Framework for Biodiversity Assessment Report

90 Gindurra Road, Somersby NSW 2250

State Significant Development Application (SSD 8660)

Amended 19th November 2019

NARLA
environmental

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Prepared for:	Jackson Environmental Pty Ltd on behalf of Kariong Sand and Soil Supplies
Prepared by:	Narla Environmental Pty Ltd
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- this document has been prepared in accordance with the brief provided by UNSW and OEH requirements of a Biodiversity Assessment Report.
- the information presented in this report is a true and accurate record of the study findings in the opinion of the authors.

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Glossary and abbreviations

Acronym	Description
BAR	Biodiversity Assessment Report
BioMetric	Refers to the State Government devised methodology for vegetation assessment
BCC	Bio-banking Credit Calculator
DPE	NSW Department of Planning and Environment
Subject Property	90 Gindurra Road, Somersby, NSW 2250
Subject Site	Development Area within 90 Gindurra Road, Somersby NSW 2250
EEC	Endangered Ecological Community
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FBA	Framework for Biodiversity Assessment
IBRA	Interim Bio-regionalisation of Australia
LGA	Local Government Area
LPI	Land and Property Information
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
m	Metres
km	Kilometres
ha	Hectares
TSC Act	NSW *Threatened Species Conservation Act 1995*

Executive Summary

This Biodiversity Assessment Report (BAR) has been prepared to accompany the State Significant Development (SSD) Application (8660) relating to the Kariong Sand and Soil Supplies (KSSS) development at 90 Gindurra Road, Somersby NSW 2250 (Lot 4, DP227279).

The proposal requires a State Significant Development Application (8660) to be lodged to allow the KSSS site to be developed to receive, process and store up to 200,000 tonnes per annum of soil, sand and building materials for recycling and manufacturing. Secretary's Environmental Assessment Requirements (SEARs) have been issued by the Department of Planning and Environment (DPE). The SEARs stipulate that the biodiversity impacts for the proposal be assessed in accordance with the Framework for Biodiversity Assessment (FBA) (OEH 2014b).

Narla Environmental conducted site assessments over multiple days in 2018 and 2019. The Ecologists determined that a large portion of the subject site had been historically cleared and modified and contained large old stockpiles of a range of materials including fill, large slabs of concrete, polystyrene, corrugated iron and conglomerate rocks. Large infestations of weeds and exotic pasture grasses had taken over much of the centre of the site, on and surrounding old stockpiles. Native vegetation was restricted mainly to the western and southern boundaries of the subject site, in which vegetation was derived from three vegetation communities classified according to Plant Community Types (PCTs), including:

- *PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast*
- *PCT 1643: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast*
- *PCT 1579: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast*

Four (4) native vegetation zones were identified based on the PCT classification above and an assessment on condition consistent with the requirements of the FBA (OEH 2014b):

- Zone 1: PCT 1642 – Low Condition
- Zone 2: PCT 1642 – Moderate to Good Condition
- Zone 3: PCT 1579 – Moderate to Good Condition
- Zone 4: PCT 1643 – Moderate to Good Condition

A further two (2) zones that constituted non-native vegetation and were not assigned a PCT were classified as 'Cleared' and 'Weeds and Exotics'.

Eight (8) plots and transects were established within the Subject Site to best sample the natural variation of the vegetation across the Subject Site. Plots were randomly stratified to attain best coverage across the Subject Site. The current and future site value scores for the vegetation zones were then assessed and calculated based on the data from the eight plots and transects collected on site and entered into the BCC. The current site value scores range between 25.17 / 100 to 83.51 / 100. For areas of complete clearing the future site value score is 0 / 100.

The BCC and Bionet identified a list of 17 species credit fauna species that were subject to targeted survey within the subject site. Targeted survey was conducted using remote camera trapping, bat acoustic monitors, spotlighting, fauna call playback, and opportunistic sightings.

Eastern Pygmy Possum (*Cercartetus nanus*) was confirmed on the subject site through targeted surveys. The Eastern Pygmy Possum is a Species Credit species. No other Species Credit fauna species were identified within the Subject Site.

A total of 32 threatened 'species credit' flora species were modelled as having potential to occur, or historically recorded within 10km of the subject site. Such species were surveyed utilising the parallel field transverse method as recommended by the *NSW Guide to Surveying Threatened Plants* (OEH 2016b). The survey periods aligned with the flowering period (when the species are most conspicuous) of most flora species, thereby having the greatest chance of displaying key diagnostic features.

During targeted surveys, Narla Ecologists identified the presence of one threatened flora species within the subject site, *Melaleuca biconvexa*, which is listed as Vulnerable under the TSC Act and EPBC Act. This species is a Species Credit species. Fifteen (15) individual specimens were recorded on the subject site. The occurrence of *Melaleuca biconvexa* was restricted to the western boundary of the subject site, confined to a small patch of mature individuals with evidence of regeneration. This small patch of *Melaleuca biconvexa* will be excluded from the development, including a 10m vegetation buffer surrounding the population. No other threatened flora species were identified within the subject site during site inspection.

Specific ameliorative measures have been suggested by Sustainability Workshop Ltd (2019) to prevent any direct or indirect impacts to this population of *Melaleuca biconvexa.* This will involve treated water being used to irrigate land draining to this plant community aiming to supply the same average annual volume of water that would have flowed to this community under predevelopment conditions.

The proposed development is restricted to the northern sections of 90 Gindurra Road, Somersby NSW (Lot 4 / DP 227279). Total impacts to native vegetation is 3.11 ha, with the remainder of the Subject Site consisting of already cleared land, or dominated by exotic vegetation. This includes the clearing of:

- 1.4 ha within Zone 1: PCT 1642 – Low Condition
- 0.78 ha within Zone 2: PCT 1642 – Moderate to Good Condition
- 0.30 ha within Zone 3: PCT 1579 – Moderate to Good Condition
- 0.63 ha within Zone 4: PCT 1643 – Moderate to Good Condition

Impacts to Eastern Pygmy-possum are anticipated within Vegetation Zone 2 and Vegetation Zone 4. A total impact of 1.41 ha to Eastern Pygmy-possum has been calculated.

In total, 103 ecosystem credit and 28 Eastern Pygmy-Possum species credits must be retired in order to offset the impacts of the proposed development.

Although complete clearing of native vegetation has been used to calculate credits within the Subject Site, several avoidance measures have been implemented during project design. Several mitigation measures will also be implemented during development to reduce impacts as much as possible.

1. Introduction

1.1 Project Background

This Biodiversity Assessment Report (BAR) has been prepared to accompany the State Significant Development (SSD) Application (8660) relating to the Kariong Sand and Soil Supplies (KSSS) development at 90 Gindurra Road, Somersby NSW 2250 (Lot 4, DP227279) (the 'Subject Property') **(Figure 1).**

The Development Area (hereby referred to as the 'Subject Site') for this assessment is defined as the northern part of Lot 4, DP227279 **(Figure 2).**

The proposal requires a State Significant Development Application (8660) to be lodged to allow the KSSS site to be developed to receive, process and store up to 200,000 tonnes per annum of soil, sand and building materials for recycling and manufacturing.

This Biodiversity Assessment Report has been prepared to meet the requirements of the NSW Biodiversity Offsets Policy for Major Projects (NSW OEH 2014a).

Secretary's Environmental Assessment Requirements (SEARs) have been issued by the Department of Planning and Environment (DPE). The SEARs stipulate that the biodiversity impacts for the proposal be assessed in accordance with the Framework for Biodiversity Assessment (FBA) (OEH 2014b). The FBA (OEH 2014b) assessment and BAR have been prepared by Kurtis Lindsay (accredited BioBanking assessor No.224), to satisfy the requirements of the SEARs.

The subject site is divided into the following sections:

- 'Cleared' land, comprising the largest area within the Subject Site;
    - This includes buildings and all areas not affected by native vegetation or significant weed infestations.
- 'Weeds and Exotics' land, comprising smaller patches within the Subject Site;
    - This includes all areas that are dominated by exotic vegetation and could not be assigned to a PCT.
- Three (3) Plant Community Types (PCTs), which include:
    - 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast;
    - 1643: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast;
    - 1579: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast

1.2 Proposed Development

The Kariong Sand and Soil Supplies development will involve the construction and operation of a best practice recycling and landscape supplies facility that will enable the receipt of up to 200,000 tonnes of sand, soil and building materials each year. The project transform the site into a state-of-the-art facility turning sand, soil and building materials into 100% recycled building and landscaping supplies. The facility aims to produce a number of building and landscape products, providing them for re-use mainly in the Central Coast region.

The proposed development will seek to expand the current facility into a best-practice recycling plant that will assist the Central Coast in achieving the NSW Government's target of an 80% recycling rate for construction and demolition waste by 2021.

The project will involve the development of a largely undeveloped industrial site, to enable the facility to be used to receive, process and recycle construction and demolition waste, as well as supply building and landscape supplies for local projects. All waste materials will be received and processed indoors, to minimise impacts on the environment and neighbours.

The front part that will be visible from Gindurra Rd will be the landscaping supply operations, including landscaping along the road frontage and landscape storage bays behind the set back area. A fully enclosed warehouse where sorting and recycling operations will be conducted will be visible from the front of the site. Along the eastern boundary, a noise barrier and a native landscape buffer will be planted to avoid noise impacts on nearly rural dwellings, and to provide an aesthetically pleasing interface between the edge of the Somersby Industrial Estate and nearby rural zone lots and dwellings.

Waste processing and recycling operations for selected materials, including crushing and mulching will be done on the southern section of the site, where processing will also be done in dedicated buildings to avoid any impacts on nearby land uses. These operations are to be conducted at maximum distance from any sensitive receptors. The southern section of the site will be retained as bushland to provide a natural buffer between the development and other residential areas more than a kilometre away from the southern boundary of the site.

Advanced water capture, rainwater harvesting, water treatment and dust suppression systems will be integrated in all buildings and outdoor areas to prevent dust being formed. The site will also include an advanced membrane filtration plant to enable much of the water captured from the site to be fully reused across the site for operational uses. The site will also include its own weather monitoring station, high volume air samplers for continuous air quality and dust analysis, and continuous noise loggers to confirm compliance with consent and licence conditions. The site will be fully serviced with fire suppression systems.

In order to facilitate the proposed works, the removal of native vegetation is required. To facilitate development of the site through each stage, the complete clearing of the entire subject site (development area) has been assumed, except for a 10 m protected buffer surrounding a population of the threatened flora species, *Melaleuca biconvexa* **(Figure 3).**

A total of 3.11 ha of native vegetation is proposed to be directly impacted by the development.

1.3 Site characteristics

1.3.1 Site Description and Land-use History

The Subject Property is located between Gindurra Road and Kangoo Road and is situated approximately 120m east (at the closes point) of the Pacific Motorway.

The Subject Property covers an area of approximately 10.75 ha, which is currently zoned 'IN1 – General Industrial'. Land adjoining the subject site to the East is zoned 'RU1 – Primary Production', whilst a number of other surrounding properties to the south of the site are zoned for various types of infrastructure.

The Subject Site, which is 6.62 ha in size, has undergone extensive historical clearing, and is now highly infested by exotic weeds with natural regeneration of native vegetation along the western border of the subject site. Much of the weed infested and cleared land is currently occupied by large expanses of old stockpile materials, exotic grasslands, weed infestations and a number of abandoned caravans and site offices.

Native vegetation exists within a strip approximately 50m wide from the north of the subject site along the western border which extends down into the south of the Subject Site. This vegetation eventually leads into intact remnant native vegetation outside of the impact zone. Vegetation outside the impact zone was not assessed and therefore not considered part of this BAR.

The southern part of the Subject Property (outside of the Subject Site) is an area totalling 4.1 ha. This area is completely vegetated with remnant vegetation including historically mapped Coastal Upland Swamp Endangered Ecological Community and habitat for threatened flora. The proponent has deliberately avoided clearing this area as part of this proposal, with all native vegetation being retained. Part of the southern portion of the Subject Property is currently a management zone under the Somersby Industrial Zone Plan of Management (Connell Wagner 2005) and contains intact vegetation and habitat for a number of threatened species, including *Prostanthera junonis* and *Hibbertia procumbens.*

1.3.2 Soil Landscapes and Geology

The subject site is situated on the 'Sydney Town Soil Landscape', however is situated on the border of the 'Somersby Soil Landscape' (Chapman & Murphy 1989).

The Sydney Town soil landscape is characterised by undulating to rolling low hills and moderately inclined slopes on quartz sandstone (Hawkesbury Sandstone and Terrigal Formation: Narrabeen Group) along the edge of the Somersby Plateau and as ridges and crests in the Macdonald Ranges and Watagan Mountains. Local relief to 80 m. Slope gradients 5–25%. Ridges and crests are moderately broad, slopes moderately inclined and drainage lines narrow. Occasional rock benches are present.

This landscape is typically situated on Hawkesbury Sandstone—medium- to coarse-grained quartz sandstone with minor shale and laminite lenses; and Narrabeen Group—Gosford Subgroup—Terrigal Formation, lithic/quartz sandstone, siltstone and claystone. Field survey indicates the dominant lithology present is coarse quartz sandstones. The soils of Sydney Town are shallow to deep (150 cm) Yellow Earths, Earthy Sands and some Siliceous Sands on crests and slopes; shallow to moderately deep (150 cm) Siliceous Sands, Leached Sands and Grey Earths in poorly drained areas and drainage lines; moderately deep (100–150 cm) Yellow Podzolic Soils and Gleyed Podzolic Soils associated with shale lenses.

The Somersby soil landscape is characterised by gently undulating to rolling rises on deeply weathered Hawkesbury Sandstone plateau. Local relief to 40 m; slopes are long, and drainage lines are narrow. Extensively cleared low eucalypt open-woodland and scrubland. This landscape is typically situated on Hawkesbury Sandstone—medium- to coarse-grained quartz sandstone with minor shale and laminite lenses. Deep (10 m) weathering in many areas of the sandstone is widespread. Soils are moderately deep to deep (100–300 cm) Yellow Earths and Earthy Sands on crests and slopes with Grey Earths in poorly drained areas and Leached Sands and Siliceous Sands along drainage lines.

