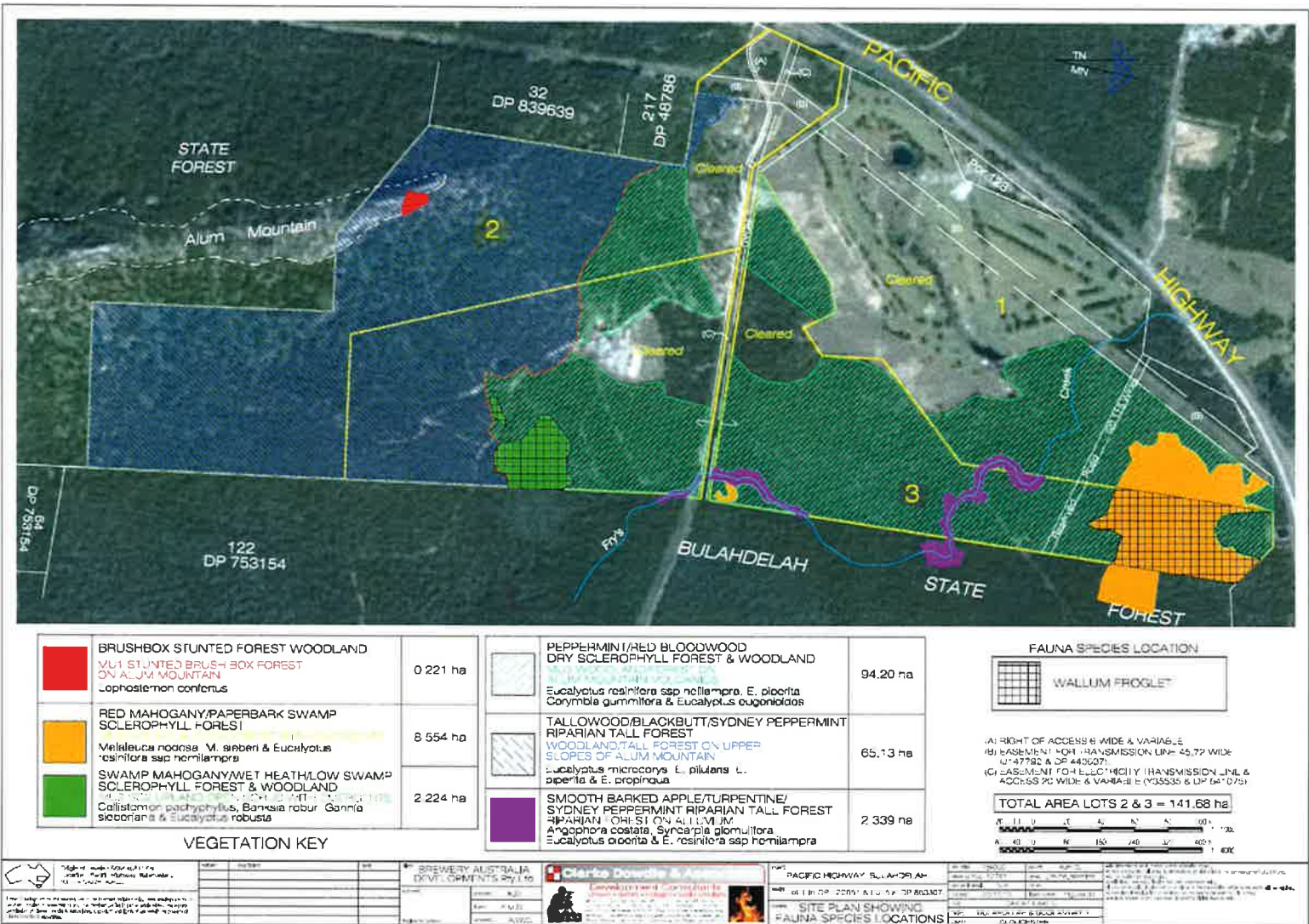




Figure 46– Potential habitat for the Wallum Froglet



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.14 The Green-thighed Frog *Litoria brevipalmata* (See Figure 47)

The Green-thighed Frog, *Litoria brevipalmata* is a poorly known species with only 16 populations known in New South Wales (Murphy and Turbill, 1999). Documentation of other species where this species has been found include open forest and open shrubland with a heathy understorey on a sand substratum on the north coast, eucalyptus woodland with a grassy understorey on sandy soil in Queensland, wet heath/shrubland on a sandy soil derived from sandstone in Queensland and gully rainforest at Ourimbah and Bluegum-Turpentine Forest with a rainforest understorey at Matcham. It is a species which has a very variable habitat and is difficult to predict.

Forest Fauna Surveys (2011) states that within the subject site, the extent of suitable habitat for the Green-thighed Frog includes the riparian zone of Fry's Creek and the Red Mahogany Paperbark Swamp Sclerophyll Forest (described as Group 2 Sub-Community 1 – Melaleuca Forest with Emergents in Areas of Impeded Drainage (Clarke Dowdle & Associates, 2010a). This area is low lying and has impeded drainage from small pock marked undulations in the soil layer and occurs in the northern section of the study area. It could also occur in the vicinity of an old dam in the same habitat, located north of Frys Creek.

The proposed Master Plan would not result in disturbance to this area.



Figure 47 – Potential habitat of the Green-thighed Frog and Stephens- banded Snake

13.15 Stephens Banded Snake *Hoplocephalus stephensii* (See also Figure 47)

Stephens Banded Snake may be present on the property in any of the forested habitats. Fitzgerald et. al., (2004) studied the species in eastern Australia and from 39 captures it was found they fed primarily on Common Bush Rats and Eastern Pigmy Possums as well as lizards, birds, small arboreal mammals, bats and frogs that occur in the tree canopy or use tree hollows. This snake maybe found in moist habitats on the property.

At a finer scale the Stephens Banded Snake occupies a wide range of habitats from coastal swamps to upland moist forest types, but also found in rocky areas comprising exfoliated granite and occasionally sandstone in the southern parts of its range (e.g. Woy Woy on Hawkesbury Sandstone). The species is dependent on tree scar crevices and rarely descends to the ground. It has been most commonly encountered on warm wet nights. There are several records of the species recorded in proximity to the subject site to suggest it's possible presence. The extent of habitat considered suitable for the species would include the low lying areas in proximity to Fry's Creek, but also potentially the rocky summit of Alum Mountain.

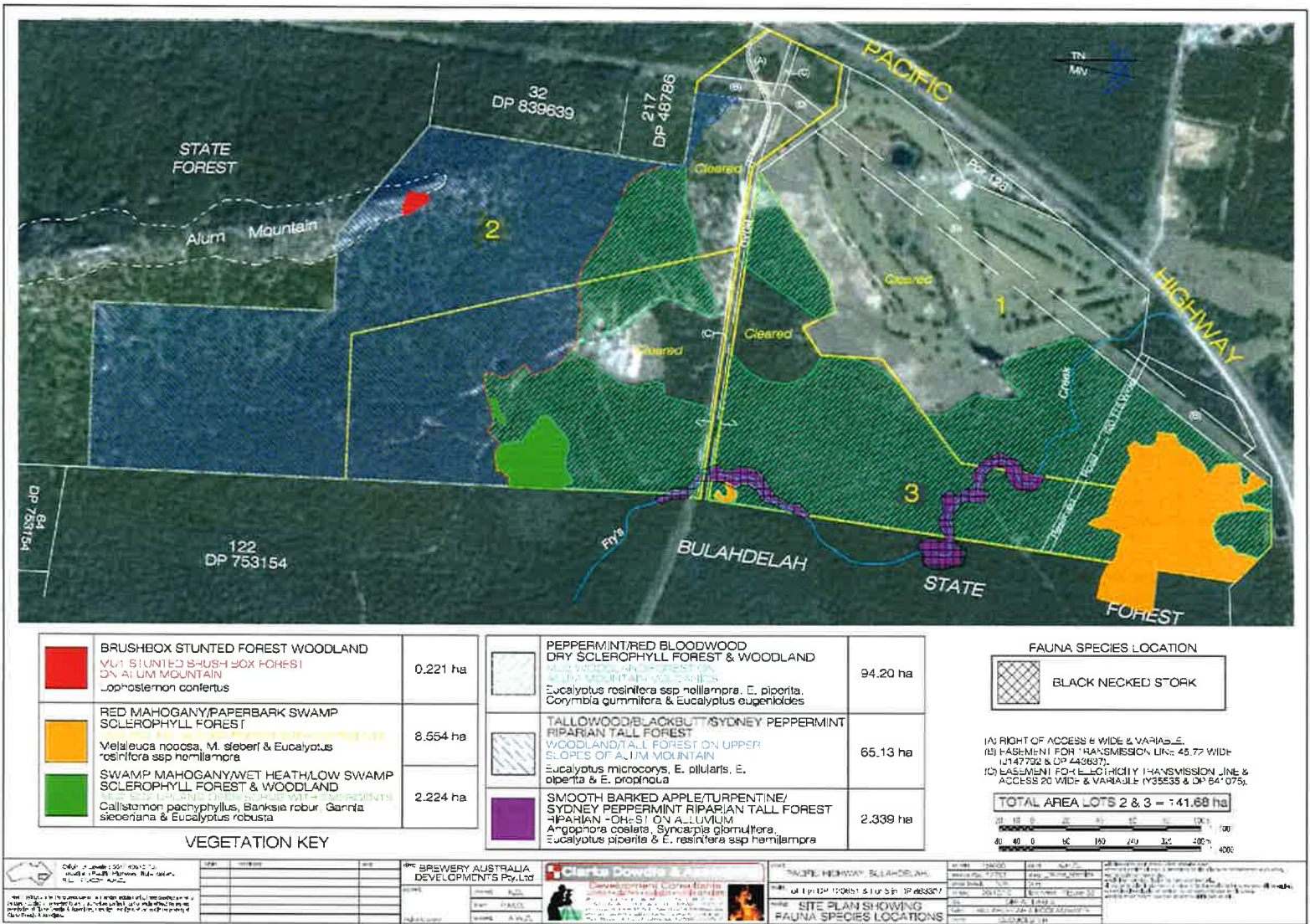
13.16 Black-necked Stork *Ephippiorhynchus asiaticus* (See Figure 48)

The Black-necked Stork has a distribution from Pakistan, India, Sri Lanka, Vietnam, the Malay Peninsula, New Guinea and Australia. In Australia it is mostly found along the coast with a southern limit of distribution south of Sydney in New South Wales. At the southern end of its range, it is rare. The habitat for this species in tropical and warm temperate areas is wetlands, estuarine and littoral habitats with occasional occurrences in grassland and wooded areas. It will forage in fresh and saline waters up to 0.5m deep, but it is seen mainly in open freshwater and when shallow water covers grassland or sedgeland, such as floodplains.

Roosting areas are mainly on the edges of wetlands where it is seen singularly or in pairs at night. It will rest during the day also on the edges of wetlands. Its breeding habits and seasons are poorly known, but observations show it will nest in or near freshwater swamps and sometimes in the forks of trees.

Food resources are largely aquatic with a variety of fish, crustaceans and insects. Snakes are sometimes eaten. They forage slowly by walking along and probing with their beaks into the water and shallow vegetation (Marchant and Higgins, 1990).

The species could be found in relation to the subject property anywhere along Frys Creek.

**Figure 48 – Potential habitat for the Black necked Stork**

THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.17 Bush Stone-curlew *Burhinus grallarius* (See Figure 49)

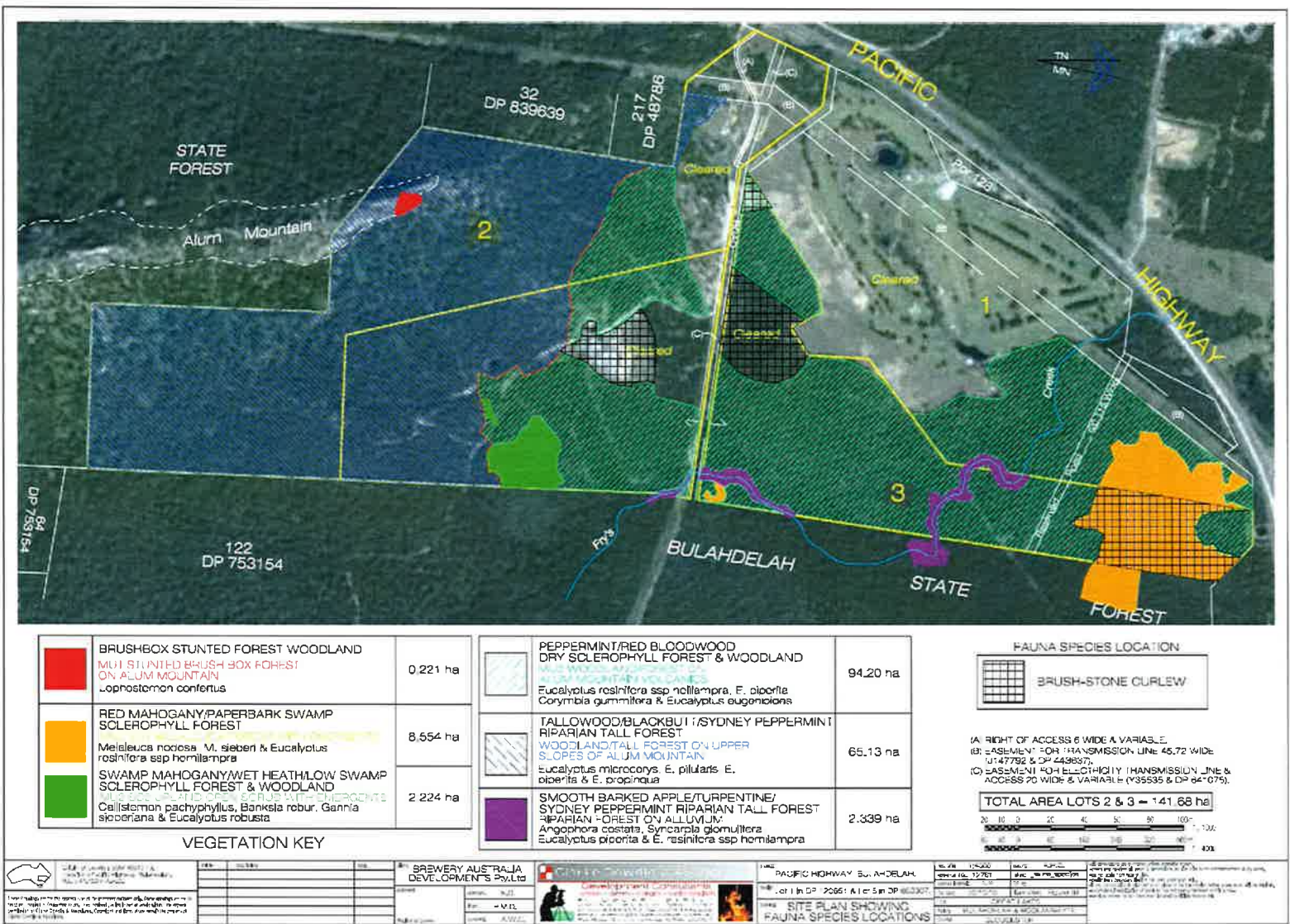
The Bush Stone-curlew is an endangered species listed on the NSW Threatened Species Conservation Act, 1995, and was once common throughout southern and eastern Australia in open grassy woodlands. As a result of a rapid decline it is now only found at very low densities west of the Great Dividing Range and in isolated pockets along the Central Coast and the north-eastern fringe of coastal New South Wales. It is believed that imported predators such as the European Fox, domestic and wild dogs and cats as well as conversion of its habitat to agricultural and urban landscapes are responsible for its decline in range.

It is known that the low land open woodlands with a ground cover of native grasses, fallen timber and leaf litter are the main habitats required for the Bush Stone-curlew. In coastal areas it is also found foraging along mudflats, saltmarsh, mangroves and foreshore public reserves. The species nests on the ground in areas which are grassed or with sparse low ground cover. It will not tolerate disturbance and the species will choose areas for breeding where it is well camouflaged. Breeding sites are territorial.

