Wednesday, 17 February 2021

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Dear Donna,

Re: Constraints advice for proposed rezoning and future residential development of Le Clos, Sancrox.

As per request, we provide a summary of our findings to date; an assessment of the Avoid/Minimise/Offset principles under the *Biodiversity Conservation Act 2016*; mitigation measures; and a preliminary overview assessment of other statutory obligations for the proposed.

The detailed information will be provided in the Biodiversity Certification Assessment Report (BCAR), which is to be prepared after approval of Planning Proposal for a final development concept for which bio-certification is to be sought.

1 VEGETATION

1.1 Plant Community Types

Three PCTs were identified on the site (one artificial being the aquatic vegetation in the large dam) in a series of vegetation zones based on broad condition (see **Figure 1**).

The two forest PCTs show high levels historical disturbance ie past logging, total clearing and more recently cattle grazing. One is completely artificial – established by a soakage created below the dam, although the Swamp Oak may also be non-original (ie. not originally in this area):

- PCT 690 – Blackbutt - Tallowwood dry grassy open forest of the central parts NSW North Coast Bioregion: Occurs in good condition (Vegetation Integrity >60) as regrowth forest, and very low condition (VI <5) as paddocks/former vineyards.
- PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion: Two patches of regrowth with approximate VI 55.
- 1740 - Tall Spike Rush freshwater wetland: Occurs as fringe around the edge of the large dam. VI not assessed as retained. Edge highly trampled by cattle.

1.2 Endangered Ecological Communities (EECs)

The proposed development envelope contains only limited areas of one EEC – *Swamp Oak Swamp Forest on Coastal Floodplains* (see **Figure 2**).

This EEC was confirmed to occur on alluvial soils at the head of the 3rd order stream on Lot 48, where it has regrown from previous clearing and may not be the original EEC. Another patch in a soak below the large dam in the west was assumed to be this EEC as no on-site soil tests were undertaken here.

The PMHC EEC mapping also maps the vegetation around the ephemeral watercourse in the southwest corner of the site as the EEC – *River-flat Eucalypt Forest on Coastal Floodplains*. A foot traverse of this area noted vegetation matching an ecotonal *River-flat Eucalypt Forest* (as defined by presence of Flooded Gum) or perhaps *Subtropical Floodplain Forest on Coastal Floodplains* as there is not clear dominance in the canopy and the understorey is dominated by common rainforest species, but only along the narrow centreline of the watercourse. The overwhelming majority of the remnant is dry sclerophyll forest on mapped residual soils whose floristics do not match any EEC listing.

1.3 Threatened Flora

No threatened flora have been found. A seasonal (spring-summer) survey for *Asperula asthenes* failed to detect any plants.

As cattle have access to the limited area of generic potential habitat around the large dam and have heavily trampled this area, this species is considered highly unlikely to be present.

Figure 1: PCTs and VZs on site

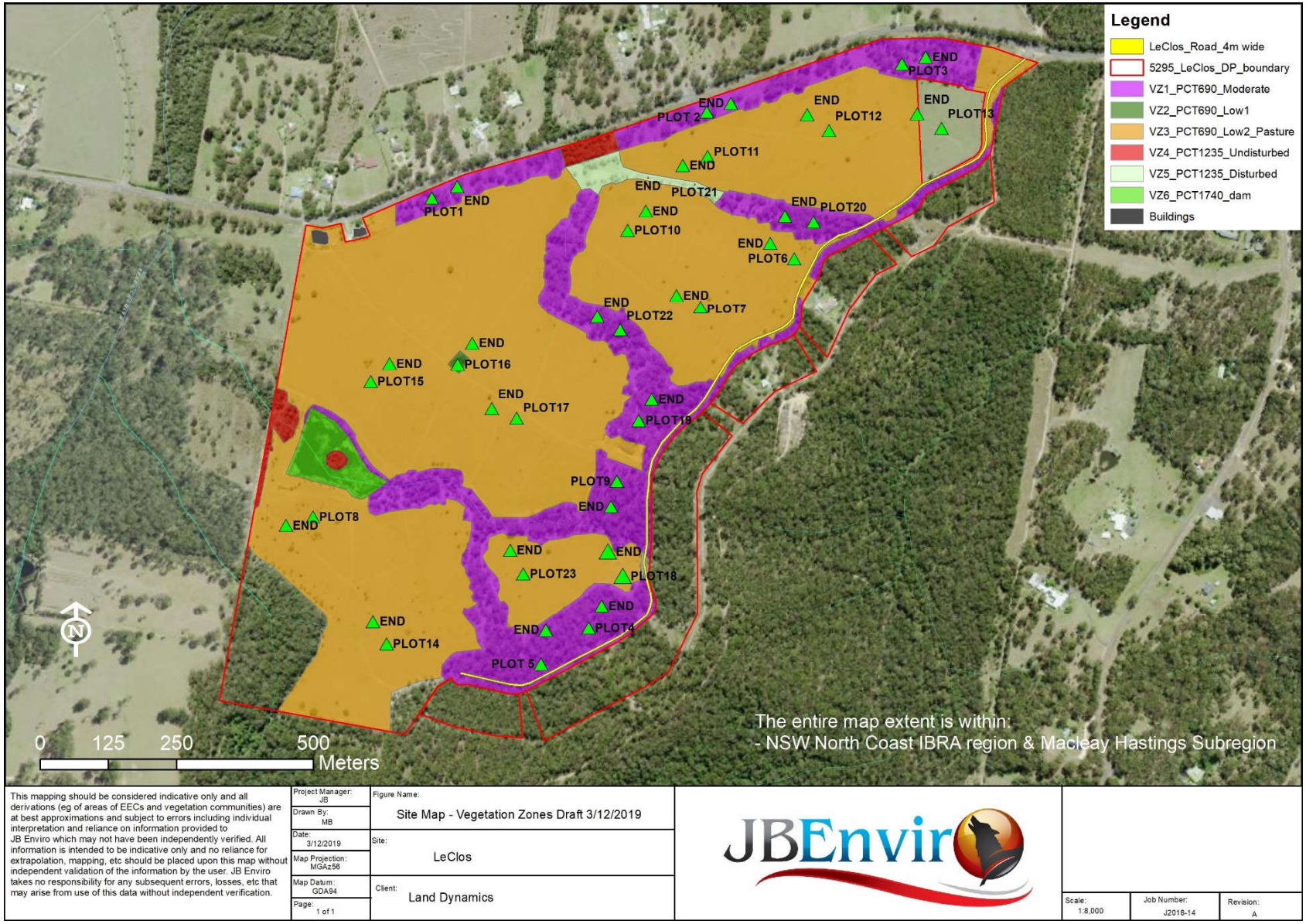
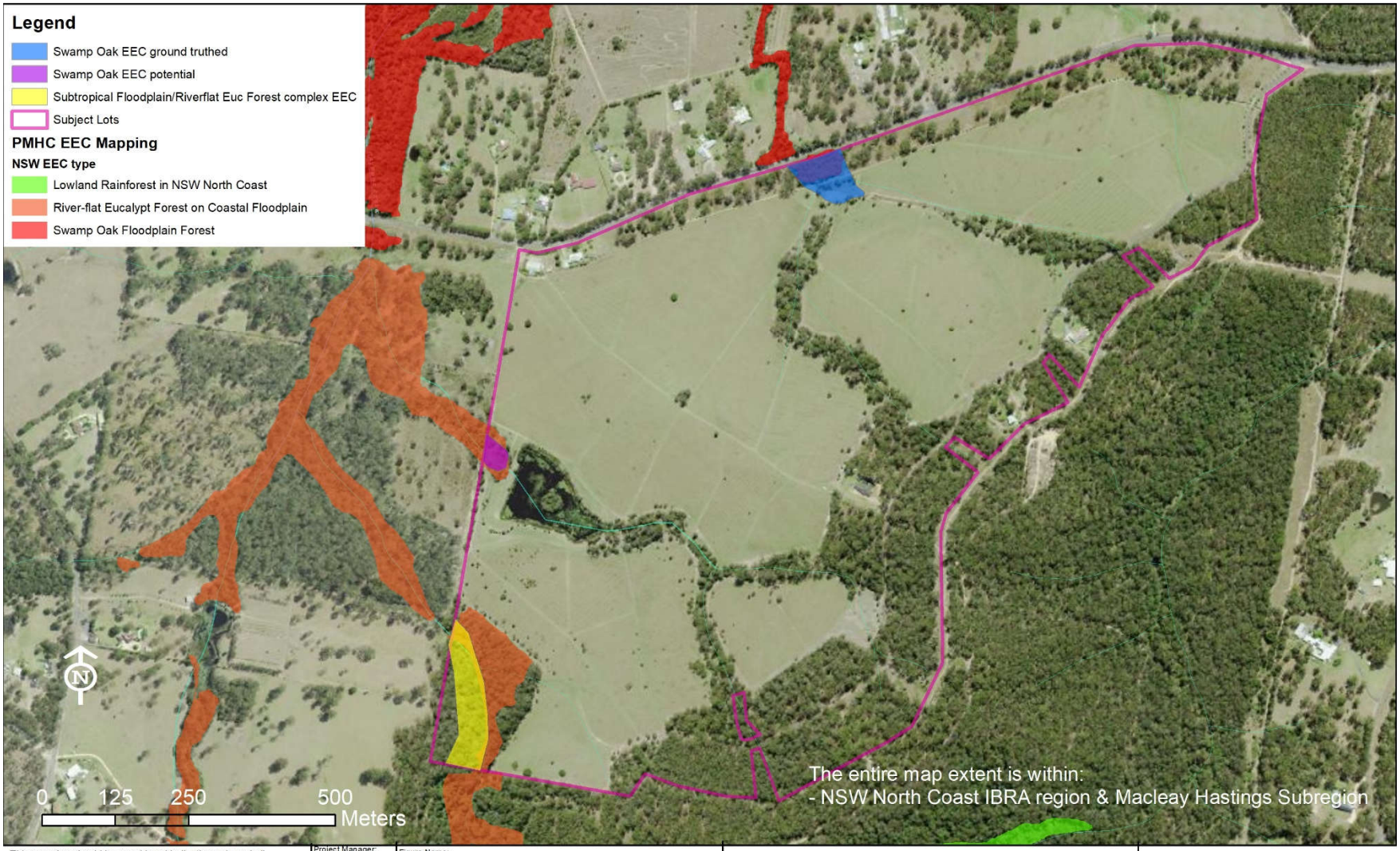


