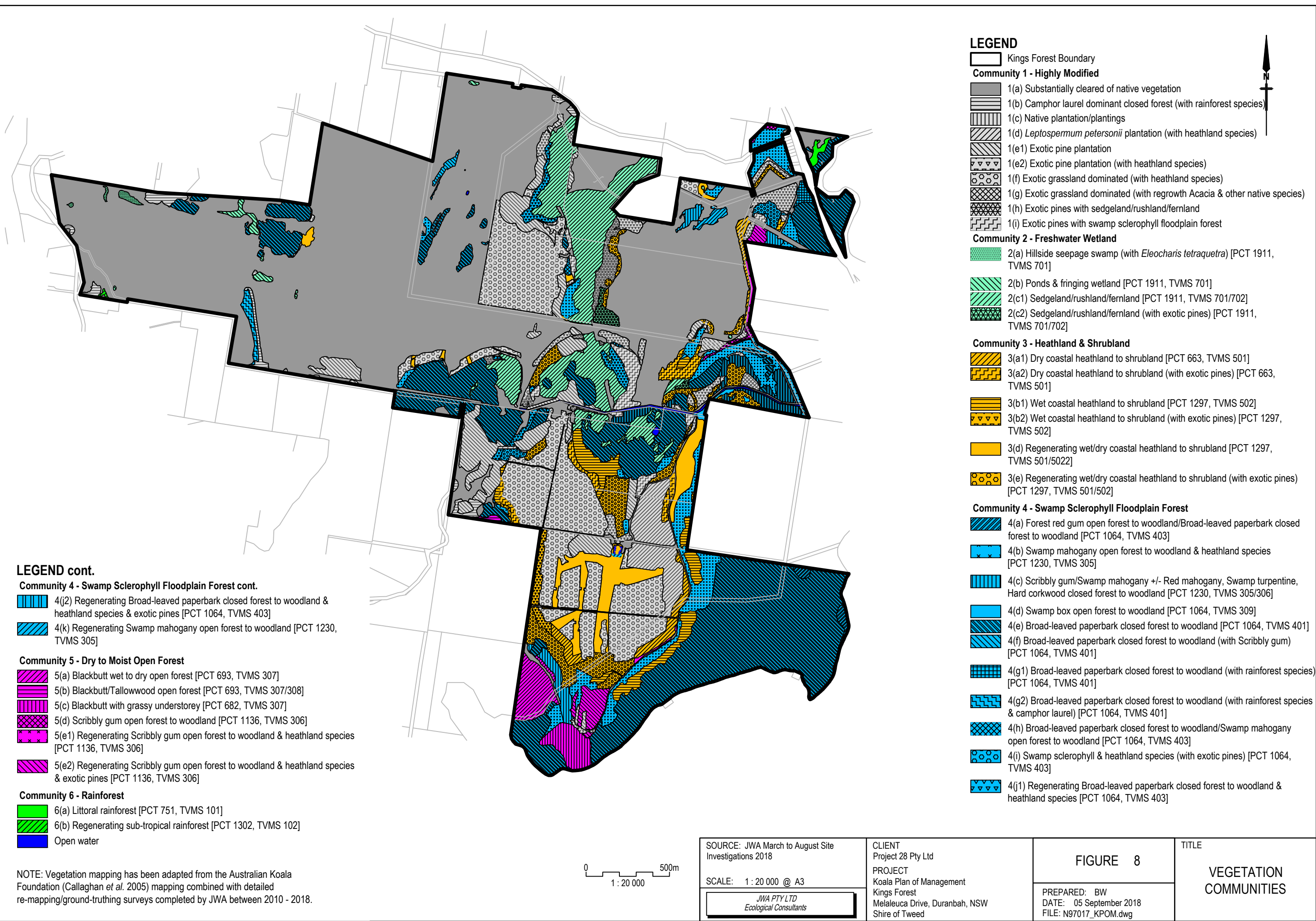




- LEGEND cont.**

Community 4 - Swamp Sclerophyll Floodplain Forest cont.

 - 4(j) Regenerating Broad-leaved paperbark closed forest to woodland & heathland species & exotic pines [PCT 1064, TVMS 403]
 - 4(k) Regenerating Swamp mahogany open forest to woodland [PCT 1230, TVMS 305]

Community 5 - Dry to Moist Open Forest

 - 5(a) Blackbutt wet to dry open forest [PCT 693, TVMS 307]
 - 5(b) Blackbutt/Tallowwood open forest [PCT 693, TVMS 307/308]
 - 5(c) Blackbutt with grassy understorey [PCT 682, TVMS 307]
 - 5(d) Scribbly gum open forest to woodland [PCT 1136, TVMS 306]
 - 5(e1) Regenerating Scribbly gum open forest to woodland & heathland species [PCT 1136, TVMS 306]
 - 5(e2) Regenerating Scribbly gum open forest to woodland & heathland species & exotic pines [PCT 1136, TVMS 306]

