

EPBC Act Referral – Butler North District Open Space

Appendix A – Matters of National Environmental Significance (MNES): Impact Assessment

September 2017

Appendix A :MattersofNationalEnvironmentalSignificance (MNES):ImpactAssessment

1 Introduction

The City of Wanneroo is proposing to develop the Butler North District Open Space (the Proposed Action Area), which spans two sites (**Figure 1** and **Figure 2**):

- 1K Darbyshire Parade, Alkimos; and
- 24 Halesworth Parade, Butler.

The Proposed Action Area is approximately 10.26 ha in size and is in accordance with the Lot 3 Romeo Road, Alkimos Local Structure Plan and Lot 9049 Marmion Avenue, Butler Structure Plan, both of which have been approved as Controlled Actions under the EPBC Act (EPBC 2008/4601 and EPBC 2009/5155 respectively).

This Appendix provides a detailed assessment of the potential impacts of the action on Matters of National Environmental Significance (MNES). It describes the available information, analyses the likelihood of occurrence for species/communities and presents an impact assessment in line with the EPBC Act Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (the Guidelines; DotE 2013).

1.1 Available information

A desktop assessment and review of previous ecological studies, environmental databases, maps and relevant literature was undertaken to evaluate existing data relating to MNES within the Proposed Action Area.

The following databases were reviewed to assess the potential for MNES to occur:

- Parks and Wildlife Services (now Department of Biodiversity, Conservation and Attractions [DBCA]) Threatened and Priority Species and Ecological Communities Database Search;
- Parks and Wildlife Services and Western Australian Museum's NatureMap online flora and fauna database (Parks and Wildlife 2007-); and
- Commonwealth Protected Matters Search Tool (PMST) for Threatened Species and Communities listed under the EPBC Act (DotEE 2017a).

The following databases/information sources were also used to inform the survey and likelihood of occurrence of flora, vegetation and fauna species:

- The International Union for Conservation of Nature (IUCN) red list (IUCN 2017)
- Department of Water and Environmental Regulation (DWER) ESA database (DWER 2017)
- Western Australian Organism List (Department of Primary Industries [DPIRD] 2017)
- Relevant Landgate databases (SLIP portal) for TECs and PECs (Government of WA 2009).

ELA conducted a Level 2 flora and Level 1 fauna assessment in 2016 within the Proposed Action Area and adjacent landholding (ELA 2017). The level 2 flora and vegetation and level 1 fauna surveys were conducted on site in line with the EPA Guidance Statement No. 51 (EPA 2004a), *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DPaW 2010) and EPA Guidance Statement No. 56 (EPA 2004b). The flora and vegetation survey included the installation of six quadrats and two relevés, as well as targeted searches. The fauna survey included black cockatoo habitat assessment and opportunistic fauna observations. The survey report contains a preliminary likelihood assessment, which has been refined in the following sections.

1.2 Likelihood assessment

The available information described above was used to analyse the likelihood of occurrence for MNES. MNES were assessed as 'known to occur', 'likely to occur', 'possible occurrence', 'unlikely to occur' or 'does not occur' according to the criteria below. This assessment is based on a number of factors including the species' or communities' known distribution, habitat quality and requirements, previous records in the vicinity of the Proposed Action Area and field assessment results¹.

Likelihood of occurrence criteria are defined as:

- Known to occur the species or ecological community has been observed within the Proposed Action Area.
- Likely to occur suitable high quality habitat for a species, population or ecological community occurs within the Proposed Action Area.
- Possible occurrence suitable habitat for a species, population or ecological community occurs within the Proposed Action Area, but there is insufficient information to categorise the species as likely, or unlikely to occur.
- Unlikely to occur a low to very low probability that a species, population or ecological community uses/occurs within the Proposed Action Area.
- Does not occur the species will not occur within the Proposed Action Area (e.g. marine species in a terrestrial study site).

Table 1 provides the results of this assessment. The following MNES were given a likelihood rating higher than 'unlikely to occur' and have been discussed further:

- Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (TEC);
- Carnaby's Black-Cockatoo
- Rainbow Bee-eater
- Fork Tailed Swift; and
- Grey Wagtail.

Marine species have not been included in **Table 1** as the Proposed Action is terrestrial in nature and will not impact on marine areas.

¹ ELA (2017a and b) provided a preliminary likelihood assessment which has been refined in this document.

Table 1: MNES likelihood assessment

	Conservat	ion code ¹		Likelihaad of	
Species or Community	EPBC Act	WC Act	Assessment	Cikelinood of occurrence	
			Threatened Ecological Communities		
<i>Banksia</i> Woodlands of the Swan Coastal Plain	EN	-	Banksia dominated woodlands of the Swan Coastal Plain. Also listed as a Priority 3 PEC by the Department of Biodiversity, Conservation and Attractions (DBCA). This community was recorded within the Proposed Action Area.	Known to occur	
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	EN	т	The community occurs in linear damplands and occasionally sumplands, between Holocene dunes. Typical and common native species are the shrubs <i>Acacia rostellifera</i> , <i>Acacia</i> saligna, <i>Xanthorrhoea preissii</i> , the sedges <i>Baumea juncea, Ficinia nodosa,</i> <i>Lepidosperma gladiatum</i> , and the grass <i>Poa porphyroclados</i> (DotEE 2017b). Field surveys undertaken by ELA did not record this community within the Proposed Action Area.	Does not occur	
Flora					
Caladenia huegelii	EN	T-S1	A slender orchid 30 to 50 cm tall. One or two striking flowers characterised by a greenish-cream lower petal with a maroon tip. Other petals are cream with red or pink suffusions. Habitat for this species occurs within well-drained, deep sandy soils of the Bassendean and Spearwood systems in low mixed Banksia, <i>Allocasuarina</i> and Jarrah woodlands (Western Australian Herbarium 1998-, DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur	