Figure 2: EECs on site



This mapping should be considered indicative only and all derivations (eg of areas of EECs and vegetation communities) are at best approximations and subject to errors including individual interpretation and reliance on information provided to JB Enviro which may not have been independently verified. All information is intended to be indicative only and no reliance for extrapolation, mapping, etc should be placed upon this map without independent validation of the information by the user. JB Enviro takes no responsibility for any subsequent errors, losses, etc that may arise from use of this data without independent verification.

Project Manager: JB	Figure Name: PMHC EECs 3/12/2019
Drawn By: MB	
Date: 27/11/2019	Site: LeClos
Map Projection: MGAz56	
Map Datum: GDA94	Client: Land Dynamics
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JBEnviro

Scale:	Job Number:	Revision:
1:8,000	J2018-14	A

2 FAUNA

2.1 Survey Methods

A comprehensive fauna survey has been conducted from July to September 2019 and later in December-January 2019/2020, and in February 2021 using the following methods, primarily to target Species Credit Species:

Table 1: Survey effort for fauna survey

Method	Habitat (ha)	Stratification units	Total effort	Target species
Arboreal Elliot A	<50 ha	1 (<50ha)	14 PIR cameras set for 6 weeks (total effort of 392 trap nights)	Squirrel Glider, Brushtailed Phascogale, Eastern Pygmy Possum
Arboreal Elliot B	<50 ha	1 (<50ha)		
Arboreal hair tubes	<50 ha	1 (<50ha)		
Area search	<50 ha	1 (<50ha)	32hrs: Walked 1km long transect across all habitats on site, doing area (0.5ha) search/call detection every 100m for up to 20mins per hectare depending on habitat) in the forest. Minimum 4hr per transect.	Ecosystem credit species, diurnal raptors, Bush-stone Curlew
Cage traps	Not used as no relevant Species Credit target species and Ecosystem species assumed present.			
Call playback/detection		1 (<50ha)	12hrs over 12 nights in July-August. One to two sites per night.	Powerful Owl, Masked Owl, Barking Owl, Bush-stone Curlew, Koala, Yellow-bellied Glider
Call recording (Anabat)		1 (<50ha)	Undertaken in Dec-Jan breeding period with two machines set at the large dam for 4 weeks.	Southern Myotis and all other Ecosystem Credit microchiropteran bat species.
Harp trapping		1 (<50ha)	Not used as no suitable potential flyways, and Anabat sufficient to detect target species.	Southern Myotis and all other Ecosystem Credit microchiropteran bat species.
Mist netting	Not used as Eastern Blossom Bat and Golden-tipped Bat not likely potential occurrences.			
Pitfall traps with drift net	<50 ha	1 (<50ha)	Modified Elliot A traps used for higher effectiveness.	Common Planigale
Terrestrial camera traps	<50 ha	1 (<50ha)	4 PIR cameras set for 4 weeks (total effort of 112 trap nights) paired with arboreal cameras in upper slope habitats	Ecosystem credit species, Rufous Bettong
Sand plots	Not used as habitat too disturbed or otherwise unsuitable for target species.			

