Acknowledgements
This document has been prepared by Eco Logical Australia Pty Ltd and Open Lines Consulting.

Disclaimer
This document may only be used for the purpose for which it was commissioned and in accordance with the contract between Eco Logical Australia Pty Ltd and the Department of the Premier and Cabinet. The scope of services was defined in consultation with the Department of the Premier and Cabinet, by time and budgetary constraints imposed by the client, and the availability of reports and other data on the subject area. Changes to available information, legislation and schedules are made on an ongoing basis and readers should obtain up to date information.

Eco Logical Australia Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report and its supporting material by any third party. Information provided is not intended to be a substitute for site specific assessment or legal advice in relation to any matter. Unauthorised use of this report in any form is prohibited.

© Government of Western Australia
Department of the Premier and Cabinet
Dumas House
2 Havelock Street
West Perth WA 6005

Website: www.dpc.wa.gov.au/greengrowthplan
Email: greengrowthplan@dpc.wa.gov.au
Tel: 08 6552 5151
Fax: 08 6552 5001
Published December 2015
Contents

List of Figures .................................................................................................................. ii

List of Tables ..................................................................................................................... iii

21 World and National Heritage Places ............................................................................. 21-1
  21.1 Summary .................................................................................................................... 21-1
  21.2 Introduction ............................................................................................................... 21-1
  21.3 Conservation outcome ............................................................................................. 21-1
  21.4 Fremantle prison (former) ....................................................................................... 21-2
  21.5 Goldfields water supply ............................................................................................ 21-6

22 Future potential listings ................................................................................................. 22-10
  22.1 Summary .................................................................................................................... 22-10
  22.2 Introduction ............................................................................................................... 22-11
  22.3 Matters potentially eligible for listing EPBC Act ...................................................... 22-11
  22.4 Identification of relevant FPAL species and ecological communities ...................... 22-12
  22.5 Nominated Banksia dominated woodlands of the Swan Coastal Plain ...................... 22-18
  22.6 The Estuarine Species Community .......................................................................... 22-27

List of Figures

Figure 21-1: Location of the World and Nationally Heritage Listed Fremantle Prison (former) within the Perth and Peel Region Strategic Assessment Area. ........................................... 21-5

Figure 21-2: Location of the National Heritage Listed Goldfields Water Supply Scheme, Mundaring to Kalgoorlie. ......................................................................................................... 21-9

Figure 22-1: Pre-European and remnant (nominated) distribution of the Banksia dominated woodlands of the Swan Coastal Plain ecological community within the Strategic Assessment Area. Pre-European distribution is shown in green. Nominated remnant distribution is shown in yellow ........................................................................................................ 22-22

List of Tables

Table 21-1: World and National Heritage selection criterion for the Fremantle Prison........................................21-4

Table 21-2: National Heritage Criteria for the Goldfields Water Supply Scheme ..................................................21-7

Table 22-1: Western Australian fauna on the Finalised Priority Assessment List (FPAL) – items currently under assessment ..............................................................................................................................................22-14

Table 22-2: Western Australian flora on the Finalised Priority Assessment List (FPAL) – items currently under assessment ..............................................................................................................................................22-16

Table 22-3: Western Australian ecological communities on the Finalised Priority Assessment List (FPAL) – items currently under assessment ..............................................................................................................................................22-17

Table 22-4: Threatened ecological communities listed under the WC Act that comprise the nominated Banksia dominated woodlands of the Swan Coastal Plain community .......................................................................................................................22-18

Table 22-5: Priority ecological communities that comprise the nominated Banksia dominated woodlands of the Swan Coastal Plain community .........................................................................................................................22-19

Table 22-6: EPBC Act criterion for which the Banksia Woodlands community has been nominated ..............................................................................................................................................22-19

Table 22-7: EPBC Act criterion for which the Estuarine Species Community has been nominated against for listing ..............................................................................................................................................22-27
21 World and National Heritage Places

21.1 SUMMARY

Two World and/or National Heritage Places occur within the Strategic Assessment Area. They are:

- The former Fremantle Prison which is listed as both a World and National Heritage Place.
- The Goldfields Water Supply Scheme which is listed as a National Heritage Place. It occurs partially within the Strategic Assessment Area where it extends east from Mundaring Weir for 560 km to Kalgoorlie (which is outside the Strategic Assessment Area).

There will be no impacts to these places from the classes of action and existing management regimes will ensure that the conservation objectives will be achieved through implementation of the Strategic Conservation Plan.

21.2 INTRODUCTION

Two World and/or National Heritage Places were identified as being present within, or within 10 km of the Strategic Assessment Area. These include:

- The former Fremantle Prison which is listed as both a World and National Heritage Place.
- The Goldfields Water Supply Scheme which is listed as a National Heritage Place. It occurs partially within the Strategic Assessment Area where it extends east from Mundaring Weir for 560 km to Kalgoorlie (which is outside the Strategic Assessment Area).

This chapter provides:

- a conservation outcome for World and National Heritage;
- a description of each place and its heritage values;
- a conservation objective for each place; and
- the overall outcome for each place.

21.3 CONSERVATION OUTCOME

The conservation outcome for World and National Heritage is:

_The values of World and National Heritage places within the Perth and Peel regions are maintained, with measures and actions consistent with Australia’s international obligations or relevant National Heritage commitments._

This conservation outcome is included in the Strategic Conservation Plan and is a key component to the implementation of the strategic assessment.
21.4 FREMANTLE PRISON (FORMER)

21.4.1 Description

The Fremantle Prison (former) is one of a number of sites in Australia that make up the World Heritage ‘Australian Convict Sites’ listing and is located in Fremantle, Western Australia (Figure 21-1). This listing is comprised of eleven complementary sites that represent an outstanding and large-scale example of the forced migration of convicts (DoE 2015d). The ‘Australian Convict Sites’ listing is made up of:

- Old Government House and Domain (NSW);
- Hyde Park Barracks (NSW);
- Cockatoo Island Convict Site (NSW);
- Old Great North Road (NSW);
- Kingston and Arthur’s Vale Historic Area (Norfolk Island);
- Port Arthur Historic Site (Tas);
- Cascades Female Factory (Tas);
- Darlington Probation Station (Tas);
- Coals Mines Historic Site (Tas);
- Estates (Tas); and
- Fremantle Prison (WA).

The Fremantle Prison (WA) component of this World Heritage Listing is comprised of the area defined in the Fremantle Prison Heritage Precinct Master Plan (Palassis Architects 2003). This includes seventeen convict built structures (Palassis Architects 2003).

The Fremantle Prison is also listed on the National Heritage List. As with the World Heritage Listing, the National Heritage Listing includes the area covered by the Fremantle Prison Heritage Precinct Master Plan (Palassis Architects 2003). This area is comprised of prison buildings located at 1 The Terrace, Fremantle, an access ramp (Fairbairn Street Ramp) and the Warders Cottage located at 7 - 41 Henderson Street. The total area of the site is approximately 6 ha.

