivity between environments
- Revegetate and restore natural areas within public open space and pastoral stations to improve levels of biodiversity across the Shire
- Enhance biodiversity and streetscape through planting of locally native street trees and vegetation
- Support education of the community regarding the management of weeds, use of 4WDs/quad bikes/motorbikes and dumping of rubbish within the Shire.
- Continue to work with the Department of Parks and Wildlife in the management of bushfires
- See opportunities for joint management of the landscape with the Traditional Owners
- Work with the Department of Agriculture and Food and the Department of Parks and Wildlife in the management of weeds, pests, feral animals and introduced species.
- Work with the Department of Parks and Wildlife to extend the conservation estate to protect under-represented areas of vegetation and habitat

These strategies are to be delivered via a number of actions, as outlined in Table 2.

Table 2: Shire of Roebourne actions to achieve biodiversity objectives

No	Action	Priority and timeframe	Partnerships	Indicator
11	Identify important biodiversity corridors in the draft Local Planning Strategy	High Immediate	DPaW	Corridors identified in LPS
12	Develop a local biodiversity strategy	Low 2-5 years	WALGA	Strategy developed
13	Identify opportunities for the joint management of natural areas with Traditional owners and Ranger groups	High 1-2 years	Yamatji Land and Sea Council	Opportunities identified
14	Ensure the preservation of protected flora and fauna including Threatened Ecological Communities as part of any future structure planning and/or development	High Ongoing	DPaW	Protection of species and communities in areas of public open space
15	Develop a fire management plan for the Shire	High 1-2 years	DPaW	Management plan completed and implemented
16	Develop a policy and community education materials regarding off-road vehicle use across the Shire	Medium 1-2 years	Community groups	Policy and materials developed
17	Fund the development of the Millars Road Off Road Vehicle Area in Karratha	High 2-5 year	Community groups	Funding obtained ORV area developed
18	Incorporate recreation infrastructure and interpretive signage in Shire managed lands to "bring the community closer to nature".	Medium 1-2 years	DPaW, landowners	Areas identified Vegetation protected/retained
19	Undertake mapping of weed infestations and monitor on an ongoing basis to determine the effectiveness of weed management activities.	High Ongoing	AgWA	Mapping completed Annual monitoring completed
20	Develop an incentive program for the planting of locally native street tree species and consider the establishment of a Shire nursery	Low 2-5 years	Local nurseries	Incentive program, established Council nursery established
21	Develop a local plant list for use by the community and the Shire as part of landscaping in public spaces and places	Medium 1-2 years	DPaW	Plant list published
22	Develop a weed brochure for weeds of particular importance to the Shire.	Low 1-2 years	AgWA	Brochure published
23	Develop a fauna awareness brochure	Low 1-2 years	DPaW	Brochure published

2.3 Coasts

Objective: Protect and enhance the cultural, environmental and recreational values of the Shire's coasts

2.3.1 Outcomes

The key outcomes with regards to the management of Coasts are:

- Recognition and enhancement of natural, cultural and recreational values of the coast
- No further loss or degradation of coastal habitat
- Management of assets and protection of values in areas susceptible to coastal vulnerability

2.3.2 Strategies

The following key strategies are recommended to be implemented:

- Any development to address the requirements of relevant coastal vulnerability studies (where available) and any substantial future development to be supported by appropriate current storm surge and flood inundation information consistent with the most current predictions for sea level rise and coastal processes.
- Identify assets within the Shire that may be subject to inundation as a result of sea level rise and/or storm surge and develop a mitigation or adaptation strategy
- Undertake a strategic assessment of coastal recreation and access and develop a framework for the future management of coastal recreation, having consideration of signage, access, safety and tourism.
- Provide local level guidance for the management of recreation at key coastal nodes consistent with the *Shire of Roebourne Coastal Management Strategy Position Paper* (Landvison, 2011) through the preparation of Foreshore Management Plans for Dampier Foreshore, Hearson Cove, Karratha Back Beach, Cleaverville, Wickham Back Beach, Point Samson/Sams Creek area and Cossack/ Settlers Beach.
- Consider opportunities for joint management of the coasts with traditional owners
- Work with the State Government and industry to ensure that any expansion of port activities and/or infrastructure minimises impacts on the environment and coastal values.
- Ensure meaningful participation by Aboriginal people including the utilisation of Ngarluma, Yindjibarndi, Yaburara, Kuruma, Marthudunera and Mardudhunera expertise in environmental management and related activities to generate respect for their cultural values of coastal areas (Burrup Peninsula in particular), river systems and water holes.
- Support and communicate with the Burrup Rangers on environmental management of the peninsula and surrounding coastal and marine areas.
- Optimise opportunities for interpretation that will improve awareness of the Shire's natural, Aboriginal and historical heritage.

- Improve awareness of the Shire's community regarding recreational impacts on the coast (and the need to minimise impacts) through ongoing education and involvement opportunities, consistent with Leave No Trace principles.

These strategies are to be delivered via a number of actions, as outlined in Table 9.

Table 3: Shire of Roebourne actions to achieve coastal management objectives

No	Action	Priority and timeframe	Partnerships	Indicator
24	Develop a climate change strategy for assets within the Shire that may be subject to inundation as a result of sea level rise and/or storm surge	Medium 2-5 years	WALGA, DoP, DoT	Assets identified Management strategy developed
25	Develop Coastal Recreation Plan for the Shire and Pilbara region	High 1-2 years	Pilbara Regional Council	Plan developed
26	Identify opportunities for the joint management of coastal areas with Traditional owners and Ranger groups including tourism activities	Medium 2-5 years	Yamatji Land and Sea Council, Burrup Rangers	Opportunities identified
27	Incorporate interpretive signage in Shire managed lands including coastal camp grounds.	Low 2-5 years	DPaW, landowners	Opportunities identified Signage erected
28	Continue to develop foreshore management plans for key coastal nodes across the Shire	Medium 2-5 years	DoP, community	Foreshore management plans developed
29	Prioritise recommendations in foreshore management plans and develop a program for implementation including identification of capital and operational funding	Medium 1-2 years	DPC, Mining companies, community	Foreshore management plans implemented
30	Continue to manage weeds, rubbish and off-road vehicles in coastal areas together with community groups and increase levels of resources where possible	Medium ongoing	Community groups	Community complaints reduced
31	Deliver education programs consistent with Leave No Trace principles for the community and key workforce sectors	High 1-2 years	Rangelands NRM, Leave No Trace Australia, Citic Pacific	# Programs delivered
32	Encourage and support community involvement in the protection of coastal and marine habitats through monitoring programs and increasing awareness through educational opportunities	Low 2-5 years	Community groups	# active community groups # programs delivered
33	Advocate for environmentally sensitive development of port infrastructure and activities	Medium ongoing	OEPA	Shire consulted as part of proposed port expansion or installation

2.4 Built environment

Objective: Improved built form outcomes in private and public places and spaces that provide for the needs of the community whilst optimising energy, water and waste resource use

2.4.1 Outcomes

The key outcomes with regards to the management of the built environment are:

- Improved air quality and noise management across the Shire
- Reduced energy consumption, improved energy efficiency of buildings and optimisation of renewable energy sources
- Reduced amounts of waste to landfill, increased recycling and reuse of waste
- Optimised use of water resources including conservation of drinking water and increased by efficient use of fit-for-purpose water sources
- Rehabilitation of contaminated land and/or groundwater

2.4.2 Strategies

The following key strategies are recommended to be implemented:

- Provide strategic guidance for the future planning and development of the Shire through completion of a Local Planning Strategy.
- Ensure proposed development is consistent with the principles and recommendations of LandCorp's *Pilbara Vernacular Handbook* including built form outcomes that optimise passive solar orientation appropriate for north-west conditions.
- Provide streetscapes, public places and spaces that enhance the local character of towns and integrate with the natural environment, optimising shade with locally native plants.
- Work with State Government and industry to ensure holistic planning and development occurs that is consistent with the strategic vision for the Shire, particularly with regards to air quality and large industrial operations in proximity to settlements.
- Work with RioTinto and the Water Corporation to optimise the use of treated wastewater from wastewater treatment plants
- Promote increases in energy efficiency within businesses and encourage the installation of water and energy efficient fittings and fixtures and smart meters in private and public buildings
- Encourage uptake of renewable energy and fit-for-purpose water sources such as photovoltaic panels, solar hot water systems, and greywater systems private and public buildings
- Ensure planning for future waste management facilities optimises opportunities for reuse and recycling of waste
- Promote waste minimisation together with recycling and reuse
- Consider establishment of a domestic recycling service
- Improve awareness of the impacts of rubbish dumping within the Shire
- Ensure industrial expansion does not result in detrimental impacts on the air quality of nearby sensitive land uses

These strategies are to be delivered via a number of actions, as outlined in Table 4.

Table 41: Shire of Roebourne actions to achieve built environment objectives

No	Action	Priority and timeframe	Partnerships	Indicator
34	Complete the Shire of Roebourne Local Planning Strategy	High Immediate	DoP	Strategy complete
35	Consider the opportunity to require improved energy performance in public and private buildings (in addition to BCA requirements)	Medium 1-2 years	DoP	Requirements initiated
36	Work with industry regarding air quality complaints around port infrastructure and other large industrial activities to improve air quality	Medium 2-5 years	Rio Tinto, Dampier Port Authority	Emissions reduced
37	Work with RioTinto and the Water Corporation to optimise the use of treated wastewater from wastewater treatment plants	Medium 1-2 years	Rio Tinto, Water Corporation	Reuse of 100% wastewater from waste water treatment plants
38	Install solar panels on Council buildings	Medium 2-5 years	WALGA	# solar panels installed
39	Introduce waste recovery program at the 7 Mile Waste Facility	High 1-2 years	DER	Program commenced
40	Develop a strategic waste management plan together with the community	High 1-2 years	DER, WALGA	Strategic Plan advertised and finalised
41	Develop educational materials on sustainable (alternative) building forms and options.	Low 1-2 years	DoP, UDIA	Materials produced
42	Develop educational materials on the impacts of rubbish dumping	Low 1-2 years	WALGA, UDIA	Materials produced
43	Obtain data from the Department of Environment Regulation regarding contaminated sites yet to be determined and monitor as required.	Medium 1-2 years	DER	Data obtained on a regular basis
44	Ensure development complies with the requirements of the Contaminated Sites Act as well as the WAPC's Acid Sulfate Soils guidelines.	High Ongoing	DER, DoP	All requirements are met
45	Extend the Port Hedland Air Quality and Noise Management Plan framework and governance structure across the Shire of Roebourne	Low 2-5 years	DER, Dampier Port Authority	Framework established

3 ENVIRONMENTAL PROFILE

3.1 Climate

The Shire of Roebourne is located within the Pilbara region which is characterised by high temperatures, particularly during the summer months and variable rainfall patterns interspersed with long dry periods. The Bureau of Meteorology (BoM) defines the wet season for the Pilbara as the period extending from December to the end of March. Tropical cyclones are a feature of the summer months and usually develop between November and May, often bringing intense rainfall and resulting in flooding. Some areas of the Pilbara have the highest average annual evaporation rate in Australia (Van Vreeswyk *et al.*, 2004). The annual evaporation rate throughout the Pilbara is considerably higher than the average rainfall.

The climate of the Shire of Roebourne can be broadly described by two climate categories: tropical along the coastal areas and arid through the central and eastern parts of the region. Regional variations in rainfall occur, with the coastal areas and western inland areas of the Shire located in the path of tropical cyclones often receiving higher rainfall, in comparison to the arid desert areas in the central east of the Pilbara.

During most of the cooler times of the year, winds tend to be easterly or south-easterly over most of the Pilbara, influenced by the passage of winter high pressure systems that move east across the mainland. In spring prevailing winds weaken as a semi-permanent heat low develops over the land. In coastal areas the wind direction becomes more variable, particularly in the warmer months, when the wind direction often reverses in the afternoon and sea breezes from the north and north-west dominate (Van Vreeswyk *et al.*, 2004).

Maximum temperatures in the Shire of Roebourne (Chart 1) are generally higher through the summer months of November to March, with average maximum temperatures reaching up to 36°C at the Karratha aerodrome and 39 °C at the Roebourne Aerodrome.

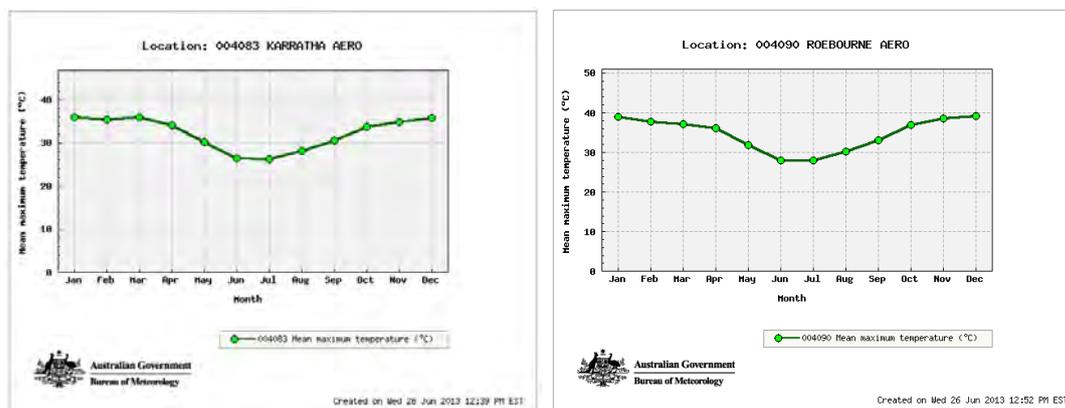


Chart 1: Karratha Aerodrome and Roebourne Aerodrome mean maximum temperature (Source: BoM, 2013)

Average minimum temperatures (Chart 2) across the Shire are significantly lower in winter, reaching approximately 14°C in July-August at the Karratha aerodrome and 12°C in July at the Roebourne Aerodrome.

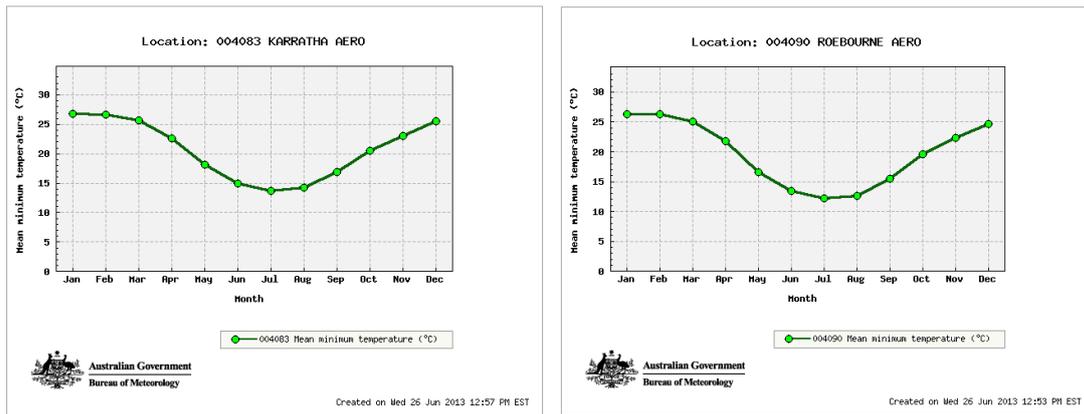


Chart 2: Karratha Aerodrome and Roebourne Aerodrome mean minimum temperature (Source: BoM, 2013)

Average annual rainfall in the Shire is typically around 300 mm (289 mm at Karratha Aerodrome and 275 mm at Roebourne Aerodrome) (Chart 3). The majority of rainfall occurs during the summer (“wet season”) rains (Chart 3).

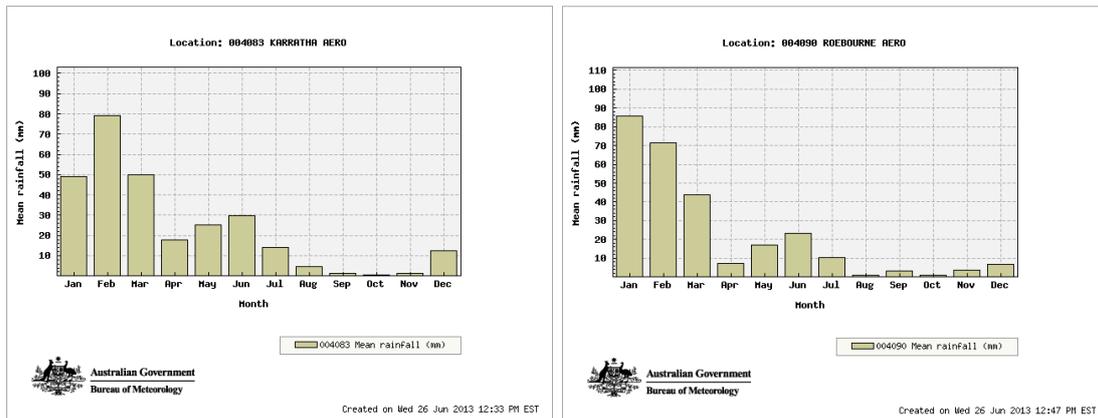


Chart 3: Karratha Aerodrome and Roebourne Aerodrome mean rainfall (Source: BoM, 2013)

Tropical cyclones

The Shire of Roebourne coast is in one of the most cyclone-prone areas of the world (Van Vreeswyk *et al.*, 2004). The severe and unpredictable nature of cyclones in the region has historically caused significant widespread damage to infrastructure and domestic livestock and even human death. Damage is often caused as a result of destructive winds and flooding from rain and storm surge.

