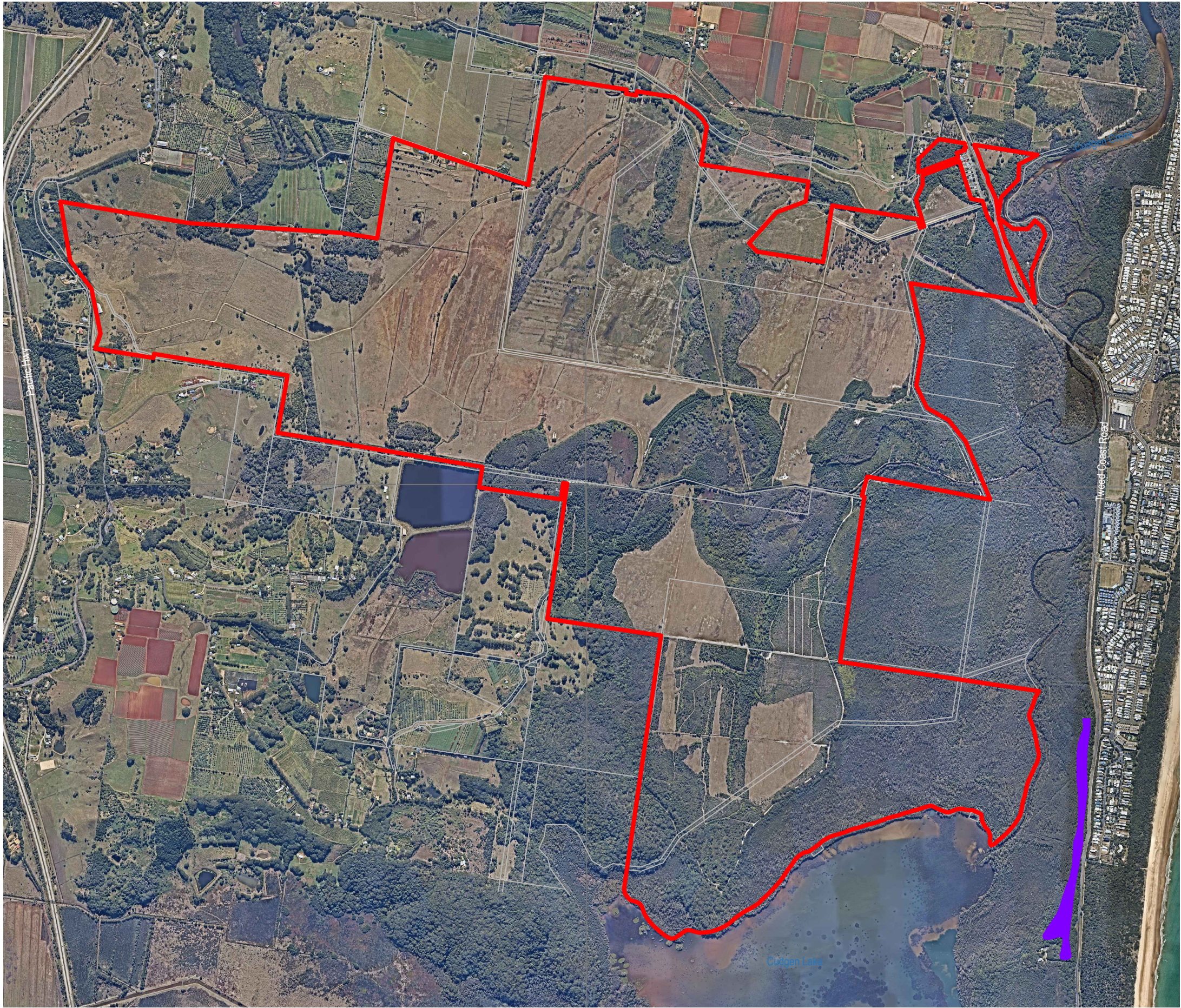
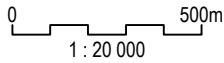




LEGEND

 SEPP 26 Littoral Rainforest

 Kings Forest Boundary



SOURCE: Landpartners - SEPP26 Littoral Rainforest; Near Map 08/08/18 Aerial SCALE: 1 : 20 000 @ A3 JWA PTY LTD Ecological Consultants	CLIENT Project 28 Pty Ltd PROJECT Koala Plan of Management Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed	FIGURE 4	TITLE
		PREPARED: BW DATE: 28 September 2018 FILE: N97017_KPOM.dwg	SEPP No. 26 LITTORAL RAINFOREST

- Lot 1 in DP 781633; and
- Lot 7 in DP 875447.