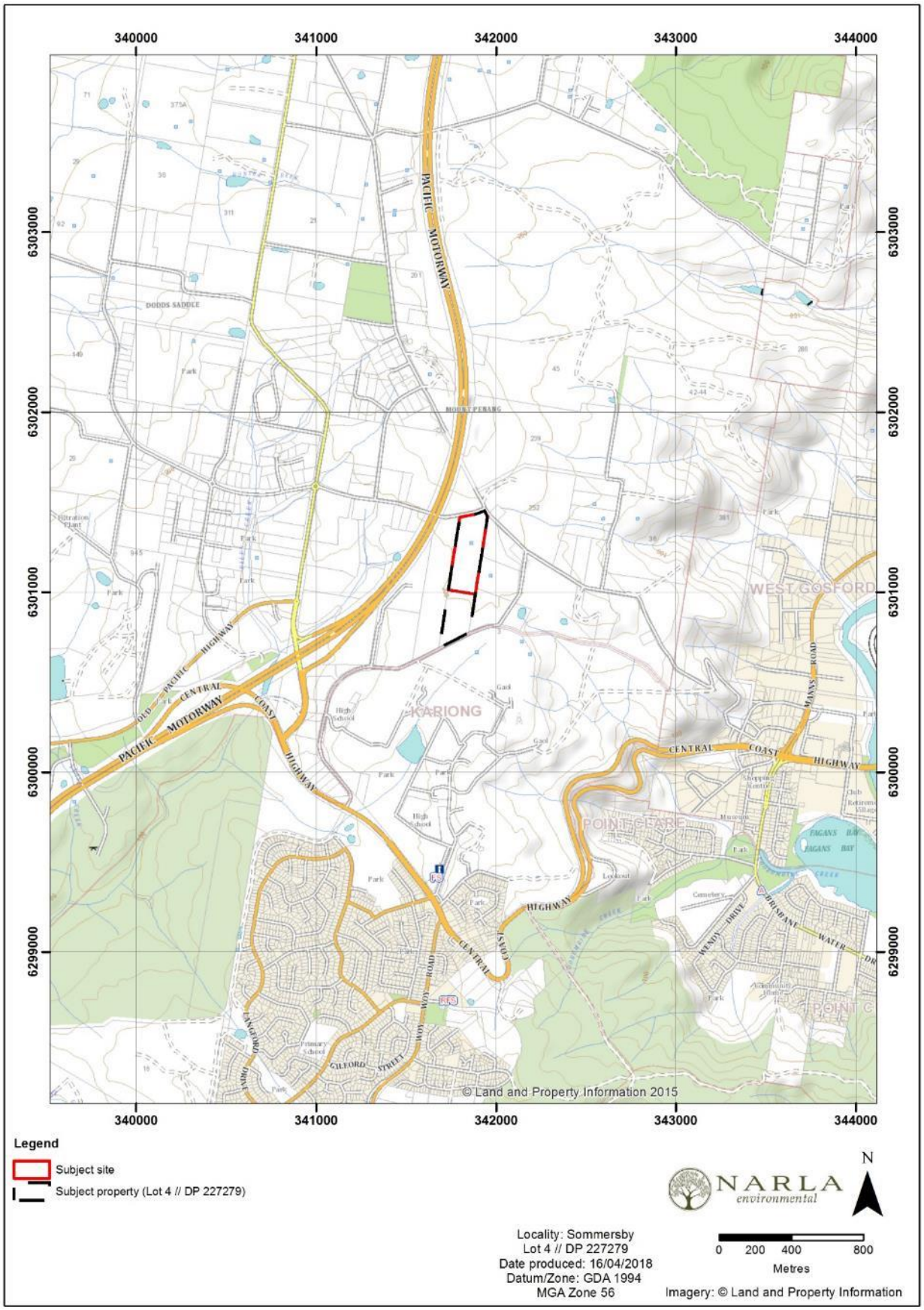

Figure 1: Site location

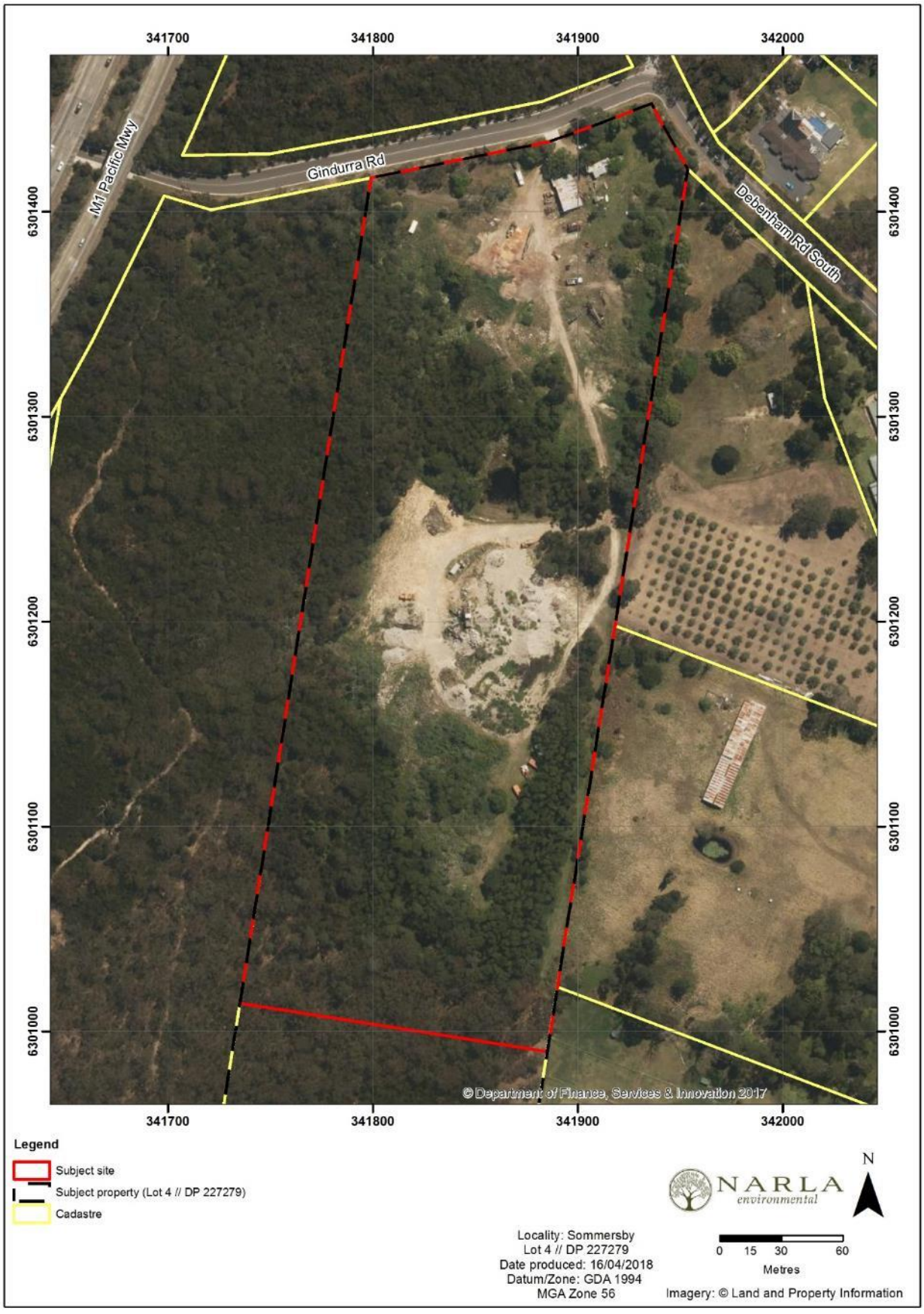

Figure 2: Subject site

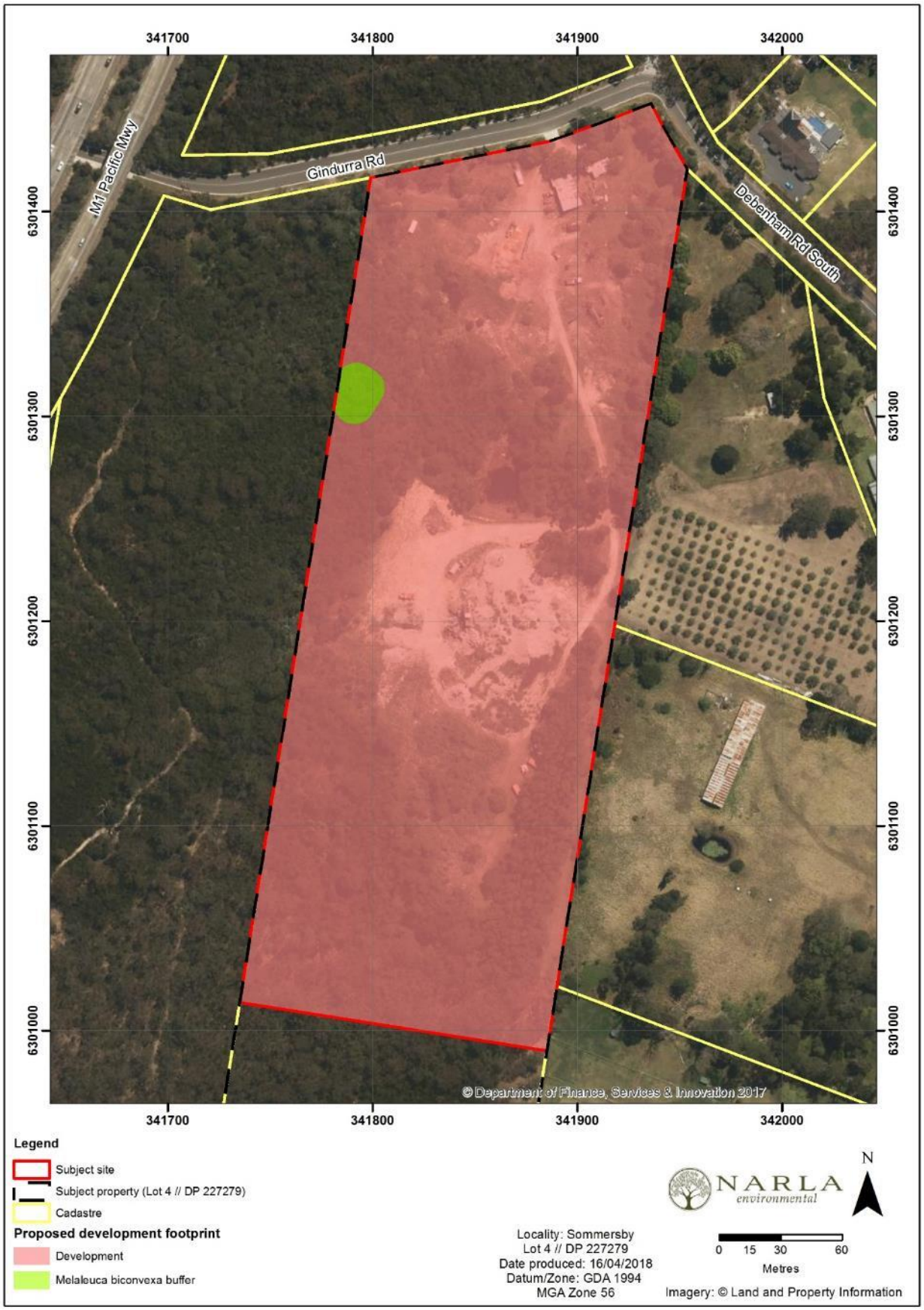

Figure 3: Proposed development footprint

1.4 Secretary's Environmental Assessment Requirements (SEARS) and Additional Comments

The Secretary's Environmental Assessment Requirements (SEARS) for Kariong Sand and Soils Supplies Facility Upgrade (SSD 8660) at 90 Gindurra Road, Somersby (Lot 4, DP 227229) were issued by the NSW Government Department of Planning and Environment on 23rd August 2017. This report has addressed the flora and fauna issues as outlined in the SEARS. Such issues are outlined in **Table 1.** This report has also addressed comments relating to biodiversity issues raised by Central Coast Council and NSW Office of Environment and Heritage **(Table 1).**

Table 1. SEARS requirements and additional comments on biodiversity issues

Authority	Issue Raised	Addressed in relevant section	Comments
NSW Government Department of Planning & Environment (SEARS)	An assessment of the proposal under the Framework for Biodiversity Assessment	This Framework for Biodiversity Assessment Report for 90 Gindurra Road, Somersby.	
	Include an assessment of any potential impacts on aquatic and riparian vegetation and groundwater dependent ecosystems	**Section 2.3.1**	No rivers, streams or estuaries were located within the Subject Site. No riparian vegetation was observed within the Subject Site and as such will not be impacted upon by the proposed development.
		Section 2.8	No Groundwater Dependent Ecosystems occur within the Subject Site. Groundwater resources will be protected as per mitigation measures outlined in Sustainability Workshop Ltd (2019).
		Section 5.2	Narla have assessed the impacts to hydrology and associated effects on biodiversity, with reference to Sustainability Workshop Ltd (2019): Water Cycle Impact Assessment and Soil and Water Management Plan. Sustainability Workshop Ltd (2019) considers that the proposed development should aim to protect the remaining vegetation within the Subject Property, and treat it as if it is a sensitive receiving water, particularly as this vegetation provides a significant natural vegetated buffer to the nearest watercourse. Specific mitigation measures have been proposed as outlined in **Section 5.2.** It is anticipated that the measures proposed within Sustainability Workshop Ltd (2019) will reduce indirect impacts to biodiversity, including the population of *Melaleuca biconvexa* within the Subject Site.
	An assessment of the proposed development against the North East Regional Forest Agreement and the *Regional Forest Agreement Act 2002*.	**Section 2.6** and **Section 2.7.**	The North-East Regional Forest Agreement and *Regional Forest Agreement Act 2002* do not apply to the Subject Site.
Office of Environment and Heritage	OEH recommends that PCT1783 be changed to PCT1643. The credit calculator will need to be	**Section 3.2**	Narla have identified three (3) PCT's within the Subject Site that specifically

Authority	Issue Raised	Addressed in relevant section	Comments
	rerun to determine modified credit yields.		occur within the Central Coast Region. This includes: ▪ PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast ▪ PCT 1579 Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast ▪ PCT 1643 Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast
	The Biodiversity Assessment Report should adequately assess and justify that the areas of non-native vegetation do not require further assessment under the Framework for Biodiversity Assessment	**Section 3.2.5**	Narla have identified two (2) non-native vegetation zones within the Subject Site: 'Cleared' and 'Weeds and Exotics'. A description of these zones are outlined in **Table 12.** As these zones contained no native vegetation, it was concluded that they did not constitute a PCT and therefore did not require further assessment under the Framework for Biodiversity Assessment.
	Targeted surveys should be undertaken for *Hibbertia procumbens* and *Prostanthera junonis* in accordance with OEH 'NSW Guide to Surveying Threatened Plants' (OEH 2016) and at their appropriate flowering times. If surveys are not undertaken, an expert report must be prepared in accordance with Section 6.6.2 of the FBA guidelines (OEH 2018).	**Section 4.1.2.2**	Narla have outlined the targeted survey effort that was undertaken to survey for species credit flora species that had the potential of occurring with the Subject Site. This includes *Hibbertia procumbens* and *Prostanthera junonis*. Additional surveys were conducted for these species at the appropriate time of year and were undertaken as per *NSW Guide to Surveying Threatened Plants* (OEH 2016b).
	Targeted surveys should be undertaken for *Caladenia tessellata* and *Diuris bracteata* in accordance with OEH 'NSW Guide to Surveying Threatened Plants' (OEH 2016) and at their appropriate flowering times. If surveys are not undertaken, an expert report must be prepared in accordance with Section 6.6.2 of the FBA guidelines (OEH 2018).	**Section 4.1.2.2**	Narla have outlined the targeted survey effort that was undertaken to survey for species credit flora species that had the potential of occurring with the Subject Site. This includes *Caladenia tessellata* and *Diuris bracteata*. Additional surveys were conducted for these species at the appropriate time of year and were undertaken as per *NSW Guide to Surveying Threatened Plants* (OEH 2016b).
	OEH recommends that all targeted flora surveys are conducted in accordance with OEH 'NSW Guide to Surveying Threatened Plants' (OEH 2016).	**Section 4.1.2.2**	Narla have outlined the targeted survey effort that was undertaken to survey for species credit flora species that had the potential of occurring with the Subject Site. Additional surveys were conducted at the appropriate time of year and were undertaken as per NSW Guide to Surveying Threatened Plants (OEH 2016b).

Authority	Issue Raised	Addressed in relevant section	Comments
	The impact of changes to hydrology resulting from the proposal should be assessed for the *Melaleuca biconvexa* community adjacent to the site and appropriate mitigation measures should be provided where required.	**Section 5.2**	The impacts to hydrology and associated effects on biodiversity have been assessed in relation to the *Melaleuca biconvexa* population within the Subject Site by Sustainability Workshop Ltd 2019. It is anticipated that the measures proposed within Sustainability Workshop Ltd (2019) will reduce indirect impacts to biodiversity, including the population of *Melaleuca biconvexa*.
Central Coast Council	The Plant Community Type (PCT) 1783 that was identified as the most dominant PCT occurring on the site poorly matches the diagnostic species for the community (no matching species for low condition PCT and only two matching diagnostic species for the moderate - good portion of the PCT). The proponent needs to consider other possible PCTs that provide a better match with diagnostic species. This is an important step as precise PCT identification will accurately identify the correct PCT for offsetting.	**Section 3.2**	Narla have identified three (3) PCT's within the Subject Site that specifically occur within the Central Coast Region.
	Targeted threatened frog surveys were conducted over two nights. Since no specific dates of targeted surveys were provided it is unclear if surveys were conducted in accordance with OEH threatened species survey guidelines. Additional species credits may be required.	**Section 4.1.2.1**	Narla have outlined the targeted survey effort that was undertaken to survey for species credit fauna species that had the potential of occurring with the Subject Site. This includes spotlighting and fauna call playback that was undertaken for threatened frog species over two nights on the 16th January 2018 and 13th February 2018. These were undertaken during the optimal survey period for such species.
	Surveys for the threatened orchid species *Caladenia tessellata* and *Diuris bracteata* were conducted at the wrong time of year and are therefore not compliant with OEH threatened species survey guide lines. The proponent needs to either conduct surveys in accordance with OEH guidelines, provide an expert report that verifies that the species would be absent from the proposal site or assume that the species are present on site and offset as required under the FBA.	**Section 4.1.2.2**	Narla have outlined the targeted survey effort that was undertaken to survey for species credit flora species that had the potential of occurring with the Subject Site. This includes *Caladenia tessellata* and *Diuris bracteata*. Additional surveys were conducted at the appropriate time of year and were undertaken as per *NSW Guide to Surveying Threatened Plants* (OEH 2016b).

2. Assessing Landscape Features

2.1 CMA Regions, IBRA bioregions, IBRA subregions and Mitchell Landscapes

The subject site is within the NSW Sydney Basin IBRA region (version 7), Pittwater IBRA subregion and lies on the border of the Hawkesbury Nepean and Hunter Central Rivers CMA regions. Previous comments from the Office of Environment and Heritage (OEH) suggested that Hunter Central Rivers vegetation types be used in the assessment as they more accurately reflect the vegetation within the region. Due to these vegetation types not being present within the Hawkesbury Nepean section of the Biobanking Credit Calculator (BCC), and noting the sites close proximity to the Hunter Central Rivers CMA **(Figure 5),** the Hunter Central Rivers has been selected for this assessment. This selection required the assessor to then identify Wyong as the IBRA subregion in which the development occurs, as Pittwater was not offered as an option by the BCC. This appears to be an inconsistency in the data in the BCC, and Wyong was selected as it is directly adjacent to Pittwater.

Narla contacted the NSW BioBanking Team OEH and received a response from Phil Wood on 12th November 2019:

> *"Given that your site is on the border between two CMAs I think using the Hunter-Central Rivers CMA would be appropriate for your case, and the vegetation options for this CMA do seem a more appropriate match for that area……..."*

The development site occurs entirely within one NSW Mitchell Landscape, 'Somersby Plateau' (Mitchell Landscapes V3.1) **(Figure 5).**

2.2 Percentage of Native Vegetation Cover

The change in native vegetation cover is assessed at two scales, which for this assessment are a 100 ha circle and a 1,000 ha circle. The area of vegetation in each circle before development was mapped using the 'Greater Hunter Vegetation Mapping' (OEH 2012; VIS3855), with the extent of vegetation updated using imagery obtained from NSW LPI SIX Viewer **(Figure 5).** Polygons tagged 'Non-native Vegetation' (MU000) were assumed to not contain native vegetation, and were therefore excluded from this assessment.

The proposed footprint of the development will impact on 3.11 ha of native vegetation, with the after-development calculations taking that impact into account.

The results of the assessment are provided in **(Table 2).** Due to the small amount of clearing no change will occur in either assessment circle, and a score of **0** is allocated for the percent native vegetation score.

Table 2: Change in percent native vegetation for each assessment circle

Assessment circle	Before development (ha)	Before development (%)	After development (ha)	After development (%)
Inner (100 ha)	49.5	46 - 50	46.4	46 - 50
Outer (1000 ha)	564.4	56 - 60	561.3	56 - 60

2.3 Connectivity Value

2.3.1 Rivers, Streams and Estuaries

There are no rivers, streams or estuaries identified within the subject site based on the topographic mapping available (1 : 25,000 scale). The closest drainage feature lies approximately 90m to the east of the subject site and is an unnamed first order stream draining east to Narara Creek. The nearest estuary lies approximately 2km to the east of the subject site, being part of the Brisbane Water Estuary.

The absence of these features was confirmed during the field visit and the proposal is not expected to impact on rivers, streams or estuaries.

2.3.1 Local and Important Wetlands

There are no local or important wetlands located within the subject site or within the 1,000 ha assessment circle.

2.3.2 State and Regional

The site does not incorporate a state or regional biodiversity link approved by the Chief Executive, OEH.

2.3.3 Connectivity Assessment

As the proposed development does not impact on a connectivity value class such as a riparian buffer of a 4th – 6th Strahler stream order, estuary or important wetland, or State or Regional biodiversity link, a complete connectivity assessment was required.

The site adjoins contiguous native vegetation to the west, between the subject site and the M1 Pacific Motorway. The vegetation, although narrow near the subject site, extends north for over 5km before being cut by the M1 Pacific Motorway. To the south of the subject site the connection is far more restricted, ending approximately 500m south of the subject site.

An assessment of the impact of the proposed development on both connectivity width and condition was conducted **(Table 3).** Although the development will impact on native vegetation within the subject site, the narrowest part of the link remains off-site, to the north-west of the subject site. The width of the connected link will therefore not be impacted by the proposed development. Due to the small amount of impact proposed within the subject site, and the overall good condition of the link, no reduction in average condition (for either over storey or mid storey) is expected from the development.

As no change in connectivity width or condition is anticipated a score of **0** is allocated for the connectivity score.

Table 3: Change in connectivity width and condition

Connectivity condition	Before development (ha)	After development (ha)
Connectivity width	>30-100m	>30-100m
Over storey condition	PFC at BM	PFC at BM
Mid storey / ground cover condition	PFC of mid storey/ground cover at BM	PFC of mid storey/ground cover at BM

2.4 Patch Size

Patch size was calculated using the site vegetation map combined with all vegetation within 100 m identified through the vegetation mapping amended from OEH (2012) referred to in **Section 2.2**.

Due to the large, contiguous patch of vegetation extending north (referred to above) the maximum patch size of 1,001ha was entered into the credit calculator. A total patch size score of **12** is recorded.

2.5 Landscape Score

Using the above data, the final landscape score was calculated to be **12**.

2.6 North East Regional Forest Agreement

The North East Regional Forest Agreement (RFA) is one of three RFAs in New South Wales, and comprises two sub regions: Upper North East and Lower North East. The Australian and New South Wales governments signed the North East RFA on 31 March 2000, establishing the framework for the sustainable management of the forests in the North East RFA region (Commonwealth Department of Agriculture and Water Resources 2018).

This Regional Forest Agreement (RFA) establishes the framework for the management of the forests of the Upper North East and Lower North East regions. Parties are committed to ensuring the Agreement is durable and that the obligations and commitments that it contains are delivered to ensure effective conservation, forest management and forest industry outcomes.

The purpose of the RFA is to:

- identify areas in the region or regions that the Parties believe are required for the purposes of a Comprehensive, Adequate and Representative Reserve System, and provides for the conservation of those areas;
- provide for the ecologically sustainable management and use of forested areas in the regions;
- provide long-term stability of forests and forest industries; and
- have regard to studies and projects carried out in relation to all of the following matters that are relevant to the regions:
    - environmental values, including Old Growth, Wilderness, endangered species, National Estate Values and World Heritage Values;
    - Indigenous heritage values;
    - economic values of forested areas and forest industries;
    - social values (including community needs); and
    - principles of Ecologically Sustainable Forest Management.

The Subject Site is mapped as 'Other Tenure – Freehold Land, Crown Land and Other Tenures' within 'Map 1 (B) Lower North East Region' which displays land tenure and zoning including Comprehensive, Adequate and Representative (CAR) Reserve System.

As the Subject Site is not mapped within a CAR Reserve System, the RFA does not apply to the Subject Site.

2.7 Regional Forest Agreements Act 2002

The main objectives of the Regional Forest Agreements Act 2002 (RFA Act) are as follows:

- to give effect to certain obligations of the Commonwealth under Regional Forest Agreements;
- to give effect to certain aspects of the National Forest Policy Statement;
- to provide for the existence of the Forest and Wood Products Council.

The Subject Site is not covered under the Regional Forest Agreements Act 2002.

2.8 Groundwater Dependent Ecosystems

Groundwater plays an important role in sustaining aquatic and terrestrial ecosystems, such as springs, wetlands, rivers and vegetation. Understanding these groundwater-dependent ecosystems (GDEs) is essential for groundwater management and planning (Bureau of Meteorology 2018).

The Groundwater Dependent Ecosystems Atlas (GDE Atlas) was developed as a national dataset of Australian GDEs to inform groundwater planning and management. It is the first and only national inventory of GDEs in Australia (Bureau of Meteorology 2018).

The Atlas contains information about three types of ecosystems:

- Aquatic ecosystems that rely on the surface expression of groundwater–this includes surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs. Marine and estuarine ecosystems can also be groundwater dependent, but these are not mapped in the Atlas.
- Terrestrial ecosystems that rely on the subsurface presence of groundwater–this includes all vegetation ecosystems.
- Subterranean ecosystems–this includes cave and aquifer ecosystems.

Narla Environmental accessed the GDE Atlas on 23rd October 2018 which revealed that there are no GDEs within the Subject Site **(Figure 4).** The Narla Ecologists did not find any vegetation communities or other ecosystems that would meet the definition of GDE during the site assessment.

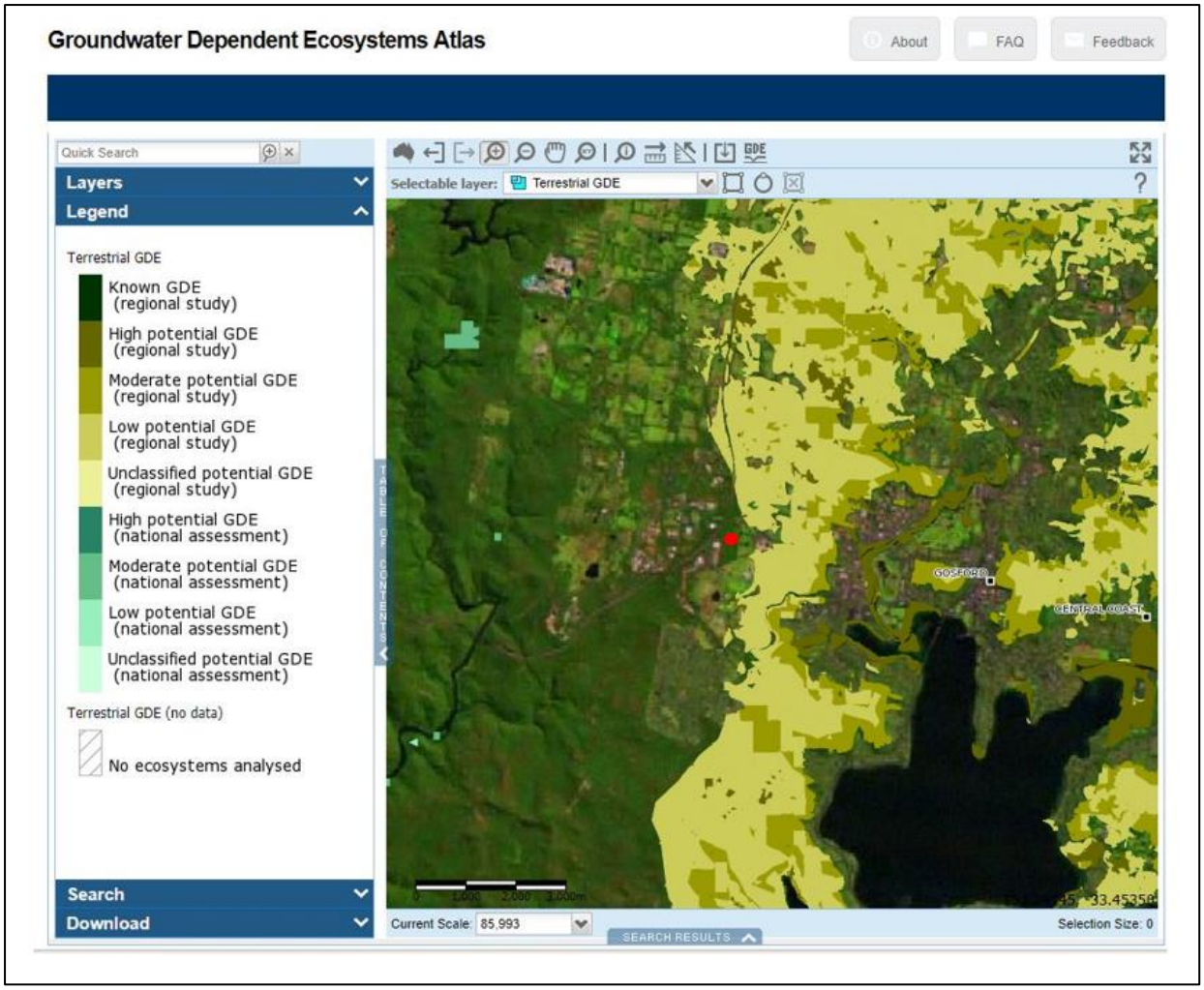

Figure 4. Groundwater Dependent Ecosystems as provided by the GDE Atlas on 23rd October 2018. Subject Site indicated by Red point.