	Conservat	ion code ¹		Likeliheed of
Species or Community	EPBC Act	WC Act	Assessment	occurrence
Calectasia cyanea	CR	T-S1	A rhizomatous, clump forming perennial, herb from 10 to 60 cm tall. Flowers are blue/purple and visible from June to October. Habitat for this species occurs in heathland on flat to gentle slopes on white, grey or yellow sand and gravel (Western Australian Herbarium 1998-, DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Dasymalla axillaris	CR	T-S1	A low, diffuse shrub growing to 30 cm tall. Flowers are vivid red to yellow-scarlet and 2.5–3 cm long. Flowering occurs between July–December. Leaves are egg-shaped, 2–4 cm long, 1–1.5 cm wide, woolly/hairy and joined at the branch by the narrow end of the leaf (DotEE 2017b). Habitat for this species occurs on sandy soils in the Yalgoo area of the northern area of the Avon Wheatbelt. Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Diuris micrantha	VU	T-S3	A slender orchid to 60 cm tall. Flowers are yellow with reddish-brown markings and visible from September to October. Habitat for this species occurs within clay-loam substrates in winter-wet depressions or swamps (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Diuris purdiei	EN	T-S2	A slender orchid to 0.35 m tall. Flowers are yellow and visible from September to October. Habitat for this species is grey-black sand substrates in winter-wet swamps which have high moisture (Western Australian Herbarium 1998-). It grows on sand to sandy clay soils, in areas subject to winter inundation, and amongst native sedges and dense heath with scattered emergent <i>Melaleuca preissiana</i> , <i>Corymbia calophylla</i> , <i>E. marginata</i> and <i>Nuytsia floribunda</i> (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur

	Conservat	ion code ¹		Likeliheed of
Species or Community	EPBC Act	WC Act	Assessment	occurrence
Drakaea elastica	EN	T-S1	A slender flower stem up to 30 cm high with a single glossy green, heart shaped leaf. The single flower is 3 to 4 cm long. It can be found on bare patches of sand within dense vegetation in low lying winter-wet swamps. <i>D. elastica</i> often occurs with other orchid species (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Drakaea micrantha	VU	T-S2	A tuberous, terrestrial herb which has a diminutive red and yellow flower, 1.2–2.5 cm long, on a stem that grows to 30 cm. Flowering occurs form September to October. Its heart-shaped leaf, about 1.5 cm long, is silvery grey with prominent green veins. Habitat for this species occurs within cleared firebreaks or open sandy patches that have been disturbed, where competition from other plants has been removed in lower lying areas near wetlands under Spearwood (<i>Kunzea glabrescens</i>) thickets (Western Australian Herbarium 1998-, DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Eleocharis keigheryi	VU	T-S3	A rhizomatous, tufted/clumped perennial herb, reaching a maximum diameter of 40 cm. When this species grows in water, there are numerous hair-like sterile stems at the base of the main stems. Flowering occurs from August to November, but will extend to December if conditions are favourable. This species grows in small clumps in a substrate of clay or sandy loam. This species is emergent in freshwater creeks and claypans (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Eucalyptus argutifolia	VU	T-S3	This species is a mallee up to 4 m high, with smooth grey to pale bark and thick glossy leaves. Habitat for this species occurs within shallow soils over limestone, on slopes or gullies of limestone ridges and outcrops (Western Australian Herbarium 1998-). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Grevillea elongata	VU	T-S2	A tall upright shrub which grows to 2 m high by 2.5 m wide with white to cream flowers	Unlikely to occur

	Conservat	ion code ¹		
Species or Community	EPBC Act	WC Act	Assessment	occurrence
			visible in October. Habitat for this species occurs on gravelly clay, sandy clay, and sand on road verges, swamps and creek banks in the Ruabon-Busselton area of Western Australia, in the Whicher Range (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	
Lepidosperma rostratum	EN	T-S2	A rhizomatous sedge to 30 cm in diameter. Stems are circular in cross section and flowers are spike-like and up to 4 cm long. Habitat for this species occurs in sandy soils among low heath comprised of <i>Banksia telmatiaea</i> and <i>Calothamnus hirsutus</i> in winterwet swamps (Western Australian Herbarium 1998-, DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
			Fauna	
Anous tenuirostris melanops - Australian Lesser Noddy	VU	S2	This species is confined to the tropical and subtropical Indian Ocean and breeds only on three islands in the Houtman Abrolhos, off Western Australia, where it nests in mangroves (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Apus pacificus</i> - Fork-tailed Swift	IA	S5	This species is almost exclusively aerial. They are most common over inland plains but sometimes over foothills in coastal areas. It is thought they roost aerially but are occasionally observed to land. There is one record of them roosting in a tree, using a bare exposed branch emergent above the foliage (DotEE 2017b). This species may potentially use the Proposed Action Area for foraging but given its vagrant nature, is unlikely to remain for a prolonged period.	Possible occurrence - vagrant
Ardea modesta, Ardea alba - Great Egret, White Egret	IA	S5	This species has been reported in a wide range of wetland (inland, coastal, saline, freshwater etc.), swamp and marsh habitats. They prefer shallow waters and may retreat to permanent wetlands or coastal areas when other wetlands are dry (DotEE 2017b).	Unlikely to occur

