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ECOLOGICAL CONSTRAINTS & OPPORTUNITIES

MEADOW VIEWS CALDERWOOD

PREPARED FOR
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1.0 INTRODUCTION

Lodge Environmental Pty Ltd were commissioned by Indesco Pty Ltd to prepare this Ecological Constraints and Opportunities (ECO) Report in anticipation of a rezoning application for a portion of land within the Shellharbour Local Government Area (LGA), located at 142-144 Calderwood Road, Calderwood (herein referred to as the Study Area) named "Meadow Views".

This report describes the native vegetation, any threatened species, populations and communities and associated habitat features which were recorded within the Study Area. This report is based on information obtained through data searches and field survey. The legislative context, methods used, and recommendations are included within this report.

1.1 SITE DESCRIPTION

The ***Study Area*** is known as 142-144 Calderwood Road, Calderwood, identified as Lot 2 in Deposited Plan (DP) 651377 and Lot A in DP 382471. The Study Area is proposed to be divided into medium and high density residential lots (**Figure 1**). The Study Area is predominately cleared, used for cattle grazing, and contains a homestead with associated sheds and dams. The portion of the Study Area subject to future rezoning and residential development is herein referred to as the ***Subject Site***.

1.2 OBJECTIVES

The purpose of this report is to provide a preliminary understanding of the sites biodiversity values and identify and assess ecological constraints of relevance for the proposal so that an informed planning proposal can be developed. It is not the intention of this report to act as an assessment of the impacts on biodiversity to the level required to gain development consent from Council.

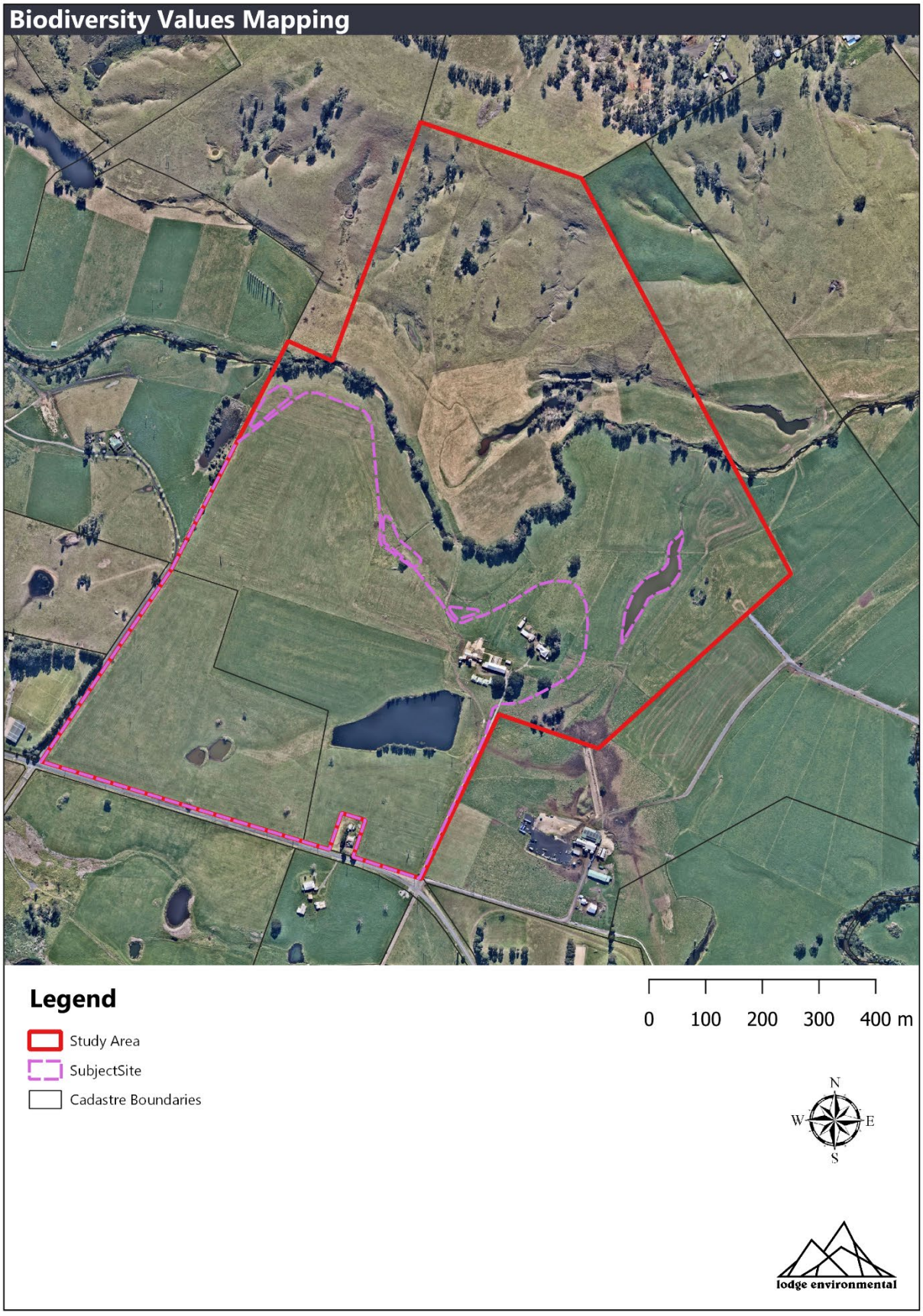


Figure 1: Aerial

2.0 LEGISLATIVE CONTEXT

2.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The NSW EP&A Act is the principal planning legislation for the state, providing a framework for the overall environmental planning, and development assessment process. Various legislative instruments, such as the BC Act, NSW *Water Management Act 2000* (WM Act) and NSW *Rural Fires Act 2007* (RF Act) are integrated with the EP&A Act and have been reviewed below where relevant. The proposal will be subject to Part 4 of the EP&A Act.

2.2 BIODIVERSITY CONSERVATION ACT 2016

The NSW BC Act aims to slow the decline of threatened species, populations and communities listed under the Act. The BC Act is integrated with the EP&A Act and requires consideration of whether a development (Part 4 of the EP&A Act) is likely to significantly affect threatened species, populations and ecological communities or their habitat.

The schedules of the BC Act lists species, populations and communities as endangered or vulnerable. All developments, land use changes or activities need to be assessed to determine if they will have an unacceptable impact on species, populations or communities listed on these schedules.

The potential impact of proposed development on any threatened species, populations or communities is assessed through application of an Assessment of Significance (AoS) under Section 7.3 of the BC Act at the development application stage. If the impacts on the area are found to be 'significant', a Biodiversity Development Assessment Report (BDAR) would be required as would concurrence from the Chief Executive of the NSW Office of Environment & Heritage (OEH) including application of the Biodiversity Assessment Methodology (BAM) and entering into the Biodiversity Offset Scheme (BOS). A BDAR would also be deemed necessary if the proposed subdivision were to involve clearance of vegetation mapped on the State Biodiversity Values Map (BVM), or involve native vegetation clearance above the thresholds tables within the BC Act (**Table 1**).

The area threshold of relevance to the Study Area with consideration to a future residential subdivision would be 0.25 ha or more of native vegetation.

Table 1: Offset scheme thresholds - area criteria

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme applies
Less than 1 ha	0.25 ha or more
1 ha, and less than 40 ha	0.5 ha or more
40 ha, and less than 1,000 ha	1 ha or more
1,000 ha or greater	2 ha or more

2.3 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The Commonwealth EPBC Act aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. Under this Act an action will require approval from the Minister for the Environment if the action has, will have, or is likely to have, a significant impact on a Matters of National Environmental Significance (MNES). MNES include listed threatened species and ecological communities, migratory species and wetlands of international importance protected under international agreements. Where applicable, the assessment criteria relevant to this Act must be drawn upon to determine whether there would be a significant impact on these species and hence whether referral to the Federal Environmental Minister is required.

2.4 RIPARIAN LEGISLATION OVERVIEW

The NSW Natural Resource Access Regulator (NRAR) administers the *Water Management Act 2000* (WM Act) and is required to assess activities carried out on waterfront land. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 meters of the highest bank of the river, lake or estuary. Certain activities within this land is defined as a 'controlled activity' and requires approval from the Office of Water.

NRAR recommends a Vegetated Riparian Zone (VRZ) is provided adjacent to the channel to provide a protective buffer between catchment land uses and aquatic habitat. This not only helps improve water quality and aquatic habitat, but provides habitat for terrestrial and riparian flora and fauna. The VRZ plus the channel width constitute the 'riparian corridor' (**Figure 2**). The width of the VRZ within waterfront land is measured from the top of the highest bank on both sides of the watercourse. The VRZ width has been predetermined and standardised for first, second, third and fourth order and greater watercourses (**Figure 3**).

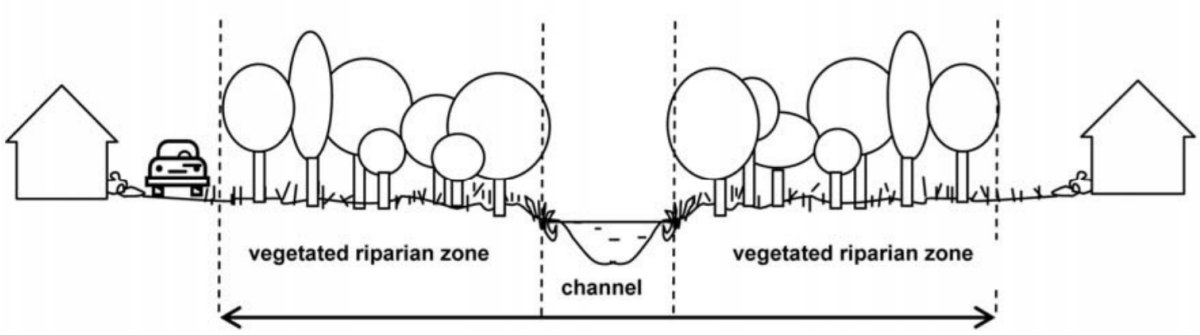
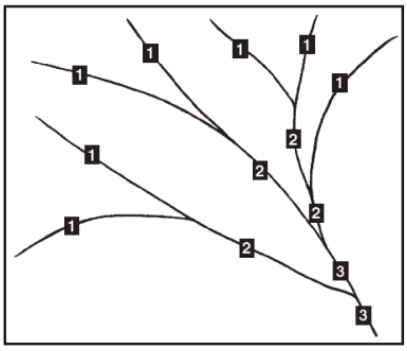


Figure 2: The riparian corridor

The watercourse type uses the Strahler stream order system of classification (**Figure 3**). The Strahler system numbers the smallest headwater streams as 1st Order, and stream order increases downstream through the catchment as streams merge and form larger streams (e.g. when two 1st Order streams join they become a 2nd Order).