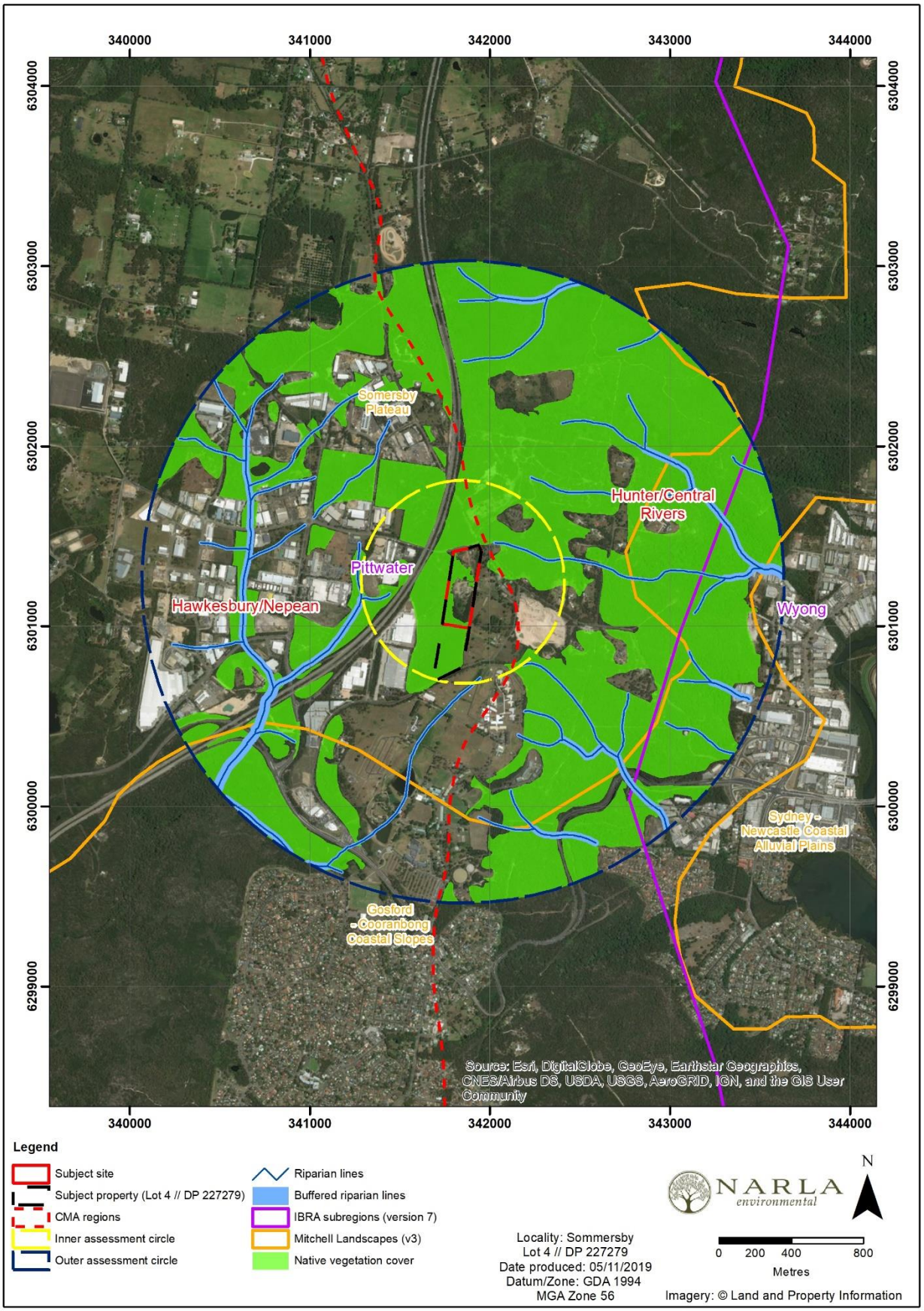

Figure 5: Location map

3. Assessing Native Vegetation

3.1 Description of The Native Vegetation on the Subject Site

3.1.1 Desktop Assessment

Vegetation within the subject site had been historically mapped within the Gosford Mapping System (Bell 2004) within three vegetation communities, including:

- E29 - Hawkesbury Banksia Scrub – Woodland
- E26 - Exposed Hawkesbury Woodland
- Xr - Disturbed - Canopy Only

Greater Hunter Native Vegetation Mapping (Sivertsen et al. 2011) revealed that the subject site contained only one vegetation community **(Figure 6).**

- MU124: Scribbly Gum / Red Bloodwood / Old Man Banksia heathy woodland of southern Central Coast

3.1.2 Site Assessment

Site assessment was undertaken by Narla Environmental Ecologists over the following days:

- 16th January 2018;
- 13th February 2018;
- 10th April 2018;
- 8th May 2019;
- 20th September 2019;
- 15th October 2019;
- 1st November 2019.

The Ecologists determined that a large portion of the subject site had been historically cleared and modified and contained large old stockpiles of a range of materials including fill, large slabs of concrete, polystyrene, corrugated iron and conglomerate rocks. Large infestations of weeds and exotic pasture grasses had taken over much of the centre of the site, on and surrounding old stockpiles **(Plate 1; Plate 2; Plate 3).**

Native vegetation was restricted mainly to the western and southern boundaries of the subject site, in which vegetation was derived from three vegetation communities classified according to Plant Community Types (PCTs), including:

- *PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast*
- *PCT 1643: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast*
- *PCT 1579: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast*

Please note that although this document uses PCTs to describe vegetation on site, the BCC requires the entry of data in BioMetric Vegetation Types (BVTs). Equivalent BVTs are identified in **Table 4**.

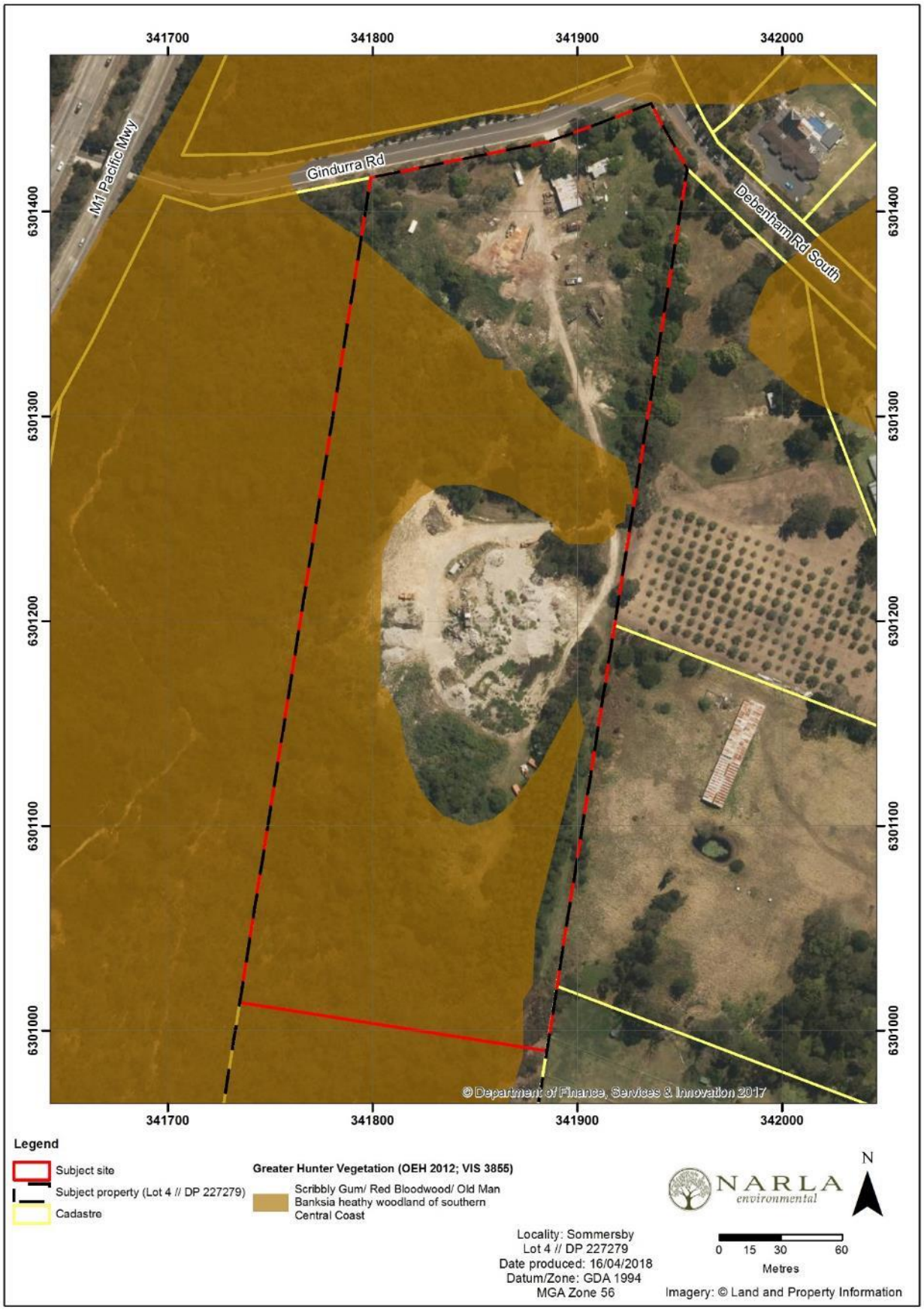

Figure 6: Mapped vegetation (Sivertsen et al. 2011)

Plate 1. Existing stockpiles with significant weed infestation within the subject site.

Plate 2. Historically cleared and weed infested land within the subject site.

Plate 3. Existing Stockpiles with significant weed infestation

3.2 Identifying Plant Community Types (PCT) on the Subject Site

The complete list of Plant Community Types (PCT) recorded in the Subject Site by Narla Environmental, and their area of coverage (ha) across the Subject Site is presented **(Table 4).**

A map showing all PCT (and exotic vegetation mapping units) is presented **(Figure 7).**

Table 4. All Plant Community Types (PCT) and other vegetation zones mapped across the Subject Site.

Plant Community Type / Biometric Vegetation Type	Equivalent Vegetation Map Unit (Sivertsen 2011)	Total area (ha)
PCT 1642 / HU856: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	MU124: Scribbly Gum / Red Bloodwood / Old Man Banksia heathy woodland of southern Central Coast	2.25
PCT 1643 / HU857: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	MU125: Red Bloodwood/ Smooth-barked Apple/ Scribbly Gum/ Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	0.63
PCT 1579 / HU793: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast	MU061: Smooth-barked Apple/ Turpentine/ Blackbutt open forest on ranges of the Central Coast	0.30
Cleared land	N/A	2.6
Dams	N/A	0.09
Weeds and exotics	N/A	0.75
	Total area (ha)	**6.62**

3.2.1 Selection of PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast

Narla selected each PCT through analysis of information and databases provided in the BioNet Vegetation Classification System (OEH 2019). The selection criteria listed within **Table 5** were selected to develop the PCT shortlist.

Table 5. Selection Criteria for PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast

Selection Criteria	Criteria entered into Bionet Vegetation Classification System Tool (OEH 2019)
IBRA Bioregion	Sydney Basin
IBRA Subregion	Pittwater
County	Gosford
Reference	Sivertsen, D., Roff, A., Somerville, M., Thonell, J. and Denholm, B. 2011. Hunter Native Vegetation Mapping. Geodatabase Guide (Version 4.0), Internal Report for the Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, Australia
Vegetation Formation	Dry Sclerophyll Forests
Upper Stratum Species	*Eucalyptus haemastoma*
Mid Stratum Species	*Banksia ericifolia*

Upon applying the search tools within **Table 5**, only one (1) PCT was generated within the BioNet search tool (OEH 2019).

The PCT selection process identified the following PCT as a potential shortlist:

- PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast

This indicates that the combination of *Eucalyptus haemastoma* and *Banksia ericifolia* is only present within the selected PCT within the Gosford County. The strong dominance of *Banksia ericifolia* in the understorey separates this PCT from 1643.

The steps taken to justify the presence or absence of each of these PCT's within the Subject Land is provided in **Table 6.**

Table 6. Justification of Selection - PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast

Candidate PCT	Characteristic Canopy (Siverstsen et al. 2011)	Characteristic Shrub / Groundcover (Siverstsen et al. 2011)	Landscape Position / Geology (Siverstsen et al. 2011)	Justification
PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	Open Forests to Woodlands dominated in the canopy by Eucalyptus spp. and related species. Canopy species include Eucalyptus *haemastoma, Angophora costata, Eucalyptus sieberi,* and/or *Corymbia gummifera*.	The mid-stratum is characterised by tall *Banksia* and *Leptospermum* shrubs over a sub-stratum of smaller sclerophyllous shrubs. The ground cover contains moisture-loving herbs and graminoids Species include *Leptospermum polygalifolium, Petrophile pulchella, Acacia suaveolens, Banksia ericifolia, Leptospermum trinervium, Persoonia levis, Banksia serrata, Lepyrodia scariosa, Actinotus minor, Anisopogon avenaceus, Platysace linearifolia.*	Typically found on dissected Sandstone Hills of the southern Central Coast hinterlands at elevations up to 350m.	Narla have assigned this PCT to Vegetation Zone 1. This PCT was selected because: ▪ Characteristic canopy species dominated within the vegetation zone including *Eucalyptus haemastoma, Angophora costata* and *Corymbia gummifera*. ▪ The mid story was characterised by dense, tall *Banksia ericifolia* and *Leptospermum polygalifolium*, with other characteristic species present in lower densities. Other similar PCT (e.g. PCT 1643) do not contain dense B.ericifolia understorey. ▪ This PCT is found on sandstone geology at elevations lower than 350m. The Subject Site is located within the southern Central Coast region, at an elevation ranging between 205m to 215m AMSL. Further justification is outlined in **Table 11.**

3.2.2 Selection of PCT 1579 Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast

Narla selected each PCT through analysis of information and databases provided in the BioNet Vegetation Classification System (OEH 2019). The selection criteria listed within **Table 7** were selected to develop the PCT shortlist.

Table 7. Selection Criteria for PCT 1579 Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast

Selection Criteria	Criteria entered into Bionet Vegetation Classification System Tool (OEH 2019)
IBRA Bioregion	Sydney Basin
IBRA Subregion	Pittwater
County	Gosford
Reference	Sivertsen, D., Roff, A., Somerville, M., Thonell, J. and Denholm, B. 2011. Hunter Native Vegetation Mapping. Geodatabase Guide (Version 4.0), Internal Report for the Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, Australia
Dominant Upper Stratum Species	*Syncarpia glomulifera and Angophora costata*

This process delivered a shortlist of four (4) PCTs that could potentially occur within the Subject Land:

- PCT 1564: Blackbutt - Rough-barked Apple - Turpentine - ferny tall open forest of the Central Coast
- PCT 1579: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast
- PCT 1627: Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast
- PCT 1628: Turpentine - Smooth-barked Apple - Broad-leaved Mahogany shrubby open forest on sandstone ranges of the Central Coast

The steps taken to justify the presence or absence of each of these PCT's within the Subject Land is provided in **Table 8.**

Table 8. Justification of Selection - PCT 1579 Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast

PCT Name	Characteristic Canopy	Characteristic Shrub / Groundcover	Landscape Position / Geology	Justification
Candidate PCT				
PCT 1564: Blackbutt - Rough-barked Apple - Turpentine - ferny tall open forest of the Central Coast	Open forests dominated by *Eucalyptus pilularis*. Other canopy species include, *Angophora floribunda, Angophora costata* and *Syncarpia glomulifera.* (Siverstsen et al. 2011)	The mid-storey includes sparse small trees and numerous shrubs and climbers. Floristics include *Allocasuarina torulosa, Glochidion ferdinandi, Leptospermum polygalifolium, Myrsine variabilis, Breynia oblongifolia, Polyscias sambucifolia, Pandorea pandorana* and *Smilax australis.* Ground stratum is generally comprised of *Calochlaena dubia, Doodia aspera, Blechnum cartilagineum, Adiantum aethiopicum, Pseuderanthemum variabile, Entolasia stricta* and *Lomandra longifolia.* (Siverstsen et al. 2011)	Mainly on sandstone substrates on the hinterland of the Central Coast at elevations below 250m. (Siverstsen et al. 2011)	This PCT does not fit the vegetation within Vegetation Zone 3. Although a number of species within this PCT were represented within Vegetation Zone 3, this vegetation zone lacked a dominant canopy of *Eucalyptus pilularis.* No *E. pilularis* were present within this zone.
PCT 1627: Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast	Open Forests to Woodlands with a generally well developed and distinctly two-layered mid-stratum. (Siverstsen et al. 2011)	The ground cover is characterized by graminoids; sub-shrubs and forbs. (Siverstsen et al. 2011)	Sandstone ranges of the Central Coast hinterland from Wisemans Ferry to Pearl Beach and north to about Wyong Creek| including Dharug NP. Elevation is from 50 to 300m. (Siverstsen et al. 2011)	This PCT does not fit the vegetation within Vegetation Zone 3. Some of the flora species from this PCT were represented in the vegetation within Zone 3, however a higher number of species were reflected in other candidate PCTs.

PCT Name	Characteristic Canopy	Characteristic Shrub / Groundcover	Landscape Position / Geology	Justification
Candidate PCT				
PCT 1628: Turpentine - Smooth-barked Apple - Broad-leaved Mahogany shrubby open forest on sandstone ranges of the Central Coast	Syncarpia dominated Open Forests; typically, with a small tree layer and a well-defined shrub layer. . (Siverstsen et al. 2011)	The ground layer is dominated by grasses & graminoids. . (Siverstsen et al. 2011)	Sandstones on the coastal ranges of the Central Coast from the Hawkesbury north to about Wollombi | occurs at altitudes up to 450m. . (Siverstsen et al. 2011)	This PCT does not fit the vegetation within Vegetation Zone 3. Some of the flora species from this PCT were represented in the vegetation within Zone 3, however a higher number of species were reflected in other candidate PCTs.
Selected PCT				
PCT 1579: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast	Open forests with a mixed canopy including *Angophora costata*. . (Siverstsen et al. 2011)	The mid- storey consists of a diverse shrub layer and climbers. The ground layer is a mix of graminoids; forbs and ferns. (Siverstsen et al. 2011)	Ranges of the Central Coast hinterland at lower elevations (Siverstsen et al. 2011)	Narla have assigned this PCT to the vegetation within Vegetation Zone 3. Although this PCT shared an equal amount of characteristic species to PCT 1564 (a total of 6 characteristic species), PCT 1564 is dominated by *Eucalyptus pilularis,* which was not present within the Subject Site. Vegetation Zone 3 was dominated by *Syncarpia glomulifera.* PCT 1579 was therefore the most suitable fit as it contained a suite of canopy species most reflective of the vegetation within Zone 3, including *Angophora costata* and *Syncarpia glomulifera.* The dominance of *Syncarpia glomulifera* within this vegetation zone is reflective of the presence of laterite within the soil,

PCT Name	Characteristic Canopy	Characteristic Shrub / Groundcover	Landscape Position / Geology	Justification
Candidate PCT				
				which was restricted to this part of the Subject Site. Other characteristic species of this PCT were evident within Vegetation Zone 3 including *Entolasia stricta, Polyscias sambuccifolia* and *Pteridium esculentum.* Further justification is outlined in **Table 11.**

3.2.3 Selection of PCT 1643 Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast

Narla selected each PCT through analysis of information and databases provided in the BioNet Vegetation Classification System (OEH 2019). The selection criteria listed within **Table 9** were selected to develop the PCT shortlist.

Table 9. Selection Criteria for PCT 1643 Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast

Selection Criteria	Criteria entered into Bionet Vegetation Classification System Tool (OEH 2019)
IBRA Bioregion	Sydney Basin
IBRA Subregion	Pittwater
County	Gosford
Reference	Sivertsen, D., Roff, A., Somerville, M., Thonell, J. and Denholm, B. 2011. Hunter Native Vegetation Mapping. Geodatabase Guide (Version 4.0), Internal Report for the Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, Australia
Dominant Upper Stratum Species	*Eucalyptus haemastoma, Corymbia gummifera and Angophora costata*

This process delivered a shortlist of four (4) PCTs that could potentially occur within the Subject Land:

- PCT 1636: Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
- PCT 1641: Dwarf Apple - Scribbly Gum heathy low woodland on sandstone ranges of the Central Coast
- PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast
- PCT 1643: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast

The steps taken to justify the presence or absence of each of these PCT's within the Subject Land is provided in **Table 10.**

Table 10. PCT Selection Justification of PCT 1643 Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast

PCT Name	Characteristic Canopy	Characteristic Shrub / Groundcover	Landscape Position / Geology	Justification
Candidate PCT				
PCT 1636: Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	Eucalypt dominated Woodlands with a shrubby mid-stratum and a graminoid ground cover. Canopy dominated by *Eucalyptus haemastoma* and *Corymbia gummifera*. . (Siverstsen et al. 2011)	Midstory typically represented by *Banksia oblongifolia, Leptospermum trinervium, Lambertia formosa, Xanthorrhoea latifolia, Hakea dactyloides*. Groundcovers characteristically include *Epacris pulchella, Ptilothrix deusta, Petrophile pulchella, Lomandra obliqua, Themeda australis, Lepyrodia scariosa, Aristida warburgii*. . (Siverstsen et al. 2011)	This community occurs on coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie. The substrate is sandstone with moist sandy soils. Elevation is usually under 100m (Siverstsen et al. 2011)	This PCT does not fit the vegetation within Vegetation Zone 4. Some of the flora species from this PCT were represented in the vegetation within Zone 4, however a higher number of species were reflected in other candidate PCTs. The elevation within the subject site was above 200m. In addition, the subject site is situated approximately 30km south west of the northern end of Tuggerah Lake.
PCT 1641: Dwarf Apple - Scribbly Gum heathy low woodland on sandstone ranges of the Central Coast	A seasonally wet woodland dominated by *Angophora* spp. Characteristic canopy species found within this PCT include *Angophora hispida* and *Eucalyptus haemastoma*. . (Siverstsen et al. 2011)	The understorey is characteristically densely shrubby and commonly includes *Banksia oblongifolia, Petrophile pulchella, Leptospermum trinervium, Baeckea diosmifolia, Isopogon anemonifolius, Hakea dactyloides, Dampiera stricta and Xanthorrhoea media*. The ground layer is typically dominated by various sedges and other grass-like species, including *Lepyrodia scariosa, Ptilothrix deusta*, *Cyathochaeta diandra* and *Lomandra glauca*; grasses, including *Entolasia stricta* and *Anisopogon avenaceus*; and scattered forbs, such as *Actinotus minor*. . (Siverstsen et al. 2011)	This community occurs on the dissected sandstone hill of the Central Coast hinterlands at elevations below 400m. . (Siverstsen et al. 2011)	This PCT does not fit the vegetation within Vegetation Zone 4. *Angophora hispida* was not present within the zone. The vegetation within the zone was also not representative of a 'heathy low woodland'.