The Fremantle Prison functioned as a prison until it was decommissioned in 1991. The Prison now operates as a tourist attraction and is managed by the Department of Finance - Building and Management Works. It was constructed using convict labour from limestone quarried on the site and timber cut sourced form the local area. It is a dominant building in Fremantle as it is located in a raised position overlooking the port and surrounds (DoE 2015d).

Due to its use as a prison for over 100 years, it has remained architecturally intact and contains materials and structures which demonstrate use of the building as an imperial convict public works establishment and adaptation for subsequent colonial and state use (DoE 2015d).

The Statement of Significance for the National Heritage listing of the site states that Fremantle Prison demonstrates the principal characteristics of an Australian Convict Site indicating that (DoE 2015d):

- “it presents aspects of Australia’s convict system including changing attitudes to punishment, reform, education and welfare;
• the Fremantle Prison in its present form demonstrates with some precision the facilities, conditions and attitudes prevailing in a major Western Australian prison – an experience rarely available to the public and made more immediate by the retention of graffiti, murals, signs, notices and recent evidence of use;

• the form and location of elements at Fremantle Prison display deliberate design and arrangement, reflecting the order and hierarchy of the place's history and function as a Prison;

• the built environment at Fremantle Prison displays a large, surviving concentration of 19th and early 20th century structures characterised by a homogeneity of form, materials, textures and colour;

• substantial parts of the site include archaeological deposits of material culture, which can be analysed to yield information about the site unavailable from documentary sources alone; and

• Fremantle Prison, its artefacts, furnishings and fittings, written and painted graffiti and records, including published material, photographs, historical, archaeological and architectural records, and databases, provide an extensive resource for a broad range of historical and social research.”

21.4.2 World and National Heritage Values

The Australian Convict Sites has been listed against two of the selection criteria outlined in the Operational Guidelines for the Implementation of the World Heritage Convention (UNESCO 2013). These being:

• Criterion (iv): to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history; and

• Criterion (vi): to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.

The Fremantle Prison (former) property meets five of the nine National Heritage Listing criteria including:

• Criteria (a): the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history.

• Criteria (b): the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.

• Criteria (c): the place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.

• Criteria (d): the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of:
  o a class of Australia's natural or cultural places; or
  o a class of Australia's natural or cultural environments.

• Criteria (g): the place has outstanding heritage value to the nation because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.

The following table (Table 21-1) provides examples of how the Fremantle Prison (former) meets the above criterion.
### Table 21-1: World and National Heritage selection criterion for the Fremantle Prison

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description/Examples of aspects that meet the Selection Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>World Heritage Values</strong></td>
<td></td>
</tr>
<tr>
<td>Criterion (iv)</td>
<td>“The Australian convict sites constitute an outstanding example of the way in which conventional forced labour and national prison systems were transformed, in major European nations in the 18th and 19th centuries, into a system of deportation and forced labour forming part of the British Empire’s vast colonial project. They illustrate the variety of the creation of penal colonies to serve the many material needs created by the development of a new territory. They bear witness to a penitentiary system which had many objectives, ranging from severe punishment used as a deterrent to forced labour for men, women and children, and the rehabilitation of the convicts through labour and discipline.”</td>
</tr>
<tr>
<td>Criterion (vi)</td>
<td>“The transportation of criminals, delinquents, and political prisoners to colonial lands by the great nation states between the 18th and 20th centuries is an important aspect of human history, especially with regard to its penal, political and colonial dimensions. The Australian convict settlements provide a particularly complete example of this history and the associated symbolic values derived from discussions in modern and contemporary European society. They illustrate an active phase in the occupation of colonial lands to the detriment of the Aboriginal peoples, and the process of creating a colonial population of European origin through the dialectic of punishment and transportation followed by forced labour and social rehabilitation to the eventual social integration of convicts as settlers.”</td>
</tr>
<tr>
<td><strong>National Heritage Values</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Criterion (a) | • An outstanding example of a nineteenth century convict establishment.  
• The most intact convict establishment in Australia. |
| Criterion (b) | • One of the most intact examples of Australia’s convict era.  
• It’s rarity is expressed through physical elements of the property including the 1859 main cell block, chapel and wards, yards and refractory cells; perimeter walls, gate house complex and prison officer residences on the Terrace; service buildings and hospital; south-eastern workshops; Fairbairn Street ramp access tramway, and the three terraces built as Warders’ Cottages, 7-17, 19-29 and 31-41 Henderson Street. |
| Criterion (c) | • The material culture present provides historical and social research opportunities into the convict experience. |
| Criterion (d) | • The Prison provides an important example of Australia’s convict system and the period in which Western Australia was developed using convict labour. |
| Criterion (e) | • The Prison played a significant role in Western Australian society over more than one hundred years (1852 – 1991).  
• Strong associations with communities in Western Australia, and more broadly, Australia.
Figure 21-1: Location of the World and Nationally Heritage Listed Fremantle Prison (former) within the Perth and Peel Region Strategic Assessment Area
21.4.3 Conservation objective

The conservation objective for the Fremantle Prison is to:

_Continue to manage the Fremantle Prison (former) to maintain its World and National Heritage values._

This conservation objective is included in the Strategic Conservation Plan and is a key component to the implementation of the strategic assessment.

21.4.4 Outcome for the Fremantle Prison (former)

The Fremantle Prison (former) is located within a developed urban area of the Strategic Assessment Area, approximately 16 km south-west of the Perth CBD. The Prison is currently operated as a tourist attraction, with approximately 175,000 visitors per year (Palassis Architects 2010). The Prison is managed by the Department of Finance - Building Management and Works Division.

Fremantle Prison Conservation Management Plan (Palassis Architects 2010) and the Fremantle Prison Heritage Precinct Master Plan (Palassis Architects 2003) are the key policies which detail the measures required to maintain the World and National heritage values of the site.

The conservation objective for the Prison will be met as the classes of action under the Strategic Conservation Plan do not include any proposed works at the Prison, or in the surrounding urban area. Therefore, there will be no direct or indirect impacts to the Fremantle Prison (former).

Given the current conservation management regime implemented by the Department of Treasury and Finance – Building Management and Works Division, additional conservation commitments are not considered necessary to ensure the conservation objective is met.