Invertebrates form the main component of its diet and foraging mainly occurs at night. Small soaks on coastal foreshore reserves are also prime foraging habitat for this species (NSW DEC, 2006b).

The species would not occur on the subject property, but it could occur on the adjoining Golf Course which would have relevance to the subject property.

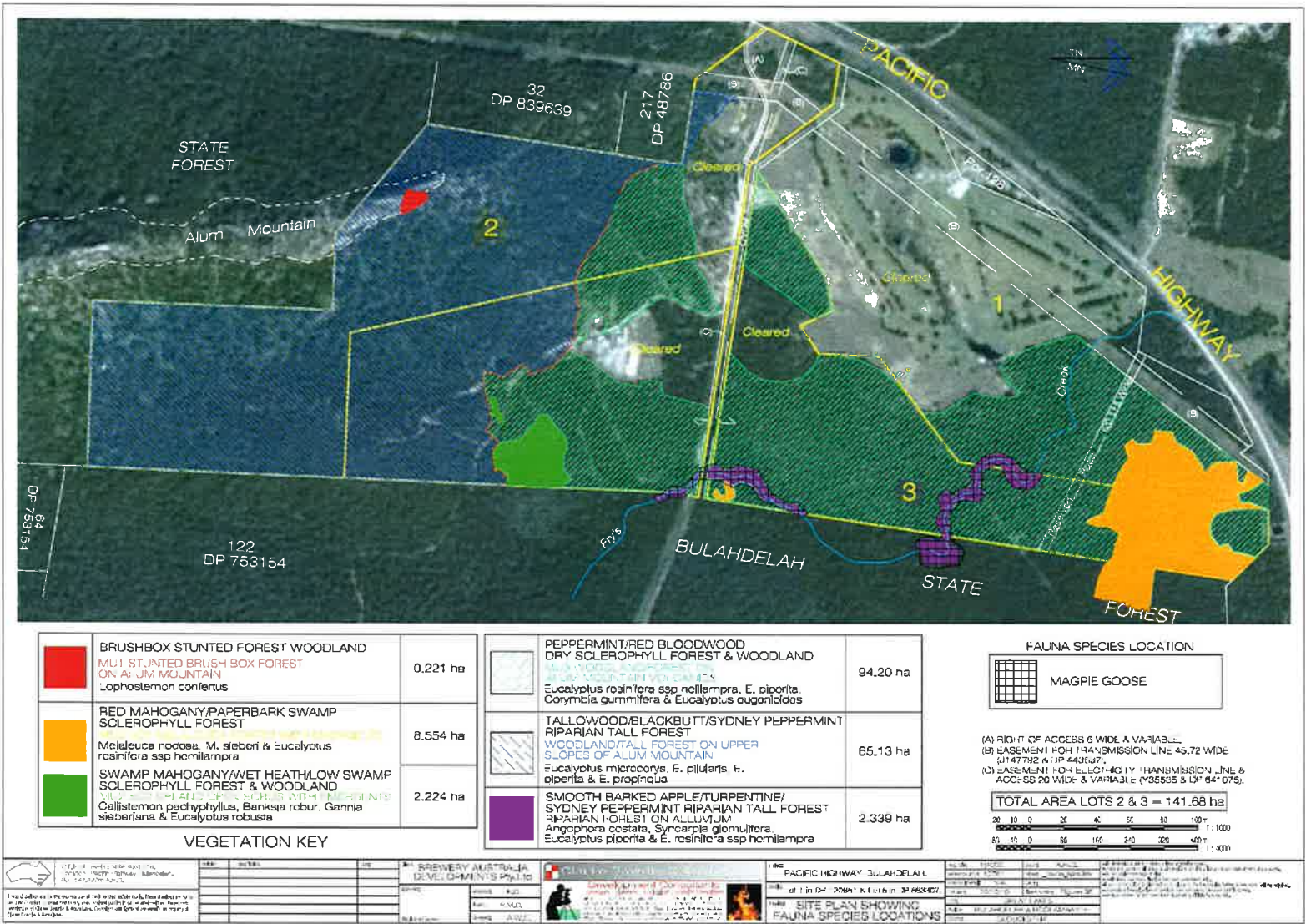
Figure 49 – Potential habitat for the Bush-stone Curlew



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELDAH



Figure 50 – Potential habitat for the Magpie Goose



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.19 Black Bittern *Ixobrychus flavicollis* (See Figure 51)

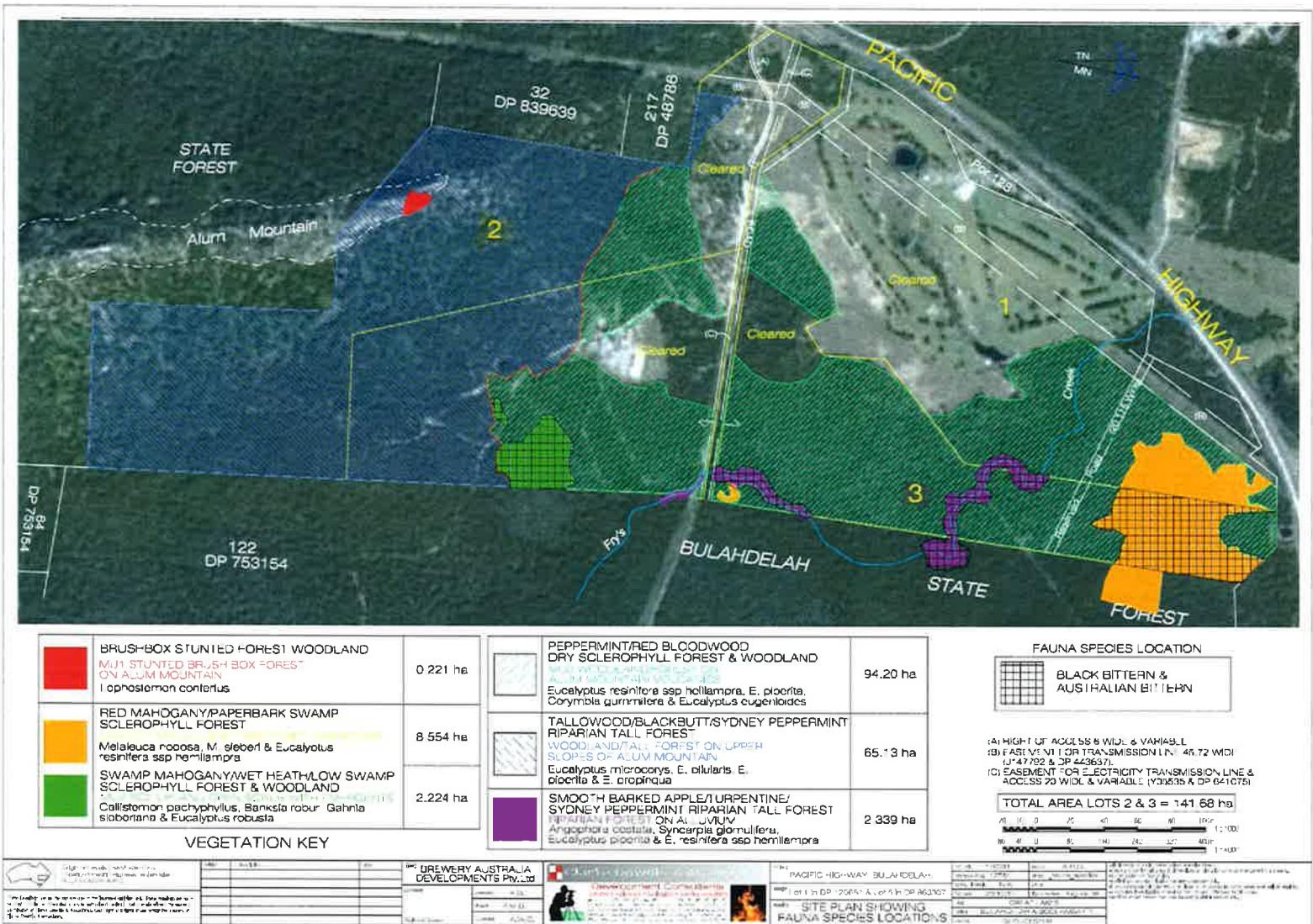
The Black Bittern is found in coastal areas from Exmouth Gulf in Western Australia and then along the coast of north-western Australia and northern Australia, Queensland, New South Wales and Victoria. It is also found south of Perth. In New South Wales it is found along the coast as far south as Sydney and then very rarely observed between Sydney and the Victorian border.

It is found in terrestrial wetlands and littoral habitats with either still or running water. The permanent wetlands where it is found are fringed by dense vegetation. Billabongs, pools, coastal estuaries and tidal reaches of creeks and rivers are also used. In these instances, the Black Bittern can be found in rank grassland, shrubland, dry or wet sclerophyll forest, rainforest, vine thickets and mangroves.

Food resources include fish and fresh water crayfish. The birds feed by standing and waiting with its neck retracted between the shoulders and slowly extending its neck to grab its prey. It is mainly a nocturnal species (Marchant and Higgins, 1990).

The Black Bittern could be found in the dense *Gahnia clarkei* sedgelands along Frys Creek and in the EEC area north of Frys Creek. Some habitat potential also occurs in the hanging swamp vegetation.

Figure 51- Potential Habitat for the Black Bittern and the Australasian Bittern



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELDAH

13.20 Australasian Bittern *Botaurus poiciloptilus* (See also Figure 51)

The Australasian Bittern occurs over most of New South Wales, Victoria and southern Queensland. It is absent from the very dry western parts of New South Wales. It has similar habitat attributes to the Black Bittern having been recorded in beds of rushes, reeds and sedges such as *Gahnia spp.* in terrestrial wetlands and occasionally estuaries. It favours tall vegetation in permanent freshwater, however (Marchant & Higgins, 1990).

Such habitat characteristics occur along Frys Creek.

13.21 Little Eagle *Hieraaetus morphnoides* (See Figure 52)

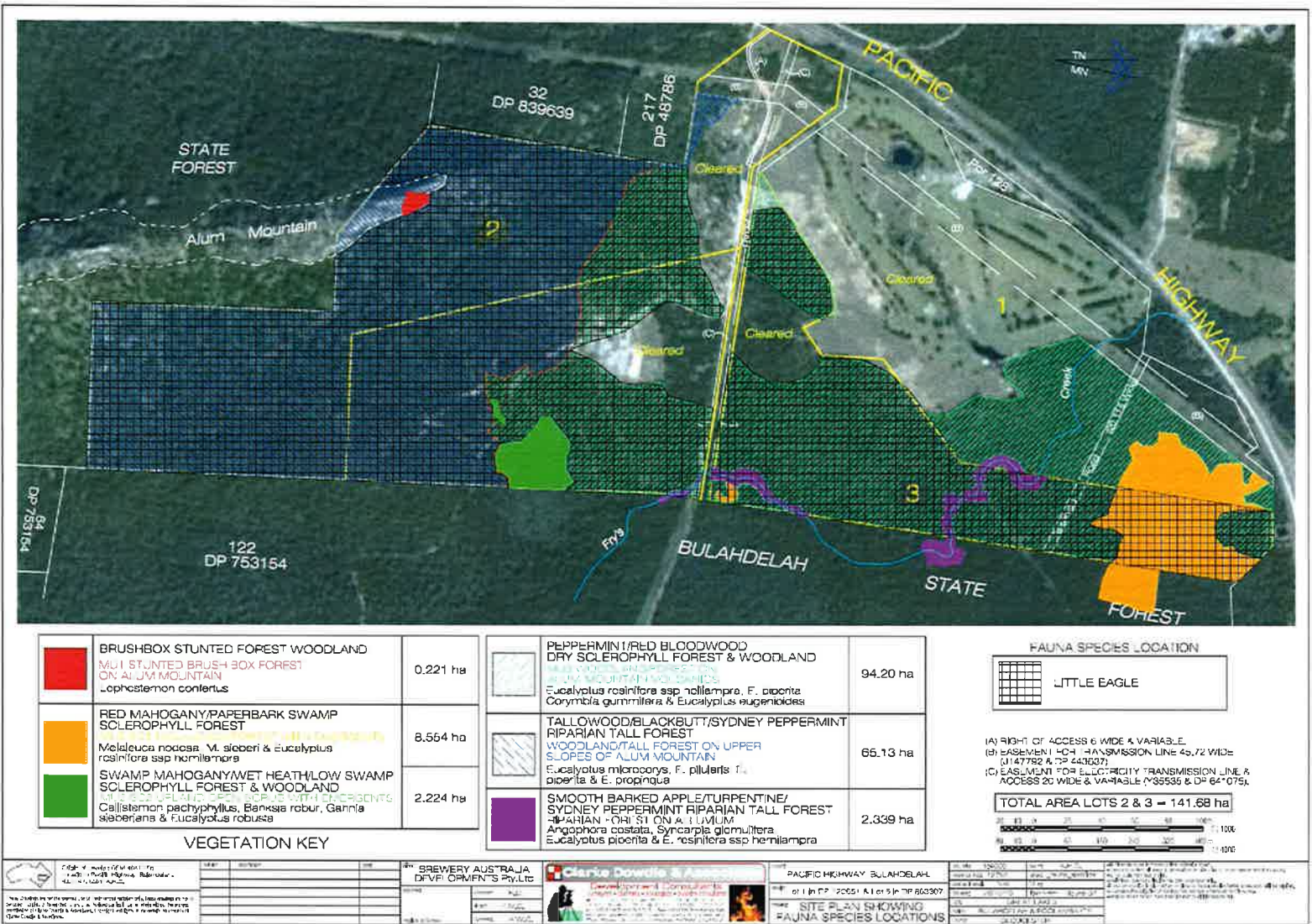
The Little Eagle is widespread throughout mainland Australia but it is uncommon and mainly found on the dense forests of the Great Dividing Range escarpment. The habitats where they occur are rich in prey species and include eucalypt forest, woodland and open woodland, Sheoak and Acacia Woodland and riparian woodland.

Tall living trees are used as nest sites and nests are built in winter for spring breeding. The species feeds on birds, reptiles, mammals and occasionally large insects. Most of its former prey species, in inland NSW have become extinct. A very large area of its foraging and breeding habitat has been cleared in NSW.

The Little Eagle could be found in all habitats on the property.



Figure 52 – Potential habitat for the Little Eagle



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.22 Wompoo Fruit-dove *Ptilinopus magnificus*, the Rose-crowned Fruit-dove *Ptilinopus regina* and the Superb Fruit-dove *Ptilinopus superbus* (See Figure 53)

The Wompoo Fruit-dove is the largest of Australia's Fruit-dove's, whilst the Rose-crowned Fruit-dove is a much smaller bird with a shorter tail. Historically, the former species was found in the Illawarra district south of Sydney to the tip of Cape York Peninsula, but these populations south of Sydney have now disappeared. The species is currently only found between the Queensland border and the Hunter River, but breeding pairs are only confined from the Queensland border and south to Coffs Harbour and the Dorrigo Plateau. Core breeding areas are restricted only to high elevation sites around Mount Warning and the Focal Peak volcanoes and the Washpool-Chaelundi areas. The areas that have been identified as breeding habitat are Washpool, New England-Dorrigo, Mount Warning and Nightcap National Parks.

The Wompoo Fruit-dove is found in remnant sub-tropical rainforest and adjoining wet sclerophyll habitats and occasionally in isolated trees amongst farmland. The Wompoo Fruit-dove makes an important contribution to seed dispersal in rainforests. This is because of their relatively large gape which enables it to feed on rainforest fruit which is otherwise too large for other rainforest pigeons and flying foxes.

The Wompoo Fruit-dove is partially territorial as it moves around within a small area in response to food availability and nesting requirements. However, it does have a seasonal altitudinal migration inhabiting upland forests during summer and moving to low elevations in winter. It is estimated that its home range is approximately 20Ha.