PCT Name	Characteristic Canopy	Characteristic Shrub / Groundcover	Landscape Position / Geology	Justification
Candidate PCT				
PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	Open forests to woodlands with a canopy characterised by *Eucalyptus haemastoma* and *Corymbia gummifera*, commonly with *Angophora costata* and *Eucalyptus sieberi*. . (Siverstsen et al. 2011)	A mid storey of taller shrubs characterised by *Banksia serrata* and *B. ericifolia* is also commonly present. The understorey is typically shrubby and includes a diverse range of species such as *Acacia suaveolens, Platysace linearifolia, Persoonia levis, P. isophylla, Hakea dactyloides, Grevillea buxifolia*, *Lambertia formosa* and *Petrophile pulchella*. The ground layer typically consists of a mix of grass-like species, including *Lepyrodia scariosa*, *Lepidosperma laterale* and *Lomandra obliqua*; grasses, including *Anisopogon avenaceus* and *Entolasia stricta*; ferns, including *Lindsaea linearis* and *Pteridium esculentum*; along with scattered forbs. . (Siverstsen et al. 2011)	This community occurs on sandstone ranges of the Central Coast in the Watagans area at mid to lower elevations (elevations up to 350m). . (Siverstsen et al. 2011)	This PCT does not fit the vegetation within Vegetation Zone 4. Some of the flora species from this PCT were represented in the vegetation within Zone 4, however a higher number of species were reflected in other candidate PCTs. PCT1642 is characterised by a dense midstorey of *Banksia ericifolia*. The assessed vegetation in this zone on the Subject Site did not contain B.ericifolia. This PCT is better suited to a different vegetation zone within the subject site.
Selected PCT				
PCT 1643: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	Open Forests to Woodlands; the canopy is typically comprised of Corymbia *gummifera, Angophora costata, Eucalyptus haemastoma.* . (Siverstsen et al. 2011)	The midstory is typically consistent of *Lambertia Formosa, Leptospermum trinervium, Banksia serrata, Phyllota phylicoides, Banksia spinulosa, Bossiaea obcordate, Persoonia levis.* The groundcovers are generally comprised of a mix of *Platysace linearifolia, Anisopogon avenaceus, Actinotus minor, Cyathochaeta diandra, Patersonia sericea, Lomandra glauca, Lepyrodia scariosa*, and *Entolasia stricta*. . (Siverstsen et al. 2011)	Heathy woodland on sandstone ranges of the Central Coast. . (Siverstsen et al. 2011)	Narla have assigned this PCT to the vegetation within Vegetation Zone 4. A higher floristic diversity reflective of this PCT was present within this vegetation zone than in comparison with PCT 1642 which shared a number of characteristic species to this PCT. The typical canopy combination of Corymbia *gummifera, Angophora costata, Eucalyptus haemastoma* was present within this zone.

PCT Name	Characteristic Canopy	Characteristic Shrub / Groundcover	Landscape Position / Geology	Justification
Candidate PCT				
				Twelve (12) characteristic species were present including *Angophora costata, Anisopogon avenaceus, Banksia serrata, Banksia spinulosa, Bossiaea obcordata, Corymbia gummifera, Entolasia stricta, Eucalyptus haemastoma, Lambertia Formosa, Lambertia Formosa, Persoonia levis, Platysace linearifolia*. Further justification is outlined in **Table 11.**

3.2.4 Final List of Plant Community Type (PCT) on the Subject Site

Field survey conducted by Narla confirmed that three (3) native vegetation community were located within the Subject Site **(Table 11).** Vegetation communities were classified to a Plant Community Type (PCT) that most represented the floristics and typical geology/landscape position of the community. These PCT's included:

- *PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast*
- *PCT 1579: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast*
- *PCT 1643: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast*

3.2.5 Identifying Vegetation Zones

Four (4) native vegetation zones were identified based on the PCT classification described above and an assessment on condition consistent with the requirements of the FBA (OEH 2014b) **(Table 11; Table 13; Figure 7).** A further two (2) zones that constituted non-native vegetation and were not assigned a PCT were classified as 'Cleared' and 'Weeds and Exotics' **(Table 12; Figure 7).**

Native vegetation condition class was determined by the Narla Environmental Ecologists, based on the definitions of 'Low condition' and 'Moderate-Good condition' vegetation within the FBA (OEH 2014b).

The Framework for Biodiversity Assessment defines 'Vegetation in Low Condition' as:

- *"Woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either:*
    - *Less than 50% of ground cover vegetation is indigenous species, or*
    - *Greater than 90% of ground cover vegetation is cleared*

OR

- *Native grassland, wetland or herbfield where either:*
    - *Less than 50% of ground cover vegetation is indigenous species, or*
    - *More than 90% of ground cover vegetation is cleared.*

Native vegetation that is not in low condition is in moderate to good condition"

The impact to each vegetation zone includes the construction of roads, stockpile areas and facilities, where complete clearing will be required. As described earlier this assessment is assuming total clearing of the site, except for a buffer area which is to be avoided due to the presence of *Melaleuca biconvexa* individuals. The total impact to native vegetation from complete clearing is 3.11 ha.

A total of 0.06 ha of vegetation will be retained within the subject site, within the buffer area protected due to the presence of *Melaleuca biconvexa* individuals. This is in addition to the 4.1 ha of native vegetation within the subject property which has been avoided, which lies south of the subject site.

Table 11. Native vegetation zones identified within the proposed development site

Vegetation Zone 1 – PCT 1642 (Low Condition)			
PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast			
			
Vegetation formation / Keith Class	Dry Sclerophyll Forest (Shrubby sub-formation) / Sydney Coastal Dry Sclerophyll Forests		
Condition classes on Subject Land	Low Condition		
Extent within Subject Land (approximate)	1.4 ha		
Description of the Vegetation on Subject Land			
Vegetation within this zone was classified as 'Low Condition due to the high density of weeds and existing disturbance. Native vegetation was largely comprised of scattered canopy and mid-story species such as *Eucalyptus punctata, Acacia decurrens, Acacia parramattensis,* and *Leptospermum polygalifolium,* with native ground covers including *Calochlaena dubia* and *Oplismenus imbicillis.* Within the vegetation zone were a high density of exotic weeds including *Lantana camara, Tradescantia fluminensis, Ageratina adenophora, Senecio madagascariensis* and *Ipomoea indica.*			
Structure of Vegetation			
The native canopy was predominately lacking within this zone, with canopy cover averaging 0.55% within two vegetation plots. Native mid-story and groundcover was also relatively sparse within the zone, with native midstorey cover averaging 9.1% and native groundcover averaging 13%.			
Description in VIS			
Open Forests to Woodlands dominated in the canopy by Eucalypts and related species. The mid-stratum is characterised by tall Banksia and Leptospermum shrubs over a sub-stratum of smaller sclerophyllous shrubs. The ground cover contains moisture-loving herbs and graminoids.			
Survey effort	Two (2) Biometric plots were established		
Justification of PCT Assignment	**Characteristic Canopy Species**	**Characteristic Shrub and**	**Geology and Landscape**

Vegetation Zone 1 – PCT 1642 (Low Condition)			
PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast			
		Groundcover Species	**Position**
	Canopy species were not the defining feature of this vegetation zone as it was historically cleared. Note that the dominant tree within this zone, *Acacia decurrens,* is not listed in any PCT within the Pittwater IBRA Subregion.	This vegetation zone contained *Leptospermum polygalifolium which* is a characteristic species of PCT 1642.	This PCT occurs on dissected Sandstone Hills of the southern Central Coast hinterlands, at elevations up to 350m. The Subject Site is located within the southern Central Coast region, at an elevation ranging between 205m to 215m AMSL. Note that this vegetation zone was highly degraded and comprised minimal native species diversity. Due to the high occurrence of *Acacia decurrens* throughout the zone indicating regeneration following a disturbance, it is expected that this zone is a historically cleared version of PCT 1642, being the most dominant vegetation community within the Subject Site.
Scientific Reference from VIS (OEH 2019)	Sivertsen, D., Roff, A., Somerville, M., Thonell, J. and Denholm, B. 2011. Hunter Native Vegetation Mapping. Geodatabase Guide (Version 4.0), Internal Report for the Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, Australia.; Somerville, M. (2009a) Hunter, Central & Lower North Coast Vegetation Classification & Mapping Project Volume 1: Vegetation Classification Technical Report. Hunter-Central Rivers Catchment Management Authority, Tocal, NSW.		
TEC Status (Biodiversity Conservation Act 2016)	The extent of this PCT on the Subject Site is not considered to form part of an Endangered Ecological Community.		
Estimate of percent cleared value of PCT in the major catchment area	30.00 %		

Vegetation Zone 2 – PCT 1642 (Moderate to Good Condition)

PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast

Vegetation formation / Keith Class	Dry Sclerophyll Forest (Shrubby sub-formation) / Sydney Coastal Dry Sclerophyll Forests
Condition classes on Subject Land	Moderate to Good Condition
Extent within Subject Land (approximate)	0.84 ha

Description of the Vegetation on Subject Land

Vegetation within this zone was classified as 'Moderate to Good Condition' as it contained high native species richness, although the zone contained some encroachment of weeds from cleared and more degraded areas.

Dominant canopy species included *Eucalyptus haemastoma, Angophora costata, Eucalyptus punctata* and *Corymbia gummifera* above a midstorey dominated b dense, *Banksia ericifolia with Acacia parramattensis, Banksia serrata, Pittosporum undulatum and Leptospermum polygalifolium*. The groundlayer included species such as *Entolasia stricta, Lindsaea linearis, Lomandra glauca, Opercularia hispida* and *Veronica plebeia.*

Structure of Vegetation

Within three (3) 20m x 20m plots, native canopy was relatively open, averaging 16.5% cover. The native shrub layer was also relatively open, averaging 14% cover. The native ground layer was relatively dense within the three plots, with an average of 75% cover.

Vegetation Zone 2 – PCT 1642 (Moderate to Good Condition)			
PCT 1642: Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast			
Description in VIS			
Open Forests to Woodlands dominated in the canopy by Eucalypts and related species. The mid-stratum is characterised by tall Banksia and Leptospermum shrubs over a sub-stratum of smaller sclerophyllous shrubs. The ground cover contains moisture-loving herbs and graminoids.			
Survey effort	Three (3) Biometric plots were established.		
Justification of PCT Assignment	**Characteristic Canopy Species**	**Characteristic Shrub and Groundcover Species**	**Geology and Landscape Position**
	This vegetation zone contained *Eucalyptus haemastoma, Angophora costata* and Corymbia *gummifera* which are characteristic of PCT 1642	This vegetation zone was characterized by dense *Banksia ericifolia* along with, *Banksia serrata, Leptospermum polygalifolium, Petrophile pulchella* and *Platysace linearifolia* which are characteristic of PCT 1642. The dominance of *Banksia ericifolia* was a defining feature of this vegetation zone.	This PCT occurs on dissected Sandstone Hills of the southern Central Coast hinterlands, at elevations up to 350m. The Subject Site is located within the southern Central Coast region, at an elevation ranging between 205m to 215m AMSL.
Scientific Reference from VIS (OEH 2019)	Sivertsen, D., Roff, A., Somerville, M., Thonell, J. and Denholm, B. 2011. Hunter Native Vegetation Mapping. Geodatabase Guide (Version 4.0), Internal Report for the Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, Australia. Somerville, M. (2009a) Hunter, Central & Lower North Coast Vegetation Classification & Mapping Project Volume 1: Vegetation Classification Technical Report. Hunter-Central Rivers Catchment Management Authority, Tocal, NSW.		
TEC Status (Biodiversity Conservation Act 2016)	The extent of this PCT on the Subject Site is not considered to form part of an Endangered Ecological Community.		
Estimate of percent cleared value of PCT in the major catchment area	30.00 %		

Vegetation Zone 3 – PCT 1579 (Moderate to Good Condition)	
PCT 1579: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast	
	
Vegetation formation / Keith Class	Wet Sclerophyll Forests (Shrubby sub-formation) / North Coast Wet Sclerophyll Forests
Condition classes on Subject Land	Moderate to Good Condition
Extent within Subject Land (approximate)	0.3 ha
Description of the Vegetation on Subject Land	
Vegetation within this zone was largely comprised of native canopy species within minimal weeds present (no exotic species were recorded within the Biometric Plot). Canopy species included an intermittent cover of *Angophora costata,* with *Syncarpia glomulifera* and *Allocasuarina littoralis* densely occupying some areas of the mid-stratum. A moderate cover of shrubs and groundcovers included species such as *Leucopogon juniperinus*, *Isopogon anemonifolius, Entolasia stricta, Polyscias sambuccifolia* and *Pteridium esculentum*.	
Structure	
Native overstorey cover was relatively open at 20.5%, with native mid-cover totaling 11.7%. The native groundlayer (including shrubs and grasses) was moderately covered, occupying 40% of the Biometric plot.	
Description in VIS	
Open forests with a mixed canopy including *Angophora costata*. The mid- storey consists of a diverse shrub layer and climbers. The ground layer is a mix of graminoids; forbs and ferns.	
Survey effort	One (1) Biometric plot was established.

Vegetation Zone 3 – PCT 1579 (Moderate to Good Condition)			
PCT 1579: Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast			
Justification of PCT Assignment	**Characteristic Canopy Species**	**Characteristic Shrub and Groundcover Species**	**Geology and Landscape Position**
	This vegetation zone contained *Syncarpia glomulifera, Angophora costata* and *Allocasuarina torulosa* which are characteristic of PCT 1579.	This vegetation zone contained *Entolasia stricta, Polyscias sambuccifolia* and *Pteridium esculentum* which are characteristic of PCT 1579.	This PCT occurs on ranges of the Central Coast hinterland at lower elevations. The Subject Site is located within the Central Coast Hinterland, at an elevation ranging between 205m to 215m AMSL. The dominance of *Syncarpia glomulifera* within this vegetation zone is reflective of the presence of laterite within the soil, which was restricted to this area of the Subject Site.
Scientific Reference from VIS (OEH 2019)	Sivertsen, D., Roff, A., Somerville, M., Thonell, J. and Denholm, B. 2011. Hunter Native Vegetation Mapping. Geodatabase Guide (Version 4.0), Internal Report for the Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, Australia Somerville, M. (2009a) Hunter, Central & Lower North Coast Vegetation Classification & Mapping Project Volume 1: Vegetation Classification Technical Report. Hunter-Central Rivers Catchment Management Authority, Tocal, NSW		
TEC Status (Biodiversity Conservation Act 2016)	The extent of this PCT on the Subject Site is not considered to form part of an Endangered Ecological Community.		
Estimate of percent cleared value of PCT in the major catchment area	0.00%		

Vegetation Zone 4 – PCT 1643 (Moderate to Good Condition)

PCT 1643: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast

Vegetation formation / Keith Class	Dry Sclerophyll Forest (Shrubby sub-formation) / Sydney Coastal Dry Sclerophyll Forests
Condition classes on Subject Land	Moderate to Good Condition
Extent within Subject Land (approximate)	0.63 ha

Description on Subject Site

The vegetation zone contained high native species diversity and was classified as 'Moderate to Good Condition', with minimal to no exotic species present.

Canopy species were dominated by *Angophora costata, Corymbia gummifera* and *Eucalyptus haemastoma.* A diverse mid-storey and shrub layer included species such as *Banksia marginata, Banksia spinulosa, Grevillea sericea, Isopogon anemonifolius, Lambertia Formosa* and *Xylomelum pyriforme*. The groundlayer contained species including *Dianella caerulea, Lindsaea linearis, Lomandra obliqua* and *Platysace linearifolia*.

Structure

A moderate cover of native canopy existed within the plot, occupying 43.5%. The mid-storey was relatively sparse at 5.5%. The groundlayer was moderately dense with 64% cover.

Description in VIS

Open Forests to Woodlands; the canopy characterised by Corymbia and Angophora. The mid-stratum is typically two-layered and composed of sclerophyllous shrub. The third (ground) stratum comprises forbs; sub-shrubs and graminoids

Survey effort	One (1) Biometric plot was established.		
Justification of PCT Assignment	**Characteristic Canopy Species**	**Characteristic Shrub and Groundcover Species**	**Geology and Landscape Position**
	The vegetation zone contained *Angophora costata, Corymbia gummifera* and *Eucalyptus haemastoma* which are characteristic of PCT 1643.	This vegetation zone contained *Anisopogon avenaceus, Banksia serrata, Banksia spinulosa, Bossiaea obcordata, Entolasia stricta, Lambertia formosa, Patersonia sericea, Persoonia levis* and *Platysace linearifolia* which are characteristic of PCT 1643.	PCT 1643 occurs within the Pittwater IBRA7 Subregion and within the Gosford County. The Subject Site is located on sandstone ranges of the Central Coast.

Vegetation Zone 4 – PCT 1643 (Moderate to Good Condition)	
PCT 1643: Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	
Scientific Reference from VIS (OEH 2019)	Sivertsen, D., Roff, A., Somerville, M., Thonell, J. and Denholm, B. 2011. Hunter Native Vegetation Mapping. Geodatabase Guide (Version 4.0), Internal Report for the Office of Environment and Heritage, Department of Premier and Cabinet, Sydney, Australia Somerville, M. (2009a) Hunter, Central & Lower North Coast Vegetation Classification & Mapping Project Volume 1: Vegetation Classification Technical Report. Hunter-Central Rivers Catchment Management Authority, Tocal, NSW
TEC Status (Biodiversity Conservation Act 2016)	The extent of this PCT on the Subject Site is not considered to form part of an Endangered Ecological Community.
Estimate of percent cleared value of PCT in the major catchment area	29.00%

Table 12. Non-native vegetation zones identified within the proposed development site

Vegetation Zone – Weeds & Exotics	
No equivalent PCT – All Exotic Vegetation	
	
Extent within Subject Land (approximate)	0.75 ha
Description on Subject Site	
The vegetation within this zone contained no native floristic diversity, with no native species within the canopy, midstorey or groundlayer. This zone was situated on historically cleared land containing large stockpiles of various materials. Large infestations of weeds and exotic pasture grasses had taken over much of this zone, on and surrounding old stockpiles, including *Paspalum dilatatum, Ricinus communis, Ipomea indica* and *Ageratina adenophora.*	
Survey effort	One (1) Biometric plot was established.
Justification of PCT Assignment	Native vegetation (defined under s. 60B of the LLSA Act) means any of the following types of plants native to New South Wales: ▪ trees (including any sapling or shrub or any scrub), ▪ understorey plants ▪ groundcover (being any type of herbaceous vegetation) ▪ plants occurring in a wetland. As this zone contained no native vegetation and occurred on predominately introduced materials, it was concluded that this zone did not constitute a PCT and was therefore classified as 'Weeds and Exotics'.

Vegetation Zone – Cleared	
No equivalent PCT – Cleared vegetation	
	
Extent within Subject Land (approximate)	2.6 ha
Description on Subject Site	
The vegetation within this zone contained no native floristic diversity, with no native species within the canopy, midstorey or groundlayer. This zone was situated on cleared land that was predominately devoid of any vegetation, with the exception of an exotic groundlayer. The northern portion of this zone within the Subject Site was completely cleared and was being utilised as a construction site. Within the southern portion of the Subject Site, this zone contained a mixture of bare earth as well as exotic grasses and groundcovers that had recently regenerated in Spring from previous clearing/excavation works. Such areas appear to be utilised for vehicular access around the Subject Site.	
Survey effort	No survey effort was conducted in this zone.
Justification of PCT Assignment	Native vegetation (defined under s. 60B of the LLSA Act) means any of the following types of plants native to New South Wales: ▪ trees (including any sapling or shrub or any scrub), ▪ understorey plants ▪ groundcover (being any type of herbaceous vegetation) ▪ plants occurring in a wetland. As this zone was predominately cleared of vegetation (with the exception of newly regenerated exotic grasses and groundcovers in the southern portion of the Subject Site) and contained no native vegetation, it was concluded that this zone did not constitute a PCT and was therefore classified as 'Cleared'.