21.5 GOLDFIELDS WATER SUPPLY

21.5.1 Description

The Goldfields Water Supply Scheme runs for 560 km from Mundaring (within the Strategic Assessment Area) to Kalgoorlie (outside the Strategic Assessment Area) (see Figure 21-2). The Scheme is comprised of dams (pondages), an extensive pipeline network, tanks, reservoirs and pump stations. It was commissioned by the first Premier of Western Australia, Sir John Forrest, and designed by Charles Yelverton O'Connor, a well-respected engineer of that time, to provide water to service the needs of the Western Australian goldfields. The pipeline was opened in 1903. The Scheme represents major advances in pipeline technology in the early 1900’s as:

- it was the first pipeline in the world to be made of steel;
- design of the pipes used innovative Australian design in the locking bar pipe which negated the need for riveting and prevented water leakage from rivet-holes; and
- when refurbished in 1933, the pipeline was lifted out of the ground and re-laid above ground, reflecting recent advances in pipeline technology worldwide (DoE 2015d).

The Scheme is recognised as an outstanding achievement for its time, and was recognised as one of the most significant engineering projects of the 20th Century by the American Society of Civil Engineers.
The pipeline, extensions and associated infrastructure continue to service the south-western Australian wheatfields today. It is currently operated by the Western Australian Water Corporation. The pipeline provides services to the agricultural area and eastern goldfields through 8,000 km of pipelines and 40 pumping stations (DoE 2015d).

The listing of the Goldfields Water Supply Scheme specifically relates to:

“…. the remaining extant features of the 1903 Scheme: the main conduit of the pipeline (the length of pipeline including all locking bar pipes, wood stave pipe and continuously welded pipes from Mundaring Weir to Mount Charlotte); with its surviving pumping stations (Pump Stations Nos 1, 3, 5,6 and 8) and their associated equipment (including the pumps, boilers, compressors, venturi meters and reservoirs located at Pump Stations 2, 4, 7 and 8), regulating tanks (located at Bullabulling, Toorak Hill, Bakers Hill and West Northam) and the Mundaring Weir (dam, including the valve houses, spillway, the weir wall profile and fabric) and the round Mount Charlotte Reservoir at Kalgoorlie.”

21.5.2 National Heritage Values

The Goldfields Water Supply Scheme meets four of the nine National Heritage Criteria including:

- Criteria (a): the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history.

- Criteria (f): the place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.

- Criteria (g): the place has outstanding heritage value to the nation because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.

- Criteria (h): the place has outstanding heritage value to the nation because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.

The following table (Table 21-2) provides examples of how the Goldfields Water Supply Scheme meets the above criterion.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description/Examples of aspects that meet the Selection Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion (a)</td>
<td>Represents an important part of Australia's cultural history as the scheme led to the growth of Western Australia through enabling agriculture and settlement to occur in the Western Australian wheatbelt.</td>
</tr>
<tr>
<td>Criterion (f)</td>
<td>Demonstrates a high degree of creative or technical achievement, as it is highly significant for its instigation and application of Australian technological innovation in the late 1800's and early 1900's.</td>
</tr>
<tr>
<td>Criterion (g)</td>
<td>Important to a number of communities which became established as a result of the development.</td>
</tr>
<tr>
<td>Criterion (h)</td>
<td>Description/Examples of aspects that meet the Selection Criterion</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>• The Goldfields Water Development Scheme is associated with Western Australia’s first Premier, Sir John Forrest as he commissioned the development.</td>
</tr>
<tr>
<td></td>
<td>• The engineer for the pipeline, Charles Yelverton O’Connor, was highly respected in Australia at the time and was responsible for developing the majority of infrastructure in Perth in the early 1900s, including the railway and harbours.</td>
</tr>
</tbody>
</table>

### 21.5.3 Conservation objective

The conservation objective for the Nationally Heritage listed Goldfields Water Supply Scheme is to:

*Continue to manage the Goldfields Water Supply Scheme to maintain its National Heritage values.*

This conservation objective is included in the Strategic Conservation Plan and is a key component to the implementation of the strategic assessment.

### 21.5.4 Outcome for the Goldfields Water Supply Scheme

Approximately 23 km of the Goldfields Water Supply Scheme pipeline (and associated infrastructure) occurs within the boundaries of the Strategic Assessment Area. Some sections of the pipeline pass through existing urban and rural areas, such as Sawyers Valley, Mount Helena and Chidlow. As can be seen in Figure 21-2, the Urban and Rural class of action footprints occur adjacent to the pipeline and existing infrastructure. Therefore, there is potential for some further urban and or rural development to occur in areas adjacent to the pipeline (Table 21-2).

The Goldfields Water Supply Scheme pipeline is currently operational and is managed by the Western Australian Water Corporation. The pipeline is maintained and upgraded by the Water Corporation and there are plans to replace approximately 15 km sections of the pipeline annually.

The Water Corporation, National Trust and stakeholders of the Goldfields and Agricultural region are currently developing a Management Plan for the pipeline. The Management Plan will provide policies that recognise and maintain operational flexibility while maintaining the heritage values of the Scheme.

Works adjacent to any Water Corporation pipelines (including the Goldfields Water Supply Scheme pipeline) must be conducted in accordance with the Corporation’s Pipeline Protection Guide.

The conservation objective for the Goldfields Water Supply Scheme will be met on the basis that:

- there will be no direct impacts to the pipeline as a result of the proposed class of actions in the Strategic Conservation Plan; and
- the current management regime implemented by the Water Corporation provides for the protection of the heritage values into the future.

Additional conservation commitments are not considered necessary.
Figure 21-2: Location of the National Heritage Listed Goldfields Water Supply Scheme, Mundaring to Kalgoorlie

Legend
- **Strategic Assessment Area**
- **Goldfields Water Supply Scheme, Western Australia**
- **Rural footprint**
- **Industrial footprint**
- **Urban footprint**

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: JL Date: 18/11/2015
## Future potential listings

### 22.1 SUMMARY

Two ecological communities that occur within the Strategic Assessment Area are considered likely to be listed as threatened under the EPBC Act in the foreseeable future. They are:

- **Banksia dominated woodlands of the Swan Coastal Plain IBRA region (Banksia Woodlands).** Nominated for vulnerable listing (noting that it may be listed as endangered).
- **The Community of estuarine species dependent on salt-wedge estuaries in southern Australia (Estuarine Species Community).** Nominated for endangered listing.

Both ecological communities are part of the Commonwealth's current Final Priority Assessment List. No other matters that are part of that listing process are considered relevant to the strategic assessment.

### 22.1.1 Banksia Woodland

Mapping indicates that there is an estimated total of 445,407 ha of remnant Banksia Woodland. Of this, 110,109 ha occurs within the Strategic Assessment Area (or approximately 25% of the estimated total area of the remnant extent). Of the 110,109 ha within the Strategic Assessment Area:

- 53,562 ha (48.6%) occurs in protected areas (IUCN I-IV and other land managed by Parks and Wildlife).
- 12,668 ha (11.5%) intersects with the classes of action.
- 43,879 ha (39.9%) occurs in other parts of the Strategic Assessment Area.