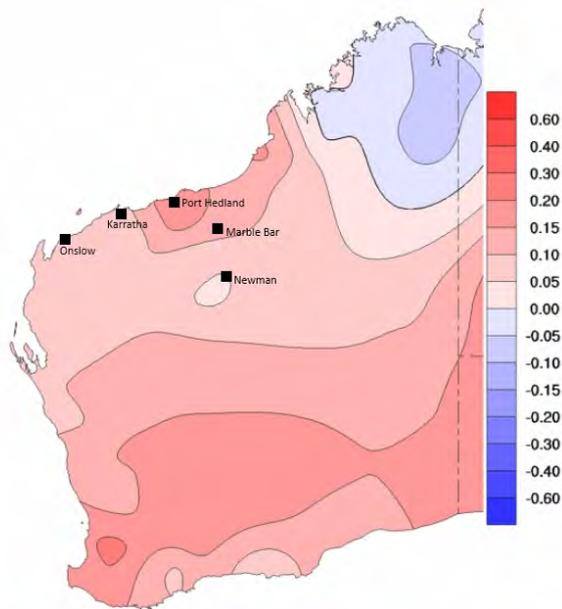
Notwithstanding the severe destruction caused by cyclones, they are also critical for supplying up to 50% of average annual rainfall (Van Vreeswyk, 2004). However, the high intensity of cyclonic events, particularly after long periods of dry weather, often results in minimal retention of rainfall within the landscape due to high velocity run-off and dry, hydrophobic soils.

3.1.1 Climate change

Reports from the International Panel on Climate Change (IPCC) provide limited detail on Australian climate change, particularly when it comes to regional climate change projections. *Climate change in Australia* (CSIRO, 2007) was developed by the Australian Greenhouse Office

together with CSIRO and the Bureau of Meteorology. It is based upon international climate change research including conclusions from the IPCC's fourth assessment report. It also builds on a large body of climate research that has been undertaken for the Australian region in recent years.

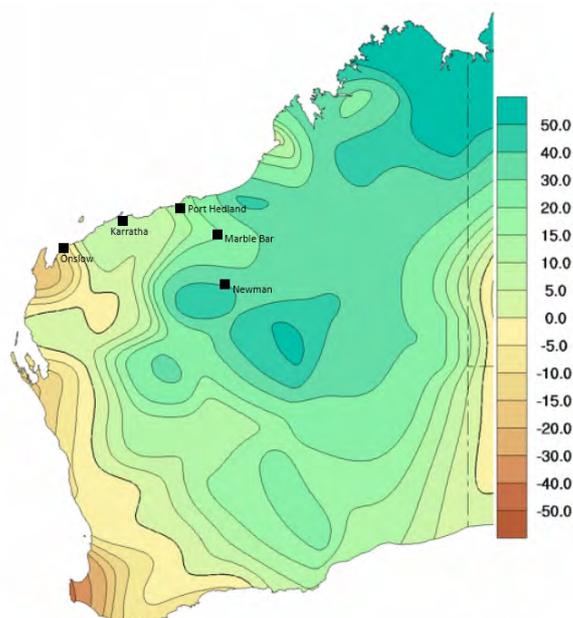
State-wide changes in average temperature and rainfall since 1970 have been mapped by the Bureau of Meteorology and are presented in Figure 2 and Figure 3 below. Since 1970 the Pilbara has experienced increasing temperatures and changing rainfall patterns, with declining rainfall in coastal areas and increasing rainfall inland.



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Issued: 29/06/2012

Figure 2: Western Australian trend in average temperature 1970-2011 ($^{\circ}\text{C}/10$ years) (Source: BoM, 2013)



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Figure 3: Western Australian trend in total annual rainfall 1970-2011 (mm/10 years) (Source: BoM, 2013)

This contradictory rainfall pattern may be because the rainfall penetrating inland is predominantly associated with major storm events which have been more prevalent, despite the general downward trend in annual rainfall. Figure 4 represents the decadal trend in the annual number of cyclones for a given area and clearly identifies an increase in the number of cyclones passing through the Pilbara since 1970. This trend may continue as predicted by the CSIRO modelling discussed previously but is predicted to be overridden by the decline in average annual rainfall at some point before 2030.

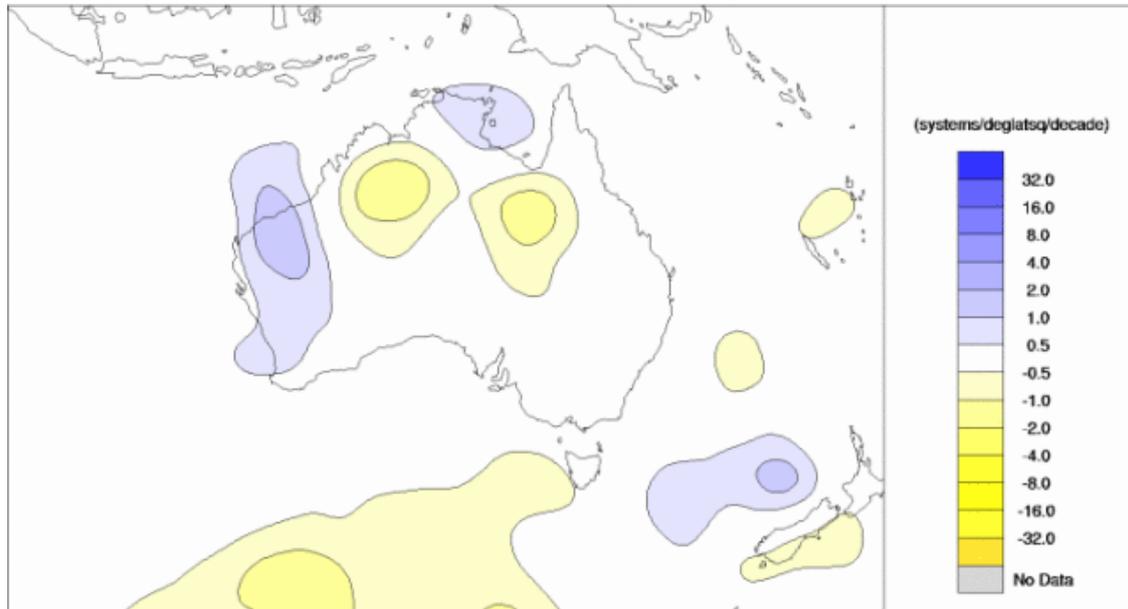


Figure 4: Trend in annual cyclone count 1970-2008 (systems/decade) (Source: BoM, 2012)

The general trend shown for Karratha and Roebourne is indicative of gradually increasing temperatures, which supports modelled scenarios (Chart 4).

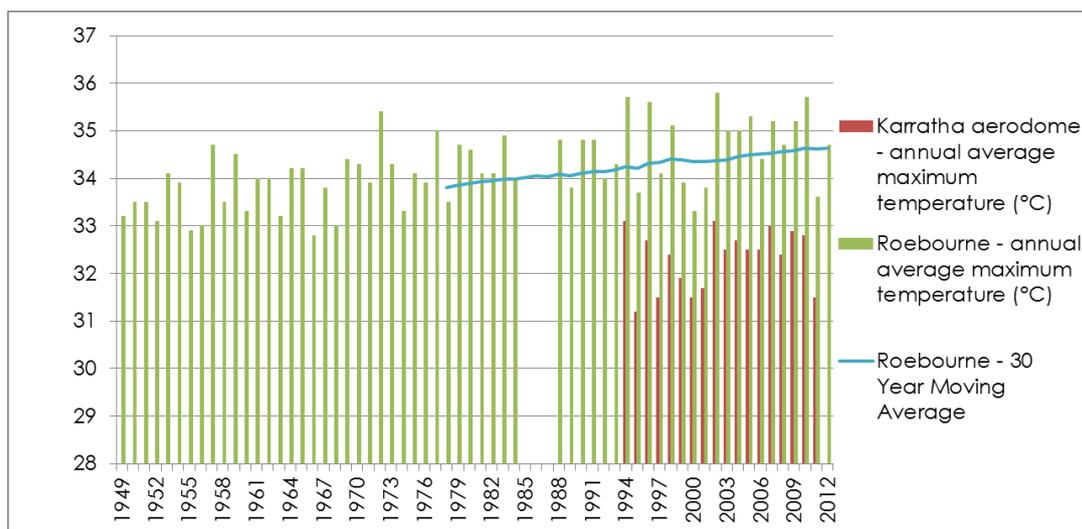


Chart 4: Karratha & Roebourne climate trend – temperature

The trend in rainfall does not indicate an obvious decline or increase in Karratha or Roebourne (Chart 5). More significant than annual rainfall amount, is the change in distribution of events. There is a clear trend in recent rainfall records towards less frequent, more significant events

which is also in agreement with CSIRO model scenarios and may have significant implications for the Shire of Roebourne.

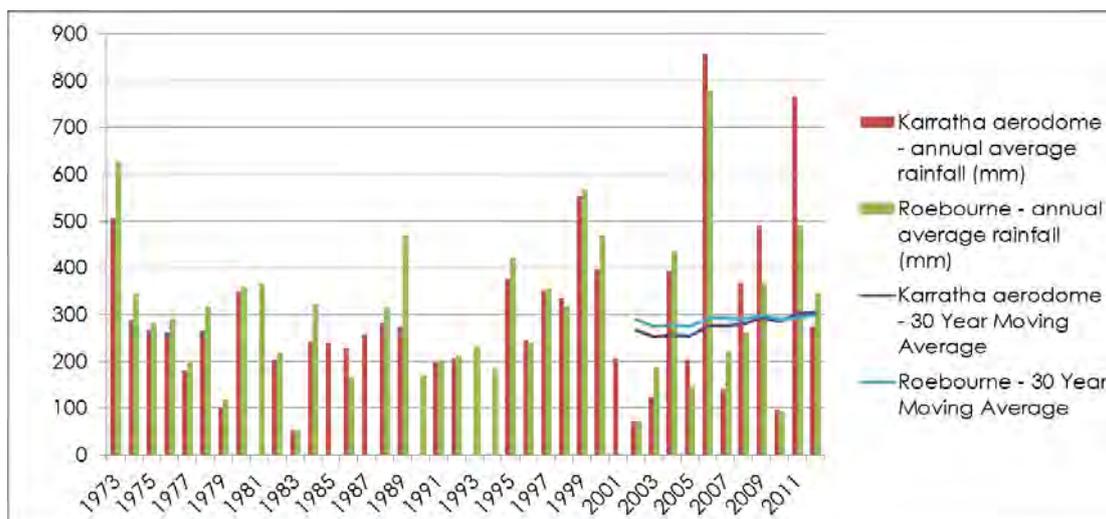


Chart 5: Karratha and Roebourne climate trend - rainfall

3.1.2 Sea levels

The Shire of Roebourne coast is potentially vulnerable to changing ocean levels including; astronomical tidal ranges, storm surges, wave set-up, sea level rise and tsunamis. The major town of the Shire with a vision of becoming a city (WAPC, 2012), Karratha, is located on the coast, and therefore sea level rise is a significant issue that may affect the vast majority of the Shire's population.

Storm surge is also an issue that requires consideration in the Shire and other coastal areas in Australia. Storm surge is an offshore rise of water associated with a low pressure weather system (typically a tropical cyclone). Storm surge is caused primarily by high winds pushing on the ocean's surface. The wind causes the water to pile up higher than the ordinary sea level. Low pressure at the centre of a weather system also has a small secondary effect, as can the bathymetry of the body of water. It is this combined effect of low pressure and persistent wind over a shallow water body which is the most common cause of storm surge flooding problems.

A study was undertaken by the Department of Climate Change in 2009 to investigate aspects of coastal vulnerability to climate change, using the Pilbara coastline as a case study (Sheridan Coakes Consulting, 2009). This study presented climate change scenario modelling undertaken by Sinclair Knight Merz for the broader Pilbara region including the impacts of rising sea levels. The study found that:

- **Temperature** – Whilst people working in the Pilbara are able to cope with extreme heat conditions the anticipated ongoing increase in heat and potential increase in number of hot days was estimated to reduce labour productivity in the region by 0.41 per cent, over the course of an average year. This loss of productivity has an equivalent annual cost of \$3.78 million.
- **Rainfall change** – Industry and local government authorities recognised that there may be some increase in flooding but were not particularly concerned. Reduced rainfall may lead to increased need for seawater desalination because of reduced yields from surface and groundwater drinking water sources.

- **Sea level change** – Rising sea levels are expected to increase maintenance costs for Port Authorities and industries. The increase in maintenance cost is estimated to be \$8 million per year.
- **Extreme weather** – The projected increase in the annual average number of severe storms was estimated to cost up to \$6.7 million in damage to residential dwellings, \$59 million in disruption to oil and gas tanker schedules, and \$34.7 million in disruption to exploration and production rigs.
- **Fire and emergency services** – Increased demands on FESA services were estimated to increase operating costs by up to \$540,000 per year.
- **Other impacts** – coastal infrastructure and shipping channels are often aligned to prevailing wind and wave direction and so changes could have potential impacts and cost implications.

Current response

The Shire of Roebourne has undertaken investigation into coastal vulnerability in key locations. The *Karratha Coastal Vulnerability Study* (JDA Consultant Hydrologists 2011) and the *Dampier Coastal Vulnerability Study* (JDA Consultant Hydrologists 2012) were undertaken to assess the effects of future climate change, including flooding from storm surge, on development in Karratha and Dampier. The Karratha study found that development in the townsite is not generally impacted by flooding with most of the existing town, Gap Ridge and Baynton West in the west, and the Karratha Light Industrial Area above the 100yr ARI flood level. Correspondingly, within the Dampier Townsite, the 100 year ARI flood extent indicates that a significant proportion of the townsite is subject to some degree of inundation. Flooding is generally restricted to the roads, reserves and creek lines, with only minor, localised flooding of residential and commercial lots; however.

Key issues and future considerations

- **Temperature** – Increases in temperature are likely to result in increased needs for cooling and/or impacts on public health. Development should incorporate passive solar design and breezeways and provide shade in public and private places.
- **Rainfall change** – may result in localised flooding and pressure on stormwater systems, as well as pressure on available water sources.
- **Sea level change** – Rising sea levels may lead to increased maintenance requirements for assets and/or the need for “managed retreat” strategies.
- **Extreme weather** – may require improved emergency management responses and plans.

3.2 Biodiversity

The Shire of Roebourne region is characterised by a diverse range of terrestrial, aquatic and marine landscapes, flora and fauna.

The Shire’s biological uniqueness includes its large areas of relatively intact native vegetation and healthy ecological processes. Although other areas across the State have been largely cleared for agriculture or development, within the Shire, native vegetation remains largely uncleared with the exception of areas for mining and associated infrastructure as well as for townsite development. It should be noted that pastoral use of land is classified as “uncleared”, although this gives no indication of vegetation condition.

An extensive five year study of biodiversity has been conducted in the Pilbara with the aim of describing patterns in the region’s biodiversity. The study, ‘*A Biodiversity Survey of the Pilbara*

Region of Western Australia 2002-2007' (WA Museum & DEC, 2013) has been recently published by the Western Australian museum, in partnership with the Department of Parks and Wildlife. Since the commencement of the ongoing biodiversity survey, many species of reptiles, birds, insects, mammals and stygofauna have been discovered and identified. Thousands of plant samples representing a variety of species, some of which are new to both science and the region, have also been collected from across the region.

Major threats to biodiversity arise from the clearing of land for development including infrastructure. The construction of substantial linear infrastructure such as railways and roads leads to additional threats to biodiversity resulting from fragmentation of land and creating barriers and risks to fauna movements.

Further loss of vegetation and biodiversity including fauna occurs as a result of the introduction of weeds, pests and feral animals, both accidentally or commercially introduced, which compete for food, water, soil and land. Environmental weeds also require a substantial management effort to control.

3.2.1 Vegetation

In order to better understand the terrestrial and aquatic biodiversity, a bioregional framework was developed by the Commonwealth and State governments which divides the country into Interim Biogeographical Regions or bioregions and bio-subregions. The Shire of Roebourne contains parts of only two IBRA subregions¹: Roebourne and Chichester (Figure 5). The Chichester subregion comprises the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges (DEC, 2003).

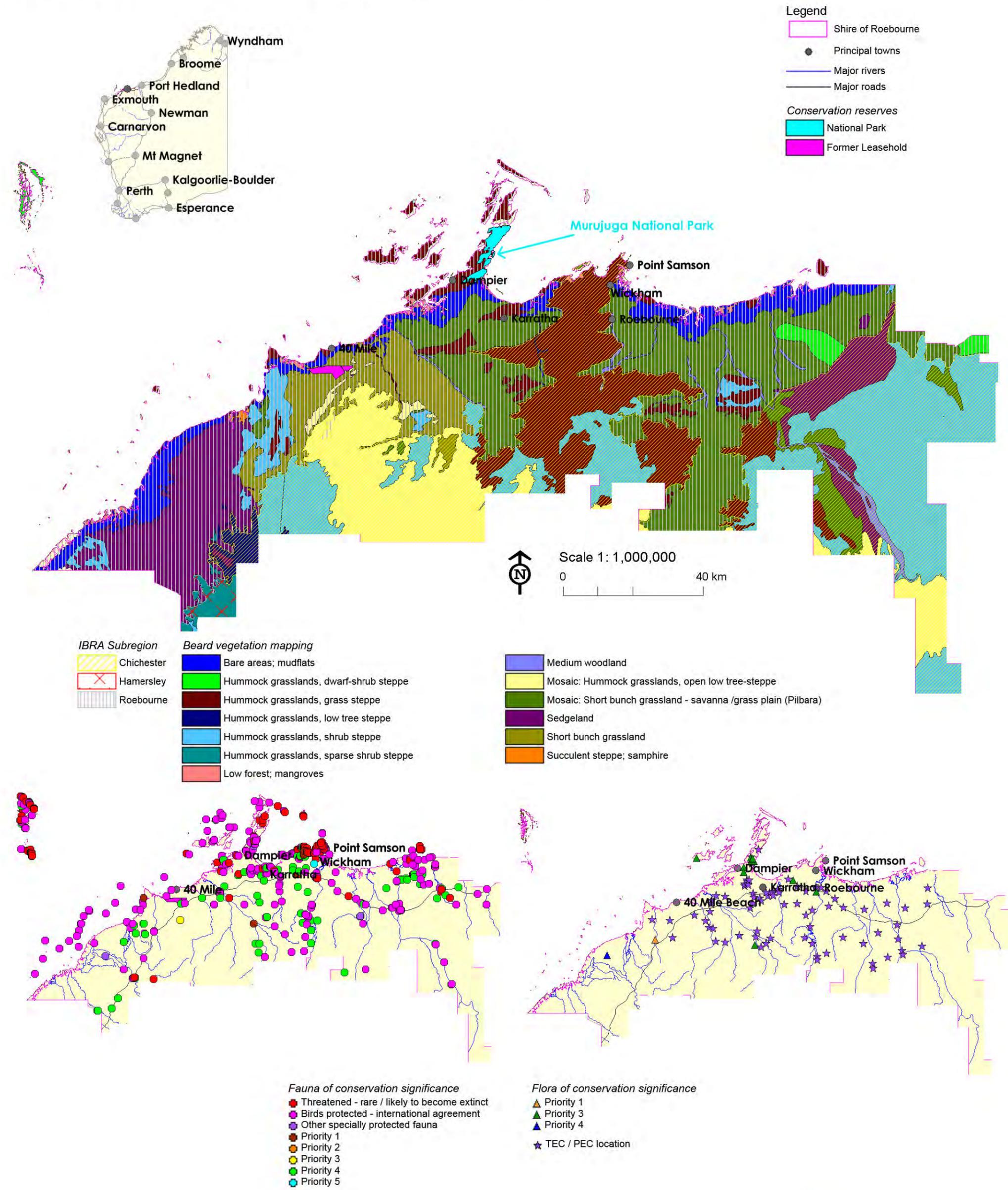
Vegetation types in the Roebourne subregion of the Pilbara bioregion, are described as Grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia stellaticeps* or *A. pyriformis* and *A. inaequilatera* on the coastal and sub-coastal plains. Uplands are dominated by *Triodia* hummock grasslands. Ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, *Sporobolus* and mangal occur on marine alluvial flats and river deltas (DEC, 2003). A more detailed description of the bio subregions of the Shire of Roebourne is found in section 3.2 of the *Pilbara Framework: Regional Profile* (WAPC, 2009) and in the DEC's *Biodiversity Audit* (DEC, 2003).