Method	Habitat (ha)	Stratification units	Total effort	Target species
Search for scats and signs; turning over logs and debris, and raking leaf litter for reptiles and frogs.	<50 ha	1 (<50ha)	18hrs over the site.	Glossy Black Cockatoo, Powerful Owl, Masked Owl, Barking Owl, Koala, Pale-headed Snake, Stephen's Banded Snake, Three-toed Snake-toothed Skink
Spotlighting from vehicle	<50 ha	1 (<50ha)	1.6km along current access road each night for 8 non-consecutive nights in July-August (1/5hrs per survey night); and repeat in Dec-Jan.	Powerful Owl, Masked Owl, Barking Owl, Koala, Yellow-bellied Glider, Greater Glider, Squirrel Glider, Brushtailed Phascogale, Spotted-tail Quoll, Ecosystem credit species, Pale-headed Snake, Stephen's Banded Snake
Spotlighting on foot	<50 ha	1 (<50ha)	32hrs in July-August and again in Dec-Jan (two ecologists over 8 non consecutive nights at min. 2hrs per night each) through forest or either side of drainage lines, targeting all hollow-bearing trees.	
Stagwatching	<50 ha	1 (<50ha)	10hrs in July-August. 10hrs in December-January	Glossy Black Cockatoo, Powerful Owl, Masked Owl, Barking Owl, Greater Glider, Squirrel Glider, Brushtailed Phascogale, Pale-headed Snake, Stephen's Banded Snake, Ecosystem credit species
Terrestrial Elliot A	<50 ha	1 (<50ha)	120 traps/night over 8 over two non-consecutive weeks (960 trap nights).	Common Planigale, Eastern Pygmy Possum, New Holland Mouse
Terrestrial Elliot B	Not used as no relevant Species Credit target species (4 terrestrial PIRC set for interest).			
Terrestrial hair tubes	Not used as no relevant Species Credit target species (4 terrestrial PIRC set for interest).			
Watercourse search	<2ha	1	Scours in several drainage lines inspected via aural-visual surveys for up to 2hrs per night over 4 nights in December-January 2019-2020; and 3 nights February 2021. Call playback for 2 mins at each scour, every 50m around big dam and one side of small dam, followed by minimum 2 minutes listening.	Ecosystem credit species, Green-thighed Frog, Green and Golden Bell Frog, Pale Headed Snake.
Wetland census (diurnal)	<1ha	1	Aural-visual surveys 2hrs per session traversing all sides of the 2 dams, repeated 4 times (8hrs) in December-January 2019-2020 and 2 times in February 2021. Call playback for 2mins at each scour/dam	Green and Golden Bell Frog

Method	Habitat (ha)	Stratification units	Total effort	Target species
			(every 50m around big dam), followed by minimum 2 minutes listening.	
Wetland census (nocturnal)	<1ha	1	Scours in several drainage lines inspected via aural-visual surveys for up to 2hrs per night over 4 nights in December-January 2019-2020; and 3 nights February 2021. Call playback for 2 mins at each scour, every 50m around big dam and one side of small dam, followed by minimum 2 minutes listening.	Ecosystem credit species, Green-thighed Frog, Green and Golden Bell Frog
Tadpole survey	1	1	Dip net survey of the two dams in February 2021 following wet period in late December-early January promoting ideal breeding conditions. 6 sample sites in main dam (Plague Minnow present); 2 in small dam. Scours with water sampled with single sample site per scour.	Green-thighed Frog, Green and Golden Bell Frog

2.2 Threatened Species

2.2.1 Detected Species

The Glossy Black Cockatoo was detected via chewed cones. A Powerful Owl was heard calling >1km south of the site during spotlighting/call playback.

The site does not contain any potential breeding hollows for these species.

The Southern Myotis was confirmed via call detection to be foraging over the large dam. This bat could potentially roost in tree hollows on site.

2.2.2 Other Target Species

Only common species of birds were detected by the diurnal surveys. The latter was dominated by medium to large woodland birds.

No response was made to nocturnal call playback of any mammal species.

Spotlighting was extremely unproductive. A few common macropods, possums, diurnal birds and foxes were the only fauna observed.

PIR cameras recorded the Brushtail Possum, Sugar Glider and Northern Brown Bandicoots. Elliot A trapping recorded very few Brown Antechinus and Bush Rats.

There are no large raptor nests on site.

Only common frogs typical of modified rural habitats and their tadpoles were detected over all survey periods. Plague Minnow are abundant in the large dam, which is a key limitation, as is cattle grazing of the emergent aquatic vegetation in both dams.

3 KOALA HABITAT PROTECTION SEPP 2020

The site contains Potential Koala Habitat (eg. Lot 48), but a combination of a SAT survey (see **Figure 3**), spotlighting and call playback in the breeding seasons failed to detect any Koalas, despite adjacent land to the south and east being identified as Core Koala Habitat (low density Koala population).

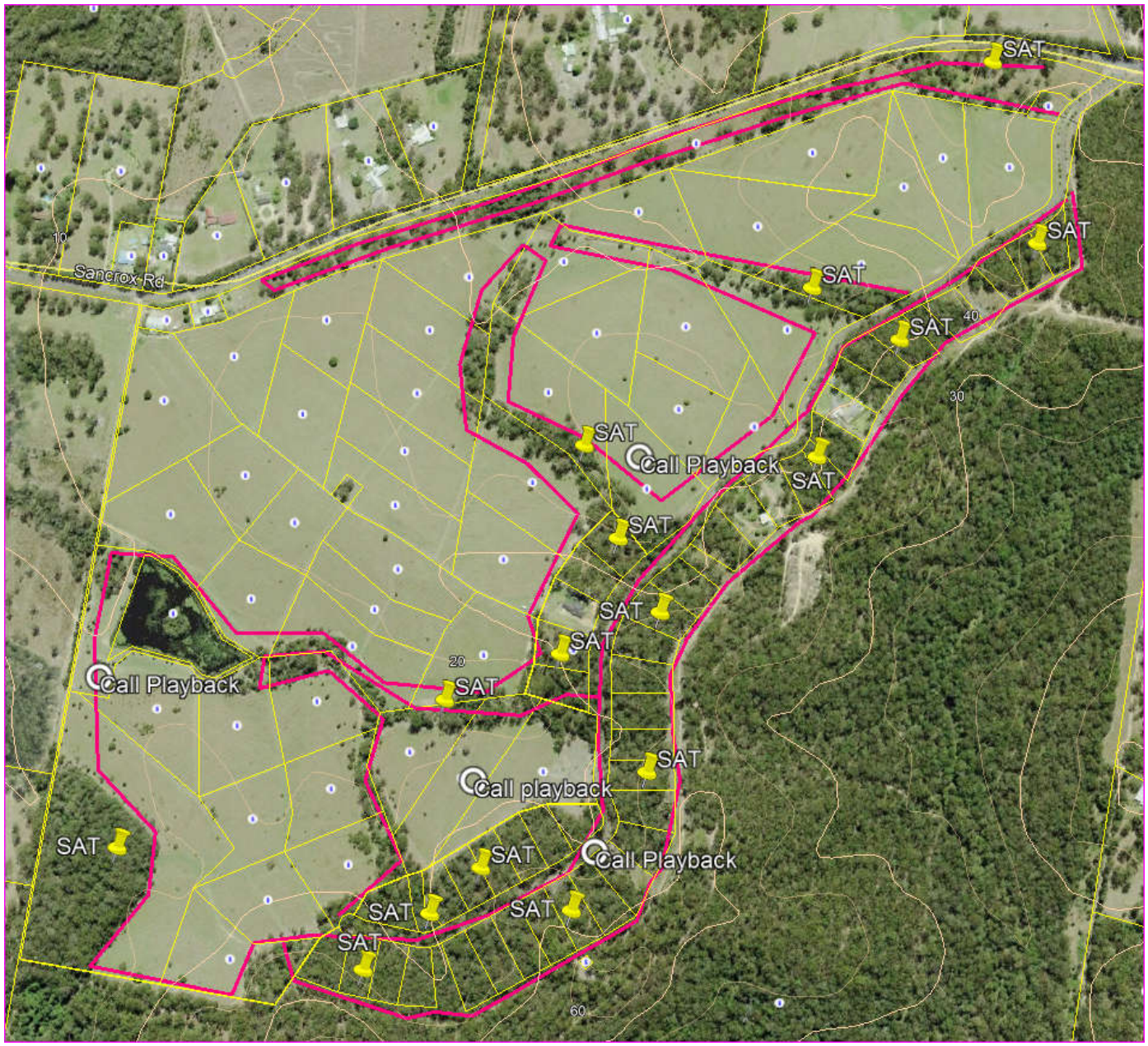
A KPoM is thus not required.