Community 6 - Rainforest

 - 6(a) Littoral rainforest [PCT 751, TVMS 101]
 - 6(b) Regenerating sub-tropical rainforest [PCT 1302, TVMS 102]
 - Open water
- LEGEND**

Kings Forest Boundary

Community 1 - Highly Modified

 - 1(a) Substantially cleared of native vegetation
 - 1(b) Camphor laurel dominant closed forest (with rainforest species)
 - 1(c) Native plantation/plantings
 - 1(d) *Leptospermum petersonii* plantation (with heathland species)
 - 1(e1) Exotic pine plantation
 - 1(e2) Exotic pine plantation (with heathland species)
 - 1(f) Exotic grassland dominated (with heathland species)
 - 1(g) Exotic grassland dominated (with regrowth *Acacia* & other native species)
 - 1(h) Exotic pines with sedgeland/rushland/fernland
 - 1(i) Exotic pines with swamp sclerophyll floodplain forest

Community 2 - Freshwater Wetland

 - 2(a) Hillside seepage swamp (with *Eleocharis tetraquetra*) [PCT 1911, TVMS 701]
 - 2(b) Ponds & fringing wetland [PCT 1911, TVMS 701]
 - 2(c1) Sedgeland/rushland/fernland [PCT 1911, TVMS 701/702]
 - 2(c2) Sedgeland/rushland/fernland (with exotic pines) [PCT 1911, TVMS 701/702]

Community 3 - Heathland & Shrubland

 - 3(a1) Dry coastal heathland to shrubland [PCT 663, TVMS 501]
 - 3(a2) Dry coastal heathland to shrubland (with exotic pines) [PCT 663, TVMS 501]
 - 3(b1) Wet coastal heathland to shrubland [PCT 1297, TVMS 502]
 - 3(b2) Wet coastal heathland to shrubland (with exotic pines) [PCT 1297, TVMS 502]
 - 3(d) Regenerating wet/dry coastal heathland to shrubland [PCT 1297, TVMS 501/502]
 - 3(e) Regenerating wet/dry coastal heathland to shrubland (with exotic pines) [PCT 1297, TVMS 501/502]

Community 4 - Swamp Sclerophyll Floodplain Forest

 - 4(a) Forest red gum open forest to woodland/Broad-leaved paperbark closed forest to woodland [PCT 1064, TVMS 403]
 - 4(b) Swamp mahogany open forest to woodland & heathland species [PCT 1230, TVMS 305]
 - 4(c) Scribbly gum/Swamp mahogany +/- Red mahogany, Swamp turpentine, Hard corkwood closed forest to woodland [PCT 1230, TVMS 305/306]
 - 4(d) Swamp box open forest to woodland [PCT 1064, TVMS 309]
 - 4(e) Broad-leaved paperbark closed forest to woodland [PCT 1064, TVMS 401]
 - 4(f) Broad-leaved paperbark closed forest to woodland (with Scribbly gum) [PCT 1064, TVMS 401]
 - 4(g1) Broad-leaved paperbark closed forest to woodland (with rainforest species) [PCT 1064, TVMS 401]
 - 4(g2) Broad-leaved paperbark closed forest to woodland (with rainforest species & camphor laurel) [PCT 1064, TVMS 401]
 - 4(h) Broad-leaved paperbark closed forest to woodland/Swamp mahogany open forest to woodland [PCT 1064, TVMS 403]
 - 4(i) Swamp sclerophyll & heathland species (with exotic pines) [PCT 1064, TVMS 403]
 - 4(j1) Regenerating Broad-leaved paperbark closed forest to woodland & heathland species [PCT 1064, TVMS 403]

NOTE: Vegetation mapping has been adapted from the Australian Koala Foundation (Callaghan *et al.* 2005) mapping combined with detailed re-mapping/ground-truthing surveys completed by JWA between 2010 - 2018.