Species or Community	Conservat	ion code ¹	Assessment	
	EPBC Act	WC Act		occurrence
			Preferred habitat is not present within the Proposed Action Area.	
<i>Bettongia penicillata ogilbyi -</i> Woylie, Brush-tailed Bettong	CR	S1	Habitat for this species occurs in open forest and woodland with a low understorey of tussock grasses or woody scrub. Formerly occurred in a wider range of habitats including spinifex hummock grasslands (DPaW n.d.). The species has been reduced to 1% of its pre-European range and currently only exists in isolated pockets in uninhabited vegetation (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Does not occur
<i>Botaurus poiciloptilus -</i> Australasian Bittern	EN	S2	Occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats. It favours wetlands with tall, dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. The species favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (e.g. <i>Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus</i>) or cutting grass (<i>Gahnia</i>) growing over muddy or peaty substrate (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur

	Conservati	ion code ¹		
Species or Community	EPBC Act	WC Act	Assessment	occurrence
<i>Calidris acuminata</i> - Sharp- tailed sandpiper	IA	S5	Habitat for this species is muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in salt works and sewage farms and use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Calidris canutus - Red Knot	EN	S5	This species is migratory. During the non-breeding season in Australasia, the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts and sometimes on sandy ocean beaches or shallow pools on exposed rock platforms. They are occasionally seen on terrestrial saline wetlands near the coast and on sewage ponds and salt works (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Calidris ferruginea</i> - Curlew Sandpiper	VU & IA	S3	This species is migratory. Known habitat includes intertidal mudflats in sheltered coastal areas, such as estuaries and non-tidal swamps and lakes near the coast. The species has been recorded less often inland around lakes, dams and bore drains with bare edges of mud or sand. The distribution of the species is limited by land clearing and disturbance at roost and feeding sites (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur

Species or Community	Conservation code ¹			
	EPBC Act	WC Act	Assessment	occurrence
<i>Calidris subminuta</i> - Long- toed Stint	IA	S5	This species occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. It has also been observed at open, less vegetated shores of larger lakes and ponds and is common on muddy fringes of drying ephemeral lakes and swamps. The Long-toed Stint also frequents permanent wetlands such as reservoirs and artificial lakes. They are uncommon, but not unknown, at tidal estuaries, saline lakes, salt ponds and bore swamps (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Calyptorhynchus banksii naso</i> - Forest Red-tailed Black-Cockatoo	VU	S3	Known habitat includes remnant eucalypt woodlands, especially Jarrah, Marri and Karri forest. The species is also known from the Perth metropolitan area and in remnant patches of native vegetation on land cleared for development or agriculture. Known to utilise <i>Corymbia calophylla</i> , * <i>Corymbia citriodora, Allocasuarina fraseriana, Eucalyptus</i> <i>patens</i> and <i>Eucalyptus marginata</i> as a foraging plant and <i>C. calophylla</i> as breeding habitat (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur

	Conservat	ion code ¹		Likelihaad of
Species or Community	EPBC Act	WC Act	Assessment	occurrence
<i>Calyptorhynchus baudinii -</i> Baudin's Cockatoo	EN	S2	Baudin's Cockatoo occurs in south-west Western Australia. The range of the species, which is generally bounded by the 750 mm isohyet, extends from Albany northward to Gidgegannup and Mundaring (east of Perth), and inland to the Stirling Ranges and near Kojonup. Habitat for this species mainly occurs in eucalypt forests, especially Jarrah, Marri and Karri forest. The species is less frequently in woodlands of wandoo (<i>E. wandoo</i>), blackbutt (<i>E. patens</i>), flooded gum (<i>E. rudis</i>), yate (<i>E. cornuta</i>), partly cleared farmlands and urban areas, including roadside trees and house gardens (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Calyptorhynchus latirostris -</i> Carnaby's Cockatoo	EN	S2	Known habitat includes remnant eucalypt woodlands, and shrubland or Kwongan heathland dominated by proteaceous species. The species is also known from the Perth metropolitan area and in remnant patches of native vegetation on land cleared for agriculture (DotE 2015b). Known to utilise <i>C. calophylla, *C. citriodora, E. patens,</i> <i>E. marginata, X. preissii</i> and <i>A. fraseriana</i> as a foraging plant, <i>C. calophylla</i> as breeding habitat and <i>C. calophylla</i> and <i>E. marginata</i> as roosting habitat (DotEE 2017b). This species was recorded in the Proposed Action Area during field surveys.	Known to occur
<i>Dasyurus geoffroii -</i> Chuditch, Western Quoll	VU	S3	Current habitat largely restricted to the southwest forests of WA. The distribution of the species is limited by land clearing and predation by feral cats and foxes (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Diomedea amsterdamensis - Amsterdam Albatross	EN	S1, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Diomedea epomophora - Southern Royal Albatross	VU	S3, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area	Unlikely to occur