Due to the limited occurrence of its food resources in the southern part of its range it has become locally extinct.

The Rose-crowned Fruit-dove has a core range in the North Coast of New South Wales and the eastern escarpment of the New England Tablelands and sometimes south to Port Stephens. Breeding has only been recorded as far south as the lower Clarence Valley, but vagrants are sometimes recorded much further south on the Central Coast and in Sydney. The species is currently widespread and moderately common to common in the Richmond Valley, but comparable data from other regions is not available.

As for the Wompoo Fruit-dove, the Rose-crowned Fruit-dove inhabits rainforest and nearby sclerophyll forests and coastal scrub which supports abundant trees with fleshy fruits. It is also found in remnant patches and regrowth forests and furthermore within pockets of Camphor Laurel and Privet regrowth. Its habitat requirements are wider than the Wompoo Fruit-dove and it occurs in moist forest and woodland with abundant fruiting trees as well as ornamental parks and gardens.

The Rose-crowned Fruit-dove will feed on fleshy fruits of rainforest trees, palms and vines, especially native figs and introduced weed trees that as Camphor Laurel, Inkweed, Wild Tobacco Bush and Lantana.

The Wompoo Fruit-dove similarly inhabits rainforest but it forages high in the canopy where it will feed on figs and palms. It is known to be partly nomadic.

On the subject site feeding habitat exists only for all species along Frys Creek where there is an abundance of *Acmena smithii*, Lilly Pilly which produces fleshy fruits in late spring and summer and furthermore on the north face of Alum Mountain where there are a number of

13.23 Little Lorikeet *Glossopsitta pusilla* (See Figure 54)

The Little Lorikeet is a common species along central mid-northern and coastal New South Wales and is very frequently recorded when winter flowering eucalypts such as *Eucalyptus robusta*, Swamp Mahogany come into flower. However, on the north-west slopes in New South Wales the species is considered to be very rare. Studies by Courtney & Debus (2006) have shown that this Lorikeet utilises traditional nest sites in mature and old growth stands of Smooth-barked Gums such as *Eucalyptus viminalis* subsp. *viminalis*, Manna Gum, *E. blakelyi*, Blakely's Red Gum, *E. dealbata*, Tumble Down Red Gum and *E. prava*, Orange Gum.

The Little Lorikeet is related to eucalypt flowering phenology. *Eucalyptus albens*, White Box which is rich in pollen and *E. melliodora*, Yellow Box, rich in nectar are the two main sources of food on the tablelands. The other eucalypt species mentioned have an unpredictable flowering pattern. Little Lorikeets will feed on White Box and Yellow Box flowers for many months as they supply a regular and continuous food resource. White Box will flower in March to September and Yellow Box from August to December.

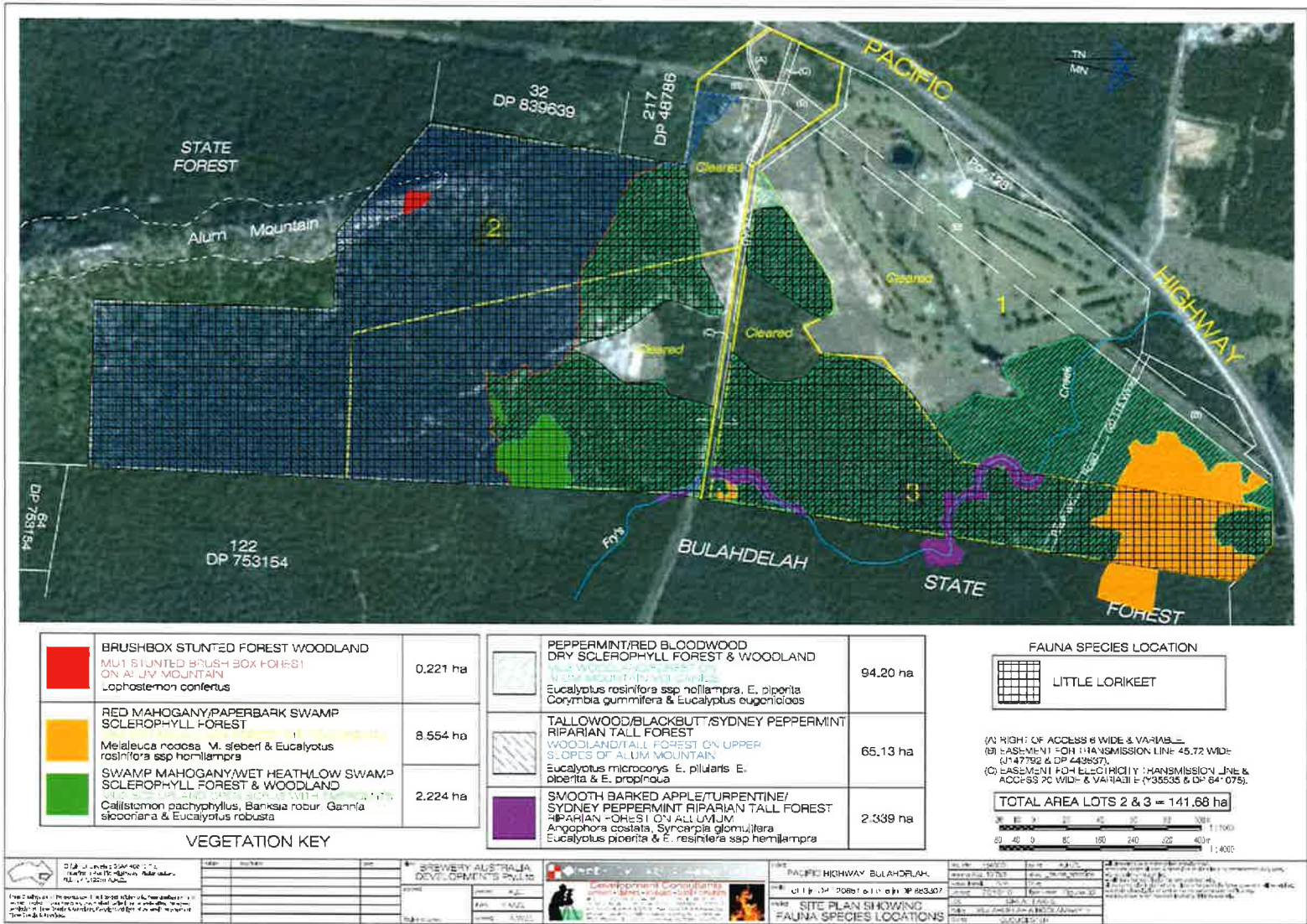
Little Lorikeets will occupy their territory in the New England Tablelands around April and will stay in the area until the blossom finishes in early December. They are absent from January to March. Breeding occurs during July with nestlings in August, September, November and fledglings in December. Due to loss of traditional nest trees and food resources on the New England Tablelands, the species has now been listed as vulnerable. Whilst the species is still very common in coastal New South Wales its breeding success and feeding attributes are largely unknown. The movements of the species are also unknown but it moves in response to food availability (Higgins, 1999).

They feed primarily on nectar and pollen of flowering trees, but also feed on flowering mistletoe. The species is highly nomadic and forages over extensive distances as many eucalypt species are unreliable in their annual flowering pattern. On the property the Little Lorikeet would feed in winter on Swamp Mahogany (Swamp Mahogany Wet Heath Low Swamp Sclerophyll Forest and Woodland) and probably on Red Mahogany in the coastal plain forests (Red Mahogany/Paperbark Swamp Sclerophyll Forest and Red Mahogany/Sydney Peppermint/Red Bloodwood Dry Sclerophyll Forest and Woodland) and all other vegetation in other seasons opportunistically as flowering occurs which is basically the extent of all the existing vegetation. The habitat matrix for the Little Lorikeet suggests the stand of Swamp Mahogany plus the structural age class matrices for large diameter tree sizes within the central low lying area, and also the elevated parts of Alum Mountain provide the higher quality habitat for the Little Lorikeet.

The Little Lorikeet is particularly common along the coast but much rarer in the tablelands.



Figure 54 – Potential habitat for the Little Lorikeet



13.24 Turquoise Parrot *Neophema pulchella* (See Figure 55)

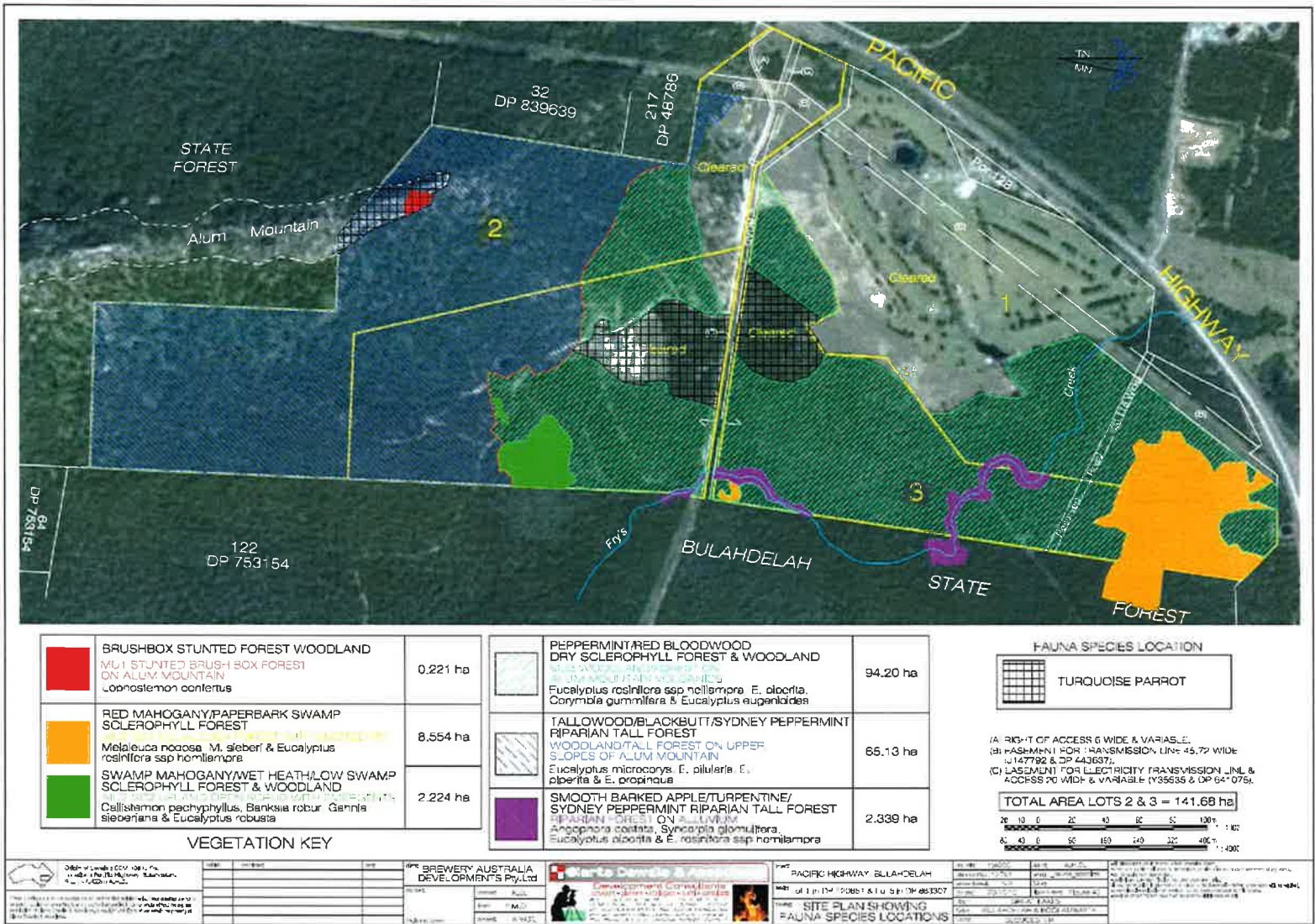
The Turquoise Parrot is found between northern-eastern Victoria, through New South Wales and into the very southern parts of Queensland, its distribution is patchy. In New South Wales it is found both east and west of the Great Dividing Range. There are a number of historical records near Sydney, but sightings now are rare in coastal eastern New South Wales and only recorded as isolated occurrences.

This species inhabits the foothills where steep rocky ridges and gullies, rolling hills and river flats occur near the Great Dividing Range. It occurs in both eucalyptus woodlands and open forests where the ground is predominantly covered in grasses and the low shrub understorey. Seeds of grasses, herbaceous plants and shrubs and a reliable source of water are its main requirements. The bird is often seen in very small blocks or even pairs. The Turquoise Parrot breed between August and January and nest close to the ground in old fence posts, stumps and hollows of small trees.

Movements are poorly known although it is known to feed predominantly on grass seed, herbaceous plants and shrubs, nectar from flowers, fruits, leaves and scale insects (Higgins, 1999).

The Turquoise Parrot may occur only in the area surrounding the yabbie dams where there is a predominantly dense grass cover with small undershrubs and on Alum Mountain.

Figure 55– Potential habitat for the Turquoise Parrot



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

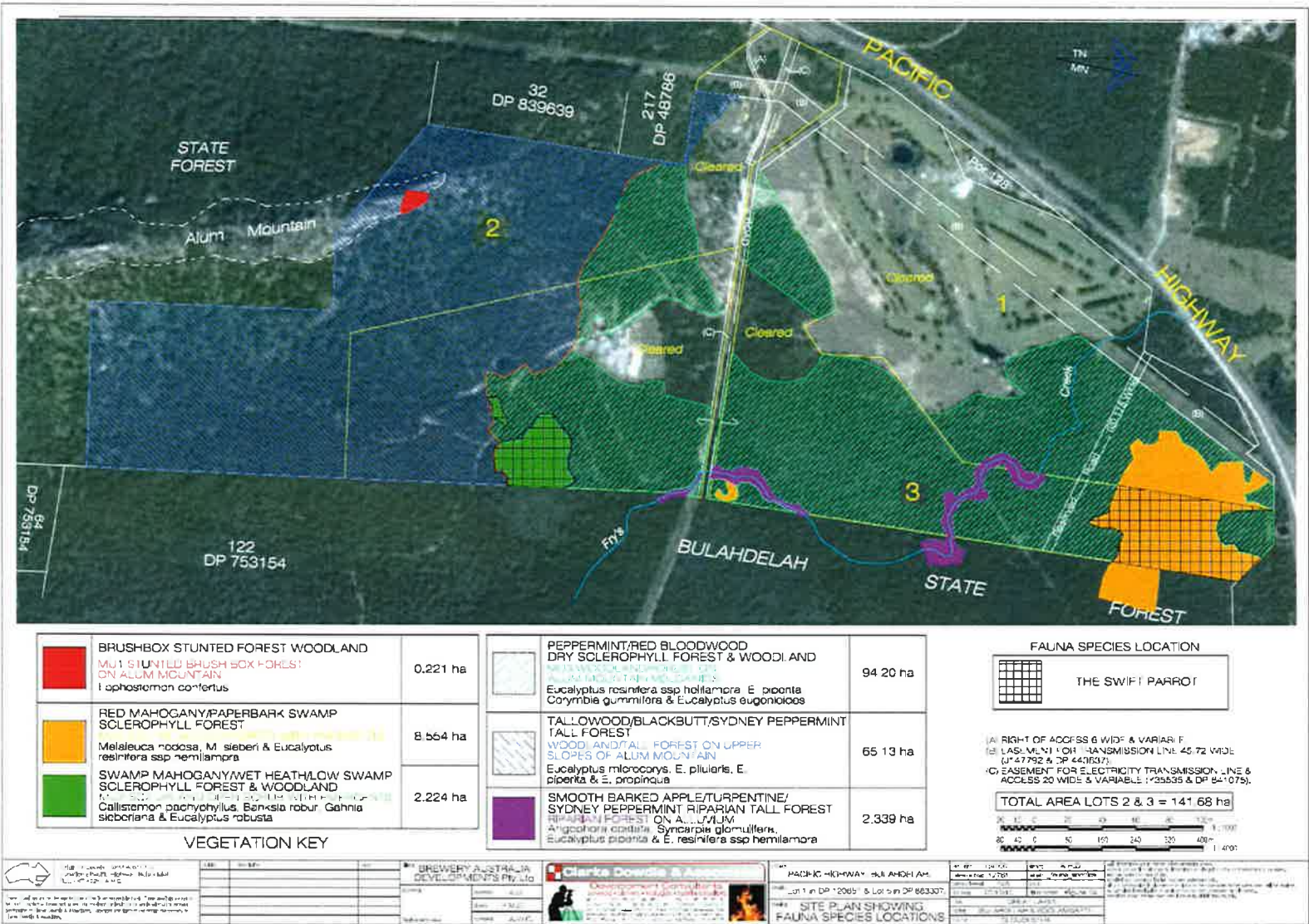
13.25 The Swift Parrot *Lathamus discolor* (See Figure 56)

The Swift Parrot is not a resident of New South Wales, but an autumn/winter visitor from Tasmania. Records show that the Swift Parrot has been observed along the foreshores of Lake Macquarie (Rathmines and Warners Bay, Dora Creek and Morisset), Wyee, North Entrance, Rocky Point and Bateau Bay on the Central Coast and on the mid – north coast at Myall Lakes. As many as 200 Swift Parrots have been observed visiting the Central Coast area but is unknown how many continue northwards to the mid-north coast.