0 500m
1 : 20 000

SOURCE: JWA March to August Site Investigations 2018

SCALE: 1 : 20 000 @ A3

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FIGURE 8

PREPARED: BW
DATE: 05 September 2018
FILE: N97017_KPOM.dwg

TITLE

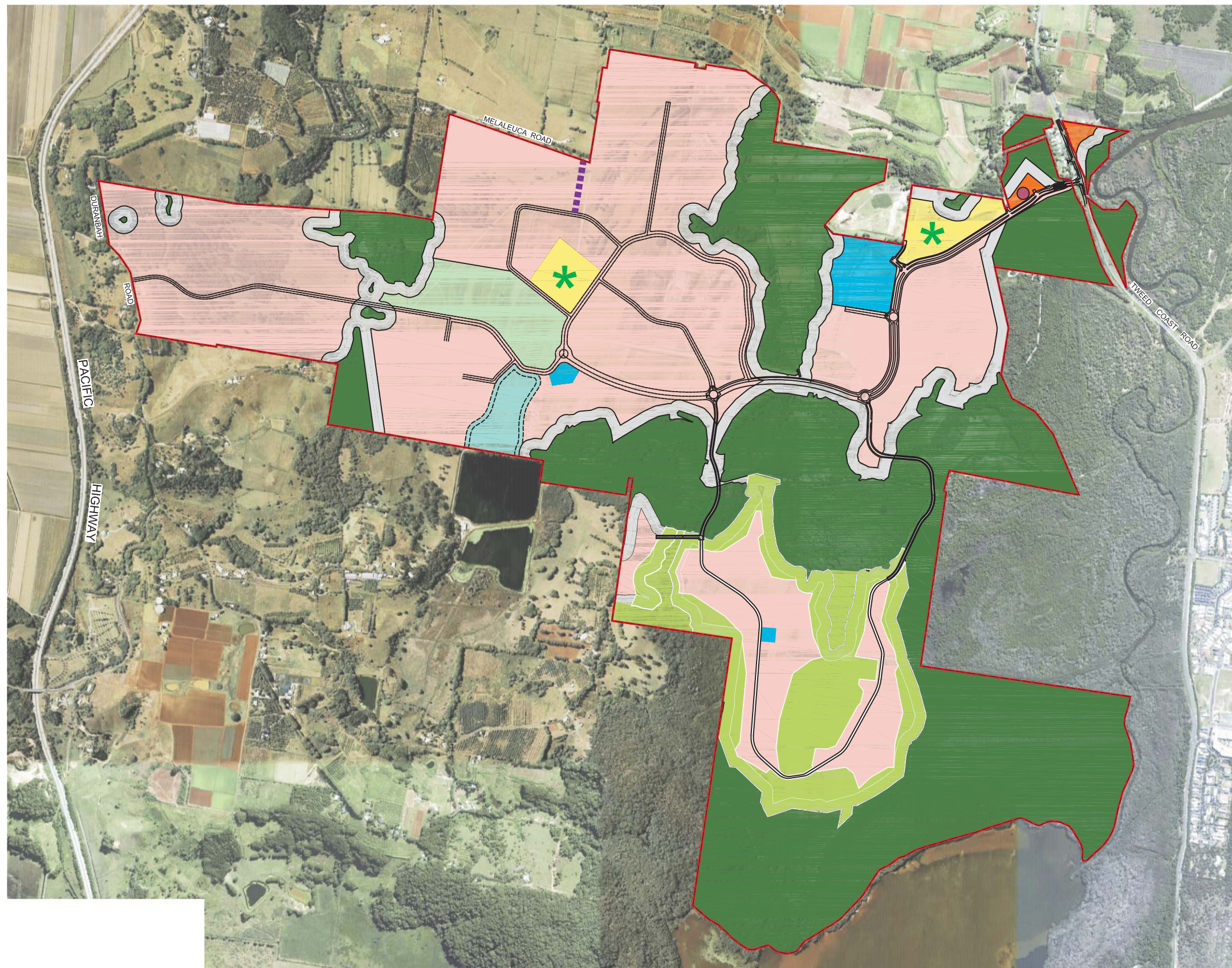
VEGETATION
COMMUNITIES

5 THE PROPOSED DEVELOPMENT

On the 19th August 2010, Concept Plan Approval No. 06_0138 was issued for Kings Forest. The site is proposed to be developed into a master planned residential community. The areas proposed for residential development are shown on the Revised Concept Plan, Revision B dated the 5th December 2013 (**FIGURE 9**). The total area of the proposed development is 422.32 ha and will include the following in accordance with the Concept Plan Approval (as modified Mods 1 to 5):

- Residential development for approximately 4500 dwellings;
- Town centre and neighbourhood centre for future retail and commercial uses;
- Community and education facilities;
- Employment land;
- Golf course;
- Open space;
- Wildlife corridors;
- Protection and rehabilitation of environmentally sensitive land;
- Utility services infrastructure;
- Water management areas and lake; and
- Roads and pedestrian and bicycle paths.

The Kings Forest project will likely proceed over many years. The length of time will be dependent, to a certain degree, on the demand for land over time. It is envisaged that the sequence of development will be in accordance with the approved Precinct Plan (**FIGURE 10**).



LEGEND

- Town Centre / Neighbourhood Centre
- Residential
- Community Facilities / Education
- Employment Land
- Structured Open Space (Active)
(Passive open space to council standards,
location subject to urban design)
- Environmental Protection Area
- 50m Ecological Buffer
(includes APZ's & roads where approved)
- ★ State School Site
- Proposed Zone Substation
(subject to Country Energy final approval)
- Potential Road Connection to Melaleuca Road

Private Open Space

- Golf Course Area
(encompassing ecological buffers where
indicated)
- Private Open Space including Lake
- Kings Forest Boundary

IMPORTANT NOTE

This plan was prepared as a preliminary concept plan for planning purposes only. As such all particulars, including lot design, areas and densities, are subject to detailed survey, site investigations and to the requirements of council and any other authority which may have requirements under any relevant legislation.
This note is an integral part of this plan.

