REPLY TO: BALLINA OFFICE

Ref: AM/N09031/Lw2

24th July 2019

Shaun Nicholson
Newland Developers Pty Ltd
PO Box 4176
Robina TC Qld 4230

Dear Shaun,

RE: DEVELOPMENT APPLICATION DA09/0701.03 - AMENDMENT TO DEVELOPMENT CONSENT DA09/0701 FOR A 256 LOT RESIDENTIAL SUBDIVISION (DEPARTMENT OF PLANNING APPLICATION MP09_0166 MOD 3)

I refer to the above modification application and note that I have reviewed the relevant correspondence prepared by the NSW Office of Environment and Heritage (OEH) dated 31st May 2019, and Tweed Shire Council (TSC) dated 19th June 2019. The OEH and TSC correspondence was prepared in response to the Proponents' Updated Response to Submissions (dated 2nd May 2019) regarding the subject Modification application (MP09_0166 MOD 3**)**. Responses to the relevant section of each are provided in the following sections.

OEH Recommendations

OEH Recommendation 1

The accredited assessor must:

a. undertake a vegetation survey in Vegetation Community 5 as required under the Biodiversity Assessment Method (BAM) including the required number of plots.

b. retain the following as candidate species credit species and assume presence, or undertake fauna and flora surveys at the appropriate time, or provide an expert report, unless further justification is provided under Step 3 of the BAM:

i. Hairy jointgrass (Arthraxon hispidus)

ii. Eastern pygmy possum (Cercartetus nanus)

iii. Three-toed snake-tooth skink (Coeranoscincus reticulatus)

iv. Coxen's fig parrot (Cyclopsitta diopthalma coxeni)

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v. Pale-headed snake (Hoplocephalus bitorquatus)

vi. Green-thighed frog (Litoria brevipalmata)

vii. Southern myotis (Myotis macropus) (the site is within 200m of a riparian zone)

viii. Pink underwing moth (Phyllodes imperialis southern subspecies)

ix. Mitchell's rainforest snail (Thersites mitchellae)

JWA Response

In accordance with Para 5.1.1.5 of the BAM, areas that are not native vegetation (i.e. land not included in native vegetation extent) do not require further assessment in the BAM except where (a) they are proposed for restoration as part of an offset or (b) they are assessed as habitat for threatened species according to Section 6.4 of the BAM. Neither (a) or (b) are considered to apply to the subject clearing area.

Regardless, to satisfy OEH, additional vegetation survey has been completed in Vegetation Community 5 in accordance with the Biodiversity Assessment Method (BAM) including the required number of plots, and an Amended Biodiversity Development Assessment Report (BDAR) subsequently prepared (**ATTACHMENT 1**).

It is considered that habitat occurring within the subject clearing area is **highly unsuitable** for the nine species listed, as detailed in Table 5 of the original BDAR. In particular it is noted that:

- Southern myotis (*Myotis macropus*) - subject land does not occur within 200m of a riparian zone. Riparian corridor widths are provided in Appendix 3 (Table 14) of the BAM. A riparian corridor width of 50m (from each side of a water body) applies to Important Wetlands and Estuarine areas. The area subject to additional clearing occurs approximately 475m from Terranorra Broadwater and is therefore approx. 425m from the riparian zone of this water body (i.e. >200m).
- Mitchell's rainforest snail (*Thersites mitchellae*) - the subject land is not subject to periodic inundation and does not contain a well-developed leaf litter layer or intact forest canopy maintaining a moist microclimate. This is an important habitat component of the species as described in the Approved Recovery Plan (NPWS 2001).
- Scented acronychia (*Acronychia littoralis*) - this species is discussed on page 2 of Attachment 1: Detailed OEH Comments but is not listed at recommendation 1(b). Regardless, this species occurs in littoral rainforest on sand. Therefore, suitable habitat does not occur on the subject land.

Regardless of their highly unlikely occurrence in the clearing impact area, to satisfy OEH, the requested candidate species credit species have been retained and their presence assumed in the Amended BDAR (JWA 2019) (**ATTACHMENT 1**).

OEH Recommendation 2

Following the above, the accredited assessor must amend the BAM credit calculations and the Biodiversity Development Assessment Report (BDAR) in the following way:

a. identify the Vegetation Community 1 as the Lowland Rainforest threatened ecological community

b. include the survey data for Vegetation Community 5 and update the credit calculations accordingly

c. include a map identifying habitat connectivity in relation to the site including the regional corridor as mapped in the Key Habitats and Corridors.

JWA Response

Threatened Ecological Community (TEC) status is irrelevant in this instance as an offset is not required for impacts on native vegetation where the vegetation integrity score is less than 15, where the PCT is representative of a TEC, in accordance with Para 10.3.1.1(a) of the BAM. Vegetation Community 1 achieved a vegetation integrity score of 13.8, thereby precluding any offset requirement regardless of its TEC status. Regardless, to satisfy OEH, Vegetation Community 1 has been identified as the Lowland Rainforest threatened ecological community in the Amended BDAR (JWA 2019) (**ATTACHMENT 1**).

Survey data for Vegetation Community 5, updated credit calculations and a map identifying habitat connectivity in relation to the site have also been included in the Amended BDAR (JWA 2019) (**ATTACHMENT 1**) as requested.