Project 28 Pty Ltd owns and manages the site which is currently used for cattle grazing and silviculture. The site consists of a mosaic of natural, partially natural, modified and regenerating plant communities including Heathland, Swamp sclerophyll (Paperbark) forest, Woodland, Pine plantation, Freshwater wetland and Pasture. The majority of the site is maintained as pasture for cattle grazing.

SEPP 14 wetland areas, as well as a number of smaller wetland and Littoral rainforest parcels have been designated Environmental Protection (Wetlands and Littoral Rainforests) (7a) zones under the Tweed Local Environmental Plan (LEP). Lands in the far south of the property are subject to clause 50b of the Tweed LEP, committing them to conservation. Apart from other smaller areas of Environmental Protection (Habitat) (7I), the remainder of the property is zoned Urban Expansion (2c) (**FIGURE 5**).

4.5 Soils and Geology

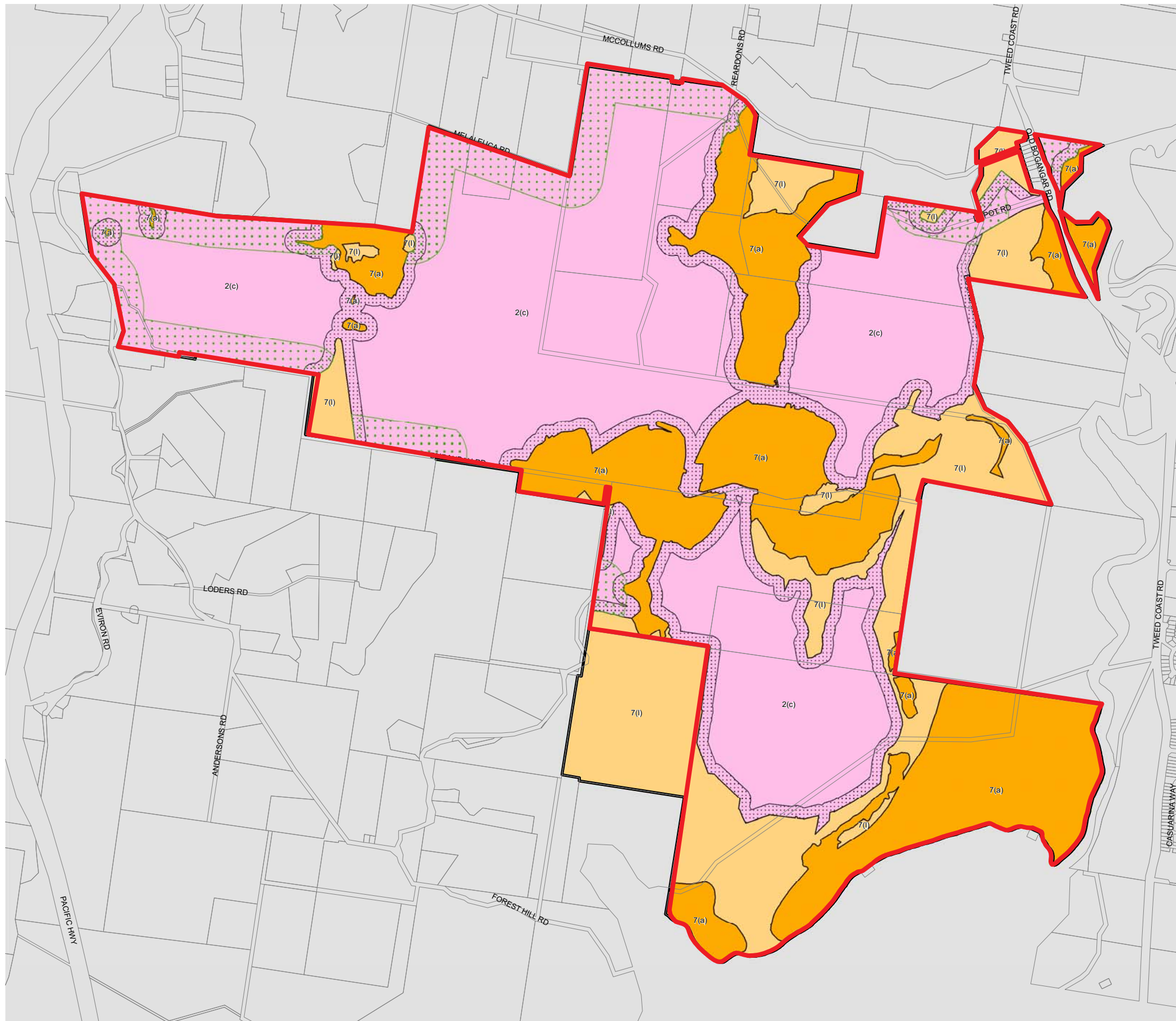
Soil landscapes within the Murwillumbah area have been mapped and described by Morand (1996). Kings Forest is situated within the Murwillumbah map sheet area (Department of Land and Water Conservation (DWLC)). The low-lying areas are predominantly Aeolian and marine formed beach ridge plains of Pleistocene origin (DWLC classification: *Kingscliff soil landscape*).