In the main, the species feeds on autumn-winter flowering Swamp Mahogany and Forest Red Gum for nectar and pollen, but on the Central Coast the birds have been seen taking lerp insects from heavily infested *Eucalyptus botryoides* Bangalays and *Eucalyptus pilularis* Blackbutts.

Throughout the site the main focus of potential feeding areas would be *within Swamp Mahogany Wet Heath Low Swamp Sclerophyll Forest and Woodland (Swamp Mahogany Wet Heath Low Swamp Sclerophyll Forest and Woodland.*

Figure 56- Potential habitat of the Swift Parrot



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELDAH

13.26 Eastern Grass Owl *Tyto longimembris* (See Figure 57)

The Grass Owl is distributed along the northern New South Wales Coast and Queensland. Its range extends into western and northern Queensland, northern South Australia and in the north of the Northern Territory and Western Australia but its range is not fully known (Debus, 2009). Along the New South Wales coast it has a preference for coastal heathland and rank grassland from the Queensland border to as far south as Kempsey and west to Narrabri (Brisbane City Council, 2005). However, there are records for the Great Lakes local government area.

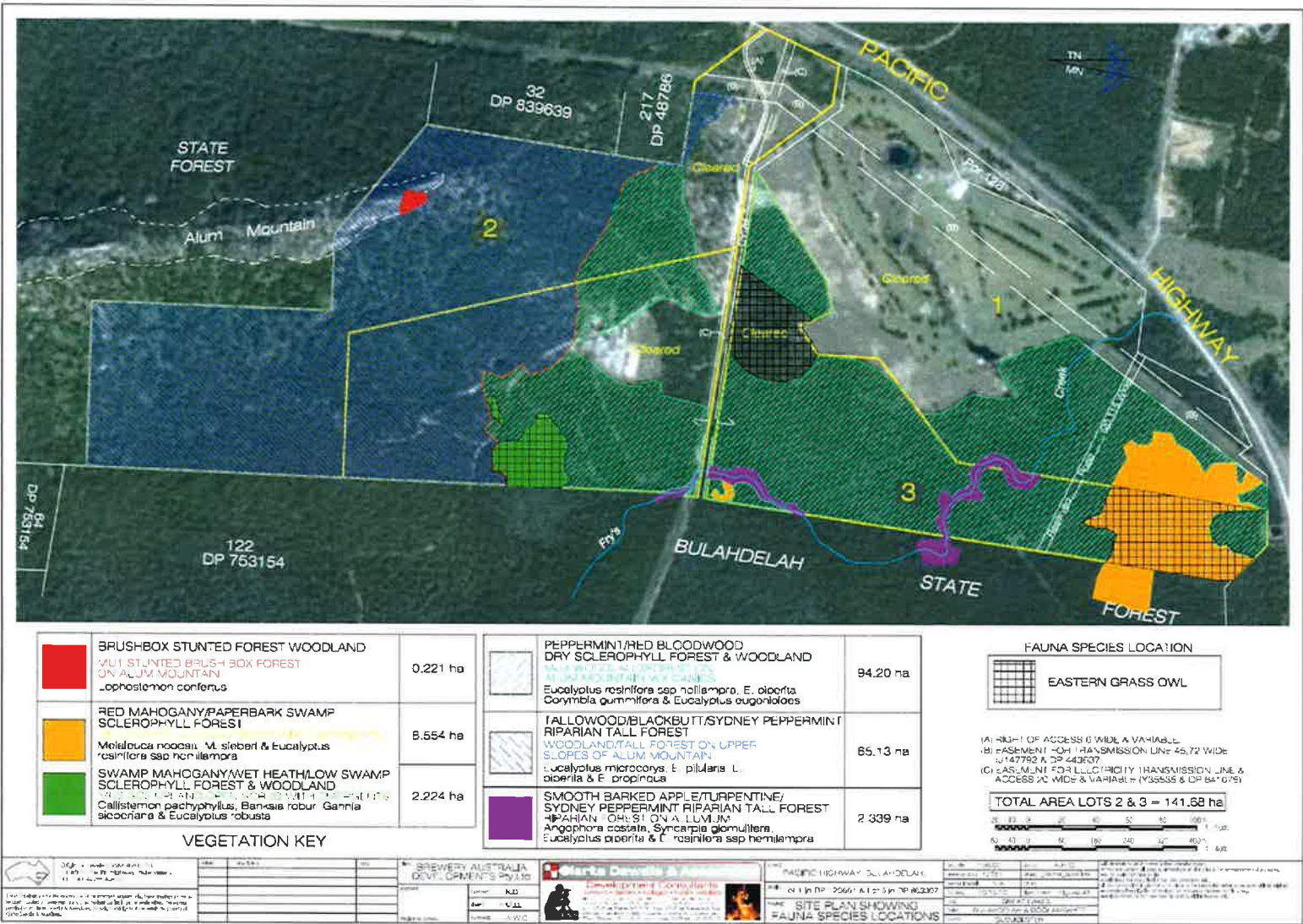
The habitat for the Grass Owl is wet and dry heath, grassy paddocks, swamps and sedgelands. The habitat's structural characteristics are 90-100% foliage cover and vegetation height of between 60-200cms which is subject to seasonal inundation.

The Grass Owl mainly feeds on small mammals particularly rodents and dasyurids and occasionally small gliders. It also takes small birds and large insects and all prey is gathered during its low and slow flights over the vegetation.

On the property, these characteristics conform to the EEC area north of Frys Creek known as Red Mahogany/Paperbark Swamp Sclerophyll Forest and it is possible that the species may occur adjacent to the golf course on other private property.



Figure 57– Potential habitat for the Eastern Grass Owl



13.27 Masked Owl *Tyto novaehollandiae* (See Figure 58)

The Masked Owl is a large robust owl that occurs over much of mainland Australia with the exception of the desert areas. This owl also primarily feeds on terrestrial mammals up to the size of rabbits and bandicoots. It also takes arboreal mammals up to the size of juvenile possums and furthermore, birds, frogs, lizards or large insects. It swoops upon its prey from tree perches where it swoops down and grabs its prey from the ground or trees and shrubs.

Masked Owls may have several roosting sites which they occupy for several months, these sites can be caves and traditional sites are occupied for many years. They call with a typical screech on dusk and throughout the night they call to advertise their territory. The Masked Owl occurs in sclerophyll forest and woodland often near the ecotone with open areas, grassland and heath. It prefers a mosaic type of vegetation having sparse and dense ground cover. It roosts in caves, dense foliage and tree hollows.

Given that the Masked Owl forages in open forest and woodland its habitat is quite extensive across the subject site. Areas of preferred habitat include the low lying forest in proximity to Fry's Creek in the northern and central section of the subject site, but also the open forest on the upper slopes of Alum Mountain in the southern section of the site. There are a number of habitat trees on the subject site which contain large to very large hollows suitable for the Masked Owl, which it would utilise for both diurnal roosting, and also nesting sites. Although no evidence of the Masked Owl was noted during fauna investigations conducted in 2006, 2008-2010 and this study suitable habitat occurs on the subject site to suggest its potential occurrence.

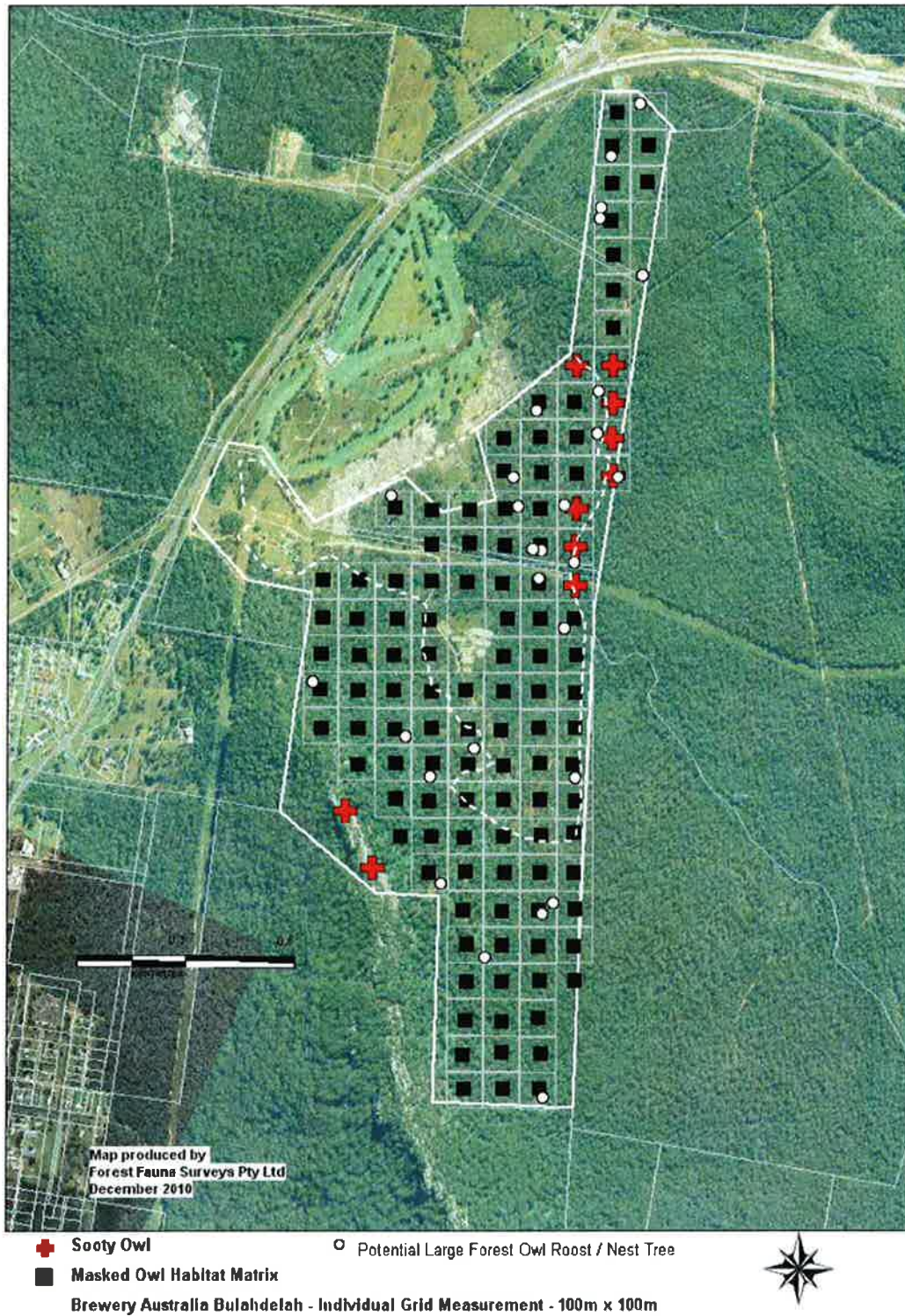


Figure 58– Potential Habitat for the Masked Owl and Sooty Owl

13.28 Sooty Owl *Tyto tenebricosa* (See also Figure 58)

The Sooty Owl occurs in coastal south-eastern Australia from Eungella National Park in mid-eastern Queensland to southern Victoria. It is a medium sized owl and it feeds upon arboreal and terrestrial mammals and in particular possums and gliders, rodents, small dasyurid marsupials as well as bandicoots and potoroos. It is also known to feed on birds, lizards and large insects. The Sooty Owl forages for its prey by long stay perch hunting, watching and listening and then swooping and flying on to its subject.

The Sooty Owl occurs in pairs and may have several roosting sites which are used on an intermittent and rotational or regular basis. Some birds have additional cave sites which are used for generations.

By day the owls are solitary and only during the courtship period do they pair. At dusk the pairs call to each other with a scream and sometimes meet with a long duet of trilling.

Sooty Owls have a large home range which is at least 400Ha, but can range between 1 000 to 3 000Ha. Breeding occurs in autumn/winter and early spring. Pairs breed solitarily in a nest which is a large hollow in a big old live forest tree. Sometimes they utilise dead trees. The hollow is usually located 50-100 metres above the ground with the hollow more than 30cms wide and up to 10 metres deep. The Sooty Owl can also nest in ledges in caves (Debus, 2009).

The Sooty Owl is more likely to roost in caves in Alum Mountain, or may utilise the large tree hollows in proximity to the mountain (Forest Fauna Surveys, 2011).