	Conservation code ¹			Likelihaad of
Species or Community	EPBC Act	WC Act	Assessment	occurrence
<i>Diomedea exulans -</i> Wandering Albatross	VU	S3, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Diomedea sanfordi -</i> Northern Royal Albatross	EN	S2, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Leipoa ocellata</i> - Malleefowl	VU	S3	This species is found principally in the semi-arid to arid zone in shrublands and low woodlands dominated by mallee and associated habitats such as Broombush and Scrub Pine. In Western Australia, they are also found in some shrublands dominated by acacia, and occasionally in woodlands dominated by eucalypts (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Limosa lapponica baueri -</i> Bar-tailed Godwit	VU	S3	This species occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and salt works, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Limosa lapponica menzbieri</i> - Northern Siberian Bar- tailed Godwit	CR	S3	This species occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and salt works, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Macronectes giganteus -</i> Southern Giant-Petrel	EN	S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Macronectes halli - Northern Giant Petrel	VU	S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur

	Conservat	ion code ¹	<u>1</u>	Likelihaad of
Species or Community	EPBC Act	WC Act	Assessment	occurrence
<i>Merops ornatus</i> - Rainbow Bee-eater ²	Μ	S5	The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water (DotEE 2017b). This species was recorded in the Proposed Action Area during field surveys.	Known to occur, however now listed as Marine, not Migratory.
<i>Motacilla cinerea</i> - Grey Wagtail	Μ	S5	This species inhabits fast-flowing mountain streams and rivers with riffles and exposed rocks or shoals, often in forested areas. It is also found in more lowland watercourses, even canals, where there are artificial waterfalls, weirs, millraces or lock gates. Outside of the breeding season it occupies a wider variety of habitats, including farmyards, sewage farms, forest tracks, tea estates and even town centres (IUCN 2017). This species may potentially use the Proposed Action Area but given its vagrant nature, is unlikely to remain for a prolonged period.	Possible occurrence - vagrant
<i>Numenius madagascariensis</i> - Eastern Curlew	CR	S3, S5	This species is migratory with a primarily coastal distribution and is commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Pachyptila turtur subantarctica - Fairy Prion	VU	-	This species is marine, with breeding only known from two rock stacks off Macquarie Island. Habitat for this species is predominantly marine/coastal (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Pandion haliaetus - Osprey	М	S5	This species inhabits the areas around shallow waters, being sufficiently tolerant of human settlement to persist in suburban and sometimes urban environments. The species predominantly feeds on live fish and builds large nests high in exposed trees (IUCN 2017). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur

	Conservation code ¹			Likelihaad of
Species or Community	EPBC Act	WC Act	Assessment	occurrence
<i>Petrogale lateralis</i> - Black- flanked Rock-wallaby, warru	EN	S2	This species is endemic to Western Australia and is confined to small patches of suitable habitat in the Wheatbelt, Avon Valley, South Coast, Pilbara and Mid-West Coast regions. The species generally shelters during the daytime under deep shade in rocky areas such as caves, cliffs, screes and rockpiles, and emerges at dusk to feed on grasses, forbs, shrubs and occasionally seeds and fruits (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Does not occur
<i>Phoebetria fusca</i> - Sooty Albatross	VU	S2, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Pterodroma mollis - Soft- plumaged Petrel	VU	-	This species is marine, breeding among rocks and tussocks (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Rostratula australis -</i> Australian Painted Snipe	EN	S2	This species generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree (<i>Melaleuca</i>) (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Sternula nereis nereis -</i> Australian Fairy Tern	VU	-	This species utilises a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands, beaches and spits (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Thalassarche carteri - Indian Yellow-nosed Albatross	VU	S2, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur

	Conservat	ion code ¹		Likelihood of occurrence
Species or Community	EPBC Act	WC Act	Assessment	
<i>Thalassarche cauta cauta -</i> Shy Albatross	VU	S3, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Thalassarche cauta steadi -</i> White-capped Albatross	VU	S3, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Thalassarche impavida -</i> Campbell Albatross	VU	S3, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
Thalassarche melanophris - Black-browed Albatross	VU	S2, S5	This species is migratory. Predominantly marine/coastal habitats (DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur
<i>Tringa nebularia</i> - Common Greenshank	IA	S5	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and salt flats DotEE 2017b). Preferred habitat is not present within the Proposed Action Area.	Unlikely to occur

¹ CR = listed as 'Critically Endangered' under the EPBC Act, EN = listed as 'Endangered' under the EPBC Act and/or the IUCN red list, V = Listed as 'Vulnerable' under the EPBC Act and/or the IUCN red list, T = Threatened Flora under the WC Act.