The *National Strategy for the Conservation of Australia's Biological Diversity* (ANZECC, 1996) contains an objective to 'establish and manage a comprehensive, adequate and representative system of protected areas covering Australia's biodiversity'. There is only one terrestrial conservation reserve in the Shire of Roebourne, the recently declared Murujuga National Park, although 3 areas of the Mardie, Karratha, and Pyramid pastoral stations are proposed to be incorporated into the conservation estate in 2015. These areas account for less than one per cent of land tenure in the Shire of Roebourne. This level of reservation is critically low compared with the internationally recognised standard of reservation of between 10 and 15% of each bioregion; however, it is recognised that parts of each IBRA subregion are reserved within the Shire of Ashburton.

¹ IBRA regions are Interim Biogeographical Regions or bioregions and bio-subregions. This framework was developed by the Commonwealth and State governments to better understand the terrestrial and aquatic biodiversity

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Figure 5 - IBRA sub-regions, vegetation types & flora, fauna & TECs/PECs of conservation significance



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 Data sources: Landgate, Geoscience Australia, Created by: H Lamparski. Projection: MGA 50: zone 50.

Murujuga National Park, recently gazetted as the 100th national park in Western Australia is the first Aboriginal owned and jointly managed national park in the State. The national park comprises 44% of the Burrup Peninsula, providing protection to the highest concentration of indigenous rock art engravings in the world. The land is vested with the Murujuga Aboriginal Corporation, comprising traditional custodians the Ngarluma-Yindjibarndi, the Yaburara-Mardudhunera and the Woon-goo-tt-oo. The freehold land is leased back to the State Government as national park, and is jointly managed under a formal agreement between Murujuga Aboriginal Corporation and the Department of Environment and Conservation (DEC, 2013a).

3.2.2 Protected flora, fauna and ecological communities

The Shire of Roebourne is an important area for persisting populations of threatened and endangered flora and fauna species as well as threatened and priority ecological communities. Threats of species extinction are recognised at both Commonwealth and State levels.

At the Commonwealth level, flora, fauna and ecological communities may be recognised as matters of national environmental significance and are protected under the *Environment Protection Biodiversity Conservation Act (EPBC Act), 1999*, administered by the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC). The categories of threatened flora and fauna protected under the EPBC Act are (i) extinct in the wild (ii) critically endangered, (iii) endangered and (iv) vulnerable. An additional category of “conservation dependent” exists, which requires special consideration but is not protected under the EPBC Act.

The Commonwealth lists a number of matters of national environmental significance in the Shire including one National Heritage Place (the Dampier Archipelago, including the Burrup Peninsula), 19 threatened species and 49 migratory species.

The threatened species listed under the EPBC Act in the Shire of Roebourne are presented in Table 5. The complete EPBC Act Protected Matters Report listing matters of national environmental significance is included in Appendix 2: EPBC Act Protected Matters Report.

Table 5: EPBC Act Threatened species listed under the EPBC Act within the Shire of Roebourne (source: EPBC Protected Matters database (DSEWPaC, 2013))

Status	Taxa	Common Name
Critically Endangered	<i>Aipysurus apraefrontalis</i>	Short-nosed Seasnake
Endangered	<i>Macronectes giganteus</i>	Southern Giant-Petrel
	<i>Balaenoptera musculus</i>	Blue Whale
	<i>Dasyurus hallucatus</i>	Northern Quoll
	<i>Eubalaena australis</i>	Southern Right Whale
	<i>Notoryctes caurinus</i>	Karkarratul, Northern Marsupial Mole
	<i>Caretta caretta</i>	Loggerhead Turtle
	<i>Dermochelys coriacea</i>	Leatherback Turtle, Leathery Turtle, Luth
Vulnerable	<i>Sternula nereis nereis</i>	Australian Fairy Tern

Status	Taxa	Common Name
	<i>Rhinonicteris aurantia (Pilbara form)</i>	Pilbara Leaf-nosed Bat
	<i>Macrotis lagotis</i>	Greater Bilby
	<i>Megaptera novaeangliae</i>	Humpback Whale
	<i>Aprasia rostrata rostrata</i>	Hermite Island Worm-lizard
	<i>Chelonia mydas</i>	Green Turtle
	<i>Eretmochelys imbricata</i>	Hawksbill Turtle
	<i>Liasis olivaceus barroni</i>	Olive Python (Pilbara subspecies)
	<i>Natator depressus</i>	Flatback Turtle
	<i>Pristis clavata</i>	Dwarf Sawfish, Queensland Sawfish
	<i>Rhincodon typus</i>	Whale Shark

Flora and fauna is also protected at the State level under the *Wildlife Conservation Act, 1950*, administered by the Department of Parks and Wildlife. The *Wildlife Conservation (Specially Protected Fauna) Notice, 2010* recognises four categories of Rare and Endangered fauna taxa, and the *Wildlife Conservation (Rare Flora) Notice 2012* recognises two categories of rare flora. In addition, the Department of Parks and Wildlife also classifies flora and fauna under five different Priority codes, with different management requirements.

The Department of Parks and Wildlife lists a number of threatened flora and fauna species in the Shire (Figure 5) which are summarised in Table 6. A full species list is included in Appendix 3.

Table 6: Threatened and priority flora and fauna species in the Shire of Roebourne (DEC, 2013)

Conservation Status	Number
Rare or likely to become extinct	22
Protected under international agreement	35
Other specially protected fauna	2
Priority 1	3
Priority 2	1
Priority 3	5
Priority 4	10
Total	78

The Department of Environment and Conservation also lists Threatened Ecological Communities. Although there are no Threatened Ecological Communities in the Shire, six Priority Ecological Communities have been identified, including one which has been found to occur within Karratha townsite, the Roebourne Plains coastal grasslands (Gilgai Grasslands). These are listed in Table 7 and their distribution shown in Figure 5.

Table 7: Threatened Ecological Communities found within the Shire of Roebourne (DEC, 2013)

Threatened ecological community	Designation
Roebourne Plains gilgai grasslands	Priority 1
Roebourne chenopod association	Priority 1
Wona Land System	Priority 1
Burrup Peninsula rock pile communities	Priority 1
Burrup Peninsula rock pool communities	Priority 1
Horseflat Land System	Priority 3

In addition to mainland biodiversity, many of the Shire of Roebourne's islands provide refuge for terrestrial and marine species. The biodiversity of these barrier and offshore islands are further discussed in Section 3.6.

3.2.3 Weeds, pests, feral animals and introduced animals

As of 1 May 2013, the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and regulations come into force. Under the BAM Act, organisms are grouped into four main classifications:

- Declared pests
- Permitted
- Prohibited
- Permitted Requiring a permit

Under the BAM Act, all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management). The Western Australian Organism List (WAOL) has been created to easily find out the declared status of Organisms that have now been classified as part of the enactment of the BAM Act. Use of the Department of Agriculture and Food's Declared Organism Search tool returned only one record of a declared organism within the Shire of Roebourne, *Datura ferox* L. (thornapple). However, this search tool is still in the process of being updated and results do not currently reflect invasive species present within the Shire.

The goat, red fox, cat, rabbit, pig, water buffalo and cane toad have all been reported as occurring in the Shire of Roebourne on the DSEWPaC's Protected Matters Search Tool (DSEWPaC, 2013). A further 11 fauna species are listed as invasive species or species with habitat likely to occur under the EPBC Act. Four invasive plant species are also listed as occurring in the Shire; *Cenchrus ciliaris* (buffel grass), *Jatropha gossypifolia* (physic nut/bellyache bush), *Parkinsonia aculeate* (parkinsonia/Jerusalem thorn), and *Prosopis* spp. (mesquite).

While Parthenium weed (*Parthenium hysterophorus*) is a Weed of National Significance considered eradicated from the Pilbara, it was reported by a mining company near Devil's Creek in the Shire, in October 2011. No sightings have been reported since (pers. comm. Department of Agriculture and Food, January 2013).

Parkinsonia (*Parkinsonia aculeate*) is present along a number of the Shire's river systems (Weeds Australia, 2013) while Mesquite (*Prosopis* spp.) is present predominantly on Mardie Station, considered to be the worst infestation in the Shire (DAFWA, 2013a).

Current response

Currently limited active management of biodiversity is undertaken by the Shire itself, and State Government largely focuses on pastoral stations and DPaW reserves. The Shire of Roebourne provides support for local management initiatives where possible, with Shire Rangers being actively assisting in the management of feral animals, bushfires and rubbish.

The Pilbara Regional Biosecurity Group Inc, a Recognised Biosecurity Group (RBG), established under the Biosecurity and Agriculture Management Act 2007 (BAM Act), is one of five groups in Western Australia that control pests that impact on public and private interests. The Pilbara RBG develops management plans to deal with introduced species on pastoral stations. The Department of Parks and Wildlife contributes to the management of these same introduced species on Reserves, National parks and Unallocated Crown Land. The Pilbara RBG is entitled to revenue raised from invasive species rates paid for by pastoral lessees in the region. The funds that are raised are matched dollar-for-dollar by the State Government (DAFWA, 2013b), and spent on on-ground management programs.

The Pilbara Mesquite Management Committee is an incorporated body established in 2000 to identify knowledge gaps in mesquite ecology and control, and to develop and implement a long-term strategy to manage mesquite effectively and control outlier infestations (CSIRO, 2013). It comprises a number of stakeholders including pastoralists, mining companies, the Department of Agriculture and Food, Rangelands NRM, representatives from local government and from programs receiving funding from the State NRM office, Caring for Country and Royalties for Regions. Research undertaken since the early 2000's has led to the development of Best Management Practices to control the weed. Biological agents, particularly the leaf-tying moth (Evippe), have been found to be the most effective method of control (pers comm, Department of Agriculture and Food, January 2013).

In 2011-2012, the Pilbara Mesquite Management Committee, in conjunction with Rangelands NRM and relevant land managers, undertook a project to advance the control of mesquite and parkinsonia infestations across 45,000 ha of land and 130 km of river system in the Pilbara. Eight pastoral stations and six mining tenements were managed for Weeds of National Significance, and approximately 450,000 mesquite plants and more than 100,000 parkinsonia plants were controlled.

Key issues and future considerations

- **Land management** – The Shire is responsible for management of lands within its control. Key issues include **rubbish/illegal dumping, off-road vehicles and uncontrolled access**. There is a need to identify areas for off-road vehicle use within the Shire and reduce rubbish dumping by the community and visitors. Opportunities for joint management of the land with traditional owners, as well as opportunities for the establishment of indigenous businesses in areas with high natural and cultural values should be sought.
- **Weeds, feral animals, introduced species and pests** – Management of weeds, feral animals and pests is an important action to reduce the decline in biodiversity in partnership with key agencies. Consider the establishment of collaborative programs, such as the Mesquite Management Committee, for the management of other priority pests, weeds and feral animals. Improve the awareness of the need to control introduced species including cats, mice, rats and cattle.
- **Bushfires** – Continue to work cooperatively in the management of fire, having regard for the impact of fire on the landscape and biodiversity, as well as human health. Consider opportunities for input into fire management practices from traditional owners and extend the Western Desert Traditional and Contemporary Fire Project approach across the Pilbara.

3.3 Water

3.3.1 Surface water

The Shire contains significant water resource assets including the Fortescue River and other surface water systems including a large proportion of the Harding Dam catchment area (Figure 6).

All waterways in the Shire of Roebourne are highly variable, flowing for only part of the year in response to larger, generally cyclonic, rainfall events. The only surface water source that is used as a major water supply in the Shire is the Harding Dam; however, due to evaporation losses and high levels of sediment, this source is not overly reliable, and the Harding Dam is only able to supply water at current levels of demand for approximately two years without a large recharge event (DoW, 2010).

Neither Ramsar nor nationally important wetlands are located within the Shire of Roebourne.

3.3.2 Groundwater

Because of the variability in rainfall and high evaporation rate in the Pilbara, groundwater is a very important water resource in the Shire. Groundwater occurs throughout the region but is most easily located and accessed near surface water drainage lines (alluvial channels).

The key groundwater aquifers in the Shire of Roebourne are the Hamersley fractured rock aquifer, Pilbara fractured rock aquifer, Lower Fortescue Alluvial, Carnarvon – Birdrong, and Pilbara coastal saline aquifer (Figure 7). The aquifers on the coast are relatively small, typically receiving an annual recharge of less than 10 GL/yr. They also play an important role during periods of low or no recharge, in sustaining permanent pools – which in turn support ecosystems in an otherwise arid environment (DoW, 2010). Allocation limits and water availability for these aquifers is presented in Table 8.

Table 8: Groundwater allocation limits

Aquifer	Allocation limit (kL/year) [^]	Availability (June 2013) ^{**}
Lower Fortescue Alluvial	6,600,000	Water available
Pilbara - Coastal Saline	2,000,000	Unknown
Pilbara - Fractured Rock	Not set*	Unknown
Hamersley - Fractured Rock	Not set*	Unknown
Carnarvon – Birdrong.	300,000	Fully allocated

Notes:

[^]Pilbara groundwater allocation plan draft for public comment (DoW, 2012a)

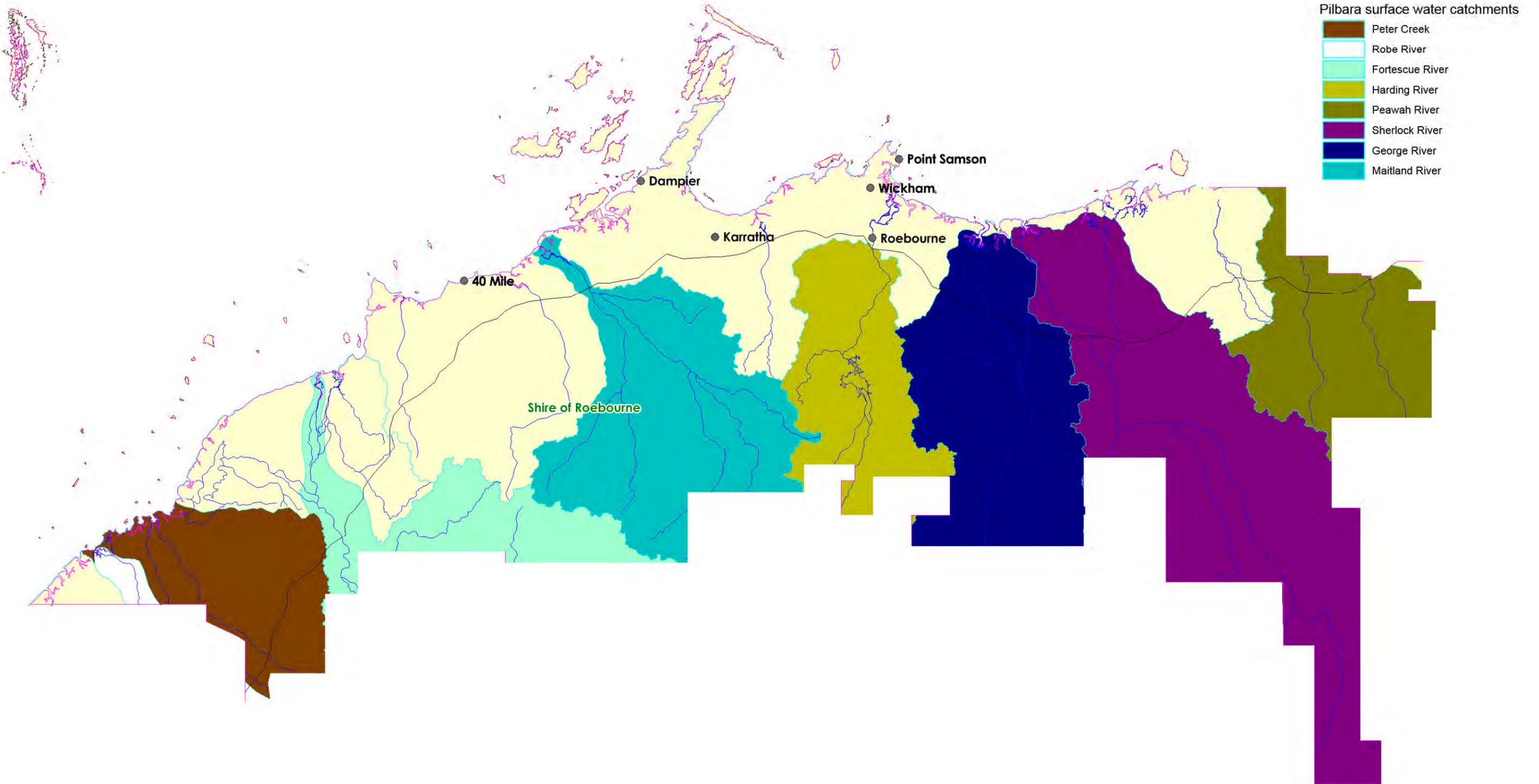
*For fractured rock aquifers, where most mining occurs, water availability will be assessed on a case-by-case basis through licensing (DoW, 2012a)

**Obtained from DoW's online Water Register: <http://www.water.wa.gov.au/ags/WaterRegister/>

The fractured rock aquifers are harder to locate than the coastal aquifers and the amount of water available from them is difficult to predict. Water supplies in these inland areas can, therefore, be problematic both in quantity and quality (DoW, 2010). The water abstracted from these aquifers is mainly for mine use and mine dewatering purposes.