It is expected that further avoidance, mitigation and offset measures throughout the life of the Strategic Conservation Plan will reduce potential impacts to the ecological community. In particular, the following measures will provide beneficial outcomes:

- further avoidance of approximately 3,000 ha within the classes of actions;
- rehabilitation of Banksia Woodland associated with BRM (approximately 400 ha) and infrastructure (to be determined as projects proceed); and
- ongoing offsets program to deliver 170,000 ha of land including substantial areas of Banksia Woodland (to be determined as the conservation program proceeds).

Despite these measures, it is expected that the classes of action will place additional pressures on the ecological community. It will be important over the life of the Strategic Conservation Plan to monitor and adaptively manage outcomes for Banksia Woodland. Particularly in the case that it becomes listed as threatened under the EPBC Act.
22.1.2 Estuarine Species Community

The Estuarine Species Community is present within the Swan River and may be greater than 50 km in length. The key issue for the ecological community within the Strategic Assessment Area is ongoing management of potential indirect impacts. Particularly, impacts associated with changes to hydrological regimes and increases to nutrient run-off.

The Strategic Conservation Plan includes a range of measures to address ongoing pressures and potential indirect impacts that are relevant to the Estuarine Species Community. These measures include:

- A package of measures (as State commitments in Action Plan G) to improve the health of the Swan Canning system. This will include a focus on reducing nutrient inflows into the system.
- Over-arching commitments in Action Plan F to ensure that potential indirect impacts of development (including issues associated with hydrology) are considered and addressed in ongoing State planning and approvals processes.

Based on the application of these measures, it is not expected for the classes of action to lead to additional pressures to the ecological community.

22.2 INTRODUCTION

The Strategic Conservation Plan is proposed to have effect until 2050, as the Perth and Peel region expands to accommodate a population of 3.5 million people. Given this long timeframe, the assessment considers potential impacts to matters that are considered to have a high likelihood of being listed under the EPBC Act during this time.

This chapter provides an analysis of these future potential listings. It:

- outlines the process for identifying the matters that are potentially eligible for listing under the EPBC Act;
- identifies the relevant matters for assessment; and
- provides an assessment of the threats, pressures and likely outcomes for the two relevant matters.

It is important to note that the level of information available about the potentially listed matters is less detailed than that available for category 1 and 2 MNES. As a result, the assessment in this chapter is focused at a higher level and looks at the likely levels of threat and likely outcomes for these matters.

22.3 MATTERS POTENTIALLY ELIGIBLE FOR LISTING EPBC ACT

The matters considered to have a high likelihood of being potentially eligible for future listing under the EPBC Act are those:

- currently included in a Final Priority Assessment Listing; or
otherwise recommended to the Minister for listing by the Threatened Species Scientific Committee (TSSC) prior to submission of this report.

A Final Priority Assessment Listing (FPAL) is a list of species, ecological communities and key threatening processes that have been nominated by the public, organisations or the Threatened Species Scientific Community (TSSC) for listing under the EPBC Act. Once the Minister approves this list, each item is required to be assessed by the TSSC within a statutory timeframe.

The TSSC determines through the assessment whether the nominated species or ecological community meets criterion under the EPBC Act for listing as a threatened species or ecological community. Should it be listed, the relevant EPBC Act legislative requirements for the protection of MNES would then apply.

The following sections identify and analyse these matters in relation to the Strategic Conservation Plan. The aim of this analysis is to identify:

- species and ecological communities on the current FPAL list relevant to the Strategic Assessment Area;
- the potential risks to these matters from future development within the Strategic Assessment Area;
- measures under the Strategic Conservation Plan which would contribute to the ongoing management and protection of these matters; and
- the need for any additional management measures to address potential outstanding risks to these matters.

### 22.4 IDENTIFICATION OF RELEVANT FPAL SPECIES AND ECOLOGICAL COMMUNITIES

Western Australian species and ecological communities currently under assessment by the Threatened Species Scientific Committee were identified and assigned to one of two categories. The two categories are:

- Relevant - there are records and/or suitable habitat present for the species or ecological community within the Strategic Assessment Area.
- Not relevant - there are no records or suitable habitat present within the Strategic Assessment Area.

The following information was used to determine the category for each FPAL nominated species or ecological community:

- NatureMap;
- Species Profile and Threats Database (DoE 2015a);
- mapping data from nomination forms (where available);
- published reference articles; and
- advice from Western Australian Department of Parks and Wildlife (Parks and Wildlife).

The following tables (Table 22-1, Table 22-2, Table 22-3) present each of the identified species and ecological communities, the category they have been assigned to, and a brief justification for the categorisation.
The likelihood of occurrence assessment identified that:

- All Western Australian flora and fauna currently on the FPAL (17 in total) do not occur within the Strategic Assessment Area and are therefore considered to not be relevant to the assessment.

- Two ecological communities currently on the FPAL (Banksia dominated woodlands of the Swan Coastal Plain, and the Estuarine Species Community) are known to occur within the Strategic Assessment Area and are therefore relevant to the assessment.

- One ecological community (Posidonia Seagrass Meadows) has the potential to occur in coastal waters adjacent to the Strategic Assessment Area. However the Seagrass Meadows of Western Australia are no longer being considered as part of the nomination, and have therefore not been considered further in this report.

