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HABITAT MANAGEMENT PLAN
(Volume 2 of 2)

Birrigan Iluka Beach
Hickey Street, Iluka
Lot 99 on DP823635

A Report Prepared for
Steven Holdings Pty Ltd

JULY 2020

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PREFACE

The preparation of the Birrigan Iluka Beach HMP has been based on the review of historical ecological assessments completed on the site (Ashby and McTackett 2015, 2016, 2017a, 2017b, 2018, 2020), ground-truthing of past vegetation mapping and ecological assessments by two (2) JWA ecologists on the 21st February 2020, a comprehensive review of the latest literature relating to the protection of relevant threatened species and their habitat, and recommendations from the Department of Agriculture, Water and the Environment (DAWE) and Clarence Valley Council (CVC).

The HMP has been prepared as two (2) Volumes:

- **VOLUME 1** is the plan itself, containing discussion of threatening processes, specific actions for management of threatened species and their habitat during the pre-development, construction and operational phases of the Birrigan Iluka Beach development, as well as providing for ongoing monitoring, management and review.
- This is **VOLUME 2** and contains the appendices.

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APPENDIX 1 - FAUNA SPECIES AND HABITAT VALUES RECORDED ON THE SUBJECT SITE

Introduction

Fauna surveys of the site and surrounds were completed by Keystone Ecological in spring 2014, summer 2016, autumn 2016, and winter 2016 (Ashby and McTackett 2018). All incidental observations of fauna species utilising the site were recorded by JWA ecologists during the site inspection in February 2020.

A total of two (2) amphibian species, seven (7) species of reptile, seventy-six (76) bird species and seventeen (17) mammal species have been recorded from the subject site. **TABLE 1** lists fauna species, as listed within schedules of the EPBC Act and/or the BC Act, which were recorded or are considered to be possible occurrences on the subject site based on the availability of suitable habitat. **TABLE 1** also summarises the suitable habitat occurring on site for each species.

TABLE 1
FAUNA SPECIES RECORDED OR CONSIDERED POSSIBLE OCCURENCES AND SUITABLE HABITAT OCCURRING ON THE SITE

Species		Recorded or Considered Possible Due to Habitat	Suitable Habitat Occurring on Site		
Common Name	Scientific Name		Relevant Vegetation Community	Area	Total Area
Threatened Species					
Emu	*Dromaius novaehollandiae*	Recorded	187	0.25 ha	18.82 ha
			190	0.41 ha	
			193	18.16 ha	
Rose-crowned fruit-dove	*Ptilinopus regina*	Recorded	190	0.41 ha	1.21 ha
			193e	0.80 ha	
Superb fruit-dove	*Ptilinopus superbus*	Recorded	190	0.41 ha	1.21 ha
			193e	0.80 ha	
Glossy black-cockatoo	*Calyptorhynchus lathami*	Recorded	193a	10.41 ha	10.41 ha
Varied Sittella	*Daphoenositta chrysoptera*	Recorded	187	0.25 ha	18.82 ha
			190	0.41 ha	
			193	18.16 ha	
Koala	*Phascolarctos cinereus*	Recorded	190	0.41 ha	15.91 ha
			193a	10.41 ha	
			193b	1.14 ha	
			193c	3.15 ha	
			193e	0.80 ha	
	Nyctophilus bifax	Recorded	190	0.41 ha	2.35 ha

Species		Recorded or Considered Possible Due to Habitat	Suitable Habitat Occurring on Site		
Common Name	**Scientific Name**		**Relevant Vegetation Community**	**Area**	**Total Area**
Eastern long-eared bat			193b	1.14 ha	
			193e	0.80 ha	
Yellow-bellied sheathtail-bat	*Saccolaimus flaviventris*	Recorded	187	0.25 ha	18.82 ha
			190	0.41 ha	
			193	18.16 ha	
Eastern freetail-bat	*Mormopterus norfolkensis*	Recorded	187	0.25 ha	18.82 ha
			190	0.41 ha	
			193	18.16 ha	
Little bentwing-bat	*Miniopterus australis*	Recorded	190	0.41 ha	15.91 ha
			193a	10.41 ha	
			193b	1.14 ha	
			193c	3.15 ha	
			193e	0.80 ha	
Spot-tailed quoll (SE mainland population)	*Dasyurus maculatus maculatus*	Possible due to presence of suitable habitat	187	0.25 ha	18.82 ha
			190	0.41 ha	
			193	18.16 ha	
Grey-headed flying-fox	*Pteropus poliocephalus*	Possible due to presence of suitable habitat	190	0.41 ha	5.5 ha
			193b	1.14 ha	
			193c	3.15 ha	
			193e	0.80 ha	
White-eared monarch	*Monarcha leucotis*	Possible due to presence of suitable habitat	190	0.41 ha	15.91 ha
			193a	10.41 ha	
			193b	1.14 ha	
			193c	3.15 ha	
			193e	0.80 ha	
Wompoo fruit-dove	*Ptilinopus magnificus*	Possible due to presence of suitable habitat	190	0.41 ha	1.21 ha
			193e	0.80 ha	
Migratory Species					
White-throated needle-tail	*Hirundapus caudacutus*	Recorded	187	0.25 ha	18.82 ha
			190	0.41 ha	
			193	18.16 ha	

Species		Recorded or Considered Possible Due to Habitat	Suitable Habitat Occurring on Site		
Common Name	Scientific Name		Relevant Vegetation Community	Area	Total Area
Rainbow bee-eater	*Merops ornatus*	Recorded	187	0.25 ha	18.82 ha
			190	0.41 ha	
			193	18.16 ha	
Rufous fantail	*Rhipidura rufifrons*	Recorded	187	0.25 ha	18.82 ha
			190	0.41 ha	
			193	18.16 ha	

Amphibians

No species of amphibian were recorded during the site surveys by Keystone Ecological (Ashby and McTackett 2018). Two (2) species of amphibian were recorded by JWA in February 2020:

- common eastern froglet (*Crinia signifera*); and
- the introduced cane toad (*Rhinella marina*).

Amphibians occurring in the region are poikilothermic, predominantly insectivorous and generally require free water for reproduction, with the exception of two highland genera (*Assa darlingtoni* and *Philoria spp.*). The habitat requirements of most species are unlikely to be determined by forest cover or floristics, but are more strongly influenced by factors such as climate, distance to water bodies, riparian vegetation, hydrological and morphological characteristics of water bodies and the availability of suitable micro-habitat for aestivation and shelter.

The majority of species that occur within the region lay eggs in or near temporary or permanent water bodies and rely on free water for larval development and metamorphosis. Of these species, only a few are dependent on forested habitats beyond the riparian zone or beyond areas of temporary inundation. These species include the Red-eyed tree frog (*Litoria chloris*), Leseuer's frog (*Litoria leseueri*), Fletcher's frog (*Lechriodus fletcheri*) and the Barred frogs of the *Mixophyes* genus.

Grasslands provide suitable habitat for a range of Amphibian species, particularly along drainage depressions and soaks. Species commonly encountered in grassland communities include the Common eastern froglet, Eastern sign bearing froglet, Striped marsh frog, Spotted grass frog, Eastern dwarf tree frog, Rocket frog, Whistling tree frog and Cane toad.

The subject site provides relatively low-quality habitat for frog species due to the lack of suitable habitat components (e.g. water bodies, wetland vegetation etc). No amphibian species listed within schedules of the EPBC Act and/or the BC Act are considered likely to occur on site based on available habitat.

Reptiles

Five (5) common reptile species were recorded during the site surveys by Keystone Ecological (Ashby and McTackett 2018):

- Lace monitor (*Varanus varius*);
- Land mullet (*Egernia major*);
- Water skink (*Sphenomorphus tympanum*);
- Jacky lizard (*Amphibolurus muricatus*); and
- Tiger snake (*Notechis scutatus*).

Two (2) additional reptile species were recorded by JWA in February 2020:

- Dark-flecked garden sunskink (*Lampropholis delicata*); and
- Eastern blue-tongue (*Tiliqua scincoides*).

As reptiles are poikilothermic, and predominantly insectivorous or carnivorous, their habitat requirements are less directly determined by vegetation species composition than other taxa which feed directly on plants. Reptile distributions are strongly influenced by structural characteristics of the vegetation, climate and other factors affecting thermoregulation such as shade and availability of shelter and basking sites (Smith et al. 1994).

In a survey of the moist forest herpetofauna of North-eastern NSW, Smith et al. (1989) found that few species discriminated between rainforest and wet sclerophyll forest, however, most species exhibited a response to differences in elevation and the availability of microhabitat components and other substrates.

The availability of microhabitats, of varying thermal properties is particularly important for most reptile species, as behavioural thermoregulation (regulation of body heat) is important in controlling critical body functions such as digestion, foraging activity and reproduction.

Reptile diversity and abundance is often (but not always) significantly higher in drier habitat types, particularly those with a wide variety of ground substrate microhabitats. This contrasts markedly with the distribution patterns of birds, and most mammals. The single limiting factor in terms of species diversity in coastal vegetation is the lack of shelter sites (e.g. logs, tree hollows and decorticating bark). Such habitat components characterise eucalypt forests and woodlands, where species diversity may be much higher, depending on disturbance factors.

The subject site is considered to provide moderate quality habitat for urbanised/disturbance adapted reptiles due to the presence of suitable habitat components (e.g. shelter and basking sites, fallen logs and leaf litter for shelter). No significant reptile species listed within schedules of the EPBC Act and/or the BC Act are considered likely to occur on site based on available habitat.

Birds

A total of seventy-six (76) species of birds have been recorded from the subject site during the site surveys (**TABLE 2**). Five (5) threatened species listed within schedules of the EPBC Act and/or the BC Act have been recorded (Ashby and McTackett 2018, 2020):

- Emu (*Dromaius novaehollandiae*) – listed as an Endangered Population (BC Act);
- Rose-crowned Fruit-dove (*Ptilinopus regina*) – listed as Vulnerable (BC Act);
- Superb Fruit-dove (*Ptilinopus superbus*) – listed as Vulnerable (BC Act);
- Glossy Black-Cockatoo (*Calyptorhynchus lathami*) – listed as Vulnerable (BC Act); and
- Varied Sittella (*Daphoenositta chrysoptera*) – listed as Vulnerable (BC Act).

Three (3) additional species listed as migratory within schedules of the EPBC Act were also recorded (Ashby and McTackett 2018, 2020):

- White-throated needle-tail (*Hirundapus caudacutus*);
- Rainbow Bee-eater (*Merops ornatus*); and
- Rufous Fantail (*Rhipidura rufifrons*).

TABLE 2
BIRD SPECIES RECORDED FROM THE SUBJECT SITE

Common name	Scientific name	Conservation status[#]		Source[1]
		EPBC Act	BC Act	
Brown thornbill	*Acanthiza pusilla*			AMc, JWA
Australian brush turkey	*Alectura lathami*			AMc, JWA
Little wattlebird	*Anthochaera chrysoptera*			AMc, JWA
Pacific baza	*Aviceda subcristata*			JWA
Fan-tailed cuckoo	*Cacomantis flabelliformis*			AMc, JWA
Yellow-tailed black-cockatoo	*Calyptorhynchus funereus*			JWA
Glossy black-cockatoo	*Calyptorhynchus lathami*		V	AMc
Pheasant coucal	*Centropus phasianinus*			JWA
Emerald dove	*Chalcophaps indica*			JWA
Shining bronze-cuckoo	*Chrysococcyx lucidus*			AMc
Grey shrike-thrush	*Colluricincla harmonica*			AMc, JWA
Little shrike-thrush	*Colluricincla megarhyncha*			AMc
White-headed pigeon	*Columba leucomela*			AMc, JWA
Black-faced cuckoo-shrike	*Coracina novaehollandiae*			AMc, JWA
White-bellied cuckoo-shrike	*Coracina papuensis*			AMc
Cicadabird	*Coracina tenuirostris*			AMc, JWA

Common name	Scientific name	Conservation status#		Source[1]
		EPBC Act	BC Act	
Australian raven	*Corvus coronoides*			AMc
Torresian crow	*Corvus orru*			JWA
Brown quail	*Coturnix ypsilophora*			JWA
Pied butcherbird	*Cracticus nigrogularis*			JWA
Australian magpie	*Cracticus tibicen*			AMc, JWA
Grey butcherbird	*Cracticus torquatus*			AMc
Laughing kookaburra	*Dacelo novaeguineae*			AMc, JWA
Varied Sittella	*Daphoenositta chrysoptera*		V	AMc
Mistletoe bird	*Dicaeum hirundinaceum*			AMc, JWA
Spangled drongo	*Dicrurus bracteatus*			JWA
Emu	*Dromaius novaehollandiae*		Epop	AMc
Blue-faced honeyeater	*Entomyzon cyanotis*			JWA
Eastern yellow robin	*Eopsaltria australis*			AMc, JWA
Dollarbird	*Eurystomus orientalis*			JWA
Australian hobby	*Falco longipennis*			AMc
Crested shrike-tit	*Falcunculus frontatus*			AMc
Bar-shouldered dove	*Geopelia humeralis*			AMc, JWA
Peaceful dove	*Geopelia striata*			JWA
Brown Gerygone	*Gerygone mouki*			AMc, JWA
Magpie-lark	*Grallina cyanoleuca*			AMc, JWA
Whistling kite	*Haliastur sphenurus*			AMc, JWA
White-throated needle-tail	*Hirundapus caudacutus*	M		AMc
Welcome swallow	*Hirundo neoxena*			JWA
White-winged triller	*Lalage sueurii*			AMc
Wonga pigeon	*Leucosarcia melanoleuca*			AMc, JWA
Brown honeyeater	*Lichmera indistincta*			AMc, JWA
Brown cuckoo-dove	*Macropygia amboinensis*			AMc, JWA

Common name	Scientific name	Conservation status#		Source[1]
		EPBC Act	BC Act	
Superb fairy-wren	*Malurus cyaneus*			AMc
Variegated fairy-wren	*Malurus lamberti*			AMc, JWA
Noisy miner	*Manorina melanocephala*			AMc, JWA
Lewin's honeyeater	*Meliphaga lewinii*			AMc, JWA
Rainbow bee-eater	*Merops ornatus*	M		AMc, JWA
Black-faced monarch	*Monarcha melanopsis*			JWA
Leaden flycatcher	*Myiagra rubecula*			AMc, JWA
Scarlet honeyeater	*Myzomela sanguinolenta*			JWA
Red-browed finch	*Neochmia temporalis*			AMc, JWA
Crested pigeon	*Ocyphaps lophotes*			AMc, JWA
Olive-backed oriole	*Oriolus sagittatus*			AMc, JWA
Golden whistler	*Pachycephala pectoralis*			AMc, JWA
Rufous whistler	*Pachycephala rufiventris*			AMc, JWA
White-cheeked honeyeater	*Phylidonyris nigra*			AMc, JWA
Eastern rosella	*Platycercus eximius*			AMc, JWA
Tawny frogmouth	*Podargus strigoides*			AMc
Eastern whipbird	*Psophodes olivaceus*			AMc, JWA
Rose-crowned fruit-dove	*Ptilinopus regina*		V	AMc, JWA
Superb fruit-dove	*Ptilinopus superbus*		V	AMc
Grey fantail	*Rhipidura fuliginosa*			AMc, JWA
Willy wagtail	*Rhipidura leucophrys*			JWA
Rufous fantail	*Rhipidura rufifrons*	M		AMc
Channel-billed cuckoo	*Scythrops novaehollandiae*			AMc, JWA
White-browed scrubwren	*Sericornis frontalis*			AMc, JWA

Common name	Scientific name	Conservation status[#]		Source[1]
		EPBC Act	BC Act	
Large-billed scrubwren	*Sericornis magnirostra*			JWA
Regent bowerbird	*Sericulus chrysocephalus*			AMc
Figbird	*Sphecotheres viridis*			AMc, JWA
Pied currawong	*Strepera graculina*			JWA
Spotted turtle-dove	*Streptopelia chinensis**			AMc, JWA
Sacred kingfisher	*Todiramphus sanctus*			JWA
Scaly-breasted lorikeet	*Trichoglossus chlorolepidotus*			JWA
Rainbow lorikeet	*Trichoglossus haematodus*			AMc, JWA
Silvereye	*Zosterops lateralis*			AMc, JWA

Species listed within schedules of the EPBC Act and/or the BC Act are shown in **bold**
[#] V=Vulnerable; E=Endangered; EPop=Endangered Population; M=Migratory species
***** Denotes an introduced species
[1] AMc - Ashby and McTackett, 2018; JWA – JWA site inspection February 2020

The significance of near coastal environments of the N.S.W. Far North Coast and South-East Queensland as over-wintering habitat for migratory birds has been established by many observers and bird banders including Keast (1968), Robertson (1973), Gravatt (1974), Porter (1982) and Robertson and Woodall (1983). These patterns may be attributable to the relatively high winter temperatures and long growing season of this region compared with the rest of south-eastern Australia (Fitzpatrick and Nix 1973; Edwards 1979; Nix 1982).

Many insectivorous birds from higher latitudes and elevation reside over winter in the locality. These include species such as the Fantail cuckoo, Sacred kingfisher, Rainbow beeeater, Noisy pitta, Tree martin, Black-faced cuckoo-shrike, Cicada bird, Golden whistler, Rufous whistler, Rose robin, Grey fantail, White-throated gerygone, Silvereye, Olivebacked oriole and Spangled drongo.

Birds such as honeyeaters and lorikeets are Blossom nomads (ibid.). These birds move locally in response to variation in the availability of nectar and or pollen, important components in their diet. Porter (1982) highlights the importance of Forest red gum (Eucalyptus tereticornis), Broad-leaved paperbark (Melaleuca quinquenervia) and Coast banksia (Banskia integrifolia) for Scaly-breasted and Rainbow lorikeets as these species flower during the lorikeet's winter breeding period. A sequence of important nectar bearing plants in the genera Eucalyptus, Banksia, Melaleuca and Callistemon provide a continuity of food for nectarivorous birds.

The habitat present on and adjacent to the subject site is likely to result in a moderate diversity of resident and nomadic birds. The study area provides a number of flowering and fruiting plant species. The study area represents moderate quality habitat for frugivorous, nectarivorous and insectivorous birds.

Hollow-bearing trees were observed. Therefore, nesting opportunities for hollow dependent birds occurs within the study area. No habitat for wetland birds is present.

Mammals

Seventeen (17) mammal species have been recorded during the site surveys (Ashby and McTackett 2018) (**TABLE 3**). Five (5) threatened species listed within schedules of the EPBC Act and/or the BC Act have been recorded:

- Koala (*Phascolarctos cinereus*) – listed as Vulnerable (EPBC Act & BC Act);
- Eastern Long-eared Bat (*Nyctophilus bifax*) – listed as Vulnerable (BC Act);
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) – listed as Vulnerable (BC Act);
- Eastern Freetail-bat (*Mormopterus norfolkensis*) – listed as Vulnerable (BC Act); and
- Little Bentwing-bat (*Miniopterus australis*) – listed as Vulnerable (BC Act).