0 500m
1 : 20 000

SOURCE: RPS Revised Concept Plan Rev B
dated 05/12/13 (Ref: 113691-PSP-4b(CONCEPT
PLAN).dwg)

SCALE: 1 : 20 000 @ A3

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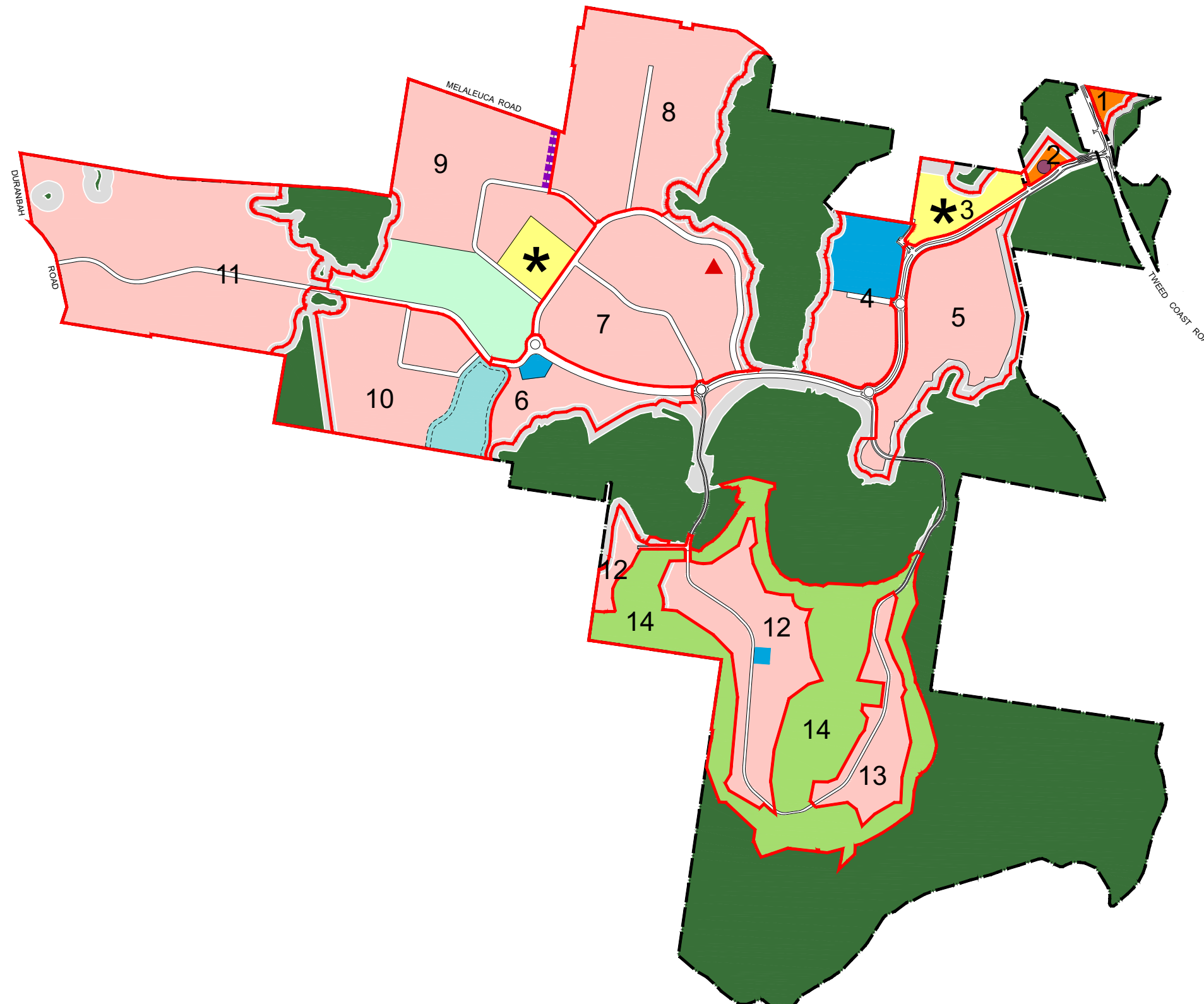
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FIGURE 9