The two ecological communities determined to be relevant are discussed in detail in Section 22.5.1 below.
<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common name</th>
<th>EPBC current status</th>
<th>WA status</th>
<th>Relevance category</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erythrotiorchis radiatus</td>
<td>Red Goshawk</td>
<td>Vulnerable</td>
<td>Vulnerable</td>
<td>Not relevant</td>
<td><em>Erythrotiorchis radiatus</em> only occurs in northern Western Australia and within tropical areas of Australia. This species does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td>Erythura goulidae</td>
<td>Gouldian Finch</td>
<td>Endangered</td>
<td>Not listed</td>
<td>Not relevant</td>
<td><em>Erythura goulidae</em> does not occur within the Strategic Assessment Area. It is restricted to the northern parts of Australia.</td>
</tr>
<tr>
<td>Malurus coronatus coronatus</td>
<td>Purple-crowned Fairy Wren</td>
<td>Vulnerable</td>
<td>Endangered</td>
<td>Not relevant</td>
<td><em>Malurus coronatus coronatus</em> is restricted to the Kimberley region in Western Australia, and Victoria River Downs in the Northern Territory. This species does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notoryctes caurinus</td>
<td>Kakarratul</td>
<td>Endangered</td>
<td>Endangered</td>
<td>Not relevant</td>
<td><em>Notoryctes caurinus</em> occurs in sandy deserts around 1000 km from the Strategic Assessment Area.</td>
</tr>
<tr>
<td>Notoryctes typhlops</td>
<td>Itjaritjari</td>
<td>Endangered</td>
<td>Endangered</td>
<td>Not relevant</td>
<td><em>Notoryctes typhlops</em> occurs in sandy deserts over 750 km away and therefore does not occur in the Strategic Assessment Area.</td>
</tr>
<tr>
<td>Petrogale concinna monastria</td>
<td>Nabarlek (Kimberley)</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not relevant</td>
<td><em>Petrogale concinna monastria</em> only occurs in the Kimberley region. This species therefore does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td>Phascogale tapoatafa</td>
<td>Brush-tailed Phascogale</td>
<td>Not listed</td>
<td>Vulnerable</td>
<td>Not relevant</td>
<td><em>Phascogale tapoatafa</em> only occurs in the Kimberley region. This species therefore does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td><strong>Insects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ogyris subterrestris petrina</td>
<td>Arid bronze azure butterfly</td>
<td>Critically Endangered</td>
<td>Critically Endangered</td>
<td>Not relevant</td>
<td><em>Ogyris subterrestris petrina</em> occurs in South-East Western Australia. The nearest known occurrence to the Strategic Assessment Area is at Muckinbudin, over 200 km away. This species does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td>Scientific name</td>
<td>Common name</td>
<td>EPBC current status</td>
<td>WA status</td>
<td>Relevance category</td>
<td>Comment</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------</td>
<td>---------------------</td>
<td>-------------</td>
<td>--------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><em>Ordtrachia septentrionalis</em></td>
<td>A snail</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not relevant</td>
<td><em>Ordtrachia septentrionalis</em> occurs in only two locations: one in the Northern Territory and the other across the border into northern Western Australia. This species therefore does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td><strong>Sharks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Sphyrna lewini</em></td>
<td>Scalloped hammerhead</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not relevant</td>
<td>These three species occur throughout tropical and warm temperate offshore waters in Australia (DoE 2015a) and may occur as transient individuals offshore of the Strategic Assessment Area. There are no known important feeding or aggregation areas for these species in the offshore areas surrounding Perth.</td>
</tr>
<tr>
<td><em>Sphyrna mokarran</em></td>
<td>Great hammerhead</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not relevant</td>
<td></td>
</tr>
<tr>
<td><em>Sphyrna zygaena</em></td>
<td>Smooth hammerhead</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not relevant</td>
<td></td>
</tr>
</tbody>
</table>
### Table 22-2: Western Australian flora on the Finalised Priority Assessment List (FPAL) – items currently under assessment

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common name</th>
<th>EPBC status</th>
<th>WA status</th>
<th>Relevance category</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia leptoneura</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not relevant</td>
<td>Acacia leptoneura is found north-east of Dowerin, over 120 km from the Strategic Assessment Area boundary in the Avon Wheatbelt region of Western Australia. The species therefore does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td>Atriplex sp. Yeelirrie Station (L. Trotter &amp; A. Douglas LCH 25025)</td>
<td>A saltbush</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not relevant</td>
<td>Atriplex sp. Yeelirrie Station (L. Trotter &amp; A. Douglas LCH 25025) only occurs in Central Western Australia. It is found near Wiluna, over 600 km from the Strategic Assessment Area boundary. This species therefore does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td>Carex paupera</td>
<td>Dwarf sedge</td>
<td>Vulnerable</td>
<td>Not listed</td>
<td>Not relevant</td>
<td>Carex paupera has been placed on the FPAL list with a nomination to delist the species. The listed species Carex paupera (Vulnerable) from Victoria is now considered to be a junior synonym of common species Carex inversa. C. inversa is found throughout southern Australia, including Western Australia. It is proposed that the junior synonym be delisted from the EPBC Act.</td>
</tr>
<tr>
<td>Hibbertia abyssa</td>
<td>A shrub</td>
<td>Not listed</td>
<td>Not listed</td>
<td>Not relevant</td>
<td>Hibbertia abyssa is only found to occur within a location near Esperance in Western Australia, over 400 km from the boundary of the Strategic Assessment Area. This species therefore does not occur within the Strategic Assessment Area.</td>
</tr>
<tr>
<td>Philotheca falcata</td>
<td>Sickle-leaved Waxflower</td>
<td>Critically endangered</td>
<td>Endangered</td>
<td>Not relevant</td>
<td>Philotheca falcata occurs 250 km to the east of the Strategic Assessment Area boundary in a different bioregion. This species therefore does not occur within the Strategic Assessment Area.</td>
</tr>
</tbody>
</table>
Table 22-3: Western Australian ecological communities on the Finalised Priority Assessment List (FPAL) – items currently under assessment

<table>
<thead>
<tr>
<th>Name</th>
<th>EPBC status</th>
<th>WA status</th>
<th>Relevance category</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banksia dominated woodlands of the Swan Coastal Plain bioregion</td>
<td>Not listed</td>
<td>Not applicable</td>
<td>Relevant</td>
<td>This ecological community has been nominated to be listed as Vulnerable. It is discussed further in Section 22.5 below.</td>
</tr>
<tr>
<td>The Estuarine Species Community</td>
<td>Not listed</td>
<td>Not applicable</td>
<td>Relevant</td>
<td>This ecological community has been nominated to be listed as Endangered. It is discussed further in Section 22.6 below.</td>
</tr>
<tr>
<td>Posidonia Seagrass Meadows</td>
<td>Not listed</td>
<td>Not applicable</td>
<td>Not relevant</td>
<td><em>Posidonia</em> seagrass meadows of Western Australia are no longer being considered as part of the nominated <em>Posidonia</em> seagrass meadow ecological community (DoE 2015, pers. comm. 30 Apr.). The assessment by the Threatened Species Scientific Committee for this community will now be comprised of the <em>Posidonia</em> seagrass meadows of New South Wales only. Therefore, this community has not been considered further in relation to the Strategic Conservation Plan.</td>
</tr>
<tr>
<td>Eucalypt Woodlands of the Western Australia Wheatbelt</td>
<td>Not listed</td>
<td>Not applicable</td>
<td>Not relevant</td>
<td>The Eucalypt Woodlands of the Western Australia Wheatbelt occur in to the east and south of the Strategic Assessment Area boundary, within the Avon Wheatbelt and Mallee subregions of southern Western Australia. This community therefore does not occur within the Strategic Assessment Area.</td>
</tr>
</tbody>
</table>
22.5 NOMINATED BANKSIA DOMINATED WOODLANDS OF THE SWAN COASTAL PLAIN

The description and assessment of the Banksia dominated woodlands of the Swan Coastal Plain community is based on information provided in:

- The nomination form for ‘Banksia dominated woodlands of the Swan Coastal Plain IBRA region’ community (UBC WA & WSWA 2012).
- The ‘Banksia Dominated Woodlands of the Swan Coastal Plain – Draft definition and other workshop outcomes (DoE 2014a).

22.5.1 Current EPBC Act listing status

Banksia Woodlands is not currently listed under the EPBC Act as a threatened ecological community.