TABLE 3
MAMMAL SPECIES RECORDED FROM THE SUBJECT SITE (ASHBY AND MCTACKETT 2018)

Common name	Scientific name	Conservation status#	
		EPBC Act	BC Act
Dog	*Canis familiaris**		
Eastern grey kangaroo	*Macropus giganteus*		
Little Bentwing-bat	*Miniopterus australis*		V
Eastern freetail-bat	*Mormopterus norfolkensis*		V
Eastern long-eared bat	*Nyctophilus bifax*		V
Long-nosed bandicoot	*Perameles nasuta*		
Koala	*Phascolarctos cinereus*	V	V
Common ringtail possum	*Pseudocheirus peregrinus*		
Black rat	*Rattus rattus**		
Pale field rat	*Rattus tunneyi*		
Yellow-bellied sheathtail-bat	*Saccolaimus flaviventris*		V
Little broad-nosed bat	*Scotorepens greyii*		
White-striped freetail-bat	*Tadarida australis*		
Common brushtail Possum	*Trichosurus vulpecula*		
Eastern forest bat	*Vespadelus pumilus*		
European red fox	*Vulpes vulpes**		

Common name	Scientific name	Conservation status#	
		EPBC Act	BC Act
Swamp wallaby	*Wallabia bicolor*		
Species listed within schedules of the EPBC Act and/or the BC Act are shown in **bold** # V=Vulnerable; E=Endangered; EPop=Endangered Population; M=Migratory species * Denotes an introduced species			

Small terrestrial mammals generally occur in highest densities in association with a complex vegetation structure. A dense understorey layer, which provides shelter from predators and provides nesting opportunities, is particularly important.

In general, medium-large terrestrial mammals such as macropods select habitats which provide a dense cover for shelter and refuge and open areas for feeding. The larger species tend to occupy drier more open habitats: the smaller species, moister and more densely vegetated habitats.

All Arboreal mammals that occur in the region (with the exception of the Koala) utilise tree hollows for nesting and shelter (although the Common ringtail possum is not dependent on hollows). Smith and Lindenmeyer (1988) consider that shortage of nest hollows is likely to limit arboreal mammal populations where density of hollow bearing trees is less than 2 to 8 trees per hectare.

Arboreal folivores (e.g. Common ringtail possum, Greater glider) are widespread and abundant but exhibit local variation in response to such factors as tree species composition, foliage protein and fibre levels, leaf toughness, toxins, forest structure and the availability of shelter sites. Arboreal folivores are expected to be most abundant in areas of high productivity, high soil fertility and moderate climate, in conjunction with adequate shelter and suitable foraging substrate.

Arboreal nectarivore/insectivores feed on a wide variety of plant and insect exudates including the nectar of flowering eucalypts, and shrubs such as Banksia and Acacia sp. These species also feed extensively on insects, particularly under the shedding bark of eucalypts. The distribution of nectarivore/insectivores is considered to be related to the abundance of nectar and pollen producing plants, the abundance of bark shedding eucalypts which harbour insect prey, and the occurrence of sap and gum exudate producing trees (Sap feed trees) and shrubs (e.g. Acacia sp.). Arboreal nectarivores and insectivores are generally hollow dependent species.

Insectivorous bats like insectivorous birds overlap considerably in diet and broad vegetation preferences (Hall 1981), but specialise in foraging in specific layers or substrates within the forest (Chrome and Richards 1988).

The study area may provide forage habitat for insectivorous bats, due to the combination of open, forested and denser areas of vegetation. The study area contains a number of fruiting and flowering trees and represents potential foraging habitat for frugivorous/nectarivorous bats.

The study area represents relatively moderate quality habitat for both ground dwelling and arboreal mammals. This is due to the general presence of habitat components (e.g. dense understorey vegetation, fallen timber and tree hollows) and connection of site habitat to adjoining vegetation in the locality.

APPENDIX 2 - RISK ASSESSMENTS

Scented Acronychia (*Acronychia littoralis*)

This species is known from the local area, but with no confirmed records from the development site itself (Ashby and McTackett 2018). It occurs in transition zones between littoral rainforest and swamp sclerophyll forest; between littoral and coastal cypress pine communities; and margins of littoral forest (OEH 2020). Its conservation is reliant upon the appropriate management of 8 key sites, including one near the Esk River in Bundjalung National Park to the north.

Direct loss of potential habitat occurs where the development will remove Pink Bloodwood – Brush Box Open Forest, Coast Cypress Pine Shrubby Forest, and Coast Banksia Woodland. This vegetation removal will also increase the fragmentation of its potential habitat.

A risk assessment for this species has been completed in **TABLE 1**.

TABLE 1
RISK ASSESSMENT – SCENTED ACRONYCHIA

Impact	Likelihood	Consequence	Risk Rating
Direct clearing of *Acronychia littoralis*	Unlikely	Major	High
Potential habitat fragmentation	Highly likely	Minor	Medium
Degradation of potential habitat – erosion and sedimentation	Unlikely	Minor	Low
Degradation of potential habitat - nutrients in stormwater	Unlikely	Minor	Low
Degradation of potential habitat – pollutants in runoff	Possible	Moderate	Medium
Degradation of potential habitat - accidental/natural spread of weeds	Likely	High	High
Degradation of potential habitat - weeds in green waste dumping	Rare	High	Low
Degradation of potential habitat – rubbish dumping	Rare	Minor	Low

White-eared monarch (*Carterornis leucotis*)

This species was not recorded on the subject site but is known from a number of records in the local area, particularly in the breeding season from September to March (Ashby and McTackett 2018). The closest record to the development site is from Iluka Nature Reserve. Characteristically, it forages for insects high in the canopy of a variety of forested habitats and the ecotones with adjacent clearings.

A risk assessment for this species has been completed in **TABLE 2**.

TABLE 2
RISK ASSESSMENT – WHITE-EARED MONARCH

Impact	Likelihood	Consequence	Risk Rating
Direct clearing of potential habitat	Highly likely	Minor	Medium
Direct clearing of nesting habitat	Possible	High	Medium
Injury / mortality to birds during clearing	Possible	Major	High
Fragmentation of potential habitat	Highly likely	Minor	Medium
Barriers to movement	Highly likely	Moderate	High
Degradation of potential habitat – erosion and sedimentation	Unlikely	Minor	Low
Degradation of potential habitat - nutrients in stormwater	Unlikely	Minor	Low
Degradation of potential habitat – pollutants in runoff	Possible	Minor	Low
Degradation of potential habitat - accidental/natural spread of weeds	Likely	High	High
Degradation of potential habitat - weeds in green waste dumping	Rare	High	Low
Degradation of potential habitat – rubbish dumping	Rare	Minor	Low

Wonga pigeon (*Leucosarcia melanoleuca*)

This species is known from many records in the local area and was observed foraging on the development site (Ashby and McTackett 2018). It occurs in a wide range of forested habitats, and feeds exclusively on the ground, foraging for seeds, fruit and occasional insects along well-defined routes.

A risk assessment for this species has been completed in **TABLE 3**.

TABLE 3
RISK ASSESSMENT – WONGA PIGEON, WOMPOO FRUIT DOVE, ROSE-CROWNED FRUIT DOVE & SUPERB FRUIT DOVE

Impact	Likelihood	Consequence	Risk Rating
Direct clearing of potential habitat	Highly likely	Minor	Medium
Direct clearing of nesting habitat	Possible	High	Medium
Injury / mortality to birds during clearing	Unlikely	Major	Low
Fragmentation of potential habitat	Highly likely	Minor	Medium
Barriers to movement	Highly likely	Moderate	High
Degradation of potential habitat – erosion and sedimentation	Unlikely	Minor	Low
Degradation of potential habitat - nutrients in stormwater	Unlikely	Minor	Low
Degradation of potential habitat - pollutants in runoff	Possible	Minor	Low
Degradation of potential habitat - accidental/natural spread of weeds	Likely	High	High
Degradation of potential habitat - weeds in green waste dumping	Rare	High	Low
Degradation of potential habitat - rubbish dumping	Rare	Minor	Low

Wompoo fruit-dove (*Ptilinopus magnificus*)

This species is rarely recorded in the local area and was not found on the development site (Ashby and McTackett 2018). It occurs in or near rainforest, low elevation moist eucalypt forest and brush box forests. It feeds on a diverse range of fruits of trees and vines and is locally nomadic, following ripening fruit.

The most likely potential habitat on the development site for this species is in the north eastern corner and in the intact forest along the site's western boundary. Both of these areas are within reserved Parks.

A risk assessment for this species has been completed in **TABLE 3**.

Rose-crowned fruit-dove (*Ptilinopus regina*)

This species is commonly recorded in the local area (particularly in Iluka Nature Reserve) and was heard calling on the development site during surveys (Ashby and McTackett 2018). They feed entirely on fruit from vines, shrubs, large trees, and palms and therefore occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where such fruits are plentiful. They are thought to be locally nomadic as they follow the ripening of fruits.

The most likely potential habitat on the development site for this species is in the north eastern corner and in the intact forest along the site's western boundary. Both of these areas are within reserved Parks.

A risk assessment for this species has been completed in **TABLE 3**.

Superb fruit-dove (*Ptilinopus superbus*)

This species is rarely recorded in the local area and was heard calling on the development site (Ashby and McTackett 2018). This species inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland, but only if fruit-bearing trees are present.

The most likely potential habitat on the development site for this species is in the north eastern corner and in the intact forest along the site's western boundary. Both of these areas are within reserved Parks.

A risk assessment for this species has been completed in **TABLE 3**.

Rufous Fantail (*Rhipidura rufifrons*)

This species is commonly recorded in the local area during spring through to autumn, being partially migratory. It was observed foraging across the development site, with an active nest observed in the intact forest along the site's western boundary (Ashby and McTackett 2018).

It mainly occurs in moist forest habitats but is not restricted to a vegetation type. Therefore, the development site provides habitat for this species across the entire lot.

A risk assessment for this species has been completed in **TABLE 4**.

TABLE 4
RISK ASSESSMENT – RUFOUS FANTAIL

Impact	Likelihood	Consequence	Risk Rating
Direct clearing of habitat	Highly likely	Minor	Medium
Direct clearing of nesting habitat	Possible	High	Medium
Injury / mortality to birds during clearing	Possible	Major	High
Fragmentation of habitat	Highly likely	Minor	Medium
Barriers to movement	Highly likely	Moderate	High
Degradation of habitat - erosion and sedimentation	Unlikely	Minor	Low
Degradation of habitat – nutrients in stormwater	Unlikely	Minor	Low
Degradation of habitat - pollutants in runoff	Possible	Minor	Low
Degradation of habitat - accidental / natural spread of weeds	Likely	High	High
Degradation of habitat - weeds in green waste dumping	Rare	High	Low
Degradation of habitat - rubbish dumping	Rare	Minor	Low

Spotted-tailed quoll (*Dasyurus maculatus*)

This species is rarely reported from the local area, with most records dating from the 1990s. It has a large home range and uses many kinds of habitats, but it requires specific habitat features for denning sites, such as hollow-bearing trees, fallen logs, small caves, rock outcrops, and rocky cliff

faces. The development site contains some suitable hollow-bearing trees and fallen logs (Ashby and McTackett 2018).

A risk assessment for this species has been completed in **TABLE 5**.

TABLE 5
RISK ASSESSMENT – SPOTTED-TAIL QUOLL

Impact	Likelihood	Consequence	Risk Rating
Direct clearing of potential foraging habitat	Highly likely	Minor	Medium
Direct clearing of potential denning habitat	Highly likely	High	High
Injury/mortality to Quolls during clearing	Rare	Major	Medium
Fragmentation of potential habitat	Highly likely	Minor	Medium
Barriers to movement	Highly likely	Moderate	High
Degradation of habitat - accidental / natural spread of weeds	Likely	High	High
Degradation of habitat - weeds in green waste dumping	Rare	High	Low
Degradation of habitat - rubbish dumping	Rare	Minor	Low

Grey-headed flying-fox (*Pteropus poliocephalus*)

This species was not recorded on site during survey, but is known from a large number of records in the local area (Ashby and McTackett 2018). There is a well-established colony at nearby Maclean, and so the foraging resources provided by the development site (blossom and fruits) are likely to be used by this species.

A risk assessment for this species has been completed in **TABLE 6**.

TABLE 6
RISK ASSESSMENT – GREY-HEADED FLYING-FOX

Impact	Likelihood	Consequence	Risk Rating
Direct clearing of potential foraging habitat	Highly likely	Moderate	High
Fragmentation of habitat	Highly likely	Minor	Medium
Degradation of habitat – nutrients in stormwater	Unlikely	Minor	Low
Degradation of habitat - pollutants in runoff	Possible	Minor	Low
Degradation of habitat - accidental/natural spread of weeds	Likely	High	High
Degradation of habitat - weeds in green waste dumping	Rare	High	Low
Degradation of habitat - rubbish dumping	Rare	Minor	Low

Eastern coastal free-tailed bat (*Micronomus norfolkensis*)

This species has rarely been recorded in the local area, but targeted survey has not been commonly undertaken. Foraging calls were identified on the development site during spring survey near Park C (Ashby and McTackett 2018). It roosts and breeds in hollow-bearing trees, and forages in open forest and woodland within a few kilometres of roosting sites. Thus, potential habitat on the development site occurs in the hollow-bearing trees and the open canopy vegetation types.

A risk assessment for this species has been completed in **TABLE 7**.

TABLE 7
RISK ASSESSMENT – EASTERN COASTAL FREE-TAILED BAT, LITTLE BENT-WINGED BAT & EASTERN LONG-EARED BAT

Impact	Likelihood	Consequence	Risk Rating
Direct clearing of foraging and roosting habitat	Highly likely	Moderate	High
Injury/mortality to bats during clearing of hollow-bearing trees	Possible	Major	High
Interruption of foraging due to additional external lighting	Highly likely	Moderate	High
Degradation of habitat - accidental/natural spread of weeds	Likely	Moderate	Medium
Degradation of habitat - weeds in green waste dumping	Rare	Moderate	Low
Degradation of habitat - rubbish dumping	Rare	Minor	Low

Little bent-winged bat (*Miniopterus australis*)

This species has rarely been recorded in the local area, but targeted survey has not been commonly undertaken. Foraging calls were identified on the development site during spring survey near Park A (Ashby and McTackett 2018). Non-breeding roosts occur in caves and tunnels and it has once been observed using a hollow-bearing tree. It forages via aerial pursuit of small insects (moths, wasps and ants) beneath the canopy of densely-vegetated habitats including rainforest, paperbark swamps and wet and dry sclerophyll forest. Thus, foraging habitat on the development site occurs in the areas that support dense canopy vegetation.

A risk assessment for this species has been completed in **TABLE 7**.

Eastern long-eared bat (*Nyctophilus bifax*)

This species has been regularly recorded in Iluka Nature Reserve and adjacent parts of Bundjalung National Park, and was possibly recorded foraging on the development site during spring survey near Park A (Ashby and McTackett 2018). Its habitat is known to occur in lowland subtropical rainforest and wet and swamp eucalypt forest, with coastal rainforest and patches of coastal scrub are particularly favoured. Roosts occur in tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns, and sometimes in buildings. All of the natural forms of roost sites are common across the development site, and particularly in the conserved vegetation within Park A and Park B.

A risk assessment for this species has been completed in **TABLE 7**.

Koala (*Phascolarctos cinereus*)

Koalas are known from isolated records in the local area, including one from the development site itself (Ashby and McTackett 2018).

Although the site does not provide high quality habitat, the potential impact to this species arises from the development through the direct removal of Koala food trees, together with the increased threat from dog attack, vehicle collision, and drowning in backyard pools when the development is occupied by residents. Other threats to the local population (such as disease, inappropriate fire regime, off site road trauma) also remain in effect irrespective of the development.

A risk assessment for this species has been completed in **TABLE 8**.

TABLE 8
RISK ASSESSMENT – KOALA

Impact	Likelihood	Consequence	Risk Rating
Direct clearing of habitat	Highly likely	Moderate	High
Injury/mortality to Koalas during clearing	Possible	Major	High
Injury/mortality to Koalas by vehicle collision after occupation	Possible	Major	High
Injury/mortality to Koalas by dog attack after occupation	Possible	Major	High
Injury/mortality to Koalas by drowning after occupation	Possible	Major	High
Fragmentation of habitat	Highly likely	Minor	Medium
Barriers to movement	Highly likely	Moderate	High
Degradation of habitat - nutrients in stormwater	Unlikely	Minor	Low
Degradation of habitat - pollutants in runoff	Possible	Minor	Low
Degradation of habitat - accidental / natural spread of weeds	Likely	High	High
Degradation of habitat - weeds in green waste dumping	Rare	High	Low
Degradation of habitat - rubbish dumping	Rare	Minor	Low

APPENDIX 3 - PRE-CONSTRUCTION PHASE IMPLEMENTATION TABLE

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
Education of Site Personnel	MA1 / MU1	An induction program will be developed prior to construction commencing and all construction personnel, and any other persons/contractors completing works on the site during the construction phases, are to complete the induction prior to starting work on the site in accordance with **SECTION 6.2**.	Principal Contractor / Site Supervisor	Induction program developed and all relevant personnel completed induction prior to starting work on the site. Records of all training conducted maintained.
Nest Boxes	MA2 / MU2 MA3 / MU4 MA4 / MU7 MA5 / MU10	Hollows removed for development replaced with nest boxes at minimum 1:1 ratio one (1) month prior to clearing works in accordance with **SECTION 6.3**.	Project Ecologist	Nest boxes installed and details of each installation provided to Council.
Provision of Spotter Catcher	MA1 / MU1	A suitably qualified fauna spotter catcher will be appointed to conduct a pre-clearing site inspection and oversee all clearing works in accordance with **SECTION 6.3.2**.	Principal Contractor / Site Supervisor	Fauna spotter catcher appointed.
Pre-clearing Site Inspection for Habitat Features	MA1 / MU1	Site Inspection completed no more that one (1) day prior to commencement of clearing with each stage to identify and mark for habitat trees/features in accordance with **SECTION 6.3.3**.	Project Ecologist	Site inspection completed and habitat trees/features marked.
	MA1 / MU1	A pre-clearing report prepared prior to clearing in accordance with **SECTION 6.3.3**.	Project Ecologist	Report prepared.
Erosion and Sediment Control Measures	MA1 / MU1	All measures contained in the Sediment and Erosion Control Plan to be implemented prior to the commencement of construction in accordance with **SECTION 6.5**.	Proponent	Sediment and erosion control measures implemented.
Management of Retained Habitat	MA2 MA3 MA4 MA5 MA6	Retained habitat within Bushland Parks A - E clearly identified on site with marking pegs prior to commencement of construction works in accordance with **SECTION 6.8**.	Principal Contractor / Site Supervisor	Boundaries of retained habitat areas identified and marked.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
Retained Habitat / Rehabilitation Monitoring	MA2 MA3 MA4 MA5 MA6	Baseline retained habitat monitoring completed prior to commencement of construction in accordance with **SECTION 7.4**.	Project Ecologist	Baseline retained habitat monitoring completed.
	MA2 MA3 MA4 MA5 MA6	Baseline monitoring report prepared in accordance with **SECTION 7.6.1**.	Project Ecologist	Baseline monitoring report completed.