13.29 Barking Owl *Ninox connivens* (See Figure 59)

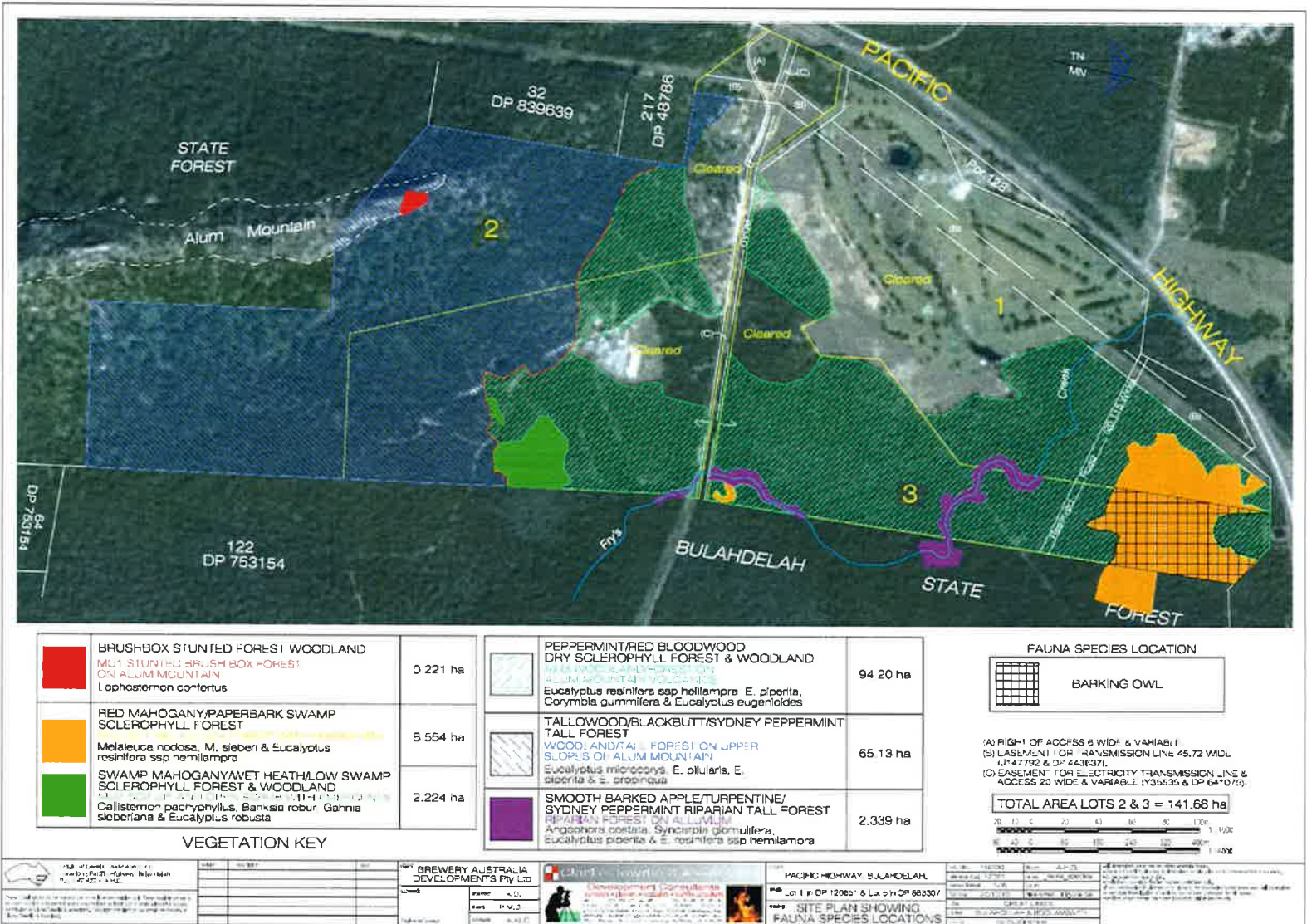
The Barking Owl is a moderately large hawk-like owl and usually is inhabitant of the drier forests and woodlands, particularly along drainage lines in those habitats. However, more recently there have been sightings of this species along coastal New South Wales.

The Barking Owl ranges from the Pilbara and Kimberley Region of Western Australia across the top end of the Northern Territory and then south through the eastern part of South Australia to southern Victoria. An isolated population occurs in the south western area of Western Australia. In New South Wales, a subspecies of the Barking Owl occurs in southern and eastern Australia.

The prey of the Barking Owl includes mammals, birds and large insects and the main part of its diet is arboreal marsupials such as small possums and gliders. It is particularly insectivorous during the breeding season and it searches for this food by short stay perch hunting, flying and swooping. It may take food from the air, from trees, from the ground and from water.

Barking Owls have traditional roosting trees which can be near or far away from the nest tree. At the roosting tree the Barking Owl can be seen in pairs or in family groups. The owls are sometimes active in the day when they are hunting near their roost. As with the Sooty Owl they emerge on dusk and call to each other with soft growling and barking. Further into the night they maintain their territory by louder barking calls.

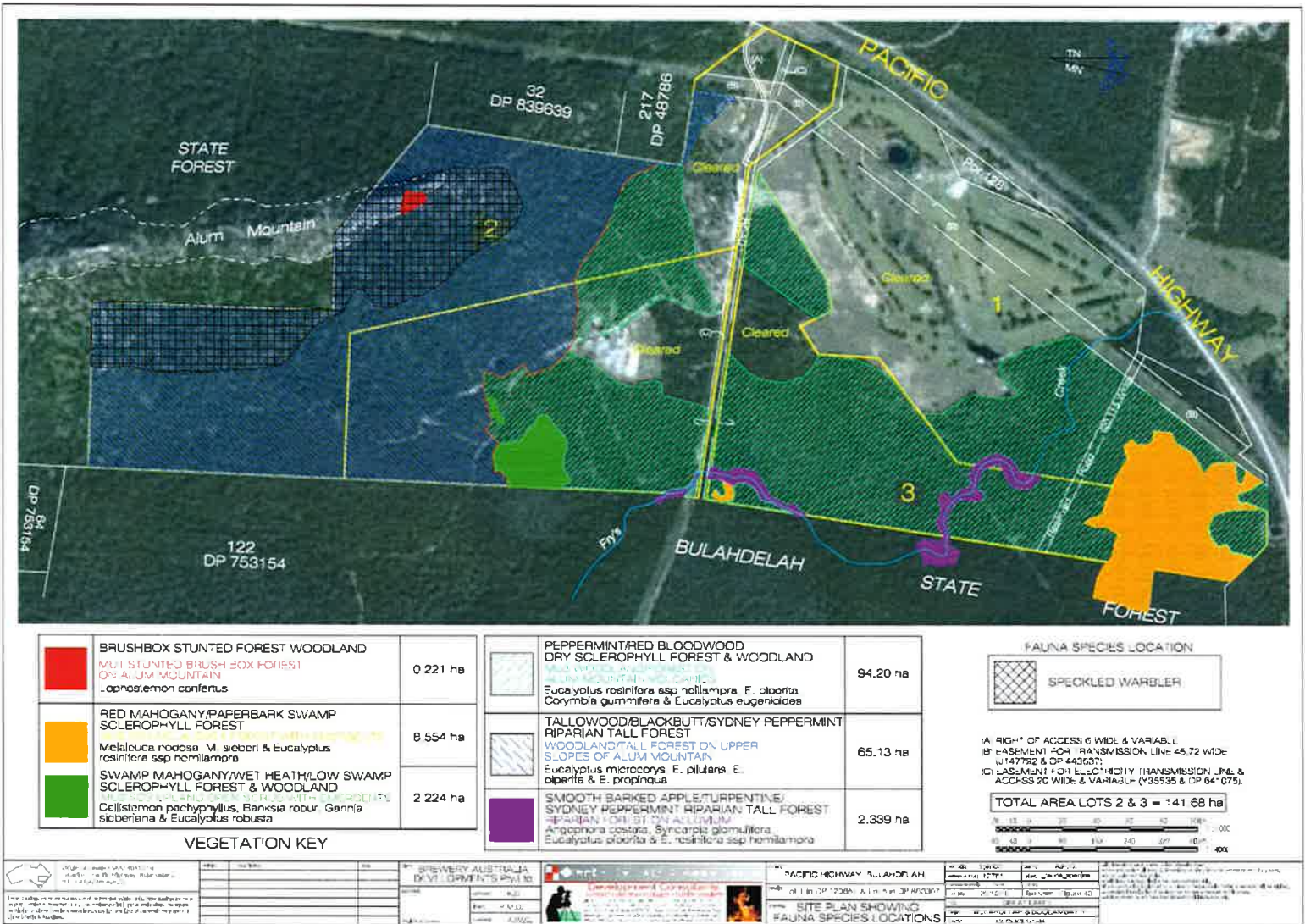
Figure 59- Potential habitat of the Barking Owl



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 -- PACIFIC HIGHWAY BULAHDELAH



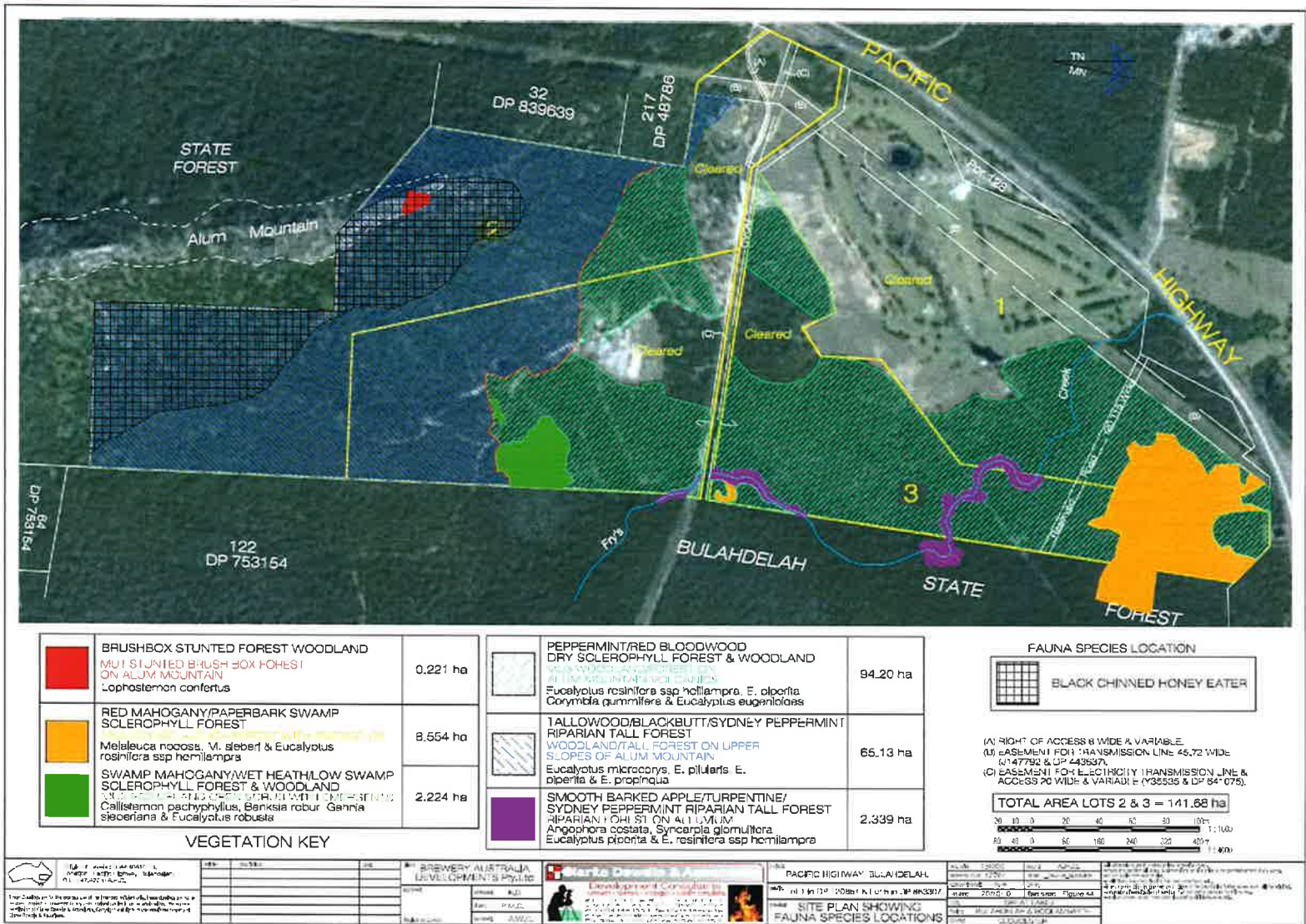
Figure 60 – Potential habitat for the Speckled Warbler



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH



Figure 61 – Potential Habitat for the Black chinned Honeyeater



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

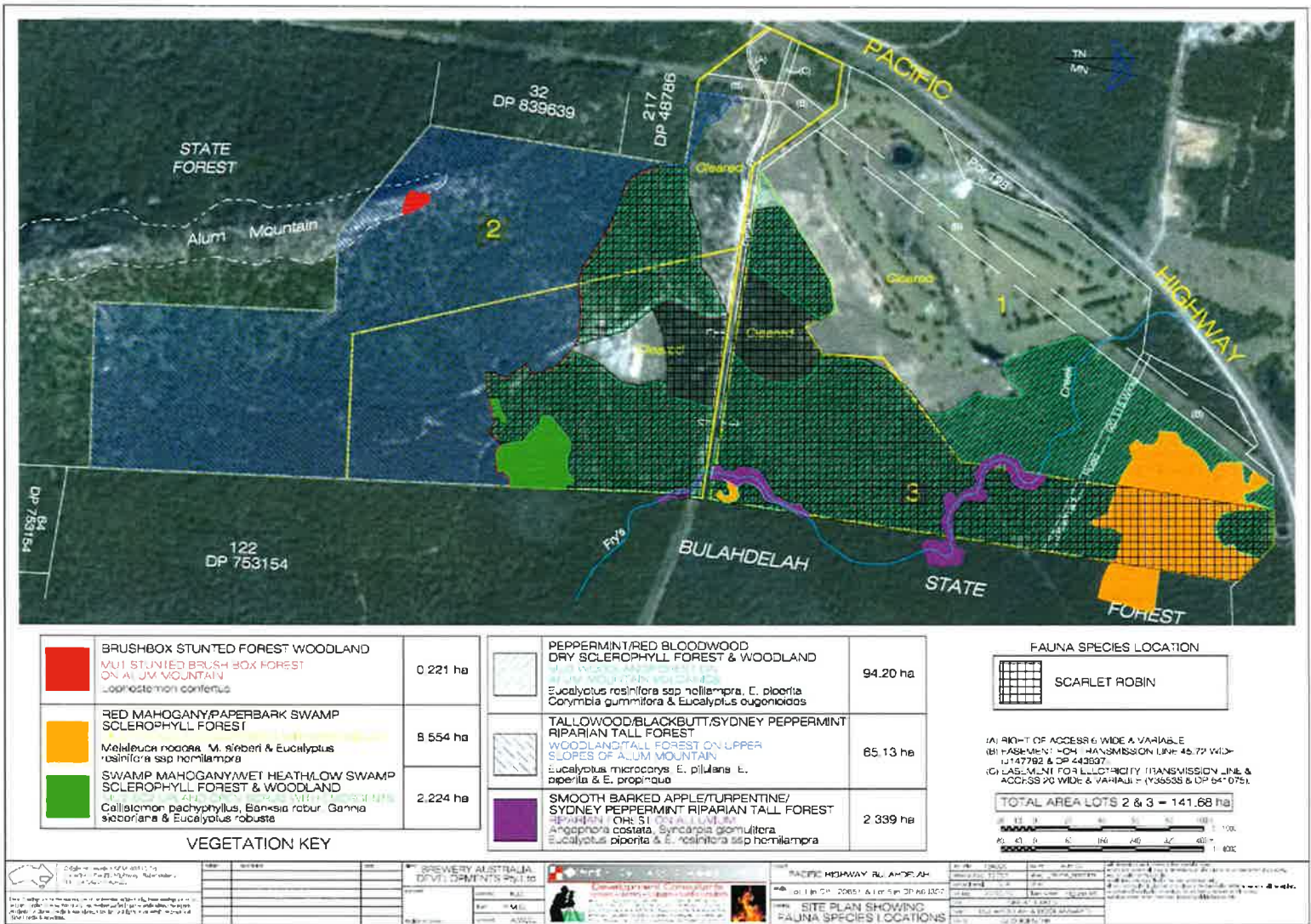
**13.32 Scarlet Robin *Petroica boodang* and Flame Robin *Petroica phoenica*
(See Figure 62)**

Scarlet Robins and Flame Robins occur together during the breeding season in south-eastern Australia, but Scarlet Robins remain in their territories all throughout the year in forested habitats. Those who occur in grassland habitats are only present during the non-breeding season. The Scarlet Robin is a sedentary species with some local movements whilst the Flame Robin is a migratory species. The species has a high adult survivorship rate and a long breeding season (Higgins & Peter, 2002; Robinson, 2008).

The species is found from south-east Queensland to Tasmania and in parts of western Victoria and south-eastern South Australia and in south-western Western Australia. It occurs in open forest and woodlands from the coast to the inland slopes and it prefers a habitat on ridges and slopes with an open understorey of shrubs and grasses. Abundant logs and coarse woody debris are important features as its preferred habitat. Foraging occurs from low branches where it feeds on invertebrates taken from the ground, tree trunks and other coarse woody debris.

On the subject property this species is more likely to occur in the coastal plain forests (Red Mahogany/Sydney Peppermint/Red Bloodwood Dry Sclerophyll Forest and Woodland).