M = listed as Migratory species under the EPBC Act.

S2 = Schedule 2: Fauna that is rare or likely to become extinct as endangered fauna (EN)

S3 = Schedule 3: Fauna that is rare or likely to become extinct as vulnerable fauna (VU)

S5 = Schedule 5: Migratory birds protected under an international agreement (IA)

S7 = Schedule 7: Other specially protected fauna (OS).

IA = Migratory birds protected under an international agreement.

[#]Source: NatureMap (DBCA 2017a), PMST (DotEE 2017).

² the Rainbow Bee-eater is no longer listed as Migratory under the EPBC Act, but remains listed as Marine.

*WAHERB = Western Australian Herbarium Database (WAH 1998-2017), TPFL = Threatened and Priority Flora Database (DBCA 2017b, 2017c), PMST = Protected Matters Search Tool

1.3 Impact assessment

In determining the significance of impacts associated with the Proposed Action, the relevant criteria listed in the Guidelines were applied, along with any additional species specific policy guidance.

EPBC Act key concepts

This impact assessment is presented within the context of the key concepts commonly applied to assessments of threatened species under the EPBC Act and defined in the Guidelines; in particular, the concepts of an important population of a species and habitat critical to the survival of a species.

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/ or that are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range.

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- To maintain genetic diversity and long term evolutionary development; or
- For the reintroduction of populations or recovery of the species or ecological community.

The following MNES may be impacted by the Proposed Action and are discussed below:

- Banksia Woodlands of the Swan Coastal Plain TEC;
- Carnaby's Black-Cockatoo;
- Rainbow Bee-eater;
- Fork Tailed Swift; and
- Grey Wagtail.

1.3.1 Banksia Woodlands of the Swan Coastal Plain

The 'Banksia Woodlands of the Swan Coastal Plain' (Banksia Woodlands TEC) is listed as Endangered under the EPBC Act and was recorded by ELA (2017). The diagnostic criteria assessment for the Banksia Woodlands of the Swan Coastal Plain TEC in ELA (2017) focussed on a study area larger than the Proposed Action Area. As such, a revised assessment, focussed on the Proposed Action Area is provided in **Table 2**.

The extent of the Banksia Woodlands TEC in the Proposed Action Area is depicted in Figure 4.

Step	Key diagnostic characteristics (DotEE 2016)	Outcome
1	Location and physical environment The Banksia Woodlands ecological community primarily occurs in the Swan Coastal Plain IBRA bioregion	Yes – the Proposed Action Area is located on the Swan Coastal Plain
	Soil and landform The Banksia Woodlands typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands	Yes – the Proposed Action Area is located on Spearwood Dune System
	 Structure The structure of the Banksia Woodlands is a low woodland to forest with these features: A distinctive upper sclerophyllous layer of low trees* (occasionally large shrubs more than 2 m tall), typically dominated or co-dominated by one or more of the Banksia species identified under composition Emergent trees of medium or tall (>10 m) height <i>Eucalyptus</i> or <i>Allocasuarina</i> species may sometimes be present above the Banksia canopy An often highly species-rich understorey that consists of: a layer of sclerophyllous shrubs of various heights; and, a herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses. The development of a ground layer may vary depending on the density of the shrub layer and disturbance history. 	The Vegetation Association BaBmLW mapped by ELA (2017) consists of a Low Woodland dominated by the key diagnostic species <i>Banksia attenuata</i> and <i>Banksia menziesii</i> (Figure 3). The community has a highly species-rich understorey that consists of a layer of sclerophyllous shrubs of various heights, and an herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, which sometimes includes grasses.
	 Composition The canopy is most commonly dominated or co-dominated by <i>Banksia attenuata</i> (candlestick banksia, slender banksia) and/or <i>B. menziesii</i> (firewood banksia). Other Banksia species that dominate in some examples of the ecological community are <i>B. prionotes</i> (acorn banksia) or <i>B. ilicifolia</i> (holly-leaved banksia); and The patch must include at least one of the following diagnostic species:	The canopy is dominated by the diagnostic species <i>Banksia</i> <i>attenuata</i> and <i>Banksia menziesii</i> . There is the presence of other codominant species, such as <i>Nuytsia floribunda</i> . The Vegetation Association BaBmLW has a high diversity of shrubs and herb species with many indicator species recorded. The contra-indicators of <i>Banksia</i> <i>littoralis</i> and <i>Banksia burdettii</i> were not recorded. The Vegetation Association BaBmLW does not represent FCT 20c – Eastern shrublands and woodlands.