Non-riparian corridor works such as asset protection zones, roads, infrastructure and recreational areas can be authorised by NRAR in the outer riparian corridor (outer 50%), so long as an equivalent area connected to the VRZ is offset and the average width of the VRZ is achieved over

the watercourse within the site (**Table 2**). The inner 50% of the VRZ must be fully maintained as a functional riparian zone.



Watercourse type	VRZ width (each side of watercourse)	Total RC width
1st order	10 metres	20 m + channel width
2nd order	20 metres	40 m + channel width
3rd order	30 metres	60 m + channel width
4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

Figure 3: The Strahler System and recommended riparian corridor widths (NRAR)

Table 2: Riparian corridor matrix

Stream order	Vegetated Riparian Zone (VRZ)	RC off-setting for non RC uses	Cycleways and paths	Detention basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1st	10m	•	•	•	•	•	•	•		
2nd	20m	•	•	•	•	•		•		
3rd	30m	•	•	•		•			•	•
4th +	40m	•	•	•		•			•	•

Watercourses are identified on 1:25,000 topographic maps published by NSW Government Spatial Services (maps.six.nsw.gov). The Guidelines for riparian corridors on waterfront land (NSW Office of Water 2012) also note that "*where a watercourse does not exhibit the features of a defined channel with beds and banks, the Office of Water may determine that the watercourse is not waterfront land for the purposes of the WM Act*". However, removal of a watercourse from the existing hydroline mapping does not alter the downstream watercourse type (i.e. Strahler stream order is fixed).

2.5 LOCAL PLANNING INSTRUMENTS

2.5.1 Shellharbour Local Environment Plan 2013

The Shellharbour Local Environment Plan 2013 (LEP) is the principle planning instrument for the Shellharbour LGA. The LEP sets out the planning framework and establishes the requirements for the use and development of land in the LGA. The LEP provides broad direction with regard to what types of development are permitted within specific land use zones.

2.5.2 Shellharbour Development Control Plan 2013

The Shellharbour Development Control Plan 2013 (DCP) aims to make detailed local provisions for all land within the LGA. Specifically, the DCP provides detailed construction, building and environmental controls for the types permitted land use described in the LEP. Environmental controls address issues such as biodiversity, bushfire prone land, trees and vegetation.

2.5.3 Wollongong LGA and Calderwood Planning Instruments

It is noted that although the Study Area is divided by Wollongong LGA in the north and Shellharbour LGA in the South, the Wollongong Council LEP and DCP are not applicable to the Subject Site. The site is also located east of and outside the land to which the Calderwood Development Control Plan applies.

3.0 METHODS

3.1 DATA AND LITERATURE REVIEW

Data records and relevant literature pertaining to the ecology of the Study Area and surrounding areas were reviewed. The material reviewed included:

- OEH threatened species profile database (DPIE 2020).
- Review of the State Biodiversity Values Map (Accessed 15 September 2020).
- Plant Community Type Vegetation Mapping (DPIE 2016).
- Relevant legislative documents.
- Aerial photography.
- Online property report.

3.2 FIELD SURVEY

To address the Ecological Constraints and Opportunities Assessment the following survey methods were undertaken on the 16th September 2020 by ecologists Jack Talbert and James Lidsey:

- Identification of plant species and vegetation communities present within the site.
- Search for signs of threatened species, observe and record significant flora and fauna – threatened and migratory species, other incidental fauna observations.
- Observe and record current disturbance and threats (e.g. weeds, trampling, litter).
- Identifying potential habitat for threatened flora and fauna species/populations (e.g. habitat bearing trees (HBTs), creeks, boulders etc) and record with a handheld GPS.
- Recording presence of environmental weeds.
- Taking reference photographs of the entire site.

3.2.1 Riparian Survey

Strahler stream order was extracted from the LPI online dataset. An assessment against the WM Act definition of a watercourse occurred during the field survey, with watercourses validated against the watercourses identified on 1:25,000 topographic maps published by NSW Government Spatial Services (maps.six.nsw.gov). The waterways considered in this assessment included:

- Marshall Mount Creek, approximately dissecting the northern and southern portions of the Study Area.
- two unnamed watercourses flanking the southern side of Marshall Mount Creek.

The waterways north of Marshall Mount Creek were not assessed as they are outside of the Subject Site. Access to the waterways within the Subject Site was adequate for the purposes of the assessment. A visual assessment of each waterway aimed to describe the general hydrology,

physical form, water quality, aquatic habitat and streamside vegetation; and provide an overall condition assessment.

3.3 SURVEY LIMITATIONS

Survey was conducted during early spring and may be outside of the optimal survey period for some flora and fauna species. It is therefore possible that some species may not have been detected due to their seasonal geographic variation. Cryptic species may not have been obvious. Targeted surveys were not conducted during the site visit.

Results from a desktop review a number of species that may require further surveys if the Biodiversity Offsets Scheme (BOS) is triggered including;

- Large-eared Pied Bat *Chalinolobus dwyeri* – Survey period; November – January
- Southern Myotis *Myotis Macropus* – Survey period; October - March

4.0 DESKTOP REVIEW

4.1 BIODIVERSITY VALUES MAP

There is some land within the Study Area mapped on the State Biodiversity Values Map (BVM) however it is not encroached by the Subject Site (**Figure 4**). The BVM entrance trigger into the Biodiversity Offset Scheme is not applicable under the current concept plan.

4.2 EXISTING VEGETATION MAPPING

A review of vegetation mapping that covers the Study Area (DPIE 2016) identified two vegetation communities within the Study Area (**Figure 5**) – being;

- Woolybutt - White Stringybark - Forest Red Gum grassy woodland on coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion – **PCT 1326**
- River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion – **PCT 1105**

Three PCTs were also mapped in close proximity to the Study Area – being;

- Coastal freshwater wetland – **PCT 781**
- Coastal freshwater swamp forest – **PCT 1232**
- Estuarine Swamp Oak forest – **PCT 1234**

4.3 STREAM ORDER

Streams within the Study Area were assigned a stream order in accordance with the Strahler system and LPI dataset. Desktop assessment results are shown in **Figure 6**.

Marshall Mount Creek forms the key drainage corridor flowing west to east across the Study Area, linking downstream with Macquarie Rivulet. There are also a number of 1st order streams leading into Marshall Mount Creek from the north and south, with a 3rd order stream leading from the east.

Figure 4: Biodiversity Values Mapping

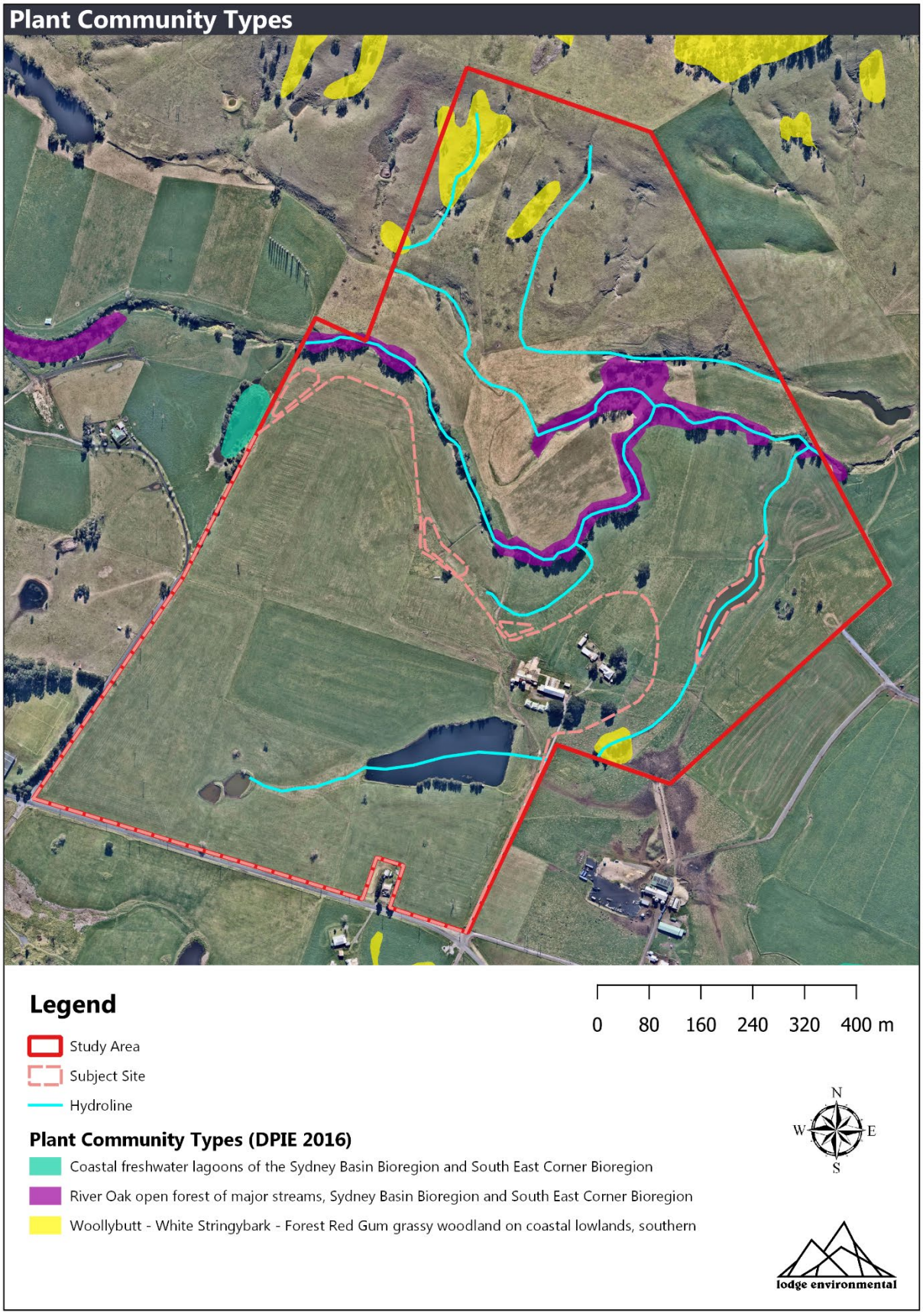


Figure 5: Vegetation communities without field validation (DPIE 2020)