Figure 62– Potential Habitat for the Scarlet Robin and Flame Robin



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.33 Regent Honeyeater *Xanthomyza phrygia* (Figure 63)

The Regent Honeyeater sightings have been recorded at Myall Lakes and coastal records have increased in recent years. This may depend upon both the embellished flower production of Swamp Mahogany and the Forest Red Gum in the coastal zone and correspondingly, the paucity of flowers of Ironbark and other winter flowering Eucalypts in the drier western zone. As the Regent Honeyeaters are nomadic they will only visit the coast if the above two factors are in operation and as such, visitation to the area is opportunistic. There is no local population of the Regent Honeyeater as they spend most of their time in the drier west and it is difficult to estimate the regional population because of their nomadic habits. However, it may be stated the visitation to the coast is irregular and isolated and the numbers are very low.

In the main, the species feeds on autumn-winter flowering Swamp Mahogany and Forest Red Gum for nectar and pollen.

Throughout the site the main focus of potential feeding areas would be within Swamp Mahogany Wet Heath Low Swamp Sclerophyll Forest and Woodland (Swamp Mahogany Wet Heath Low Swamp Sclerophyll Forest and Woodland).

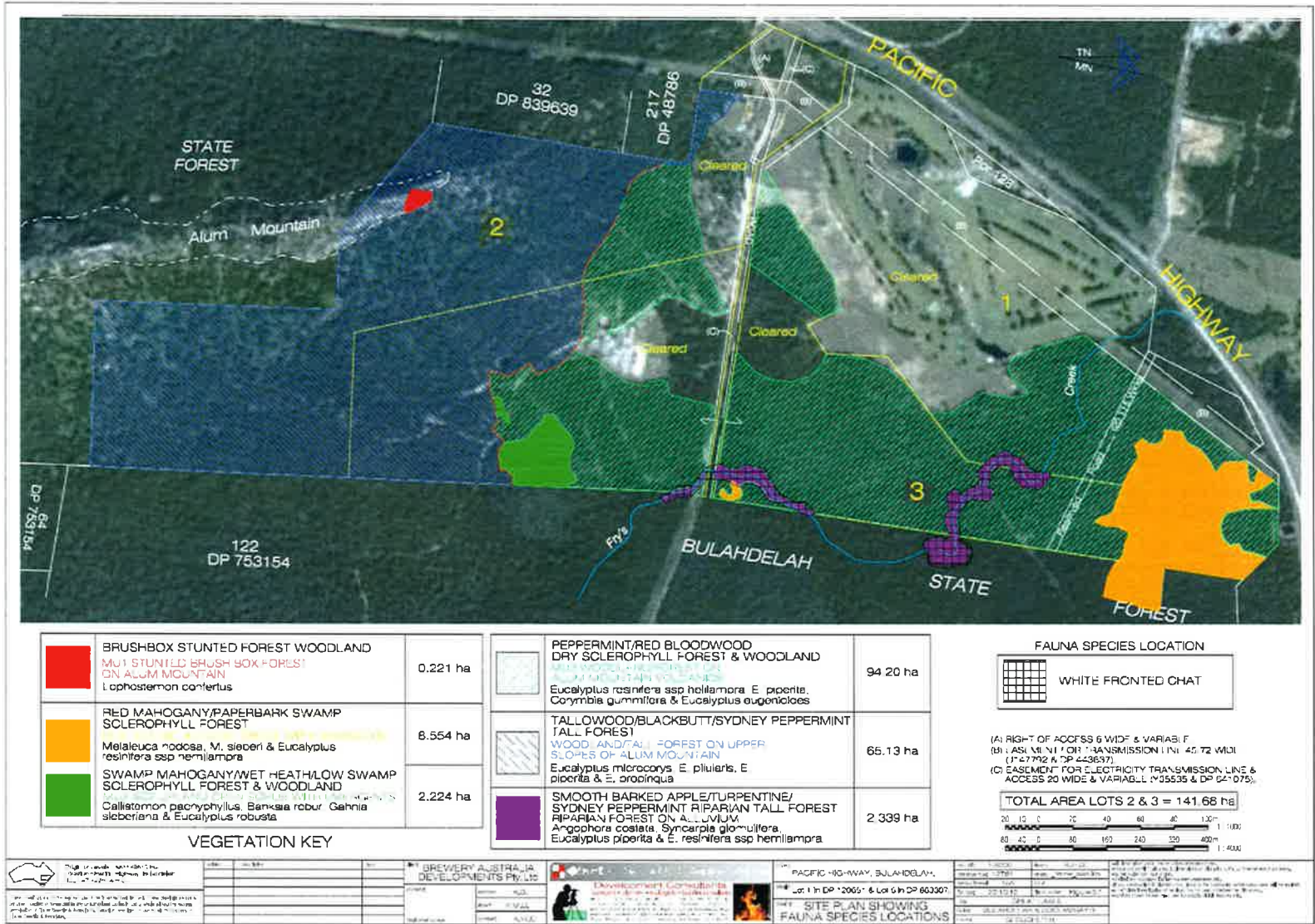
13.34 White-fronted Chat *Epthianura albifrons* (Figure 64)

The White-fronted Chat extends across the southern half of Australia from southern Queensland to southern Tasmania and to Western Australia. The species is an inhabitant of temperate and arid climates and it is very rarely observed in subtropical areas. It is doubtful whether the species occurs on the subject site of the previous landowner suggests that Chats were present sometime ago. The White-front Chat would occupy the foothills and lowlands on the subject site where there are damp open habitats and near waterways, particularly wetlands (Higgins, Peter & Steel, 2001).

At a finer scale, the Chats would be found in marshy vegetation less than one metre tall and within grasslands and low shrubs bordering wetland areas. Frys Creek would be the only suitable habitat for this species.



Figure 64 – Potential habitat for the White-fronted Chat.



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.35 Barred Cuckoo-shrike *Coracina lineata* (See Figure 65)

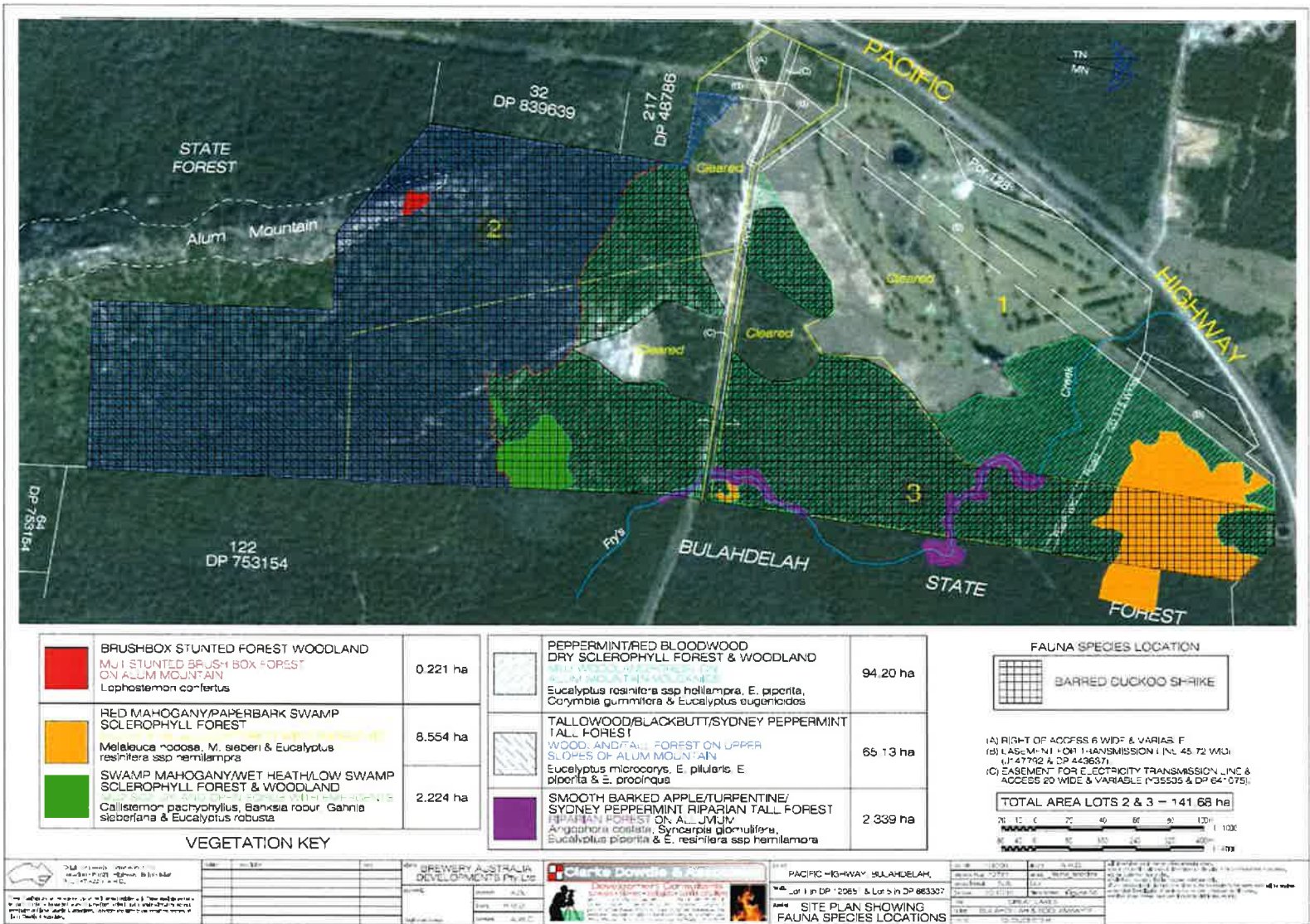
The Barred Cuckoo-shrike occurs along coastal eastern Australia from Cape York to the Manning River catchment. The recordings of this species in the Great Lakes local government area are at the southern limit of distribution of its range. Details of this habitat are known although it is rare in New South Wales. Habitats where the species has been sited include rainforest, eucalypt forest and woodlands, clearing amongst secondary regrowth of vegetation, swamp woodlands and along watercourses.

The Barred Cuckoo-shrike is usually seen in pairs or small flocks foraging amongst the foliage of trees for insects and fruit. They are act and move from tree to tree seeking these resources. Figs form part of their diet.

Most of the habitats that occur on the property maybe utilised by the Barred Cuckoo-shrike.



Figure 65 – Potential habitat for the Barred Cuckoo-shrike.



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP 1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.36 Diamond Firetail *Stagonopleura guttata* (See Figure 66)

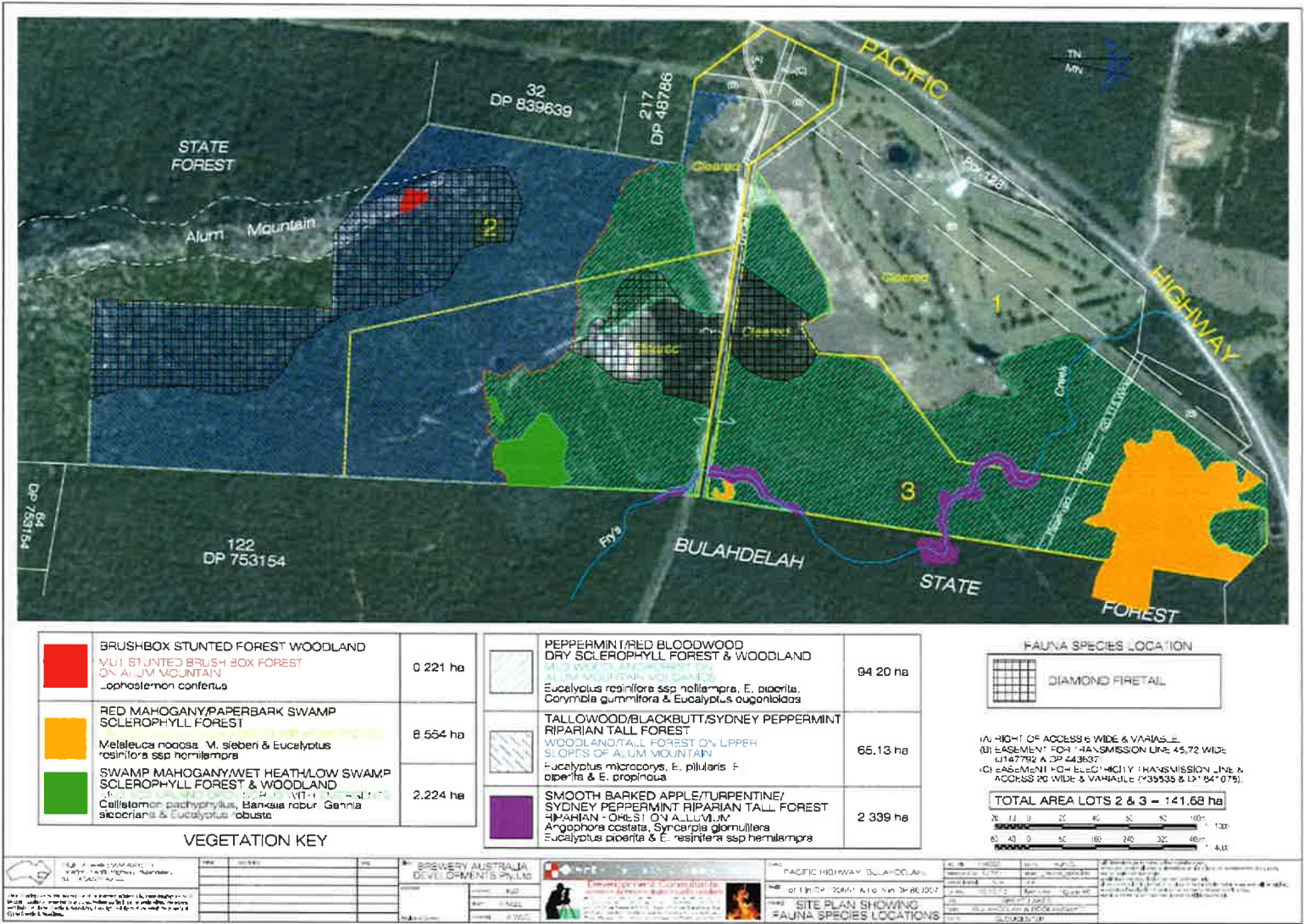
The Diamond Firetail is known to make construct its nest from Mistletoe, suggesting that the evergreen foliage of Mistletoe provides the good structure for efficient nest building, a favourable micro-climate and high levels of nest concealment that may reduce predation (Cooney & Watson, 2005). Read (1994) had studied the diet of the Diamond Firetail and found it mainly fed on the diet of seeds from introduced grasses.

The species is found throughout south-eastern Australia between Central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in New South Wales on the northern central and southern tablelands and the northern central and south western slopes. It also occurs on the North West plains and the Riverina area. There are records from Sydney to the Hunter Valley and the Bega Valley as well as the Central Coast area.

Its main habitat is grassy woodland as well as open forest and riparian areas. On the subject property it could be encountered on any of the cleared areas and on the wooded areas of Alum Mountain.