Notwithstanding this, the proposed development concept in **Figure 5** considers the potential for long term recovery of the local Koala population via:

- Converting the majority of the currently heavily forested parts of the site (much of which is currently zoned for large lot residential) to an Environmental zoning to protect it in perpetuity.
- Infill planting with native forest dominated by Koala food trees in the existing cleared area in the southwest to reinforce local and regional linkage values.
- Retaining and augmenting riparian zones to maintain local corridor values.
- Utilising best practice for road crossings of riparian zones to provide for Koalas to pass under the roads.

Figure 3: Koala survey (winter-spring)

Red line indicates spotlighting route



4 PMHC DCP

4.1 EECs:

The EECs identified on site will require 35m fully vegetated buffer zones under the DCP.

These will be achieved either in combination with the riparian zone infill planting (northern EEC) or as a distinct planted zone (western EEC), as shown in Figure 5. The southwest EEC has an existing vegetated buffer.

Planting will be governed by a Vegetation Management Plan (VMP).

4.2 Hollow-bearing trees (HBTs):

The site (the upper half of the eastern large lots were not surveyed as not impacted) contains the following as illustrated in **Figure 4**:

- 15 hollow-bearing trees (potentially a few more on upper slopes of eastern fringe of site on large lot residential area)
- 18 hollow-bearing termitaria.

The following appear to fall into the development envelope:

- 4 hollow-bearing trees (3 stags in poor condition, 1 large Grey Gum on the edge of the existing road possibly at risk if road widened)
- 4 termitaria with cavities (low value as dens for mammals often due to isolation or likely small internal cavity size).

The assessment under the DCP HBT protocol is provided in **Table 2**. The hollow-bearing trees which occur close to very close (latter being the aforementioned Grey Gum) to the edge of the existing access road formation are to be surveyed to determine if they can be retained during upgrade of the road.

Any HBT or hollow-bearing termitaria which has to be removed will be offset with nest boxes or similar artificial hollow (eg. recent entrance making strategy into suitable trees pioneered by OEH in Coonabarabran) at a ratio of at least 1:1 per hollow. Where one hollow may support fauna with different internal cavity requirements, more nest boxes will be required eg. bat boxes and bird or glider boxes for the one hollow.

The eastern E1 area and Lot 48 which contain the bulk of the site's hollow-bearing trees and termitaria (most termitaria are in the drainage lines) will be protected in perpetuity by rezoning these areas to Environmental Protection.

Figure 4: Hollow-bearing trees (H) and arboreal termitaria (T) on site

Table 2: PMHC DCP 2013 HBT protocol assessment

HBT	Tree species	Alive/Dead		Trunk DBH (cm)		No. Hollows		Hollow Size (cm)		Habitat Proximity		Longevity		Total Score	Comments
1	stag	Dead	1	<60	0	1	0	>10cm	3	<30m	2	High	0	6	Consists of a small arboreal termitaria in handful of trees on top of hill in open paddock. **To be removed.**
2	Grey Gum 1	Alive	3	60-80	1.5	2-4	1.5	>10cm	3	<30m	2	High	3	14	On edge of 1st order drainage line and retained in VRZ. Likely Brushtail Possum scratches on trunk. Two medium sized branch hollows.
3	stag	Dead	1	<60	0	1	0	>10cm	3	<30m	2	Low	0	6	Single chimney hollow in broken leader which offers no significant value – at best a Brushtail Possum or Wood Duck. Highly comprised stability by major fire scar at base. **To be removed.**
4	stag	Dead	1	<60 (cm	0	1	0	>5cm	2	<30m	2	High	0	5	Final stage stag (no crown limbs) with basal fire scar on edge of Le Clos Rd. Small termitaria in top and fissure hollow on north side. **To be removed**.
5	stag	Dead	1	80-100	3	2-4	1.5	>10cm	3	<30m	2	High	0	10.5	Very large final stage stag with stubs of former twin leaders with chimney hollows on top, probably dirt filled. Fissures on side indicating limited viability. **To be removed**.
6	Tallowwood	Alive	3	60-80	1.5	2-4	1	<5cm	1	<30m	2	High	3	11.5	Over-rated value as hollows only in termitaria and likely to be limited internal cavity as termitaria is not very wide in girth. **To be removed**.
7	Thick-leaved Mahogany	Alive	3	<60	0	1	0	<5cm	1	In situ	3	High	3	10	Single trunk hollow at base of leader split. Potential Sugar Glider, bat or small parrot hollow. Near crossing but appears retained.
8	White Stringybark 1	Alive	3	<60	0	2-4	1.5	<5cm	1	<30m	2	High	3	10.5	Small termitaria (about 50cm diameter) with two small hollows, probably not occupied due to insufficient internal cavity. **Possibly to be removed**

HBT	Tree species	Alive/Dead		Trunk DBH (cm)		No. Hollows		Hollow Size (cm)		Habitat Proximity		Longevity		Total Score	Comments
9	White Stringybark 2	Alive	3	<60	0	2-4	1.5	<5cm	1	<30m	2	High	3	10.5	Small termitaria with small hollows, probably not occupied due to insufficient internal cavity. **Possibly to be removed**
10	Grey Gum 2	Alive	3	80-100	3	2-4	1.5	>5cm	2	In situ	3	High	3	15.5	Very large, mature Grey Gum on edge of existing Le Clos Rd, **possibly at risk of removal by road upgrade**. Bark scratched and hollows likely occupied.

Photo 1: The largest stag to be removed

Photo 2: A typical termitaria to be removed

4.3 Koala Food Trees:

The DCP requires 1:2 offsets for loss of Koala food trees (KFTs).

The vast majority of KFTs have been avoided by retaining the majority of existing forest on site. The total number (295) of primary and secondary KFTs to be removed is estimated as follows:

- Primary browse: 69 Tallowwoods
- Secondary browse: 226 Grey Gums

Many of the Grey Gums are only suppressed trees <6m tall and <15cm trunk DBH in the southwest patches which will never achieve a significant level of development due to competition with established canopy trees. The site has also experienced no significant fire since its recovery post-logging, and these trees may well be lost in natural pruning events such as a medium to high intensity fire event.