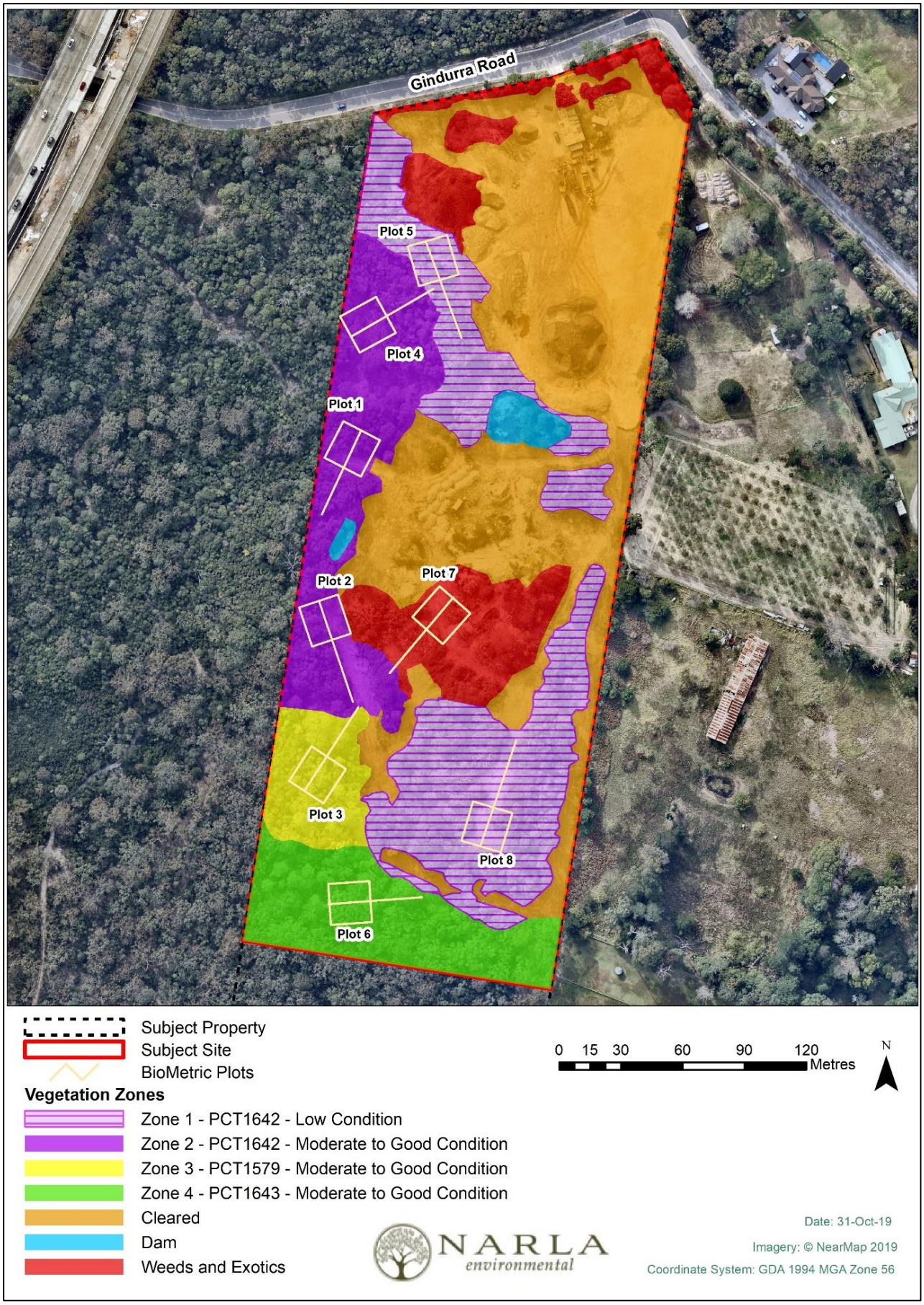

Figure 7: Field Validated Plant Community Types and Plot Transect Locations

Table 13: Native vegetation zones within the subject site

Vegetation zone ID	PCT ID	PCT name	Condition	Area impacted (ha) - clearing
Zone 1: PCT 1642 – Low Condition	PCT 1642	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	Low	1.4
Zone 2: PCT 1642 – Moderate to Good Condition	PCT 1642	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	Moderate to Good	0.78
Zone 3: PCT 1579 – Moderate to Good Condition	PCT 1579	Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast	Moderate to Good	0.30
Zone 4: PCT 1643 – Moderate to Good Condition	PCT 1643	Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	Moderate to Good	0.63
			Total	**3.17**

3.3 Biometric Plots and Transects

Site assessment was undertaken by Narla Environmental Ecologists Emily Rix and Nathan Banks over the course of three days; 16th January 2018, 13th February 2018 and 10th April 2018, including plot and transect based surveys (as per the FBA - OEH 2014b). An additional two (2) plots were undertaken by Emily Rix and Chris Moore on the 8th May 2019. All Ecologists were experienced in the undertaking of field assessment and environmental restoration works within the Sydney Basin region, particularly in sandstone woodland vegetation. The weather conditions in the lead up and during these field surveys are outlined in **Table 14.**

Table 14: Weather conditions taken from the nearest weather station (Gosford) in the lead up and during the field survey (BOM 2018) (Survey dates in bold)

Survey date	Minimum Temp.	Maximum Temp. °C	Rainfall (mm)
9/1/18	21.7	29.8	18.2
10/1/18	20.1	23.5	2.8
11/1/18	17.7	24.8	0
12/1/18	20.1	29.4	0
13/1/18	23.4	35.8	0
14/1/18	16.2	23.1	0
15/1/18	16.4	23.8	0
16/1/18	**17.6**	**22.5**	**0.8**
6/2/18	16.5	26.9	0
7/2/18	16.1	27.1	0
8/2/18	15.8	29.3	0
9/2/18	18.1	30.8	0
10/2/18	20.5	29.1	1.0
11/2/18	21.5	34.0	0.4
12/2/18	20.2	28.5	0
13/2/18	**22.8**	**28.7**	**0**
3/4/18	19.3	24.2	40.6
4/4/18	19.1	24.7	0.2
5/4/18	16.8	26.8	1.6
6/4/18	15.3	25.7	0
7/4/18	16.1	28.3	0
8/4/18	16.0	27.6	0
9/4/18	16.3	34.2	0
10/04/18	**18.3**	**24.2**	**0**
1/5/19	14.4	23.3	0
2/5/19	16.2	25.4	0
3/5/19	16.9	23.6	0.2
4/5/19	17.5	21.5	4.0
5/5/19	13.6	20.0	0
6/5/19	13.8	20.4	4.6
7/5/19	6.6	23.5	0
8/5/19	**8.9**	**21.4**	**0**

Eight (8) plots and transects were established within the Subject Site to best sample the natural variation of the vegetation across the Subject Site. This exceeds the requirements of the FBA (OEH 2014b), which sets the minimum as 1 plot and transect per 2 ha (or part thereof), increasing proportionally with the size of the vegetation zone.

Plots were randomly stratified to attain best coverage across the Subject Site. Due to the relatively small impact from the proposed development plots and transects were completed across the subject site as to not bias the assessment. An example of the plot sheets used is provided in **Appendix 2**.

The summarised results obtained from each plot are provided in **Table 15**. The eight (8) plot and transect locations are shown in **Figure 7.**

Table 15: Biometric plot and transect results

Plot No.	1	2	3	4	5	6	7	8
Vegetation zone	Zone 2	Zone 2	Zone 3	Zone 2	Zone 1	Zone 4	Weeds and Exotics	Zone 1
Coordinates (Easting)	341792	341776	341765	341787	341822	341777	341839	341852
Coordinates (Northing)	6301262	6301176	6301086	6301307	6301355	6301031	6301183	6301062
Native Plant Species Richness (%)	29	29	18	23	6	39	0	4
Native Over-storey Cover (%)	24	20.5	20.5	5	1.1	43.5	0	0
Native Mid-storey Cover (%)	16.5	12.2	11.7	12	18.2	5.5	0	0
Native Ground Cover (Grasses) (%)	4	50	24	40	16	40	0	0
Native Ground Cover (Shrubs) (%)	18	32	14	6	6	18	0	2
Native Ground Cover (Other) (%)	56	8	2	2	4	6	0	0
Exotic Plant Cover (%)	16	12	0	49.6	88	0	92	72
Number of Trees with Hollows	0	3	0	0	1	18	0	0
Over-storey Regeneration (score) (%)	1	1	0.66	1	0	1	0	0
Fallen Logs (m)	27	41	26	14	26	57	0	4

3.4 Current and Future Site Value Scores

The current and future site value scores for the vegetation zones assessed were calculated based on the data from the eight plots and transects collected on site and entered into the BCC. As described above, the complete clearing of the subject site (apart from the *Melaleuca biconvexa* population and associated 10 m buffer) has been assessed.

The current site value scores range between 25.17 / 100 to 83.51 / 100 **(Table 16).** For areas of complete clearing the future site value score is 0 / 100.

Table 16: Current and future site value scores

Vegetation zone ID	PCT ID	PCT name	Condition	Area impacted - (ha)/	Current site value	Future site value - clearing
Zone 1: PCT 1642 – Low Condition	PCT 1642	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	Low	1.4	25.17	0
Zone 2: PCT 1642 – Moderate to Good Condition	PCT 1642	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	Moderate to Good	0.78	60.94	0
Zone 3: PCT 1579 – Moderate to Good Condition	PCT 1579	Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast	Moderate to Good	0.30	46.88	0
Zone 4: PCT 1643 – Moderate to Good Condition	PCT 1643	Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	Moderate to Good	0.63	83.51	0

4. Assessing Threatened Species and Populations

4.1 Species Credit Species

4.1.1 Geographic and Habitat Features

Species credit species are those species that cannot be reliably predicted by habitat surrogates, the PCT or distribution, and therefore require additional assessment, and potentially targeted survey.

A component of preparing a candidate species list for survey includes the completion of geographic and habitat questions required by the BCC. The question posed and responses are provided below **(Table 17).** No impact will occur through the proposal to any species or habitat type listed in the geographic/habitat questions in the BCC.

Table 17: Assessment of geographic and/or habitat features

Common name	Scientific name	Feature	Impacted
Broad-headed Snake	*Hoplocephalus bungaroides*	land within 500 m of sandstone escarpments with hollow-bearing trees, rock crevices or flat sandstone rocks on exposed cliff edges and sandstone outcropping	No
Brush-tailed Rock-wallaby	*Petrogale penicillata*	land within 1 km of rock outcrops or clifflines	No
Common Planigale	*Planigale maculata*	rainforest, eucalypt forest, heathland, marshland, grassland or rocky areas	Yes
Diuris bracteata	*Diuris bracteata*	Dry sclerophyll woodland and forest with a predominantly grassy understorey.	Yes
Eastern Osprey	*Pandion cristatus*	land within 40 m of fresh/brackish/saline waters of larger rivers or creeks; estuaries, coastal lagoons, lakes and/or inshore marine waters	No
Giant Barred Frog	*Mixophyes iteratus*	land below 1000 m in altitude and within 40 m of rainforest or eucalypt forest with deep leaf litter	No
Giant Burrowing Frog	*Heleioporus australiacus*	land within 40 m of heath, woodland or forest with sandy or friable soils	Yes
Green and Golden Bell Frog	*Litoria aurea*	land within 100 m of emergent aquatic or riparian vegetation	Yes
Green-thighed Frog	*Litoria brevipalmata*	land within 100 m of semi-permanent or ephemeral ponds or depressions containing leaf litter	No
Heath Wrinklewort	*Rutidosis heterogama*	heath on sandy soils, or moist areas in open forest	Yes
Large-eared Pied Bat	*Chalinolobus dwyeri*	land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels	No
Littlejohn's Tree Frog	*Litoria littlejohni*	land within 100 m of permanent rocky streams with thick fringing vegetation	No
Pale-headed Snake	*Hoplocephalus bitorquatus*	land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber	Yes
Red-crowned Toadlet	*Pseudophryne australis*	heath or eucalypt forest on sandstone with a build-up of litter or other debris and containing, or within 40 m of, ephemeral or intermittent drainage lines	Yes
Rosenberg's Goanna	*Varanus rosenbergi*	land within 250 m of termite mounds or rock outcrops	Yes

Common name	Scientific name	Feature	Impacted
Somersby Mintbush	*Prostanthera junonis*	land containing Somersby or Sydney Town soil landscapes	Yes
Stuttering Frog	*Mixophyes balbus*	rainforest or tall open wet forest with understorey and/or leaf litter and within 100 m of streams	No
Wallum Froglet	*Crinia tinnula*	land within 40 m of swamps, wet or dry heaths or sedge grasslands	Yes

4.1.2 Candidate List for Survey

4.1.2.1 Fauna Species

Narla Environmental performed specialised surveys to target all potentially occurring threatened fauna **(Table 17).** These targeted surveys were undertaken during the same period as the collection of the BioMetric Plot data, between 16th January 2018 to 10th April 2018. After answering the geographic and habitat questions the BCC produces a candidate species list for further consideration. Consistent with Section 6.5.1.3 of the FBA (OEH 2014b), each species listed was reviewed and a habitat assessment conducted to determine if the species required further assessment, including targeted survey.

A list of 17 species credit fauna species were identified by the BCC and Bionet search (OEH 2017) as requiring further consideration **(Table 20).** All of these species were subject to targeted survey within the subject site utilising the described fauna detection methods **(Table 18).**

Eastern Pygmy Possum (*Cercartetus nanus)* was confirmed on the subject site through targeted surveys **(Plate 4).** The Eastern Pygmy Possum is a Species Credit species. No other Species Credit fauna species were identified within the Subject Site.

Plate 4. Eastern Pygmy Possums recorded within the subject site captured by Narla Environmental using remote cameras

Remote Camera Trapping

Ten (10) Remote Camera Traps were deployed across the Subject Site during the 16th January 2018 to 13th February 2018. These were installed in a range of vegetation communities, and microclimates; with the aim of capturing fauna which were utilising various habitat features, such as the escarpment, boulders, open ground and dense vegetation. Five cameras were set close to the ground, to target Brush-tailed Phascogale, Eastern Pygmy Possum, Rosenberg's Goanna, Common Planigale, Eastern Chestnut Mouse, Parma Wallaby and Southern Brown Bandicoot. Five cameras were established facing Banksia flowers sprayed with a mixture of honey and water to attract Eastern Pygmy Possum, Squirrel Glider and other threatened nectarivorous birds and mammals.

Bat Acoustic Monitors

One bat acoustic monitor (*Song Meter SM4 Bat*) was installed within habitat most likely to be utilised by micro-bats. The SM4 was installed directed at a flyway, within material made up of a large pile of debris that contained several small anthropogenic caves and crevices. The unit was deployed within the field for a total of fifteen (15) nights from 16th January 2018 to 28th January 2018. This was utilised to survey for Golden-tipped Bat. Analysis of the collected data was undertaken by a bat specialist Peter Knock (2018). One threatened species, Little Bent-winged Bat (*Miniopterus australis*) (Vulnerable TSC Act), was identified as "possible" on 23rd January 2018 and 26th January 2018, and identified as "probable" on 27th January 2018. Due to the low number of calls (one call per night) a definite identification could not be ascertained. Little Bent-wing Bat is not listed as a species credit species within the BCC.

Spotlighting

Active spotlight fauna searches were undertaken for Brush-tailed Phascogale, Eastern Pygmy Possum, Squirrel Glider, Common Planigale, Koala, Parma Wallaby, Southern Brown Bandicoot, Pale-headed Snake, Red-crowned Toadlet, Giant Burrowing Frog, Stephens' Banded Snake, Wallum Froglet, and Green and Golden Bell Frog over two nights on the 16th January 2018 and 13th February 2018. Searches were initiated an hour or more after sunset and involved a meandering walk through the site with enhanced search effort on dams, canopy, crevices, under logs and within dense foliage. Each spotlight search was of approximately four (4) person hours in duration.

Fauna Call Playback

Call playback was undertaken to target a number of suspected threatened species with appropriate habitat available within the site. Squirrel Glider, Koala, Red-crowned Toadlet, Giant Burrowing Frog, Green and Golden Bell Frog and Wallum Froglet calls were played around the dam in daylight and at night within the north of the subject site. Call playback was performed over the course of two nights from two locations on the 16th January 2018 and 13th February 2018. Timing was within the required survey period for all surveyed species (OEH BioNet 2019).

Opportunistic sightings and analysis of scats, tracks and traces

During all site visits, throughout the project opportunistic fauna observations including sightings, scats, tracks, characteristic scraps on trees, burrows and bone were collected. These were identified within the site, and/or used as focus areas to position additional targeted survey techniques to determine species presence. In addition, avian species sighted or heard during all site visits were recorded.

Table 18. Threatened fauna species surveyed within the Subject Site

Candidate Fauna Species	Survey Period (BAMC)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Brush-tailed Phascogale *Phascogale tapoatafa*	✓	✓										
Common Planigale *Planigale maculata*	✓	✓										
Eastern Chestnut Mouse *Pseudomys gracilicaudatus*	✓	✓										
Eastern Pygmy-possum *Cercartetus nanus*	✓	✓										
Giant Burrowing Frog *Heleioporus australiacus*	✓	✓										
Golden-tipped Bat *Phoniscus papuensis*	✓											
Green and Golden Bell Frog *Litoria aurea*	✓	✓										
Koala *Phascolarctos cinereus*	✓	✓							✓	✓	✓	
Pale-headed Snake *Hoplocephalus bitorquatus*	✓	✓										
Parma Wallaby *Macropus parma*	✓	✓										
Red-crowned Toadlet *Pseudophryne australis*	✓	✓										
Regent Honeyeater *Anthochaera phrygia*	✓	✓		✓					✓	✓	✓	
Rosenberg's Goanna *Varanus rosenbergi*	✓	✓									✓	
Southern Brown Bandicoot (eastern) *Isoodon obesulus subsp. obesulus*	✓	✓										
Stephens' Banded Snake *Hoplocephalus stephensii*	✓	✓										
Squirrel Glider *Petaurus norfolcensis*	✓	✓										
Wallum Froglet *Crinia tinnula*	✓	✓										
Key	✓ = Ecologist visit to Subject Property						= Optimum Survey Period					

4.1.2.2 Flora Species

A total of 32 threatened 'species credit' flora species were modelled as having potential to occur, or historically recorded within 10km of the subject site (OEH 2017) **(Table 21).** These species were identified for 'further consideration'. Targeted surveys were conducted for each of these species by Narla Ecologists Emily Rix and Nathan Banks during the field assessment on the 16th January 2018, 14th February 2018 and 10th April 2018. Additional targeted surveys were conducted by Narla Ecologists Emily Rix and Sarah Cardenzana on the 20th September 2019, 15th October 2019 and 1st of November 2019 **(Table 19).**

The *NSW Guide to Surveying Threatened Plants* (OEH 2016b) was employed with maximum effort directed toward sampling areas likely to be directly affect by the proposal. The survey periods aligned with the flowering period (when the species are most conspicuous) of most flora species, thereby having the greatest

chance of displaying key diagnostic features. Targeted surveys were conducted within Vegetation Zones 1-4 utilising the parallel field traverse technique (as directed by OEH 2016b). These transects are displayed in **(Figure 8).** According to OEH (2016b), "*Only the potential habitat of the target species within the site needs to be surveyed*".

Note that not all parts of Vegetation Zone 1 could not be completely penetrated due to dense thickets of *Lantana camara* and as such were not surveyed. Targeted surveys were not conducted within the vegetation zones 'Cleared' or 'Weeds and Exotics' (as shown in **Figure 7**) as these were deemed as not containing suitable habitat for the persistence of the targeted threatened species. These areas of intense weed infestation were highly degraded, located on imported landfill and since the soil and vegetation was artificial, no suitable habitat for the targeted threatened flora species is expected to occur within.

Specific details have been provided to describe the targeted survey effort for the species that were cryptic/seasonal and/or were considered most likely to occur within the Subject Site.

Table 19. Flowering times of threatened flora species

Candidate Flora Species	Survey Period (BAMC)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Acacia bynoeana	✓	✓							✓	✓	✓	
Ancistrachne maidenii	✓	✓		✓								
Angophora inopina	✓	✓		✓					✓	✓	✓	
Astrotricha crassifolia									✓	✓	✓	
Baloskion longipes	✓	✓		✓					✓	✓	✓	
Caladenia tessellata									✓	✓		
Callistemon linearifolius	✓									✓	✓	
Cryptostylis hunteriana	✓										✓	
Cynanchum elegans	✓	✓		✓					✓	✓	✓	
Darwinia glaucophylla	✓	✓		✓					✓	✓	✓	
Darwinia peduncularis	✓	✓		✓					✓	✓	✓	
Diuris bracteata									✓			
Diuris praecox								✓				
Epacris purpurascens var. purpurascens									✓	✓		
Eucalyptus camfieldii	✓	✓		✓					✓	✓	✓	
Genoplesium insigne									✓	✓		
Grevillea parviflora subsp. parviflora	✓	✓		✓					✓	✓	✓	
Grevillea shiressii									✓	✓	✓	
Hibbertia procumbens										✓	✓	
Lasiopetalum joyceae									✓	✓	✓	
Melaleuca biconvexa	✓	✓		✓					✓	✓	✓	
Melaleuca deanei	✓	✓		✓					✓	✓	✓	
Melaleuca groveana	✓	✓		✓					✓	✓	✓	
Persoonia hirsuta	✓	✓		✓					✓	✓	✓	
Prostanthera askania									✓	✓	✓	
Prostanthera junonis										✓	✓	

Candidate Flora Species	Survey Period (BAMC)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rhodamnia rubescens	✓	✓		✓					✓	✓	✓	
Rutidosis heterogama	✓	✓		✓					✓	✓	✓	
Senna acclinis	✓	✓		✓					✓	✓	✓	
Syzigium paniculatum				✓								
Tetratheca glandulosa									✓	✓	✓	
Tetratheca juncea									✓	✓	✓	
Key	✓ = Ecologist visit to Subject Property						= Optimum Survey Period					

Melaleuca biconvexa

During targeted surveys, Narla Ecologists identified the presence of one threatened flora species within the subject site, *Melaleuca biconvexa*, which is listed as Vulnerable under the TSC Act and EPBC Act. This species is a Species Credit species. Fifteen (15) individual specimens were recorded on the subject site **(Plate 5).** The occurrence of *Melaleuca biconvexa* was restricted to the western boundary of the subject site, confined to a small patch of mature individuals with evidence of regeneration. This small patch of *Melaleuca biconvexa* will be excluded from the development, including a 10m vegetation buffer surrounding the population.

No other threatened flora species were identified within the subject site during site inspection.

Plate 5. *Melaleuca biconvexa* within the subject site

Prostanthera junonis

Targeted surveys were undertaken for *Prostanthera junonis* (Somersby Mintbush) across the Subject site on 20th September 2019, 15th October 2019 and 1st November 2019. Narla Environmental contacted the Office of Environment and Heritage (OEH) for the location of a suitable, proximal reference site for *Prostanthera junonis* in order to ensure that a local population of the species is in flower at the time of survey. In addition, it was important to understand the habitat requirements of the species for reference to the Subject Site. A reference population was provided by OEH which is located at the end of Little Mooney Creek Road, Somersby, in Brisbane Water National Park. This reference population was visited immediately prior to the surveys on 20th September 2019, 15th October 2019 and 1st November 2019. The reference population was in full flower when visited on 20th September 2019 **(Plate 6)** and 15th October 2019. Flowering had significantly declined when visited on 1st November, although a number of flowers continued to remain on the plant. No *Prostanthera junonis* were observed in the Subject Site by Narla Environmental.

Plate 6. *Prostanthera junonis* at the Reference Population in Brisbane Waters National Park (Image captured by Narla Environmental 20th September 2019)

Diuris bracteata

Targeted surveys for *Diuris bracteata* were conducted by Narla ecologists across the Subject Site on 20th September 2019. No individuals were observed within the Subject Site.

Note that according to OEH (2019), "*this species is known only from the illustration of it in Fitzgerald R (1891) Austral. Orch. 2(4): 26. Specimens identified as D. bracteata were all misidentified. Those from Duffys Forest, Mt White and Kulnura are misidentified plants of Diuris platichila. Rupp's specimen from Buladelah is D. aurea. The specimens from the Northern Tablelands are D. abbreviata. Following the latest taxonomy, this species is thought to be extinct or at least there are no known extant plants or populations*".

Also note that in regards to the population of *Diuris bracteata* in the Somersby region, there has been some debate about the actual identify of these populations. It is understood that plants formerly recognised as *Diuris bracteata* are actually *Diuris platichila* (B. Towle pers comm).

Caladenia tessellata

Narla Environmental contacted the Office of Environment and Heritage (OEH) for the location of a suitable, proximal reference site for *Caladenia tessellata* in order to ensure that a local population of the species is in flower at the time of survey. Due to the sensitivity of the reference location, Narla were unable to access the site. However, OEH did confirm that this species was in bud in October 2019 at the undisclosed reference population (K. Coutts-McClelland pers. comm.).

Targeted surveys for *Caladenia tessellata* were conducted by Narla ecologists across the Subject Site on 20th September 2019 and 15th October 2019. No individuals were observed within the Subject Site. Note that there are there are no known records of this orchid from the Somersby region (OEH 2017).