Table 2: Diagnostic criteria – Banksia Woodlands of the Swan Coastal Plain

Step	Key diagnostic characteristics (DotEE 2016)	Outcome
	 Other trees of a medium height that may be present, and may be codominant with the Banksia species across a patch, include <i>Eucalyptus todtiana</i> (blackbutt, pricklybark), <i>Nuytsia floribunda</i> (Western Australian Christmas tree), <i>Allocasuarina fraseriana</i> (western sheoak), <i>Callitris arenaria</i> (sandplain cypress), <i>Callitris pyramidalis</i> (swamp cypress) and <i>Xylomelum occidentale</i> (woody pear); and The understorey typically contains a high to very high diversity of shrub and herb species that often vary from patch to patch*** Contra-indicators: Patches clearly dominated by <i>Banksia littoralis</i> are not part of the Banksia Woodlands ecological community but indicates a different, dampland community is present. Patches clearly dominated by <i>Banksia burdettii</i> are not part of the Banksia Woodlands ecological community but indicates a tall shrubland and not the Banksia Woodlands ecological community. FCT 20c – Eastern shrublands and woodlands, corresponds with a separate EPBC ecological community listing, Shrublands and Woodlands of the eastern Swan Coastal Plain. Occurrences of this FCT should be considered under that separate listing. 	
2	Condition thresholds	Vegetation was assessed and
	 Assessments of a patch should initially be centered on the area of highest native floristic diversity and/or cover, i.e. the best condition area of the patch. Consideration must be given to the timing of surveys and recent disturbance. Ideally surveys should be undertaken in spring with two sampling periods to capture early and late flowering species. The surrounding context of a patch must also be taken into account when considering factors that add to the importance of a patch that meets the condition thresholds. Certain vegetation components of the Banksia Woodlands ecological community merit consideration as critical elements to protect. Three components are recognised as threatened in their own right in WA and, as such, are priorities for protection; refer to Table 1 in the Approved Conservation Advice (DotEE 2016c). A relevant expert (e.g. ecological consultant, local NRM or environment agency) may be useful to help identify the 	sampled in the highest condition representation available in the Proposed Action Area in Spring, which is the most appropriate season to survey on the Swan Coastal Plain (ELA 2017). The Vegetation Association BaBmLW has been determined to represent the FCT 28 Spearwood Banksia attenuata or Banksia attenuata - Eucalyptus woodlands (Gibson et al. 1994). FCT 28 forms part of the Banksia Woodlands ecological community listing (DotEE 2016). This FCT does not represent a standalone TEC or PEC listed at the State level.

Step	Key diagnostic characteristics (DotEE 2016)	Outcome
	ecological community and its condition.	
3	 Minimum patch size Minimum patch sizes apply for consideration of a patch as part of the listed ecological community for EPBC Act referral, assessment and compliance purposes. Where patches meet different levels of condition, different minimum patch sizes apply: 'Pristine' – no minimum patch size applies 'Excellent' – 0.5 ha or 5,000 m2 (e.g. 50 m x 100 m) 'Very Good' – 1 ha or 10,000 m2 (e.g. 100 m x 100 m) 'Good' – 2 ha or 20,000 m2 (e.g. 200 m x 100 m). Note: To be considered as part of the EPBC Act ecological community, a patch should meet at least the Good Condition 	The total patch size of this occurrence of the TEC is 9.29 ha. The highest quality vegetation contained within this patch was rated as Excellent and encompassed 4.92 ha (ELA 2017). This occurrence therefore meets the condition requirements of a minimum of 0.5 ha of Excellent condition when considered in isolation from surrounding vegetation.
	category.	8.80 ha of this occurrence of the TEC occurs within the Proposed Action Area, 0.98 ha of which will be retained in conservation areas (Figure 2 and Figure 4).
4	 Further information to assist in determining the presence of the ecological community and significant impacts. The landscape position of the patch, including its position relative to surrounding vegetation also influences how important it is in the broader landscape. For example, if it enables movement of native fauna or plant material or supports other ecological processes A patch is a discrete and mostly continuous area of the ecological community. A patch may include small-scale (<30 m) variations, gaps and disturbances, such as tracks, paths or breaks. Where there is a break in native vegetation cover, from the edge of the tree canopy of 30 m or more (e.g. due to permanent artificial structures, wide roads or other barriers; or due to water bodies typically more than 30m wide) then the gap typically indicates that separate patches are present. Variation in canopy cover, quality or condition of vegetation across a patch should not initially be considered to be evidence of multiple patches. Patches can be spatially variable and are often characterised by one or more areas within a patch that meet the key diagnostic characteristics and condition threshold criteria amongst areas of lower condition. Average canopy cover and quality across the broadest area that meets the general description of the ecological community should be used initially in determining overall canopy cover and vegetation condition. Also note any areas that are either significantly higher or lower in quality, gaps in canopy 	The Vegetation Association BaBmLW within the Proposed Action Area represents a separate patch of the Banksia Woodlands of the Swan Coastal Plain TEC. There are significant gaps (railway line, residential development and roads) between nearby occurrences of the TEC and the occurrence of the TEC within the Proposed Action Area (i.e. within adjacent public reserves, Neerabup National Park etc.). Therefore, the TEC within the Proposed Action Area is considered to be a separate patch. The occurrence of the TEC within the Proposed Action Area is considered to represent FCT 28 Spearwood Banksia attenuata or Banksia attenuata - Eucalyptus woodlands. This FCT does not represent a standalone TEC or PEC listed at the State level.