A smaller number of other supplementary tree species will also be removed (eg. White Stringybark).

The primary and secondary trees are to be replaced in the infill planting of the riparian zones as co-dominant species in the plantings here, in existing canopy gaps on Lot 48, and in the large southwest offset area as part of complete revegetation of these areas for a net biodiversity benefit, in line with the objectives of section 2.6.3.2 of the DCP: "*To retain viable representative samples of native vegetation, which have an intact structure and complete floristics, wherever practical*".

4.4 Riparian zones:

In line with the *Water Management* (WM) *Act 2000*, vegetated riparian zones (VRZs) will be established along the drainage lines. Offsets for intrusions into the VRZ are met by infill planting to widen the riparian zones.

The Biodiversity Assessment Methodology (BAM) has recommended different specifications for buffer widths, as does the PMHC DCP 2013. The following table compares these widths (WMA Act and BAM measured from one side of the watercourse from top of bank, hence total width is double specifications shown):

Table 3: PMHC DCP 2013 riparian zone buffers

Stream Order	WMA Act VRZ (m)	BAM buffers (m)	DCP 2013 Intermittent Flow (m)	DCP 2013 Permanent Flow (m)
1	10	10	10	30
2	20	20	40	40
3	30	30	50	50
4	40	40	65	65
5	40	40	-	-
6+	40	50	-	-

5 BIODIVERSITY CONSERVATION ACT 2016

5.1 Serious and Irreversible Impacts

No SAII species is known or likely to occur, hence no SAII threshold is exceeded.

5.2 Biodiversity Offset

In addition to the mitigation measures, the proposal will require Ecosystem Credits for the approx. 6.61ha of dry sclerophyll forest PCT, and Species Credits for the Southern Myotis.

The DA consent will specify the offset requirements, and the credits must be retired before commencement of the activity.

5.3 Avoid, Minimise, Offset, and Prescribed Impacts

The following tables assesses the relevant sections of the BAM which assess the “Avoid Minimise Offset” principles, and Prescribed Impacts in line with the BAM (see section 8, sub-sections 8.1-8.3), and BAM Operations Manual for Stage 2.

5.3.1 Locating a Project to Avoid and Minimise Impacts

The following table details where the proposal has aimed to avoid and minimise impacts on vegetation and habitat by location of the development footprint after considering the findings of the BAM and fauna survey, which saw significant changes to the original concept layout to reduce the extent of vegetation removal.

Table 4: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Locating the proposal in areas where there are no biodiversity values	• Majority of development footprint located within former vineyards which was below minimum VI hence no offsets required. • Original footprint included development of Lot 48. Lot 48 now largely retained for corridor values, hollow-bearing trees and density of primary-preferred KFTs. • Southwest corner remnant identified as significant for corridor and riparian buffer role, hence retained as is. • Large dam retained with perimeter vegetation to be expanded to improve connectivity and buffering. • EECs retained with buffers. • Majority of primary preferred KFTs and HBTs retained.	• Three areas of forest to be cleared to consolidate separation of core forest habitats from riparian corridors for higher long term bushfire management practicality, and reduce incentive for fauna to cross multiple points of a main road and hence be exposed to vehicle strike. This allows mitigation to be focused as key crossing points for maximum effectiveness. • Net gain in forest area via infill planting of riparian zones, Lot 48 and southern revegetation area to widen key local linkages. • Majority of high value vegetation kept separate from development and adjoining other forest habitat, to be dedicated public reserve.
Locating the proposal in areas where the native vegetation or threatened species habitat is in the poorest condition	As above: development is predominantly focussed on former vineyards.	As above plus removal of approximately 6.61ha of native vegetation offset by revegetation of approx. 9.41ha.
Locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species	• All EECs avoided and retained with buffers as per DCP.	• EECs retained within vegetated riparian zones within public reserves. • VMP to improve condition of the EECs and establishment of buffer zone where not currently present (western EEC).

Approach	How addressed	Justification
Locating the proposal such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained	• All existing riparian zones with forest retained as vegetated. • Number of riparian zone crossings minimised by road design. • Crossings of Lot 48 and riparian zones mitigated by best practice in line with RMS standards. • No more residences east of existing access road to minimise additional fragmentation. • APZs setback from retained and revegetation areas via roads and dwelling setback. • No residential developing in southern cleared area to pose a gap between forested land east and west within a key local corridor.	• All riparian zone corridors apart from southwest corner currently have high edge effect constraints, or major gaps in forest connectivity. Replanting these area (eg. both sides of the large dam) improves the functional effectiveness of these riparian zones as corridors, and helps offset the road crossings. • Crossings of Lot 48 and riparian zones mitigated by best practice in line with RMS standards. • Key corridor via southwest retained and significantly augmented via infill planting of over 2ha of cleared land to widen corridor and buffer edge effects. This corridor is much more significant for local movements to the northwest given its width, connection to a large body of core habitat to the south, and connection to the next largest local remnant to the northwest.

5.3.2 Designing a Project to Avoid and Minimise Impacts

The development has been designed in a way which avoids and minimises impacts as outlined below:

Table 5: Designing a proposal to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Reducing the clearing footprint of the project	• Majority of development has focused on existing cleared land where VI <20 hence no Ecosystem Credits required. • All currently approved lots for dwellings east of current access road not developed now to be dedicated as public reserve.	• Four areas of existing forest in southeast to be removed to consolidate separate core forest habitat and development for more practical bushfire control, and reduce incentive for fauna to cross multiple points of a main road and hence be exposed to vehicle strike. • Layout retains most of Lot 48 for its linkage value, and more importantly the majority of forest fringing the east and south, with revegetation seeing a net gain.
Locating ancillary facilities in areas where there are no biodiversity values	• Stormwater infrastructure within existing cleared areas. • APZs achieved via setback from public reserves. • No residential lots to have retained vegetation hence 10/50 rule will not apply. • Communications, power, water and electricity combined with road easements, or existing (eg. along current access road).	
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower Vegetation Integrity score)	As above.	As above.
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC)	As above – all EECs avoided.	Primary access may trim edges of EEC buffer zone but this is countered by WSUD measures and infill planting to fill in canopy gaps and widen upstream VRZs, adding further buffer functions.