22.5.2 Current WC Act listing status

There are three threatened ecological communities (TECs) (Table 22-4), and four Priority Ecological Communities (PECs) (Table 22-5) listed by the WA State Government that comprise the nominated Banksia dominated woodlands of the Swan Coastal Plain.

*Table 22-4: Threatened ecological communities listed under the WC Act that comprise the nominated Banksia dominated woodlands of the Swan Coastal Plain community*

<table>
<thead>
<tr>
<th>Identifier category</th>
<th>Community name</th>
<th>WA Category</th>
<th>EPBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCP20a</td>
<td><em>Banksia attenuata</em> woodland over species rich dense shrublands</td>
<td>EN</td>
<td>Not listed</td>
</tr>
<tr>
<td>SCP20b</td>
<td><em>Banksia attenuata</em> and/or <em>Eucalyptus marginata</em> woodlands of the eastern side of the Swan Coastal Plain</td>
<td>EN</td>
<td>Not listed</td>
</tr>
<tr>
<td>SCP20c</td>
<td>Shrublands and woodlands of the eastern side of the Swan Coastal Plain</td>
<td>CR</td>
<td>EN</td>
</tr>
</tbody>
</table>
Table 22-5: Priority ecological communities that comprise the nominated Banksia dominated woodlands of the Swan Coastal Plain community

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Community Name</th>
<th>WA category</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCP22</td>
<td>Banksia ilicifolia woodlands, southern Swan Coastal Plain (‘community type 22’)</td>
<td>P2</td>
</tr>
<tr>
<td>SCP23b</td>
<td>Swan Coastal Plain Banksia attenuata - Banksia menziesii woodlands (‘community type 23b’)</td>
<td>P3</td>
</tr>
<tr>
<td>SCP21c</td>
<td>Low lying Banksia attenuata woodlands or shrublands (‘community type 21c’)</td>
<td>P3</td>
</tr>
<tr>
<td>SCP21b</td>
<td>Southern Banksia attenuata woodlands (‘community type 21b’)</td>
<td>P3</td>
</tr>
</tbody>
</table>

22.5.3 Current nomination status

The Banksia dominated woodlands of the Swan Coastal Plain (Banksia Woodlands community) was nominated by the Urban Bushland Council of Western Australia and Wildflower Society of Western Australia for listing as a vulnerable threatened ecological community under the EPBC Act in March 2012 (UBC WA & WSWA 2012). The Banksia Woodlands community is currently under assessment by the Threatened Species Scientific Community (TSSC).

The Banksia Woodlands community has been nominated to be listed as a vulnerable threatened ecological community under the EPBC Act as it was considered to meet the criteria as provided in Table 22-6 below (UBC WA & WSWA 2012).

It is important to note that a vulnerable listed threatened ecological community under the EPBC Act is not an MNES (that only applies to endangered or critically endangered listings). However, despite being nominated as vulnerable it is possible that it will be listed as endangered.

Table 22-6: EPBC Act criterion for which the Banksia Woodlands community has been nominated

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 1 - Decline in geographic distribution</td>
<td>There has been a large decline of &gt;70% of the original distribution of the community. It is estimated that 30% or less of the pre-European settlement distribution remains, with less than 10% of the distribution remaining in the inner regions around Perth.</td>
</tr>
<tr>
<td>Criterion 3 - Loss or decline of functionally important species</td>
<td>Pollinator species associated with the Banksia Woodland community have experienced considerable population declines. Small mammals such as Tarsipes rostrum (Honey Possum) and some small bird species have become locally extinct.</td>
</tr>
<tr>
<td>Criterion 4 – Reduction in community integrity</td>
<td>Banksia Woodland has experienced ongoing reduction in community integrity as a result of frequent fires and loss of mammal and invertebrate species. Community integrity has also been reduced through reduced vegetation condition resulting from weed invasion and Phytophthora dieback.</td>
</tr>
<tr>
<td>Criterion 5 - Rate of continuing detrimental change</td>
<td>The rate at which the distribution of Banksia Woodland is declining is considered by experts and community groups to be of significant concern. Clearing and fragmentation from urban expansion, and repeated disturbance from fire and weed invasion are have and will continue to cause detrimental change to the community.</td>
</tr>
</tbody>
</table>
22.5.4 Draft Banksia Woodlands description

A draft description of the nominated Banksia Woodlands community has been developed by the Department of the Environment in consultation with relevant stakeholders, experts and members of the TSSC. The definition of the community is likely to be further refined as the assessment of the nomination of the community is progressed. The current draft description for the Banksia Woodlands community states that:

“The ecological community is a woodland that is typically dominated by a tree canopy of Banksia with other scattered trees, generally Eucalyptus and Allocasuarina, a dense species rich shrub layer and a diverse ground layer.” (DoE 2014a).

The draft description also states that Banksia Woodlands are comprised of the following principal structural vegetation features:

- A distinctive upper sclerophyllous layer of low trees (occasionally large shrubs, more than 2 m tall, dominated or co-dominated by one or more of the Banksia species identified below; including at least one of the following species: Banksia attenuata (candlestick banksia), Banksia menziesii (firewood banksia), Banksia prionotes (acorn banksia), Banksia ilicifolia (holly-leaved banksia).
- A species-rich sclerophyllous shrub layer and sometimes grasses.
- A species rich herbaceous layer.
- In the canopy, a tree layer of medium height, including Eucalyptus or Allocasuarina species, (>10 m tall), may occur (DoE 2014a).

Variability in the composition of species and structural vegetation features (height, cover and density) is also recognised in the nomination form and draft description of Banksia Woodlands as being a consideration when identifying the community.

The variation can be attributed to differences in rainfall, soil condition, availability of soil resources (i.e. water, nutrients) or natural (fire) or human-induced disturbances throughout the Swan Coastal Plain. These factors can further interact with groundwater levels, groundwater quality, and seasonal fluctuations and flows in groundwater to result in variation within the community structure. In some locations, high variation in the composition of the community can occur across short distances of less than 500 m (DoE 2014a). Variation is particularly evident in the shrub and grass layers of the community.

Key diagnostic characteristics and condition thresholds are currently being drafted as part of the nomination assessment of the community to ensure the natural variation and degree of degradation throughout the community is taken into account (DoE 2014a).

22.5.5 Nominated distribution of Banksia Woodlands

Banksia Woodland is only found in Western Australia. The community is considered to occur only in the South West bioregion of Western Australia, which includes the Dandaragan Plateau (SWA1) and the Swan Coastal Plain (SWA2) subregions of the Interim Biogeographic Regionalisation of Australia (Commonwealth of Australia 2012). This area extends from Jurien Bay to the north, to Busselton in the south.
The current distribution of the community is described as being highly fragmented in the nomination form of the community (UBC WA & WSWA 2012). Fragmentation of the community occurs to a lesser extent on the northern Swan Coastal Plain, north of the Moore River.