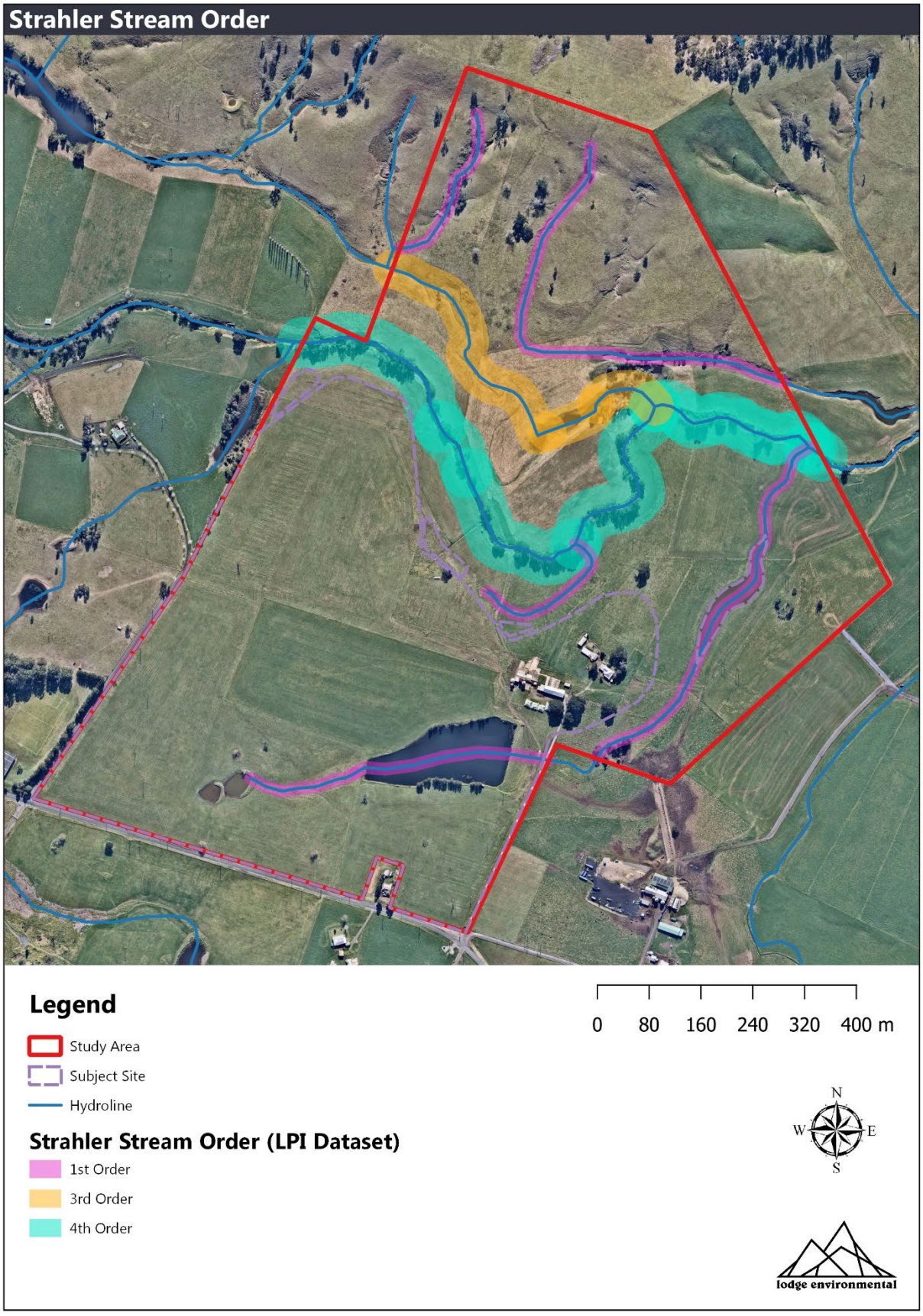


Figure 6: Strahler Steam Order

4.4 ZONING

The Study Area comprises four zoning classifications, however, the portion of the site subject to rezoning is covered by **RU1 – Primary Production**.

4.5 THREATENED SPECIES

A review of the DPIE and Department of the Environment and Energy (DEE) databases identified 109 threatened flora and fauna listed under the BC Act and/or the EPBC Act that have been previously recorded, or are considered to have habitat, within 10 km of the site (**Figure 7**). This initial compilation of potentially occurring species informed the site survey, providing an indication of which species required consideration within the site.

The following threatened flora species in **Table 3** were identified as having a potential to occur within the Study Area prior to field survey.

Table 3: Potentially occurring threatened flora prior to field survey

Scientific name	Common name	BC	EPBC
Flora			
Chorizema parviflorum	Chorizema parviflorum Benth. in the Wollongong and Shellharbour Local Government Areas	E	-
Cynanchum elegans	White-flowered Wax Plant	E	E
Gossia acmenoides	Gossia acmenoides population in the Sydney Basin Bioregion south of the Georges River	E	-
Lespedeza juncea subsp. *sericea*	-	E	-
Pimelea curviflora var. *curviflora*	-	V	V
Pterostylis gibbosa	Illawarra Greenhood	E	E
Solanum celatum	-	E	-
Zieria granulata	Illawarra Zieria	E	E

The following threatened fauna species in **Table 4** were identified as having a potential to occur within the Study Area prior to field survey.

Table 4: Potentially occurring threatened fauna prior to field survey

Scientific name	Common name	BC	EPBC
Birds			
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-
Botaurus poiciloptilus	Australasian Bittern	E	E
Circus assimilis	Spotted Harrier	V	-
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-
Ixobrychus flavicollis	Black Bittern	V	-
Lophoictinia isura	Square-tailed Kite	V	-
Oxyura australis	Blue-billed Duck	V	-
Petroica boodang	Scarlet Robin	V	-
Petroica phoenicea	Flame Robin	V	-
Rostratula australis	Australian Painted Snipe	E	E
Stictonetta naevosa	Freckled Duck	V	-
Amphibian			
Litoria aurea	Green and Golden Bell Frog	V	E
Mammals			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-
Miniopterus australis	Little Bent-winged Bat	V	-
Miniopterus schreibersii oceanensis	Large Bent-winged Bat	V	-
Myotis macropus	Southern Myotis	V	-
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Scoteanax rueppellii	Greater broad-nosed bat	V	-

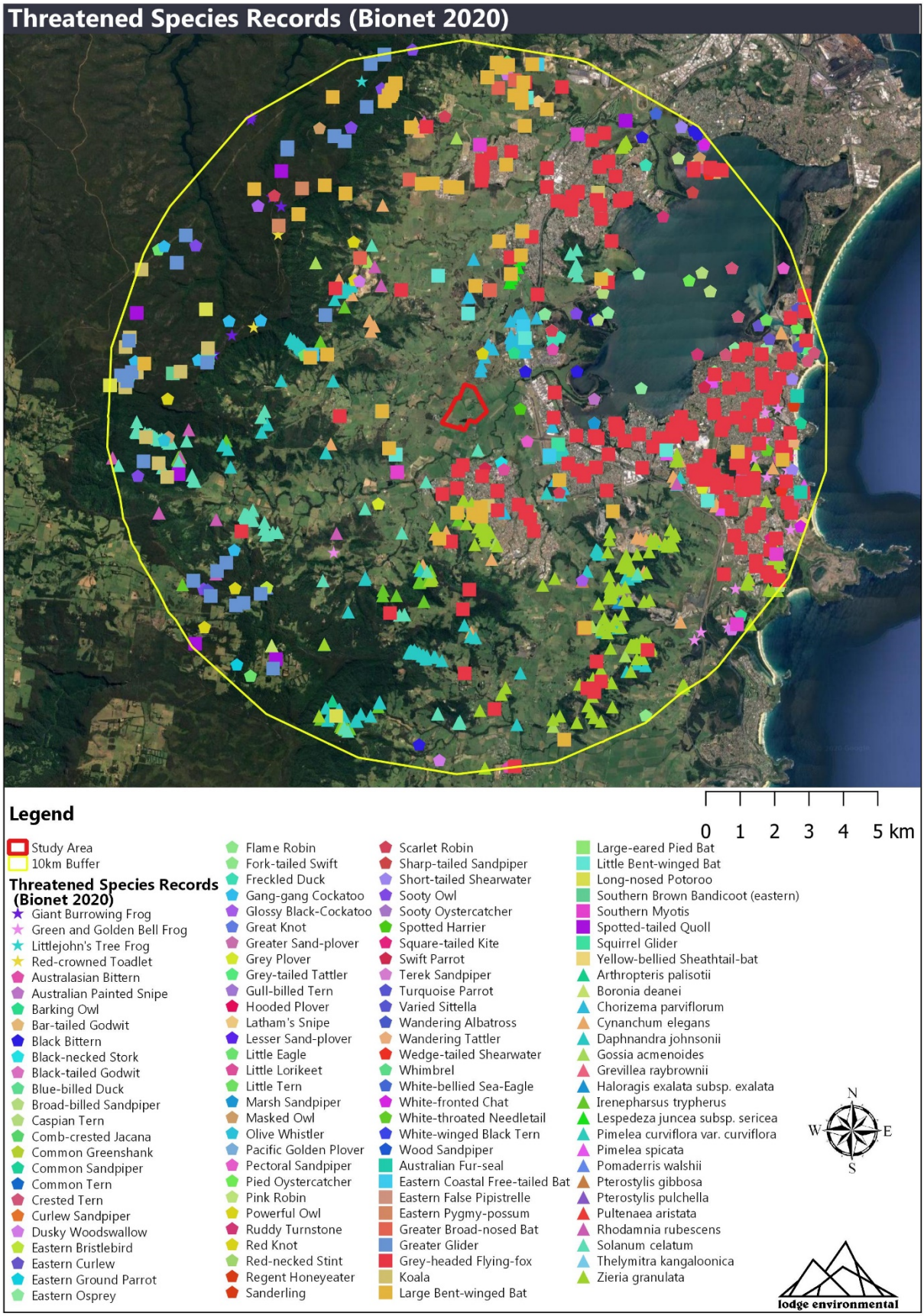


Figure 7: Threatened Species Records within 10km (Bionet 2020)