An ancient stream channel cuts through the inner barrier sediments, creating low-lying swampy areas of Holocene origin dominated by Organosols (Gilbert and Sutherland 2011). Low hills of Neranleigh-Fernvale derived material bound the site in part on the western, south-western and southern fringes, with a low hill of basalt derived material present on the north-western boundary.

The beach ridge plain is comprised essentially of Pleistocene sands and extends from Cudgen Lake north to Old Bogangar Road and west to the low hills bordering Duranbah Road. The south of the site, including Cudgen Paddock, consists of a poorly drained depression within Pleistocene sand sheets and dunes. Elevation is less than 3 m in these areas of the site and water ponding is common with the water table generally within 100 cm of the surface (Morand 1996). Artificial drains run north and south through the Cudgen Paddock.

An area of wetland bisects the beach ridge plain at the centre of the site and extends to the northern boundary and along a relict stream channel flowing east towards Cudgen Creek.

Six (6) main soil orders have been identified at the site, according to the Australian Soil Classification (Isbell 2002). These are Podosols, Organosols, Dermosols, Kandosols, Ferrosols and Hydrosols. In general, the soils on the site can be classified into three (3) main areas. Those soils occurring on the Pleistocene beach ridge plain, the more recently deposited Holocene peats and sediments of the wetland areas, and the soils associated with the higher slopes on the western boundaries of the site (Gilbert and Sutherland 2011) (**FIGURE 6**).



- LEGEND**
- Kings Forest Boundary
- ZONING**
- 2(c) Urban Expansion
 - 7(a) Environmental Protection (Wetlands & Littoral Rainforests)
 - 7(l) Environmental Protection (Habitat)
 - Agricultural Buffer (150m)
 - Ecological Buffer (50m)