The original extent of the community has been estimated to be approximately 690,900 ha. This extent is comprised from an estimate of Banksia low woodland (622,900 ha) and Banksia woodland with scattered emergent eucalypts (68,000 ha) as calculated from a “Vegetation Survey of Western Australia” (Beard & Sprenger 1984). The extent has been estimated to have declined by approximately >70% (Keighery GJ, pers. comm. 2012 in DoE 2012). However, the nomination form notes that the loss of the community around central Perth is likely to be greater, with approximately only 10% remaining in this urbanised area (UBC WA & WSWA 2012).

The pre-European extent and remnant (nominated) distribution of the Banksia Woodlands community within the Strategic Assessment Area is shown in Figure 22-1 below.

22.5.6 Nominated description of habitat and ecology

The nomination of the Banksia Woodlands community describes it as occurring on the dominant landforms of the Swan Coastal Plain including Quindalup Dunes, Spearwood Dunes, Bassendean Dunes and, to a very small extent, on the Pinjarra Plain landforms (UBC WA & WSWA 2012). These landforms occur across a generally flat landscape. The stratigraphy of this landscape is complex due to the variation in the age of the landforms. The stratigraphy is comprised of a variety of marine sands and other sediment types which overlie older landforms in complex soil and ancient rock structures (UBC WA & WSWA 2012). The high degree of variation in vegetation types and composition that occur, including the nominated Banksia Woodlands community, reflect the underlying high variability in landforms.

The nominated Banksia Woodlands community provides habitat for a range of fauna, flora and fungi.

22.5.7 Nominated threats

The nominated threats are:

- clearing for urban and rural development;
- groundwater drawdown;
- climate change;
- frequent fires;
- weed invasion;
- feral animal invasion; and,
- dieback disease caused by Phytophthora cinnamomi (UBC WA & WSWA 2012).
Figure 22-1a (Northern): Pre-European and remnant (nominated) distribution of the Banksia dominated woodlands of the Swan Coastal Plain ecological community within the Strategic Assessment Area.
Figure 22-1b (Southern): Pre-European and remnant (nominated) distribution of the Banksia dominated woodlands of the Swan Coastal Plain ecological community within the Strategic Assessment Area.
22.5.8 Banksia Woodland in the Strategic Assessment Area

Mapping for Banksia Woodland was undertaken across its range. This mapping identifies remnant occurrences of the community based on:

- Twenty three vegetation associations identified by Beard (1989).
- An additional 26 vegetation associations identified by Parks and Wildlife that were considered to meet the definition of the nominated ecological community (based on description, NVIS information or Floristic Community Types).

The mapping indicates that there is an estimated total of 445,407 ha of remnant Banksia Woodland within the region. Of this, 110,109 ha occurs within the Strategic Assessment Area, or approximately 25% of the estimated total area of the remnant extent.

Of the 110,109 ha within the Strategic Assessment Area:

- 53,562 ha (48.6%) occurs in protected areas (IUCN I-IV and other land managed by Parks and Wildlife).
- 12,668 ha (11.5%) intersects with the classes of action. This is made up of:
  - BRM - 1,413 ha (1.3%).
  - Infrastructure - 1,487 ha (1.4%).
  - Urban - 6,713 ha (6.1%).
  - Industrial - 2,067 ha (1.9%).
  - Rural residential 988 ha (0.9%).
- 43,879 ha (39.9%) occurs in other parts of the Strategic Assessment Area.

The 12,668 ha that intersects with the classes of action represents a significant proportion of the ecological community, and depending on the actual level of impact over time will lead to greater fragmentation and pressure. In relation to the areas that intersect with the classes of action, it is important to note that:

- There are significant areas that currently occur within land that is sympathetic to conservation and are unlikely to be impacted over the life of the Strategic Conservation Plan. For example, there are a range of Bush Forever sites that occur within the classes of action that will continue to be protected.
- Additional retention of vegetation (including Banksia woodland) will occur over the life of the Strategic Conservation Plan. This will be provided for as planning progresses to a more detailed level than that which has been identified through the class of action footprints. The outcomes of these measures are discussed below.

The intersect areas therefore provide an early indication of the scale of potential impacts and should be interpreted as a worst-case scenario.
22.5.9 **Avoidance, mitigation and offset measures**

A large proportion of the measures for Carnaby's cockatoo that relate to banksia foraging habitat for the species have already and are likely to further provide beneficial outcomes for Banksia Woodland. In particular, these measures include:

- **Avoidance measures including:**
  - Those implemented in the planning and assessment phase that has reduced the area of Swan Coastal Plain habitat for Carnaby's cockatoo (representing Banksia woodland) intersected by the classes of action by 2,907 ha (from 5,113 ha to 2,206 ha). This has occurred through reduction in the urban and industrial expansion areas (with more infill used and prioritisation of cleared areas over vegetated areas).
  - Avoidance of 12,800 ha of vegetation (predominantly Banksia woodland) through master planning of BRM areas, and setting aside areas not be mined in Exclusion Areas.
  - Those to be implemented in future detailed planning (further avoidance) including retention of areas of habitat in open space, formal protection of RSNAs, and refinement of infrastructure corridors. This is currently estimated to reduce the total remaining area of Banksia woodland intersected by the classes of action by a further 3000 ha.

- **Mitigation measures including:**
  - Rehabilitation of Banksia woodland within infrastructure development corridors in areas disturbed for construction but not required for the permanent structures and maintenance.
  - Rehabilitation of Banksia woodland in BRM areas not required for future urban, industrial, or infrastructure development.

- **Offsets, including:**
  - Acquisition of large areas of Banksia woodland and transfer to conservation estate for management by Parks and Wildlife.
  - On-ground management program to rehabilitate and enhance degraded Banksia woodland.

In addition to this, general protection and management of sites throughout the Strategic Assessment Area is likely to lead to a range of benefits to Banksia Woodland.

22.5.10 **Outcome for Banksia Woodland**

The assessment has identified the following key points relevant to the outcome for Banksia Woodland:

- The Banksia Woodland ecological community is currently nominated for vulnerable listing under the EPBC Act (which would not be an MNES). However, it may be listed as endangered. Potential impacts from the proposed classes of action will put the ecological community under further pressure, and conservation measures to protect and manage Carnaby's cockatoo habitat will be critical.

- Mapping indicates that there is an estimated total of 445,407 ha of remnant Banksia Woodland remaining. With 110,109 ha occurring within the Strategic Assessment Area, or approximately 25% of the estimated total area of the remnant extent.
• Of the 110,109 ha within the Strategic Assessment Area:
  o 53,562 ha (48.6%) occurs in protected areas (IUCN I-IV and other land managed by Parks and Wildlife).
  o 12,668 ha (11.5%) intersects with the classes of action.
  o 43,879 ha (39.9%) occurs in other parts of the Strategic Assessment Area.