5.0 FIELD SURVEY RESULTS

5.1 EXISTING ENVIRONMENT AND HABITAT

The environment of the Study Area comprised predominately cleared land, used for cattle grazing, and contained a homestead with associated sheds and dam. The land appears to have a long history of agrarian use and clearing. The native vegetation patches exist primarily within the riparian corridor associated with Marshall Mount Creek, as well as south of the dam and surrounding the homestead and associated sheds.

The native tree cover across the site is expected to facilitate the movement and foraging of a wide variety of highly mobile native fauna species (i.e. birds and mammals) between the Study Area and wider locality. Recorded habitat features are mapped in **Figure 10** with descriptions of each feature below (**Table 5**). Notable features included habitat bearing trees, feed trees, artificial structures and the dams.

Table 5: Habitat features present within the Study Area

Habitat Feature	Description of the feature	Presence of the habitat feature	Number of features within the Study Area
Habitat-bearing trees	Habitat-bearing trees can be alive or dead (stag) and include any additional sheltering, roosting or nesting features that may be relied upon by native fauna, but are not captured within the traditional definition of a Hollow-bearing tree. These features include; Hollows, crevices, cracks, fissured branches, exfoliating bark, nests, dreys and arboreal termite mounds	Habitat-bearing trees were present within the Study Area	A total of 14 Habitat-bearing Trees were identified within the Study Area. Habitat features included. 23x Small hollows 8x Medium hollows 3x Large hollows 1x Fissured branch 2x Nests
Species specific feed trees	A number of threatened fauna rely on specific feed trees for foraging purposes. Some feed trees can be essential during wintertime when foraging resources in the landscape are relatively sparse	Several *Ficus* species were identified within the Study Area. These generally fruit in early spring and are an important resource for locally occurring threatened species such as the Grey-headed Flying-fox	6x *Ficus macrophylla* 1x *Ficus superba* 1x *Ficus rubiginosa*
Waterbodies	Waterbodies are valuable resource within the landscape for a variety of threatened and non-threatened fauna.	Marshall Mount Creek runs from west to east through the Study Area. The vegetation along within the riparian corridor was identified as PCT 1105. This provides habitat for a variety of threatened and non-threatened species. Two dams were identified in the Southern portion of the Study Area. Although suitable roosting habitat for threatened fauna was	Marshall Mount Creek runs from west to east through the Study Area. Two constructed dams were identified within the Study Area.

		not recorded, the dam is considered to provide opportunistic foraging habitat for a variety of threatened and non-threatened fauna (**Figure 8**)	
Artificial Structures	Artificial structures have the potential to provide unique microhabitats for a variety of threatened and non-threatened fauna, a more notable group that utilise artificial structures is microbats	Several artificial structures that were considered habitat for fauna were identified across the Study Area. The use of thick hardwood for the foundations of the structures creates unique microhabitats.	Most structures identified on site showed potential signs of habitat suitability for a number of threatened microbat species.

Figure 8: A dam identified within the Study Area

5.2 RIPARIAN ASSESSMENT

The riparian assessment focused on the streams that fell within the Subject Site. This included the 4th order stream Marshall Mount Creek and two previously mapped 1st order streams running into Marshall Mount Creek

Marshall Mount Creek is a 4th order stream, requiring a 40m Vegetated Riparian Zone (VRZ). Its riparian corridor (VRZ + channel) is mapped in **Figure 6**. The current proposed layout avoids encroachment into the VRZ zone therefore no further considerations are given to Marshall Mount Creek.

The two unnamed waterways running into Marshall Mount Creek within the south east of the Study Area were mapped as 1st order waterways. Inspection during field investigations confirmed the waterways do not exhibit any defined bed, channel, banks or geomorphic processes and are mostly indistinguishable from the surrounding exotic paddock.

Results of the condition assessment of each inspected creek are in **Table 6** and **Table 7**. The final validated riparian corridors are displayed in **Figure 9**.

For the purposes of the *Water Management Act 2000* (WM Act), the 1st order streams assessed did not meet the definition of a 'river' under the WM Act. Land within 40m of the 1st order streams is therefore not considered waterfront.

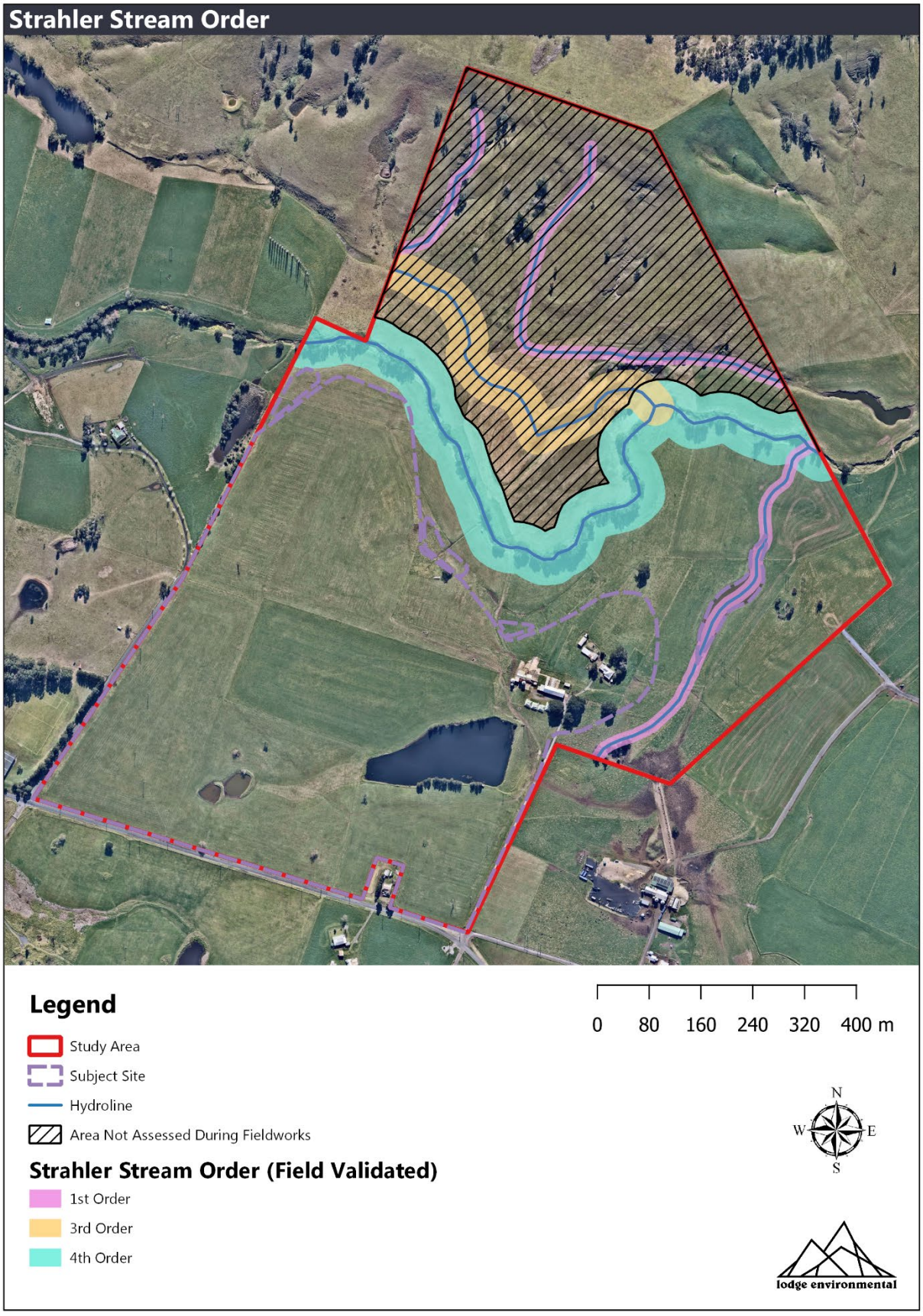


Figure 9: Validated Streams (LE 2020)

Table 6: Condition assessment of Marshall Mount Creek

Waterway	Marshall Mount Creek
Stream order	4th
Hydrology and Physical Form	The drainage line was recorded in a stable condition. The waterway features an incised bed, faceted lower bed benches and near vertical walls. The channel bed is lined with small to large rocks. Agricultural disturbance is present in the form of trampling from cattle, vegetation thinning and weediness.
Water Quality and Aquatic Habitat	The water quality was observed to be turbid and moderately fast flowing. The stream did not contain aquatic vegetation but showed signs of woody debris and rocks which would contribute towards habitat complexity.
Streamside Vegetation	Streamside vegetation was thin, generally of one tree width, and occasionally weedy. *Casuarina* sp. dominated.
Overall Condition	Moderate-poor
Photos	 Creek showing clear Top of Bank facing north east.

Creek showing clear Top of Bank facing south west, with weediness apparent.

In stream environment, dominated by Sheoak and occurrences of the invasive *Salix* sp.

No in stream vegetation apparent, banks were dominated by exotic species.