APPENDIX 4 - CONSTRUCTION PHASE IMPLEMENTATION TABLE

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
No Go Zones	MA2 MA3 MA4 MA5 MA6	Access to no-go zones (Management Areas 2 – 6) by construction personnel and machinery is prohibited during clearing works except for non-destructive works (e.g. bush regeneration) with prior approval in accordance with **SECTION 6.4.3**.	Principal Contractor / Site Supervisor / Project Ecologist	No unauthorised access to no-go zones.
	MA2 MA3 MA4 MA5 MA6	In accordance with **SECTION 6.3.5** the following activities are not permitted within the No Go Zones: • Storage and mixing of materials; • Vehicle parking; • Liquid disposal; • Machinery repairs and/or refuelling; • Construction site office or shed; • Combustion of any material; • Stockpiling of soil, rubble and debris, cleared vegetation and site mulch; • Any filling or excavation including trench line, topsoil skimming and/or surface excavation; and • Unauthorised pesticide, herbicide or chemical applications.	Principal Contractor / Site Supervisor	No prohibited activities within no go zones.
Pre-clearing Site Inspection for Fauna	MA1 / MU1	Clearing are to be inspected for presence of koalas and other fauna prior to the commencement of clearing each day in accordance with **SECTION 6.3.4**.	Fauna Spotter Catcher	Pre-clearing site inspection for fauna completed.
Nest Boxes	MA2 / MU2 MA3 / MU4 MA4 / MU7 MA5 / MU10	Additional hollows removed during clearing works replaced with nest boxes at minimum 1:1 ratio in accordance with **SECTION 6.3**.	Project Ecologist	Nest boxes installed and details of each installation provided to Council.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
	MA2 / MU2 MA3 / MU4 MA4 / MU7 MA5 / MU10	Nest boxes monitored and maintained on an annual basis until completion of all stages and then for an additional period of three (3) years in accordance with **SECTION 7.3**.	Project Ecologist / Community Property (Lot 1) Contractor	Nest boxes monitored and repaired/replaced as required.
	MA2 / MU2 MA3 / MU4 MA4 / MU7 MA5 / MU10	Annual nest box monitoring results to be included in the Annual Habitat Monitoring Report in accordance with **SECTION 7.3** and **SECTION 7.6.2**.	Project Ecologist / Community Property (Lot 1) Contractor	Reporting completed.
Vegetation and Fauna Management During Construction Phase	MA1 / MU1	Tree clearing undertaken in accordance with procedures outlined in **SECTION 6.3.6** and **SECTION 6.3.7**.	Principal Contractor / Site Supervisor / Fauna Spotter Catcher	Tree clearing procedures followed.
	MA1 / MU1	Vegetation waste to be mulched and retained on site for re-use in landscape works or disposed of appropriately in accordance with **SECTION 6.3.6.**	Principal Contractor / Site Supervisor	Vegetation waste reused on site or disposed of appropriately.
	MA1 / MU1	Hollow logs to be relocated to areas proposed for rehabilitation works in accordance with **SECTION 6.3.6**.	Project Ecologist	Hollow logs relocated where appropriate.
	MA1 / MU1	Stockpile areas are to be clearly delineated on plans and on the ground and soil and vegetation debris must be stockpiled within defined areas in accordance with **SECTION 6.3.6**.	Principal Contractor / Site Supervisor	Stockpile locations identified and marked. Soil and vegetation debris stockpiled in designated areas.
	MA1 / MU1	Construction zone to be regularly monitored for weeds and any weeds controlled in accordance with SECTION 6.3.6.	Principal Contractor / Site Supervisor	Weeds controlled during construction phase.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
	ALL	Hygiene protocols for machinery (such as wash-down procedures) and personnel (such as boot-cleaning), are to be strictly observed to minimise the spread of weeds and the movement of pathogens in accordance with **SECTION 6.3.6**.	Principal Contractor / Site Supervisor	Hygiene protocols followed.
	MA1 / MU1	Any fauna captured on site during clearing works will be relocated/translocated by the spotter catcher to a suitable habitat area/s on or adjacent to the site the same day of capture in accordance with **SECTION 6.3.7.4**.	Fauna Spotter Catcher	Fauna relocated as required.
	MA1 / MU1	Any animals injured or requiring support / rehabilitation during tree clearing to be immediately removed from site and taken to an appropriately qualified veterinary surgeon / wildlife carer or centre as required in accordance with **SECTION 6.3.7.4** and **SECTION 6.3.8.**	Fauna Spotter Catcher	Animals provided appropriate care.
	MA1 / MU1	Earthworks and/or the clearing of native vegetation will be temporarily suspended (up to 72 hrs) within a 25 m radius of any tree in which a koala is located and will not resume until the koala has moved outside of the clearing area of its own accord (**SECTION 6.3.7.4**). If the animal does not self-relocate out of the clearing area within 72 hrs of its initial observation, experts will be consulted in relation to an appropriate protocol to encourage the animal to relocate. The tree can only to be removed following inspection by an appropriately qualified ecologist/fauna handler to ensure that the koala has dispersed and that the removal of the tree poses no direct threat to the health or survival of the koala.	Fauna Spotter Catcher	Procedures for tree clearing in vicinity of koalas observed.
	MA1 / MU1	A Post Clearing Fauna Spotter Report to be prepared within two (2) weeks of completion of each stage of clearing activities and forwarded to all relevant agencies including CVC in accordance with **SECTION 6.3.7.4**.	Principal Contractor / Site Supervisor / Fauna Spotter Catcher	Post Clearing Fauna Spotter Report prepared and provided to relevant agencies.
Protocols for the Discovery of an Injured or Dead Animal	ALL	Any animals injured or requiring support / rehabilitation during construction phase to be immediately removed from site and taken to an appropriately qualified veterinary surgeon /	Principal Contractor /	Animals provided appropriate care.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
		wildlife carer or centre as required in accordance with **SECTION 6.3.7.4** and **SECTION 6.3.8.**	Site Supervisor / Fauna Spotter Catcher	
	ALL	WIRES to be notified of any dead animals in accordance with **SECTION 6.3.8**.	Principal Contractor / Site Supervisor / Fauna Spotter Catcher	WIRES notified as required.
	ALL	Any koala observation or incident during the construction phase should result in an observation/incident report in accordance with **SECTION 6.3.8**.	Principal Contractor / Site Supervisor / Fauna Spotter Catcher	Observation/incident report completed as required.
Fencing During Construction	MA1 / MU1	The works area to be clearly delineated with temporary fencing (e.g. with high visibility para-webbing) during clearing and construction works in accordance with **SECTION 6.4.1**.	Principal Contractor / Site Supervisor	Temporary fencing installed.
	MA1 / MU1	Temporary fencing to be inspection at not less than one (1) monthly intervals in accordance with **SECTION 6.4.1**.	Principal Contractor / Site Supervisor	Temporary fencing inspected.
	MA1 / MU1	Any damage to fences to be repaired within two (2) working days of the discovery in accordance with **SECTION 6.4.1**.	Principal Contractor / Site Supervisor	Temporary fencing repaired as required.
Construction Signage	ALL	Temporary signage to be installed during construction phases in accordance with **SECTION 6.4.3**. Following signage required: • Signs warning all personnel and the public of dangers, work health and safety requirements and contact details for the Site Manager. • At appropriate and highly visible locations noting the total prohibition of dogs on the site;	Principal Contractor / Site Supervisor	Temporary signage installed.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
		• Beside temporary roads/haul routes noting a 50 km/hr speed limit, or 40 km/hr speed limit where roads traverse the environmental protection areas; and • At approximately 100 m intervals along all fencing stating "Environmental Protection Zone – No Unauthorised Entry".		
Permanent Signage	ALL	Permanent signage to be installed at end of construction phase at each Bushland Park in accordance with **SECTION 6.4.4, SECTION 6.11** and **SECTION 6.10**. Following types of signage required: • Notification of conservation area (including educational material on significant flora, fauna and EECs known to occur within the local area – Coastal Cypress Pine Forest and Littoral rainforest); • Specific information regarding the Iluka Peninsula Koala population; • Prohibition of dumping of garden refuse in bushland areas; • The importance of dog control, particularly between dusk and dawn and warning of total prohibition of dogs within the conservation area; • Contact details for WIRES as the primary organization for the rehabilitation of sick and injured koalas in the locality; and • Contact information for incident reporting.	Principal Contractor / Site Supervisor	Permanent signage installed.
Erosion and Sediment Control Measures	MA1 / MU1	All measures contained in the Sediment and Erosion Control Plan to be implemented and maintained throughout construction phase in accordance with **SECTION 6.5**.	Principal Contractor / Site Supervisor	Sediment and erosion control measures implemented and maintained.
	ALL	All traffic access to occur via Hickey Street or at the intersection of Elizabeth Street and Micalo Street, or within the	Principal Contractor /	Appropriate traffic and access controls implemented.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
Access and Traffic Management		existing bushfire access track during construction in accordance with **SECTION 6.6**.	Site Supervisor	
	ALL	Vehicles and deliveries are not to block any access along roads or the fire trail in accordance with **SECTION 6.6**.	Principal Contractor / Site Supervisor	Appropriate traffic controls implemented.
	ALL	Vehicles and construction plant to be restricted to a maximum speed of 40 kph (or less as identified by the contractor) and daylight operation for the duration of the construction phase in accordance with **SECTION 6.6**.	Principal Contractor / Site Supervisor	Appropriate traffic controls implemented.
Verge Management and Maintenance	MA1 / MU1	Tree planting in the road verges to be completed in accordance with the Landscape Master Plan (Moir Landscape Architecture 2018) and **SECTION 6.7**.	Principal Contractor / Site Supervisor	Tree planting in road verges completed as required.
Management of Retained Habitat	ALL	Retained habitat to be maintained/improved through weed control and rehabilitation works in accordance with the protocols as described in **SECTION 6.8** and **SECTION 6.9.**	Bush Regeneration Company	Weed control and rehabilitation works completed as required. Specific performance indicators and targets for rehabilitation works are provided in **SECTION 7.4.3**.
Rehabilitation Strategy	MA2 MA3 MA4 MA5 MA6	Rehabilitation works and weed control to be completed in accordance with **SECTION 6.9**.	Bush Regeneration Company	Rehabilitation works and weed control completed. Specific performance indicators and targets for rehabilitation works are provided in **SECTION 7.4.3**.
	MA2 MA3 MA4 MA5 MA6	Weed monitoring visits will be completed every month for the duration of the establishment period, and every six (6) months during the maintenance period in accordance with **SECTION 6.9.5.5**.	Bush Regeneration Company	Weed monitoring completed.
	MA2 MA3 MA4 MA5 MA6	Plantings within the APZs are to be minimal and consist of low, 'fire retardant' ground covers in accordance with **SECTION 6.9.7.4**.	Bush Regeneration Company	Minimal plantings within APZ.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
	MA2 MA3 MA4 MA5 MA6	No rehabilitation plantings are to occur within the existing fire break along the southern boundary in accordance with **SECTION 6.9.7.4**.	Bush Regeneration Company	No plantings within fire break.
	MA2 MA3 MA4 MA5 MA6	Replacement preferred koala food trees to be planted in rehabilitation areas in accordance with **SECTION 6.9.7.4**.	Bush Regeneration Company	Replacement trees planted.
	ALL	No plantings of any *Acronychia* species are to occur on site in accordance with **SECTION 6.9.7.4**.	Bush Regeneration Company	No *Acronychia* species planted.
Domestic Pet Controls	ALL	All dogs will be banned from the subject site during the construction phase in accordance with **SECTION 6.10**.	Contractor / Site Supervisor	No dogs on site.
	ALL	Any evidence of dogs within Bushland Parks observed during monitoring or maintenance works to be reported to the Community Association in accordance with **SECTION 6.10**.	Contractor / Site Supervisor	Evidence of dogs reported.
Fire Management	ALL	Fire hazard within Bushland Parks managed appropriately in accordance with **SECTION 6.12**.	The Proponent	Fire management activities completed as required.
Fauna Management Monitoring	MA1 / MU1	Details of all fauna encountered during clearing works are to be recorded and reported in accordance with **SECTION 7.2**.	Project Ecologist / Fauna Spotter Catcher	Reporting completed.
Retained Habitat / Rehabilitation Monitoring	MA2 MA3 MA4 MA5 MA6	Retained habitat / rehabilitation monitoring to be completed six (6) monthly until the establishment period performance criteria are met and then annually during the maintenance period in accordance with **SECTION 7.4.2**.	Project Ecologist	Retained habitat / rehabilitation monitoring completed

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
	MA2 MA3 MA4 MA5 MA6	The bush regeneration team to keep work sheets detailing works completed in accordance with **SECTION 7.4.2.4**.	Bush Regeneration Company	Reporting completed.
Infrastructure, Construction and Operational Management Monitoring	ALL	Relevant construction activities and infrastructure to be monitored during and after construction in accordance with **SECTION 7.5**.	Contractor / Site Supervisor / Project Ecologist	Monitoring completed.
	ALL	Construction/installation of temporary and/or permanent fences and signage to be monitored to ensure that no barriers to wildlife movement created and temporary fencing does not prevent koalas accessing koala habitat on the site in accordance with **SECTION 7.5.2**.	Project Ecologist	Fencing and signage installation / construction monitored and no barriers created.
	ALL	Visual inspections of infrastructure to be completed on a monthly basis during construction phase in accordance with **SECTION 7.5.2**.	Project Ecologist	Inspections completed.
	ALL	Where damage or other failures to infrastructure are observed a report will be prepared within 24 hours and the damage or failure corrected within 48 hours of the report in accordance with **SECTION 7.5.2**.	Principal Contractor / Site Supervisor	Report completed. Damage or failure corrected.
Disease Management for Koalas	ALL	In the event that a suspected diseased koala is observed during monitoring, the time, date and location of the sighting must be recorded and provided to an appropriate wildlife care organization as soon as practicable in accordance with **SECTION 8.3.2**.	Project Ecologist	Suspected diseased koalas reported.
Annual Habitat Monitoring Report	ALL	Annual Habitat Monitoring Report to be prepared and submitted to CVC and DAWE in accordance with **SECTION 7.5.2, SECTION 7.6.2** and **SECTION 7.6.3.**	Project Ecologist	Annual Habitat Monitoring Report prepared and submitted.
Annual Koala Activity Monitoring and Reporting	MA2 MA3 MA4 MA5	Annual Koala activity monitoring to be completed from the date of commencement of works and continue for a period extending to five (5) years after completion of the final stage in accordance with **SECTION 8.3.2**.	Project Ecologist	Koala activity monitoring completed.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
	MA6			
	MA2 MA3 MA4 MA5 MA6	Additional koala activity monitoring event to be completed in the event of an uncontrolled bushfire occurring on the Birrigan Iluka Beach site in accordance with **SECTION 8.3.3**.	Project Ecologist	Additional monitoring completed as required.
	MA2 MA3 MA4 MA5 MA6	Annual Koala Monitoring Report to be prepared in accordance with **SECTION 8.3.2** and **SECTION 8.6.2**.	Project Ecologist	Annual Koala Monitoring Report prepared.
Lighting	MA1 / MU1	Lighting in public areas to be kept at a minimum required for safety and amenity in accordance with **SECTION 6.4.5**.	Contractor, Utility Service Provider (electricity and lighting)	Appropriate lighting installed.
	MA1 / MU1	All street lighting to be capped and/or positioned to minimise light spill into retained habitat and habitat rehabilitation areas in accordance with **SECTION 6.4.5**.	Contractor, Utility Service Provider (electricity and lighting)	Street lighting capped and/or appropriately positioned.

APPENDIX 5 - OPERATIONAL PHASE IMPLEMENTATION TABLE

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
Fencing Post Construction	ALL	No fencing to be constructed within Bushland Parks in accordance with **SECTION 6.4.2**.	Community Property (Lot 1) Contractor	No fencing installed in Bushland Parks.
	ALL	Bollards or large stone blocks to be installed (where required) to delineate boundaries of Bushland Parks and prevent vehicle incursion in accordance with **SECTION 6.4.2**.	Community Property (Lot 1) Contractor	Appropriate measures installed where required to delineate Bushland Park boundaries and prevent vehicle access.
Permanent Signage	ALL	Permanent signage to be maintained in accordance with **SECTION 6.4.4, SECTION 6.11** and **SECTION 6.10**.	Community Property (Lot 1) Contractor	Permanent signage maintained.
Lighting	MA1 / MU1	Lighting in public areas to be kept at a minimum required for safety and amenity in accordance with **SECTION 6.4.5**.	Contractor, Utility Service Provider (electricity and lighting)	Appropriate lighting installed.
	MA1 / MU1	All street lighting to be capped and/or positioned to minimise light spill into retained habitat and habitat rehabilitation areas in accordance with **SECTION 6.4.5**.	Contractor, Utility Service Provider (electricity and lighting)	Street lighting capped and/or appropriately positioned.
	MA1 / MU1	Outdoor lighting in residential lots to be of low-wattage and of a type that reduces spills and glare in accordance with **SECTION 6.4.5**.	Owners and Occupiers	Appropriate lighting installed.
	MA1 / MU1	No lights to be directed towards the retained bushland or into the entrances of pre-existing hollows in accordance with **SECTION 6.4.5**.	Community Property (Lot 1) Contractor / Residents	Lighting appropriately positioned.
Swimming Pools	MA1 / MU1	Backyard swimming pools to include an acceptable Koala escape mechanism in accordance with **SECTION 6.4.6**.	Owners and Occupiers	Koala escape mechanisms provided to swimming pools.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
Access and Traffic Management	ALL	Access to the Bushland Parks to be via the existing roads and fire trails and internal tracks within the development footprint in accordance with **SECTION 6.6**.	Community Property (Lot 1) Contractor	No unauthorised vehicle access.
	ALL	No vehicular access to the site is to occur through the Bushland Parks or via any new access point from Iluka Road in accordance with **SECTION 6.6**.	Community Property (Lot 1) Contractor	No unauthorised vehicle access.
	ALL	Fire trail and APZs are to remain clear and act as maintenance tracks in accordance with **SECTION 6.6**.	Community Property (Lot 1) Contractor	Fire trails and APZs managed and maintained.
	MA1 / MU1	Traffic calming measures to be implemented after occupation in accordance with **SECTION 6.6**.	Community Property (Lot 1) Contractor	Appropriate traffic calming measures installed where required.
Verge Management and Maintenance	MA1 / MU1	Internal public road verges on site and existing external public road verges surrounding the site to be managed and maintained in accordance within **SECTION 6.7**.	Community Property (Lot 1) Contractor	Road verges managed and maintained.
Management of Retained Habitat	ALL	Weeds to be controlled within Bushland Parks in accordance with **SECTION 6.8** and **SECTION 6.9.5.**	Community Property (Lot 1) Contractor	Weeds controlled as needed.
Domestic Pet Controls	ALL	Any evidence of dogs within Bushland Parks observed during monitoring or maintenance works to be reported to the Community Association in accordance with **SECTION 6.10**.	Community Property (Lot 1) Contractor	Evidence of dogs reported.
	MA1 / MU1	Dog-proof and koala-proof exclusion fences and koala escape posts / planks to be installed at premises with dogs in accordance with **SECTION 6.10**.	Owners and Occupiers	Dog-proof and koala-proof exclusion fences and koala escape posts / planks installed where required.
	MA1 / MU1	Dogs to be on leash at all times within the subdivision when outside of fenced premises in accordance with **SECTION 6.10**.	Owners and Occupiers	Dogs properly controlled when outside fenced premises.
	MA1 / MU1	Domestic dogs to be confined indoors or within a koala exclusion external fence in accordance with **SECTION 6.10**.	Owners and Occupiers	No domestic dogs outside premises or enclosures.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
	MA1 / MU1	Domestic cats to be confined indoors or within a cat-proof enclosure in accordance with **SECTION 6.10**.	Owners and Occupiers	No domestic cats outside premises or enclosures.
	ALL	All domestic pets are prohibited from Bushland Parks in accordance with **SECTION 6.10**.	Community Property (Lot 1) Contractor / Residents	No domestic pets in Bushland Parks.
	MA1 / MU1	Dogs and cats are to be desexed in accordance with **SECTION 6.10.**	Owners and Occupiers	Dogs and cats desexed.
	MA1 / MU1	All domestic pets are to be microchipped and registered within the CVC in accordance with **SECTION 6.10**.	Owners and Occupiers	Dogs and cats microchipped and registered.
	MA1 / MU1	Vaccinations for all dogs and cats are to be kept up to date at all times in accordance with **SECTION 6.10**.	Owners and Occupiers	Dogs and cats vaccinated.
	MA1 / MU1	Dogs and cats are to be wearing appropriate identification (collar and tag) at all times in accordance with **SECTION 6.10**.	Owners and Occupiers	Dogs and cats wearing identification.
	MA1 / MU1	Domestic cats are to either be fitted with a bell to their collar or a motion activated audible and visual alarm to warn nearby wildlife in accordance with **SECTION 6.10**.	Owners and Occupiers	Cats wearing bell or alarm.
Disease Management for Koalas	ALL	In the event that a suspected diseased koala is observed during monitoring, the time, date and location of the sighting must be recorded and provided to an appropriate wildlife care	Project Ecologist / Community	Suspected diseased koalas reported.

Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
		organization as soon as practicable in accordance with **SECTION 8.3.2**.	Property (Lot 1) Contractor	
Fire Management	ALL	Fire hazard within Bushland Parks managed appropriately in accordance with **SECTION 6.12**.	Community Property (Lot 1) Contractor	Fire management activities completed as required.
Raising Community Awareness and Education	MA1 / MU1	All new residents will be provided with a copy of the Community Management Statement/bylaws and an environmental education package in accordance with **SECTION 6.13**.	The Proponent	Community Management Statement/bylaws and an environmental education package provide to all new residents.
Retained Habitat / Rehabilitation Monitoring and Reporting	MA2 MA3 MA4 MA5 MA6	Retained habitat / rehabilitation monitoring to be completed six (6) monthly until the establishment period performance criteria are met and then annually during the maintenance period in accordance with **SECTION 7.4.2**.	Project Ecologist / Community Property (Lot 1) Contractor	Retained habitat / rehabilitation monitoring completed
	MA2 MA3 MA4 MA5 MA6	The bush regeneration team to keep work sheets detailing works completed in accordance with **SECTION 7.4.2.4**.	Bush Regeneration Company	Reporting completed.
	MA2 MA3 MA4 MA5 MA6	Annual Habitat Monitoring Report to be prepared and submitted to CVC and DAWE in accordance with **SECTION 7.6.2.**	Project Ecologist / Community Property (Lot 1) Contractor	Annual Habitat Monitoring Report prepared and submitted.
Annual Koala Activity Monitoring and Reporting	MA2 MA3 MA4 MA5 MA6	Annual Koala activity monitoring to be completed from the date of commencement of works and continue for a period extending to five (5) years after completion of the final stage in accordance with **SECTION 8.3.2**.	Project Ecologist / Community Property (Lot 1) Contractor	Koala activity monitoring completed.
	MA2 MA3 MA4	Additional koala activity monitoring event to be completed in the event of an uncontrolled bushfire occurring on the Birrigan Iluka Beach site in accordance with **SECTION 8.3.3**.	Project Ecologist /	Additional monitoring completed as required.

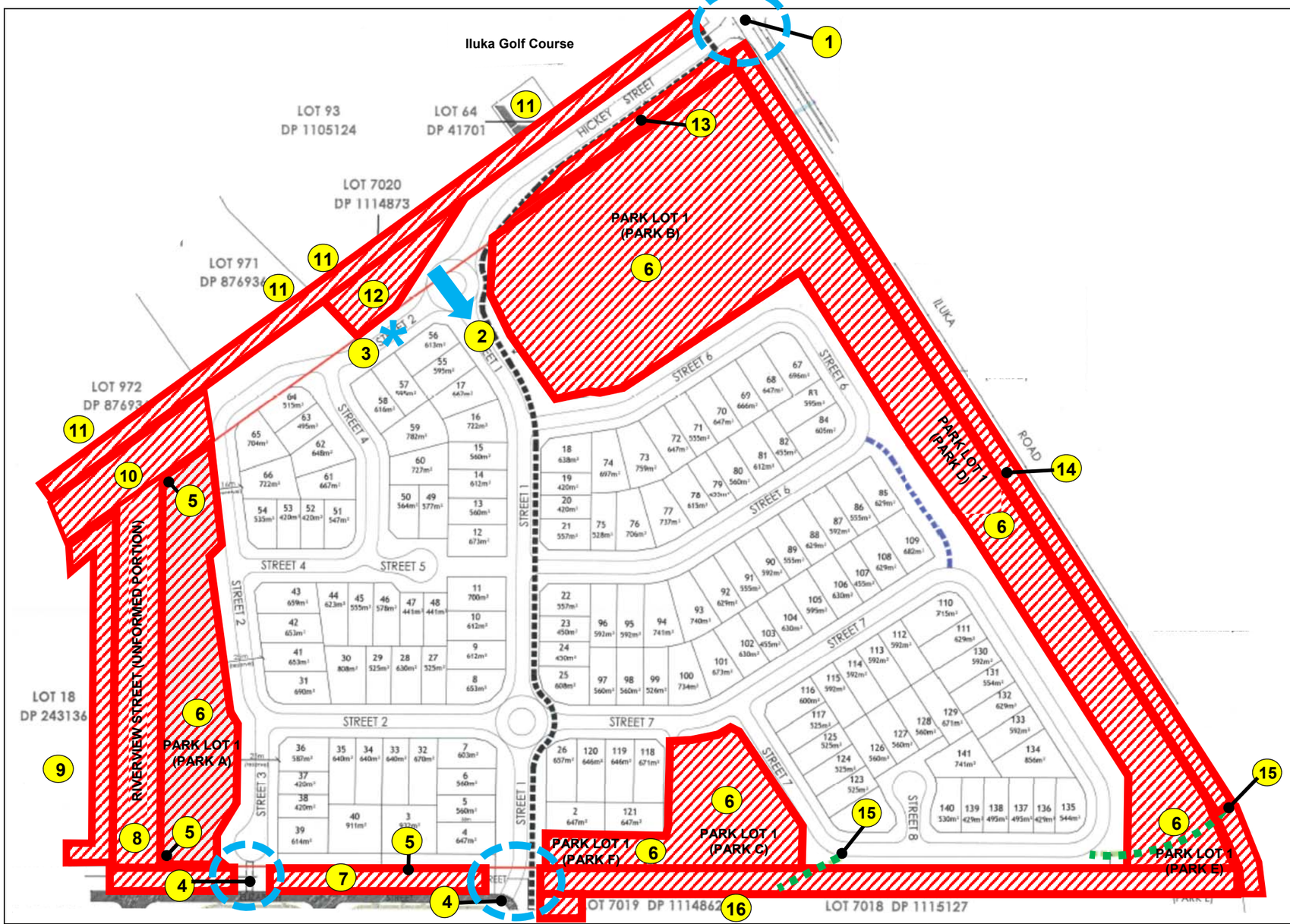
Management Strategy	Applicable Management Area/s	Management Action	Responsibility	Performance Measure
	MA5 MA6		Community Property (Lot 1) Contractor	
	MA2 MA3 MA4 MA5 MA6	An Annual Koala Monitoring Report to be prepared in accordance with **SECTION 8.6.2**.	Project Ecologist	Report prepared.

APPENDIX 6 – NO GO ZONES & CONSTRUCTION ACCESS ARRANGEMENTS

Ocean Park Consulting Pty Limited

Birrigan Iluka Beach, Community Scheme Residential Subdivision, Hickey Street, Iluka, NSW
Principal – Stevens Holdings Pty Limited
Land Owner – Birrigan Gargle Local Aboriginal Land Council (BGLALC)
Access and "NO GO ZONES" For General Construction

Drawing No. BE-02(C)
28 April 2020



LEGEND

- 1 — Reference Number
- Construction Access
- Construction Compound (mobile – temporary)
- External Infrastructure Connection & Intersections
- (i) "NO GO ZONE" for General Construction – Refer to Habitat Management Plan for strictly controlled "bushland" management activity in Community Property - Lot 1 (retained bushland) and all adjacent road reserve road verge areas;
  (ii) The "NO GO ZONE" to be marked by surveyor prior to construction commencement

Note: *(i) This Subdivision Masterplan image based on Drawing PO147-04 June 2017 by OneCollective. This Masterplan may be amended from time to time where approved by Clarence Valley Council.*
(ii) Lot 1 – Community Property (Retained Bushland)

Property Description

- Lot 99 DP823635
- Situated – Iluka Road, Hickey Street, Riverview Street, Elizabeth Street, Micalo Street and adjacent Vacant Crown Land, Iluka, New South Wales

Purpose

The purpose of this drawing is to identify the Birrigan Iluka Beach Community Scheme Residential Subdivision, Hickey Street, Iluka:

Access and "NO GO ZONES" for the Construction Phase.

To protect the native vegetation and habitat in Lot 1 and adjoining road verge areas.

Controlled Access – Construction Phase

1. All Construction access via Hickey Street intersection. Contractor to manage intersection during times of peak construction vehicle movements.
2. Construction access from Hickey Street to Lot 99 DP823635. Contractor to minimise impact on the Iluka Golf Course.
3. Construction Compound – temporary – and mobile Compound position to be approved by the Principal.
4. Construction access to the Elizabeth Street and Micalo Street Intersection to be limited to direct works at the intersection, infrastructure connections, and to be constructed fire trail.
   Need to minimise impact on existing residential area, Iluka Pre School, and Iluka Library in the near vicinity.

"NO GO ZONES" – Construction Phase

Contractor to have regard to the Habitat Management Plan and have suitably marked "NO GO ZONES" in the locations as noted:

5. "NO GO ZONE" – Significant trees to BGLALC
6. "NO GO ZONE" – Community Property - Lot 1 (All Park Areas) Retained Bushland
7. "NO GO ZONE" – Elizabeth Street Road Verge adjacent Lot 99 DP823635
8. "NO GO ZONE" – Riverview Street
9. "NO GO ZONE" – Lot 18 DP243136
10. "NO GO ZONE" – Hickey Street (Part)
11. "NO GO ZONE" – All land north of Hickey Street
12. "NO GO ZONE" – Lot 7020 DP1114873
13. "NO GO ZONE" – Hickey Street Road Verge
14. "NO GO ZONE" – No access from or to Iluka Road + Iluka Road road verge
15. "NO GO ZONE" – No access to the bushfire trail for construction purposes. Maintain the bushfire trail for emergency access only.
16. "NO GO ZONE" – To Vacant Crown Land Lot 7019 DP1114862, Lot 7018 DP1115127 and all other Crown Land.

APPENDIX 7 – WEED SPECIES OCCURRING ON SITE AND APPROPRIATE REMOVAL METHODS

Weed Species Recorded

Weed species recorded on the subject site are listed in **TABLE 1**.

TABLE 1
WEED SPECIES RECORDED ON SITE

Scientific Name	Common Name
Thunbergia alata	Black-eyed Susan vine
Schefflera actinophylla HTW	Umbrella Tree
Syagrus romanzoffiana	Cocos Palm
Asparagus aethiopicus WONS	Ground Asparagus
Asparagus densiflorus	Foxtail Fern
Conyza sp.	
Delairea odorata HTW	Cape ivy
Tradescantia fluminensis HTW	Trad
Tradescantia zebrina	Inchplant
Ipomoea cairica HTW	Morning Glory
Bryophyllum delagoense HTW	Mother-of-millions
Senna pendula var. glabrata HTW	Easter cassia
Cinnamomum camphorum HTW	Camphor laurel
Ficus elastica	Rubber plant
Psidium cattleyanum var. cattleyanum HTW	Cattley guava
Ochna serrulata HTW	Mickey Mouse Plant
Pinus sp. HTW	
Megathyrsus maximus HTW	Guinea Grass
Paspalum urvillei HTW	
Solanum nigrum	Black Nightshade
Solanum seaforthianum HTW	Brazilian nightshade
Lantana camara WONS	Lantana

Weed Control Methods

(Adapted from BSRLG 2005)

The following are control techniques that are to be utilised during site regeneration works:

- **Cut Stump Method** - This method involves cutting plant stems as close to ground level as possible and immediately painting the cut stump with herbicide. This treatment can also be applied as a basal bark application to the first 15-20 cm (entire circumference) of an uncut stem if the adult bark has not yet developed. The type of chemical used with this application is dependent upon the proximity of the weed to naturally ponding water or waterways and whether or not the chemical is registered for aquatic use.

- **Stem Injection** - Herbicides may be applied directly to the plant via stem injection. This involves applying herbicide to the plant directly by drilling a hole into the stem and inserting the chemical. Axe cuts for stem injection can also be used. Cuts can be made at regular

intervals around the stem and should leave a "pocket" into which the chemical must be immediately injected. Axe cuts should penetrate the cambium layer, but not the hardwood.

- **Spray Method** - There are two (2) types of spraying methods that will be employed where appropriate:
    - Selective blanket spraying: The area must initially be checked for the presence of any native species. Any weeds within 2 m of the drip zone of existing native species will be removed by hand. Alternatively, native species will be covered with impermeable material (e.g. a tarpaulin) for protection during spraying;
    - Spot spraying: The spray nozzle will be kept close to ground to avoid any overspray. Individual weeds will be spot-sprayed at the site. This method of spraying will be employed as native species are interspersed throughout the exotic grasses; and
    - Herbicides specific to each target species, where appropriate, will be identified prior to the implementation of any works. Herbicides will be applied in accordance with the manufacturer's specifications and when environmental conditions are most preferred (e.g. wind and rainfall).
- **Cutting and Chipping** - Manual weeding may involve cutting and chipping, pulling, digging or slashing and is preferred, depending on the growth stage and situation as detailed:
    - Where native plants are growing within a weed infestation and the use of selective herbicide is not possible;
    - Where inadequate foliage is present to allow for successful uptake of herbicide e.g. Mile-a-minute runners typically exhibit this trait; and
    - When hand weeding, the stem must be grasped firmly at the base of the plant and pulled. A trowel, mattock or sharp knife may be needed to loosen the soil. Care must be taken not to leave behind stems or other plant pieces that may re-shoot. Hand weeding should also be undertaken at times when weeds are not seeding to reduce dispersal and spread. Hand pulling is not recommended for some weed species as they readily sucker if their roots are disturbed e.g. *Lantana camara.* This method will be employed when removing exotic grass species within retained vegetation.
- **Ring Barking -** This method involves removing the lower bark from the stem using a sharp implement to expose the phloem and xylem tissue to the outer environment thereby destroying it.
- **Basal Bark Method** - This method involves applying herbicide to the lower 35-45 cm bark around the entire stem using a hand-pump backpack sprayer fitted with a shut-off at the wand tip and an adjustable cone nozzle or a small, ATV- (All-Terrain Vehicle) mounted sprayer with a shut-off at the wand tip and an adjustable cone nozzle.

Species Specific Control Methods

Botanical Name	**Common Name**	**Control Method**
Ageratina adenophora	Crofton weed	**Plants:** hand-pull and hang to dry or spray (G 100 mL/10 L +S or 0, or MM 1-2 g/10 L + W or 0).

Botanical Name	**Common Name**	**Control Method**
Ageratina riparia	Mistflower	**Plants:** hand-pull and hang to dry or spray (G 100 mL/10 L +S or 0, or MM 1-2 g/10 L + W or 0).
Ageratum houstonianum	Blue billygoat weed	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Ambrosia artemisiifolia	Annual ragweed	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Ardisia crenata	Coral berry	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Asparagus aethiopicus	Asparagus fern	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + MM 1.5 g/I0 L)
Baccharis halimifolia	Groundsel	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Bidens pilosa	Cobblers pegs	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Bryophyllum pinnatum	Resurrection plant	**Plants:** spray or hand-pull and spray regrowth (G 20 mL/10 L + MM 1 g/I0 L)
Chloris gayana	Rhodes grass	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Cinnamomum camphora	Camphor laurel	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or 0, or G 200 mL/10 L+ MM 1.5 g/10 L + W or 0). **Saplings:** CS&P (G 1:1.5). **Trees:** F/I (G 1:1.5) or CS&P (G 1:1.5).
Conyza albida	Fleabane	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Crotalaria lanceolate	Rattlepod	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Erythrina x sykesii	Coral tree	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or 0, or G 200 mL/10 L+ MM 1.5 g/10 L + W or 0). **Saplings:** CS&P (G 1:1.5). **Trees:** F/I (G 1:1.5) or CS&P (G 1:1.5).
Gomphocarpus physocarpus	Balloon cotton bush	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Ipomoea cairica	Coastal morning glory	**Vines**: hand-pull or CS&P (G 1:1.5). **Seedlings and regrowth**: Spray: (G 200 mL/10 +Sor0,orG200mL/10L+MM1.5g/10L+Wor 0)
Ipomoea purpurea	Morning glory	**Vines**: hand-pull or CS&P (G 1:1.5). **Seedlings and regrowth**: Spray: (G 200 mL/10 +Sor0,orG200mL/10L+MM1.5g/10L+Wor 0)
Koelreuteria elegans subsp. *Formosana**	Chinese rain tree	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or 0, or G 200 mL/10 L+ MM 1.5 g/10 L + W or 0). **Saplings:** CS&P (G 1:1.5). **Trees:** F/I (G 1:1.5) or CS&P (G 1:1.5).
Lantana camara	Lantana	**Seedlings:** hand-pull or CS&P (G 1:1.5).