Step	Key diagnostic characteristics (DotEE 2016)	Outcome
	cover and the condition categories that would apply	
	across different parts of the site respectively. Where the	
	average canopy cover or quality falls below the minimum	
	thresholds, the next largest area or areas that meet key	
	diagnostics (including minimum canopy cover	
	requirements) and minimum condition thresholds should	
	be specified and protected. This may result in multiple	
	patches being identified within the overall area first	
	considered.	
	• A buffer zone is a contiguous area immediately adjacent	
	to a patch of the ecological community that is important	
	for protecting its integrity. The purpose of the buffer zone	
	is to help protect and manage the national threatened	
	ecological community. The edges of a patch are	
	considered particularly susceptible to disturbance and the	
	presence of a buffer zone is intended to act as a barrier to	
	further direct disturbance.	
	• The recommended minimum buffer zone for the	
	ecological community is 20–50 metres from the outer	
	edge of a patch, and the appropriate size depends on the	
	nature of the buffer and local context (e.g. slope). A larger	
	buffer zone should be applied, where practical, to protect	
	patches that are of particularly high conservation value, or	
	if patches are down slope of drainage lines or a source of	
	nutrient enrichment, or groundwater drawdown.	

Potential impacts and mitigation

The Conservation Advice has not provided any threshold levels for disturbance that would constitute a significant impact. The potential of the proposed development to result in significant impact to the Banksia Woodlands TEC has been considered in accordance with the criteria for Critically Endangered and Endangered ecological communities (*the Guidelines*).

Significant impact criteria An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real change or possibility that it will:	Description of proposed action in relation to significant impact criteria
Reduce the extent of an ecological community.	The Proposed Action will result in the clearing of approximately 7.82 ha of <i>Banksia</i> woodland TEC. 0.98 ha of Banksia woodland will be retained within the Proposed Action Area as per the Vegetation Management Plan approved under EPBC 2009/5155 (Figure 2).
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines.	Majority of vegetation within the Proposed Action Area will be cleared. Retained vegetation within the proposed conservation areas will fragment the remaining extent of the TEC within the Proposed Action Area.
Adversely affect habitat critical to the survival of an ecological community.	The TEC is well represented in nearby conservation reserves (e.g. Neerabup National Park etc.) (DotEE 2016), therefore the Proposed Action is unlikely to affect habitat critical to the survival of the TEC.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.	Majority of vegetation within the Proposed Action Area will be cleared. No changes to groundwater levels are expected, and surface water flows/drainage will be managed to minimise impacts to retained vegetation within the proposed conservation areas. It is anticipated that indirect impacts to the TEC as a result of modification of abiotic factors are unlikely.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.	The Proposed Action will result in the clearing of 7.82 ha of the TEC. The 0.98 ha of retained TEC is proposed to be managed in conservation areas, and substantial change to species composition is not expected in these areas.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: - assisting invasive species, that are harmful to the listed ecological	Majority of vegetation within the Proposed Action Area will be cleared, and retained vegetation within the proposed conservation areas will be managed; therefore, reduction in quality or occurrence of the TEC is unlikely to occur.

Table 3: Significant impact criteria for Threatened Ecological Communities

Significant impact criteria An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real change or possibility that it will:	Description of proposed action in relation to significant impact criteria
 community, to become established, or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community. 	
Interfere with the recovery of an ecological community	The Proposed Action involves the clearing of a relatively small amount of the TEC (i.e. 7.82 ha), which when considered at a regional level (i.e. representation in nearby conservation reserves such as Neerabup National Park [DotEE 2016]), will not interfere with the recovery of the TEC.

1.3.2 Carnaby's Black-Cockatoo

Carnaby's Black-Cockatoo is endemic to south-west WA with populations extending from the Murchison River to Esperance, and inland to Coorow, Kellerberrin and Lake Cronin. The species feeds on seeds, nuts and flowers of a variety of native species including *Banksia, Hakea, Grevillea, Allocasuarina, Eucalyptus* and *Corymbia.* Carnaby's Black-Cockatoos have also been recorded feeding extensively on seeds from the cones of exotic pines (*Pinus* spp.; Shah 2006). Pine plantations in the coastal zone are now considered important feeding areas in the non-breeding season (Cale 2003).

The species is a post-breeding nomad, tending to move west to coastal areas with its young after breeding (late spring to mid-winter), particularly to the Swan Coastal Plain. A small number of birds remain resident on the Swan Coastal Plain all year and have been recorded breeding in a number of areas including Gingin, Yanchep, Mandurah, and Bunbury. Like most cockatoo species, Carnaby's Black-Cockatoo is gregarious and is usually seen in small groups and will occasionally congregate in large flocks comprised of hundreds or, exceptionally, thousands of birds. During the breeding season, adults nest as solitary pairs.

Carnaby's Black-Cockatoo nest in hollows of smooth-barked eucalypts, especially Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*Eucalyptus wandoo*), but nests have also been found in other eucalypts, including York Gum (*Eucalyptus loxophleba*), Flooded Gum (*Eucalyptus rudis*), Tuart (*Eucalyptus gomphocephala*) and the rough-barked Marri (*Corymbia calophylla*). On the Swan Coastal Plain, most nests are in Tuart trees (Johnstone & Storr 1998). Breeding birds forage no more than approximately 20 km from their nesting hollows during the breeding season, and therefore having sufficient foraging and water resources close to breeding areas is critical to their breeding success (Saunders 1980).