PREPARED: BW
DATE: 05 September 2018
FILE: N97017_Concept Plan.cdr

TITLE

REVISED
CONCEPT
PLAN



- TOWN CENTRE / NEIGHBOURHOOD CENTRE
- RESIDENTIAL
- COMMUNITY FACILITIES / EDUCATION
- EMPLOYMENT LAND
- STRUCTURED OPEN SPACE (ACTIVE)
(Passive open space to council standards, location subject to urban design).
- ENVIRONMENTAL PROTECTION AREA
- 50m ECOLOGICAL BUFFER
(Includes APZs & Roads where approved)
- STATE SCHOOL SITE
- PROPOSED ZONE SUBSTATION
(Subject to County Energy final approval)
- POTENTIAL AFFORDABLE HOUSING LOCATION
- POTENTIAL ROAD CONNECTION TO MELALEUCA ROAD
- PRIVATE OPEN SPACE
- GOLF COURSE AREA
(Encompassing ecological buffers where indicated)
- PRIVATE OPEN SPACE INCLUDING LAKE

IMPORTANT NOTE
This plan was prepared as a preliminary concept plan for planning purposes only. As such all particulars, including lot design, areas and densities, are subject to detailed survey, site investigations and to the requirements of council and any other authority which may have requirements under any relevant legislation.
This note is an integral part of this plan.

0 500m
1 : 20 000

SOURCE: RPS Precinct Plan Rev B dated 05/12/13 (Ref: 113691-PSP-4b(PRECINCT PLAN).dwg) SCALE: 1 : 20 000 @ A3 JWA PTY LTD Ecological Consultants	CLIENT Project 28 Pty Ltd PROJECT Koala Plan of Management Kings Forest Melaleuca Drive, Durambah, NSW Shire of Tweed	FIGURE 10 PREPARED: BW DATE: 05 September 2018 FILE: N97017_Precinct Plan.cdr	TITLE PRECINCT PLAN
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6 KOALA POPULATION AND HABITAT ASSESSMENT

6.1 Introduction

This section provides details of the Koala population and habitat resources of the Tweed Local Government Area and the Kings Forest site.

6.2 Conservation Status

The Koala (*Phascolarctos cinereus*) is listed as a vulnerable species within schedules of the TSC 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 EPBC Act.

The Koala, between the Tweed and Brunswick Rivers east of the Pacific Highway, is listed as an endangered population within the schedules of the TSC Act.

6.3 Koala Population Size

6.3.1 Tweed Local Government Area

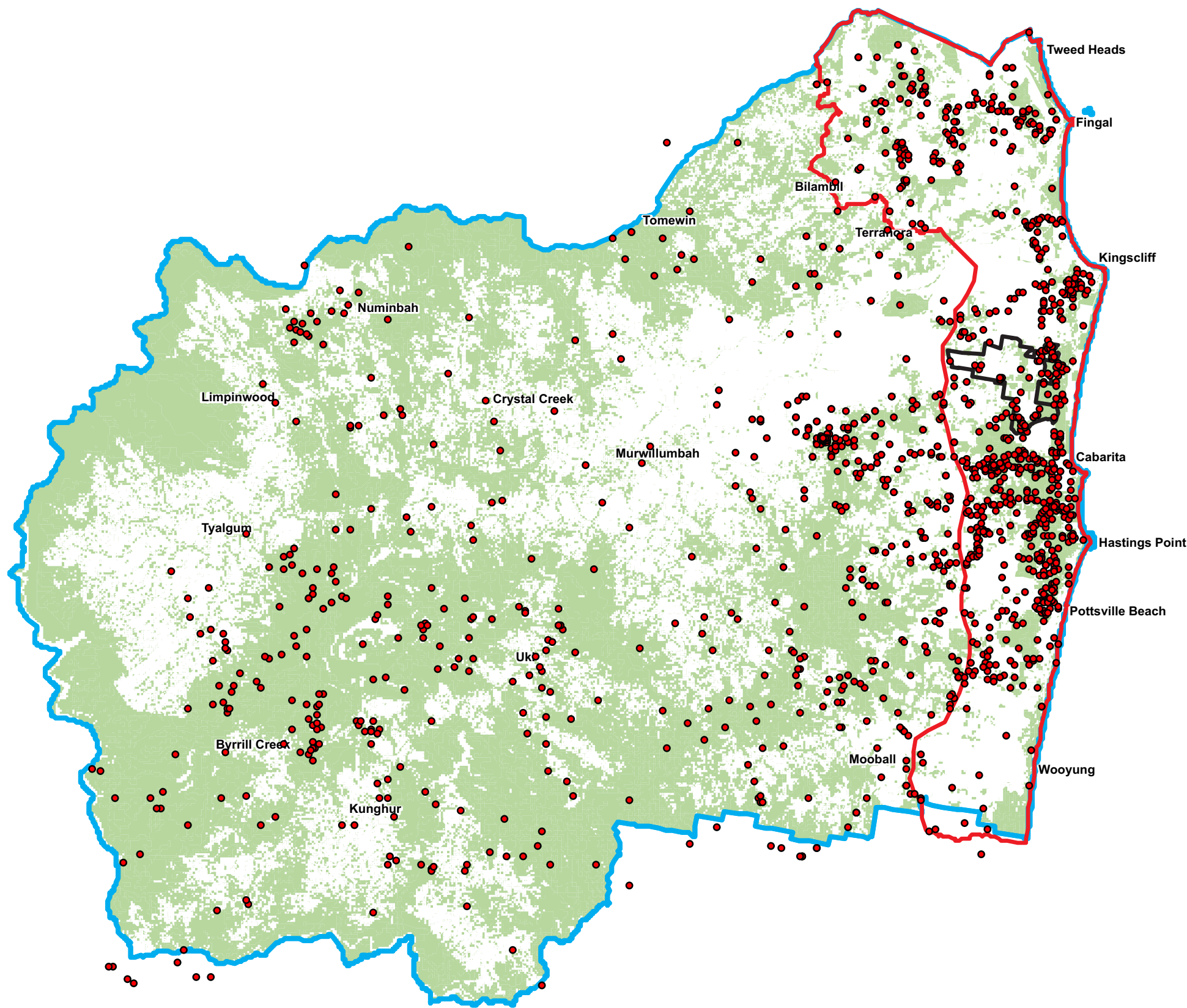
DoE (2014) notes that the number of Koalas in north-east NSW is uncertain and population surveys are required to establish current population size. Nevertheless, they likely numbered in the low thousands in 2010 (approximately 7000), but the nature and extent of exposure to threats suggests that declines have occurred, and will continue, in many areas (TSSC 2012a).