Botanical Name	**Common Name**	**Control Method**
		Shrubs: spray or cut down and spray regrowth (G 200 mL/10 L + S)
Ligustrum sinense	Small-leaved privet	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or 0, or G 200 mL/10 L + MM 1.5 g/10 L + W or 0, or MM 1-2 g/10 L + W or 0). **Saplings:** CS&P or C&P (G 1:1.5). **Trees:** F/I (G 1:1.5).
Melinis minutiflora	Molasses grass	**Plants:** hand-pull or dig up. Spray (G 100 mL/10 L + S or
Murraya paniculata	Mock orange	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Ochna serrulata	Mickey mouse plant	**Stems:** CS&P or S&P or F/I (G 1:1.5). **Seedlings and regrowth:** spray (G 200 mL/10 L + S or 0, or G 200 mL/10 L + MM 1.5 g/10 L + W or 0, or MM 1-2 g/10 L + W or 0)
Onopordum acanthium	Scotch thistle	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Paspalum dilatatum	Paspalum	**Plants:** hand-pull or dig up. Spray (G 100 mL/10 L + S or
Passiflora edulis	Passionfruit	**Vines**: hand-pull or CS&P (G 1:1.5). **Seedlings and regrowth**: Spray: (G 200 mL/10 +Sor0,orG200mL/10L+MM1.5g/10L+Wor 0)
Passiflora foetida	Stinking passionfruit	**Vines**: hand-pull or CS&P (G 1:1.5). **Seedlings and regrowth**: Spray: (G 200 mL/10 +Sor0,orG200mL/10L+MM1.5g/10L+Wor 0)
Passiflora suberosa	Corky passionfruit	**Vines**: hand-pull or CS&P (G 1:1.5). **Seedlings and regrowth**: Spray: (G 200 mL/10 +Sor0,orG200mL/10L+MM1.5g/10L+Wor 0)
Passiflora subpeltata	White passionflower	**Vines**: hand-pull or CS&P (G 1:1.5). **Seedlings and regrowth**: Spray: (G 200 mL/10 +Sor0,orG200mL/10L+MM1.5g/10L+Wor 0)
Pennisetum clandestinum	Kikuyu	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Pennisetum purpureum	Elephant grass	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Ricinus communis	Castor oil plant	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Rivina humilis	Coral berry	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Schinus terebinthifolius	Broad-leaf pepper tree	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or 0, or G 200 mL/10 L+ MM 1.5 g/10 L + W or 0). **Saplings:** CS&P (G 1:1.5). **Trees:** F/I (G 1:1.5) or CS&P (G 1:1.5).
Schefflera actinophylla	Umbrella tree	**Seedlings:** hand-pull and hang to dry or spray (G 200 mL/10 L + S or 0, or G 200 mL/10 L + MM 1.5 g/10 L + W or 0). **Trees:** CS&P and cut

Botanical Name	**Common Name**	**Control Method**
		and stack branches above the ground to dry or F/I (G 1:1.5).
Senna pendula var. *glabrata*	Winter senna	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or G 200 mL/10 L + MM 1.5 g/I0 L + W or 0, or MM 1-2 g/10 L + W or 0). **Shrubs:** CS&P (G 1:1.5). **Trees:** C, S and P or F/I (G 1:1.5). Collect and bag seed pods
Senna X floribunda	Smooth senna	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or G 200 mL/10 L + MM 1.5 g/I0 L + W or 0, or MM 1-2 g/10 L + W or 0). **Shrubs:** CS&P (G 1:1.5). **Trees:** C, S and P or F/I (G 1:1.5). Collect and bag seed pods
Setaria sphacelata	Pigeon grass	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Solanum chrysotrichum	Giant devil's fig	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or G 200 mL/10 L + MM 1.5 g/I0 L + W or 0, or MM 1-2 g/10 L + W or 0). **Shrubs:** CS&P (G 1:1.5). **Trees:** C, S and P or F/I (G 1:1.5).
Solanum mauritianum	Tobacco bush	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or G 200 mL/10 L + MM 1.5 g/I0 L + W or 0, or MM 1-2 g/10 L + W or 0). **Shrubs:** CS&P (G 1:1.5). **Trees:** C, S and P or F/I (G 1:1.5).
Solanum nigrum	Blackberry nightshade	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Solanum seaforthianum	Climbing nightshade	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Sporobolus africanus	Parramatta grass	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).
Syagarus romanzoffiana	Cocos palm	**Seedlings:** hand-pull or spray (G 200 mL/10 L + S or 0, or G 200 mL/10 L + MM 1.5 g/10 L + W or 0, or MM 1-2 g/10 L + W or 0). **Saplings:** CS&P or C&P (G 1:1.5). **Trees:** F/I (G 1:1.5).
Verbena bonariensis	Purple top	**Plants:** spray or hand-pull and spray regrowth (G 100 mL/10 L + S or 0).

Abbreviations
CS&P = cut, scrape and paint
S&P = scrape and paint
C&P = cut and paint
F/I = frill/stem-inject/spear or drill
Numbers in brackets are G = glyphosate, MM = metsulfuronmethyl dilution ratios
S = surfactant, e.g. LI 700 W = wetting agent, e.g. Agral, Pulse
0 denotes use of spray adjuvant, e.g. Codacide, Protec Pl

APPENDIX 8 – BUSH REGENERATOR'S WORK RECORD SHEETS

Progress Report for Bushland Management Works
Page 1 of 3

Management Area	
Management Unit	

Date of inspection	**Stage of inspection** (e.g. pre works, 6 month year 1, 12 months year 1)
Name and contact details of person(s) collecting data	

GENERAL CONDITION					
	Major	**Minor**	**None**	**N/A**	**Notes**
Pollution					
Litter / rubbish					
Excessive sediment					
Erosion					
Weeds adjacent to rehabilitation area					
Pests					
Diseases					
Feral animals					
Native fauna evidence (scats, sightings etc)					
Overall habitat value (logs, cover, food etc)					

Progress Report for Bushland Management Works

Page 2 of 3

REGENERATION / WEED CONTROL PERFORMANCE

Quadrat identifier:
Photograph identifier:

Locational details of quadrat (e.g. GPS reading)

Natural recruitment observed	In quadrat: Y ▫ N ▫

WEEDS

Exotic species identified	% cover			% age composition	
	Canopy	Mid storey	Ground	Seedling / juvenile	Mature / semi mature

Weed control comments:

Progress Report for Bushland Management Works **Page 3 of 3**					
NATIVES					
		Trees	**Shrubs**	**Grasses / graminoids / herbs**	**Climbers / scramblers**
Species Diversity (number) (approx. number of species in each layer)					
Structure (m) (height of average specimen in each stratum class)					
Overall cover in quadrat	Nil ¤	<5% ¤	5-20% ¤	>20% and <50% ¤	>50% ¤
Extent of bare soil in quadrat	Nil ¤	<5% ¤	5-20% ¤	>20% and <50% ¤	>50% ¤
Extent of leaf litter in quadrat	Nil ¤	<5% ¤	5-20% ¤	>20% and <50% ¤	>50% ¤
Depth of leaf litter (mm)					
Evidence of plant damage / death by feral animals	Yes ¤	No ¤	Details		
Native plant regeneration - comments					
Corrective actions					
Were previous corrective actions implemented?	Yes ¤	No ¤	N/A ¤	**Comments**	
Proposed corrective actions – detail					

Daily Work Record

Name……..
Date ……
Site Name / Location _____Date _____ Time _____ to _____

Team / Staff _____

Growing conditions	Temperature / Humidity	Weather conditions	Wind direction / Speed

Zone(s) / Work locations	Hours	Weeds treated	Method	New T.S. encountered / Location

Chemicals used / Rates / Totals								Notes and comments
Equipment used	Round-up	Associate	Herbidye	Pulse		Water	Number mixed	
Daily Chemical Totals								

Assessor……					Progress on Weed Control
Date……					……
MZ……					……
Weather……					Progress on Enhancement Plantings
General Conditions ……					……
	Existing Natives	Volunteer Natives	Weeds	Plantings	……
Canopy Height	…….	…….	……	…….	Progress on Natural Regeneration
% Cover Canopy	…….	…….	……	…….	……
% Cover Ground	…….	…….	……	…….	……
Photos (Photo #)	North	South	East	West	Damage to Site
Point 1	…….	…….	……	…….	……
Point 2	…….	…….	……	…….	Adaptive Management Strategies
Summary of Management Works……					……
……					Requirements for on Going Maintenance
……					……

Existing Natives					**Volunteer Natives**				
Species	Stratum	Stems (#)	Height (cm)	Cover (%)	Species	Stratum	Stems (#)	Height (cm)	Cover (%)
Enhancement Plantings					**Exotics**				
Species	Stratum	Stems (#)	Height (cm)	Cover (%)	Species	Stratum	Stems (#)	Height (cm)	Cover (%)

APPENDIX 9 – BASELINE KOALA MONITORING REPORT (JWA 2020)

JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

KOALA
(*Phascolarctos cinereus*)
BASELINE MONITORING REPORT

Birrigan Iluka Beach, Iluka
Lot 99 on DP823635

A Report Prepared for
The Stephens Group Pty Ltd

JUNE 2020

NEW SOUTH WALES
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www.jwaec.com.au

DOCUMENT CONTROL

Document

Title	Koala (*Phascolarctos cinereus*) Baseline Monitoring Report
Job Number	N202001
File Reference	\\SERVER\data\2020 CLIENTS\202001 - Birrigan Iluka Beach - Iluka\Basline Monitoring
Version and Date	RW3 02/06/20
Client	The Stephens Group Pty Ltd

Revision History **(office use only)**

Issue	Version	Draft/Final	Date Sent	Distributed To	No. Copies	Media	Delivery Method
1	RW1	DRAFT	24/03/20	JWA	1	.docx	Email
2	RW2	DRAFT	27/05/20	Client	1	.pdf	Email
3	RW3	FINAL	02/06/20	Client	1	.pdf	Email
4	RW4	FINAL	12/06/20	Client	1	.pdf	Email

Client Issue

Version	Date	Author		Approved by	
		Name	Initials	Name	Initials
RW2	27/05/20	Nicole Davies	ND	Adam McArthur	AM
RW3	02/06/20	Nicole Davies	ND	Adam McArthur	AM
RW4	12/06/20	Nicole Davies	ND	Adam McArthur	AM

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background

JWA Pty Ltd have been engaged by The Stephens Group Pty Ltd to undertake baseline monitoring for the koala (*Phascolarctos cinereus*) population at the Birrigan Iluka Beach development site, located at Hickey Street, Iluka - formally described as Lot 99 on DP823635. The Birrigan Iluka Beach development is an approved 141 lot community scheme subdivision over the subject land (**FIGURE 1**).

The koala is listed as a vulnerable species within schedules of the NSW *Biodiversity Conservation Act (2016)* (BC Act). The koala (combined population in Queensland, New South Wales and the Australian Capital Territory) is listed as a vulnerable species within schedules of the Commonwealth E*nvironment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Comprehensive Koala surveys have previously been undertaken by Keystone Ecological in 2014, using a variety of direct and indirect methods (spotlight, call broadcast, camera trap, predator scats, scratch searches, and Spot Assessment Technique surveys) (Keystone Ecological 2018). The presence of this species on the subject site was confirmed by a single camera trap image (Keystone Ecological 2018a).

In order to comply with approval condition 4f issued by the Commonwealth Department of the Environment and Energy (DEE), a Koala Monitoring and Reporting Program is required. The Koala Monitoring Program must be consistent with the provisions of the Clarence Valley Comprehensive Koala Plan of Management, including any provisions for registration of data on koala presence.

This report details the methodology and results from the koala baseline monitoring completed by JWA during February 2020.

1.2 Site Description

Birrigan Iluka Beach is a 19.41 ha site located in Iluka, within the Clarence Valley Local Government Area (LGA) (**FIGURE 2**). The Birrigan Iluka Beach subdivision is surrounded by residential development in the west and south-west, bushland to the north, east and south-east and the Iluka Golf Course to the north-east. Iluka Nature Reserve and the Bundjalung National Park are in proximity to the site to the east.

The site has experienced disturbance comprising clearing, sand mining, severe fires, weed infestation, possibly some recontouring and some seeding and/or planting of unknown material. The site continues to be used by locals as a dumping ground for garden waste, old furniture, building materials and other rubbish.

The vegetation is a mosaic of regenerating locally native canopy species. The understorey is dominated by exotic species across most of the site, particularly Lantana (*Lantana camara*) and Guinea Grass (*Megathyrsus maximus*). A narrow band of vegetation at the

PROJECT:
ILUKA
LOT 99 ON DP 823635

LOCATION:
ILUKA ROAD, ELIZABETH, RIVERVIEW AND HICKEY STREETS
ILUKA, NSW, 2466

DEVELOPMENT CHARACTERISTICS	
ITEM	DESCRIPTION
PROPERTY DESCRIPTION	LOT 99 DP823635
AREA OF LOT 99	19.41 ha.
TOTAL NUMBER OF LOTS	141
PART LOT 1 (Approx.)	5.29 ha.

CLARENCE VALLEY COUNCIL
APPROVAL

This is the plan referred to in Council's Notice of Determination of SUB2015/0034

Date: 13/11/2019

BIKE / PATHWAY CONNECTION TO ILUKA ROAD
- BIKE LANE SITUATED ON THE NORTH EASTERN SIDE OF THE ILUKA ROAD INTERSECTION WITH HICKEY STREET AND TO PROVIDE A REFUGE ISLAND ON ILUKA ROAD

LOT 93 DP 1105124
LOT 64 DP 41701
LOT 7020 DP 1114873
LOT 971 DP 876936
LOT 972 DP 876936
LOT 18 DP 243136
LOT 7019 DP 1114862
LOT 7018 DP 1115127

HICKEY STREET
ILUKA ROAD
RIVERVIEW STREET (UNFORMED PORTION)
New Bushfire Trail Connection
bike / pathway
PART LOT 1 (PARK B)
PART LOT 1 (PARK D)
PART LOT 1 (PARK A)
PART LOT 1 (PARK C)
PART LOT 1 (PARK F)
PART LOT 1 (PARK E)
STREET 1
STREET 2
STREET 3
STREET 4
STREET 5
STREET 6
STREET 7
STREET 8
AWAY 3
16m (reserve)
25m (reserve)
35m
MAINTAIN EXISTING BUSHFIRE TRAIL ACCESS TO ILUKA ROAD
REALIGN EXISTING BUSHFIRE TRAIL
Emergency Access Only
ELIZABETH STREET
MICALO STREET
BIKE / PATHWAY CONNECTION TO MICALO STREET

STREETS FOR LIVING - CHARACTERISTICS				
STREET	RESERVE WIDTH (m)	VERGE WIDTH (m)	TOTAL SEAL WIDTH (m)	CUL DE SAC DIAMETER (m)
HICKEY STREET	30 EXISTING	VARIES	8	-
1	20	6	8	30 outer, 15 inner
2	20 (*1)	6 (*1)	8	-
3	25	6 (*2)	8	20
4, 6, 7	20	6	8	-
5, 8	20	6	8	20
AWAY 3	VARIES	3.5 (*3)	4	-

PURPOSE OF STREET CORRIDORS
- STREET FOR LIVING
- WATER SENSITIVE URBAN DESIGN CORRIDOR
- INFRASTRUCTURE CORRIDOR
- FAUNA / FLORA CORRIDOR

AWAY - MEANS ACCESS WAY

NOTES:
(* 1) - RESERVE WIDTH INCREASED TO 25m (AND VERGE OF 11m) TO ACCOMMODATE WSUD TREATMENT WITHIN RESERVE ON PARK SIDE OF STREET 2 - VERGE REDUCES TO 2m ON PARKSIDE FOR NORTHERN PART OF STREET 2 WHERE DETENTION / WSUD NOT REQUIRED. EXISTING RESERVE WIDTH APPROX. 30m FOR NORTHERN SECTION WHERE STREET 2 IS ACCOMMODATED WITHIN EXISTING HICKEY STREET RESERVE
(* 2) - VERGE WIDTH INCREASED TO 11m ON PARKSIDE TO ACCOMMODATE WSUD TREATMENT
(* 3) - ON SIDE WITH LOT ACCESS ONLY - REDUCED / VARIED VERGE WIDTH ON NON-ACCESS SIDE

TYPICAL ALLOTMENT ATTRIBUTES		
AREA (m2)	WIDTH (m)	LENGTH (m)
>400	13-14	30-35
500	14	35
600	17.5	35
700	19	37

NOTES:
1. **These notes form part of this plan.**
2. **Boundaries identified by plan dimensions only, the boundaries have not been surveyed.**
3. **Adjoining property boundary boundaries may not be complete, a summary of compiled DCDB only.**
4. **The dimensions, bearings, areas and number of allotments shown on this plan are subject to field survey and approval of relevant Government Authorities having jurisdiction over statutory requirements pursuant to any relevant legislation.**
5. **The information for this plan has been prepared for the purpose of a Development Approval for Subdivision and should not be used for any other purpose.**
6. **This plan has been prepared for the Stevens Group.**
7. **Do not scale from this plan.**

note: the layout is preliminary only and subject to detailed engineering and surveying input. all dimensions and areas are indicative only.

Scale 1 : 2500 - Lengths in metres

20 0 20 40 60 80 100

SOURCE: OneCollective - Masterplan (191113 CVC Approved Plans - Extract.pdf)

SCALE: 1 : 2500 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Ocean Park Consulting Pty Ltd

PROJECT
Baseline Koala Monitoring Report
Birrigan Estate
Lot 99 on DP823635, Hickey Street, Iluka NSW
Clarence Valley Council LGA

FIGURE 1

PREPARED: BW
DATE: 02 June 2020
FILE: N202001_SAT_20200302.dwg

TITLE
APPROVED MASTER PLAN

LEGEND

Site Boundary

Scale 1:20 000 - Lengths in metres

200 0 200 400 600 800 1000

SOURCE: Open Street Maps

SCALE: 1 : 20 000 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Ocean Park Consulting Pty Ltd

PROJECT
Baseline Koala Monitoring Report
Birrigan Estate
Lot 99 on DP823635, Hickey Street, Iluka NSW
Clarence Valley Council LGA

FIGURE 2

PREPARED: BW
DATE: 02 March 2020
FILE: N202001_SAT_20200302.dwg

TITLE

LOCALITY PLAN

western end of the site supports large trees and the landform seems to reflect a more natural pattern of dune and swale.

Three vegetation types have been recorded on the site (Keystone Ecological 2018):

- Community 190 Coast Banksia woodland and open forest of coastal dunes: 0.41 ha of relatively undisturbed vegetation at the site's western end. This area has elements of regenerating Littoral Rainforest (for example, some vines and rainforest tree species), but it is not structurally or floristically well developed.
- Community 193 Pink Bloodwood - Brush Box open forest on coastal dunes and sandplains: dominant community, occupying 18.16 hectares.
- Community 187 Coast Cypress Pine shrubby open forest: restricted on site to a dense patch of adult trees near the site's southern boundary, occupying 0.25 hectares.

2 METHODOLOGY

2.1 Background

A Baseline Koala Monitoring program was established in February 2020 across the retained vegetation on site to collect data to allow future monitoring to determine any changes in the distribution and level of Koala activity.

Monitoring is then to be undertaken annually to determine the effectiveness of management actions implemented and to monitor the Iluka Koala population.

2.2 Koala Monitoring Program

2.2.1 Introduction

This section discusses the proposed monitoring program for koalas at the Birrigan Iluka Beach site including the key monitoring objectives, methodologies employed during baseline monitoring and to be implemented during ongoing annual monitoring, and reporting requirements.