Hibbertia procumbens

Narla Environmental have extensive experience surveying for *Hibbertia procumbens* in the Somersby area. This species has been observed by Narla ecologists flowering in October 2018 at a property along Wisemans Ferry Road, Somersby, and in November 2018 at a property along Somersby Falls Road, Somersby. Narla ecologists also viewed *Hibbertia procumbens* flowering on 20th September 2019, at the end of Little Mooney Creek Road, Somersby **(Plate 7).** This species is distinct and easy to detect during the flowering period.

According to OEH (2019), this species can be surveyed for between October and January. Targeted surveys for this species were undertaken on 20th September 2019, 15th October 2019 and 1st November 2019. Although September is outside the appropriate time of year (as per OEH 2019), as this species was viewed flowering at the end of Little Mooney Creek Road, Somersby, immediately prior to the September survey at the Subject Site, it was deemed appropriate to survey for. No *Hibbertia procumbens* were observed within the Subject Site during any of these targeted surveys.

Plate 7. *Hibbertia procumbens* flowering in September 2019, at the end of Little Mooney Creek Road, Somersby

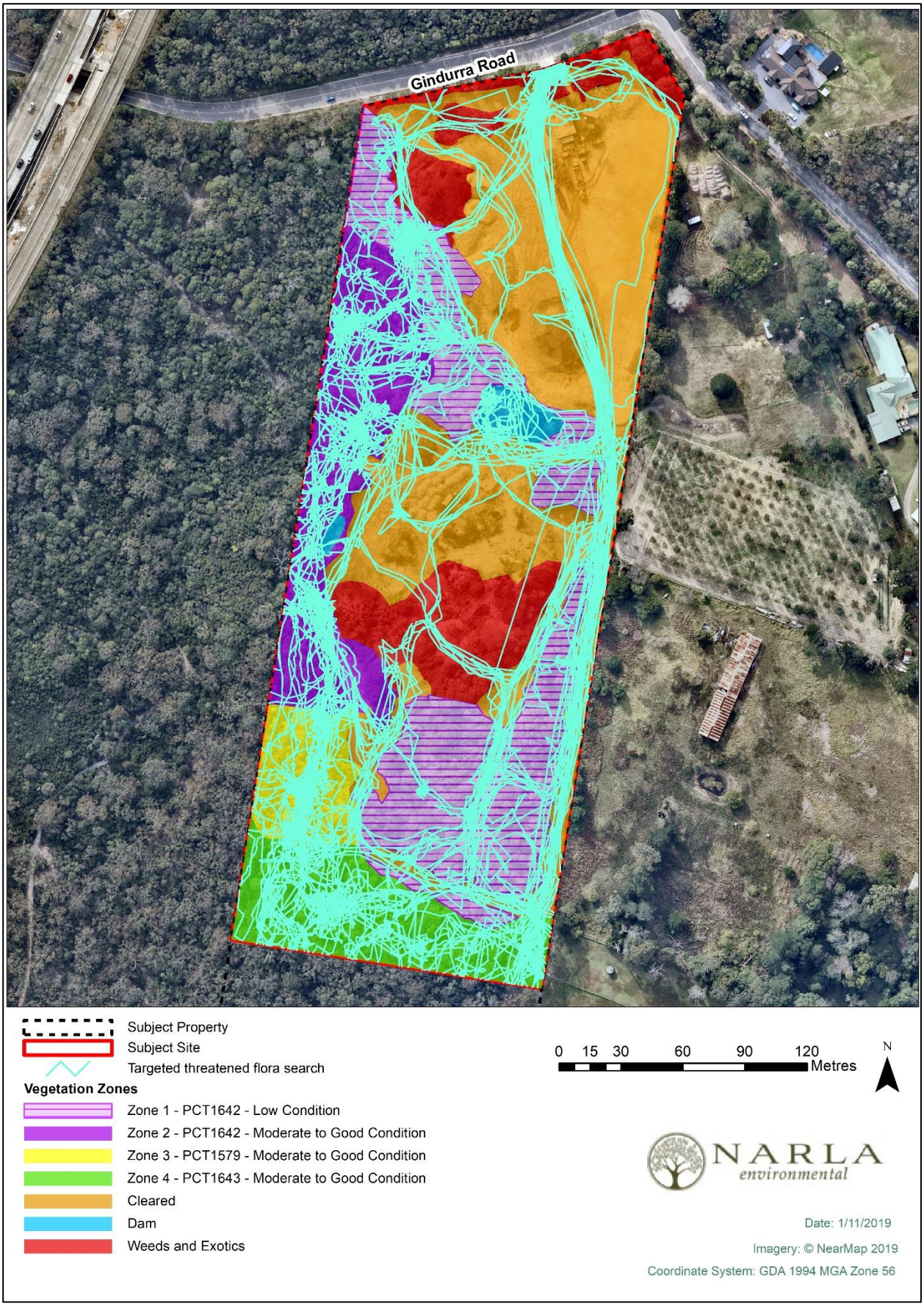

Figure 8. Targeted survey for threatened plants within the Subject Property (16th January 2018, 14th February 2018, 10th April 2018, 21st August 2018, 20th September 2019, 15th October 2019 and 1st November 2019)

Table 20. Identifying candidate fauna species for further assessment (species credit species)

Common name	Scientific name	TSC Act status	EPBC Act status	Further Assessment Required	Justification
Common Planigale	*Planigale maculata*	Endangered	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Eastern Pygmy-possum	*Cercartetus nanus*	Vulnerable	Not Listed	Yes	Targeted surveys confirmed that this species is present within the subject site. Credit calculations have been determined and are discussed in Section 6.
Giant Burrowing Frog	*Heleioporus australiacus*	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Golden-tipped Bat	*Phoniscus papuensis*	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Green and Golden Bell Frog	*Litoria aurea*	Endangered	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Koala	*Phascolarctos cinereus*	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Pale-headed Snake	*Hoplocephalus bitorquatus*	Vulnerable	No	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Parma Wallaby	*Macropus parma*	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Red-crowned Toadlet	*Pseudophryne australis*	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Regent Honeyeater	*Anthochaera phrygia*	Critically Endangered	Critically Endangered	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.

Common name	Scientific name	TSC Act status	EPBC Act status	Further Assessment Required	Justification
Rosenberg's Goanna	*Varanus rosenbergi*	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Southern Brown Bandicoot (eastern)	*Isoodon obesulus subsp. obesulus*	Endangered	Endangered	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Stephens' Banded Snake	*Hoplocephalus stephensii*	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Squirrel Glider	*Petaurus norfolcensis*	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Wallum Froglet	*Crinia tinnula*	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.

Table 21: Identifying candidate flora species for further assessment (species credit species)

Scientific name	Common name	TSC Act status	EPBC Act status	Further Assessment Required	Justification
Acacia bynoeana	Bynoe's Wattle	Endangered	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Ancistrachne maidenii		Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Site assessment revealed that the subject site provided suboptimal habitat to the species, it typically occurs gullies and the subject site was a ridgetop.
Angophora inopina	Charmhaven Apple	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Astrotricha crassifolia	Thick-leaf Star-hair	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Baloskion longipes	Dense Cord-rush	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Caladenia tessellata	Thick Lip Spider Orchid	Endangered	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the Subject Property does not support the species. Note that during extensive targeted orchid surveys, no orchid species were found across the entire Subject Site. Non-threatened orchid species, such as *Microtis* spp. and *Calochilus* spp. were only found further south of the Subject Site (within the southern end of the Subject Property), in higher condition native vegetation that was more suited to terrestrial orchid species.
Callistemon linearifolius	Netted Bottle Brush	Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Cryptostylis hunteriana	Leafless Tongue Orchid	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the Subject Property does not support the species. Note that during extensive targeted orchid surveys, no orchid species were found across the entire Subject Site. Non-threatened orchid species, such as *Microtis* spp. and *Calochilus* spp. were only found further south of the Subject Site (within the southern end of the Subject Property), in higher condition native vegetation that was more suited to terrestrial orchid species.
Cynanchum elegans	White-flowered Wax Plant	Endangered	Endangered	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species. Furthermore, this species is not typically associated with the vegetation communities that were identified on the Subject Site.

Scientific name	Common name	TSC Act status	EPBC Act status	Further Assessment Required	Justification
Darwinia glaucophylla		Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Darwinia peduncularis		Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Diuris bracteata		Endangered	Extinct	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the Subject Property does not support the species. Note that during extensive targeted orchid surveys, no orchid species were found across the entire Subject Site. Non-threatened orchid species, such as *Microtis* spp. and *Calochilus* spp. were only found further south of the Subject Site (within the southern end of the Subject Property), in higher condition native vegetation that was more suited to terrestrial orchid species.
Diuris praecox	Rough Doubletail	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Surveys and site assessment revealed that the Subject Property does not support the species. Note that during extensive targeted orchid surveys, no orchid species were found across the entire Subject Site. Non-threatened orchid species, such as *Microtis* spp. and *Calochilus* spp. were only found further south of the Subject Site (within the southern end of the Subject Property), in higher condition native vegetation that was more suited to terrestrial orchid species.
Epacris purpurascens var. purpurascens		Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Eucalyptus camfieldii	Camfield's Stringybark	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Genoplesium insigne	Variable Midge Orchid	Critically Endangered	Critically Endangered	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the Subject Property does not support the species. Note that during extensive targeted orchid surveys, no orchid species were found across the entire Subject Site. Non-threatened orchid species, such as *Microtis* spp. and *Calochilus* spp. were only found further south of the Subject Site (within the southern end of the Subject Property), in higher condition native vegetation that was more suited to terrestrial orchid species.
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Grevillea shiressii		Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.

Scientific name	Common name	TSC Act status	EPBC Act status	Further Assessment Required	Justification
Hibbertia procumbens	Spreading Guinea Flower	Endangered	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Lasiopetalum joyceae		Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Melaleuca biconvexa	Biconvex Paperbark	Vulnerable	Vulnerable	Yes	Targeted survey conducted within the subject site revealed approximately 15 individuals within the subject site and were confirmed to be restricted to this patch of vegetation. This small patch of *Melaleuca biconvexa* will be excluded from the development, including a 10m vegetation buffer surrounding the population.
Melaleuca deanei	Deane's Paperbark	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Melaleuca groveana	Grove's Paperbark	Vulnerable	Not listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Persoonia hirsuta	Hairy Geebung	Endangered	Endangered	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Prostanthera askania	Tranquillity Mintbush	Endangered	Endangered	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Prostanthera junonis	Somersby Mintbush	Endangered	Endangered	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Rhodamnia rubescens	Scrub Turpentine	Critically Endangered	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Rutidosis heterogama	Heath Wrinklewort	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Senna acclinis	Rainforest Cassia	Endangered	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species. Furthermore, this species is not typically associated with the vegetation communities that were identified on the Subject Site.

Scientific name	Common name	TSC Act status	EPBC Act status	Further Assessment Required	Justification
Syzygium paniculatum	Magenta Lillypilly	Endangered	Endangered	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Tetratheca glandulosa		Vulnerable	Not Listed	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.
Tetratheca juncea	Black-eyed Susan	Vulnerable	Vulnerable	No	No individuals were recorded on the subject site during the site assessment. Targeted surveys and site assessment revealed that the subject site does not support the species.

4.2 Ecosystem Credit Species

4.2.1 Predicted Ecosystem Credit Species

Species that require ecosystem credits have a high likelihood of being present on the development site, based on the data entered into the BCC including PCT details, patch size and the location of the development.

Twenty-nine (29) ecosystem credit species were identified by the BCC **(Table 22).** A habitat assessment was conducted for each species to determine if the species should remain in the assessment or be removed consistent with Section 6.3.1.8 of the FBA (OEH 2014b).

One ecosystem credit species Barking Owl (*Ninox connivens*) was confirmed on site, with potential habitat for the other 28 species also considered present. Therefore, all ecosystem species were maintained in the assessment.

Table 22: Identifying candidate species for further assessment (ecosystem credit species)

Common name	Scientific name	TSC Act status	EPBC Act status	Species present in vegetation zone?
Barking Owl	*Ninox connivens*	Vulnerable	-	Yes – Species Confirmed on Site
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis subsp. gularis*	Vulnerable	-	Potential
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus subsp. victoriae*	Vulnerable	-	Potential
Bush Stone-curlew	*Burhinus grallarius*	Endangered	-	Potential
Diamond Firetail	*Stagonopleura guttata*	Vulnerable	-	Potential
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Vulnerable	-	Potential
Eastern Freetail-bat	*Mormopterus norfolkensis*	Vulnerable	-	Potential
Gang-gang Cockatoo	*Callocephalon fimbriatum*	Vulnerable	-	Potential
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	Vulnerable	-	Potential
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Vulnerable	-	Potential
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis subsp. temporalis*	Vulnerable	-	Potential
Little Eagle	*Hieraaetus morphnoides*	Vulnerable	-	Potential
Little Lorikeet	*Glossopsitta pusilla*	Vulnerable	-	Potential
Long-nosed Potoroo	*Potorous tridactylus*	Vulnerable	Vulnerable	Potential
Masked Owl	*Tyto novaehollandiae*	Vulnerable	-	Potential
Painted Honeyeater	*Grantiella picta*	Vulnerable	Vulnerable	Potential
Powerful Owl	*Ninox strenua*	Vulnerable	-	Potential
Red-legged Pademelon	*Thylogale stigmatica*	Vulnerable	-	Potential
Scarlet Robin	*Petroica boodang*	Vulnerable	-	Potential
Sooty Owl	*Tyto tenebricosa*	Vulnerable	-	Potential

Common name	Scientific name	TSC Act status	EPBC Act status	Species present in vegetation zone?
Speckled Warbler	*Chthonicola sagittata*	Vulnerable	-	Potential
Spotted-tailed Quoll	*Dasyurus maculatus*	Vulnerable	Endangered	Potential
Square-tailed Kite	*Lophoictinia isura*	Vulnerable	-	Potential
Squirrel Glider	*Petaurus norfolcensis*	Vulnerable	-	Potential
Swift Parrot	*Lathamus discolor*	Endangered	Critically Endangered	Potential
Turquoise Parrot	*Neophema pulchella*	Vulnerable	-	Potential
Varied Sittella	*Daphoenositta chrysoptera*	Vulnerable	-	Potential
Yellow-bellied Glider	*Petaurus australis*	Vulnerable	-	Potential
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable	-	Potential

5. Impact Assessment and Credit Calculations

5.1 Final project footprint and assessment of impacts

The proposed development is restricted to the northern sections of 90 Gindurra Road, Somersby NSW (Lot 4 / DP 227279). The total area of the Subject Property is 10.75 ha, with the Subject Site (area proposed for development) totalling 6.62 ha. Total impacts to native vegetation total 3.11 ha, with the remainder of the Subject Site consisting of already cleared land, or dominated by exotic vegetation.

For the purposes of this assessment all lands within the Subject Site are assessed for complete clearing, except for a 10 m buffer surrounding the *Melaleuca biconvexa* individuals recorded on site, totalling 0.06ha. The final project impact is provided in **Table 23,** and the footprint is displayed in **Figure 9**.

Table 23: Total impact on native vegetation

Vegetation zone ID	PCT ID	PCT name	Condition	Area impacted (ha) - clearing
Zone 1: PCT 1642 – Low Condition	PCT 1642	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	Low	1.4
Zone 2: PCT 1642 – Moderate to Good Condition	PCT 1642	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	Moderate to Good	0.78
Zone 3: PCT 1579 – Moderate to Good Condition	PCT 1579	Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast	Moderate to Good	0.30
Zone 4: PCT 1643 – Moderate to Good Condition	PCT 1643	Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	Moderate to Good	0.63
			Total	**3.11**

Two species credit species have been confirmed on site:

- Eastern Pygmy-possum, and
- *Melaleuca biconvexa*

Impacts to Eastern Pygmy-possum are anticipated within Vegetation Zone 2 (*Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast*) and Vegetation Zone 4 (*Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast*). A total impact of 1.41 ha to Eastern Pygmy-possum is calculated. The species polygon is displayed in **Figure 10**.

Fifteen (15) individuals of *Melaleuca biconvexa* have been identified on site. The population is restricted to the western edge of the Subject Site. The species extent is presented (**Figure 11**). Although this area is to be excluded from development and will be protected within a 10 m buffer. Efforts will be made to reduce the impacts on the population of *Melaleuca biconvexa* which are discussed in **Section 5.2.**

5.2 Impacts to Hydrology and Effects on Biodiversity

The *Melaleuca biconvexa* occurs in damp areas, often near watercourses, on alluvium soils over shale (Terrigal formation) (Benson & McDougall 1998). The species may form a dense stand in a narrow strip adjacent to a watercourse.

The vegetation communities in which the *Melaleuca biconvexa* generally occurs include 'Eucalypt open-forest' with Sydney Blue Gum (*Eucalyptus saligna*), Swamp Mahogany (*Eucalyptus robusta*) and Mountain Cedar Wattle (*Acacia elata*) and in 'Paperbark scrub' with Prickly-leaved Paperbark (*Melaleuca styphelioides*), Snow-in-summer (*Melaleuca linariifolia*), White Feather Honeymyrtle (*Melaleuca decora*), Sieber's Paperbark (*Melaleuca sieberi*) and *Melaleuca nodosa*.

The *Melaleuca biconvexa* population on the Subject Site is growing in soils that are not obviously waterlogged. Their location on a ridgetop with no proximal permanent flowing watercourse suggests that the plants at this location are more tolerant of drier soils than other populations of the species.

The impacts to hydrology and associated effects on biodiversity have been assessed, particularly in relation to the impacts on the *Melaleuca biconvexa* population within the Subject Site (Sustainability Workshop Ltd 2019). It is anticipated that the measures proposed below will reduce indirect impacts to biodiversity, including the population of *Melaleuca biconvexa.*

The following measures have been proposed:

- It is expected that the proposed development will reduce a small catchment flowing to the population of *Melaleuca biconvexa.* According to Sustainability Workshop Ltd (2019), treated water from the proposed operations on the Subject Site will be used to irrigate land draining to this plant community aiming to supply the same average annual volume of water that would have flowed to this community under predevelopment conditions.

- Once water is discharged from the site onto adjoining bushland, a 50m wide level spreader will spread the water out onto adjoining bushland. The soils on this site are sandy soils with the likelihood that most flows would be absorbed and flow below the surface to form an important subsurface flow to sustain the downhill remnant vegetation (Sustainability Workshop Ltd 2019).