Koala records remain widely distributed throughout the Tweed LGA, which covers approximately 103,000 ha (**FIGURE 11**). While a reduction in the extent of occurrence of Koalas across the Tweed LGA of at least 18% has previously been documented (Phillips *et al.* 2011), the size of the LGA's Koala population is unknown and beyond the scope of this KPOM.

The Tweed LGA is the fastest growing urban area on the North Coast of NSW; its population is expected to grow from 82,955 (the 2006 census) to a potential 120,000 by 2025. It is predicted that most of this growth will occur along the coastal strip (i.e. Cobaki, Bilambil Heights, South Tweed Heads, Kingscliff to Bogangar and Pottsville) which covers approximately 21,200 ha. This population growth will potentially impact on the density and distribution of the Koala population within the Tweed LGA.

6.3.2 Tweed Coast

Evidence of generational persistence is widespread throughout this area indicating a long history of occupancy and successful reproduction by Koalas. Historically, the Tweed Coast's Koala population has persisted within a fragmented habitat affected by a range of threatening processes. The study by Phillips *et al.* (2011) indicates that north of the Tweed River there are small relic populations in the Terranora-Bilambil Heights and Tweed Heads South areas. South of the Tweed River, three (3) disjunct sub-populations occur: Bogangar/Kings Forest/Forest Hill; Tanglewood/Round Mountain/Koala Beach; and Pottsville Wetlands/Black Rocks. A further



LEGEND

- Koala Records
- Bushland
- Tweed Coastal Strip
- Tweed LGA Boundary
- Kings Forest Boundary

Note: Records shown are since 1950 and have been sourced from Tweed Shire Council, DECCW and various other sources.

0 5km
1 : 200 000

SOURCE: Biolink Ecological Consultants - Tweed Coast Koala Habitat Study (2011) Figure 2.2

SCALE: 1 : 200 000 @ A3

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FIGURE 11

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FILE:N97017_Tweed Koalas.cdr

TITLE
**KOALA RECORDS
WITHIN TWEED LGA
& COASTAL STRIP**

small population occurs around Duranbah and Eviron Road. Phillips *et al* (2011) identified that the three (3) main areas of Koala habitat on the Tweed Coast totalled approximately 1,260 hectares i.e. Area 1: Bogangar-Kings Forest-Forest Hill (358ha); Area 2: Tanglewood-Round Mountain-Koala Beach (578ha) - this metapopulation occupies a large proportion of Cudgen Nature Reserve, and Area 3: Pottsville Wetlands-Black Rocks (316ha). Tweed Shire Council manage most of this area.

Of the 360ha identified by Phillips *et al* (2011) in Area 1, the Kings Forest site contains only 20 hectares of Primary Koala habitat and 170 hectares of secondary habitat.

Based on the above data, the main stakeholders responsible for the management of the Tweed Coast Koala population are NSW Office of Environment & Heritage (managers of Cudgen Nature Reserve) and Tweed Shire Council (managers of the Pottsville Wetlands reserve and Pottsville Environment Park).

The work of Phillips *et al*. (2011) determined that occupancy rates by Koalas within the coastal strip had halved in the years immediately preceding their study to result in an estimated population size (i.e. inferred by density data) of approximately 145 Koalas **TABLE 5**.