2.2.2 Monitoring Program

2.2.2.1 Baseline koala monitoring

The aims of the baseline monitoring are to establish survey sites and protocols and to collect data which will allow future monitoring to determine any changes in the distribution and level of Koala activity within the Birrigan Iluka Beach site.

Baseline koala monitoring has been completed across the vegetated areas to be retained on the site. Baseline monitoring was completed prior to the commencement of works on the site by suitably qualified and/or accredited persons[1]. Baseline monitoring included:

- diurnal searches of Birrigan Iluka Beach koala habitat; and
- a full measure of koala activity i.e. application of Spot Assessment Technique (SAT) methodology (Phillips and Callaghan 2011).

2.2.2.2 Annual koala monitoring

Annual koala monitoring will be completed over the Birrigan Iluka Beach site following the methodology described in the Baseline koala monitoring section (**SECTION 2.2.2.1**), and will include:

- diurnal searches of Birrigan Iluka Breach koala habitat; and
- a full measure of koala activity i.e. application of Spot Assessment Technique (SAT) methodology (Phillips and Callaghan (2011).

[1] Means a qualified ecologist with appropriate training and at least five years of experience in undertaking surveys in relation to the relevant EPBC Act listed threatened species.

In reporting of annual monitoring results, liaison is to be undertaken with the Clarence Valley Council, NSW Koala Preservation Society, NSW – Office of Environment and Heritage and/or Clarence Valley WIRES to gather data on any koala incidents that may have occurred within the area in the previous two-year period. In accordance with the HMP (Keystone Ecological 2018), annual reports detailing the results of the monitoring program is to include:

- a comparison of koala activity with data from past surveys;
- a summary of koala incidents having occurred over the previous two year period;
- any other observations of relevance to koala management; and
- a discussion of the findings of the program and any recommendations for amendment of the Community Scheme Residential Subdivision Koala Plan of Management or further action by the Birrigan Iluka Beach Association or Clarence Valley Council or other relevant party.

Reporting of Koala sightings should be in accordance with the protocol adopted by the Clarence Valley Council – refer to the Council website for "Register a Koala Sighting Form".

Any records of diseased koalas will be included in the results of the annual koala monitoring report. In the event that a suspected diseased koala is observed during monitoring, the time, date and location of the sighting must be recorded. These details should be passed on to an appropriate wildlife care organization as soon as practicable. If required, the observer should remain at the location until the wildlife rescuer attends.

2.2.3 Monitoring Methodology

Sampling

The field surveys will utilise the Spot Assessment Technique (SAT) (Phillips and Callaghan 2011), which involves a radial assessment of koala "activity" within the immediate area surrounding a SAT site. In the field, the technique is applied as follows:

1. Locate the SAT site;
2. Identify and uniquely mark the thirty (30) nearest trees to the SAT site;
3. Undertake a search for koala faecal pellets beneath each of the thirty (30) marked trees based on a cursory inspection of the undisturbed ground surface within a distance of 100 centimetres around the base of each tree, followed (if no faecal pellets are initially detected) by a more thorough inspection involving disturbance of the leaf litter and ground cover within the prescribed search area.

For assessment purposes, a tree is defined as "a live woody stem of any plant species (excepting palms, cycads, tree ferns and grass trees) which has a diameter at breast height (DBH) of 100 mm or greater" (Phillips *et al*. 2000). In the case of multi-stemmed trees, at least one of the live stems must have a DBH of 100 millimetres or greater in order to qualify.

Strict adherence to the 100 cm search area is a fundamental component of the SAT methodology. It is this distance that both optimises the probability of success in terms of actually finding faecal pellets, while at the same defining a workable search area (Phillips and Callaghan, 2011). In terms of search effort, an average of approximately two (2) person minutes per tree should be dedicated to the faecal pellet search. For assessment purposes, the search should be concluded once a single faecal pellet has been detected or when the maximum search time has expired, whichever happens first. This process should be repeated until each of the 30 trees in the site has been assessed. Where the location of faecal pellets falls within overlapping search areas due to two (2) or more trees growing in close proximity to each other, both should be scored for pellet(s).

In addition to the SAT analysis demographic attributes of the koala population will be determined via targeted searches of:

a) 25 m fixed radius from the central tree (0.196 ha); and

b) opportunistic sightings whilst traversing the subject site.

The following information relating to each koala sighting should be collected:

- Age class: Adult, sub-adult (2-4 kg) or juvenile (less than one (1) year old, less than 2 kg, not yet independent);
- Reproductive status: the presence of a pouch young, back young, or no young associated with an adult female;
- Health status: healthy, or showing signs of Chlamydia such as cystitis (wet, stained bottom) and/or conjunctivitis (red swollen eyes discharging pus), or other indicators of poor health such as discharges from nose or mouth, wasted or emaciated appearance etc.; and
- Koala location: using a map and/or GPS unit, the location of each koala should be plotted on a map to gain an overall distribution of koalas on the site.

Field sampling will be carried out between August to February (i.e. the breeding season) by ecologists experienced in koala faecal pellet identification, koala survey and tree species identification.

Data Analysis

Koala Activity

Koala 'activity' at each site will be determined by dividing the number of trees with a koala faecal pellet by the number of trees searched in the site (a minimum of 30). Activity thresholds of Phillip and Callaghan (2011) will be used to describe the results of field sites. This threshold allows interpretation of the activity level at each site in order to determine its relative importance to the koala population. The key measures on the east coast are summarized below in **TABLE 1**.

TABLE 1
SUMMARY OF KOALA ACTIVITY CATEGORIES AND THEIR INTERPRETATION

Activity Category	Activity Level	Interpretation
Significant activity	≥ 22.52%	Site is regularly used by one or more koalas as part of normal ranging behaviour.
Low activity	0% - 22.51%	Occasional or transitory use of the site by (for example) dispersing animals not yet displaying established home ranging movement patterns.

Habitat Utilisation / Occupancy rates

Two measures of "occupancy" are to be assessed. "Occupancy" describes the proportion of a sampled area where the target species is present. The first is usage of habitat by koalas at any level (Habitat Utilisation rate), be it occasional or frequent. The second and more useful measure is occupancy by resident koala populations (Koala Occupancy rate). Changes in occupancy by resident koalas in a population is more meaningful, as it describes the trend as it relates to the majority of the koala population at any given time.

Baseline Habitat Utilisation rate will be estimated on the basis of the numbers of sampled field sites in which koala faecal pellets were recorded, while the Baseline Koala Occupancy rate will be the subset of these sites that had koala activity levels > 22.52%. The first provides a measure of what proportion of available habitat is currently utilised by koalas in any way, the second indicating what proportion of habitat is occupied by resident populations.

A Baseline koala density estimate will be determined by dividing the total number of koalas sighted within the 0.196 ha radial assessments, by the total area covered by this assessment process over the sampling period.

A test of significance utilising the Paired Student t-test will be completed after each monitoring event to determine if a statistically significant reduction in koala occupancy rates has occurred (i.e. to test the hypothesis that pre-development koala activity is higher than the post-development koala activity). As sample sizes are relatively small, however, the value of p (typically 0.05 or 0.01 in order for significance to be determined) should be raised to something that better reflects the limitations of the sample size. A p of 0.25 as the statistical benchmark of significant change should be considered, further qualified by a requirement that a major review should be initiated only after consideration of the monitoring data from two (2) successive monitoring events.

2.2.4 Performance Criteria and Corrective Actions

TABLE 2 provides the performance criteria for the koala monitoring program. Corrective actions are provided that are to be implemented if performance criteria are not met.

TABLE 2
KOALA MONITORING PERFORMANCE CRITERIA AND CORRECTIVE ACTIONS

Performance Indicator	Corrective Action
For monitoring purposes, the benchmark habitat occupancy rate to be achieved for koala populations inhabiting the Birrigan Iluka Beach site will be equal to or greater than baseline levels	Investigate habitat usage on the Birrigan Iluka Beach site. Determine which areas of potential habitat are not being utilised by the population. Consult with OEH and koala experts to develop a strategy to improve/facilitate the usage of the potential koala habitat. Implement the strategy.
Mitigate processes which are limiting koala occupancy rates and / or population sizes: Bushfire related deaths or damage to habitat are minimised	If a bushfire occurs within land an investigation will be triggered to assess damage to koalas and their habitat on the Birrigan Iluka Beach lands. The investigation will include a survey of the koala population occurring on the site. Consultation will occur with RFS, Council and OEH to determine the cause of the fire. A report will be prepared after the consultation. The report will address, causes, impacts and proposed changes, if considered necessary, to Bushfire management plans.
Mitigate processes which are limiting koala occupancy rates and / or population sizes: No evidence or reports of dog attacks on a koala	If there is an instance of one (1) attack by a dog on a koala then an investigation of causes will be triggered. Dog management within the Birrigan Iluka Beach site will be investigated. If dog management strategies are considered to be ineffective or dog owners do not have sufficient awareness of their responsibilities, then Council, OEH and relevant specialists will be consulted and a more prescriptive dog ownership/management/education strategy will be prepared and implemented, including the installation of additional educational signage if necessary.
Mitigate processes which are limiting koala occupancy rates and / or population sizes: No reported vehicle strike mortalities	If there is an instance of one (1) koala killed or injured on Birrigan Iluka Beach internal roads then an investigation of causes will be triggered.
Mitigate processes which are limiting koala occupancy rates and / or population sizes: High rates of diseased koalas are not detected	Disease condition assessments will be carried out during the baseline monitoring assessment and in every annual assessment thereafter. If expert opinion considers that disease occurrence is over and above that which would be expected in a wild population of koalas or they consider that there has been a significant increase in diseased animals since the Baseline assessment, then

Performance Indicator	Corrective Action
	advice will obtained from appropriate OEH scientists and/or other koala experts as considered necessary or appropriate. The advice will be implemented.
Mitigate processes which are limiting koala occupancy rates and / or population sizes: Swimming pool drownings	If there is an instance of a koala drowning in a residential pool then an investigation will be triggered to ensure pool ownership strategies are in place e.g. checking to ensure all pool owners have pool fences which are koala-proof and pools have acceptable Koala escape mechanisms installed (e.g. shallow end or a thick rope A report will be prepared in consultation with OEH, Council and/or koala experts as necessary or appropriate. The recommendations contained in the report will be implemented.

3 BASELINE RESULTS

3.1 Koala Surveys

3.1.1 Field Sites

Nine (9) sites were sampled across the subject site by JWA ecologists as part of the baseline survey in February 2020 (**FIGURE 3**). **TABLE 3** provides a summary of activity/occupancy data at the nine (9) sites sampled.

3.1.2 Koala Sightings

No koalas were sighted during the 2020 Baseline survey (**TABLE 3**).

3.1.3 Koala Activity

Koala activity was not recorded from any of the nine (9) field sites sampled during this baseline study.

3.1.4 Habitat Utilisation / Occupancy rates

Baseline Habitat Utilisation rates (number of sampled field sites in which koala faecal pellets were recorded) were estimated at 0% (n=0) of the 9 sampled sites. This provides a measure of what proportion of available habitat is currently utilised by koalas in any way.

Baseline Koala Occupancy rate (subset of sites that had koala activity levels > 22.52%) were estimated at 0% (n=5) of the 9 sampled sites. The Baseline Koala Occupancy rate indicates what proportion of habitat is occupied by resident populations.

3.1.5 Koala Density and Population Estimate

The Baseline koala density and population estimates could not be estimated due to no koalas seen during the baseline surveys.

CLARENCE VALLEY COUNCIL APPROVAL

This is the plan referred to in Council's Notice of Determination of SUB2015/0034

Date: 13/11/2019

LOT 99 DP 823635

- Core Conservation Zone
- Bushfire Trail Zone
- Street Verges / Landscape Zone
- APZ setbacks
- Residential Lots
- New Bushfire Trail Connection
- Koala SAT Site

note: the layout is preliminary only and subject to detailed engineering and surveying input. all dimensions and areas are indicative only.

Scale 1 : 2500 - Lengths in metres

20 0 20 40 60 80 100

SOURCE: JWA Site Investigations Feb 2020; OneCollective - Vegetation Zones (191113 CVC Approved Plans - Extract.pdf)

SCALE: 1 : 2500 @ A3

JWA PTY LTD
Ecological Consultants

CLIENT
Ocean Park Consulting Pty Ltd

PROJECT
Baseline Koala Monitoring Report
Birrigan Estate
Lot 99 on DP823635, Hickey Street, Iluka NSW
Clarence Valley Council LGA

FIGURE 3

PREPARED: BW
DATE: 02 June 2020
FILE: N202001_SAT_20200302.dwg

TITLE

KOALA SAT SITES

TABLE 3
BASELINE KOALA SURVEY RESULTS

Site	Trees Surveyed		No. of trees with Scats	Koalas Present	Koala Activity
	Species	Number			
1	Forest red gum (*Eucalyptus tereticornis*)	4	x	x	0 (inactive)
	Pink bloodwood (*Corymbia intermedia*)	7			
	Hickory wattle (*Acacia disparrima*)	19			
2	Pink bloodwood (*Corymbia intermedia*)	5	x	x	0 (inactive)
	Hickory wattle (*Acacia disparrima*)	16			
	Yellow pear-fruit (*Mischocarpus pyriformis*)	6			
	Fraser Island apple (*Acronychia imperforata*)	3			
3	Forest red gum (*Eucalyptus tereticornis*)	2	x	x	0 (inactive)
	Brushbox (*Lophostemon confertus*)	2			
	Pink bloodwood (*Corymbia intermedia*)	6			
	Yellow pear-fruit (*Mischocarpus pyriformis*)	8			
	Hickory wattle (*Acacia disparrima*)	6			
	Fraser Island apple (*Acronychia imperforata*)	6			
4	Brushbox (*Lophostemon confertus*)	2	x	x	0 (inactive)
	Fraser Island apple (*Acronychia imperforata*)	6			
	Yellow pear-fruit (*Mischocarpus pyriformis*)	10			
	Hickory wattle (*Acacia disparrima*)	10			
	Pink bloodwood (*Corymbia intermedia*)	2			
5	Pink bloodwood (*Corymbia intermedia*)	4	x	x	0 (inactive)
	Hickory wattle (*Acacia disparrima*)	16			
	Yellow pear-fruit (*Mischocarpus pyriformis*)	3			
	Fraser Island apple (*Acronychia imperforata*)	1			
	Brushbox (*Lophostemon confertus*)	1			
6	Pink bloodwood (*Corymbia intermedia*)	8	x	x	0 (inactive)
	Hickory wattle (*Acacia disparrima*)	18			

Site	Trees Surveyed		No. of trees with Scats	Koalas Present	Koala Activity
	Species	Number			
	Fraser Island apple (*Acronychia imperforata*)	3			
	Brushbox (*Lophostemon confertus*)	1			
7	Pink bloodwood (*Corymbia intermedia*)	5	x	x	0 (inactive)
	Brushbox (*Lophostemon confertus*)	6			
	Fraser Island apple (*Acronychia imperforata*)	10			
	Hickory wattle (*Acacia disparrima*)	9			
8	Pink bloodwood (*Corymbia intermedia*)	8	x	x	0 (inactive)
	Brushbox (*Lophostemon confertus*)	6			
	Hickory wattle (*Acacia disparrima*)	16			
9	Pink bloodwood (*Corymbia intermedia*)	3	x	x	0 (inactive)
	Fraser Island apple (*Acronychia imperforata*)	10			
	Tree heath (*Trochocarpa laurina*)	6			
	Broad-leaved paperbark (*Melaleuca quinquenervia*)	5			
	Yellow pear-fruit (*Mischocarpus pyriformis*)	6			

4 DISCUSSION AND CONCLUSION

No Koalas or evidence of Koala activity (i.e. scats) were detected during the 2020 Baseline surveys. The proportion of habitat occupied by a resident koala population at the time of the baseline survey, and areas of the site that are subject to any koala use (whether occasional or frequent e.g. transient) at the time of the baseline surveys is therefore estimated at 0%.

The nine (9) field sites sampled during this baseline study are considered to provide good coverage of the habitat on the subject site, are placed regularly throughout the landscape, and therefore provide a sound sample from which to examine trends over time. Proposed revegetation/regeneration works on the subject site in accordance with the Habitat Restoration Plan (JWA 2020) include planting of preferred koala food trees and other koala habitat embellishment measures, which may potentially lead to increased koala activity on the site. Two measures of "occupancy" will be assessed during ongoing annual koala monitoring. "Occupancy" describes the proportion of a sampled area where the target species is present. The first measure that will be monitored is usage of habitat by koalas at any level (Habitat Utilisation rate), be it occasional or frequent. The second and more useful measure that will be monitored over time is occupancy by resident koala populations (Koala Occupancy rate). Changes in occupancy by resident koalas in a population is more meaningful, as it describes the trend as it relates to the majority of the koala population at any given time.

5 NEXT MONITORING ROUNDS

The requirements and future survey dates for the annual Koala Monitoring Program are present in **TABLE 4**. Reporting will be annually for the duration of the monitoring program. The next monitoring event (i.e. first annual monitoring) will occur during the August 2020 to February 2021 period (i.e. the breeding season) and the results will be compared to the results of this baseline monitoring report.

TABLE 4
MONITORING PROGRAM REQUIREMENTS AND SURVEY DATES

Survey	Requirements/Frequency	Latest Survey Date	Next Survey Date
Koala Monitoring Survey	Annually for a minimum five-year management period following the completion of the initial phase of habitat protection works	Baseline: February 2020	1st Annual monitoring: between August 2020 and February 2021

REFERENCES

Keystone Ecological (2018a) Ecological Response for Preliminary Documentation, Hickey Street Iluka, Clarence Valley LGA. Report to Stevens Group.

Keystone Ecological (2018) Habitat Management Plan, Hickey Street Iluka, Clarence Valley LGA. Report to Stevens Group.

Phillips, S., and Callaghan, J. (2011) The "Spot Assessment Technique": a tool for determining localized levels of habitat use by Koalas *Phascolarctos cinereus*. *Australian Zoologist:* **35(3)**, 774 – 780.

APPENDIX 10 – LANDSCAPE MASTER PLAN (MOIR LANDSCAPE ARCHITECTS 2018)

Landscape Master Plan as prepared by Moir Landscape Architecture.