0 500m
1 : 20 000

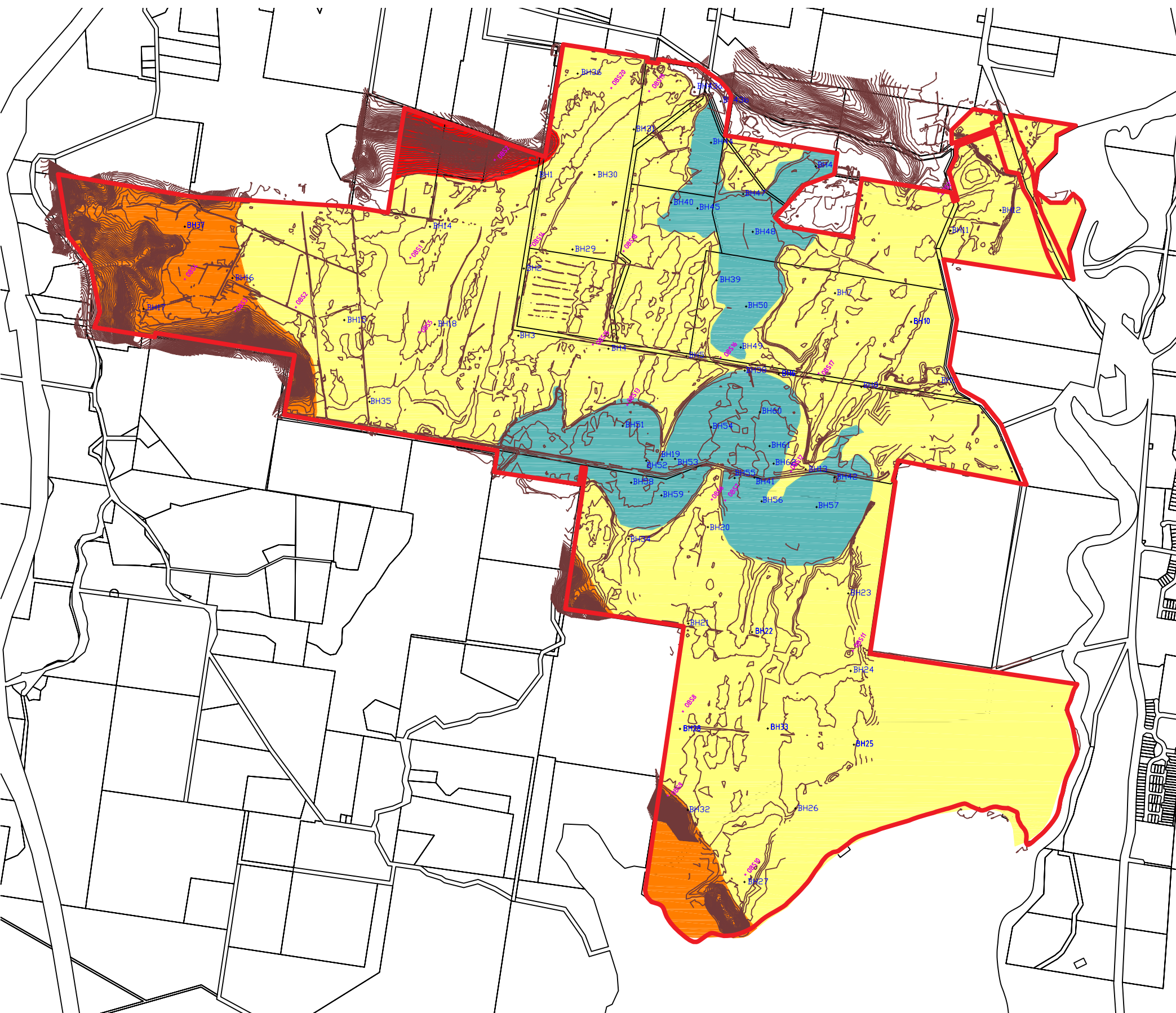
SOURCE: NSW Planning SEPP (Major Development) 2005 - Kings Forest Land Zoning Map (Ref: SEPP_MD_KIF_LZN_001_20100201)
SCALE: 1 : 20 000 @ A3
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Shire of Tweed

FIGURE 5

PREPARED: BW
DATE: 05 September 2018
FILE: N97017_Zoning.cdr

TITLE
ZONING PLAN



- LEGEND**
- Kings Forest Boundary
- SOILS MAPPING**
- Podosols
 - Meta-sediments consisting of Kandasols & Dermasols (Hydrosol at OBS4)
 - Ferrosols
 - Organosols
 - Borehole Location (June 1998)
 - Location of Soil Classification Observation (June 1998)

0 500m
1 : 20 000

SOURCE: Gilbert & Sutherland (Ref: soils.pdf)	CLIENT Project 28 Pty Ltd PROJECT Koala Plan of Management Kings Forest Melaleuca Drive, Duranbah, NSW Shire of Tweed	FIGURE 6	TITLE SOILS PLAN
		PREPARED: BW DATE: 05 September 2018 FILE: N97017_G&S Soils.cdr	

4.6 Topography and Drainage

The site is on a gently undulating coastal floodplain with the Duranbah Ridge bordering the western boundary. The majority of the site (and surrounding lands) is generally low lying and of low relief, with a large proportion comprising a beach ridge plain. Approximately 94% of the land is below 10 m AHD and the remainder generally less than 20 m AHD with the exception of two (2) areas in the western portion of the site and an area within the Environmental Protection Zone in the south, which have slopes exceeding 20%. Approximately 25% of the coastal plain within the site is permanent wetland.