Figure 66 – Potential habitat for the Diamond Firetail



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.37 Square-tailed Kite *Lophoictinia laura* (Figure 67)

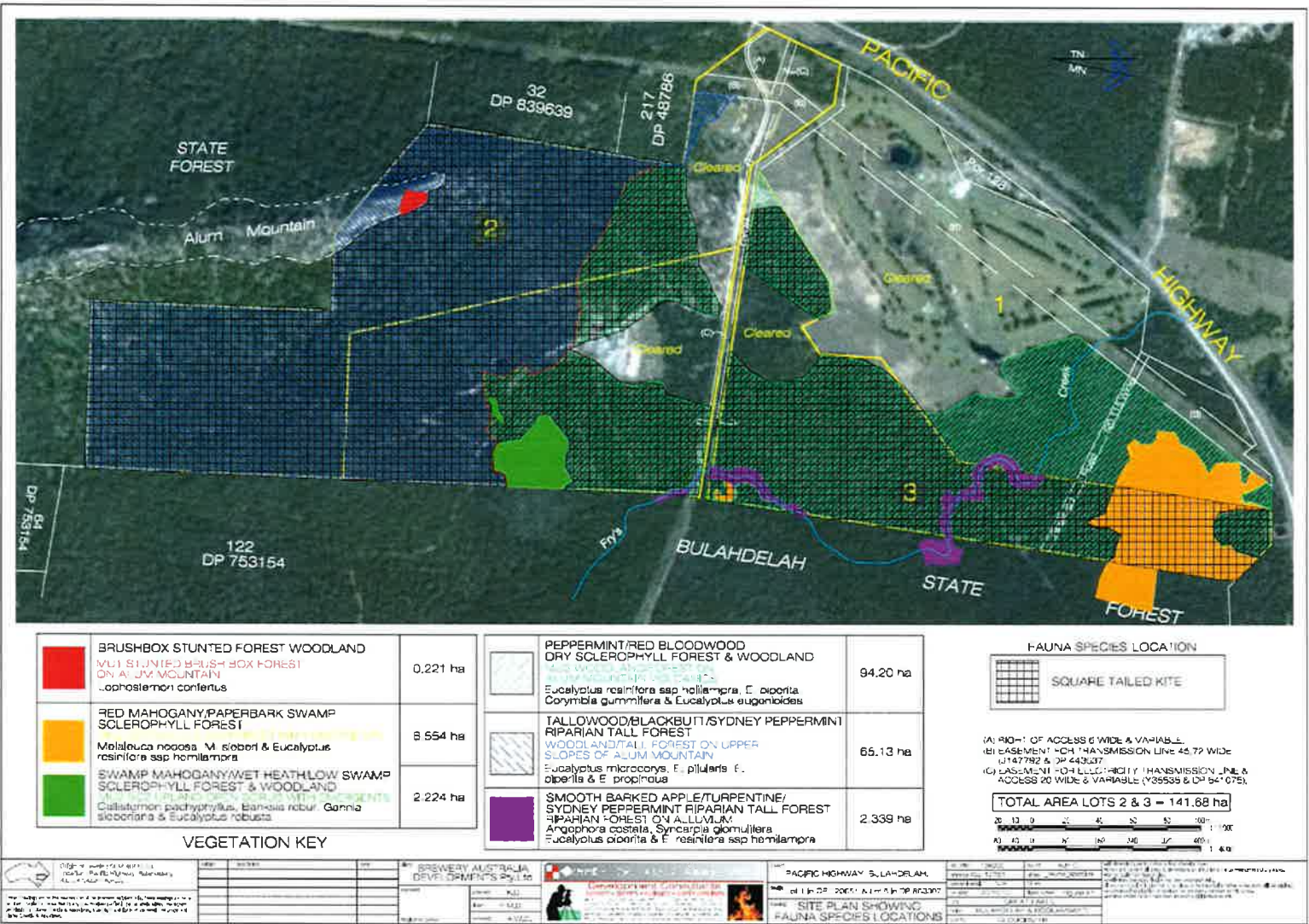
The Square-tailed Kite is a medium sized long-winged rapture and it is a widely dispersed species throughout New South Wales with a congregation of records along the New South Wales coast. It inhabits coastal forested and wooded lands of the tropical and temperate regions of Australia. Timbered watercourses also form part of its habitat. It is often associated with ridge and gully forests with a shrubby understorey.

It is a specialist hunter of passerines, especially Honeyeaters and insects in the tree canopy, which it takes from the outer foliage. It has a large hunting range often been seen in the mornings, afternoons and evenings. Nesting sites are located within the watercourses.

The Square-tailed Kite may occur in any habitat on the subject property.



Figure 67 – Potential habitat for the Square Tailed Kite



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

13.38 White-bellied Sea Eagle *Haliaeetus leucogaster* , Black-faced Monarch *Monarcha melanopsis*, Spectacled Monarch *Monarcha trivirgatus*, Rufous Fantail, *Rhipidura rufifrons* and Satin Flycatcher, *Myirgra cyanoleuca* (Figure 68)

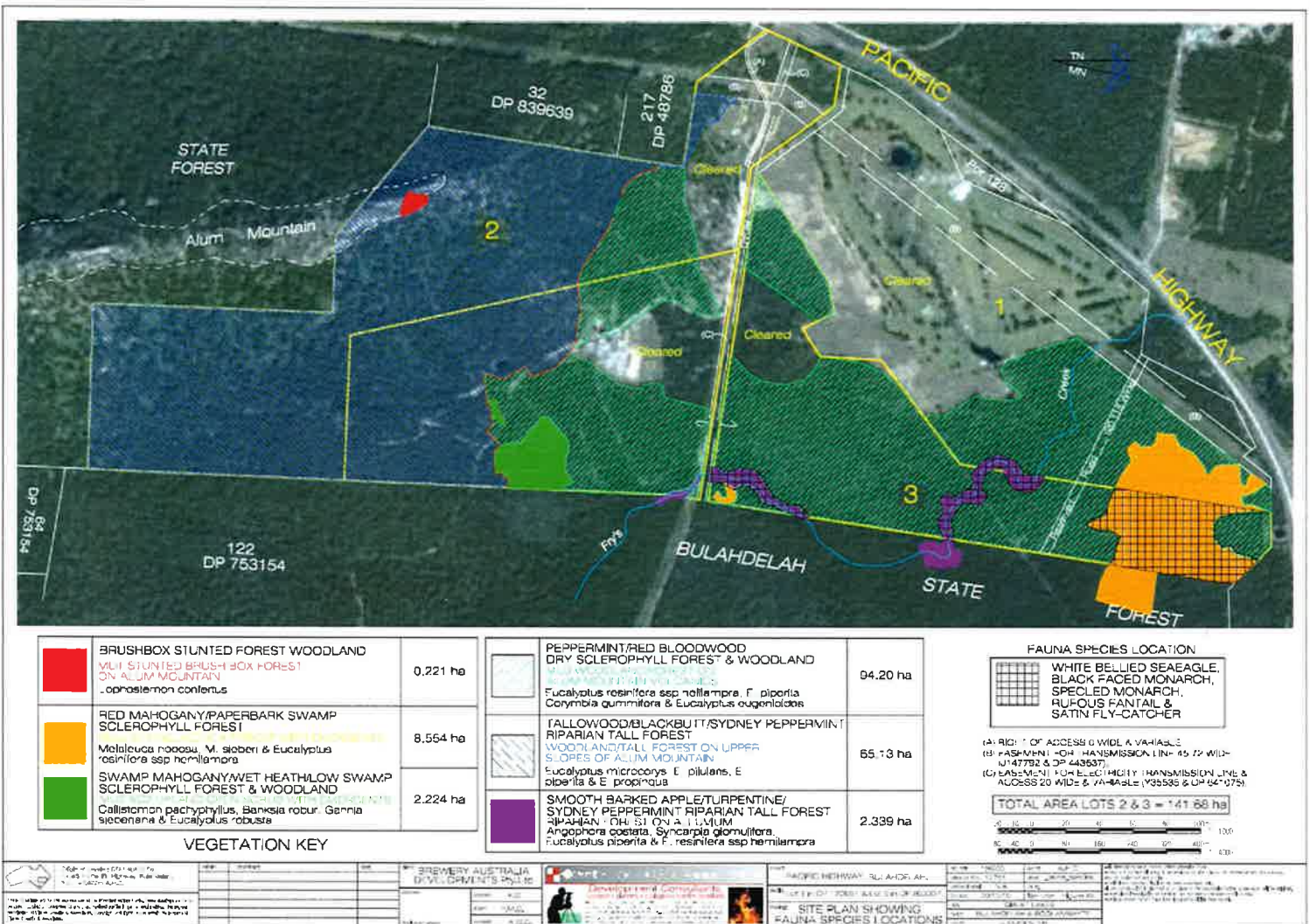
These five species are listed on the Department of Environment, Arts and Heritage website as being migratory terrestrial species. Whilst the list is not exhaustive at this stage further species may be required to be considered once the Department's website is up and running again. The White-bellied Sea Eagle was recorded either to the north of Frys Creek or adjacent the subject property several times during the latter part of the surveys. However, no nest trees could be found, but it is present in the vicinity of the subject site.

The other four species, the Black-faced Monarch, the Spectacled Monarch, the Rufous Fantail and the Satin Flycatcher are national migratory species. They are all summer breeding migrants from Queensland which migrate to coastal south-east Australia around August/September/October and returns to north-east Queensland between February and April. For their migratory pattern they require the many littoral and gully habitats along coastal New South Wales and Queensland for refuge.

On the subject property these species are more likely to be found along Frys Creek.



Figure 68– Potential movement habitat for the White-bellied Sea Eagle, Black-faced Monarch Spectacled Monarch, Rufous Fantail and Satin Flycatcher



THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

14.0 FAUNA HABITAT ASSESSMENT

14.1 Habitat Assessment

A fauna habitat significance assessment of each vegetation community was conducted in accordance with Great Lakes Council LES guidelines. Table 30 outlines the findings from the assessment with the full details of the results found in Appendix 5. Four categories are included which are the fauna habitat significance (Table 30), threatened fauna species that were recorded, threatened fauna species that were not recorded and likely to occur even as vagrants and those migratory species listed by the NSW Department, Arts, Heritage & Environment (Table 30).

Table 30 – Fauna habitat significance results

Vegetation Community	Score	Significance
Stunted Forest on Alum Mountain Volcanics-Group 1 (Brushbox Stunted Forest Woodland)	75	Medium
Melaleuca Forest with emergents in areas of impeded drainage-Group 2 (Red Mahogany/Paperbark Swamp Sclerophyll Forest).	120	High
Upland Open Scrub with emergents of Swamp Mahogany in areas of impeded drainage-Group 2 (Swamp Mahogany Wet Heath Low Swamp Sclerophyll Forest and Woodland)	125	High
Tallowwood/Blackbutt/Sydney Peppermint Riparian Tall Forest -Group 4 (Tallowwood/Blackbutt/Sydney Peppermint Riparian Tall Forest)	105	Medium
Red Mahogany/Sydney Peppermint/Red Bloodwood Dry Sclerophyll Forest and Woodland -Group 3 (Red Mahogany/Sydney Peppermint/Red Bloodwood Dry Sclerophyll Forest and Woodland)	100	Medium
Smooth-barked Apple/Turpentine/Sydney Peppermint Riparian Tall Forest -Group 5 (Smooth-barked Apple/Turpentine/Sydney Peppermint Riparian Tall Forest)	120	High

Table 30 highlights the fact that the project site contains three areas of high faunal habitat significance (Red Mahogany/Paperbark Swamp Sclerophyll Forest, Swamp Mahogany Wet Heath Low Swamp Sclerophyll Forest and Woodland and Smooth-barked Apple/Turpentine/Sydney Peppermint Riparian Tall Forest) and three areas (Brushbox Stunted Forest Woodland, Tallowwood/Blackbutt/Sydney Peppermint Riparian Tall Forest and Red Mahogany/Sydney Peppermint/Red Bloodwood Dry Sclerophyll Forest and Woodland) of medium faunal habitat significance. Figure 69 highlights the vegetation overlayed with the faunal habitat significance mapping. In addition Table 31 shows that Red Mahogany/Sydney Peppermint/Red Bloodwood Dry Sclerophyll Forest and Woodland, Tallowwood/Blackbutt/Sydney Peppermint Riparian Tall Forest and Smooth-barked Apple/Turpentine/Sydney Peppermint Riparian Tall Forest) are likely to support the greatest number of threatened fauna species, including those commonwealth species that are listed as migratory terrestrial. Combining the two factors all vegetation communities, except for the stunted forest on Alum Mountain can be expected to have a medium to high value for threatened fauna species.

Table 31 – Threatened Fauna occurring and have the potential to occur in vegetation Communities

Species	Group 1	Group 2/1	Group 2/2	Group 3	Group 4	Group 5
Threatened species recorded						
Squirrel Glider						
Parma Wallaby						
Eastern Bent-wing Bat						
Little Bent-wing Bat						
Eastern Freetail Bat						
Large-footed Myotis						
Eastern Cave Bat						
Large-eared Pied Bat						
Grey-headed Flying Fox						
Powerful Owl						
Glossy Black-cockatoo						
Varied Sittella						
TOTAL	0	0	4	9	10	6
Other threatened species likely to occur						
Eastern Chestnut Mouse						
Eastern Pigmy Possum						
Spotted-tailed Quoll						
Brush-tailed Phascogale						
Koala						
Yellow-bellied Glider						
Long-nosed Potoroo						
Brush-tailed Rock						

THREATENED SPECIES ASSESSMENT
LOT 3 IN DP1120817 & LOT 100 IN DP 1139447 – PACIFIC HIGHWAY BULAHDELAH

Wallaby						
Wallum Froglet						
Stephens Banded-snake						
Black-necked Stork						
Bush Stone-curlew						
Magpie Goose						
Black Bittern						
Little Eagle						
Square-tailed Kite						
Grey Falcon						
Wompoo Fruit-dove						
Rose-crowned Fruit-dove						
Little Lorikeet						
Turquoise Parrot						
Eastern Grass Owl						
Masked Owl						
Speckled Warbler						
Black-chinned Honeyeater						
Scarlet Robin						
Flame Robin						
Diamond Firetail						
Total	0	7	6	15	15	12
Commonwealth migratory species						
White-bellied Sea Eagle						
Black-faced Monarch						
Satin Flycatcher						
Rufous Fantail						
Total	0	3	1	3	1	4
Grand Total	0	10	11	27	26	22



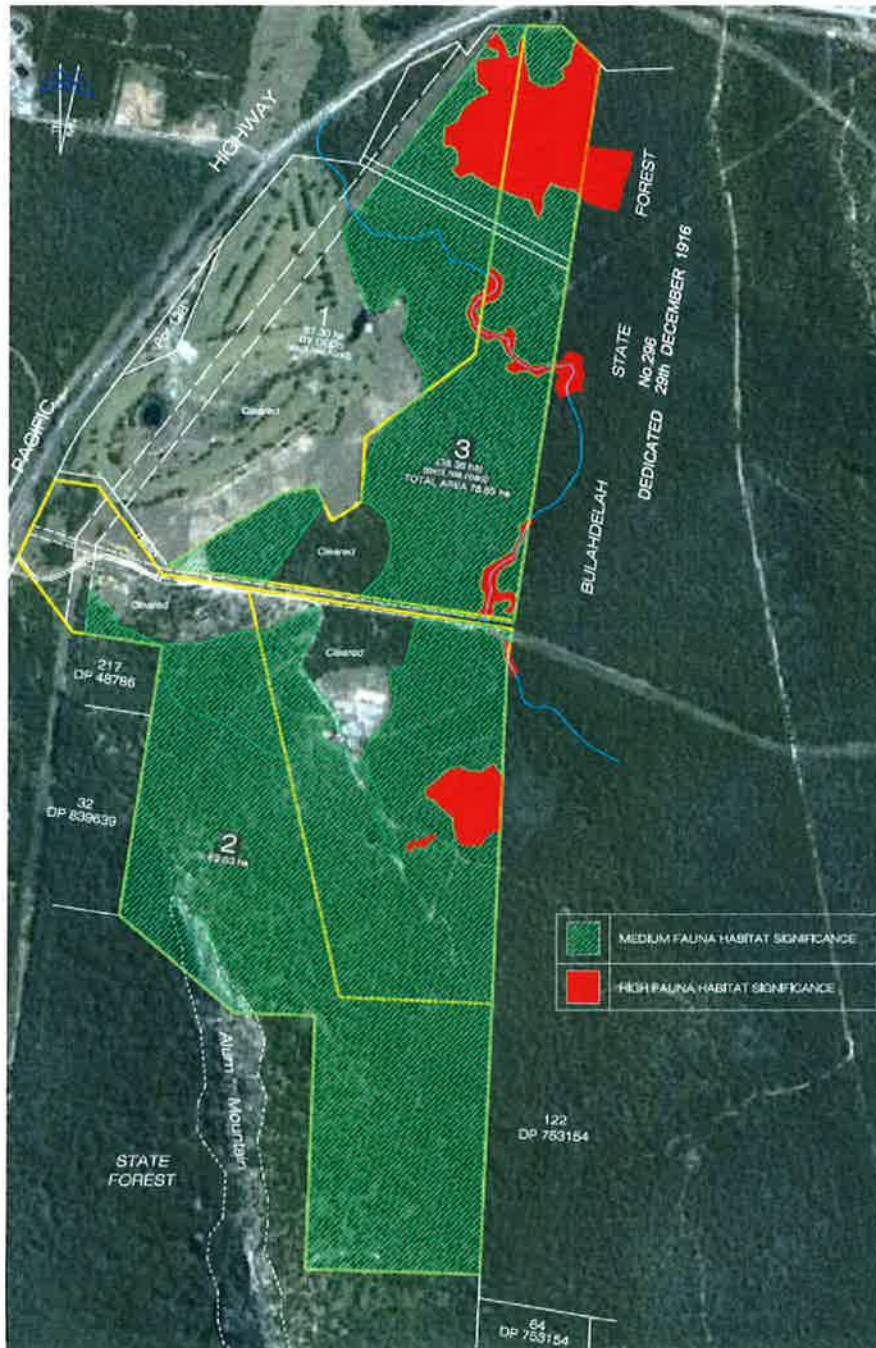


Figure 69 - Site Plan showing fauna habitat significance within each identified vegetation community

15.0 DISCUSSION

Twelve threatened and listed fauna species were recorded or potentially recorded during the fauna surveys but the management of the main suite of threatened species is discussed hereunder. Initially the target species approach (Kavanagh, 1991) using the Grey-headed Flying Fox was considered for the fauna management detail but given the low number of threatened species recorded (microbats excluded), it was decided to adopt a species approach.