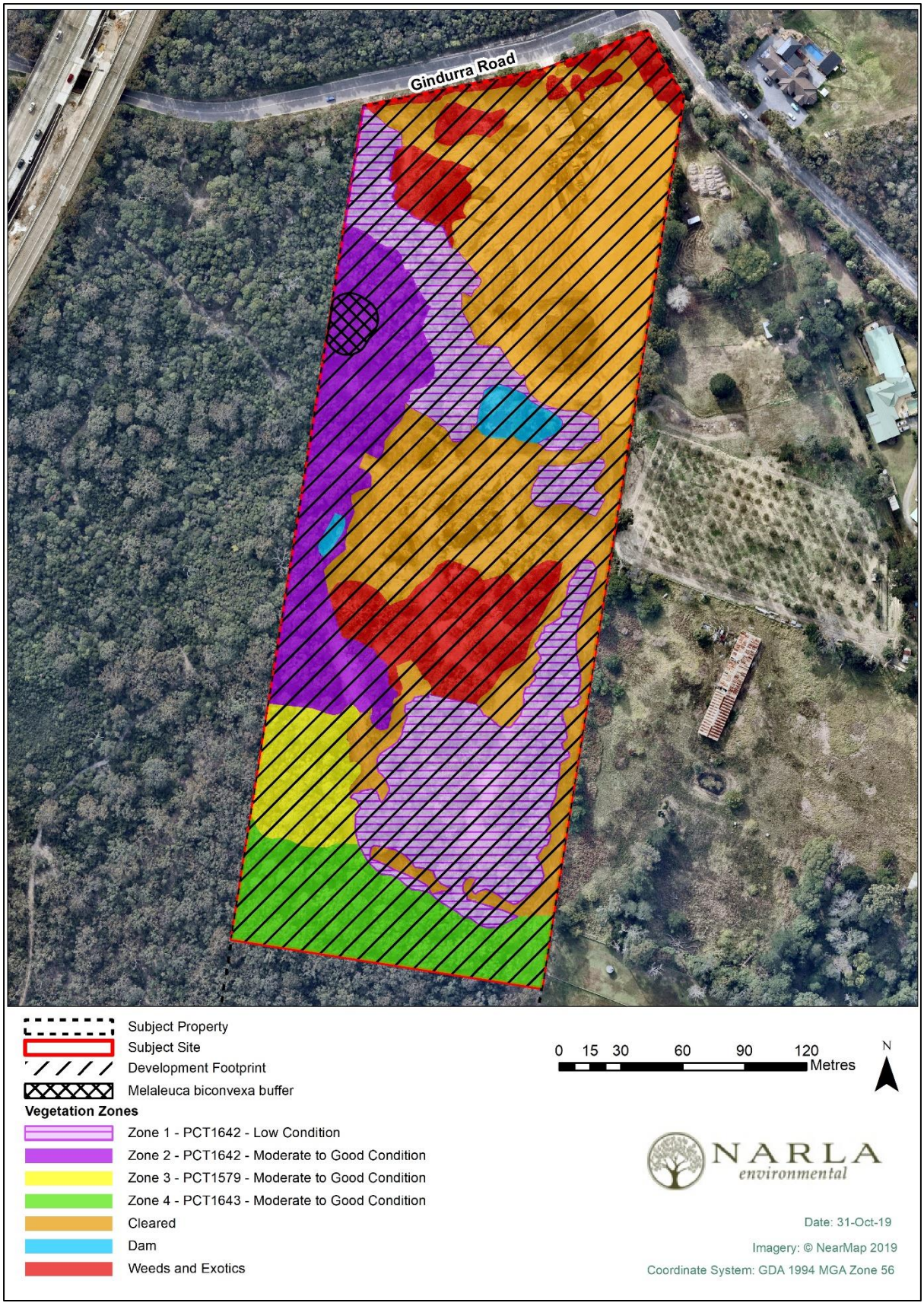

Figure 9: Development footprint and native vegetation extent

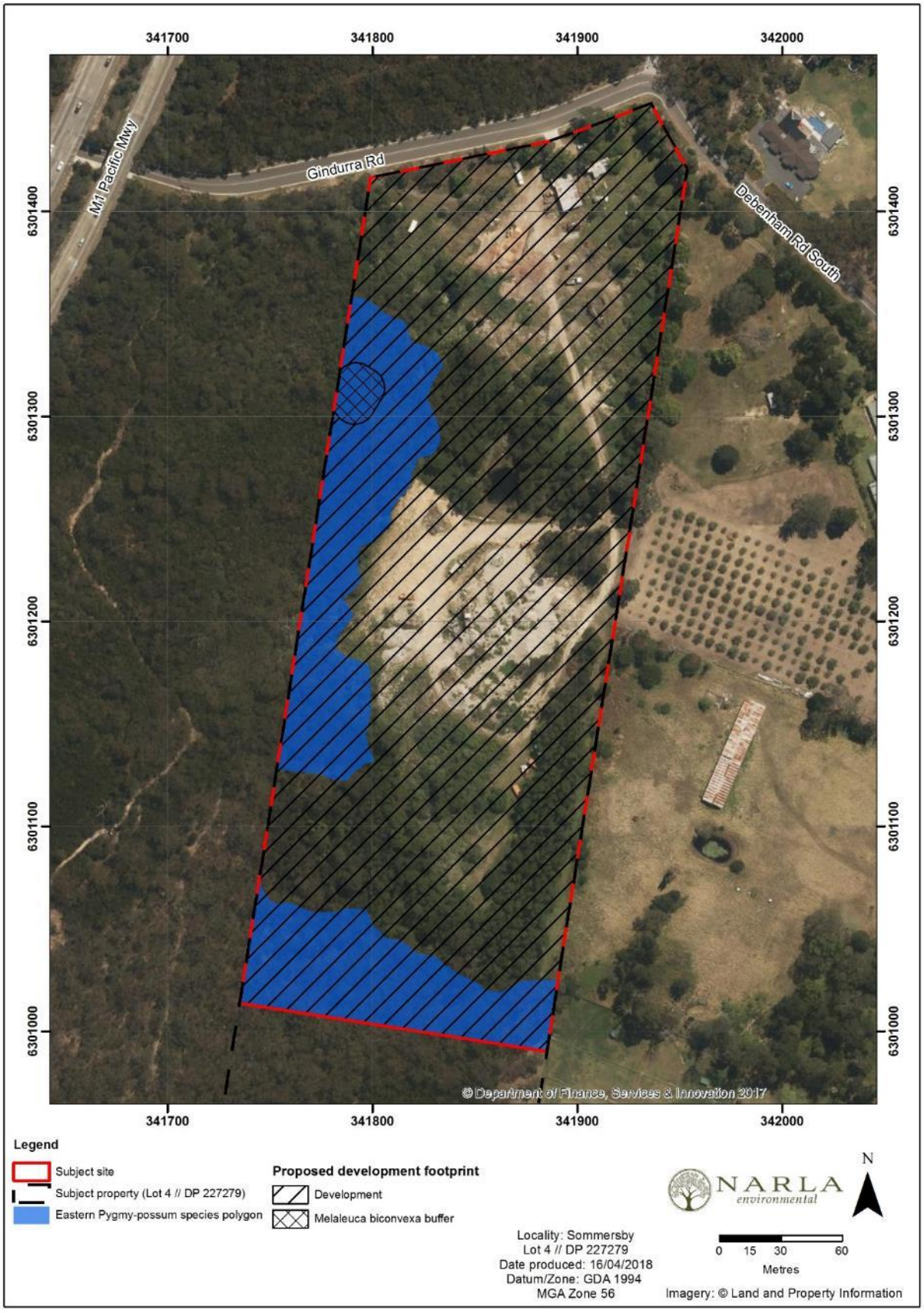

Figure 10: Eastern Pygmy-possum species polygon

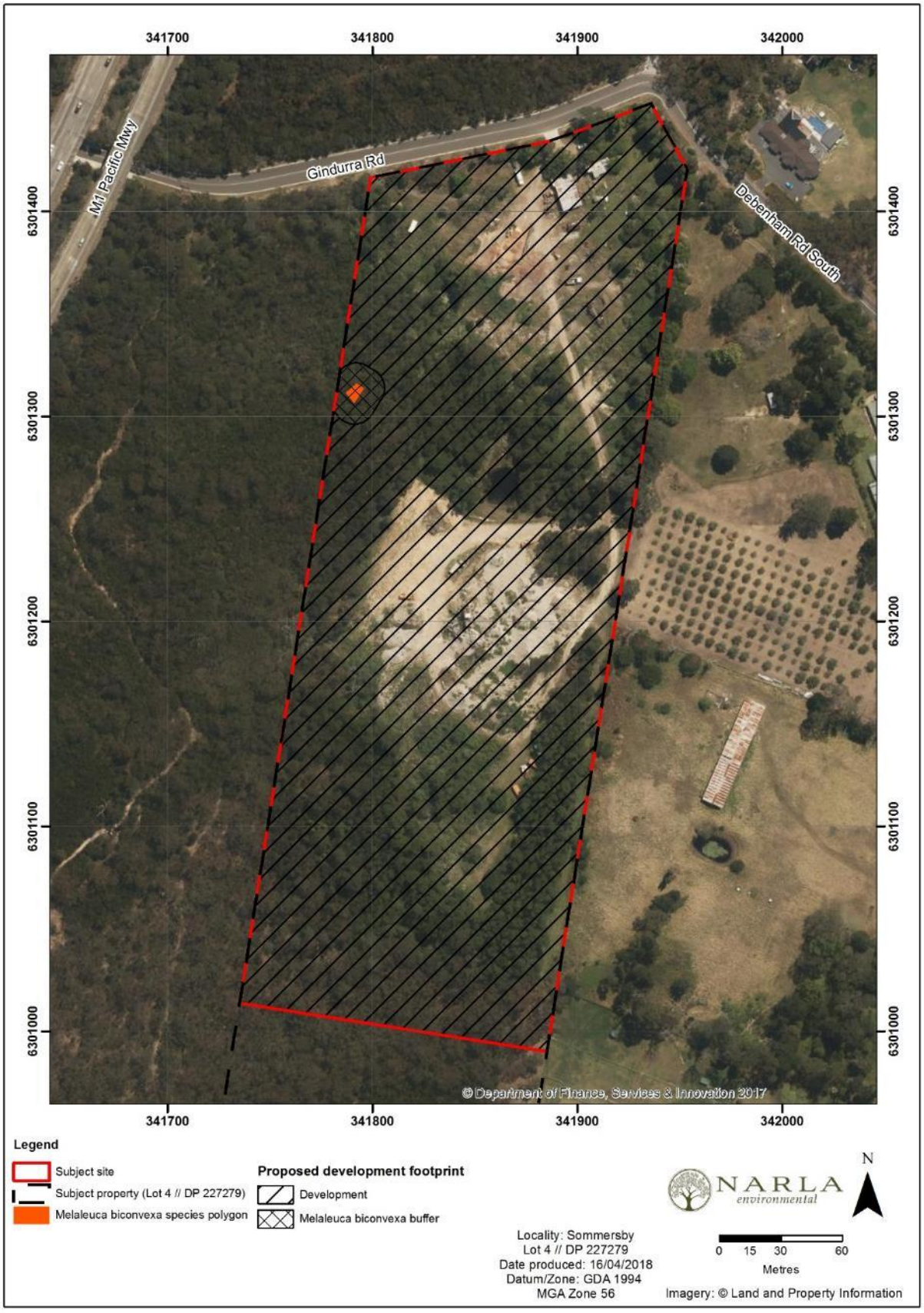

Figure 11: *Melaleuca biconvexa* species extent and buffer

5.3 On-going Operations

Narla Environmental have undertaken a comprehensive assessment of the cumulative impacts from all clearing activities and operations, associated edge effects and other direct impacts on biodiversity in accordance with the EP&A Act 1979. Provided these recommendations are followed, impacts to biodiversity will be reduced.

5.3.1 Stormwater

Prior to any construction, areas of the site will need to be cleared and contoured to provide adequate drainage to the existing stormwater detention pond. Civil site works will need to ensure that there is appropriate drainage and stormwater capture at the site. There is an existing stormwater dam on the subject site. This will be modified and enlarged as a point for stormwater capture (along the western boundary of the site). The two dams located in the centre of the site shall be filled. The captured stormwater would be used for operational purposes at the site.

This needs to be considered in the stormwater management system design. The design will consider best practice guidelines in:

- Landcom (2004). Managing Urban Stormwater – Soils and Construction. Published by the NSW Government.
- Department of Environment and Conservation (2006). Managing Urban Stormwater – Harvesting and Reuse. Published by the NSW Department of Environment and Conservation.

Provided these measures are taken, and all control measures are in line with the two above mentioned documents, there should be no significant impact on biodiversity within the subject site.

5.3.2 Noise

A 5m constructed noise barrier will be constructed along the eastern boundary of the site, as well as two internal 3m noise barriers within the site to mitigate against noise impacts. Noise is not likely to further impact upon any threatened species within the subject site, as the subject site is already situated within close proximity to a number of busy roads and motorways.

5.3.3 Sewerage

The site will be connected to the Council sewer system on completion of the development. No on-site sewage treatment is required for this project.

5.4 Biosecurity Risk Assessment

Biosecurity risks have the potential to impact native biodiversity unless reasonable control measures have been identified and implemented. Narla have identified such biosecurity risks and provided recommended control measures for pre and post development **(Table 24).**

Table 24. Biosecurity Risk Assessment Analysis

Identified Risk	Risk Analysis	Risk Rating Prior to Implementation of Control	Solution/ Control Measure	Residual Risk Rating Post Control
Pathogens	Infection by *Phytophthora cinnamomi* and *Puccinia psidii* (Myrtle Rust). These pathogens were not recorded within the subject site. Phytophthora and Myrtle Rust are pathogens which can be spread through infected soil, with potentially large detrimental impact.	High	Basic control principles include avoiding transport of sediment onto the vegetated areas of the property by cleaning all work clothing, gloves, tools and machinery that enter any protected, vegetated areas. In some cases, a solution of 70% ethanol or methylated spirits in 30% water may be sufficient to disinfect equipment prior to use. The report, 'Arrive Clean, Leave Clean' (Commonwealth of Australia 2015) provides further information and best practice methods to reduce spread of these pathogens between work Subject Sites.	Low
Pests	Vertebrate pests were recorded on the subject site, including *Oryctolagus cuniculus* (European Rabbit) and *Vulpes vulpes* (European Fox). Such pest species can impact on threatened species within the Subject Site, including the predation by European Fox on Eastern Pygmy-possum, and the grazing by European Rabbit on regeneration of *Melaleuca biconvexa.*	High	Vertebrate pests should be controlled on an annual basis (or more regularly as required). Control methods include 1080 fox baiting, trapping, den fumigation and shelter habitat removal.	Low
Weeds	The subject site (Development area) was heavily infested with environmental and priority weeds.	High	All environmental and priority weeds will be entirely eradicated from the subject site and then managed under a Vegetation Management Plan (VMP). The VMP will require an annual site visit by a team of qualified bush regenerators to ensure the control of weeds within the subject site.	Low

5.5 Avoiding and mitigating impacts

A total of 3.11 ha of native vegetation is proposed to be impacted by the project, with a further 3.35 ha of cleared land and exotic vegetation also to be impacted within the Subject Site. Although complete clearing of native vegetation has been used to calculate credits within the Subject Site, several avoidance measures have been implemented during project design. Several mitigation measures will also be implemented during development to reduce impacts as much as possible.

Avoidance and mitigation measures include:

- A 10 m buffer surrounding *Melaleuca biconvexa* individuals to minimise direct impacts on this species from the development.
- Preparation of a Vegetation Management Plan (VMP) to guide the on-going protection and management of the *Melaleuca biconvexa*,
- Treated water will be used to irrigate land draining to the population of *Melaleuca biconvexa,* aiming to supply the same average annual volume of water that would have flowed to this community under predevelopment conditions (Sustainability Workshop Ltd 2019).
- Once water is discharged from the site onto adjoining bushland, a 50m wide level spreader will spread the water out onto adjoining bushland. The soils on this site are sandy soils with the likelihood that most flows would be absorbed and flow below the surface to form an important subsurface flow to sustain the downhill remnant vegetation (Sustainability Workshop Ltd 2019).
- Avoidance of the southern portion of the Subject Property (outside of the subject Site), which totals 4.1 ha and contains habitat for *Prostanthera junonis* and *Hibbertia procumbens*. The area partially falls under Management Zone 1b and 1d of the Somersby Industrial Park Draft Plan of Management (Connell Wagner 2005).
- Assigning an Ecologist to undertake a pre-clearing survey of the vegetation prior to clearing and development. If any significant ecological values such as nests are found, clearing is to be delayed until the nest is vacated.
- Assigning an Ecologist to undertake pre-clearing trapping of Eastern Pygmy-possum within the Subject Site. Fifty (50) Elliot Traps will be laid out within the Subject Site over seven days. Any Eastern Pygmy-possums or other fauna trapped will be relocated to suitable habitat within the south of the Subject Property that is outside of the clearing footprint.
- Assigning an Ecologist to be present on site during the clearing events. The Ecologist will be able to guide works crews away from sensitive ecological features and will be on hand to capture and relocate displaced fauna. Where possible the clearing of mature trees will be avoided if they can be accommodated into the development footprint.
- Preventing the inadvertent introduction of exotic flora propagules by following the DEP (2015) 'Arrive Clean, Leave Clean' Guidelines.
- Ensuring appropriate erosion and sedimentation controls are maintained throughout the construction phase and the period immediately following as outlined in the 'Blue Book' (Landcom 2004).

The unavoidable impact of clearing vegetation will be completely offset based on the credit calculations provided in **Section 6**.

6. Offset Credit Calculations

Section 9: Table 4 of the FBA (OEH 2014b) provides thresholds for the assessment and offsetting for the unavoidable impacts of development. Four thresholds have been defined, including:

1. Impacts that require further consideration by consent authority
2. Impacts for which the assessor is required to determine an offset
3. Impacts for which the assessor is not required to determine an offset
4. Impacts that do not require further assessment by the assessor.

The proposed development meets the requirements of (2). Therefore, the credit requirements for the project has been calculated.

6.1 Ecosystem credits

Ecosystem credits were calculated based on the landscape value assessment, native vegetation assessment and threatened species assessment documented in this report.

In total 103 credits are required for the proposed impact of 3.11 ha of native vegetation and ecosystem species habitat. The ecosystem credit offset requirement is summarised in **Table 25**, and the final credit report is displayed in **Appendix 4**. The credit offset options are considerable, with many possible vegetation types available.

Table 25 Ecosystem credit requirement (BCC, 2019)

Plant community type	Condition	Area impacted (ha)	Credits required
Zone 1: PCT 1642 / HU856 (*Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast*)	Low	1.4	13
Zone 2: PCT 1642 / HU856 (*Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast*)	Moderate to Good	0.78	38
Zone 3: PCT 1579 / HU793 (*Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast*)	Moderate to Good	0.3	11
Zone 4: PCT 1643 / HU857 (*Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast*)	Moderate to Good	0.63	41
	Total	**3.11**	**103**

6.2 Species credits

The impact to 1.41 ha of Eastern Pygmy-Possum habitat requires 28 species credits to be retired.

No other species credits will need to be retired to facilitate this project.

6.3 Biodiversity Offset Obligations

6.3.1 Retiring of Biobanking Credits

A total of 103 'Biobanking' ecosystem credits and 28 Eastern Pygmy-Possum 'Biobanking' species credits must be retired in order to offset the impacts of the proposed development (see **section 6.2** and **section 6.3**).

A review of the credits currently available on the offsets market on November 8th 2019 revealed that no identical credits are available for the impacted PCTs within the Wyong subregion, however several alternative credits are available including BioMetric Vegetation Types HU833, HU838, HU839, HU850 and HU895.

As of November 8th 2019, Eastern Pygmy-Possum credits are also currently available from a number of sites in adequate numbers. The proponent will consider contacting credit holders and completing a Credits Wanted request for the required credits as the project proceeds.

Once the availability of matching credits is determined landholders Expression of Interest (EOIs) will also be reviewed. Should a match occur the landholders listed in the EOI register will be contacted to determine if interest to enter into a Biodiversity Stewardship Agreement still exists and, if still interested, the likely cost of the credits required to offset the project.

6.3.2 Alternative Options to Meet Offset Obligation

It should be noted that the proposal has assessed impacts to biodiversity values in accordance with the FBA which falls under the TSC Act (as per the SEARs requirements). As such, the proponent is required to retire 'BioBanking credits' in order to offset the residual impacts of the proposal.

The *Biodiversity Conservation Act 2016* together with the Biodiversity Conservation Regulation 2017 commenced on 25 August 2017. They replaced the TSC Act and associated regulation. The TSC Act had previously provided the framework for creation of biodiversity credits and biodiversity credit obligations (also called offset obligations). These are also known as BioBanking credits after the name of the program. The change in legislation also included a change in the method that was used to create biodiversity credits and to calculate offset obligations.

To ensure that credits and credit obligations created under the TSC Act could still be used or met within the newer credit market, The *Biodiversity Conservation (Savings and Transitional) Regulation 2017 (Savings and Transitions Regulation)* preserved these credits and credit obligations. The Savings and Transitions Regulation also provided the power for the Environment Agency Head (EAH) to determine reasonable equivalence of these credits or credit obligations, that is, to match older BioBanking credits or credit obligations to the new Biodiversity Offsets Scheme credit numbers and classes.

The proponent may apply for an 'assessment of reasonable equivalence' because, as a condition of approval of this SSD the proponent will:

- have a BioBanking credit obligation (calculated under the provisions of the TSC Act) and you wish to retire credits created under the BC Act to meet that obligation.
- have a BioBanking credit obligation (calculated under the provisions of the TSC Act) and you wish to discharge that obligation by payment into the Biodiversity Conservation Fund.

If the proponent chooses to undertake an 'assessment of reasonable equivalence' they will still be permitted to transfer and retire BioBanking credits that match BioBanking credit obligations.

7. Conclusion

The proposed development has been assessed consistent with the FBA, including the preparation of a site scale vegetation map and completion of the eight (8) Biometric plots and transects. The results of the assessment found that:

- 103 ecosystem (BioBanking) credits are required
- 28 Eastern Pygmy-Possum species (BioBanking) credits are required.

The proponent has the option of:

- purchasing the above 'Biobanking' credits directly from holders of such credits from the market;
- alternatively, the proponent may request an 'assessment of reasonable equivalence'. This will result in the proponent being able to meet their offset obligation through the NSW *Biodiversity Conservation Act 2016 Biodiversity* Assessment Method (BAM). This option allows the proponent to either:
    - make a payment into the Biodiversity Conservation Fund (BCT); or
    - purchasing the equivalent 'BAM biodiversity offset credits' from the open market.

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9. Appendix

Appendix 1 – Flora list for the subject site

Appendix 2 – Fauna list for the subject site

Appendix 3 – Sample BioMetric Plot and Transect Proforma

Appendix 4 - Biodiversity credit report

Appendix 1 -Flora list for the subject site

Table 26. Flora species recorded within the subject site

Scientific Name	PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	PCT 1643 - Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	PCT 1579 - Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast
Acacia decurrens			
Acacia oxycedrus			
Acacia parramattensis			
Acacia ulicifolia			
Acacia suaveolens			
Adiantum hispida			
Ageratina adenophora			
Allocasuarina littoralis			
Allocasuarina torulosa			x
Angophora costata	x	x	x
Anisopogon avenaceus		x	
Banksia ericifolia	x		
Banksia marginata			
Banksia oblongifolia			
Banksia serrata	x	x	
Banksia spinulosa		x	
Bidens pilosa			
Billardiera scandens			
Bossiaea obcordata		x	
Bouteloua dactyloides			
Breynia oblongifolia			
Callistemon linearis			
Calochlaena dubia			
Camphor laurel			
Cassytha glabella			
Casuarina glauca			
Conyza bonariensis			
Corymbia gummifera	x	x	
Cymbopogon refractus			
Dianella caerulea			
Echinopogon caespitosus			
Echinopogon ovatus			
Ehrharta erecta			
Empodisma minus			
Entolasia stricta		x	x
Eragrostis curvula			
Eucalyptus capitellata			

Scientific Name	PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	PCT 1643 - Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	PCT 1579 - Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast
Eucalyptus haemastoma	x	x	
Eucalyptus punctata			
Eurycorda complanata			
Gahnia sieberiana			
Grevillea sericea			
Glochidion ferdinandi			
Hakea dactyloides			
Hakea gibbosa			
Hakea teretifolia			
Hibbertia aspera			
Hovea linearis			
Hydrocotyle bonariensis			
Imperata cylindrica			
Ipomea indica			
Isopogon anemonifolius			
Kunzea ambigua			
Lambertia formosa		x	
Lantana camara			
Leptospermum polygalifolium	x		
Leucopogon juniperina			
Ligustrum sinense			
Lindsaea linearis			
Lomandra glauca			
Lomandra gracilis			
Lomandra longifolia			
Lomandra obliqua			
Lonicera japonica			
Melaleuca biconvexa			
Microlaena stipoides			
Nepholepis cordifolia			
Ochna serrulata			
Opercularia hispida			
Oplismenus aemulus			
Oplismenus imbicillus			
Ozothamnus diosmifolius			
Parsonsia straminea			
Patersonia sericea		x	
Paspalum dilatatum			
Pennisetum clandestinum			
Petrophile pulchella	x		
Persoonia isophylla			

Scientific Name	PCT 1642 - Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	PCT 1643 - Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	PCT 1579 - Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast
Persoonia levis		x	
Phyllanthus hirtellus			
Philotheca hispidula			
Pittosporum undulatum			
Platysace linearifolia	x	x	
Polyscias sambucifolia			x
Pteridium esculentum			x
Scaevola ramosissima			
Schizaea bifida			
Selaginella uliginosa			
Senecio madagascariensis			
Senna pendula			
Setaria sp.			
Stephania japonica			
Syncarpia glomulifera			x
Telopea speciosissima			
Veronica plebeia			
Woollsia pungens			
Xanthorrhoea sp.			
Xanthosia pilosa			
Xanthosia tridentata			
Xylomelum pyriforme			