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Figure 6 - Wetlands and waterways



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Scale 1: 750,000

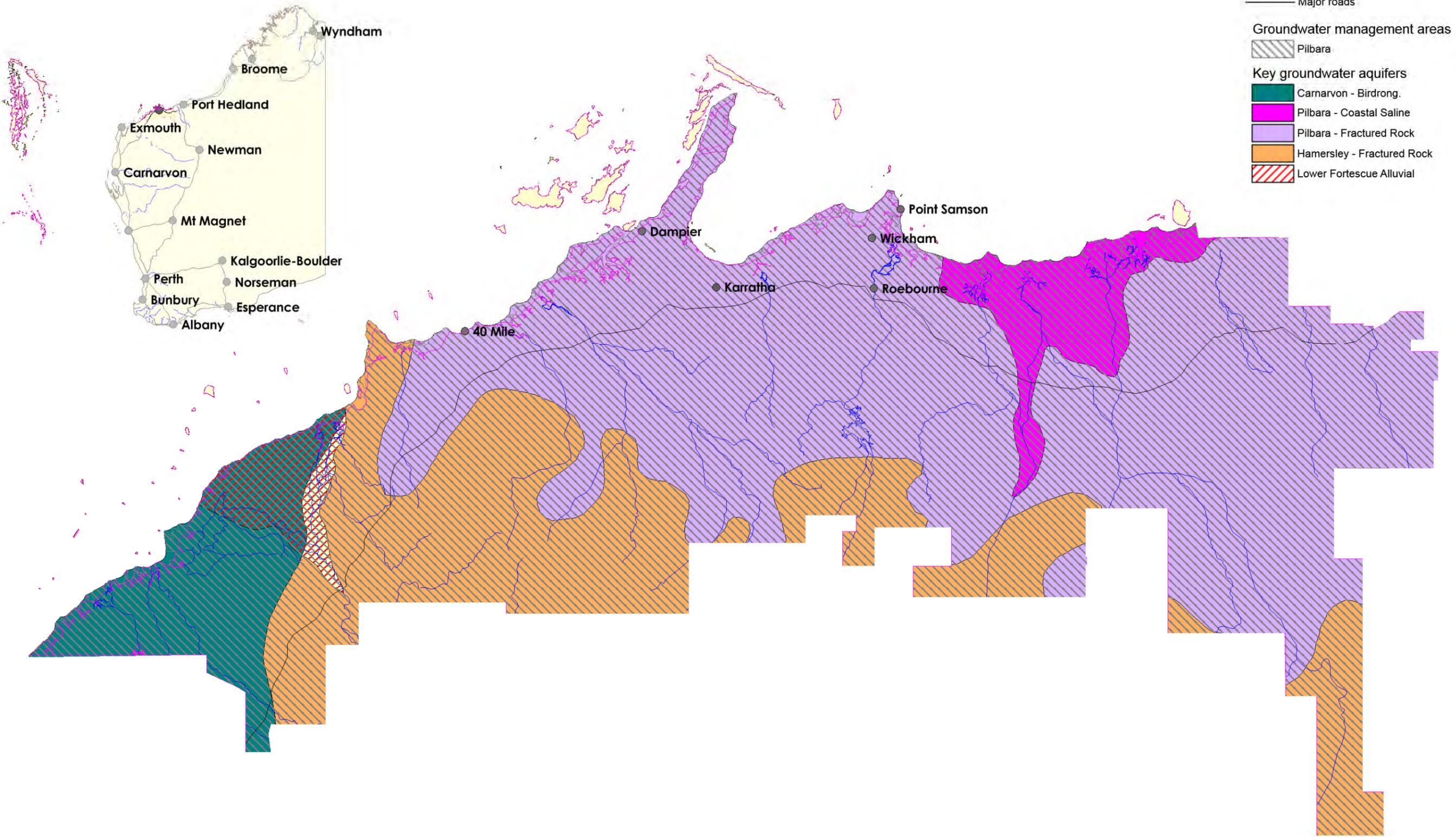
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Shire of Roebourne - Environmental Strategy

Figure 7 - Groundwater



Legend

- Shire of Roebourne
- Principal towns
- Major rivers
- Major roads

Groundwater management areas

- Pilbara

Key groundwater aquifers

- Carnarvon - Birdrong.
- Pilbara - Coastal Saline
- Pilbara - Fractured Rock
- Hamersley - Fractured Rock
- Lower Fortescue Alluvial

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Scale 1: 750,000

0 30 km



Groundwater is the primary water source for the majority of the Pilbara region, with a large proportion of this for mining use including dewatering. However, water for the West Pilbara water supply scheme, which supplies most of the coastal towns and port facilities of the Shire (Karratha, Dampier, Roebourne, Wickham, Point Sampson and Cape Lambert), comes mainly from the Harding Dam with the Millstream borefield being used when water is not available from the dam (DoW, 2010). This scheme is currently operating at capacity and the Water Corporation is relying on water from the Millstream borefield. The Department of Water will ensure the enforcement of the water abstraction rules to minimise impacts on the ecosystem, which include substantial monitored of the groundwater and ecosystems.

Current response

Water resources in the region are managed by the Department of Water. Water and wastewater services in the key towns of the Shire are provided by either Rio Tinto or the Water Corporation. Point Samson, however, is unsewered, with only drinking water provided by the Water Corporation through their West Pilbara Water Supply Scheme.

An extra 10 GL/year groundwater source from the Rio Tinto owned and operated Bungaroo Creek borefield will be delivered to the West Pilbara water supply scheme by mid-2014 (Water Corporation 2013). While Bungaroo Creek is located in the Shire of Ashburton, groundwater from this aquifer will be used to supply Karratha, Dampier, Roebourne, Wickham, Point Samson and Cape Lambert (DoW, 2012b).

Although the Shire is not responsible for the provision of water or wastewater services, it is responsible for drainage and the irrigation of public open space. Currently, irrigation water for public open space is largely provided from scheme water, although it is proposed that wastewater from the upgraded Karratha wastewater treatment plant may be used to supply non-potable water to the Mulataga development or for use by the Shire.

The Shire is also supportive of the concept of water sensitive urban design and is actively promoting these principles as part of planning and development.

Key issues and future considerations

- **Drinking water supplies** – Although the State Government is working towards the delivery of adequate water supplies to support the growth of the region, there is a need to ensure adequate drinking water is provided to remote Aboriginal Communities.
- **Environmental water requirements** – Although there is a need to supply water for public use, it is also important to sustainably manage the water resources of the region to maintain environmental, cultural and social values. This includes the management of land use and discharges to ground and surface waters to avoid contamination, as well as the protection of significant waterholes in co-operation with Traditional Owners.
- **Water use efficiency**- Optimise groundwater use so as not to overwater public open spaces and increase education by supporting National Water Week and other Water Corporation programs including becoming a Waterwise Council.
- **Water reuse** – Increase water recycling and reuse to provide fit-for-purpose sources of water including for public open space, thereby reducing pressure on scarce water resources. Work with industry to identify opportunities for the use of dewatered groundwater from mine sites in Shire or community projects.
- **Flooding from stormwater** - Adequately manage the risk of flooding in townsites through a review of townsite drainage systems and ensure appropriate levels of service will be maintained as development occurs and water quality of stormwater is addressed.

3.4 Geology, soils and contamination

3.4.1 Topography and geology

Figure 8 presents mapping from Geoscience Australia's *Surface geology of Australia 1:1,000,000 scale, Western Australia* (Stewart et al. 2008). The soils in the Shire are predominantly alluvial and colluvial sand in coastal areas, with silt and clay deposited on floodplains, with clay soils surrounding the rocky and stony soils further inland, at the Karratha hills.

3.4.2 Acid sulfate soils

Acid sulfate soils are soils and sediments that contain iron sulfides. They occur naturally in Western Australia and are harmless when left in a waterlogged, undisturbed environment. However, when exposed to air, through drainage or excavation, the iron sulfides in the soil react with oxygen and water to produce iron compounds and sulfuric acid. This acid can release other substances, including heavy metals, from the soil and into the surrounding environment and waterways (DEC, 2013b).

Much of Western Australia's acid sulfate soil material lies just below current water-tables. Continuing declines in annual rainfall, changes in land uses and increasing ground-water abstraction will lead to lower water-tables, resulting in possible widespread acid sulfate soil oxidation (DEC, 2013b).

Although current information suggests the presence of soils with high to moderate risk of acid sulphate soils occurring along the coastline and mudflat areas of the Shire (see Figure 9), site investigations have yet to encounter any actual acid sulphate soils.

3.4.3 Contaminated sites

Western Australia's contaminated sites legislation aims to protect people's health and save the environment from harm. Under the *Contaminated Sites Act 2003*, contaminated sites must be reported to the Department of Environment Regulation, investigated and, if necessary, cleaned up.

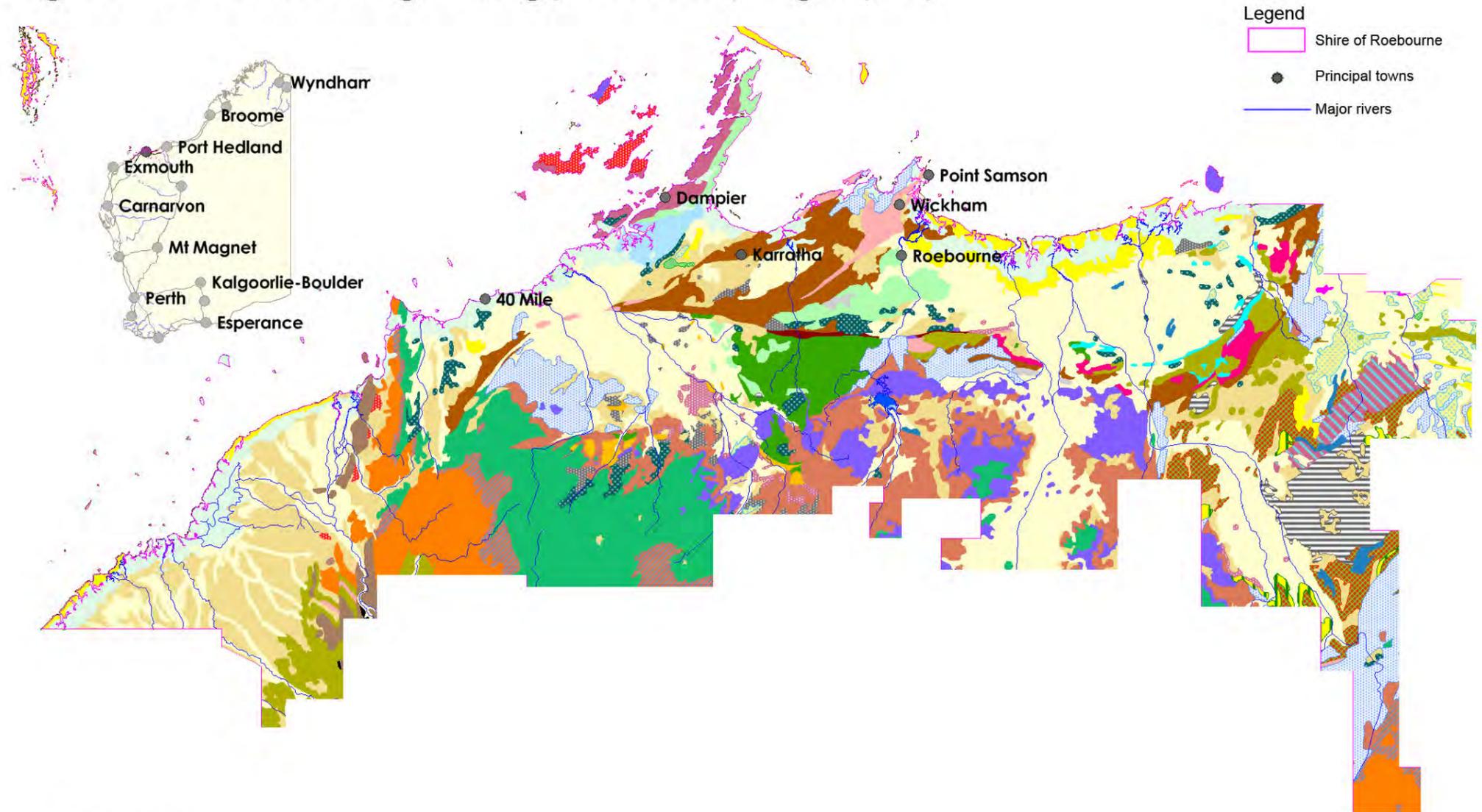
Land owners, occupiers and polluters are required to report all known or suspected contaminated sites to the Department of Environment Regulation. Reported sites are then classified, in consultation with the Department of Health, based on the risks posed to the community and environment.

Figure 9 provides a map of sites currently registered on the Department of Environment Regulation's database. There are nine sites registered contaminated sites in the Shire, most of which are in relation to hydrocarbon contamination.

Other sites reported to the Department of Environment Regulation, including sites awaiting classification are recorded separately by the Department of Environment Regulation and have not been mapped.

Shire of Roebourne - Environmental Strategy

Figure 8 - Surface geology and topography



Surface geology

Basalt, komatite - Awr, Abcl	Calcrete - Czk	Ultramafic volcanic rock - Aep	Shale - Ashm, Asd, Asc, Awc, Ksw, Lsy, Awfj
Clay (metamorphic rock) - Anyp	Lateritic duricrust - Czl	Basalt - Abcn	Dolerite - Adfc, Adp, Adf, Ad, Adrm
Granophyre (igneous felsic rock) - Aggy	Diorite - Agipw	Mylonite - Azp	Gabbro - Adgy, Adbh, Adrd, Adro, Adrr, Adrw, Adav
Lake sediments - Qt	Basalt, andesite - Abfk	Sand (coastal dunes, limestone, sand plain) - Qdc, Qi, Qd, Czs	Dacite - Afpr, Afck
Andesite (basalt, chert) - Awf	Rhyolite - Lfhw	Olivine gabbro - Adlo, Adrs	Granodiorite - Agaiv, Agaij, Agpf, Ager
Estuarine sediments - Qe	Iron formation, chert - Lchb	Alluvial sediment - Qa, Cza	Tonalite - Agbif, Agzl, Agait, Agij
Basalt, dolerite - Abh	Basalt, basaltic andesite - Abfm	Chert, banded iron formation, mudstone - Acg, Achm	Water
Colluvial sediment - Qrc	Sandstone, siltstone - Awfh	Granite - Agi, Agis, Agnl	
Greywacke, banded iron formation - Ascc	Greenstone (metamorphosed rock) - Atp	Monzogranite - Agpo, Agyn, Agaie, Agail, Agiel, Agpb, Agyt, Agai, Ag, Agaia, Agair, Agaic	
Alkali feldspar granite - Agir	Tuff, limestone, shale - Awft	Mafic volcanic rock - Abfr, Adlm	



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Datasources: Landgate, Geoscience Australia, Created by: H Lamparski. Projection: MGA50:zone 50.



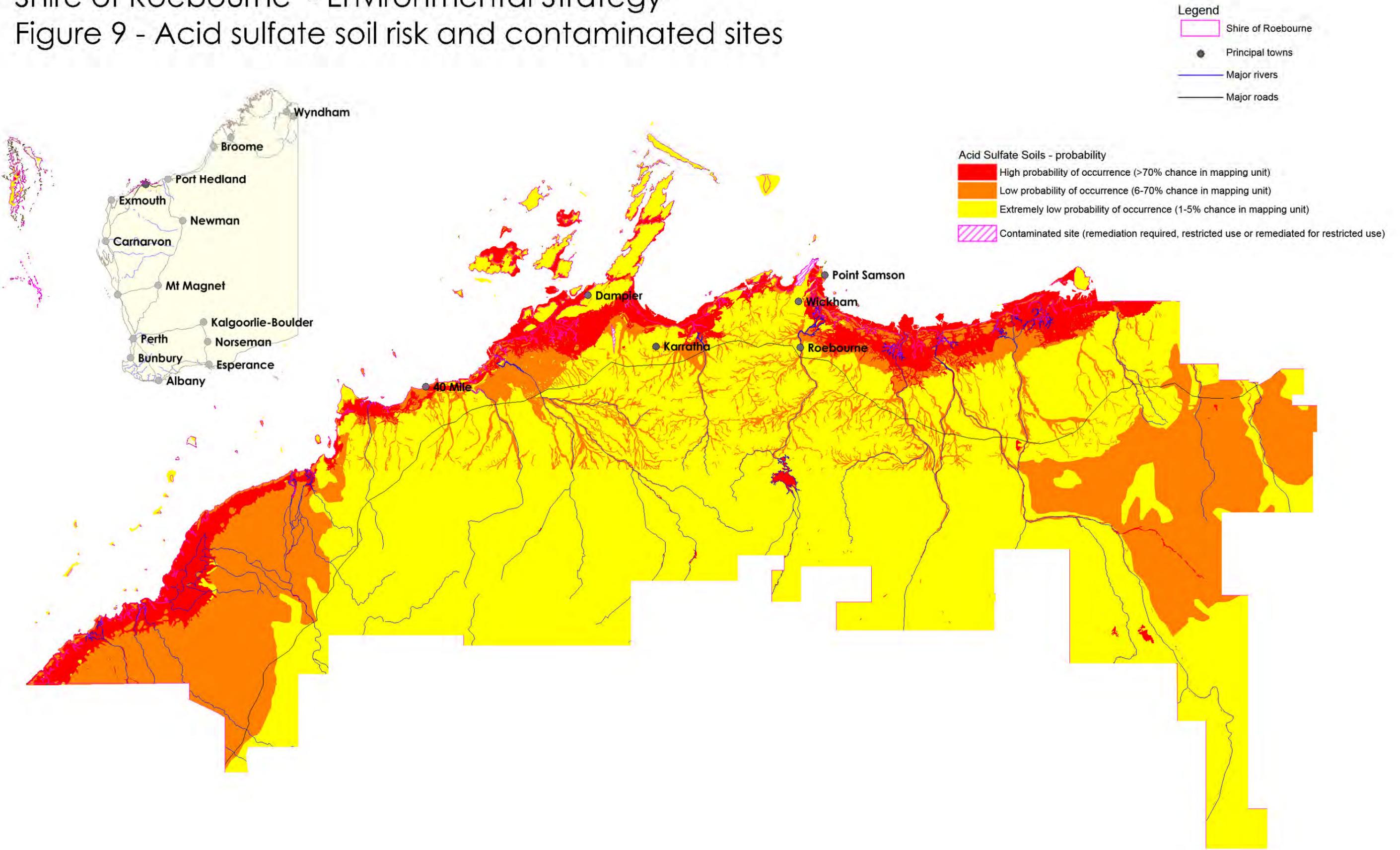
Scale 1: 1,000,000



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Figure 9 - Acid sulfate soil risk and contaminated sites



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Scale 1: 750,000
0 30 km



Current response

The Western Australian Planning Commission has released the *Acid Sulfate Soils Planning Guidelines* (WAPC, 2008b) which outline a range of matters that need to be addressed at various stages of the planning process to ensure that the subdivision and development of land containing acid sulfate soils is planned and managed to avoid potential adverse effects on the natural and built environment.