• It is expected that further avoidance, mitigation and offset measures throughout the life of the Strategic Conservation Plan will reduce potential impacts to the ecological community. In particular, the following measures will provide beneficial outcomes:
  o further avoidance of approximately 3000 ha within the classes of actions;
  o rehabilitation of Banksia Woodland associated with BRM (approximately 400 ha) and infrastructure (to be determined as projects proceed); and
  o ongoing offsets program to deliver 170,000 ha of land including substantial areas of Banksia Woodland (to be determined as the conservation program proceeds).

• Despite these measures, it is expected that the classes of action will place additional pressures on the ecological community. It will be important over the life of the Strategic Conservation Plan to monitor and adaptively manage outcomes for Banksia Woodland. Particularly in the case that it becomes listed as threatened under the EPBC Act.
22.6 THE ESTUARINE SPECIES COMMUNITY

The description and assessment of the Community of estuarine species dependent on salt-wedge estuaries in southern Australia (Estuarine Species Community) within the following sections is based on information provided in the nomination form provided to the Department of Environment in March 2012 (DoE 2012). The assessment of the nomination for this community by the Threatened Species Scientific Committee (TSSC) is in the very early stages, and the nomination form is currently the only source of information available (DoE 2015, pers. comm. 2015).

22.6.1 Current EPBC Act listing status

The nominated Estuarine Species Community is not currently listed under the EPBC Act as a threatened ecological community.

22.6.2 Current WC Act listing status

The nominated Estuarine Species Community is not currently listed under the WC Act.

22.6.3 Current nomination status

The Estuarine Species Community was nominated for listing as an endangered ecological community under the EPBC Act in March 2012 (Threatened Ecological Community Nomination Form 2012). It is currently in the early stages of assessment by the Threatened Species Scientific Community (TSSC).

The nomination form for the community identified two criterion for which the community met for listing under the EPBC Act (Threatened Ecological Community Nomination Form 2012). These criterion and the justification for their application to the nominated community is detailed in Table 22-7 below.

Table 22-7: EPBC Act criterion for which the Estuarine Species Community has been nominated against for listing

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 4 – Reduction in community integrity</td>
<td>There are multiple factors which are contributing to the reduction in integrity of salt-wedge estuarine ecological communities including changes to sediment and nutrient levels, removal of catchment and riparian native vegetation, residential development along estuarine shorelines and altered flow regimes.</td>
</tr>
<tr>
<td>Criterion 5 - Rate of continuing detrimental change</td>
<td>Changes to rainfall and resultant flow regimes will occur at a higher rate over the next two to three decades as climate change impacts increase. These changes will impact on the hydrological cycles of salt-wedge estuaries and threaten to change these systems from estuarine dominated biota to marine dominated biota.</td>
</tr>
</tbody>
</table>
22.6.4 Nominated description

There is currently no draft description of the nominated Estuarine Species Community. However, the nomination form provides an indicative description of the community and the associated habitat in which the community is dependent on (salt-wedge estuaries).

Salt-wedge estuaries are described in the nomination form as estuaries "with a gradient in salinity from the head to mouth, and two distinct layers vertically" (CSIRO in Threatened Ecological Community Nomination Form, 2012). The wedge of saline water underlies a layer of fresh water. The wedge is cyclical, with late winter to early spring flows flushing the salt-wedge from the system, and a new wedge gradually reforms. The new wedge provides oxygenated water and nutrients. The formation of the new wedge provides a cue for fish spawning and hatching of invertebrates from dormant life-history stages.

The nomination form notes that salt-wedge estuaries are highly productive ecosystems, with productivity levels comparable to those of coral reefs and rainforests.

22.6.5 Nominated distribution

The nomination of the Estuarine Species Community describes the community as being found in both south-western and south-eastern Australia including Western Australia, Victoria, Tasmania and southern New South Wales.

Salt-wedge estuaries of south-western Australia are identified in the nomination form as occurring in the Swan River, Toby Inlet to the east of Cape Naturaliste, the Greenough estuary just north of Cape Burney, Hardy Inlet and the Blackwood River estuary east of Cape Leeuwin and Wilson Inlet near Denmark (Brearley 2005).

Figure 22-2 provides an indicative map of salt-wedge estuaries within south-western Australia as identified in the nomination form.

22.6.6 Nominated threats

The nomination form for the community identifies the following current threats to the Estuarine Species Community:

- disruption to the annual hydrological cycle though direct and indirect impacts;
- increased nutrient loads resulting from urban settlement;
- increased salinity and run-off resulting from vegetation clearing;
- increased sedimentation resulting from land clearing;
- dredging; and
- climate change.

22.6.7 Estuarine Species Community within Strategic Assessment Area

The nomination form proposes that the Estuarine Species Community is present within the Swan River and may be greater than 50 km in length. The Swan River is within the Strategic Assessment Area, and is currently subject to anthropogenic pressures from existing development. The nomination form for the Estuarine Species Community states that:

“The Swan River estuary which supports a significant salt wedge in its upper reaches experiences micro-algal blooms resulting from increased nutrient loads.”

The nominated ecological community within the Swan River may be under further pressure from indirect impacts resulting from proposed developments within the Swan River catchment.
22.6.8 Outcomes for the Estuarine Species Community

The key issue for the Estuarine Species Community within the Strategic Assessment Area is ongoing management of potential indirect impacts. Particularly, impacts associated with changes to hydrological regimes and increases to nutrient run-off.

The Strategic Conservation Plan includes a range of measures to address ongoing pressures and potential indirect impacts that are relevant to the Estuarine Species Community. These measures include:

- A package of measures (as State commitments in Action Plan G) to improve the health of the Swan Canning system. This will include a focus on reducing nutrient inflows into the system.
- Over-arching commitments in Action Plan F to ensure that potential indirect impacts of development (including issues associated with hydrology) are considered and addressed in ongoing State planning and approvals processes. Relevant commitments include:
  - Implement the infrastructure impact assessment process (which includes planning, avoidance, mitigation, and offsets) to achieve the outcomes and objectives for MNES and State factors (see Action Plan C).
  - Implement environmental assessment and management measures, controls and standards for all development to reduce direct and indirect impacts. This will include, but is not limited to, controls on vegetation clearing, water quality and use, stormwater, dust, noise, emissions, public access. This process will involve:
    - ensuring controls / conditions placed on existing approvals continue to be implemented; and
    - ensuring that new proposals that are approved incorporate at a minimum the existing standard and expectations for control / mitigation / management of direct and indirect impacts.

Based on the application of these measures, it is not expected for the classes of action to lead to additional pressures to the ecological community.