The Proposed Action Area is within the modelled distribution and breeding range for this species (DSEWPaC 2012). A Black Cockatoo assessment was undertaken within the Proposed Action Area in accordance with the *EPBC Act Referral Guidelines for Three Threatened Black-Cockatoo Species* (DSEWPaC 2012). The presence of Carnaby's Black-Cockatoos was confirmed by ELA during the survey of the site, through chewed *Banksia* cones at several locations (ELA 2017).

No potential breeding habitat was recorded in the Proposed Action Area, however, approximately 7.98 ha of suitable foraging habitat was recorded within both mapped Vegetation Associations: BaBmLW and BsXpHtTOS, described below (**Figure 3** and **Figure 5**):

- BaBmLW Banksia attenuata and Banksia menziesii low woodland over Xanthorrhoea, Hibbertia hypericoides subsp. hypericoides and Leucopogon polymorphus open low heath over Mesomelaena pseudostygia very open sedgeland and *Briza maxima and *Ehrharta calycina very open grassland over Burchardia congesta, Waitzia suaveolens var. suaveolens and Podotheca gnaphalioides very open herbland.
- BsXpHtTOS Banksia sessilis var. cygnorum, Xanthorrhoea preissii and Hakea trifurcata tall open scrub over Acacia pulchella var. glaberrima, Calothamnus quadrifidus, Acacia pulchella var. glaberrima and Hibbertia hypericoides open low heath Mesomelaena pseudostygia and Desmocladus fasciculatus very open sedgeland and *Briza maxima and Microlaena stipoides very open grassland over Podotheca chrysantha, Acanthocarpus preissii and Waitzia suaveolens var. suaveolens very open herbland.

Both Vegetation Associations contained high densities of suitable foraging species and evidence of foraging by Carnaby's Black-Cockatoos. Consequently, the quality of Carnaby's Black-Cockatoo foraging habitat is considered to be 'high'.

Whilst there is no breeding or roosting habitat for Carnaby's Black-Cockatoos within the Proposed Action Area, breeding is known to occur approximately 10 km to the north within Yanchep National Park (Department of Planning 2011; **Figure 7**). While breeding, Carnaby's Cockatoo will generally forage up to 12 km away from their nesting site (SEWPaC 2012); however, given the relatively small size of the Proposed Action Area, and large amounts of high quality foraging habitat located closer to the known breeding site; it is unlikely that the Proposed Action Area would constitute an important food source for a breeding population. Additionally, the presence of numerous known roosting sites surrounding the breeding location (Department of Planning 2011) suggests that the local population of Carnaby's Black-Cockatoos would utilise foraging habitat within Yanchep National Park on a regular basis.

Historical EPBC Act approvals exist over the Proposed Action Area (Lot 3 Romeo Road, Alkimos Local Structure Plan and Lot 9049 Marmion Avenue, Butler Structure Plan), both of which have been approved as Controlled Actions under the EPBC Act (EPBC 2008/4601 and EPBC 2009/5155 respectively). Both of these considered impacts to Carnaby's Black-Cockatoo to be significant and required proponents to deliver offsets to mitigate impacts to the species which are summarised below:

- EPBC 2008/4601:
 - Acquisition of 459 ha of Carnaby's Black-Cockatoo habitat north of Gingin; and
 - A pro-rata contribution to acquire 477 ha of Carnaby's Black-Cockatoo habitat east of Badgingarra;
- EPBC 2009/5155: acquisition of 1250 ha of Carnaby's Black-Cockatoo habitat in the Regan's Ford or Badgingarra regions.

Given that impacts to Carnaby's Black-Cockatoo associated with clearing of vegetation within the Proposed Action Area have been offset previously; residual impacts to Carnaby's Black-Cockatoo resulting from the Proposed Action are not considered to be significant.

1.3.3 Migratory and Marine species

In this referral, potential impacts to migratory species that are known, likely or have the potential to occur within the Proposed Action Area (including indirect effects adjacent to the Proposed Action Area) have been considered within the context of two key concepts commonly applied under the EPBC Act for threatened species (DotE 2013):

- Whether impacts to an ecologically significant proportion of the population could result
- Whether impact to important habitat could result.

Where neither of these two features of a migratory species is present, significant impacts are generally not considered likely to occur (DotE 2013).

Two migratory species with potential to occur in the Proposed Action Area are:

- Fork Tailed Swift; and
- Grey Wagtail.

Neither the Fork Tailed Swift and Grey Wagtail were recorded within the Proposed Action Area, however, they may occur as vagrants on an irregular basis. Given the wide range of habitats used by these three species, their highly mobile nature, and retention of potential habitat in conservation areas within the Proposed Action Area; it is unlikely that the Proposed Action will significantly impact the species or important habitat.

Rainbow Bee-eaters were observed flying around the Proposed Action Area, and burrows (nests) were observed in the sand quarry (rail reserve) on the eastern boundary of the Proposed Action Area (ELA 2017). This conservation status of this species has recently been changed from Migratory to Marine.

The Proposed Action is wholly terrestrial, and as such, no other Marine species are expected to be impacted.

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