The Shire currently includes a link to the Western Australian Planning Commission's *Acid Sulfate Soils Self-Assessment Form*, required as part of any potentially soil disturbing activity, particularly in relation to the preparation of development applications.

Key issues and future considerations

- **Acid sulphate soils** - Declining soil and land quality can occur as a result of development where acid sulphate soils are disturbed. This leads to the release of acid and heavy metals which can cause significant harm to the environment and infrastructure. There is a need to continue to identify the presence of acid sulphate soils in areas of medium and high risk where changes in groundwater are likely. Management should be consistent with current best practice.
- **Contaminated sites** - Unsewered residential and industrial areas have the potential to lead to contamination of land and groundwater. Consideration should be given to the remediation of contaminated sites as part of any future development.

3.5 Bushfires

Fire plays an important part in maintaining the landscape of the Pilbara. Fire helps shape the diversity of plants and animals (EPA, 2007). Fire in the rangelands has been used as a land management technique, first by the Aboriginal inhabitants and later by the pastoral industry. Many native plants have evolved fire-related adaptations over time, such as fire-induced flowering or smoke-induced germination.

Fires are most often naturally started by lightning strikes. Electrical storms are common in the Pilbara particularly in remote desert areas and can result in the ignition of multiple fires across a vast area at the same time. These fires are particularly difficult to control, due to the vast areas of land and their inaccessibility (EPA, 2007). In addition to electrical storms, fires are also started by human error in remote areas and have the ability to cause widespread damage, burning out of control in the hot, Pilbara climate.

Problems occur when ecosystems are burnt too often and can lead to loss of biodiversity through inadequate recovery and reproduction times for many plants and animals (EPA, 2007). This can result in a simplification of ecosystems. Animals can be adversely impacted upon if they have limited capacity to escape fire or to find alternative food sources and shelter if fire temporarily removes habitat.

Fires can also exacerbate or cause additional threatening processes to occur such as soil erosion, release of particulates to the atmosphere and weed invasion. Fires also result in the release of greenhouse gases (EPA, 2007).

The extent of fires in the Pilbara bioregion varied considerably between 1997 and 2005, as indicated in Table 9, with relatively large areas burnt in 1997 and 2000 (DSEWPac, 2008). The majority of fires occurred during the August to December period and were presumed to produce hotter, more intense burns than fires in other months (DSEWPac, 2008).

Table 9: Percentage of areas burnt as a result of bushfires in the Pilbara bioregion 1999-2005 (DSEWPaC, 2008)

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005
% area burnt	20.1	2.5	9.7	25.8	9.4	11.8	3.1	3.1	1.1

Updated information from the Australian Collaborative Rangelands Information System (ACRIS, 2010) presented in Figure 10 indicates that the extent of fires in the Shire of Roebourne in 2006 was moderate and has remained low since then. Detailed fire scar mapping data for the Shire of Roebourne for a number of years is available from both the State and federal Governments through FireWatch and DSEWPaC.

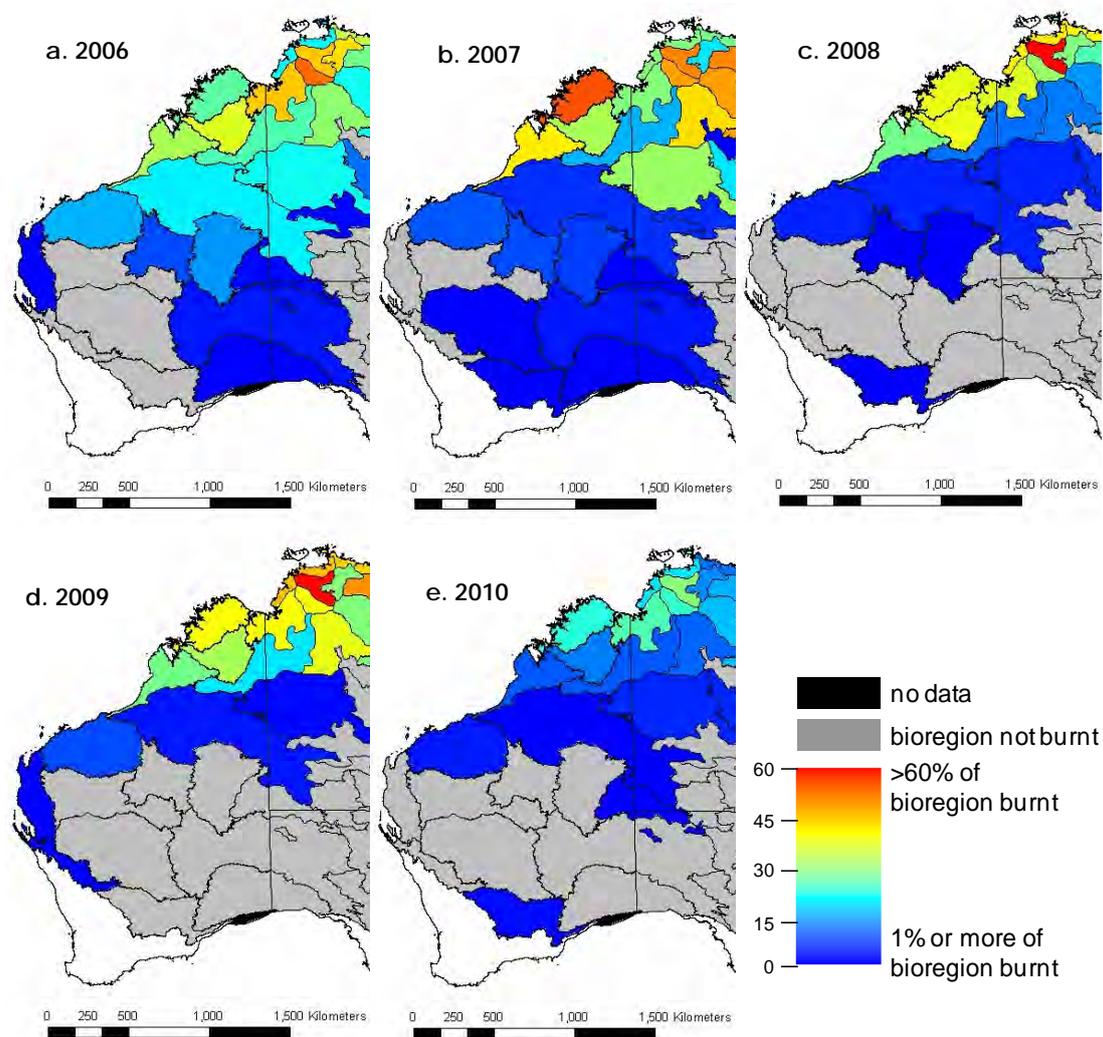


Figure 3a-e: Fire extent shown as the percentage area of bioregions burnt 2006-2010 (Source: ACRIS, 2010)

Current response

A restricted fire season exists all year within the Shire of Roebourne. Lighting fires is not permitted without a permit from the Shire. Lighting of fires in the open air for the purpose of camping or cooking is exempt from requiring a permit but cooking fires (including gas cooking appliances) are prohibited on days of Very High, Severe, Extreme or Catastrophic fire danger forecast.

Whilst the Department of Fire and Emergency Services is responsible for coordinating emergency services during a bushfire that threatens life and property, the Department of Parks and Wildlife is responsible for the management of conservation areas in order to prevent bushfires.

Under Section 33 of the *Bush Fires Act 1953*, pastoral land managers are responsible for management of their pastoral lands in order to prevent bushfires, as notified by local government. Pastoral land managers are required to obtain permits from the Shire to light fires as part of management of their station.

It is currently difficult to achieve coordinated management of bushfires in the Shire of Roebourne due to the differences in management preferences (burning for asset protection in comparison to burning for biodiversity protection) including scale and timing for prescribed burns.

Key issues and future considerations

- Bushfires are a significant land management issue which should be recognised appropriately by the land use planning system, primarily in terms of emergency management including access routes and community awareness and population-intensive land uses in proximity to bushfire prone areas.
- Continue to work cooperatively in the management of fire, having regard for the impact of fire on the landscape and biodiversity, as well as human health, including consideration of opportunities for input into fire management practices from traditional owners via programs such as the Western Desert Traditional and Contemporary Fire Project.

3.6 Coasts and marine environment

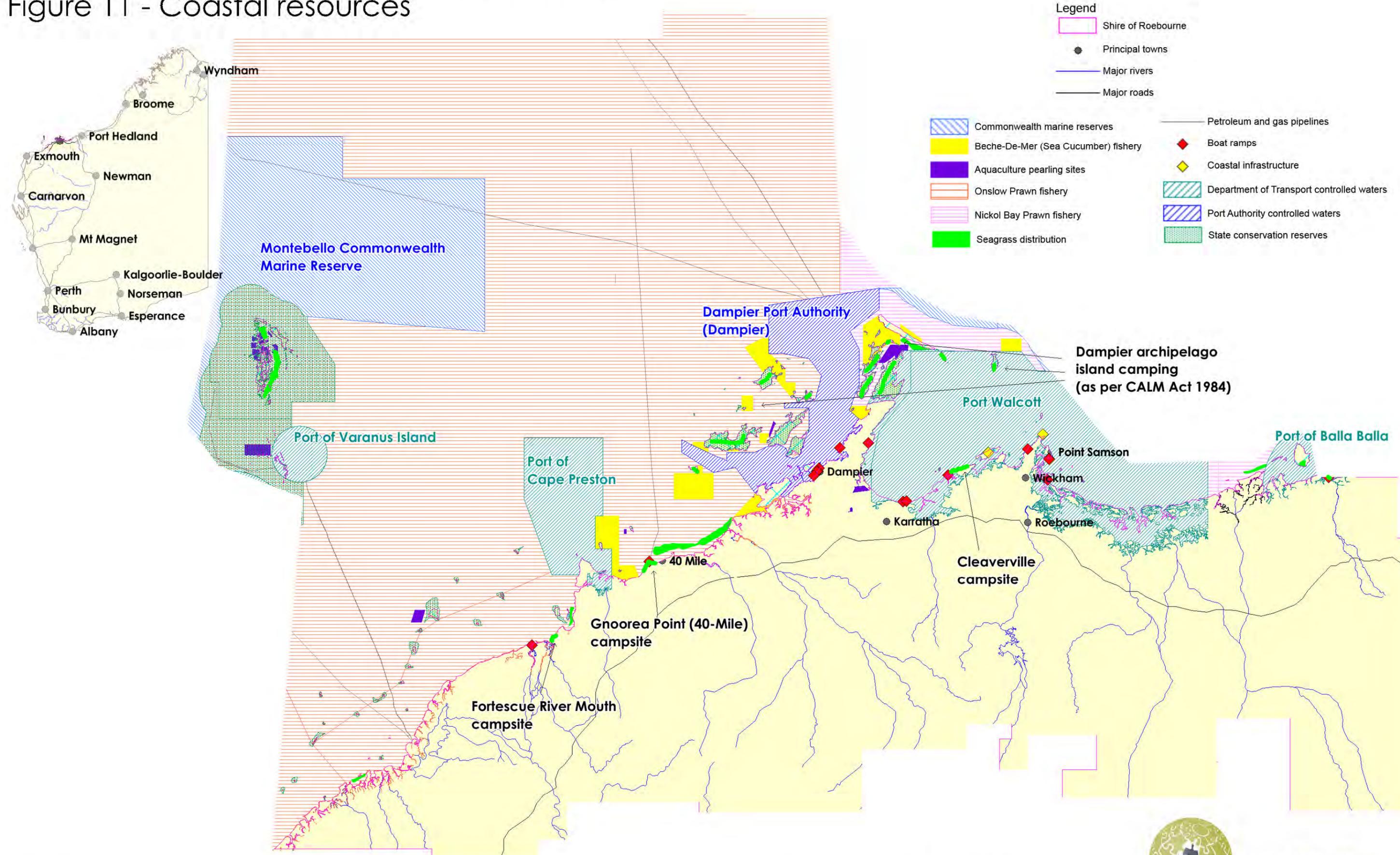
The mainland coastline of the Shire of Roebourne stretches for approximately 350 km, with the Shire of Ashburton to the south and the Town of Port Hedland to the north east (Figure 11). The Shire's coastline contains a diverse range of ecosystems including marine environments with intertidal rocky reefs, deep-water coral reefs, limestone reefs, mangroves, riverine estuaries, extensive mud-flats, seagrass beds and headlands, hills and dunes. Six pastoral leases abut the coast, the largest being Mardie Station, which lies adjacent to around thirty per cent of the Shire's coastline.

The Shire of Roebourne coastline is also subject to coastal vulnerability as discussed previously in section 3.1. Coastal influences vary seasonally, and high water during storm surge events can proceed as far inland as fifteen kilometres beyond the normal average tide (Landvision, 2011).

The Roebourne coastline is used for recreational and cultural activities and has a number of sites of historical significance. In waters adjacent to the Dampier Townsite and those of the Dampier Archipelago, boat-based fishing is popular, occurring in both deeper offshore waters as well as in tidal estuaries and mangroves near Dampier (Davies and Cammell, 2009).

Shire of Roebourne - Environmental Strategy

Figure 11 - Coastal resources



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Scale 1: 750,000



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Swimming, snorkelling, yachting, diving and nature appreciation is popular at a number of the Archipelago islands (including Barrow Island and the Montebello Islands), as well as at Point Samson and the historical town of Coassack. Some shacks provide basic accommodation for visitors on the archipelago islands and are managed by the Department of Parks and Wildlife (Davies and Cammell, 2009).

Camping activity is popular at the designated camp grounds at Cleaverville, Forty Mile (Gnoorea) and Balla Balla, although the community has raised some concerns about the level of activity and resultant impacts on fragile ecosystems and fish stocks. Areas around these campsites and along other stretches of the Shire's coastline have been impacted by uncontrolled access from 4WD and off-road vehicles.

The Shire of Roebourne is one of the major locations in the state for the exploration, extraction, processing and export of iron ore, salt and natural gas. It contains a number of deepwater ports and onshore processing and export support facilities. Additional facilities are also planned at Anketell (near Wickham) and many existing operations are planned for expansion. Port operations and the installation of infrastructure along the sea bed generally require significant dredging of marine environments. Over 100 million cubic metres of material is proposed to be dredged in the Dampier port, resulting in significant impacts on nearby marine habitats and ecosystems.

The marine waters adjacent to Karratha fall within the Northwest Shelf Province of the Northwest Marine region, an area that supports a complex range of habitats including rocky coastlines, sandy substrates with mangroves and seagrass, and a number of islands and associated reefs. These habitats support a high diversity of marine species, including significant populations of protected marine mammal, reptile and shark species (Government of WA, 2010). Key protected areas include the Montebello Commonwealth Marine Reserve, the Dampier Commonwealth Marine Reserve and the Montebello Islands Marine Park.

The Montebello Islands include more than 250 low-lying islands and islets. The complex system of reefs, lagoons and channels and the convoluted island coastlines provide an exceptionally diverse range of habitats for marine plants and animals. The area supports at least 150 species of hard coral, more than 450 species of fish, more than 630 species of molluscs and 170 known species of sea stars, urchins and other echinoderms (DEC and Department of Fisheries, 2009). Further studies are likely to reveal new species.

The Dampier Archipelago comprises 42 islands, islets and rocks that range from less than 2ha to 3,290ha in size and covers an area of approximately 400 km². The mangrove systems in the sandy embayments of Nichol Bay are important marine habitat and are also recognised habitat for the Dugong and Flatback Turtle. Turtle nesting areas include both the Burrup Peninsula and islands of the Dampier Archipelago.

Over one hundred species of birds have been recorded in the Dampier Archipelago region, including both terrestrial species and sea and shore birds, some of which are migratory. Many reptiles also exist, with thirty-two species known from the Burrup Peninsula and forty-one species known from the islands of the Dampier Archipelago (DSEWPaC website, 2013).

Additional information on the significant marine fauna around the Karratha area can be found in the *Dampier Archipelago/Regnard Marine Reserve Indicative Management Plan*.

The Burrup Peninsula has significant conservation and environmental values. The peninsula is home to a diverse range of flora and fauna, and provides an undisturbed habitat for many species endemic to the Pilbara. Much of the peninsula remains in a relatively untouched state. The area is also rich in aboriginal heritage sites and cultural values. The Burrup Peninsula

contains the world's richest known concentration of rock art and as such, is a conservation resource of international significance. The Burrup Peninsula is also home to a large industrial estate in the southern portion with multiple heavy industrial developments and ports.

There are few places in the world where mangroves occur in arid conditions and as such, the mangroves along the Karratha coastline are considered regionally significant arid zone mangroves (Government of WA, 2010). The waters off Karratha are also subject to substantial recreational fishing pressures due to the use of the town by fly-in fly-out workers as well as tourists during the winter months.

Current response

As indicated in section 3.1, the outcomes of the coastal vulnerability studies for Karratha and Dampier are being used by the Shire to guide planning decision-making in the region. Where development is planned in a coastal area, decisions are being made with consideration of coastal hazard risk management and consistent with *State Planning Policy 2.6: Coastal Planning Policy* (Government of WA, 2003, amended 2013).