Approach	How addressed	Justification
Providing structures to enable species and genetic material to move across barriers or hostile gaps	• Crossings of riparian zones and Lot 48 linear corridor in line with RMS best practice designs.	• Crossings of riparian zones unavoidable due to other constraints eg. safe bushfire escape and serviceability for school buses and garbage trucks. • Utilising best practice design and methodology to mitigate impacts of linear infrastructure.
Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	• Total extent of infill planting and revegetation will see net gain in forest cover. • VMP to manage all revegetation, and improve condition of existing forest eg. removal of lantana from Lot 48 EEC. • Retained habitat to be dedicated as public reserve.	• Infill planting and revegetation under VMP aims to achieve net gain in forest habitat, buffer EECs but also achieve same or net gain in KFTs to meet DPC objectives.
Efforts to avoid and minimise impacts through design must be documented and justified.	• As above.	As stated above

5.3.3 Prescribed biodiversity impacts

The future development is assessed for prescribed biodiversity impacts as follows:

Table 6: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities affected
Impacts of development on the habitat of threatened species or ecological communities associated with: • karst, caves, crevices, cliffs and other geological features of significance, or • rocks, or • human made structures, or • non-native vegetation	• No karst, caves, rocks, abandoned buildings, mines, etc on site. • No non-native vegetation providing habitat. • Large dam offers potential foraging habitat for Southern Myotis.	• Large dam offers potential foraging habitat for Southern Myotis and to be buffered by vegetated buffer.
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	• Crossing of 3 of the 4 main riparian zones with roads and of linear corridor along Lot 48 by roads. • Most important linkage (southwest corridor) retained and to be significantly augmented by infill planting over 2ha of pasture. • Eastern parts of site retained forested separated by existing road from residential area development apart from existing dwellings. • All remaining habitat to be dedicated public reserve to maintain values in perpetuity.	• Increased vehicle strike risk for any fauna crossing current access and new threat to fauna using the central and northern riparian zones. • Not Core Koala Habitat and Lot 48 and three riparian zones do not provide key linkages to any significant habitat to north or northwest due to historical clearing for rural landuses and eventual physical barrier of Hastings River. • No threatened species with low mobility confirmed to use the corridors affected.

Prescribed biodiversity impact	Description in relation to the development site	Threatened species or ecological communities affected
Impacts of development on movement of threatened species that maintains their lifecycle	As above	• No threatened species with low mobility and dependent on the affected linkages for lifecycle movements confirmed to use the corridors affected. The affected riparian zones and Lot 48 highly constrained by edge effects. • Southwest corridor augmentation will affirm its value as the most significant local corridor.
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)	• No dams to be removed. • Urbanisation of catchment mitigated by WSUD and infilling of riparian zones to widen VRZ or create where currently absent, to buffer nutrient and runoff changes. • No reduction of flows to Coastal Floodplain EECs – no new dams created.	• Swamp Oak Floodplain Forest and River-flat Eucalypt Forest EEC present, but buffered by existing or proposed vegetated buffers and WSUD. • Southern Myotis would forage periodically forage over large dam, but again buffered by existing or proposed vegetated buffers and WSUD.
Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.	• No TECs directly impacted by roads. • Crossing of three riparian zones by roads will pose new threat to fauna which are common to both TECs and non-TECs.	• No TEC's directly impacted. • Marginal Green-thighed Frog potential habitat in southwest not affected.

5.3.5 Locating a project to avoid and minimise prescribed biodiversity impacts

The following table evaluates if the development has been located in a way which avoids and minimises prescribed biodiversity impacts:

Table 7: Locating a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Locating the envelope of surface works to avoid direct impacts on the habitat features	• Most of development footprint in vegetation below minimum VI. • Minimised number of crossings of riparian zones. • Large dam retained.	• No impacts on bushrock. • No non-native vegetation providing habitat for threatened species. • Large dam offers foraging habitat for Southern Myotis.
Locating the envelope of sub-surface works, both in the horizontal and vertical plane, to avoid and minimise operations beneath the habitat features, e.g. locating long wall panels away from geological features of significance or water dependent plant communities and their supporting aquifers	• No change to current watertable or landscape drainage patterns	• Major drainage lines are retained as per WM Act requirements. • Infill planting to widen VRZs above statutory requirements.
Locating the project to avoid severing or interfering with corridors connecting different areas of habitat, migratory flight paths to important habitat or preferred local movement pathways	• Minimised crossing of riparian zones and Lot 48 subject to other constraints. • Consolidation of habitat to east and south which provides the key local corridor for biodiversity, and providing a distinct separation from residential development via the existing access road.	• Current zoning potentially allows clearing/fragmentation of intact forest along eastern fringe for dwellings. Now conserved as public reserve. • Removal of patches of forest outside riparian zones west of existing access allows consolidation of habitat and residential land, improving practical management of bushfire in the long term under a drier climate.

Approach	How addressed	Justification
Optimising project layout to minimise interactions with threatened and protected species and ecological communities, e.g. designing turbine layout to allow buffers around features that attract and support aerial species, such as forest edges, riparian corridors and wetlands, ridgetops and gullies	• Consolidation of core habitat to east and south separated from residential footprint by boundary road. • Southwest corner avoided and existing gap in southern corridor to be infilled to offset changes in edge effects impacting other riparian linkages and Lot 48 linkage. • EECs retained with buffers and in public reserve. • All remaining habitat retained in public reserves in zoning that prevents future development.	• Consolidation of core habitat to east and south separated from residential footprint by boundary road assists in reducing vehicle strike risk, dumping of greenwastes, conflicts between bushfire risk perception and ecological management. • Dedication of all habitat to public reserve consolidates conservation management to one authority.
Locating the project to avoid direct impacts on water bodies	• All existing dams retained within riparian zones with widening of VRZs to increase buffering.	• Large dam recognised as providing source of biodiversity in study area, and periodic foraging habitat for Southern Myotis.

5.3.6 Designing a project to avoid and minimise prescribed biodiversity impacts

The following table evaluates if the development has been designed in a way which avoids and minimises prescribed biodiversity impacts.

Table 8: Designing a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed	Justification
Engineering solutions, e.g. proven techniques to minimise fracturing of bedrock underlying features of geological significance, water dependent communities and their supporting aquifers; proven engineering solutions to restore connectivity and favoured movement pathways	• Road design at crossings of riparian zones and Lot 48 to incorporate underpass and arboreal crossings in line with RMS best practice.	• Maintain current values of these areas as linkages, although southwest corridor has the most significant value due to its width and direct connection between the remnant northwest and Cowarra State Forest to the south.

Approach	How addressed	Justification
Design of project elements to minimise interactions with threatened and protected species and ecological communities	• Consolidation of core habitat to east and south separated from residential footprint by boundary road. • Southwest corner avoided and existing gap in southern corridor to be infilled to offset changes in edge effects impacting other riparian linkages and Lot 48 linkage. • EECs retained with buffers and in public reserve. • All remaining habitat retained in public reserves in zoning that prevents future development.	• Consolidation of core habitat to east and south separated from residential footprint by boundary road assists in reducing vehicle strike risk, dumping of greenwastes, conflicts between bushfire risk perception and ecological management. • Dedication of all habitat to public reserve consolidates conservation management to one authority.
Design of the project to maintain environmental processes critical to the formation and persistence of habitat features not associated with native vegetation	• Overwhelming majority of forest retained in public reserves. • Fallen HBTs and large trees to be relocated to southern revegetation area to act as hollow logs.	• Consolidation of core habitat to east and south which form part of larger local band of largely intact forest extending north from Cowarra State Forest to northern Sancrox. Maintaining this larger edge:volume ratio buffers edge effects and also increases viability of local populations via higher carrying capacity and niche diversity, than achievable in narrow riparian zones or small patches of forest separated by roads from core habitat.
Design of the project to maintain hydrological processes that sustain threatened species and TECs	• All riparian zone crossings to include structures to maintain free flows, and also not increase erosion and sedimentation eg. via scouring. • No diversion of low away from TECs. • WSUD to maintain water quality to statutory limits.	• Design of crossings to meet statutory requirements. • Design of WSUD to meet statutory requirements.