Appendix 2 – Fauna list for the subject site

Table 27. Fauna species recorded within the subject site

Class	Scientific Name	Common Name	Status
Amphibia	*Crinia signifera*	Common Eastern Froglet	Protected
Amphibia	*Litoria fallax*	Eastern Dwarf Tree Frog	Protected
Amphibia	*Litoria peronii*	Peron's Tree Frog	Protected
Aves	*Acanthiza lineata*	Striated Thornbill	Protected
Aves	*Acanthiza nana*	Yellow Thornbill	Protected
Aves	*Acanthiza pusilla*	Brown Thornbill	Protected
Aves	*Acanthorhynchus tenuirostris*	Eastern Spinebill	Protected
Aves	*Anthochaera carunculata*	Red Wattlebird	Protected
Aves	*Anthochaera chrysoptera*	Little Wattlebird	Protected
Aves	*Coracina novaehollandiae*	Black-Faced Cuckoo-shrike	Protected
Aves	*Corvus coronoides*	Australian Raven	Protected
Aves	*Cracticus tibicen*	Australian Magpie	Protected
Aves	*Cracticus torquatus*	Grey Butcherbird	Protected
Aves	*Dacelo novaeguineae*	Laughing Kookaburra	Protected
Aves	*Eopsaltria australis*	Eastern Yellow Robin	Protected
Aves	*Eudynamys orientalis*	Eastern Koel	Protected
Aves	*Geopelia humeralis*	Bar-shouldered Dove	Protected
Aves	*Haliastur sphenurus*	Whistling Kite	Protected
Aves	*Hirundo neoxena*	Welcome Swallow	Protected
Aves	*Lalage tricolor*	White-winged Triller	Protected
Aves	*Lichenostomus chrysops*	Yellow-faced Honeyeater	Protected
Aves	*Malurus cyaneus*	Superb Fairy-wren	Protected
Aves	*Meliphaga lewinii*	Lewin's Honeyeater	Protected
Aves	*Myiagra rubecula*	Leaden Flycatcher	Protected
Aves	*Myzomela sanguinolenta*	Scarlet Honeyeater	Protected
Aves	*Neochmia temporalis*	Red-Browed Finch	Protected
Aves	*Ninox connivens*	Barking Owl	Vulnerable
Aves	*Pachycephala rufiventris*	Rufous Whistler	Protected
Aves	*Pardalotus punctatus*	Spotted Pardalote	Protected
Aves	*Phaps chalcoptera*	Common Bronzewing	Protected
Aves	*Phylidonyris niger*	White-cheeked Honeyeater	Protected
Aves	*Phylidonyris novaehollandiae*	New Holland Honeyeater	Protected
Aves	*Platycercus eximius*	Eastern Rosella	Protected
Aves	*Psophodes olivaceus*	Eastern Whipbird	Protected
Aves	*Ptilonorhynchus violaceus*	Satin Bowerbird	Protected
Aves	*Pycnonotus jocosus*	Red-whiskered Bull-bull	Introduced
Aves	*Rhipidura albiscapa*	Grey Fantail	Protected
Aves	*Rhipidura leucophrys*	Willie Wagtail	Protected
Aves	*Rhipidura rufifrons*	Rufous Fantail	Migratory EPBC Act
Aves	*Scythrops novaehollandiae*	Channel-billed Cuckoo	Protected
Aves	*Sericornis frontalis*	White-Browed Scrubwren	Protected
Aves	*Strepera graculina*	Pied Currawong	Protected
Aves	*Todiramphus sanctus*	Sacred Kingfisher	Protected
Aves	*Trichoglossus moluccanus*	Rainbow Lorikeet	Protected
Aves	*Turdus merula*	Common Blackbird	Introduced
Aves	*Zosterops lateralis*	Silvereye	Protected
Mammalia	*Antechinus stuartii*	Brown Antechinus	Protected
Mammalia	*Austronomus australis*	White-striped freetail Bat	Protected
Mammalia	*Cercartetus nanus*	Eastern Pygmy Possum	Vulnerable TSC Act
Mammalia	*Chalinolobus gouldii*	Gould's Wattled Bat	Protected
Mammalia	*Miniopterus australis*	Little Bent-winged Bat	Vulnerable TSC Act
Mammalia	*Nyctophilus sp.*	Long-eared Bat	Protected
Mammalia	*Oryctolagus cuniculus*	European Rabbit	Introduced
Mammalia	*Petaurus breviceps*	Sugar Glider	Protected

Mammalia	*Pseudocheirus peregrinus*	Common Ringtail Possum	Protected
Mammalia	*Rattus fuscipes*	Bush Rat	Protected
Mammalia	*Rattus rattus*	Black Rat	Introduced
Mammalia	*Rhinolophus megaphyllus*	Eastern Horseshoe Bat	Protected
Mammalia	*Scotorepens orion*	Eastern Broad-nosed Bat	Protected
Mammalia	*Tachyglossus aculeatus*	Short-beaked Echidna	Protected
Mammalia	*Trichosurus vulpecula*	Common Brushtail Possum	Protected
Mammalia	*Vespadelus pumilus*	Eastern Forest Bat	Protected
Mammalia	*Vulpes vulpes*	Red Fox	Introduced
Mammalia	*Wallabia bicolor*	Swamp Wallaby	Protected
Reptilia	*Egernia major*	Land Mullet	Protected
Reptilia	*Eulamprus quoyii*	Eastern Water Skink	Protected
Reptilia	*Pseudechis porphyriacus*	Red-bellied Black Snake	Protected
Reptilia	*Varanus varius*	Lace Monitor	Protected

Appendix 3 – Sample BioMetric Plot and Transect Proforma

Monitoring Plot Data Sheet (Biometric)	Site Sheet No.	

Plot Information		Recorders	Nathan Banks.	Date	16/01/2018.
Site Name/Code	P1 -90 Gindurra Road, Somersby				
Start Easting	E151·29848 P1S	20m Easting	E151·29840 P1M	50m Easting	E151·29826 P1F
Start Northing	S 33.41633	20m Northing	S 33.41648.	50m Northing	S 33.41671
Orientation of transect plot (direction and degrees)	SSW	Photo No. start		Slope (degrees)	
		Photo No. end of 50m transect			

* Record Easting and Northing of each stake, from the start, 20m mark and end of 50m transect

Vegetation Zone Identification	
Location	
Vegetation Community	
Condition (Low or Mod-Good)	moderate - good (B. encifolia is senescent), lack of [illegible]
Habitat Features (rocks etc.)	large fallen tree @ P1F & thick leaf litter.
Comments	- low number of ground covers. - Xanthorrea sp. present - mid storey dominated by B. encifolia, - sedges present. - canopy dominated by E. punctata

Average Canopy Cover (Specht)	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Sum /10	%
Native overstorey cover (%)	35	40	15	25	65	0	30	0	25	5		24
Native mid-cover (%)	5	5	25	5	45	50	30	25	10	5		16.5
Exotic overstorey cover (%)												
Exotic mid-cover (%)	1											0.1

Point Intersect (m)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Sum x 2	%
Native Shrub					1													1	1	1					1	5	10
Native Grass															1								1			2	4
Native Other	1		1	1		1	1	1	1	1	1	1	1	2	2	1										14	28
Exotic		1		1																						2	4
Bare Earth (BE), Leaf (L)																	L				L	L		L			

Point Intersect (m)	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Sum x2	%
Native Shrubs			1			1	1																		1	4	8
Native Grasses																										0	0
Native Other		1	1	1	1	1		1	1	1				1	1	1	1						1		3	14	28
Exotic														1				2	1	2	1	1				6	12
Bare Earth (BE), Leaf (L)	L										L	L	L											L			

20m x 50m Quadrat	Number of individual trees with hollows (only hollow ≥5cm diameter):	Total length fallen logs in metres (only logs >10cm width)
	0	4+1+5+4+10+3=27m

Whole Veg. Zone	Over-storey regeneration	Over-storey Species		Regenerating (<5cm)	Comments
		Number			
		Stem Size Class DBH			

Cover: <1, 1,2,3,4,5, 15,20,25,30,35 etc foliage cover %

Site No: PLOT 1			Date: 16/1/18	Recorders: EMILY BENN		
	Species Native	CA	GF	Species Exotic	CA	GF
1	Oplismenus aemulus	>1	G	Senecio madagascarensis	>1	E
2	Oplismenus imbicillis	>1	G	Kikuyu grass	2	E
3	Parsonsia straminea	>1	V	Lantana camara	2	E
4	Entolasia stricta	>1	G	Senna pendula	>1	E
5	Banksia ericifolia	90	T	Crofton weed	>1	E
6	Eucalyptus punctata	10	T	Bidens pilosa	>1	E
7	Petrophyle pulchella	>1	S	Hydrocotyl b	>1	E
6	Kunzea ambigua	3	S	Small-leaf Privet	2	E
9	Casuarina glauca	3	T	Ehrhata erecta	>1	E
10	Acacia decurrens	2	T	Ochna serrulata	>1	E
11	Acacia parramattensis	2	T	Gnaphalium polycaulon	21	E
12	Acacia oxycedrus	1	S			
13	Lindsaea linearis	>1	H			
14	Xanthorrhoea sp.	2	G			
15	Hakea dactyloides	>1	S			
16	Breynia oblongifolia	>1	S			
17	Pittosporum undulatum	>1	T			
18	Cassytha glabella	>1	V			
19	Banksia serratta	5	T			
20	Woolsia pungens	>1	H			
21	Eucalyptus haemostoma	5	T			
22	Stephania japonica	>1	V			
23	Hakea teretifolia	>1	S			
24	Billiardiaria scandens	>1	V			
25	Opercularia hispida	>1	H			
26	Lomandra glauca	1	G			
27	Saleginella uliginosa	>1	H			
28	Leptospermum polygalifolium	5	T			
29	Veronica plebia	>1	H			
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
Total				Total		

GA (Growth form): T = tree, S = shrub, G = grass, V = vine, H = Herb, E = exotic
CA (Cover Abundance Braun-Blanquet scale): 1: <5% - rare/<3 individuals, 2: <5% - uncommon,/>3 individuals, 3: <5% - common, scattered or locally common, 4a: <5% - very abundant, 4b: 5-25%, 5: 25-50%, 6: 50-75%7: 75-100%

Monitoring Plot Data Sheet (Biometric)	Site Sheet No.	

Plot Information		Recorders	CM ER	Date	28/05/19
Site Name/Code	Plot 7 – 90 Gindurra Road, Somersby				
Start Easting	341839.36 E	20m Easting	341826.00 E	50m Easting	341808.00 E
Start Northing	6301183.75 S	20m Northing	6301165.00 S	50m Northing	6301144.00 S
Orientation of transect plot (direction and degrees)	218° SW	Photo No. start		Slope (degrees)	
		Photo No. end of 50m transect			

* Record Easting and Northing of each stake, from the start, 20m mark and end of 50m transect

Weeds Plot

Vegetation Zone Identification	
Location	South West of Subject Site. (Weeds on Fill)
Vegetation Community	N/A
Condition (Low or Mod-Good)	Low
Habitat Features (rocks etc.)	Nil
Comments	Exotic Weeds

Average Canopy Cover (Specht)	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Sum /10	%
Native overstorey cover (%)	0	0	0	0	0	0	0	0	0	0	0	0
Native mid-cover (%)	0	0	0	0	0	0	0	0	0	0	0	0
Exotic overstorey cover (%)	0	0	0	0	0	0	0	0	0	0	0	0
Exotic mid-cover (%)	0	0	0	0	0	0	0	0	0	0	0	0

Point Intersect (m)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Sum x 2	%
Native Shrub																										0	0
Native Grass																										0	0
Native Other																										0	0
Exotic	/	/	/	/	/					/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	21	42
Bare Earth (BE), Leaf (L)						BE	BE	BE	BE																		

Point Intersect (m)	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Sum x2	%
Native Shrubs																										0	0
Native Grasses																										0	0
Native Other																										0	0
Exotic	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	25	50
Bare Earth (BE), Leaf (L)																											

20m x 50m Quadrat	Number of individual trees with hollows (only hollow ≥5cm diameter):	Total length fallen logs in metres (only logs >10cm width)
	0	0

Whole Veg. Zone	Over-storey regeneration	Over-storey Species		Regenerating (<5cm)	Comments
		Number			
		Stem Size Class DBH			

Cover: <1, 1,2,3,4,5, 15,20,25,30,35 etc foliage cover %

Site No:		Date:		Recorders:		
Species Native	**CA**	**GF**		**Species Exotic**	**CA**	**GF**
1				Bidens pilosa	3	E
2				verbena bunariensis	3	E
3				Ageratina adenophora	7	E
4				Senecio madagascariensis	2	E
5				Ipomoea alba	4a	E
6				Arundo donax	4a	E
7				Castor oil	3	E
6				Paspalum dilatatum	4b	E
9				Setaria parviflora	3	E
10				Whiskey grass	3	E
11				Conyza bonariensis	2	E
12				Lantana camara	2	E
13				Red flower mullein	1	E
14				Trifolium repens	1	E
15				Couch grass	2	E
16				Strahlay ryger	1	E
17				Buffalo grass	3	E
18				Plantago lanceolata	2	E
19						
20						
21						
22						
23						
24						
25						
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45						
46						
47						
48						
49						
Total				**Total**		

GA (Growth form): T= tree, S = shrub, G = grass, V = vine, H = Herb, E = exotic
CA (Cover Abundance Braun-Blanquet scale): 1: <5% - rare/<3 individuals, 2: <5% - uncommon,/>3 individuals, 3: <5% - common, scattered or locally common, 4a: <5% - very abundant, 4b: 5-25%, 5: 25-50%, 6: 50-75%7: 75-100%

Monitoring Plot Data Sheet (Biometric)	Site Sheet No.	

Plot Information		Recorders	ER + CM	Date	8/5/19
Site Name/Code	PLOT 8 - Acacia				
Start Easting	341852.88 E	20m Easting	341858.00 E	50m Easting	341867.00 E
Start Northing	6301062.07 S	20m Northing	6301083.00 S	50m Northing	6301111.00 S
Orientation of transect plot (direction and degrees)	17° N	Photo No. start		Slope (degrees)	
		Photo No. end of 50m transect			

* Record Easting and Northing of each stake, from the start, 20m mark and end of 50m transect

Vegetation Zone Identification	
Location	South of site
Vegetation Community	Acacia mono culture dominated by weeds
Condition (Low or Mod-Good)	Low
Habitat Features (rocks etc.)	Nil.
Comments	

Average Canopy Cover (Specht)	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Sum /10	%
Native overstorey cover (%)	0	0	0	0	0	0	0	0	0	0	0	0
Native mid-cover (%)	0	0	0	0	0	0	0	0	0	0	0	0
Exotic overstorey cover (%)	0	0	0	0	0	0	0	0	0	0	0	0
Exotic mid-cover (%)	0	0	0	0	0	0	0	0	0	0	0	0

Point Intersect (m)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Sum x 2	%
Native Shrub								1																		1	2
Native Grass																										0	0
Native Other																										0	0
Exotic	1	1		1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23	46
Bare Earth (BE), Leaf (L)			BE																								

Point Intersect (m)	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Sum x2	%
Native Shrubs																										0	0
Native Grasses																										0	0
Native Other																										0	0
Exotic	1	1				1		1	1		1	1	1						1	1	1		1	1		13	26
Bare Earth (BE), Leaf (L)			BE	BE	BE		BE			BE				BE	BE	BE	BE	BE				BE			BE		

20m x 50m Quadrat	Number of individual trees with hollows (only hollow ≥5cm diameter):	Total length fallen logs in metres (only logs >10cm width)
	0	4

Whole Veg. Zone	Over-storey regeneration	Over-storey Species	N/A	Regenerating (<5cm)	Comments
		Number	N/A	None	
		Stem Size Class DBH	N/A	None	

Cover: <1, 1,2,3,4,5, 15,20,25,30,35 etc foliage cover %

Site No:		Date:		Recorders:		
Species Native	**CA**	**GF**		**Species Exotic**	**CA**	**GF**
1 Acacia decurrens.	3			Lantana camara	6	
2 Commelina	2			Crofton weed	5	
3 Alternanthera distans	1			Whiskey grass	3	
4 Melia azardach	3			Bidens pilosa	3	
5				Paspalum dilatatum	3	
6				Conyza bonariensis	3	
7				Senecio madegascarensis	3	
6				Chloris gigana	5	
9				Setaria parviflora	3	
10				Sida rhombifolia	4	
11				Solanum mauritianum	2	
12				Stinking roger	3	
13				Cobbler weed	6	
14				Madeira vine	3	
15				Acetosa sagittata	4a	
16				Ipomea indica	3	
17				Panicum	3	
18				Tradescantia	3	
19				Medicago	3	
20				Plantago lanceolata	3	
21				Bindi	2	
22				Scarlet pimpernel	2	
23				Buffalo grass	2	
24				Solanum nigrum	2	
25				Verbena	2	
26				Sow thistle	2	
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
Total				**Total**		

GA (Growth form): T = tree, S = shrub, G = grass, V = vine, H = Herb, E = exotic
CA (Cover Abundance Braun-Blanquet scale): 1: <5% - rare/<3 individuals, 2: <5% - uncommon,/>3 individuals, 3: <5% - common, scattered or locally common, 4a: <5% - very abundant, 4b: 5-25%, 5: 25-50%, 6: 50-75%7: 75-100%

Appendix 4 – Biodiversity credit report

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 7/11/2019 Time: 4:50:07PM Calculator version: v4.0

Major Project details

Proposal ID:	224/2019/5027MP
Proposal name:	90 Gindurra Road Somersby (SSD8660)
Proposal address:	90 Gindurra Road Somersby NSW 2250
Proponent name:	
Proponent address:	90 Gindurra Road NSW 2250
Proponent phone:	02 9956 3866
Assessor name:	Kurtis Lindsay
Assessor address:	PO Box 406 Mona Vale NSW 2103
Assessor phone:	9986 1295
Assessor accreditation:	224

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	0.63	41.00
Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	2.18	51.01
Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast	0.30	11.00
Total	3.11	103

Credit profiles

1. Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast, (HU793)

Number of ecosystem credits created	11
IBRA sub-region	Wyong

Offset options - Plant Community types	Offset options - IBRA sub-regions
Smooth-barked Apple - Turpentine - Blackbutt open forest on ranges of the Central Coast, (HU793) Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion, (HU507) Tallowwood - Narrow-leaved White Mahogany open forest of the hinterland ranges of the North Coast, (HU643) Turpentine - Grey Myrtle forest of sheltered sandstone gullies of the Central Coast hinterland, Sydney Basin Bioregion, (HU650) Sweet Pittosporum - Forest Oak - Rough-barked Apple depauparate gully rainforest on the Liverpool Range, (HU724) New England Blackbutt moist very tall open forest on the southern escarpment of the Liverpool Range to Barrington Tops region, southern Brigalow Belt South Bioregion to NSW North Coast Bioregion, (HU705) Large-fruited Grey Gum - White Mahogany shrub - grass open forest on the slopes of Barrington Tops and lower North Coast, (HU775) Tallowwood - Sydney Blue Gum shrub - grass tall open forest on ranges of lower North Coast, (HU776) White Mahogany - Turpentine moist shrubby tall open forest, (HU780) Tallowwood - Brush Box - Sydney Blue Gum moist shrubby tall open forest on foothills of the lower North Coast, (HU781) Blackbutt - Turpentine - Sydney Blue Gum mesic tall open forest on ranges of the Central Coast, (HU782) Flooded Gum - Brush Box - Tallowwood mesic tall open forest on ranges of the lower North Coast, (HU783) Grey Myrtle - Mountain Blue Gum - Rough-barked Apple ferny tall open forest in sandstone gullies of the Sydney Basin, (HU786) Sydney Blue Gum - Lilly Pilly mesic tall open forest of coastal ranges and tablelands escarpment, (HU787) Messmate - Forest Ribbon Gum - New England Blackbutt shrub - grass tall open forest of Barrington Tops and Northern Tablelands escarpment, (HU789)	Wyong and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast, (HU856)

Number of ecosystem credits created	38
IBRA sub-region	Wyong

Offset options - Plant Community types	Offset options - IBRA sub-regions
Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast, (HU856) Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion, (HU595) Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion, (HU622) Scribbly Gum - Smooth-barked Apple - Red Bloodwood shrubby forest of the Lower Hunter, Sydney Basin Bioregion, (HU715) Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands, (HU833) Smooth-barked Apple open forest on coastal lowlands of the Central Coast, (HU835) Smooth-barked Apple - Swamp Mahogany - Red Mahogany - Cabbage Palm open forest on lowlands of the Central Coast, (HU838) Red Bloodwood - Sydney Peppermint - Podocarpus spinulosus shrubby open forest of the southern Central Coast, (HU839) Sydney Peppermint - Silvertop Ash - Gymea Lilly ferny woodland on lowlands of the Central Coast, (HU846) Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast, (HU850) Smooth-barked Apple - Red Bloodwood - Scribbly Gum grass - shrub woodland on lowlands of the Central Coast, (HU852) Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast, (HU857) Smooth-barked Apple - Cabbage Palm - Broad-leaved Mahogany woodland on Wallarah Peninsular, (HU895)	Wyong and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast, (HU856)

Number of ecosystem credits created	13
IBRA sub-region	Wyong

Offset options - Plant Community types	Offset options - IBRA sub-regions
Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion, (HU595) Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion, (HU622) Scribbly Gum - Smooth-barked Apple - Red Bloodwood shrubby forest of the Lower Hunter, Sydney Basin Bioregion, (HU715) Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands, (HU833) Smooth-barked Apple open forest on coastal lowlands of the Central Coast, (HU835) Smooth-barked Apple - Swamp Mahogany - Red Mahogany - Cabbage Palm open forest on lowlands of the Central Coast, (HU838) Red Bloodwood - Sydney Peppermint - Podocarpus spinulosus shrubby open forest of the southern Central Coast, (HU839) Sydney Peppermint - Silvertop Ash - Gymea Lilly ferny woodland on lowlands of the Central Coast, (HU846) Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast, (HU850) Smooth-barked Apple - Red Bloodwood - Scribbly Gum grass - shrub woodland on lowlands of the Central Coast, (HU852) Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast, (HU856) Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast, (HU857) Smooth-barked Apple - Cabbage Palm - Broad-leaved Mahogany woodland on Wallarah Peninsular, (HU895)	Wyong and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Eastern Pygmy-possum	Cercartetus nanus	1.41	28

4. Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast, (HU857)

Number of ecosystem credits created	41
IBRA sub-region	Wyong

Offset options - Plant Community types	Offset options - IBRA sub-regions
Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast, (HU857) Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion, (HU595) Smooth-barked Apple - Sydney Peppermint - Turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion, (HU622) Scribbly Gum - Smooth-barked Apple - Red Bloodwood shrubby forest of the Lower Hunter, Sydney Basin Bioregion, (HU715) Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands, (HU833) Smooth-barked Apple open forest on coastal lowlands of the Central Coast, (HU835) Smooth-barked Apple - Swamp Mahogany - Red Mahogany - Cabbage Palm open forest on lowlands of the Central Coast, (HU838) Red Bloodwood - Sydney Peppermint - Podocarpus spinulosus shrubby open forest of the southern Central Coast, (HU839) Sydney Peppermint - Silvertop Ash - Gymea Lilly ferny woodland on lowlands of the Central Coast, (HU846) Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast, (HU850) Smooth-barked Apple - Red Bloodwood - Scribbly Gum grass - shrub woodland on lowlands of the Central Coast, (HU852) Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast, (HU856) Smooth-barked Apple - Cabbage Palm - Broad-leaved Mahogany woodland on Wallarah Peninsular, (HU895)	Wyong and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

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