TABLE 5
KOALA POPULATION ESTIMATES (N) FOR CURRENTLY OCCUPIED AREAS OF THE TCSEA
BASED ON THE DENSITY ESTIMATE DETERMINED BY FIELD SURVEY
(SOURCE: PHILLIPS *et al*. 2011)

Locality	Cell Size (ha)	Available Habitat	Population Estimate		
			Lower 95% CI	N	Upper 95% CI
Bogangar / Kings Forest / Forest Hill	358	71%	5	36	66
Tanglewood / Round Mountain / Koala Beach	578	80%	9	64	120
Pottsville Wetlands / Black Rocks	316	79%	10	35	65
Duranbah / Eviron	625	10%	1	9	16
TOTAL			25	144	267

Fire frequency and intensity within remaining habitat areas over the last decade has been identified as the major contributor to recent population attrition, with recovery potential now impeded in remaining habitat areas by ongoing incidental mortality rates due mostly to motor vehicle strike (Phillips *et al*. 2011).

More recently, Tweed Shire Council has prepared the Tweed Coast Comprehensive Koala Plan of Management (TCCKPoM) (TSC 2014). The plan was adopted by Council on 19 February 2015 and was prepared in conjunction with the Tweed Coast Koala Advisory Group, in accordance with State Environmental Planning Policy No. 44 - Koala Habitat Protection. The strategies within the plan are based on the outcomes of the Tweed Coast Koala Habitat Study.

One of the priority actions of the TCCKPoM was the re-assessment of the status of the Tweed Coast Koala population, as it had been five years since survey work was completed for the original Tweed Coast Koala Habitat Study (Phillips *et al.* 2011). The Tweed Coast Koala Study (Tweed Shire Council 2015a) was completed in December 2015 and describes the methods, results and implications of the most recent survey. However, it is noted that the Tweed Coast Koala Study (Tweed Shire Council 2015a) did not attempt to provide an estimate of population size.

Sixty-one (61) sites were sampled in both the 2015 and the previous survey, allowing comparisons of koala activity levels between the two survey periods. When results of the 2015 survey are compared to those reported in the 2011 Habitat Study, activity levels were found to have decreased across the study area. For sites that were active during either of the sampling occasions, and sampled on both, the mean activity level during this study was found to be significantly lower than that recorded during the 2011 Habitat Study. **FIGURE 12** illustrates changes in activity category at each of the field sites between the 2015 study and the previous study (Tweed Shire Council 2015a).

Since the commencement of the TCCKPoM, Council has been implementing the priority actions of the plan. Progress towards the implementation of the works program is reported to Council on a quarterly basis by the Natural Resource Management Unit. Further, annual summaries are prepared for general distribution and information and detail key outcomes from the reporting period. In accordance with the Year 4 priority actions of the TCCKPoM, reassessment of koala activity throughout the Tweed Coast will be completed in 2018.