The *Shire of Roebourne Coastal Management Strategy Position Paper* prepared for the Shire by Landvision in 2011 sets out the Shire's objectives for the management of its 350km length of coast. The Position Paper identifies a series of projects that are recommended to be commenced immediately as interim measures prior to the preparation of Foreshore Management Plans for the designated recreational activity nodes of Dampier Foreshore, Hearson Cove, Karratha Back Beach, Cleaverville, Wickham Back Beach, Point Samson/Sams Creek area and Cossack/ Settlers Beach.

The Shire was successful in obtaining Coastwest funding for 2013 to assist in the preparation of foreshore management plans for Karratha, Point Samson and Gnoorea (40 Mile). These management plans are soon to be advertised for public comment and will assist the Shire to determine management priorities.

The Shire has also recognised the need to address damage to coastal areas from off road vehicles. The report on *Off Road Vehicles in the Shire of Roebourne*, by Trail Bike Management, was commissioned by the Shire in response to community concerns regarding off road vehicle use. The report details the concerns, assesses the current situation and makes recommendations for strategies and options to address the issues. A key recommendation is the development of the Millars Road Off Road Vehicle Area, which is already gazetted under the *Control of Vehicle (Offroad Areas) Act 1978*, consistent with the WA State Trail Bike Strategy.

The Burrup Rangers are a group of indigenous community members from the Murujuga Aboriginal Corporation (MAC) that are responsible for jointly managing the Murujuga (Burrup) Peninsula with the Department of Parks and Wildlife. The group was established through the Burrup and Maitland Industrial Estates Agreement (BMIEA), which gave freehold tenure over the non-industrial land on the Peninsula to its traditional custodians. The Rangers have been active since April 2012 and now comprise both women's and men's teams. They are trained in spiritual knowledge and cultural safety of sacred sites through their circle of elders group. The Rangers will also be trained in how to manage fire preparedness, weeds and feral animals. Funding for the Burrup Rangers is provided by the Rock Art Foundation Committee established by Woodside, as part of the Conservation Agreement Woodside signed with the Australian Government in 2007.

Key issues and future considerations

- **Sea level rise and storm surge** – Existing and future development may be subject to the impacts of sea level rise and storm surge. Planning and development decisions should be supported by current information consistent with State policy.
- **Coastal recreation** – results in significant impacts in designated recreation nodes and other areas along the coast. Further investment in planning, infrastructure and management of coastal recreation activities along the Pilbara coastline is required to enable both environmental conservation, protection of cultural heritage values and appropriate establishment and management of recreational opportunities.
- **Joint management opportunities** – exist to actively support management of the coasts by traditional owners and the community for the protection of cultural heritage, environmental conservation and recreational activities.

3.7 Cultural Heritage

3.7.1 Aboriginal Heritage

The Shire of Roebourne is home to a number of traditional landowner language groups, many of which have a strong spiritual, physical and cultural connection to the region and landscape. Aboriginal people are thought to have inhabited the region for up to 40,000 years (Pilbara RDA, 2012). As such a rich cultural and historical indigenous heritage exists in the region, particularly in natural features such as rivers, hills and rock formations where people, animals and characters left traces of their journey across the landscape. These places may be valuable because of mythological lore (The Dreaming); because of past use as meeting places for special ceremonies; as burial grounds for ancestors; or as places where culture and history was recorded through rock art. The location of these important cultural sites within the natural landscape means there is considerable overlap between Aboriginal and natural heritage in the region.

The Ngarluma/Yindjibarndi people are recognised as having Native Title rights over a significant portion of the Shire of Roebourne and the Jaburara (or Yaburara) Aboriginal language group are recognised as the original inhabitants of the Burrup Peninsula (known as Murujuga) and Dampier Archipelago. The Dampier Archipelago contains one of the densest concentrations of rock engravings in Australia with some sites containing thousands or tens of thousands of images. It was listed on the National Heritage List in 2007, the National Trust of Australia Endangered Places Register in 2002 (National Trusts in Australia, 2012), the Register of the National Estate and is protected by the *Environment Protection and Biodiversity Conservation Act* as a Matter of National Environmental Significance.

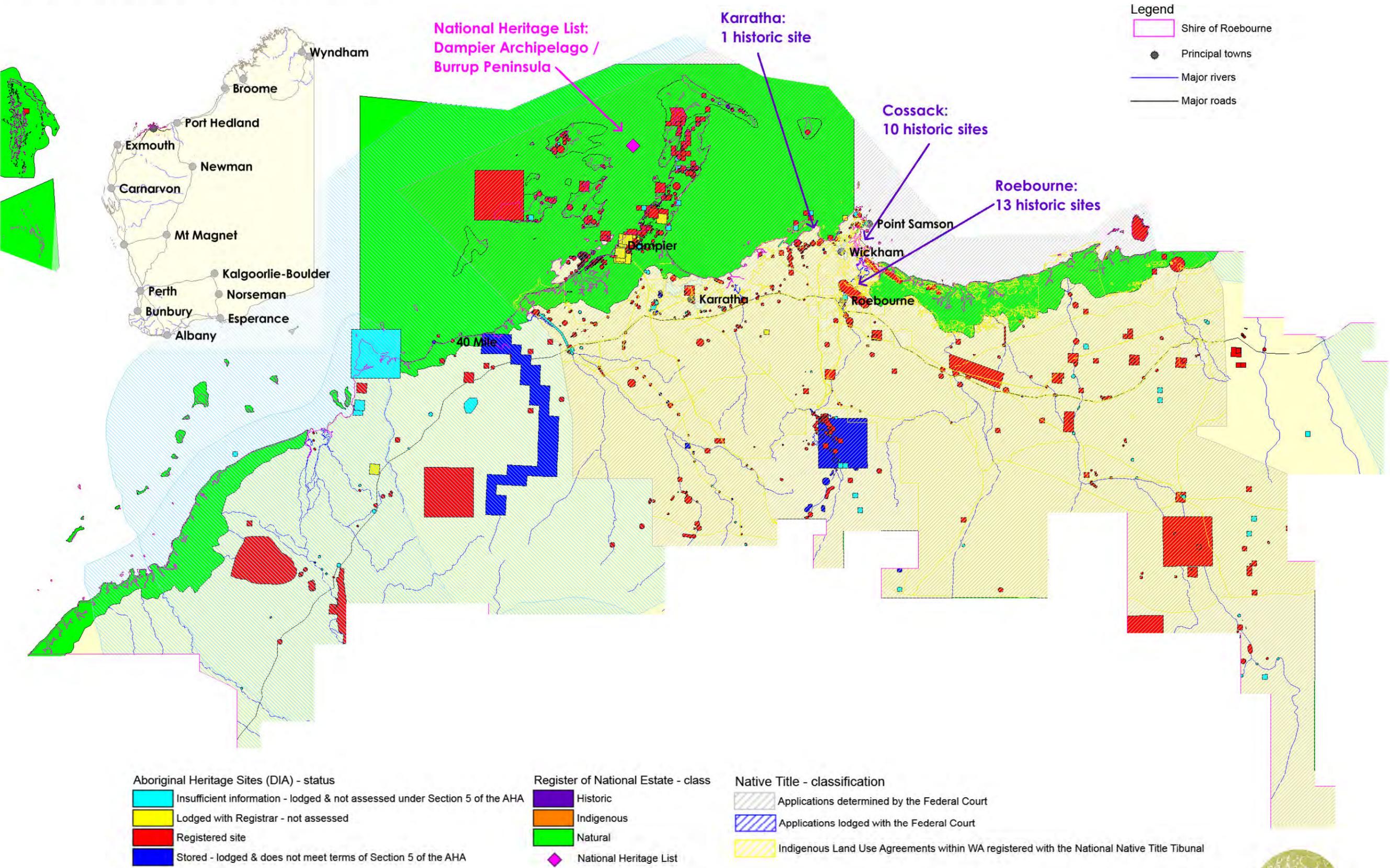
Over two thousand indigenous heritage sites have been identified in the Shire and are protected under the *Aboriginal Heritage Act 1972* (Figure 12).

3.7.2 Post European Settlement Heritage

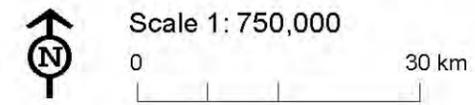
The European history of the Pilbara began in the Shire of Roebourne in 1699 when William Dampier's ship, 'The Roebuck,' laid anchor in the Dampier Archipelago at Malus Island (Karratha Visitor's Centre, 2012). A series of townships were established soon after, the most famous being the now ghost town of Cossack, as well as Roebourne and Point Samson. As a result the Shire's European heritage is rich, with a large number of sites recognised on the Shire's municipal heritage register.

Shire of Roebourne - Environmental Strategy

Figure 12 - Heritage sites



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The Shire of Roebourne is well known for the historic town of Cossack and many important heritage buildings and sites in the town of Roebourne. A number of historic shipwrecks have been identified off the Shire of Roebourne coast on the *Australian National Shipwreck Database*, associated with the region's European history. Seven wrecks have been identified in the Montebello Islands, as well as one wreck off Point Samson and one wreck near Dampier, dating back to 1868 (DSEWPaC, 2012).

Current response

The Shire of Roebourne *Municipal Heritage Inventory* has recently been revised to incorporate additional information about the acknowledged heritage sites in the municipality. There are currently 76 heritage sites recognised on the Shire's revised *Municipal Heritage Inventory*, however, these are still under review (pers. comm, Shire of Roebourne, May 2013). It is noted; however that the Municipal Heritage Inventory does not address heritage sites prior to European occupation.

The Shire is also working with Transplan Pty Ltd and the National Trust of Australia (WA) to prepare a plan for the upgrading of the Yaburara Heritage Trail. This trail was one of over 150 heritage trails established in 1988 to commemorate Australia's Bicentenary. The trail is now 24 years old and in need of redevelopment. The trail has been battered by cyclones and heavy rains, as well as by 4WD vehicles and trail bikes. The 3.5km point-to-point trail takes users past several notable indigenous sites including numerous petroglyphs, artefact scatterings, shell middens, aboriginal quarrying sites, a Thalu site as well as a number of stunning lookouts over Karratha, the Burrup Peninsula and Nickol Bay. The upgrading plan is to consider trail surface improvements, rock steps, improved trail directional markers, interpretation, shelters and seats, trailhead design and the development of loop trails (Transplan's Trail log, 2013, <http://www.transplan.com.au/blog/?p=91>).

Key issues and future considerations

- **Protection of heritage sites and values** - While heritage is primarily managed through State and Commonwealth legislation, opportunities exist to protect and promote both aboriginal and European cultural heritage through joint management arrangements with traditional owners and optimise opportunities for Indigenous training, employment and businesses.
- **Engagement with traditional owners** - is required to meet legislative requirements of Native Title. Increased benefits may be observed through an elevated level of involvement of the traditional owners within the Shire in terms of land and cultural heritage management: Ngarluma, Yindjibarndi, Yaburara, Kuruma, Marthudunera/Mardudhunera

3.8 Waste Management

Waste in the Shire of Roebourne is generated from domestic land uses including residential, building and construction, council works and commercial and industrial activities including mining. The predominant means of disposing of waste in the Pilbara is by landfill, with limited recycling or reuse of materials. This is largely a factor of high transport costs and a lack of markets for recyclable materials; however it is compounded by high levels of contamination, the costs of recovery, and the generally free access by households to dump trailer waste at landfills.

The Shire of Roebourne provides waste management services to the key regional settlements of Karratha, Dampier, Roebourne, Wickham, Cossack and Point Samson. The Shire operates the

7 Mile Waste Facility which is approximately 10km from Karratha and Roebourne/Wickham Waste Transfer Station is located on the Roebourne-Point Samson Road. Limited recycling occurs, with the exception of scrap metal, car batteries and oil. Tyres have been identified by the local community as a waste issue in particular (Essential Environmental, 2013). Green waste separation and treatment for use as mulch is also not common place, possibly due to the level of weeds in green waste.

There are also three Aboriginal communities in the Shire: Cheeditha, which is based close to the town of Roebourne, and Weymul and Mingullatharndo, which are more remote. Waste services at Weymul (Cherrata) are provided by the Weymul Aboriginal Corporation in a manner consistent with remote communities. Waste is disposed of in an area that has the potential to contaminate the groundwater bore providing water to the Community; however a community layout plan has been established which designates an area for a waste transfer station that aims to protect the well-head zone (Plexus Town Planning, 2007a).

Issues also exist with waste management at the Mingullatharndo Community. An unfenced waste disposal area is located approximately 300 metres south west of the Community in the form of a two metre pit which is filled in over time. It has been recognised that this is not adequate and it is intended that a system of waste transfer to Roebourne will eventually be implemented (Plexus Town Planning, 2007b).

Current response

The Shire of Roebourne is planning to introduce a waste recovery program at the 7 Mile Waste Facility in 2013/14 to improve waste management through an increase in recycling facilities, as recommended by the Council's Waste Advisory Group (pers. comm. Shire of Roebourne, July 2013).

Illegal dumping of rubbish is managed by Shire of Roebourne rangers and an online litter report is available on the Shire's website, to report all illegal litter and dumping activity.

Future considerations

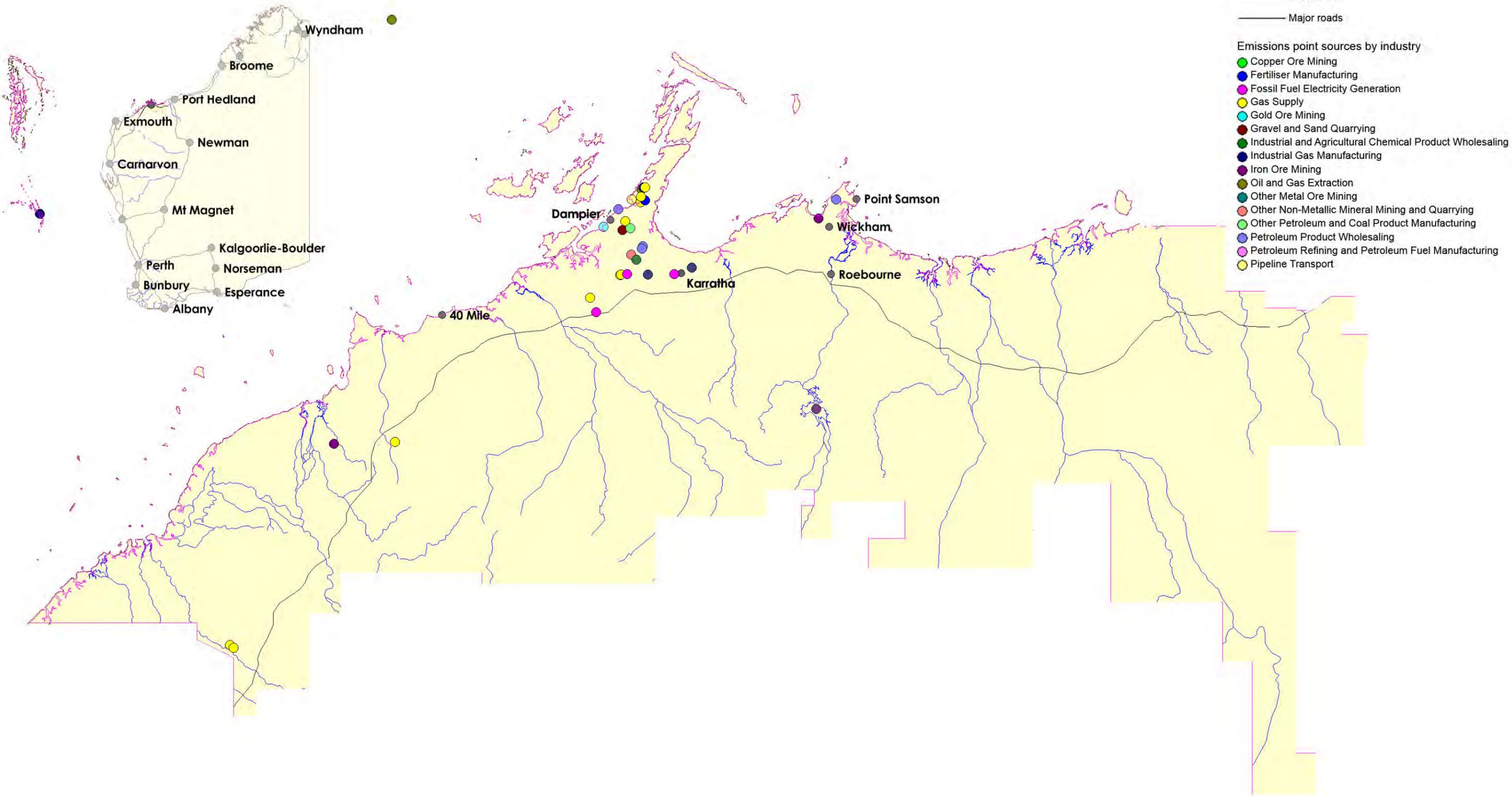
- **Waste management** - currently relies heavily on landfill. Services within the key townsites are currently adequate however there is a need for improved services in remote communities.
- **Waste minimisation, reuse and recycling** - Although there are current difficulties associated with recycling and reuse of waste in the Pilbara, there is a need to improve opportunities and develop alternative strategies, possibly at a regional level.
- **Rubbish dumping** - is a significant issue across the Shire, resulting from the actions of both residents and visitors. There is a need to change community behaviour to combat this substantial problem, which also requires considerable Council resources.

3.9 Air Quality

While the air quality in the majority of the Shire of Roebourne is considered generally to be good, there are a variety of industrial activities in the coastal centres of Karratha, Dampier and Cape Lambert which may impact on air quality (Figure 13). Port facilities, particularly those for iron ore shipment, are recognised as having the potential to impact on ambient air quality, as a result of particulates (dust) and emissions from ships. These impacts may result in declining air quality, pollution of adjacent land and waters and impacts on biodiversity.