Example exotic species identified across the bank - *Ageratina riparia* (Mist Flower)

Table 7: Condition assessment of western most unnamed waterway

Waterway	Unnamed – north of the Subject Site, south of Mount Marshall Creek
Stream order	1st
Hydrology and Physical Form	1st order stream within a cleared paddock. Upper reaches consist of paddock. Ephemeral overland flows only. No defined bed, channel, bank or geomorphic process (e.g. no erosion, sediment transport or deposition zones). A pathway was noted from cattle using the area for movement.
Water Quality and Aquatic Habitat	Nil. Covered in Kikuyu.
Streamside Vegetation	Nil. As above.
Overall Condition	Degraded. Not a 'river' under WM Act
Photos	 No 'river' along unnamed waterway

Table 8: Condition assessment of unnamed waterway running through the large farm dam

Waterway	Unnamed – within Subject Site
Stream order	1st
Hydrology and Physical Form	1st order stream within a cleared paddock. Upper reaches consist of a large farm dam. Ephemeral overland flows only. No defined bed, channel, bank or geomorphic process (e.g. no erosion, sediment transport or deposition zones).
Water Quality and Aquatic Habitat	Nil. Covered in Kikuyu.
Streamside Vegetation	Nil. As above.
Overall Condition	Degraded. Not a 'river' under WM Act
Photos	 No 'river' along unnamed waterway

5.3 VEGETATION COMMUNITIES

The field inspection recorded four vegetation types as mapped in **Figure 10**, which included:

- PCT 1105 - River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion (Poor Condition)
- PCT 1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion (Poor Condition)
- PCT 1300 - Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion (Poor Condition)
- No PCT Cleared / Exotic Pastures and Trees
- No PCT Planted Natives

Two of these PCTs are associated with Endangered Ecological Communities (EEC) including;

- Illawarra Subtropical Rainforest in the Sydney Basin Bioregion – **PCT 1300**
- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions – **PCT 1232**

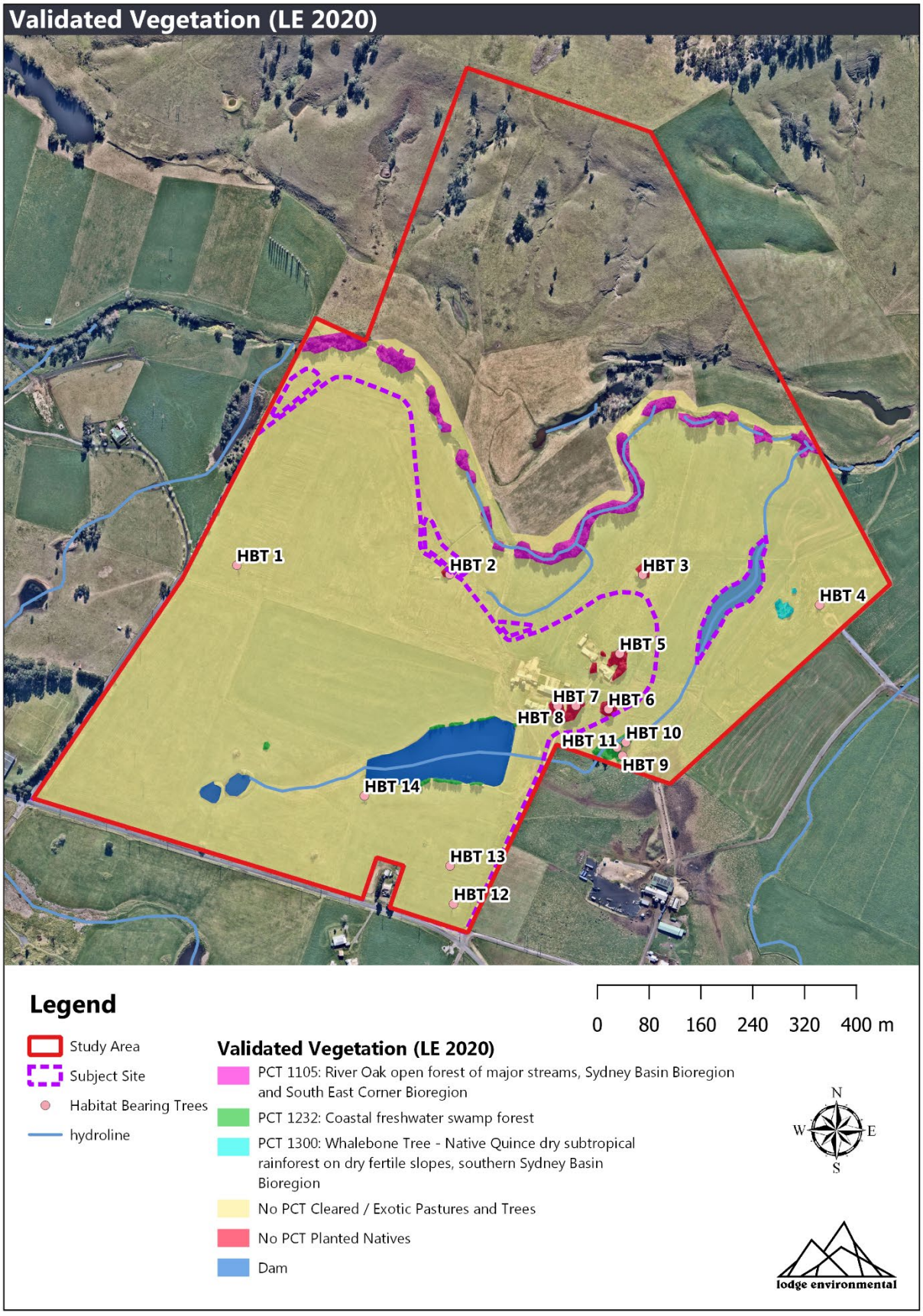


Figure 10: Validated vegetation communities and habitat features as mapped by Lodge Environmental (2020)

PCT 1105 - River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion (Poor condition)

This vegetation community is generally dominated by *Casuarina cunninghamiana* (River Oak) in the upper stratum. The mid stratum is co-dominated by *Acacia floribunda* (White Sally Wattle) and *Acacia mearnsii* (Black Wattle) with occurrences of *Pandorea pandorana* (Wonga Wonga Vine)*; Stephania japonica* (Snake Vine)*; Urtica incisa* (Stinging Nettle) and *Hymenanthera dentata* (Tree Violet) throughout. The ground stratum is co-dominated by various species including *Dichondra repens* (Kidney Weed)*; Lomandra longifolia* (Spiny-Head Mat-Rush)*; Microlaena stipoides* var*. stipoides* (Weeping Grass)*; Oplismenus aemulus* (Australian Basket Grass).

The *River Oak open forest of major streams (Poor Condition)* area of vegetation (**Figure 10**) grows primarily along the edges of Marshall Mount Creek. Within the Study Area the vegetation community was poorly represented with the only diagnostic species present being the *Casuarina cunninghamiana* (River Oak) in the upper canopy and occasional occurrences of mid stratum species including; *Acacia mearnsii* (Black Wattle) and *Urtica incisa* (Stinging Nettle).

No threatened flora species were recorded within the vegetation type.

The Plant Community Type (PCT) 1105 – River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion is further broken down in **Table 9**

Table 9: PCT Justification Table

River Oak open forest of major streams			
PCT ID	1105		
Vegetation formation	Forested Wetlands		
Vegetation class	Eastern Riverine Forests		
PCT Generic descriptor	Other Diagnostics Features: Occurs on sand or gravel alluvium along swift-flowing streams such as the Coxs, Abercrombie, Wollondilly, Shoalhaven and Deua Rivers between 20 and 600m. Open or tall open forest with an open shrub layer and a dense or patchy groundcover of grasses and forbs.; Landscape Position: Occurs on river banks of major rivers or banks of swift flowing streams and rivers.		
Condition on site	Poor condition		
Survey effort	Random meander		
PCT Justification: Expected Species by Stratum (Bold denotes species present within Study Area patch)	Upper Stratum: ***Casuarina cunninghamiana***	Mid Stratum: *Acacia floribunda;* ***Acacia mearnsii****;* *Pandorea pandorana;* *Stephania japonica;* ***Urtica incisa;*** *Hymenanthera dentata;*	Ground Stratum: *Dichondra repens;* *Lomandra longifolia;* *Microlaena stipoides* var*. stipoides;* *Oplismenus aemulus*
TEC Status	There are currently no TECs associated with this PCT.		

PCT Photo	

PCT 1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion (Poor Condition)

This PCT is generally represented by *Casuarina glauca* (Swamp Oak) dominating the canopy with *Melaleuca* spp. (Paperbarks) also being present. The shrub layer is very sparse. A diverse range of plant species can occur in response to the prevailing conditions. Herbs, ferns, grasses, rushes and sedges may be found in various combinations at any given site. Distinctly freshwater conditions may feature *Persicaria decipiens* (Slender Knotweed), *Carex appressa* (Tall Sedge) and *Gahnia sieberiana* (Red-Fruit Saw-Sedge). Sites that have a brackish influence commonly include *Juncus kraussii* (Sea Rush) amongst the ground layer.

The *Swamp Oak floodplain swamp forest (Poor Condition)* area of vegetation (**Figure 10**) grows in poorly drained substrates that are periodically inundated by water. Within the Study Area the vegetation community was poorly represented with the only diagnostic species present being the *Casuarina glauca* (Swamp Oak) in the upper canopy. The shrub layer was absent and ground layer ranged between bare ground and exotic dominated ground cover.

No threatened flora species were recorded within the vegetation type.