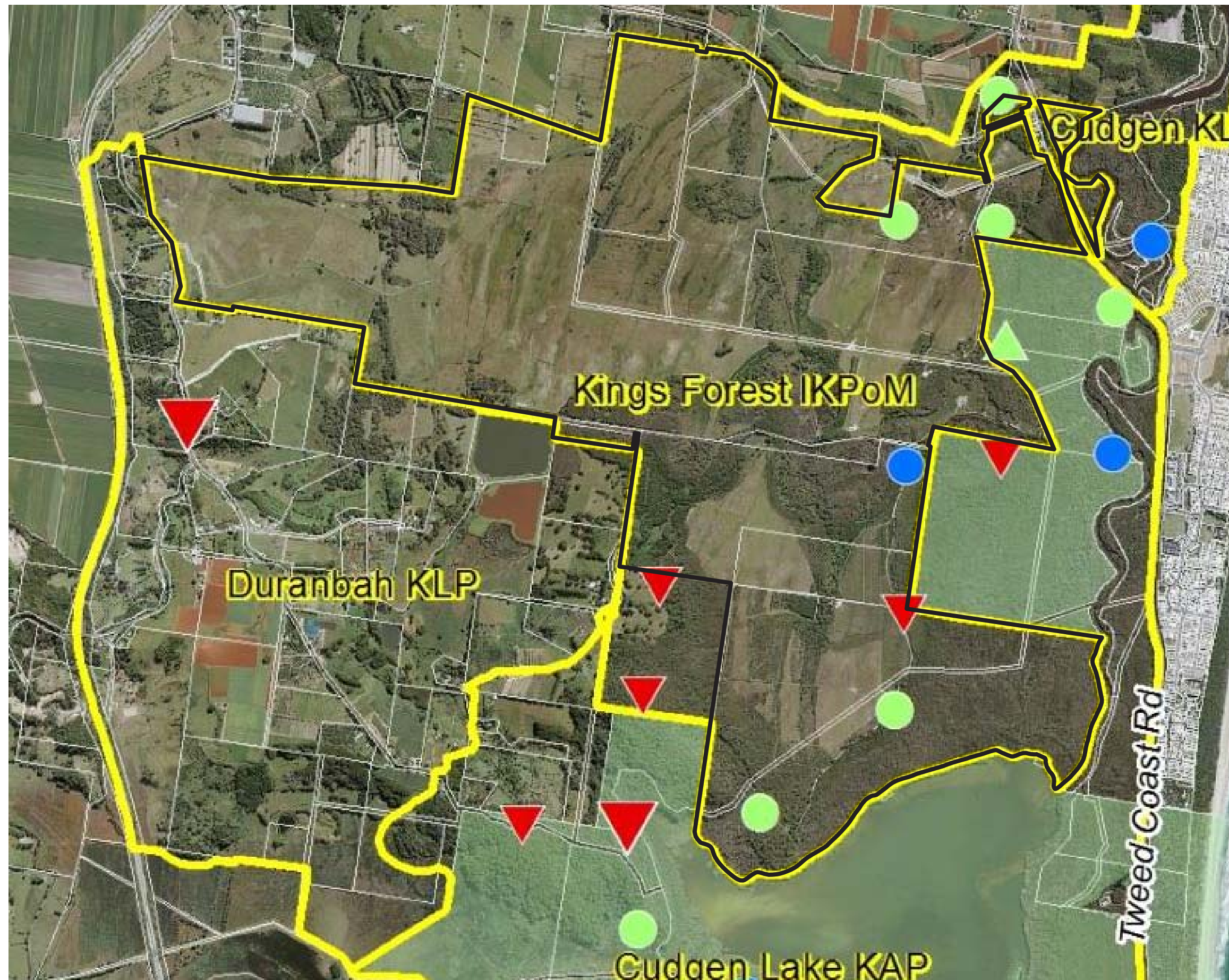
Phillips *et al.* (2011) have stated that the Tweed Coast Koala population is in serious decline and may be extinct within 20-30 years (from 2011). Active intervention is required to ensure the persistence of the Tweed Coast population. The amelioration of threatening processes such as road kill, dog attack, disease, lack of habitat and isolation is pivotal to its recovery.

6.3.3 Bogangar/Kings Forest/Forest Hills

The Koala sub-population of the Bogangar/Kings Forest/Forest Hills area, as modelled by Phillips *et al.* (2011), currently occupies an area of approximately 360 ha, that includes part of the habitat to which this KPoM applies. The area extends from Depot Road in the north to Cudgen Lake in the south encompassing some of Cudgen Nature Reserve and from Forest Hills to the Tweed Coast Road. Approximately 70% of this area is vegetated (**FIGURE 13**). It is estimated that thirty-six (36) Koalas could occur in this area (Phillips *et al.* 2011).

6.3.4 Kings Forest

Multiple assessments for the occurrence of Koalas at Kings Forest have been completed. These assessments have included direct observation (including spotlight surveys); short-term radio tracking studies; faecal pellet surveys (to detect Koala presence); faecal cuticle analysis (to determine diet) and vegetation assessments (Warren 2000, Callaghan *et al.* 2004, Phillips and Pereoglou 2004, Sainty 2006, Phillips *et al.* 2011). Koalas have been recorded over much of the site (**FIGURE 14**). Estimates of the population of Koalas occupying Kings Forest have varied. Warren (2000) and Smith (2005) estimated that Kings Forest itself could support around fifteen



- LEGEND**
- KPoM Management Precincts
 - Data Deficient Area
 - Nature Reserve
 - Property Boundary
 - Kings Forest Boundary
- Change in Activity Category
- ▼ Decrease
 - ▼ Major Decrease
 - ▲ Increase
 - No Change (Active)
 - No Change (Inactive)

0 500m
1 : 20 000

SOURCE: Tweed Shire Council Tweed Coast
Koala Study 2015 - Figure 3

SCALE: 1 : 20 000 @ A3

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FIGURE 12

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DATE: 28 September 2018
FILE: N97017_TSC 2011-2015.cdr

TITLE
**CHANGE IN
ACTIVITY CATEGORY
BETWEEN
2011 & 2015**



- LEGEND**
- Metapopulation Boundaries
- Significant Activity
 - High Activity
 - Undefined Boundary
- Koala Sighting
- Koala Sighting
- Field Sites
- Active
 - Inactive
- Major Roads
- Nature Reserve
 - Tweed Coastal Strip
 - Tweed LGA Boundary
 - Kings Forest Boundary

0 750m
1 : 30 000

SOURCE: Biolink Ecological Consultants - Tweed Coast Koala Habitat Study (2011) Figure 3.2
SCALE: 1 : 30 000 @ A3
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FIGURE 13
PREPARED: BW
DATE: 05 September 2018
FILE: N97017_Metapops.cdr

TITLE
**INDICATIVE
METAPOPOPULATION
BOUNDARIES**