Approach	How addressed	Justification
Design of the project to avoid and minimise downstream impacts on rivers, wetlands and estuaries by control of the quality of water released from the site.	• All riparian zone crossings to include structures to maintain free flows, and also not increase erosion and sedimentation eg. via scouring. • WSUD to maintain water quality to statutory limits. • Widening of VRZs beyond statutory requirement and infill planting to revegetate currently non-forested riparian zones.	• Design of crossings to meet statutory requirements. • Design of WSUD to meet statutory requirements. • Contributes to meeting net gain in habitat objective.

6 MITIGATION MEASURES

The following table details the draft proposed mitigation measures, which are in addition to the offsets required under the BC Act:

Table 9: Mitigation measures

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Infill planting of riparian zones to widen corridors. • Approximately 9.41ha to be re-established or augmented to forest. • Includes KFTs offsets to meet DCP. • Includes VRZ requirements for WM Act 2000 to offset crossings. • Area to be protected in perpetuity.	High: • Loss of approx. 6.61ha of vegetation for development. • Three riparian zones crossed by roads.	Very low: • Condition of consent. • Governed by VMP. • Compliance enforcement under development consent by PMHC.	• Infill area between APZ and existing riparian zones outside recreation and WSUD areas. • Canopy trees dominated by KFTs (except adjunct to roads). • Understorey of rainforest pioneer species to reduce fire risk. • Outer edge of *Lomandra* or *Gahnia*. • Vegetation Management Plan (VMP) to guide and govern. • Area to be protected in perpetuity.	• Enhanced buffering of riparian zones. • Enhanced carrying capacity. • Enhanced corridor functions. • Pedestrian access only via provided paths.	Construction to operation	Proponent (VMP) PMHC (compliance enforcement)

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Infill southwest offset area: • Offset loss of approx. 6.61ha of fully structured dry sclerophyll forest for crossings and residential lots. • Includes KFTs offsets to meet DCP.	High: • Loss of 6.61ha of vegetation for development. • Three riparian zones crossed by roads.	Very low: • Condition of consent with performance indicators linked to subsequent approvals. • Governed by VMP. • Compliance enforcement under development consent by PMHC.	• Infill paddock in southwest with fully structured forest, grading from dry to wet sclerophyll with slope. • Canopy trees dominated by KFTs (except adjunct to roads). • Understorey to vary from dry sclerophyll to rainforest pioneer species as per natural succession to assist bushfire management. • Outer edge fronting development planted with *Lomandra* or *Gahnia*. • Vegetation Management Plan (VMP) to guide and govern. • Area to be protected in perpetuity. • Retain firetrail along boundaries.	• Enhanced carrying capacity. • Enhanced northwest corridor function. • Pedestrian access only via provided paths.	Construction to operation	Proponent (VMP) PMHC (compliance enforcement)

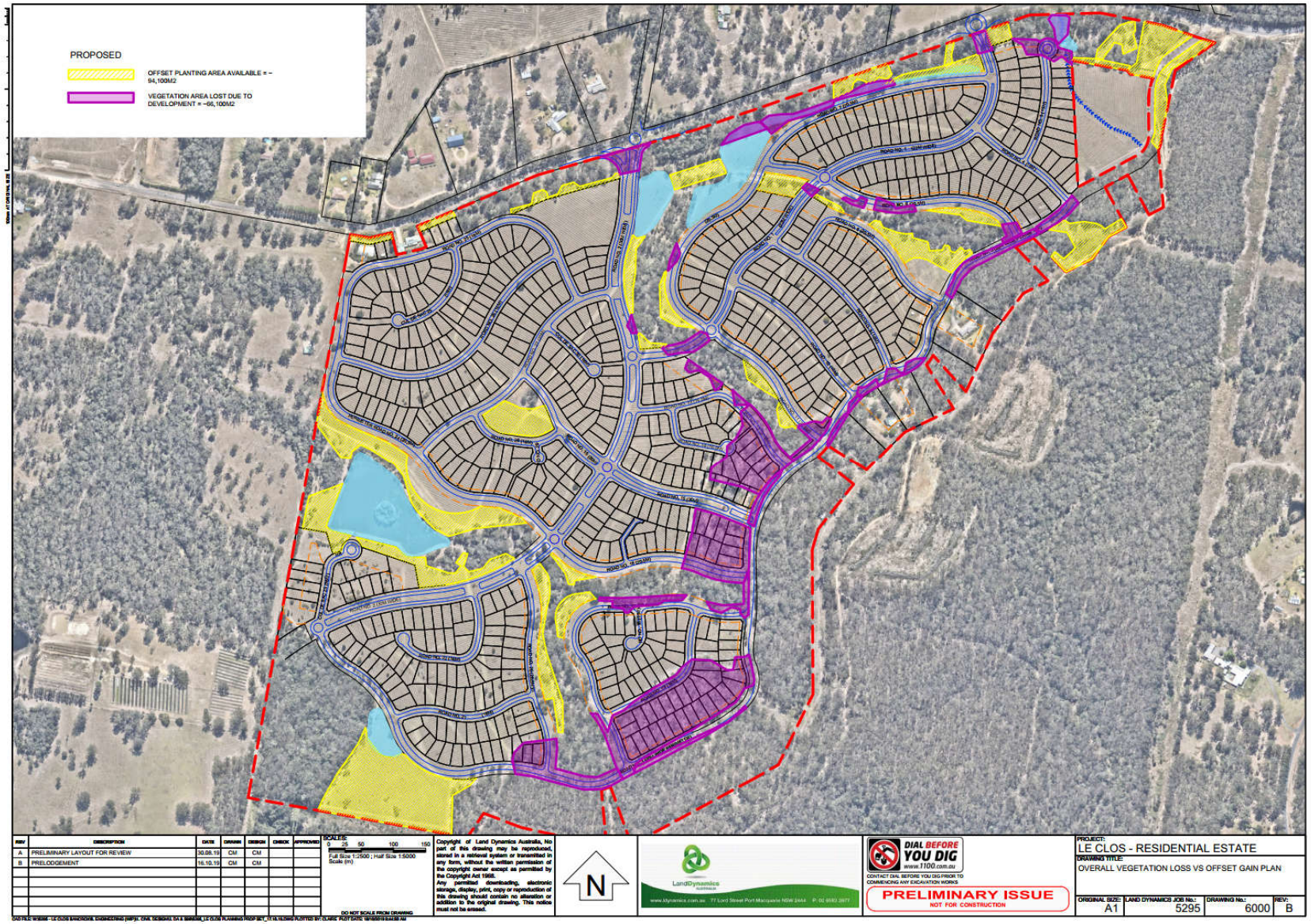
Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Planting out of EEC buffers as per DCP	Low: • Currently subject to runoff from former vineyard, now grazed by cattle.	Very low: • Combined with VRZ widening, EECs will be significantly buffered from current status	• EECs to be buffered by 35m planting of fully structured native forest, which will include KFTs. • Implemented under VMP.	• DCP obligations met. • Additional biodiversity. • Additional carrying capacity	Construction - operation	Proponent
Fauna crossings - terrestrial	High – three riparian zones to be crossed as well as two crossings of ribbon of forest on Lot 48, creating new barrier with increased threat of vehicle mortality.	Very low: • Crossings to be designed at pre-DA stage and meet RMS standard principles.	• Riparian zone crossings to use minimum 3m x 3m culverts – subject to topography but not <2.4m x 2.4m. • Fauna furniture to be provided as per RMS guidelines. • Fauna fencing (floppy top or similar) up and downstream of crossing to funnel fauna into the underpass. • Streetlighting on road at crossing points to maximise driver detection of fauna.	• No effective barrier to fauna movement.	Construction	Proponent