The Plant Community Type (PCT) 1232 - Swamp Oak floodplain swamp forest, Sydney Basin Bioregion and South East Corner Bioregion is further broken down in **Table 10**

Table 10: PCT Justification Table

River Oak open forest of major streams	
PCT ID	1232
Vegetation formation	Forested Wetlands
Vegetation class	Coastal Swamp Forests
PCT Generic descriptor	Coastal Freshwater Swamp Forest occupies poorly drained substrates that are periodically inundated by fresh or brackish water. Swamp oak (*Casuarina glauca*) forms an open too dense canopy. Tall paperbarks (*Melaleuca* spp.) may also be present in the upper stratum, although more frequently they are found as small trees in the sub-canopy layer. The shrub layer is very sparse. Instead there is a prominent cover of water-loving plants found beside open boggy ground and standing water. A diverse range of plant species can occur in response to the prevailing conditions. Herbs, ferns, grasses, rushes and sedges may be found in various combinations at any given site. Distinctly freshwater conditions may feature slender knotweed (*Persicaria decipiens*), tall sedge (*Carex appressa*) and red-fruit saw-sedge (*Gahnia sieberiana*). Sites that have a brackish influence commonly include sea rush (*Juncus kraussii*) amongst the ground layer. Coastal Freshwater Swamp Forest is found across the coastal plain and hinterland of the Sydney metropolitan area. It is not restricted to particular substrates. While it is commonly found on floodplains it also occurs near freshwater lagoons associated with sand deposits, poorly drained shale depressions on the Cumberland Plain and freshwater fed backswamps near coastal estuaries. Sample sites within the Sydney area lie within an elevational range of two to 10 metres above sea level and a mean annual rainfall range of 850 to 1250 millimetres. Elsewhere this community is found in similar habitats along the New South Wales south coast (Tozer *et al.* 2010) and Central Coast (NPWS 2000c).
Condition on site	Poor condition

Survey effort	Random meander		
PCT Justification: Expected Species by Stratum (Bold denotes species present within Study Area patch)	Upper Stratum: ***Casuarina glauca;*** *Melaleuca quinquenervia*	Mid Stratum: *Myoporum* spp.*;* *Melaleuca ericifolia;* *Melaleuca styphelioides*	Ground Stratum: *Juncus kraussii;* *Samolus repens;* *Sarcocornia quinqueflora;* *Suaeda australis;* *Baumea juncea;* *Cynodon dactylon;* *Alternanthera denticulata;* *Carex appressa;* *Centella asiatica;* *Commelina cyanea;* *Phragmites australis*
TEC Status (Bold denotes TEC present within Study Area patch)	There are a number of TECs associated with this community including; • Listed BC Act, Endangered: River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part); • **Listed BC Act, Endangered: Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Part)** • Listed BC Act, Endangered: Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Equivalent);		
PCT Photo			

PCT 1300 - Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion (Poor Condition)

This vegetation community generally has an upper stratum consisting of *Streblus brunonianus* (Whalebone Tree), *Alectryon subcinereus* (Native Quince), *Pittosporum undulatum* (Sweet Pittosporum), *Diospyros australis* (Black Plum), *Alphitonia Excelsa* (Red Ash), *Acacia maidenii* (Maiden's wattle) and *Pouteria australis* (Black Apple). The mid stratum is co-dominated by *Backhousia myrtifolia* (Grey myrtle), *Guioa semiglauca* (Wild Quince), *Breynia oblongifolia* (Coffee Bush), *Clerodendrum tomentosum* (Downy Chance), *Croton verreauxii* (Green Native Cascarilla), *Eustrephus latifolius* (Wombat Berry), *Geitonoplesium cymosum, Maclura cochinchinensis* (Cockspur Thorn), *Marsdenia rostrata, Myrsine variabilis* (Muttonwood), *Notelaea venosa, Pandorea pandorana* (Wonga Wonga Vine), *Parsonsia straminea* Monkey Rope), *Pittosporum multiflorum* (Orange Thorn), *Pittosporum revolutum* (Rough-Fruited Pittosporum), *Smilax australis* and *Cassine australis* (Red Olive-Berry). The ground stratum is co-dominated by various species including *Asplenium flabellifolium* (Necklace Fern), *Doodia aspera* (Prickly Rasp), *Gymnostachys anceps, Oplismenus imbecillis, Pellaea falcata* (Sickle Fern) and *Pseuderanthemum variabile.*

Within the Study Area the vegetation community was poorly represented with the only diagnostic species present being the *Streblus brunonianus* (Whalebone Tree), in the upper canopy. The shrub layer was absent and ground layer was dominated by exotic ground cover.

No threatened flora species were recorded within the vegetation type.

The Plant Community Type (PCT) 1300 - Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes, southern Sydney Basin Bioregion is further broken down in **Table 11**

Table 11: PCT Justification Table

Whalebone Tree - Native Quince dry subtropical rainforest on dry fertile slopes			
PCT ID	1300		
Vegetation formation	Rainforests		
Vegetation class	Dry Rainforests		
PCT Generic descriptor	Other Diagnostics Features: Low closed forest with prominent shrub stratum and sparse groundcover. Landscape Position: Occurs mainly on dry slopes on fertile soils below about 300m in the Illawarra-Kiama and Milton areas.		
Condition on site	Poor condition		
Survey effort	Random meander		
PCT Justification: Expected Species by Stratum (Bold denotes species present within Study Area patch)	Upper Stratum: ***Streblus brunonianus***, *Alectryon subcinereus,* *Pittosporum undulatum,* *Diospyros australis,* *Alphitonia excelsa;* *Acacia maidenii;*	Mid Stratum: *Backhousia myrtifolia;* *Guioa semiglauca;* *Breynia oblongifolia;* *Clerodendrum tomentosum;* *Croton verreauxii;*	Ground Stratum: *Asplenium flabellifolium;* *Doodia aspera;* *Gymnostachys anceps;* *Oplismenus imbecillis;* *Pellaea falcata;* *Pseuderanthemum variabile*

	Pouteria australis	*Eustrephus latifolius;* *Geitonoplesium cymosum;* *Maclura cochinchinensis;* *Marsdenia rostrata;* *Myrsine variabilis;* *Notelaea venosa;* *Pandorea pandorana;* *Parsonsia straminea;* *Pittosporum multiflorum;* *Pittosporum revolutum;* *Smilax australis;* *Cassine australis*	
TEC Status (<u>Bold denotes TEC present within Study Area patch</u>)	There are a number of TECs associated with this community including; • **Listed BC Act, Endangered: Illawarra Subtropical Rainforest in the Sydney Basin Bioregion (Equivalent);** • Listed BC Act, Endangered: Milton Ulladulla Subtropical Rainforest in the Sydney Basin Bioregion (Equivalent)		
PCT Photo			

No PCT Cleared / Exotic Pastures and Trees

The No PCT Cleared / Exotic Pastures and Trees primarily consisted of *Pennisetum clandestinum* (Kikuyu) within the pasture grazing areas which covered the large majority of the Study Area (**Figure 11**). This vegetation area was heavily grazed by cattle and was comprised of primarily ground stratum with minor occurrences of landscaped native tree species such as *Ficus* spp. (Figs). No threatened flora species were recorded within the vegetation type.

Figure 11: No PCT Cleared / Exotic Pastures

No PCT Planted Natives

Several planted natives were identified across the Study Area. Planted natives included:

- *Angophora floribunda* (Rough-Barked Apple)
- *Brachychiton acerifoliusb* (Flame Bottletree)
- *Eucalyptus bosistoana* (Coast Grey Box)
- *Ficus macrophylla* (Moreton Bay Fig)
- *Ficus superba* var*. henneana* (Strangler Fig)
- *Ficus rubiginosa* (Port Jackson Fig)
- *Melaleuca citrina* (Bottlebrush)
- *Melaleuca styphelioides* (Prickly-leaved Paperbark)

A notable species in the planted natives was the numerous *Ficus macrophylla* (Moreton Bay Fig) recorded across the Study Area as scattered paddock trees (**Figure 12**). Moreton Bay Figs are typical of early plantings introduced throughout the Illawarra region used for ornamental purposes and as windbreaks to protect homesteads and associated buildings.

Ficus macrophylla, commonly known as the Moreton Bay Fig, is a large evergreen banyan tree of the *Moraceae* family that is a native of most of the eastern coast of Australia, from the Atherton Tableland in the north to the Illawarra and Lord Howe Island. Its common name is derived from Moreton Bay in Queensland, Australia. It is best known for its beautiful buttress roots. *Ficus macrophylla* is a "strangler fig", it has an "obligate mutualism" with fig wasps and its roots are highly aggressive. Aboriginal people traditionally used the fibres for fishing nets.

No threatened flora species were recorded within the vegetation type.

Figure 12: No PCT Planted Natives - *Ficus macrophylla*

5.4 FLORA

A total of 56 species were recorded during the site inspection (18 natives and 38 exotic). A species list is provided in **Appendix A**.

5.4.1 Threatened Flora Species

There were no threatened flora species identified within the site. Following site survey and observing the environmental conditions within the Study Area, it was determined that the proposed impact areas provide a very low likelihood that any threatened flora species previously mentioned would occur within the site.

5.5 FAUNA

A total of 28 fauna species were identified within the site. A species list is included in **Appendix B**. Targeted surveys were not conducted as part of this assessment.

5.5.1 Threatened Fauna Species

There were no threatened fauna species identified within the site.

There is potential for a number of mobile threatened fauna species to utilise the site for roosting and foraging purposes within the native canopy, artificial structures and habitat bearing trees. A total of 14 Habitat-bearing trees (HBTs) were recorded within the Study Area during survey. These features, as well as the native canopy and site structures, provide potential habitat for locally occurring threatened fauna as listed in (**Table 12**).

Table 12: Threatened fauna species with a potential to use the sites habitat features

Scientific name	Common name	BC	EPBC
Birds			
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-
Circus assimilis	Spotted Harrier	V	-
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-
Lophoictinia isura	Square-tailed Kite	V	-
Oxyura australis	Blue-billed Duck	V	-
Petroica boodang	Scarlet Robin	V	-
Petroica phoenicea	Flame Robin	V	-
Stictonetta naevosa	Freckled Duck	V	-
Mammals			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-
Miniopterus australis	Little Bent-winged Bat	V	-
Miniopterus schreibersii oceanensis	Large Bent-winged Bat	V	-
Myotis macropus	Southern Myotis	V	-
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Scoteanax rueppellii	Greater broad-nosed bat	V	-

5.5.2 Habitat Bearing Trees

A total of 14 Habitat Bearing Trees (HBT) were recorded during the field investigations within the Study Area. HBTs are categorised in **Table 13** with their corresponding location mapped in **Figure 13**.