CONTENTS

moir landscape architecture

Studio 1, 88 Fern Street | PO Box 111
Islington NSW 2296
Phone (02) 4965 3500 Fax (02) 4965 3555
admin@moirla.com.au
www.moirla.com.au

The main design elements of the landscape masterplan are to:

1. Provide a landscape and streetscape overlay to the proposed subdivision. The regime supports a variety of species in the form of habitat provision and food sources.
2. Provide a legible and functional pedestrian and bicycle network through the subdivision and which connects with existing networks. The share path to be 2500mm. All other footpaths to be provided are turf verges with some access over the swales.
3. Provide legible entry points at Hickey Street and Micalo Street Entry. Accommodate entry features within the existing road reserve and the community subdivision, on the verge or in the vegetated round-about.
4. Fencing to demarcate access ways and no-go zones.
5. Bushfire trails and access control gates to be provided with pedestrian access nominated.
6. Park boundaries contacting existing bushland reserve to be defined by survey pegs and/or star picket fencing which allows for un-inhibited fauna access.
7. No fencing to be located within the 6m set-back of the streetscape.
8. All rear fencing to be designed to prevent koalas from climbing.
9. Provision to be maintained for fauna access out of back yards in the instance that an animal is trapped.
10. Bollards and wire rope facing subdivision where level access is proposed. To be located at the top of embankments.
11. Opportunity for seating to be accommodated within the streetscape at Hickey Street entry adjacent to Park B, and bushfire trail access section near Park E.
12. Traffic calming devices to be used on Street 1 connection between Hickey and Micalo Street.
13. Paved threshold to support animal movements across corridors to vegetated remnants.
14. Variation in planting to help narrow street-way visually and slow traffic.
15. Koala and fauna signs incorporated to ensure awareness of animals

Park Edge

Existing Vegetation External to site.

Street Pavement

Raised Threshold Concrete Treatment

Bush Fire Trail

Driveways (Indicative Location)

Shared Footpath / Cycleway (2.5m)

Turf Footpath (1.5m)

Swale Type 1

Swale Type 2

Swale Type 3 /Planting in APZ

Verge

Large Feature Tree (Located at Entry Ways and Key Circulation Points

Large Verge Trees

Medium/ Small Verge Trees

Entry Signage + Planting

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1586 ILUKA COMMUNITY SUBDIVISION - LANDSCAPE MASTERPLAN

LANDSCAPE MASTER PLAN

6th April 2018
Issue A

LA - 02

Street Hierarchy and street treatment are illustrated adjacent.

Three key street types are proposed for the sub-division
1. the main Link street
2. east-west Habitat Corridors
3. perimeter/secondary streets.

Across the subdivision streets are generally 8m with a 6m verge on either side.

Verges have been designated for Water Saving Urban Design (WSUD) purposes and have the capacity to slow and treat impervious run-off across the site.

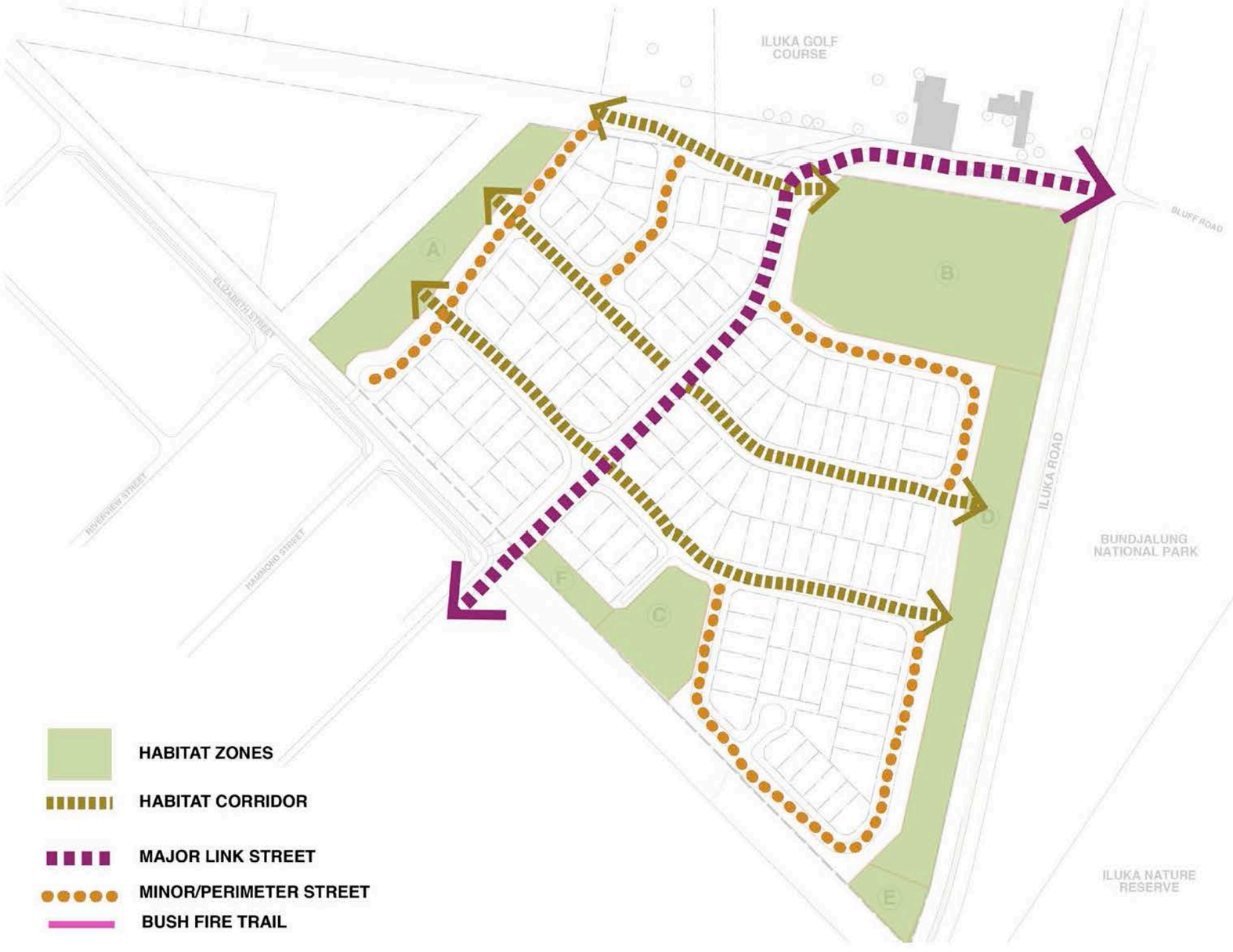
Three different street arrangements are proposed depending on street type, refer to sections.

Streetscape Images and Ideas
Habitat Swales with endemic planting/food trees on Habitat Corridor and Link Street (outside APZ).

Habitat Swales with endemic planting/food trees.

Images show rocks, sandy edges and habitat options within swales to support fauna movement and shelter as well as WSUD benefits.

Habitat Swales with endemic planting/food trees on Habitat Corridor and Link Street (outside APZ).



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ROAD HEIRARCHY + STREET TREATMENT

6th April 2018
Issue A

LA - 03

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1586 ILUKA COMMUNITY SUBDIVISION - LANDSCAPE MASTERPLAN

PLANTING SCHEME

6th April 2018
Issue A

LA - 04

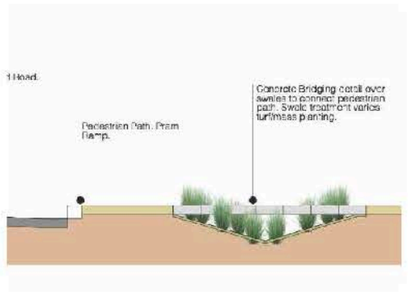
Share Path
Running north-south and connected to the existing cycle network a 2500mm share path is proposed. In addition to the works proposed within the subdivision a refuge is proposed on Iluka Road north of the subdivision.

Turf Footpath
Throughout the sub-division a 1500mm turf edge has been allocated adjacent to the residential boundaries and above the swales. Where crossing may be desirable across the swales a bridging detail is proposed as per image below.

Bushfire Trail Zones
The third access path type is along Bushfire Trail access paths which will be sealed and provide additional access throughout the subdivision.

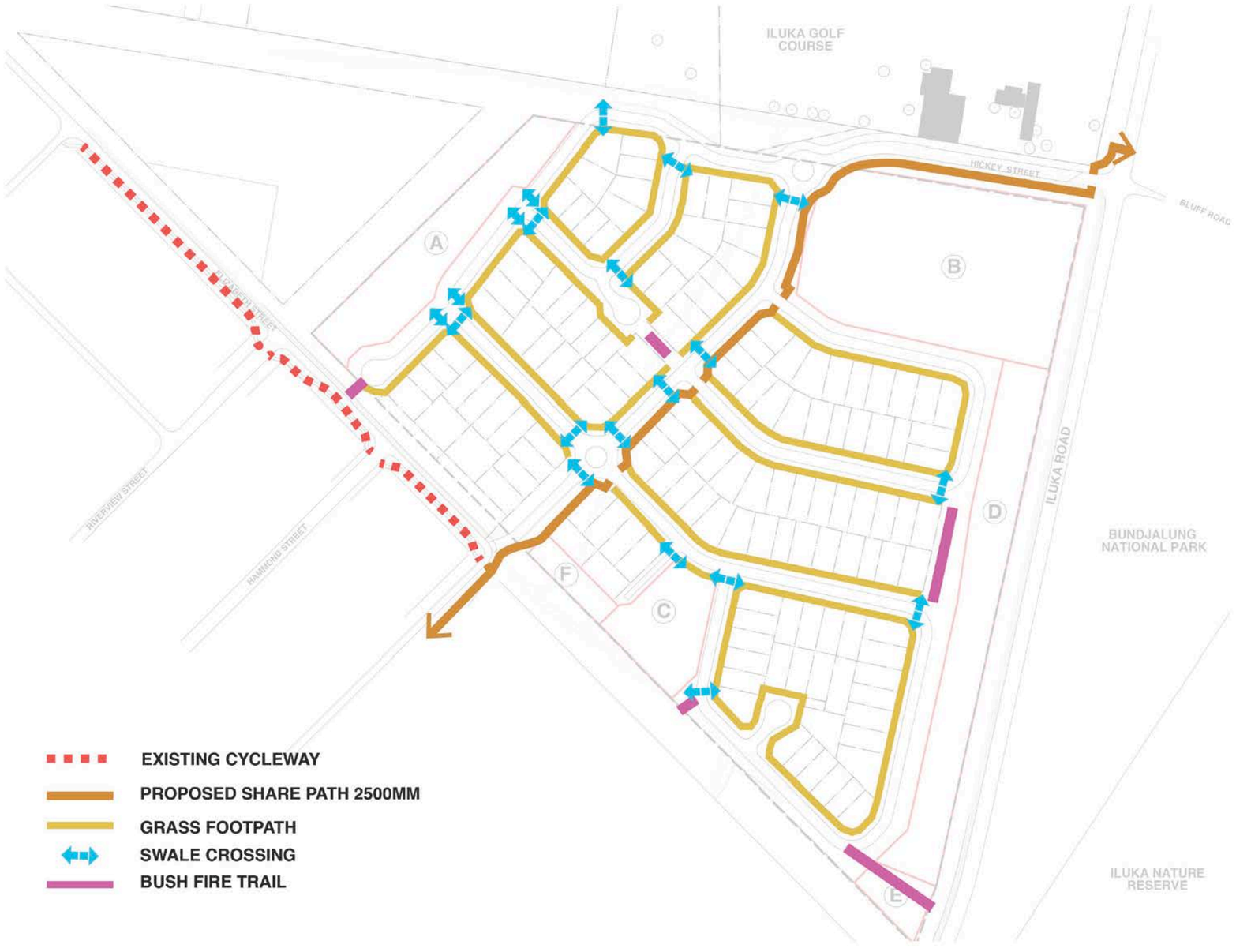
2500MM Share Path through subdivision

1500mm Turf Access way through subdivision on Property



Typical Access over swales. Possible Solution

Sealed Bush-fire Trail suitable for pedestrian access



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PEDESTRIAN + CYCLE NETWORK

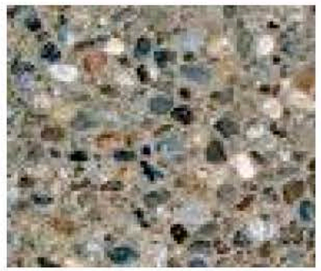
6th April 2018
Issue A

LA - 05

Entry Statements
The Link Street is nominated as the key connector road between Hickey and Elizabeth Street. This will be the main entry to the site with proposed entry features at the north and south. Paved thresholds at the entry on Elizabeth Street and at the T- intersection will assist in the definition of this main street as well as provide opportunity for traffic calming.

Gates
Bushfire trails require access gates. These are required to limit vehicles to areas of the site and allow for emergency fire vehicles only. Fencing adjacent to these areas will consist of bollards and steel rope which allows for pedestrian and animal movement to be clear.

Fencing
Three types of fencing are proposed;
Type 1- Temporary - Survey pegs or star pickets.
Type 2- Subdivision Edge - Bollards and Steel Rope
Type 3 - Fauna Sensitive - Koala climb-proof fencing located on property boundaries where owners have animals. As per the adjacent plan this is located outside of the 6m set-back to ensure the free flow if animals along the road verges and within the front 6m of each property.


Change in paving type to slow traffic a key locations on Link Street (indicative only).


Entry Feature to future detail. Sample Image


Bollard and Steel Rope on subdivision edge at key locations.


Star Pickets to define park edge


Koala Exlusion Fence

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1586 ILUKA COMMUNITY SUBDIVISION - LANDSCAPE MASTERPLAN
FENCE AND ENTRY STATEMENTS

6th April 2018
Issue A

LA - 06

1 6000mm Building Setback
Planting by owners to include small tree and max 25% lawn. All mass planting to be derived from future species list in Design Guidelines.
Setback provides additional habitat opportunities across the site.

Tree Planting in set-back by owners to future Design Guidelines. Contribute to overall opportunities for habitat across the site.

2 WSUD - Planted Swales Type 2
Planting in swales to provide opportunity for water treatment. Simplified species mix. Includes species suitable for temporary inundation and periods of dry. Rock lined base to reduce erosion and improve infiltration.

3 Street Tree Planting
Street Trees to be planted 1 per lot. Species derived from local vegetation communities and provide opportunity for habitat and food sources for local species.

4 Turf Edge (1500mm)
1500mm Turf edge on property boundaries provide pedestrian access across the subdivision and include a service corridor.

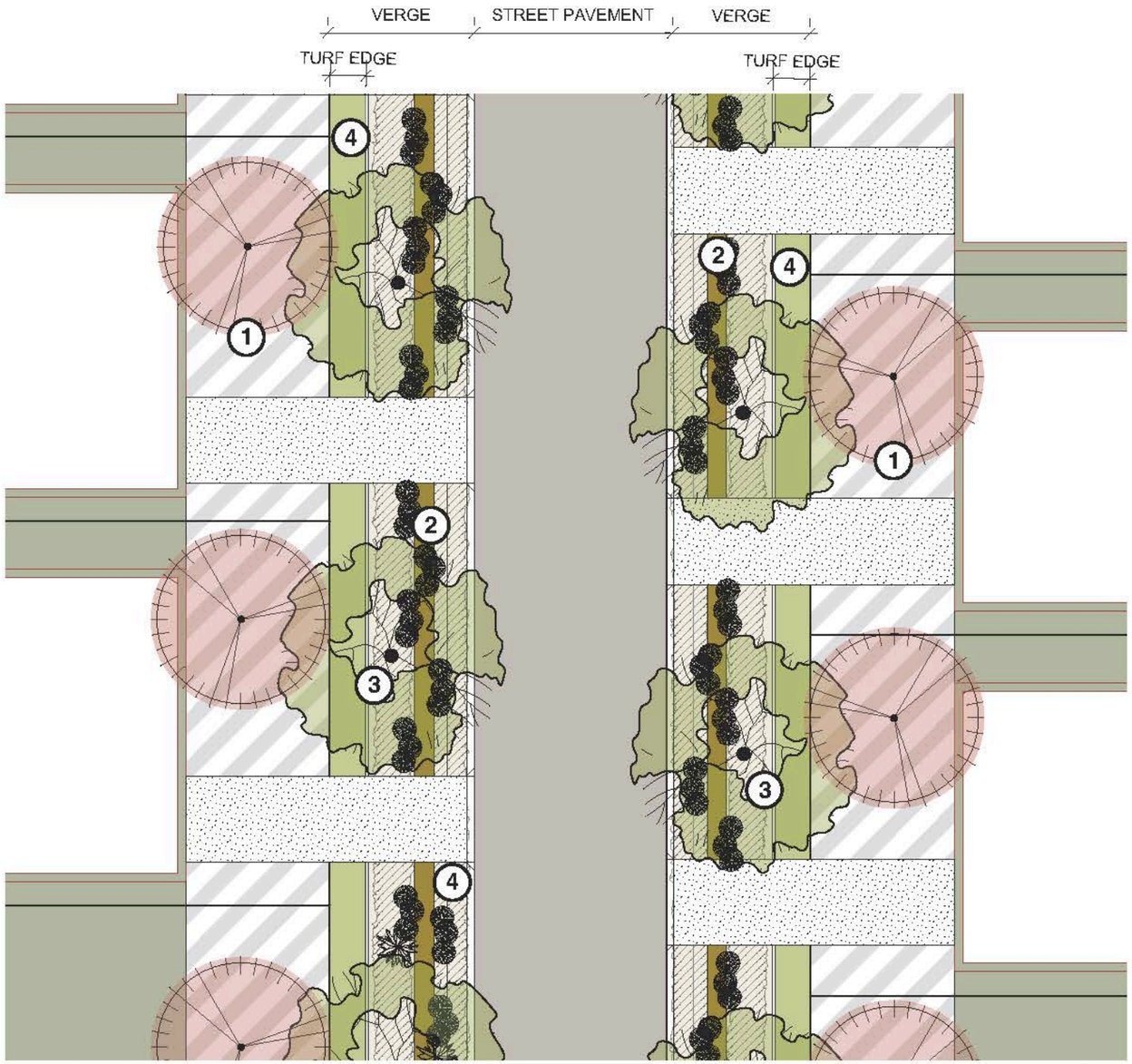
Small- Medium Tree

Future Residence

Street Pavement

Driveway

Residential Open Space



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1586 ILUKA COMMUNITY SUBDIVISION - LANDSCAPE MASTERPLAN
MINOR STREETS - CONCEPT DESIGN