The site is dominated by two (2) major and a number of minor drainage lines (**FIGURE 7**). The two (2) major drainage features are:

- Blacks Creek, which has a small catchment to the south of the western portion of the Kings Forest site in “Turners Land”. Blacks Creek enters the site and then drains immediately east through a maintained large drain, traverses the SEPP 14 landscape feature and exits to the Cudgen Nature Reserve at the eastern boundary to the site; and
- The SEPP 14 wetland habitats in the northern central and middle eastern portions of the site and associated constructed drains. The northern central portion of the SEPP 14 drains to the south (via a constructed drain) and into the middle eastern portion of the SEPP 14. All this water then continues via constructed drains into Blacks Creek.

It should be noted that although these drainage features are labelled as intermittent on the topographical mapping (**FIGURE 7**) site observations over the last 25 years would indicate that these are permanent streams.

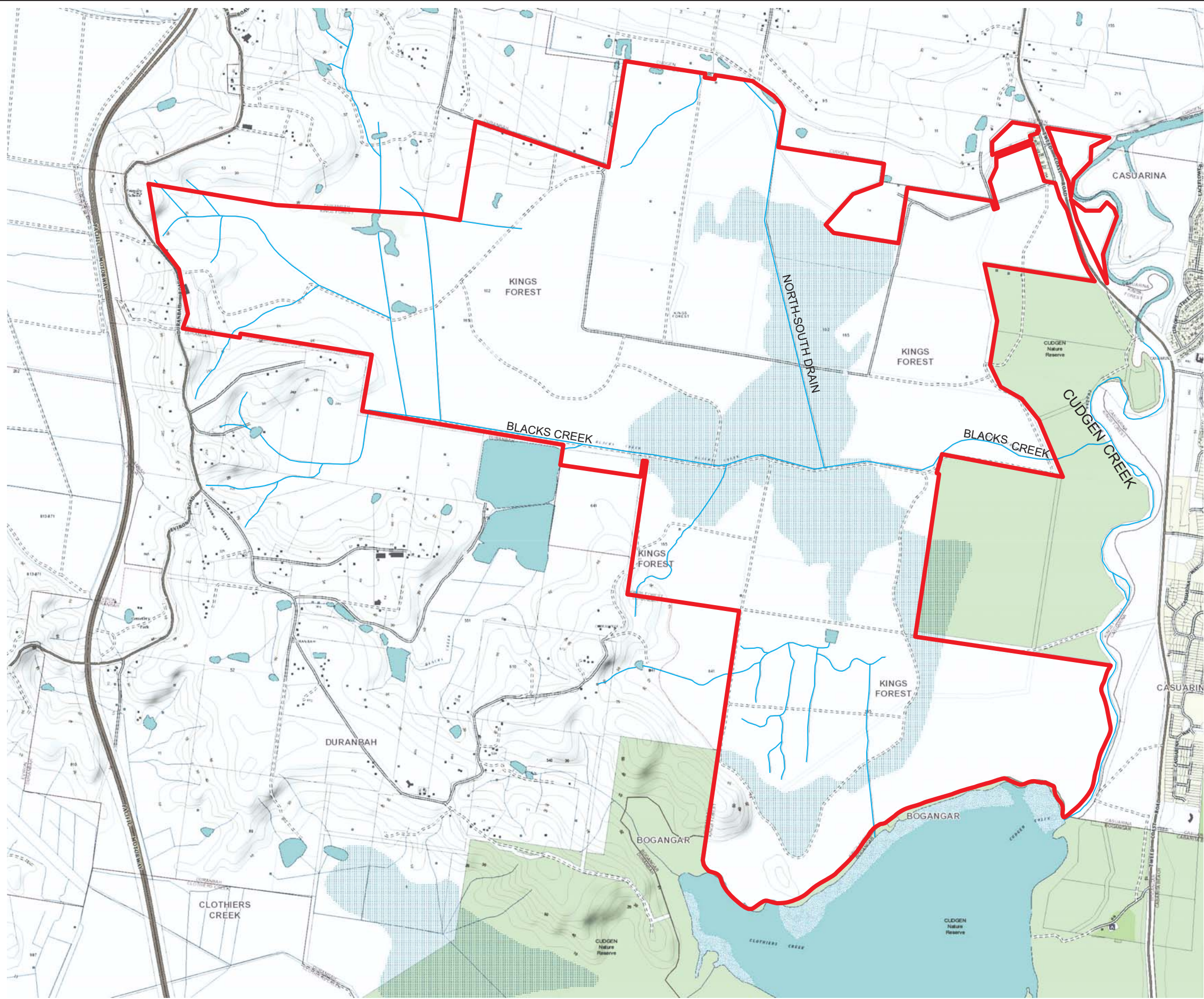
The majority of the land in the southern portion of the Kings Forest site (Cudgen Paddock) drains to the north into the SEPP 14 (middle eastern portion) and thence into the Blacks Creek system.