The threatened species most commonly seen on the property is the Glossy Black-Cockatoo which appear to be present in the same area every time the site was visited. However, it was noted that several areas are used for feeding, based on the evidence of discarded cones, mainly on the mid and higher slopes where *Allocasuarina littoralis* is prominent (Table 19, Figure 33). The Glossy Black Cockatoo was found as a small group of birds and mostly foraging on the mid slopes within this extensive Black Sheoak area. This pocket of vegetation may also be the roosting area for this group because each time this area was visited they were present and there are old trees with hollows in the vicinity. That suggestion would need to be confirmed by further survey in the breeding season. Given that Forest Fauna Surveys (2011) has made a recommendation to protect habitat attributes for the species further finer detail with regards to the roosting and breeding tree locations is warranted (see Figure 70) to ensure the security of the birds on Alum Mountain. Figure 70 is presented as a guide to determine at least part of their range over the subject site and nearby and it may turn out that the important trees are present in state forest.

However, the nominal approach would be to capture their necessary habitat attributes within a proposed wildlife corridor associated with the state forest.

The Powerful Owl, also a threatened species, whilst it was recorded near the site and as a dead bird along Frys Creek, probably forages throughout the site but is not permanently present. Brush-tailed Possums, a main food source for the Powerful Owl appear to be in low numbers but the Squirrel Glider, also a food source, whilst it appeared to be in moderate numbers previously, now appears to be absent. This may explain the absence of the Powerful Owl because other habitat attributes, such as suitable tree hollows and roosting areas, are present for the species. There is no management action for the Powerful Owl provided part of the wildlife corridor is implemented to sustain possums and gliders.

The microbats are considered to be the most important fauna component on the subject site due to the presence of Alum Mountain and thus more focus is placed upon these species. This is because the northern end of Alum Mountain provides potential roost and breeding habitat for threatened cave roosting bat species such as the Eastern Cave Bat and the Large-eared Pied Bat. Known roost sites for the cave dwelling protected Eastern Horseshoe Bat were found during the survey (Ecotone Ecological Consultants (2010)). The large caves on the eastern side of Alum Mountain (Photo 7) appear to be too exposed to be utilized for roosting purposes by the bent-wing bat species although they could not be accessed during the survey to confirm this fact. The Little and Eastern Bent-wing Bats are not known to breed in Alum Mountain and only one disused mine adit at the southern end of the mountain appears to be used by these species on an irregular basis (Kevin Carter, Brad Law and Glenn Hoyer pers. comm.). The entrance to this adit was gated some years ago in an effort to protect the bats however the gate was repeatedly vandalised and the entrance is now left open (Kevin Carter, pers. comm.). Observed populations appear to be small (<20 individuals), although a group of about 1000 little bent-wing bats was observed in 2001 (Glenn Hoyer, pers. comm.).

However, given the information collected at this point in time and the more recent habitat assessment, Alum Mountain may be an important rest area for southerly populations of bent-wing bats that are travelling to and from their maternity caves at Willi Willi near Kempsey. Pregnant female Little and Eastern Bent-wing Bats are known to leave a roost near Raymond Terrace some 45km south-west of Alum Mountain in early December and return in late February. Juveniles arrive a month later (Ecotone Ecological Consultants, 2000). Whether these bats are flying to the Willi Willi Caves to breed is unknown but the finding of two Little Bent-wing Bats banded at Willi Willi at Alum Mountain in 2001 (Glenn Hoyer, pers. comm.) suggests that this may be the case.

All of the habitats surrounding Alum Mountain provide suitable foraging areas for most of the local cave-roosting species, although the Eastern Horseshoe Bat is likely to avoid open areas. It is also likely that all of the cave roosting species would forage well beyond the limits of the subject lands as they are known to travel several kilometres in one night. For example, the tall moist forest, located below Alum Mountain provides an important buffer to the rocky escarpments and in particular provides initial foraging habitat after dusk close to the roost sites. The forest also provides protection from wind to any roost site located lower down on the escarpment and within the subject land provides ample opportunity for tree hollow roosting bat species, particularly north of the transmission line on the coastal plain where hollow bearing trees, suitable for microbats, are plentiful.

Past logging, wildfire and clearing has significantly reduced the number of hollow bearing trees for microbats across the remainder of the site but only scattered large trees still occur.

Although potential roost sites are largely restricted to scattered large mature trees with many dead stags within the tall moist forest habitat, the recorded species diversity (17 species) is higher than that found in other habitats. Furthermore, the removal of habitat for the Pacific Highway upgrade close by to the west and the recent extensive logging in the adjoining Bulahdelah State Forest to the east has increased the importance of the forests within the study area and the existing adjacent State Forest for microbats. The remaining vegetation also provides a foraging corridor to extensive areas of intact forest in the locality for many of the bat species known to occur (e.g. Bulahdelah State Forest, Myall River State Forest and Myall Lakes National Park).

The development of the subject lands has the potential to impact on insectivorous bats by causing the loss of roost sites for tree roosting species, the loss and modification of foraging habitat, a reduction in the species diversity utilising the subject lands, a reduction in the population sizes and most significant of all a potential increase of disturbance of cave roost sites by increased human activity and domestic predators, particularly cats (Ecotone Ecological Consultants, 2010).

As a guide for microbat management to assist in the planning for the proposal, it should be noted firstly that microbats are highly mobile species and most species are known to travel great distances. Given this fact, which was established partly by the Anabat surveys, it would be reasonable to expect that most of the recorded species could forage in all of the available habitats in the study area.

The clearing of the coastal plain forest north of the transmission line would result in the loss of a number of potential roost sites for at least twelve tree roosting bat species known to occur in the locality. This includes three threatened species such as the East-coast Freetail Bat, the Yellow-bellied Sheath-tail Bat and the Greater Broad-nosed Bat. Based on the tree hollow matrix produced by Forest Fauna Surveys (2011) hollow bearing trees are not spread evenly across the area with numbers ranging between 0-2 to 8-14 hollow trees per hectare. The highest count recorded was 2-5 in eleven hectare squares followed by 5-8 in seven hectare squares. If a corridor is proposed as part of this development it should aim to capture these hollows.

The loss of any tall forest on the mid to upper slopes would reduce foraging and/or roosting habitat for all of the species recorded in the study area and lessens the protective buffer to Alum Mountain. Figure 8 shows that tree hollow availability is at the lower end of the scale with most of the hectare squares numbering 0-2 hollow bearing trees per hectare and the remaining ten squares recording 2-5 hollow bearing trees per hectare. Large hollow bearing trees (often dead stags) are scattered on the mid to upper slopes providing ideal potential bat roost sites. The open nature of this forest also provides ideal foraging for a range of species including the fast direct flying species. These species would include the threatened bent-wing bats and Greater Broad-nosed Bat, which can fly below the canopy. The corridor should aim to capture therefore the buffer area and then link the lower slopes and coastal plain.

The lower slopes have been subjected to higher levels of disturbance (mainly logging) resulting in smaller trees with few hollows. Any development of this area and the cleared land would have least impact on the bat populations as few hollow bearing trees would be lost. Although the survey results show a reasonable species diversity (8) in these areas, most of the species recorded (see Table 2) regularly forage in open environments including within or on the edge of urban areas. The loss of the yabbie ponds would remove a focal

drinking and foraging point for most of the recorded species and could be particularly important for the threatened large-footed myotis which primarily feeds over open water.

In order to maintain conservation of microbat habitat the ecological team recommends a buffer zone for the protection of Fry's Creek, which would then comply with the Water Management Act 2000. This should be included in the corridor and therefore would afford some protection to large hollow bearing trees noted to occur along some parts of the creek banks and retain some hollow bearing trees in the adjoining forest. Such action would preserve potential roosting and foraging habitat for a number of bat species, including threatened species and also provide a corridor and buffer to the adjoining Bulahdelah State Forest.

Most of the tall moist forest should be retained as a buffer to Alum Mountain within this corridor and this action would also protect important bat roosting and foraging habitat. Any loss of open water ponds could be replaced by the construction of sedimentation and drainage control ponds, even in a landscape theme.

The recommendation that is of significant importance is the control of increased human and domestic animal activity on Alum Mountain and its surrounding habitat. It is our view that this would be difficult to directly control. Bans on the keeping of household pets such as cats and dogs in other sensitive developments have proven to be generally ineffective. The best course of action may be an education program, reminding new residents to the area of their obligation to control their pets and activities with regards to fauna and Alum Mountain generally.

The Parma Wallaby was observed on all occasions in close proximity to the yabbie ponds located on the site, where a moist *Entolasia stricta* Wiry Panic grassland community (see section 10.7) has developed after previous clearing many years ago. This indicates that this habitat may provide an important feeding resource for this species with its dense grass cover. Grassy areas south east of the existing dwelling may also be important but it would appear from the sightings that the group of animals is only small (2-3 animals) and that they are always restricted to the vegetated slope to the south of the existing dwelling. It was also concluded from the survey that the vegetation above where these animals were seen is very dense and would provide an appropriate refuge but nearby clearing of the vegetation is taking place. A follow up survey by Forest Fauna Surveys (2011), using remote cameras, failed to re-produce any evidence of the Parma Wallaby over a period of two months but it is always difficult to prove a species has disappeared from a formerly occupied site. Whether the nearby clearing or the grassland becoming overgrown is responsible for their disappearance may never be known. However the area shown on Figure 23 and based on the precautionary principle should be set aside for habitat of the Parma Wallaby unless it can be shown they have disappeared.

There was a substantial population of the Squirrel Glider present in 2006 but no evidence of the Squirrel Glider was recorded during the repeated surveys in late 2010 (Forest Fauna Surveys, 2011). Part of the population was also recorded off-site in the adjoining Bulahdelah State Forest. The absence of Squirrel Glider records in 2010 indicates the population has declined since 2006, possibly due to impacts such as fire, but also a natural variation in preferred foraging resources may have occurred. The areas of preferred habitat for the Squirrel Glider include the following mapped vegetation communities (Figure 3) which are *Group 2 Sub-community 2; Upland Open Scrub with Emergents of Swamp*

Mahogany in Areas of Permanent High Water Tables and Group 3 Woodland / Forest on Alum Mountain Volcanics over Lower Coastal Slopes and Plains.

Any future development of the subject site will need to ensure that sufficient areas of the Group 3 Woodland / Forest, and that the entire Group 2 Sub-community 2 are preserved to ensure persistence of the local Squirrel Glider population in a corridor proposal. Given that the distribution of habitat trees with hollows, which are potentially suitable for the Squirrel Glider, are widespread across the subject site such trees within, and also in close proximity to these two vegetation communities are likely to be more significant to the Squirrel Glider than habitat trees more distant. The low density of preferred sap trees for the Squirrel Glider, namely Red Bloodwood *Corymbia gummifera* is either a natural reflection of the vegetation communities on the subject site, or possibly their selective removal during past logging. Plantings of this tree species around the periphery of any proposed development (adjacent to retained remnant vegetation) may increase the abundance of this foraging resource for the Squirrel Glider.

The koala was not observed on the site and in lieu of no evidence of koalas being found a koala habitat assessment was prepared. From an analysis of the canopy tree vegetation only the Red Mahogany/Sydney Peppermint/Red Bloodwood Dry Sclerophyll Forest and Woodland vegetation lacks any habitat significance for potential koala habitat according to SEPP 44. However, it should be noted whilst no koalas occur on the property and only one sighting has ever been recorded the precautionary approach should be applied. The literature is showing that additional tree species over and above what is listed on SEPP 44 are being utilized by the Koala. Callaghan et al (2011) in their latest findings have identified *Eucalyptus propinqua* Small-fruited Grey Gum, *Eucalyptus resinifera* Red Mahogany and *Lophostemon confertus* Brush Box as resource trees (refer to Appendix 13). In their updated results the authors show that *Eucalyptus tereticornis* Forest Red Gum, *E. microcorys* Tallowwood and *E. robusta* Swamp Mahogany ranked the highest for koala usage whilst *E. resinifera* Red Mahogany, *E. siderophloia* Grey Ironbark and *E. propinqua* Small-fruited Grey Gum all ranked as being key eucalypt species for the koala for southern Queensland data.

However it is much more difficult to manage the koala because they do not necessarily utilize corridors because their movements are more random and a koala's movements are influenced by other koalas (Faulks, 1990). The Tallowwoods, Brush Box, Sydney Bluegum and Small-fruited Grey Gum are found the upper slopes near Alum Mountain and may be able to be retained and included in the buffer area recommended for inclusion as microbat habitat. This vegetation buffer should circumvent the western edges of the property and capture the Swamp Mahogany trees.



Photo 7 – Large caves and fissures are present in the eastern face of Alum Mountain which may serve as overwintering and breeding sites.

Forest Fauna Surveys (2011) also states that the majority of higher quality foraging habitat for the Koala occurs on the mid and upper slopes of Alum Mountain where higher densities of preferred foraging tree species occur. With the exception of the Swamp Mahogany forest, the remainder of higher quality foraging habitat for the Koala occurs outside of the footprint of the current proposed Master Plan for the subject site.

Of the structural characteristics, the main factor responsible for the skewed distribution of smaller diameter trees is due to past intensive logging of the majority of the subject site (Forest Fauna Surveys, 2011). In particular, the central section of the subject site in proximity to the yabby dams, has been extensively thinned in the recent past. The majority of plots which recorded higher scores of trees >60 cm were located in the central portion of the subject site.

The subject site also supports a low abundance of habitat trees, with the highest number of assessment plots scoring habitat tree abundance of less than 5 per hectare. Based on the assessment, the higher densities of habitat trees are situated in the lower elevation parts of the subject site, particularly the low lying swamp forest in proximity to Fry's Creek. In contrast, the upper slopes of Alum Mountain have been extensively logged with only low distribution of habitat trees.

A total of 192 habitat trees were recorded for an average abundance of 1.34 habitat trees per hectare, which is considered very low. However, the distribution of potential habitat trees for possums, glider and microchiropteran bats varies widely across the subject site. In

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