6th April 2018
Issue A

LA - 07

residential lot | street reserve | residential lot

6m setback | turf | planted swale

planted swale | turf | 6m setback

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MINOR STREETS - CONCEPT DESIGN - TYPICAL SECTION

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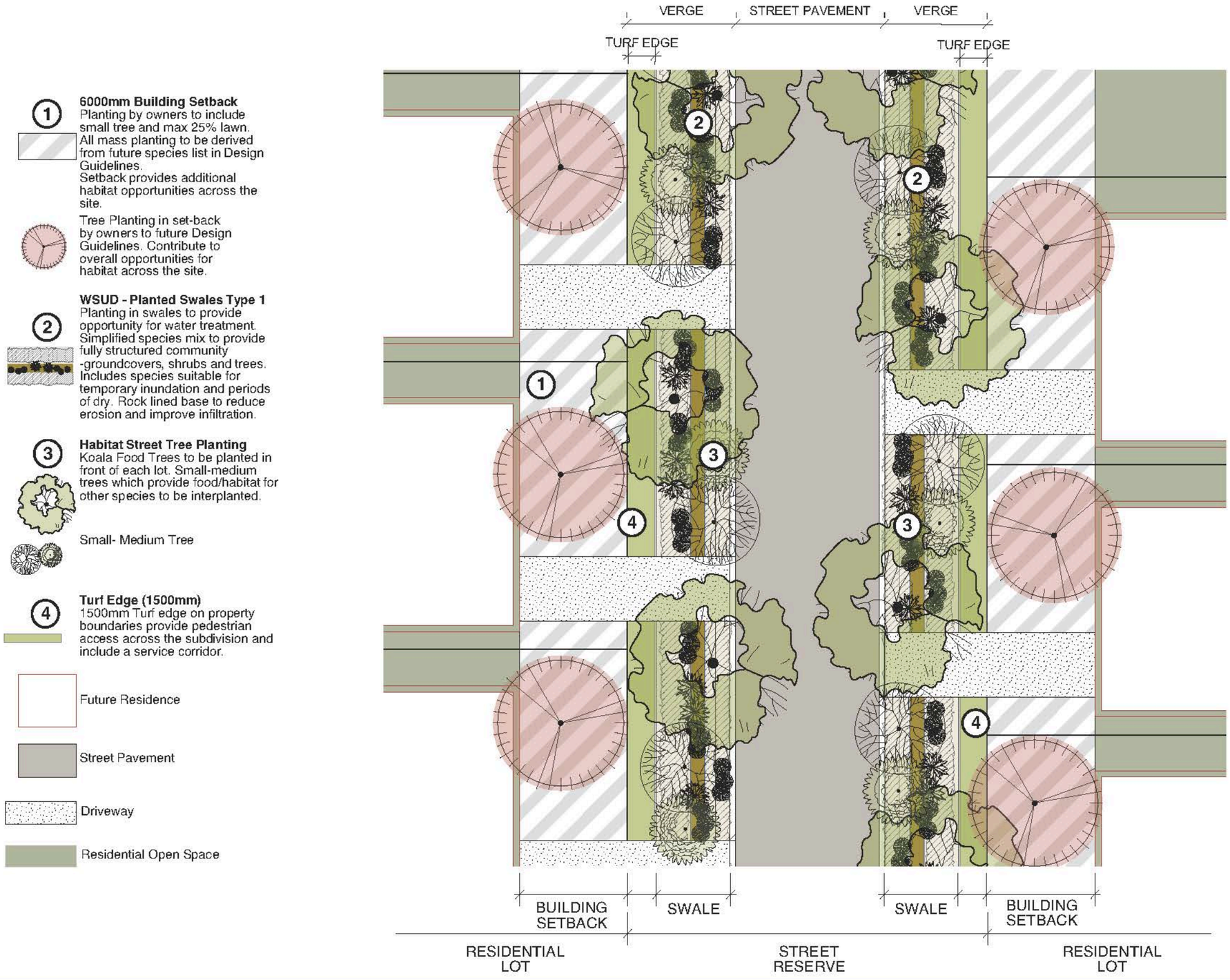
Issue A

LA - 08



1 6000mm Building Setback
Planting by owners to include small tree and max 25% lawn. All mass planting to be derived from future species list in Design Guidelines.
Setback provides additional habitat opportunities across the site.

Tree Planting in set-back by owners to future Design Guidelines. Contribute to overall opportunities for habitat across the site.

2 WSUD - Planted Swales Type 1
Planting in swales to provide opportunity for water treatment. Simplified species mix to provide fully structured community -groundcovers, shrubs and trees. Includes species suitable for temporary inundation and periods of dry. Rock lined base to reduce erosion and improve infiltration.

3 Habitat Street Tree Planting
Koala Food Trees to be planted in front of each lot. Small-medium trees which provide food/habitat for other species to be interplanted.

Small- Medium Tree

4 Turf Edge (1500mm)
1500mm Turf edge on property boundaries provide pedestrian access across the subdivision and include a service corridor.

Future Residence

Street Pavement

Driveway

Residential Open Space

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HABITAT CORRIDOR STREET + LINK STREET - CONCEPT DESIGN

6th April 2018
Issue A

LA - 09

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HABITAT CORRIDOR STREET - CONCEPT DESIGN - TYPICAL SECTION

6th April 2018
Issue A

1 6000mm Building Setback.
Planting by owners to include small tree and max 25% lawn. All mass planting to be derived from future species list in Design Guidelines.
Setback provides additional habitat opportunities across the site. Note in some locations the APZ encroaches within residential lot.

2 WSUD - Planted Swales Type 3
Planting in swales to provide opportunity for water treatment. Species suitable for APZ. Includes species suitable for temporary inundation and periods of dry. Rock lined base to reduce erosion and improve infiltation.

3 Street Tree Planting
Street Trees to be planted 1 per lot. Species derived from local vegetation communities and provide opportunity for habitat and food sources for local species.

4 Turf Edge (1500mm)
1500mm Turf edge on property boundaries provide pedestrian access across the subdivision and include a service corridor.

5 Park for Conservation
Weed management in line with HMP vegetation.

Tree Planting with APZ in clumps. Species derived from Littoral Rainforest species list.

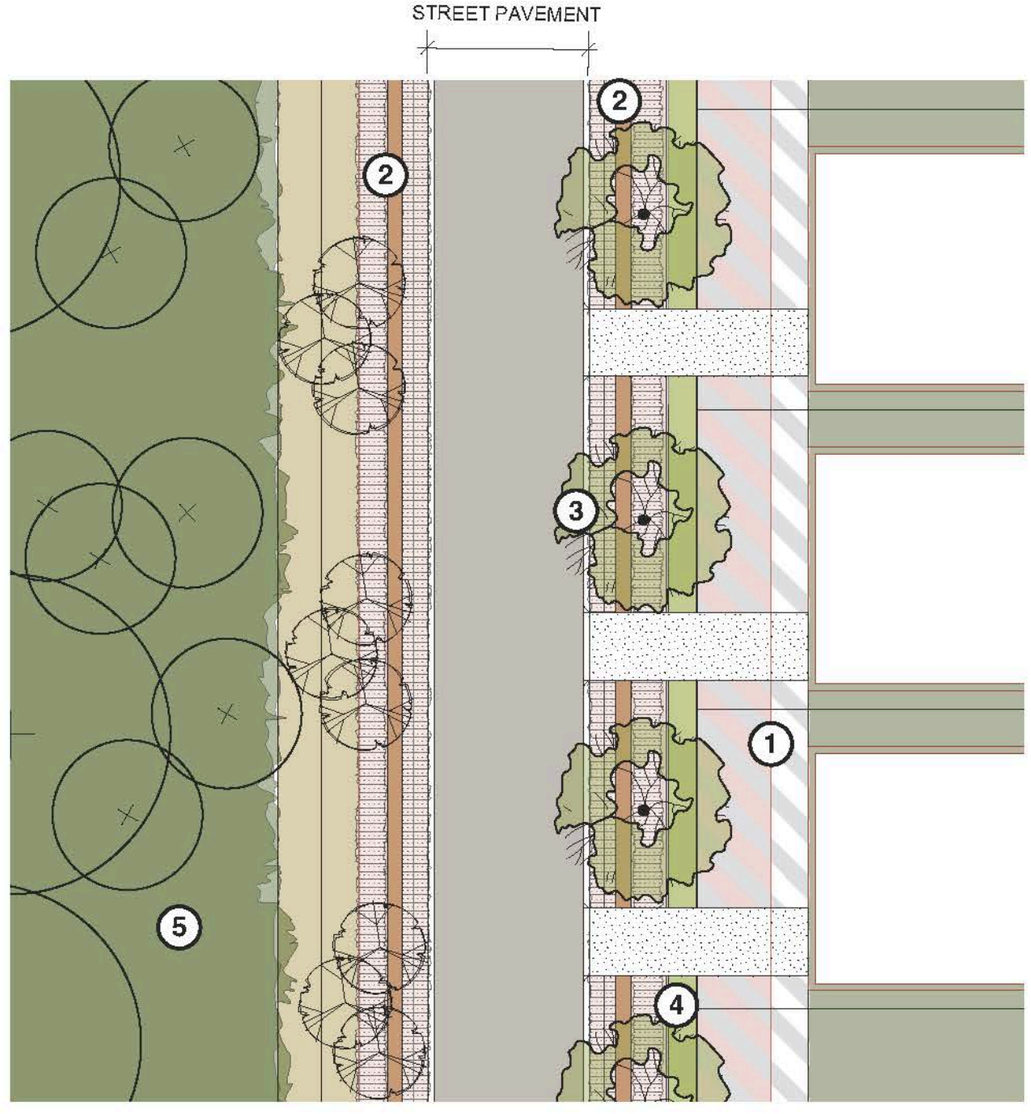
APZ Boundary

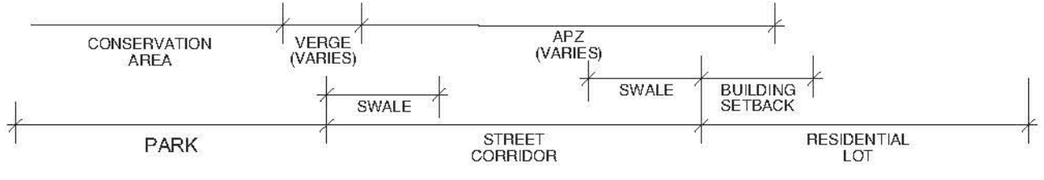
Future Residence

Street Pavement

Driveway

Residential Open Space





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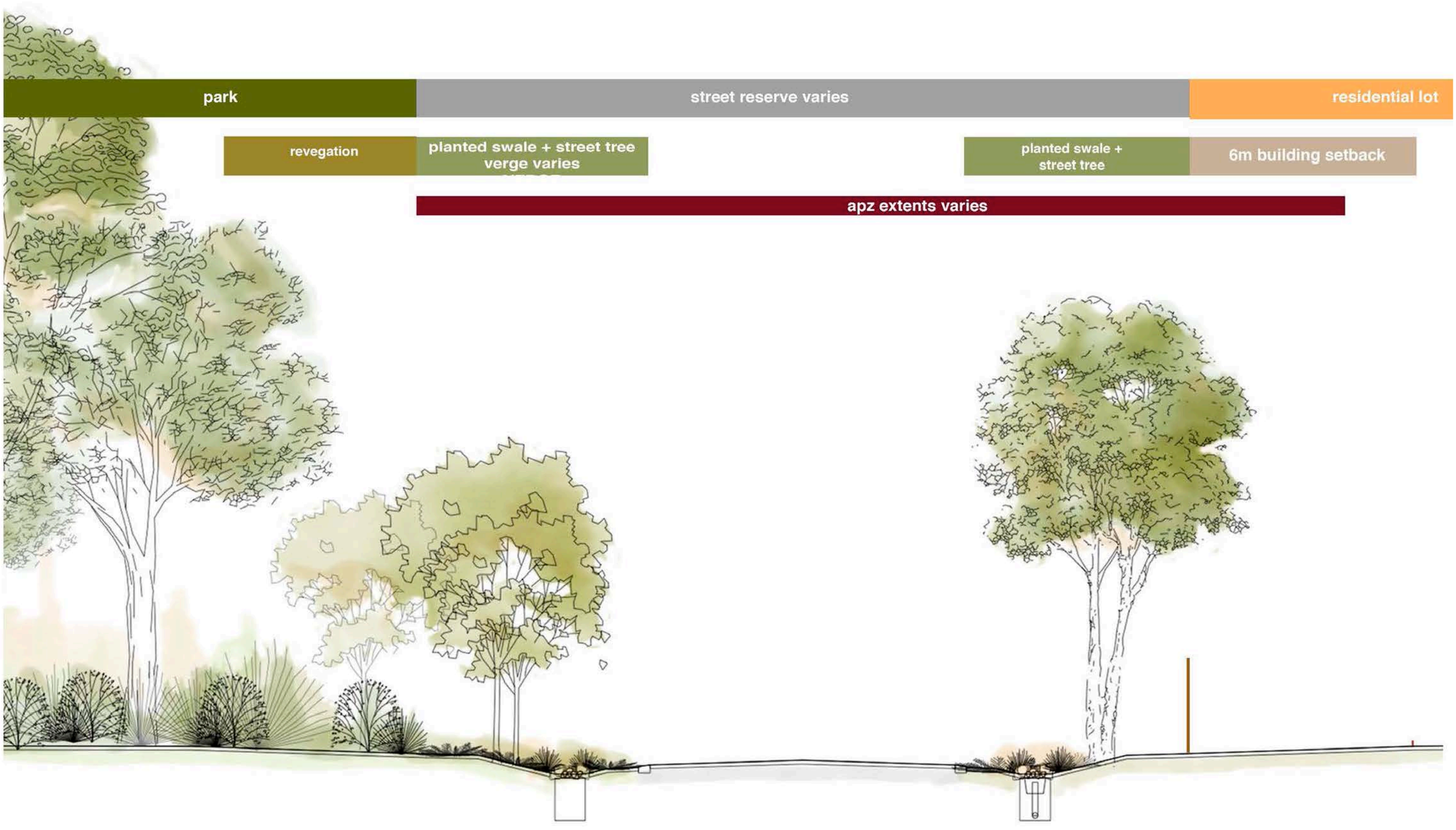
PERIMETER STREET WITH APZ - CONCEPT DESIGN

6th April 2018
Issue A

LA - 11



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PERIMETER STREET WITH APZ - CONCEPT DESIGN - TYPICAL SECTION

6th April 2018
Issue A

LA - 12

1 6000mm Building Setback
Planting by owners to include small tree and max 25% lawn. All mass planting to be derived from future species list in Design Guidelines.
Setback provides additional habitat opportunities across the site.

Tree Planting in set-back by owners to future Design Guidelines. Contribute to overall opportunities for habitat across the site.

2 WSUD - Planted Swales Type 2
Planting in swales to provide opportunity for water treatment. Simplified species mix. Includes species suitable for temporary inundation and periods of dry. Rock lined base to reduce erosion and improve infiltration.

3 Street Tree Planting
Street Trees to be planted 1 per lot. Species derived from local vegetation communities and provide opportunity for habitat and food sources for local species.

4 Turf Edge (1500mm)
1500mm Turf edge on property boundaries provide pedestrian access across the subdivision and include a service corridor.

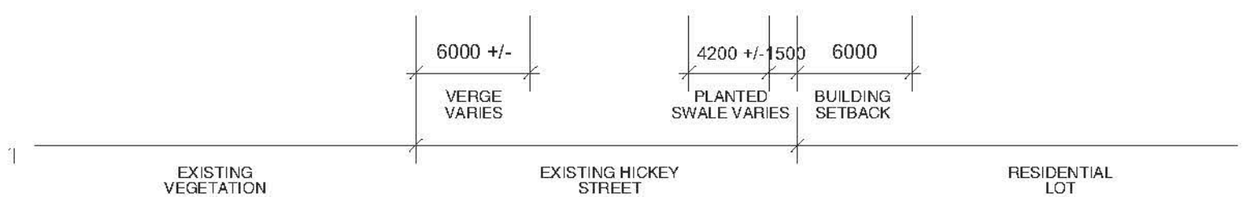
5 Golf Course Boundary Verge
Maintain verge and Swales consistent with subdivision. Opportunity for increased variety of species and sizes of street trees.

Future Residence

Street Pavement

Driveway

Residential Open Space



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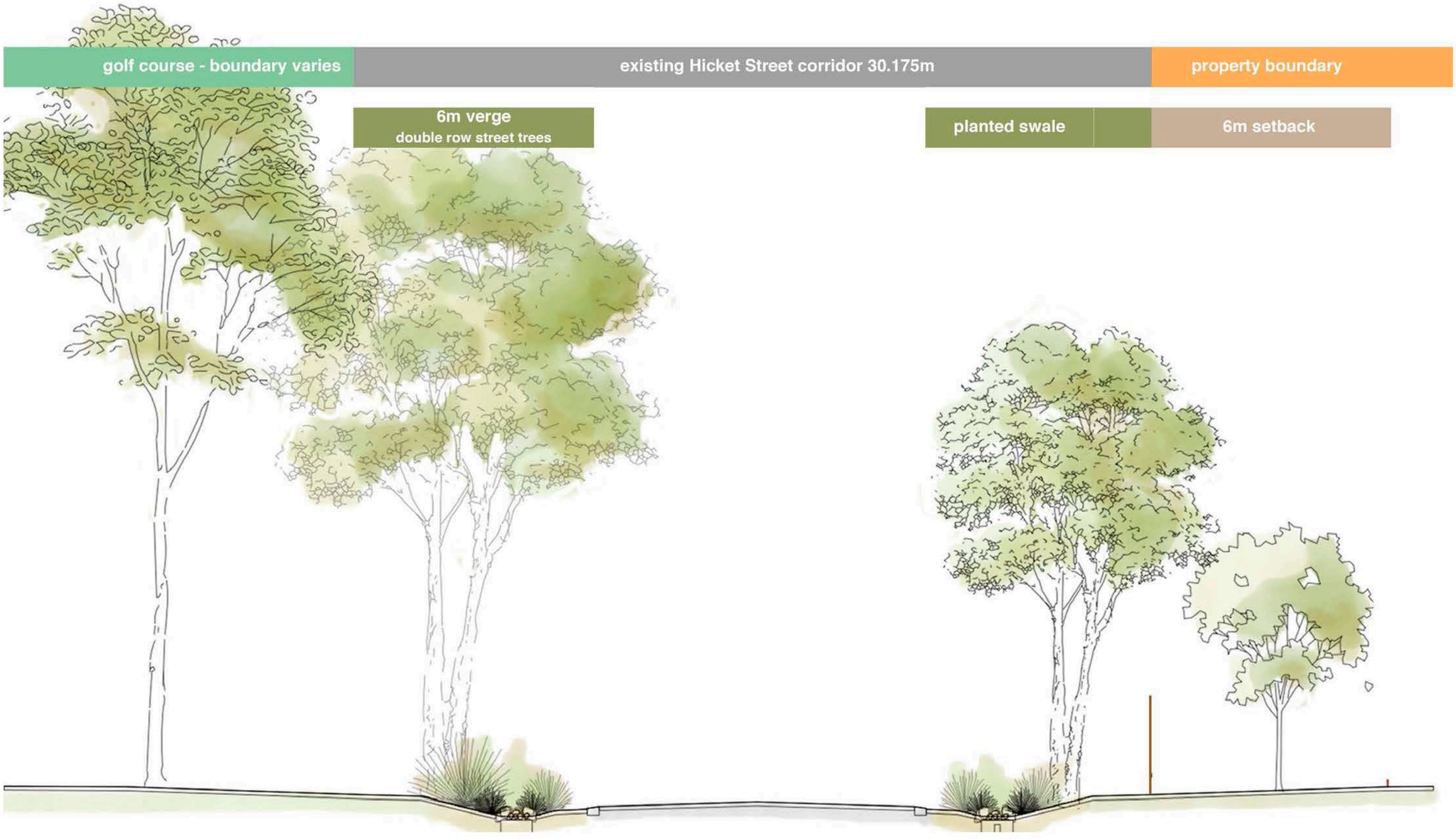
HICKEY STREET - CONCEPT DESIGN

6th April 2018
Issue A



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HICKEY STREET - TYPICAL SECTION

6th April 2018
Issue A