Shire of Roebourne - Environmental Strategy

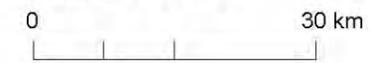
Figure 13 - Air emissions point sources



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Scale 1: 750,000



Significant sources of emissions to air on the Burrup Peninsula include the North West Shelf Joint Venture; Rio Tinto's iron ore export facility; and Burrup Fertilisers ammonia plant. Other contributing sources include shipping activity in the Port of Dampier and urban emissions from the towns of Karratha and Dampier (Burrup Rock Art Monitoring Management Committee, 2009). In response to concerns expressed about possible adverse impacts on the rock art by industrial emissions to air, the Western Australian Government established the Burrup Rock Art Monitoring Management Committee in 2002. This Committee commissioned a number of environmental investigations to establish whether industrial emissions are having adverse impacts on the rock art on the Burrup Peninsula. Having reviewed all the evidence of the reports and the comments from an international peer review panel, the Committee reached the conclusion that at March 2009 there was no scientific evidence to indicate that there is any measurable impact of emissions on the rate of deterioration of the Aboriginal rock art in the Burrup (Burrup Rock Art Monitoring Management Committee, 2009).

The Department of Environment Regulation's Air Quality Management Branch has the role of protecting and maintaining air quality in Western Australia. The branch provides strategic, technical, and policy advice on air quality matters such as ambient air quality, industrial emissions, odour modelling, meteorology, health standards and air toxics (DEC website, 2013). The 2004 Pilbara Air Quality Study undertaken by the former Department of Environment identified particulate levels in Dampier that exceed NEPM criteria. It found that industry was the single largest contributor to emissions in the airshed in Karratha, contributing 95% of the volatile organic compounds, 82.3% of the oxides of nitrogen and 19.6% of the carbon monoxide (DEC, 2004). No air quality monitoring has been undertaken in the Shire of Roebourne by the State Government since this study.

Monitoring is, however, undertaken by facilities as required by the National Environment Protection Measure (NEPM) and the National Pollutant Inventory publishes annual air emission data from reporting by facilities (<http://www.npi.gov.au/data/search.html>). Published monitoring data is currently limited to total annual loads (kg) and therefore cannot be used to determine the number of exceedances of NEPM standards.

3.9.1 Noise

Noise pollution has been an issue in the Pilbara, particularly in areas where mining and industrial activity are adjacent to residential and tourist areas. Similar to air quality, noise created by industrial activities has increased with the expansion of port operations in locations in the Pilbara (DSD, 2010). The construction phase of expansions in particular, both in port precincts and associated transport corridors, can result in significant noise pollution issues.

Noise pollution results in a decrease in amenity, risk to community health associated with elevated noise levels, impacts on fauna and conflict between land owners and adjacent industry. While noise pollution and management has been addressed in the Town of Port Hedland through the *Port Hedland Air Quality and Noise Management Plan* (DSD, 2010), similar issues have not been addressed in the Shire of Roebourne.

Current response

No further monitoring has been made available regarding the quality of the Karratha and Dampier airsheds since the Pilbara Air Quality Study in 2004, as industry is focussed on the impacts that currently exist in Port Hedland. It is hoped that the findings of the Port Hedland Dust Taskforce are translated appropriately into the Shire of Roebourne in the near future.

The Shire's Environmental Health Service is responsible for maintaining environmental and public health standards. Environmental Health Officers administer various Acts and other legislation which regulate both air quality and noise.

No noise monitoring has been undertaken or planned for in the future in the Shire of Roebourne.

Key issues and future considerations

- **Industrial activity in proximity to sensitive uses** - may exacerbate air quality and noise issues and generally requires ongoing monitoring to improve management responses

3.10 Priorities for the Shire

There are a number of significant environmental assets and issues associated with Shire activities and operations that require consideration and action. These are summarised below. Responses to the following issues are provided in the Environmental Strategy in Section 2.

Biodiversity

- Land management including rubbish/illegal dumping, off-road vehicles and uncontrolled access.
- Weeds, feral animals, introduced species and pests
- Bushfires

Water

- Drinking water supplies
- Environmental water requirements and protection of significant water resources
- Water use efficiency and water reuse
- Flooding from stormwater

Coasts

- Sea level rise and storm surge
- Coastal recreation
- Protection of heritage sites and values
- Engagement with traditional owners

Built environments

- Waste minimisation, reuse and recycling
- Improved energy and water efficiency
- Rubbish dumping
- Industrial activity in proximity to sensitive uses
- Acid sulphate soils and contaminated sites

4 ABBREVIATIONS

DER	Department of Environment Regulation
DPaW	Department of Parks and Wildlife
DSEWPaC	Department of Sustainability Environment Water Population and Communities
DoP	Department of Planning
DoT	Department of Transport
DoW	Department of Water
NHT	National Heritage Trust (WA)

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APPENDIX 1: INTEGRATING ENVIRONMENTAL ISSUES INTO THE LAND USE PLANNING SYSTEM

A. POLICY FRAMEWORK FOR ENVIRONMENTAL PLANNING

Guidance for the protection and management of the environment and natural resources as part of land use planning and development is provided in both planning and environmental legislation, as well as state planning policy.

a. Federal environmental protection legislation

i. *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places- defined in the EPBC Act as matters of national environmental significance (NES). The EPBC Act is administered by the Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA).

There are eight matters of NES defined under the EPBC Act. These are:

- world heritage sites;
- national heritage places;
- wetlands of international importance;
- nationally threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park; and
- nuclear actions.

Any action that has, will have, or is likely to have, a significant impact on a matter of NES requires the approval of the Federal Minister for the Environment under the EPBC Act.

An 'action' is broadly defined under the Act as a project, development, undertaking, activity or series of activities, or an alteration of any of these things. An 'action' occurs at the time of site disturbance and includes "site preparation and construction, operation and maintenance, and closure and completion stages of a project, as well as alterations or modifications to existing infrastructure" (Commonwealth of Australia, 2009). Strategic or statutory planning activities such as structure plans and subdivision are not considered to constitute an 'action' under the EPBC Act.

The preparation of greenfield sites for subdivision is considered to be an action under the EPBC Act. Thus where the subdivision and future development of land is likely to have a significant impact on any matter of NES, it should be referred to the Commonwealth Government for their decision regarding the need for assessment. However, it is recommended that local structure plans are referred to the Commonwealth Government where they affect matters of NES to facilitate more strategic and timely outcomes.

b. State environmental protection legislation

ii. *Environmental Protection Act 1986*

Environmental protection in Western Australia is provided primarily by the *Environmental Protection Act 1986* (EP Act). Part IV of the EP Act enables the Environmental Protection Authority (EPA) to undertake the environmental impact assessment (EIA) of a proposal if it is considered likely to have a significant effect on the environment. Section 48A of the EP Act relates to the assessment of planning schemes, whereas mining proposals are assessed under S38 of the EP Act. Licensing of prescribed premises occurs under Part V of the EP Act.

In the event that the project requires the clearing of native vegetation the Department of Environment and Conservation will need to be consulted to determine whether a clearing permit is required under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

iii. *Conservation and Land Management Act 1984*

The *Conservation and Land Management Act* establishes a comprehensive set of legislative provisions dealing with state conservation and land management matters. It also provides for the vesting or reservation of land, particularly state forest or timber reserve, and the ability to enter into agreements with private landholders, state conservation and land management matters.

iv. *Wildlife Conservation Act 1950*

The *Wildlife Conservation Act 1950* provides for the conservation and protection of all native flora and fauna. Under the Act, individual species of plants and animals are protected, with the level of protection varying depending on whether the species is rare or endangered. Flora and fauna that needs special protection because they are under identifiable threat of extinction, are rare, or otherwise in need of special protection are placed on the threatened species list.

v. *Contaminated Sites Act 2003*

The *Contaminated Sites Act 2003* imposes significant responsibilities on parties causing contamination, and on owners of contaminated land. Land owners, occupiers and polluters are required to report known or suspected contaminated sites to the Department of Environment Regulation. Reported sites are then classified, in consultation with the Department of Health, based on the risks posed to the community and the environment and responsibility for clean-up is allocated.

vi. *Biosecurity and Agriculture Management Act 2007*

As of 1 May 2013, the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and regulations come into force. Under the BAM Act, organisms are grouped into four main classifications ;

- Declared pests
- Permitted
- Prohibited
- Permitted Requiring a permit

Under the BAM Act, all declared pests are placed in one of three categories, namely C1 (exclusion), C2 (eradication) or C3 (management). The Western Australian Organism List (WAOL) has been created to easily find out the declared status of Organisms that have now been classified as part of the enactment of the BAM Act. Use of the Department of Agriculture and Food's Declared Organism Search tool returned no records of declared organisms specifically within the Shire of Roebourne; however, there are a number of Declared Organisms listed for the whole State that are likely to be found within the Shire.

vii. Rights in Water and Irrigation Act 1914

Under the *Rights in Water and Irrigation Act 1914* a Bed and Banks licence will be required from the Department of Water should construction activities disturb the bed and banks of any river, creek or drainage channel within the town centre.

In addition, a dewatering licence may be required from the Department of Water if dewatering activities are required during construction activities; a 26D licence for the construction of bores; and a 5C licence to abstract groundwater may be required from the should groundwater be required for construction purposes.

viii. Heritage of Western Australia Act 1990

The *Heritage of Western Australia Act 1990* provides for, and encourages, the conservation of places which have significance to the cultural heritage in the state and established the Heritage Council of Western Australia. The objectives of the *Heritage of Western Australia Act 1990* are to:

- identify, conserve and where appropriate enhance those places within Western Australia which are of significance to the cultural heritage; and
- in relation to any area, to facilitate development that is in harmony with the cultural heritage values of that area; and
- to promote public awareness as to the cultural heritage, generally.

ix. Aboriginal Heritage Act 1972

The Aboriginal Heritage Act 1972 makes provision for the preservation on behalf of the community of places and objects customarily used by or traditional to the original inhabitants of Australia or their descendants, or associated therewith, and for other purposes incidental thereto.

c. Environmental protection policy and guidelines

The Environmental Protection Authority develops two types of policies that are adopted as whole-of Government policies: statutory Environmental Protection Policies (EPPs) and non-statutory State Environmental Policies (SEPs). Those relevant to the Shire of Roebourne include:

i. Guidance for the Assessment of Environmental Factors No 33: Environmental Guidance for Planning and Development (2008)

The Environmental Protection Authority prepares Environmental Assessment Guidelines (formerly Guidance Statements) to provide advice to proponents and the public generally on the procedures and minimum environmental requirements that the Environmental Protection

Authority expects to be met during the environmental impact assessment process. Environmental Assessment Guidelines are not statutory documents. The most relevant Environmental Assessment Guideline is *Guidance for the Assessment of Environmental Factors No 33: Environmental Guidance for Planning and Development (2008)*, which comprehensive information about the consideration of NRM issues as part of planning decision making. It contains a significant reference list, a list of DER, DPaW and EPA policies, other useful publications, guidelines for agricultural activities and a list of websites.

A complete list of Environmental Assessment Guidelines can be found on the Environmental Protection Authority's website (www.epa.wa.gov.au).

d. Planning legislation

Land use planning and development in Western Australia is governed by the *Planning and Development Act 2005*, the purpose of which is to:

- provide for an efficient and effective land use planning system in the State; and
- promote the sustainable use and development of land in the State.

The *Planning and Development Act 2005* identifies preservation and conservation as matters which may be dealt with by planning schemes, specifically:

- the preservation of places and objects of cultural heritage significance...;
- the conservation of the natural environment...including the protection of natural resources, the preservation of trees, vegetation and other flora and fauna, and the maintenance of ecological processes and genetic diversity; and
- the conservation of water.

The *Planning and Development Act 2005* ensures the referral of all proposed schemes and scheme amendments to the EPA for consideration of their potential impact on the environment.

e. State planning policy - environment

Environmental protection and natural resource management is cited as a key element in the policy framework that guides land use planning and development in Western Australia. This is highlighted in the *State Planning Strategy (WAPC 1997)* and *State Planning Framework (State Planning Policy No 1, Variation 2, Government of Western, 2006)* and in *Liveable Neighbourhoods (WAPC, 2007)*.

i. State Planning Strategy

The *State Planning Strategy (WAPC, 1997)* sets out key principles which guide the way in which planning decisions are made. Five key principles are identified. In the areas of environment, community, economy, infrastructure and regional development. The environmental principle in the *State Planning Strategy (1997)* is:

To protect and enhance the key natural and cultural assets of the State and deliver to all West Australians a high quality of life which is based on environmentally sustainable principles.

The *State Planning Strategy* contains strategies which are proposed to secure a high quality environment. The strategies are supported by recommended criteria for incorporating the

environmental principle into planning, and are proposed to be achieved via specific actions, both existing and new. The following strategies to address NRM matters are contained within the *State Planning Strategy*:

- Increasingly use energy sources which have minimal impact on the environment;
- Prevent further loss in biodiversity;
- Ensure that air quality is protected;
- Ensure that water resources are conserved and their quality protected;
- Ensure that land and soil is safeguarded and that degradation does not occur;
- Reduce consumption of materials and promote recycling;
- Promote planning, management and protection of resources;
- Protect landscape, open space and public access;
- Enhance the quality of life for all Western Australians; and
- Protect the State's cultural heritage.

These strategies provide a comprehensive basis for the establishment of more detailed NRM strategy and policy as part of the remainder of the State planning framework.

The *State Planning Strategy* was released prior to the gazettal of the EPBC Act and therefore makes no reference to matters of NES. The State Planning Strategy is currently being revised by the Department of Planning (DoP) and Western Australian Planning Commission (WAPC).

ii. *State Planning Policy*

State planning policies (SPP) are made under Section 26 of the *Planning and Development Act 2005*. They are the "highest" form of policy and as such, the WAPC and local governments must have 'due regard' to the provisions of the policies when preparing or amending local planning schemes or making decisions on planning matters. The State Administrative Tribunal is also required to take account of SPPs when determining appeals.

There are currently 27 SPPs and 1 draft SPP. In accordance with *SPP No 1: State Planning Framework (2006)* there are five primary policies or "sector" policies in the areas of:

- Environment and Natural Resources;
- Urban Growth and Settlement;
- Economy and Employment;
- Transport and Infrastructure; and
- Regional Development and Planning.

It should be noted that only the first two sector policies have been developed. Of the 27 available SPPs, 19 of those have some relevance to environmental management. These include:

- SPP 2 Environment and Natural Resources Policy
- SPP 2.1 Peel-Harvey Coastal Plain Catchment Policy
- SPP 2.2 Gnamagara Groundwater Protection
- SPP 2.3 Jandakot Groundwater Protection Policy
- SPP 2.4 Basic Raw Materials
- SPP 2.5 Agricultural and Rural Land Use Planning
- SPP 2.6 State Coastal Planning Policy
- SPP 2.7 Public Drinking Water Source Policy
- SPP 2.8 Bushland Policy for the Perth Metropolitan Region
- SPP 2.9 Water Resources
- SPP 2.10 Swan-Canning River System

- SPP 3 Urban Growth and Settlement
- SPP 3.2 Planning for Aboriginal Communities
- SPP 3.4 Natural Hazards and Disasters
- SPP 3.5 Historic Heritage Conservation
- SPP 4.1 State Industrial Buffers
- SPP 4.3 Poultry Farms Policy
- SPP 6.1 Leeuwin-Naturaliste Ridge Policy
- SPP 6.3 Ningaloo Coast

SPP No 2: Environment and Natural Resources Policy (2003) (ENR SPP) provides general guidance regarding how NRM matters are to be considered during planning decision making. The ENR SPP contains 3 objectives. They are to:

- integrate environment and natural resource management with broader land use planning and decision-making;
- protect, conserve and enhance the natural environment; and
- promote and assist in the wise and sustainable use and management of natural resources.

The ENR SPP contains thirteen general policy measures which provide broad guidance for decision making, supported by more specific policy guidance in the areas of:

- Water Resources;
- Air Quality;
- Soil and Land Quality;
- Biodiversity;
- Agricultural Land and Rangelands;
- Minerals, Petroleum and Basic Raw Materials;
- Marine Resources and Aquaculture;
- Landscapes; and
- Greenhouse Gas Emissions and Energy Efficiency.

Additional guidance on environmental matters is provided by the sector policies.

iii. *Liveable Neighbourhoods*

Liveable Neighbourhoods: a Western Australian Government sustainable cities initiative (WAPC, 2007) is an operational policy for the design and assessment of structure plans (regional, district and local) and subdivision for new urban (predominantly residential) areas in the metropolitan area and country centres, on greenfield and large urban infill sites. It promotes safe, sustainable and attractive neighbourhoods with a strong, site-responsive identity, supportive of local community.

Liveable Neighbourhoods (WAPC, 2007) facilitates the achievement of NRM outcomes through its performance based approach which acknowledges the requirements of sustainability and focuses on structure planning as a key tool to achieve more sustainable outcomes and to facilitate innovation. *Liveable Neighbourhoods* requires consideration of the site and its context in determining the design outcome, which should result in a design which acknowledges the environmental attributes of a site and integrates them into the design outcome. It is dependent; however, on there being good geographical NRM information available to ensure the environmental assets and issues are identified. *Liveable Neighbourhoods* pays special attention to the integration of water into the urban form through Element 5: Urban Water Management.

iv. *Integrating land and water planning*

Better Urban Water Management (WAPC, 2008) provides guidance on the implementation of *State Planning Policy 2.9 Water Resources* (2006). It outlines the requirements for integrating land and water planning and improving the achievement of total water cycle outcomes and water sensitive urban design as part of land use planning and development.

Better Urban Water Management is designed to facilitate better management and use of water resources by ensuring an appropriate level of consideration is given to the total water cycle at each stage of the planning system. The document provides guidance for regional, district and local land use planning, as well as subdivision phases of the planning process. *Better Urban Water Management* is to be used by all stakeholders and decision makers and has statewide application for new urban, commercial, industrial and rural-residential developments.

B. INTEGRATING ENVIRONMENTAL ISSUES INTO LAND USE PLANNING

The integration and consideration of NRM as part of planning can be achieved at all levels of the planning system as part of both strategic and statutory planning. It is recognised that the effectiveness of this depends on the information which can be provided to support planning decision-making.

a. Planning tools and environmental management

The Western Australian land use planning system involves strategic and statutory planning activities. Statutory planning applications for land use change, subdivision or development are generally guided by strategic plans which implement planning policy and consider a wide range of economic, social and environmental issues.