Table 13: Habitat Bearing Trees and their corresponding habitat features

HBT	Habitat Feature	Total Habitat Features
1	**4 x Medium Hollows and 1 x Large Hollow**	**5**
2	**2 x Small Hollows**	**2**
3	2 x Small Hollows and 1 x Medium Hollow	3
4	6 x Small Hollows and 1 x Medium Hollow	7
5	3 x Small Hollows	3
6	1 x Small Hollow	1
7	2 x Small Hollows	2
8	1 x Nest	1
9	Stag: 3 x Small Hollows	3
10	1 x Medium Hollow	1
11	2 x Small Hollows and 1 x Fissured Branch (equivalent to a small hollow)	3
12	**Stag: 6 x Small Hollows, 1 x Medium Hollow and 1 x Large Hollow**	**8**

13	**Stag: 1 x Large Hollow**	**1**
14	**1 x Medium Hollow and 1 x Nest**	**2**
	Total	42 (**18**)

Bolded text denotes HBTs proposed for removal

A total of five off the 14 HBTs are currently proposed to be removed. Within these HBTs a total of 18 habitat features were identified. The remaining 9 HBTs and 24 habitat features will be marked for retention.

5.6 BOS ENTRY

Currently, the proposal includes the removal of 0.1 ha of native vegetation (**Figure 13**). This is below the BOS impact entry threshold of 0.25 ha for the Study Area. Therefore, the first BOS entry trigger is not met.

The second trigger relates to areas mapped as Biodiversity Values (BV). Within the Study Area, BV mapping is restricted to Marshall Mount Creek and the associated riparian vegetation. Impacting any native vegetation (including groundcover, trees and understorey plants) within BV mapped areas will trigger entry into the BOS. If development within areas on the BV Map does not involve clearing native vegetation or a prescribed impact (as set out in clause 6.1 of the Biodiversity Conservation Regulation 2017), the BOS is not applied based on the BV Map, and entry into the BOS is not triggered.

The current proposal layout does not encroach into areas mapped as BV along Marshall Mount Creek, therefore the second BOS trigger is not met. Care should be taken as to avoid unnecessary entry into the BOS.

The third and final BOS entry trigger is whether the proposal will result in a significant impact on species or ecological communities listed under the BC Act. An FFA will be required to undertake Assessments of Significance (AoS) at the DA stage to document whether a significant impact is considered likely.

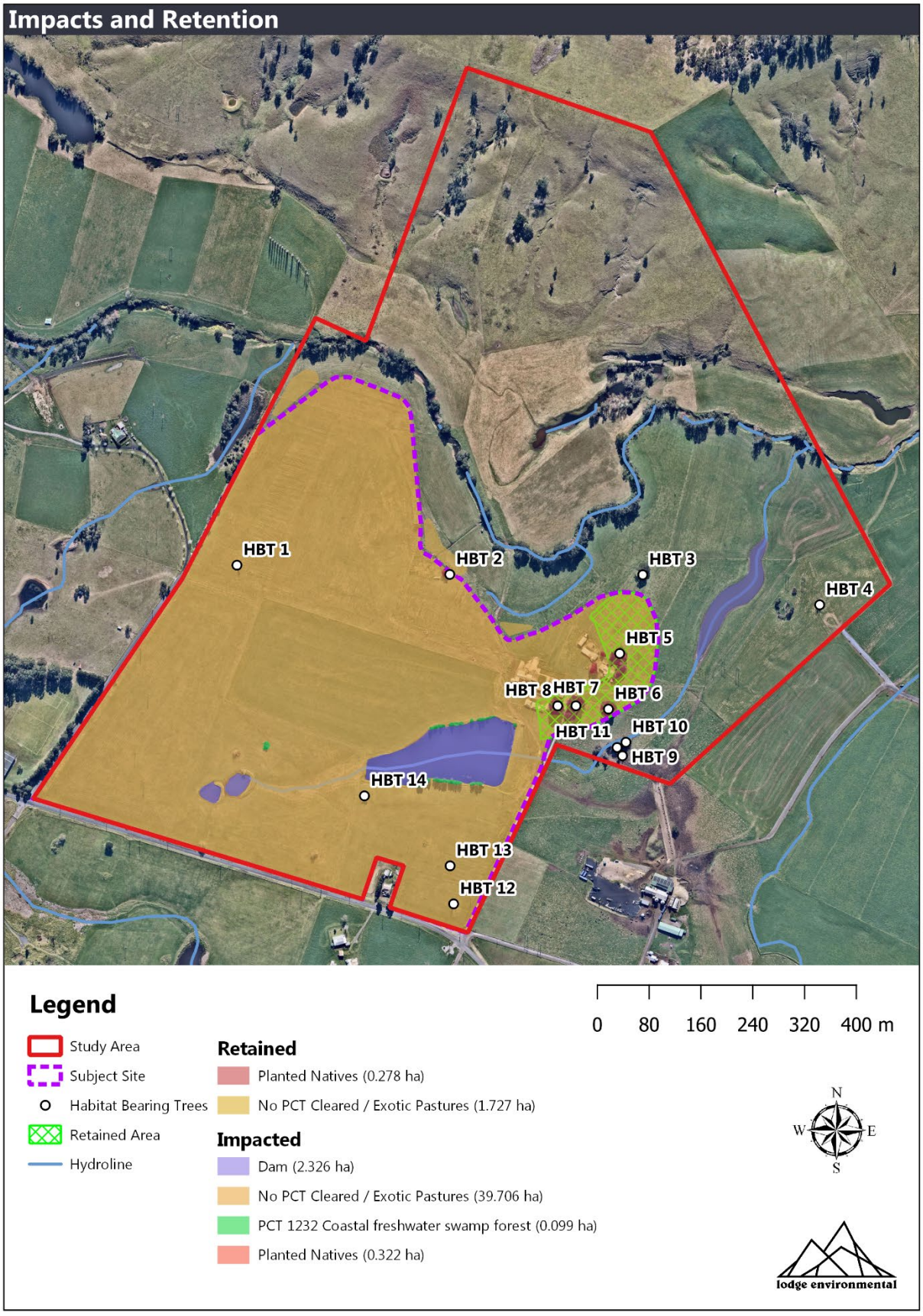


Figure 13: Areas of impact and retention

6.0 ECOLOGICAL CONSTRAINTS

Ecological values identified through the literature review and field survey were ranked on a scale of high, moderate, and low based on the level of ecological value and legislative protection. The constraint levels and relevant attributes recorded within the Study Area are detailed in **Table 13**.

Table 14: Ecological Constraints within the Study Area

Constraint Level	Description/Activity
High	• Encroaching into Biodiversity Values (BV) mapping associated with Marshall Mount Creek. • Removal of Habitat-bearing trees (HBT)
Moderate	• Removal of feed trees for listed nomadic pollinators • Adjacent wetland in North Western corner
Low	• Clearance of pre-existing cleared land • Dewatering of the dam

High Constraints

If the proposed development encroaches into BV mapping associated with Marshall Mount Creek the Biodiversity Offsets Scheme (BOS) may be triggered and potential offsets required. If development is proposed within areas of the BV Map and does not involve clearing native vegetation or a prescribed impact (as set out in clause 6.1 of the Biodiversity Conservation Regulation 2017) within the mapped area, the BOS is not applied based on the BV Map, and entry into the BOS is not triggered.

The HBTs contain small, medium and large hollows which could be utilised by numerous threatened fauna species. It is recommended that the HBTs within the impact area are considered in the context of the subdivision design with the goal of retaining these important trees wherever possible. If any HBTs are to be cleared it is recommended that nocturnal survey is undertaken to assess the usage of the tree by any threatened fauna. Assessments of Significance (AoS) will need to be undertaken within a Flora and Fauna Assessment (FFA) for the potentially occurring fauna should the removal of these trees be deemed unavoidable. Recommendations should include consideration of the following:

Habitat Clearance Procedure

Clearing should be a two-stage process where non-habitat trees are removed first, encouraging fauna to move on to other areas, followed by the removal of habitat trees.

Removal of the HBTs is to be conducted under supervision of a qualified and licenced ecologist with experience in handling wildlife and who is vaccinated for Australian Bat Lyssavirus. The ecologist will instruct on soft felling techniques to reduce the potential for harm to any fauna residing in the habitat features. The clearance will be undertaken in stages and detailed further within a FFA.

Nest Boxing

Nest boxing is recommended to assist in mitigating the impacts associated with the removal of any HBTs. Numbers and types of nest boxes are to be finalised within the FFA. A suitably qualified ecologist is recommended to advise on and supervise the installation of nest boxes within the areas of retained vegetation within the Study Area.

Moderate Constraints

Feed trees for listed nomadic pollinators should be considered for retention where possible. Tree species considered to be more preferential to the listed species and nomadic pollinators below should be prioritised for retention. Listed nomadic pollinator species include:

- Grey-headed Flying-fox *Pteropus poliocephalus* - Vulnerable EPBC and BC Act

Tree species identified within the Study Area that are considered feed tree species include:

- *Angophora floribunda* (Rough-Barked Apple)
- *Eucalyptus bosistoana* (Coast Grey Box)
- *Ficus macrophylla* (Moreton Bay Fig)
- *Ficus superba* var*. henneana* (Strangler Fig)
- *Ficus rubiginosa* (Port Jackson Fig)
- *Melaleuca citrina* (Bottlebrush)
- *Melaleuca styphelioides* (Prickly-leaved Paperbark)

If avoidance of all feed trees is not possible, future landscaping should aim to replenish any lost feed trees by planting equivalent species.