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Fauna crossings - arboreal	High – three riparian zones to be crossed and two crossings of Lot 48, creating new barrier with increased threat of vehicle mortality.	Very low: • Crossings to be designed at pre-DA stage and meet RMS standard principles.	• Rope bridge to be provided over each riparian zone and Lot 48 crossings.	• No effective barrier to fauna movement.	Construction	Proponent
Install nest boxes to offset loss of minimum 7 hollow-bearing trees and arboreal termitaria: • All hollow-bearing trees lost are stags with limited longevity eg. basal fire scars.	High: • Development will see loss of 3 hollow-bearing trees and 4 termitaria. One to two more hollow-bearing trees may need removal for existing road upgrade	Nil: • Final road design to avoid additional HBT loss if possible. • Offset via nest boxes per hollow, including 2 extra HBTs in case have to be removed.	• Two HBTs on edge of existing road to be surveyed and accounted in final road redesign. • Nest boxes to be erected in retained forest along east and southwest where hollows are currently uncommon or absent. • Nest boxes to be erected at least 2 months before clearing to allow fauna to detect them.	• HBT loss minimised. • Offset requirements of DCP met.	Construction	Proponent Ecologist

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Relocation of hollow logs to southwest offset area to augment habitat regeneration: • Studies show coarse woody debris is a key habitat component for biodiversity. • Hollow logs take >100 years to recruit from regrowth forest, but enhance biodiversity via provided refuge and foraging substrate.	High: • Logs will be destroyed during clearing. • >100 years to gain logs in planted area via natural processes.	Low: • Logs relocated to meet consent condition. • Ecologist to direct and document log relocation.	• Relocate any salvageable current or potential (>50cm DBH) hollow-bearing trees and logs to southwest offset area during clearing phase. • Randomly locate to provide refuge habitat for fauna.	• Majority of existing hollows and logs relocated. • Higher diversity of fauna in offset area within 10yrs of planting.	Construction	Proponent Ecologist
Timing works to avoid critical life cycle events such as breeding or nursing.	High – loss of at least 7 hollow-bearing trees and termitaria, plus some groundcover and logs.	Low	Clearing outside breeding season of Southern Myotis which has potential to roost in tree hollows.	Avoid impacts on breeding.	Avoid spring-summer	Proponent
Instigating clearing protocols including pre-clearing surveys and staged clearing, and the presence of a trained ecological or licensed wildlife handler during clearing events	High – loss of at least 7 hollow-bearing trees and termitaria, plus some groundcover and logs.	Low	Consent condition requiring the measure in future DA.	Minimal if any fauna mortality	Prior to and during clearing.	Proponent PMHC Ecologist.
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance	Moderate – risk of impacts on retained KFTs and HBTs, and adjacent EECs.	Low	Consent condition requiring the measure in future DA.	EECs and habitat features protected during construction.	DA consent and construction phase.	Proponent PMHC

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment during dwelling construction	High – risk of impacts on EEC and large dam (frog and Southern Myotis habitat)	Low	• Consent condition requiring the measure in future DA. • Development complies with WSUD during construction and operation.	Watercourses and dam protected during construction and operation.	DA consent and construction phase.	Proponent PMHC
Selective retention of in APZ during clearing.	High – risk of loss of these trees	Very low	Consent condition requiring the measure in future DA.	Protected during construction.	DA consent and construction phase.	Proponent PMHC
Temporary fencing and signage to protect significant environmental features such as riparian zones during construction.	High – risk of impacts riparian zone.	Very low	Consent condition requiring the measure in future DA.	Threatened plant protected during construction.	DA consent and construction phase.	Proponent PMHC
Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Low – risk of introduction of frog and plant diseases.	Very low	Consent condition in future DA for hygiene measures ie. washdown of construction machinery before entering site.	No disease introduced during major earthmoving works.	DA consent and construction phase.	PMHC
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.	High – risk of impacts on riparian zone.	Very low	Consent condition requiring include toolbox talks to ensure all workers aware of issues.	No impacts during construction.	DA consent and construction phase.	Proponent PMHC
Firewood collection banned from public reserves	Low risk of residents collecting firewood.	Very low	• Protective zoning. • Signage indicating public reserve and firewood collection is illegal	No firewood collection	DA consent Operation	Proponent PMHC

Figure 5: Proposed loss and gain areas



7 EPBC Act 1999

The provisions of the EPBC Act require determination of whether the proposal has, will or is likely to have a significant impact on a "*matter of national environmental significance"*. These matters are listed and addressed as follows:

1. **World Heritage Properties**: The site/study area is not listed as a World Heritage area nor does the proposal affect any such area.

2. **Ramsar Wetlands of International Significance**: No Ramsar wetland occurs on or adjacent to the site, nor does the proposal affect a Ramsar Wetland.

3. **Threatened Species and Communities:** The White-throated Needletail (Vulnerable), Koala (Vulnerable), Grey-Headed Flying Fox (Vulnerable) and the Spotted-tail Quoll (Endangered) considered potential occurrences in the study area. One EEC has been confirmed to occur, and possibly an ecotonal version of another nominated EEC may occur. None are considered at risk of a significant impact.

4. **Migratory Species Protected under International Agreements**: No migratory species is likely to be significantly affected by the proposal.

5. **Nuclear Actions**: The proposal is not a nuclear action.

6. **The Commonwealth Marine Environment (CME)**: Listed as relevant to the site though is not within the CME nor does it affect such.

7. **The Great Barrier Reef Marine Park:** The proposal does not affect the Great Barrier Reef Marine Park.

8. **National Heritage**: The site does not contain an item of National Heritage.

9. **A water resource, in relation to coal seam gas development and large coal mining development:** The proposal is not a mining development.

The proposal thus is not considered to require referral to the Department of Environment and Energy (DotEE) for approval under the EPBC Act.

Yours faithfully,

Jason Berrigan.
Director, JBEnviro
B. Nat. Res. (Hons). Grad. Cert. (Fish.).
MECANSW, MRZSNSW, MABS, MAHS, MAPCN