Ideally, the planning process commences at the State level and becomes more detailed as it progresses through regional, district and local planning to subdivision, and development. The following scales of planning have been recognised within the land use and water-planning framework *Better Urban Water Management* (WAPC, 2008a).

1. Regional and subregional planning
2. District planning
3. Local planning
4. Subdivision - stage a: application and stage b: construction
5. Development

Planning at each stage should involve both strategic and statutory planning activities. These activities or tools are identified in Table 4, consistent with *Better Urban Water Management* (WAPC, 2008).

Table 4: Scales of the land use planning system and relevant planning tools (WAPC, 2008).

Planning stage/ scale	Indicative area of coverage	Strategic planning tool	Statutory planning tool	Responsibility for approval
1. Regional and subregional planning	>1 Local government area (LGA)	(Sub)Regional strategy, (sub)regional structure plan	Region scheme	WAPC
2. District planning	Generally > 300 ha, may be >1 LGA	District structure plan Development guide plan Local planning strategy	Region scheme amendment Local planning scheme	WAPC
3. Local planning	< 300 ha	Local structure plan/ local area plan/ outline development plan	Local planning scheme amendment Local structure plan/ local area plan/ outline development plan	WAPC/local government
4. Stage a: application for subdivision Stage b: construction of subdivision	Large > 20 ha Small < 20 ha	Detailed area plan	Subdivision application with conditions Detailed area plan Clearance of conditions Issuing of title	WAPC WAPC/local government/ DoP

Planning stage/ scale	Indicative area of coverage	Strategic planning tool	Statutory planning tool	Responsibility for approval
5. Development	Lot		Development application (sometimes) Building licence Developer covenant Local planning policy Local laws	Local government

Significant environmental and natural resource assets and issues should be recognised at each of these stages of planning and development, primarily in strategic planning instruments but also referenced in statutory mechanisms where necessary.

i. Regional and subregional planning

Addressing priority natural resources at the regional or subregional scale is often constrained by the scale and style of planning, as regional and subregional strategies tend to be very broad in nature and are often conceptual or provide a number of future options for land use change and development.

Where detailed information is available such as the specific locations of priority natural resources, this can generally be included in appropriate maps and strategies. This opportunity is reduced; however, where there is limited information or where on-site verification is required. In these instances, a reference to the need to protect priority natural resources should be included in strategic documents together with instructions which outline how particular priority natural resources should be addressed at future stages of planning. This option requires clear guidelines on how the information should be collected, for what purpose and how it will be assessed (significance criteria as well as process) at later stages of planning.

ii. District planning

Similarly to regional planning, strategic planning at the district scale (which includes district structure plans and local planning strategies) is also generally conceptual. District-level strategies and plans highlight areas that have the potential for future land use change and development. This may not provide sufficient certainty regarding the proposed development outcome to determine the specific actions with regards to priority natural resources; however, it provide an opportunity to highlight the priority natural resources and incorporate requirements for further investigations or actions as part of future planning and development. District structure plans and local planning strategies also provide an opportunity for the inclusion of objectives or performance criteria regarding priority natural resources, which would then need to be achieved as part of future stages of planning and development.

This scale of planning does not usually support or require detailed site assessment however known priority natural resources should be identified as part of a desktop assessment. Where these matters are not defined but are “likely” to occur, the requirement for site investigations at the next stage of planning (local) should be incorporated into the strategic tool (and possibly statutory mechanisms where this is considered necessary).

iii. Local planning

Local-scale planning includes the preparation of local structure plans and local scheme amendments. Local planning actions are generally supported by some on-ground

investigation and this stage of planning provides a good opportunity to consider priority natural resources together with the objectives for good and proper planning (including land affordability) to achieve a sustainable outcome.

In order to achieve the protection and management of priority natural resources, a local structure plan may include reference to specific environmental assets which need to be addressed as part of the proposed development, such as the protection of identified habitat or commitments to deliver appropriate mitigation and management actions. Where insufficient investigations have been undertaken, the structure plan may require certain actions to be completed prior to subdivision.

Another planning tool which may be effective in delivering outcomes is the use of special control areas. A special control area may be applied over an area of known habitat which requires some actions to be undertaken and incorporated into planning decision-making. These actions could include levels (and methodologies) of investigation, consultation which must be undertaken and performance criteria which must be met.

iv. Subdivision

Subdivision is considered quite late in the planning and development process to optimise planning and natural resource outcomes, as the layout and form of the future development is largely determines as part of structure planning.

The subdivision phase allows the demonstration and delivery of key objectives associated with the layout and structure including coastal setbacks, preservation of significant flora, fauna, communities and habitat in areas of open space, and urban water management outcomes. Subdivision design should also ensure achievement of appropriate orientation for climate responsive design.

The construction of the subdivision should also be managed to minimise any impact on the surrounding environment. The construction of the subdivision will need to be in accordance with any conditions of subdivision which are placed on the approval.

v. Development

Development involves the construction of the dwelling or premises. Most local schemes do not require a development application for the construction of a single house; however, the development still needs to be consistent with any design guidelines or requirements of the structure plan or scheme.

Where development is proposed in environmentally sensitive areas, design guidelines are recommended to address issues such as landscaping, water management, turtle-sensitive lighting and climate responsive design.

C. ROLE OF ENVIRONMENTAL AGENCIES IN LAND USE PLANNING

There are many agencies which are directly involved in the management of the environment and natural resources. These agencies perform a number of regulatory and advisory roles, including the development of objectives, policy, guidelines and performance criteria.

Issue	Key Agency	Contact number	Website
Wetlands	Department of	Head Office	www.dpaw.wa.gov.au
Biodiversity – remnant vegetation, terrestrial, aquatic and marine biodiversity	Parks and Wildlife	(08) 9219 9000 Karratha (08) 9143 1488	
Fire			
Air quality, pollutants, light, noise, buffers	Department of Environment Regulation	Head Office 08 6467 5000	www.der.wa.gov.au
Acid sulphate soils Contamination			
Water – groundwater, surface water, flooding, water availability, urban water management	Department of Water	Head Office (08) 6250 8000 Karratha 08 9144 0200	www.water.wa.gov.au
Aboriginal heritage	Department of Aboriginal Affairs	Head Office 08 9235 8000	www.daa.wa.gov.au
Agriculture and horticulture	Department of Agriculture and Food	Head Office 08 9368 3333 Karratha 08 9143 7000	www.agric.wa.gov.au
Minerals and petroleum Basic raw materials	Department of Mines and Petroleum	Head Office 08 9222 3333 Karratha (08) 9186 8888	www.dmp.wa.gov.au
Fisheries and aquaculture	Department of Fisheries	Head Office 08 9482 7333 Karratha (08) 9144 4337	www.fish.wa.gov.au
Coastal vulnerability Landscape	Department of Planning	Head Office 08 6551 9000 Karratha (08) 9159 6911	www.planning.wa.gov.au
Climate change	Office of Climate Change	DPaW	As above

Other advice could be sought from Rangelands NRM, and the Department of Fire and Emergency Services.

APPENDIX 2: EPBC ACT PROTECTED MATTERS REPORT



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

LGA ROEBOURNE, WA

Report created: 27/06/13 18:28:13

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010



Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communities:	None
Threatened Species:	19
Migratory Species:	49

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov>.

Commonwealth Lands:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	102
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

Place on the RNE:	52
State and Territory Reserves:	18
Regional Forest Agreements:	None
Invasive Species:	20
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place
Threatened Species		[Resource Information]
Name	Status	Type of Presence
BIRDS		

Name	Status	Type of Presence
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat likely to occur within area
MAMMALS		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Dasyurus hallucatus Northern Quoll [331]	Endangered	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Notoryctes caurinus Karkarratul, Northern Marsupial Mole [295]	Endangered	Species or species habitat likely to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat likely to occur within area
REPTILES		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aprasia rostrata rostrata Hermite Island Worm-lizard [64481]	Vulnerable	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARKS		
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Migratory Marine Species		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		within area Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew [847]		Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Defence - KARRATHA TRAINING DEPOT

Listed Marine Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur

Name	Threatened	Type of Presence
Larus pacificus Pacific Gull [811]		within area Breeding known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew [847]		Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bengalensis Lesser Crested Tern [815]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur

Name	Threatened	Type of Presence within area
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Acentronura larsonae Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys latispinosus Muiron Island Pipefish [66196]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Doryrhamphus dactyliophorus Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus multiannulatus Many-banded Pipefish [66717]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Phoxocampus belcheri Black Rock Pipefish [66719]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Solenostomus paegnius Rough-snout Ghost Pipefish [68425]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area

Mammals

Name	Threatened	Type of Presence
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus a seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area
Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Places on the RNE [[Resource Information](#)]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Coastal Margin Cape Preston to Cape Keraudren	WA	Indicative Place
Coastal Margin Exmouth Gulf to Cape Preston	WA	Indicative Place
Dampier Archipelago Marine Areas	WA	Indicative Place
Chichester Range National Park (1977 boundary)	WA	Registered
Coastal Islands Dixon Island to Cape Keraudren	WA	Registered
Coastal Islands Mary Anne to Regnard	WA	Registered
Dampier Archipelago	WA	Registered
Islands Exmouth Gulf and Rowley Shelf	WA	Registered
Montebello Islands	WA	Registered
Montebello Islands Marine Area	WA	Registered
Mungaroona Range Nature Reserve	WA	Registered
Indigenous		
Boundaries Engravings Site	WA	Registered
Burrumburra Thalu and Jigurdaar Thalu	WA	Registered
Burrup Peninsula - North Area	WA	Registered
Dampier Art Site	WA	Registered
Dampier Climbing Men Area	WA	Registered
Depuch Island Engraving Site	WA	Registered
Goodluck Hills Art Site	WA	Registered
Wonakaladna	WA	Registered
Historic		
Cooya Pooya Station Homestead Group	WA	Indicative Place
Holy Trinity Anglican Church	WA	Indicative Place
Jagers House	WA	Indicative Place
Masonic Lodge (former)	WA	Indicative Place
Mount Welcome House	WA	Indicative Place
Roebourne Cemetery (disused)	WA	Indicative Place
Roebourne Hospital, Kitchen Block and Matrons Quarters	WA	Indicative Place
Cossack Cemetery	WA	Registered
Cossack Historic Town	WA	Registered
Cossack Post and Telegraph Office (former)	WA	Registered
Cossack School (former)	WA	Registered
Croydon Station Group	WA	Registered
Customs House and Bond Store	WA	Registered
Galbraiths Store	WA	Registered
Gaol, Police Station and Courthouse Precinct	WA	Registered
Grave Site on Dolphin Island	WA	Registered
Jarman Island Lighthouse and Quarters	WA	Registered
Karratha Station Group	WA	Registered
Landbacked Wharf	WA	Registered
Legendre Island Lighthouse	WA	Registered
Mallina Homestead and Kitchen excluding other outbuildings	WA	Registered
Malus Island Whaling Site	WA	Registered
North West Mercantile Store and Office (former)	WA	Registered
Old Bluestone Building	WA	Registered
Old Cossack Courthouse	WA	Registered
Old Roebourne School	WA	Registered
Police Quarters, Lockup and Service Buildings (former)	WA	Registered
Roebourne Courthouse	WA	Registered
Roebourne Police Station	WA	Registered
Roebourne Post Office and Quarters	WA	Registered
Sherlock Station Group	WA	Registered
Union Bank Building (former)	WA	Registered
West Lewis Island Pastoral Settlement	WA	Registered

State and Territory Reserves [[Resource Information](#)]

Name	State
Barrow Island	WA
Great Sandy Island	WA
Millstream-Chichester	WA
Montebello Islands	WA

Name	State
Montebello Islands	WA
Mungaroona Range	WA
North Sandy Island	WA
Unnamed WA36907	WA
Unnamed WA36909	WA
Unnamed WA36910	WA
Unnamed WA36913	WA
Unnamed WA36915	WA
Unnamed WA38287	WA
Unnamed WA40828	WA
Unnamed WA40877	WA
Unnamed WA41080	WA
Unnamed WA44667	WA
Weld Island	WA

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit,

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area

Name	Status	Type of Presence within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area

- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Department of Environment, Climate Change and Water, New South Wales](#)
- [-Department of Sustainability and Environment, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment and Natural Resources, South Australia](#)
- [-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [-Environmental and Resource Management, Queensland](#)
- [-Department of Environment and Conservation, Western Australia](#)
- [-Department of the Environment, Climate Change, Energy and Water](#)
- [-Birds Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-SA Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Atherton and Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [-State Forests of NSW](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

[Please feel free to provide feedback via the Contact Us page.](#)

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APPENDIX 3: FLORA AND FAUNA LISTINGS

A. DPAW (FORMERLY DEC) LISTED FAUNA

Taxa	Common Name	Conservation Code
Birds		
<i>Ardeotis australis</i>	Australian Bustard	4
<i>Burhinus grallarius</i>	Bush Stone-curlew	4
<i>Phaps histrionica</i>	Flock Bronzewing	4
<i>Actitis hypoleucos</i>	Common Sandpiper	IA
<i>Ardea alba subsp. modesta</i>	Eastern Great Egret	IA
<i>Ardea modesta</i>	Eastern Great Egret	IA
<i>Ardea sacra</i>	Eastern Reef Egret, Eastern Reef Heron	IA
<i>Arenaria interpres</i>	Ruddy Turnstone	IA
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	IA
<i>Calidris alba</i>	Sanderling	IA
<i>Calidris ruficollis</i>	Red-necked Stint	IA
<i>Calidris subminuta</i>	Long-toed Stint	IA
<i>Chlidonias leucopterus</i>	White-winged Black Tern	IA
<i>Cuculus saturatus subsp. optatus</i>	Oriental Cuckoo	IA
<i>Egretta sacra</i>	Eastern Reef Egret, Eastern Reef Heron	IA
<i>Fregata ariel</i>	Lesser Frigatebird	IA
<i>Gallinago stenura</i>	Pin-tailed Snipe	IA
<i>Glareola maldivarum</i>	Oriental Pratincole	IA
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	IA
<i>Limosa limosa</i>	Black-tailed Godwit	IA
<i>Merops ornatus</i>	Rainbow Bee-eater	IA
<i>Numenius minutus</i>	Little Curlew	IA
<i>Numenius phaeopus</i>	Whimbrel	IA
<i>Oceanites oceanicus</i>	Wilson's Storm Petrel	IA
<i>Onychoprion anaethetus</i>	Bridled Tern	IA
<i>Plegadis falcinellus</i>	Glossy Ibis	IA
<i>Pluvialis fulva</i>	Pacific Golden Plover	IA
<i>Pluvialis squatarola</i>	Grey Plover	IA

Taxa	Common Name	Conservation Code
<i>Puffinus pacificus</i>	Wedge-tailed Shearwater	IA
<i>Sterna bengalensis</i>	Lesser Crested Tern	IA
<i>Sterna caspia</i>	Caspian Tern	IA
<i>Sterna dougallii</i>	Roseate Tern	IA
<i>Sterna hirundo</i>	Common Tern	IA
<i>Tringa brevipes</i>	Grey-tailed Tattler	IA
<i>Tringa glareola</i>	Wood Sandpiper	IA
<i>Tringa nebularia</i>	Common Greenshank	IA
<i>Tringa stagnatilis</i>	Marsh Sandpiper	IA
<i>Xenus cinereus</i>	Terek Sandpiper	IA
<i>Falco peregrinus</i>	Peregrine Falcon	S
<i>Calidris canutus</i>	Red Knot	T
<i>Calidris ferruginea</i>	Curlew Sandpiper	T
<i>Calidris tenuirostris</i>	Great Knot	T
<i>Charadrius leschenaultii</i>	Greater Sand Plover	T
<i>Charadrius mongolus</i>	Lesser Sand Plover	T
<i>Falco hypoleucos</i>	Grey Falcon	T
<i>Limosa lapponica</i>	Bar-tailed Godwit	T
<i>Numenius madagascariensis</i>	Eastern Curlew	T
<i>Puffinus huttoni</i>	Hutton's Shearwater	T
Fish		
<i>Leiopotherapon aheneus</i>	Fortescue Grunter	4
Mammals		
<i>Mormopterus loriae subsp. cobourgiana</i>	Little North-western Mastiff Bat	1
<i>Lagorchestes conspicillatus subsp. leichar</i>	Spectacled Hare-wallaby	3
<i>Hydromys chrysogaster</i>	Water-rat	4
<i>Leggadina lakedownensis</i>	Short-tailed Mouse, Lakeland Downs Mouse, Kerakenga	4
<i>Macroderma gigas</i>	Ghost Bat	4
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse, Ngadji	4
<i>Dugong dugon</i>	Dugong	S
<i>Dasyurus hallucatus</i>	Northern Quoll	T
<i>Lagorchestes hirsutus</i>	Rufous Hare-wallaby, Mala	T
<i>Lagostrophus fasciatus subsp. fasciatus</i>	Bernier Is. Banded Hare-wallaby, Mernine	T
<i>Megaptera novaeangliae</i>	Humpback Whale	T
<i>Petrogale lateralis</i>	Black-flanked Rock-wallaby	T
<i>Pseudomys fieldi</i>	Shark Bay Mouse, Djoongari	T

Taxa	Common Name	Conservation Code
Reptiles		
<i>Lerista quadrivincula</i>	Four-chained Slider, skink	1
<i>Notoscincus butleri</i>	Lined Soil-crevice Skink	4
<i>Aprasia rostrata</i>	Monte Bello Worm-lizard	T
<i>Chelonia mydas</i>	Green Turtle	T
<i>Ctenotus angusticeps</i>	Airlie Island Skink	T
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	T
<i>Lerista neviniae</i>	slider, skink	T
<i>Liasis olivaceus subsp. barroni</i>	Pilbara Olive Python	T
<i>Natator depressus</i>	Flatback Turtle	T
Invertebrates		
<i>Dupucharopa millestriata</i>	land snail	2

B. DPAW (FORMERLY DEC) LISTED FLORA

Taxon	Conservation status	WA rank
<i>Goodenia pallida</i>	1	
<i>Acacia glaucocaesia</i>	3	
<i>Gymnanthera cunninghamii</i>	3	
<i>Stackhousia clementii</i>	3	
<i>Terminalia supranitifolia</i>	3	
<i>Goodenia nuda</i>	4	



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Client: Shire of Roebourne

Report	Version	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
Draft report	V1	SSh	HBr	Electronic	13 August 2013

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