A good condition wetland adjacent to the Study Area located in North Western corner was noted during field investigations. The wetland is considered to provide habitat for locally occurring threatened fauna that may utilise the wetland for roosting and foraging habitat. Threatened fauna species include;

- Black Bittern (*Ixobrychus flavicollis*) – Vulnerable BC Act
- Australasian Bittern (*Botaurus poiciloptilus*) – Endangered EPBC and BC Act
- Freckled Duck (*Stictonetta naevosa*) – Vulnerable BC Act
- Blue-billed Duck (*Oxyura australis*) – Vulnerable BC Act

These species vary in their conspicuousness depending on lifestyle and time of the year. Generally, species that frequent open water such as the Freckled Duck and Blue-billed Duck will be conspicuous and easily detected throughout the day. Bitterns contrastingly inhabit dense vegetation in wetlands making them often be difficult to sight. Detection will usually rely on call recognition or flushing. In general, calls will be most frequent in the early morning but are also strongly dependent on time of year (DEWHA 2010). To assess the presence of the above listed species four consecutive mornings of listening surveys and systematic point counts will determine the species presence. Surveys can occur between mid-October until the end of March.

Although no direct impacts are to occur to the wetland from the current proposal, it is recommended that the wetland is considered in project planning and design as potential indirect impacts such as increased dust, run-off and excessive noise can cause adverse impacts to threatened wetland species. Appropriate screen plantings of species suitable for wetland forest communities (i.e. *Melaleuca* and *Casuarina*) will assist in buffering the aquatic habitat such that any indirect impacts to any threatened wetland species can be mitigated.

Low Constraints

The dam located within the Study Area is considered a low constraint and is to be dewatered and filled in for the proposal. An ecologist should be present at the final stages of the dam dewatering to rescue native fauna (turtles, frogs and eels) and relocate them elsewhere, the Flora and Fauna Assessment should detail appropriate dam dewatering protocols.

The artificial structures located within the Study Area is considered a low constraint and are to be removed for the current proposal. An ecologist should inform on the staged demolition and be present during the removal process to minimise the risk of harm to any roosting microbat species. The Flora and Fauna Assessment should detail appropriate mitigation measures, undertake assessments of significance and advise on removal protocols.

The pre-existing cleared areas are considered a low constraint. The majority of the Study Area consists of cleared land suitable for development.

7.0 CONCLUSION

Lodge Environmental has conducted a preliminary assessment of the biodiversity values present at 142-144 Calderwood Road, Calderwood in the context of the proposal.

Currently, the proposal includes the removal of 0.1 ha of native vegetation. This is below the BOS entry threshold of 0.25 ha. Within the Study Area, BV mapping is restricted to Marshall Mount Creek and the associated riparian vegetation. Impacting any native vegetation (including groundcover, trees and understorey plants) within BV mapped areas will trigger entry into the BOS. It is recommended that a conservative approach is taken from the development near this area and any works proposed on the northern boundary near the BV Mapping is carefully planned as to avoid the need to impact (directly or indirectly) on native vegetation. If native vegetation is impacted in these areas, entry into the BOS will be triggered. The FFA should clearly outline the successful avoidance of any impacts on native vegetation within the BV Mapping at the DA stage.

The Study Area contains the potential for several threatened fauna species to utilise the sites habitat features, particularly the HBTs and hollow bearing structures. An FFA is required to assess the impact of the proposal on these species if these features are to be impacted. If the impact is deemed significant, the proposal will require entry into the BOS and the preparation of a Biodiversity Development Assessment Report (BDAR). The below recommendations should be considered and taken into account for the DA design process to reduce the likelihood of significant impacts:

- Retention of as much native vegetation as possible, with preference given to the hollow bearing trees and feed trees.
- If any HBTs are to be cleared it is recommended that nocturnal survey is undertaken to assess the usage of the tree by any threatened fauna prior to removal.
- If any HBTs are to be removed, they should be replaced with nest boxes and their clearance supervised by an appropriately qualified fauna spotter and catcher.
- A sediment and erosion control plan should be in place throughout construction.
- A detailed FFA is to be prepared to further inform appropriate mitigation measures at the DA stage.

Once the final subdivision layout is designed, the FFA should be prepared and submitted along with the DA.

8.0 REFERENCES

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9.0 LIMITATIONS

This report and the associated services performed by Lodge Environmental are in accordance with the scope of services set out in the contract between Lodge Environmental and the Client. The scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to Site.

Lodge Environmental derived the data in this report primarily from visual inspections, and, limited survey and analysis made on the dates indicated. In preparing this report, Lodge Environmental has relied upon, and presumed accurate, certain information provided by government authorities, the Client and others identified herein. The report has been prepared on the basis that while Lodge Environmental believes all the information in it is deemed reliable and accurate at the time of preparing the report, it does not warrant its accuracy or completeness and to the full extent allowed by law excludes liability in contract, tort or otherwise, for any loss or damage sustained by the Client arising from or in connection with the supply or use of the whole or any part of the information in the report through any cause whatsoever.

The data, findings, observations, conclusions and recommendations in the report are based solely upon the state of the Site at the time of the investigation. The passage of time, manifestation of latent conditions or impacts of future events (e.g. changes in legislation, scientific knowledge, land uses, etc) may render the report inaccurate. In those circumstances, Lodge Environmental shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of the report.

This report has been prepared on behalf of and for the exclusive use of the Client and is subject to and issued in connection with the provisions of the agreement between Lodge Environmental and the Client. Lodge Environmental accepts no liability or responsibility whatsoever and expressly disclaims any responsibility for or in respect of any use of or reliance upon this report by any third party or parties.

It is the responsibility of the Client to accept if the Client so chooses any recommendations contained within and implement them in an appropriate, suitable and timely manner.

Appendices

Appendix A: Flora Species List

Scientific name	Common name	Native	Exotic
Acacia maidenii	Maidens Wattle	Yes	
Ageratina riparia	Mist Flower		Yes
Angophora floribunda	Rough-Barked Apple	Yes	
Anredera cordifolia	Madeira Vine		Yes
Asparagus aethiopicus	Asparagus Fern		Yes
Avena barbata	Bearded Oats		Yes
Bindens pilosa	Cobbler's Pegs		Yes
Blasam sp.	Jewelweed		Yes
Brachychiton acerifolius	Flame Bottletree	Yes	
Carex inversa	Knob Sedge	Yes	
Casuarina cunninghammii	River She-Oak	Yes	
Casuarina glauca	Swamp Sheoak	Yes	
Conium maculatum	Poison Hemlock		Yes
Conium maculatum	Hemlock		Yes
Conyza sp.	Fleabane		Yes
Cyperus congestus	Dense Flat-Sedge		Yes
Daucus carota	Wild Carrot		Yes
Erigeron bonariensis	Fleabane		Yes
Erythrina x sykesii	Coral Tree		Yes
Eucalyptus bosistoana	Coast Grey Box	Yes	
Ficus macrophylla	Moreton Bay Fig	Yes	
Ficus ruginosa	Rusty Fig	Yes	
Ficus superba	Sea Fig		Yes
Foeniculum vulgare	Fennel		Yes
Hibiscus heterophyllus	Native Rosella	Yes	
Hypochaeris radicata	Flatweed		Yes
Juncus usistatus	Common Rush	Yes	
Kikuyu	Kikuyu		Yes

Lantana camara	Lantana		Yes
Leontodon taraxacoides	Hairy Hawkbit		Yes
Marsdenia rostrata	Milk Vine	Yes	
Melaleuca citrina	Bottlebrush	Yes	
Melaleuca ericifolia	Swamp Paperbark	Yes	
Melaleuca quinquinervia	Broad-Leaved Paperbark	Yes	
Melaleuca styphelpides	Prickly-Leaved Paperbark	Yes	
Ochna serrulata	Ochna		Yes
Phalaris aquatica	Bulbous Canary Grass		Yes
Pteridium esculentum	Common Bracken	Yes	
Ricinus communis	Castor Oil Plant		Yes
Rosa rubiginosa	Sweet Briar		Yes
Rubus fruiticosus	Blackberry		Yes
Rumex brownii	Swamp Dock	Yes	
Salix sp.	Willow		Yes
Schinus molle	Pepper Tree		Yes
Senecio madagascariensis	Fireweed		Yes
Solanum mauritianum	Tobacco Bush		Yes
Solanum nodiflorum	Glossy Nightshade		Yes
Sonchus oleraceus	Milk Thistle		Yes
Sonchus oleraceus	Common Sowthistle		Yes
Taraxacum officinale	Dandelion		Yes
Tradescantia fluminensis	Wandering Trad		Yes
Trifolium repens	White Clover		Yes
Urtica dioica	Stinging Nettle		Yes
Verbena bonariensis	Purple Top		Yes
Vicia sativa	Common Vetch		Yes
Yucca sp.	Yucca sp.		Yes

Appendix B: Fauna Species List

Class Name	Scientific Name	Common Name
Amphibians	*Crinia signifera*	Common Eastern Froglet
	Litoria fallax	Eastern Dwarf Tree Frog
	Litoria peronii	Peron's Tree Frog
Bird	*Acridotheres tristis*	Common Myna
	Anas superciliosa	Pacific Black Duck
	Anthochaera chrysoptera	Little Wattlebird
	Cacatua sanguinea	Little Corella
	Corvus orru	Torresian Crow
	Cracticus tibicen	Australian Magpie
	Eolophus roseicapilla	Galah
	Falco cenchroides	Nankeen Kestrel
	Grallina cyanoleuca	Magpie-Lark
	Hirundo neoxena	Welcome Swallow
	Lopholaimus antarcticus	Topknot Pigeon
	Malurus cyaneus	Superb Fairywren
	Megalurus timoriensis	Tawny Grass Bird
	Microcarbo melanoleucos	Little Pied Cormorant
	Ocyphaps lophotes	Crested Pigeon
	Phalacrocorax varius	Australian Pied Cormorant
	Platycercus eximius	Eastern Rosella
	Rhipidura leucophrys	Willie Wagtail
	Trichoglossus moluccanus	Rainbow Lorikeet
	Turdus merula	Common Blackbird
Fish	*Anguilla australis*	Short-Finned Eel
Mammal	*Bos taurus*	Cow
	Felis catus	Cat
	Vulpes vulpes	Red Fox
Reptile	*Intellagama lesueurii*	Australian Water Dragon