A creek and smaller SEPP 14 wetland drainage system occurs between in the western portion of the site. This creek system drains to the south of the Kings Forest site.

4.7 Vegetation

The Kings Forest site has a decades-long history of various land uses and land management practices, including pine plantation, sand mining, pasture improvement and turf production, dairy farming, small cropping and sugar cane production. It is presently used generally for cattle grazing. Over many years the land has been extensively cleared for these activities. There remain, however, large areas of undisturbed vegetation in the eastern and south-eastern portions of the property and within wetland areas throughout. These areas of the site are generally zoned for Environment Protection.

Vegetation at the subject site has been described in varying degrees of detail (Warren 2000, Kingston *et al.* 2004, Callaghan *et al.* 2005). The most comprehensive vegetation mapping over the Kings Forest site was completed by the Australian Koala Foundation (Callaghan *et al.* 2005). However, harvesting of areas of pine plantation, continued infestation of native vegetation



- LEGEND**
- Kings Forest Boundary
- DRAINAGE FEATURES**
- Intermittent Stream
 - Perennial Lake
 - Land Subject to Inundation
 - Sand



SOURCE: NSW Department of Finance & Services 2012 Topographic map of NSW

SCALE: 1 : 20 000 @ A3

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Shire of Tweed

FIGURE 7

PREPARED: BW
DATE: 05 September 2018
FILE: N97017_Topo Drainage.cdr

TITLE

DRAINAGE PLAN

with Slash pine (*Pinus elliotii*) wildings and areas of natural heath regeneration has occurred since the preparation of this map.

FIGURE 8 shows the vegetation communities occurring over the site (as at December 2017) and has been adapted from the Callaghan *et al.* (2005) mapping combined with detailed re-mapping/ground-truthing surveys completed by JWA between 2010 - 2017.

In total, six (6) broad vegetation types comprising forty-two (42) discrete vegetation communities have been identified over the Kings Forest site (**FIGURE 8**). The six (6) vegetation types mapped over the site include:

- Highly modified vegetation communities;
- Freshwater wetlands;
- Heathland and shrublands;
- Swamp sclerophyll floodplain forests;
- Dry to moist open forests; and
- Rainforest.

Vegetation community descriptions in this KPoM, including proposed offset/compensatory habitat areas, are discussed in relation to their closest Plant Community Type (PCT) descriptions which were accessed via the NSW Office of Environment and Heritage (OEH) database (i.e. the BioNet Vegetation Classification System). PCTs are classified based on vegetation types occurring within the Interim Biogeographic Regionalisation for Australia (IBRA) subregions, as developed by the Commonwealth government. The IBRA framework divides Australia landscapes into bioregions and subsequently subregions based on common features such as climate, geology, landform, and vegetation.

It is noted however that PCT descriptions are still undergoing revision and many remain undescribed for the SEQ03 - Burringbar-Conondale Ranges IBRA subregion. Therefore, corresponding Tweed Vegetation Management Strategy 2004 (TVMS) codes have also been provided.

For consistency, relevant PCT descriptions and corresponding TVMS codes have also been used when discussing Koala habitat categories within the Tweed Coast Koala Habitat Study (Phillips *et al.* 2011), the Tweed Coast Koala Study (Tweed Shire Council 2015a) and the Tweed Coast Comprehensive Koala Plan of Management (Tweed Shire Council 2015b).