OEH Recommendation 3

"The BDAR be amended to more fully consider indirect and prescribed impacts, particularly connectivity for threatened species such as the koala and water quality and changes to the hydrological regime on threatened ecological communities in the immediate vicinity of the development footprint."

JWA Response

The BDAR has been prepared to address the small area of additional vegetation clearing, on land formally described as Lot 1 DP175234, associated with the Modification to a Part 3A project application under the *Environmental Planning and Assessment Act 1979* (EP&A Act). The small area of clearing is in addition to the previously approved impacts of the Altitude Aspire development (MP09_0166). It is not considered that there will be any additional significant impacts on connectivity for threatened species such as the koala as a result of the small area of additional vegetation clearing. The proposed development will occur on an area that is predominantly cleared and/or highly disturbed. A row of predominantly Camphor laurel trees, occurring along a fence-line adjacent to the eastern boundary of the subject site, may facilitate the local dispersal of some disturbance adapted species. However, it is highly unlikely that this row of trees would provide a significant contribution to regional or sub-regional corridors.

It is noted that there are recent Koala (*Phascolarctos cinereus*) records to the south and south-east of the subject site from within residential areas. Although Koalas are known to utilise rows of trees to disperse through the landscape (e.g. lineal eucalypt windbreaks planted by orchardists) it is considered highly unlikely that the row of Camphor laurel trees to be impacted would represent a significant movement corridor.

The above potential impacts were clearly discussed in the original BDAR and further discussion is now provided in the Amended BDAR (JWA 2019) (**ATTACHMENT 1**). Potential impacts on water quality and changes to the hydrological regime were also addressed and are further discussed below.

OEH Recommendation 4

> *"The BDAR must provide mitigation measures specific to the bulk earthworks in the development footprint. These should include erosion and sediment control, slope stabilisation, weed control, fencing and demarcation of the work area. No works (including temporary and permanent ancillary construction and maintenance facilities) should be located outside the development footprint. If there is a need for sedimentation ponds or other ancillary development outside the development footprint, then this will require an amendment to the current BDAR and other relevant documents."*

JWA Response

Stormwater management within the Altitude Aspire development as a whole has been addressed in the previously approved Stormwater Management Plan prepared by Gilbert and Sutherland (April 2013) and subsequently amended in the BIOME Report - Bioretention Basin and Drainage Reserve design Report (Version 4 - March 2019). In relation to potential impacts on water quality or changes to the hydrological regime on threatened ecological communities as result of the small area of additional vegetation clearing, correspondence from the project engineer (**ATTACHMENT 2**) has confirmed that the works proposed are earthworks only at this stage. All exposed areas will be controlled and treated prior to adequate new grass cover being established. The Erosion and Sediment Control for this area will be subject to the submission of a Construction Certificate for Earthworks which is currently being documented. Conceptual Erosion and Sediment Control will be shown in this application.

OEH Recommendation 5

> *"Once the BAM credit calculations and BDAR are amended, the revised version of the BDAR should be provided to the OEH for review including all relevant shape file data and the finalised BAM credit calculations."*

JWA Response

The Amended BDAR and associated BAM credit calculations are included as **ATTACHMENT 1**. Relevant shape file data is available on request.

OEH Recommendation 6

> *"The proponent should consider referring the development matter to the Commonwealth Department of Environment and Energy for impacts on Macadamia tetraphylla as a possible controlled action if this has not already been done."*

JWA Response

Impacts on *Macadamia tetraphylla* were assessed for the Altitude Aspire development. There are no additional impacts on this species as a result of the small area of additional vegetation clearing and therefore it is not considered necessary to refer the proposed action to the Commonwealth for assessment under the EPBC Act.

TSC Issues/Comments

TSC Issue/Comment 1

> "*It is noted that OEH has already provided comment on the BDAR and identified a number of issues that need to be addressed in order for the BDAR to be considered adequate, including consideration of additional threatened species and vegetation communities."*

JWA Response

Relevant OEH recommendations have been addressed above and an Amended BDAR (JWA 2019) is provided as **ATTACHMENT 1.**

TSC Issue/Comment 2

> "*We note that under Biodiversity Offsets Scheme the DPE is required to be satisfied that all attempts to avoid and minimise impacts on threatened species and communities have been explored prior to considering offset mechanisms."*

JWA Response

Noted.

TSC Issue/Comment 3

> "*The BDAR does not adequately consider measures to avoid and mitigate impact on the Macadamia tetraphylla or other impacted species. The BDAR should be amended to do so."*

JWA Response

Relevant OEH recommendations have been addressed above and an Amended BDAR (JWA 2019) is provided as **ATTACHMENT 1.**

TSC Issue/Comment 4

> *"Translocation of the affected individual Macadamia tetraphylla may still be an appropriate approach to minimise impact on the threatened spec1es, and provide a better biodiversity outcome, while also potentially meeting requirements to avoid and/or minimise impact."*

JWA Response

Following preparation of the *Macadamia tetraphylla* Translocation Plan (JWA 2018), the NSW Office of Environment and Heritage (OEH) requested that a Biodiversity Development Assessment Report (BDAR) be prepared for the MOD 3 area in accordance with the requirements of the Biodiversity Conservation Act 2016 (BC Act). It was determined during the preparation of the BDAR that the loss of *Macadamia tetraphylla* from the impact site would generate an offset obligation of eight (8) species credits in accordance with the Biodiversity Offset Scheme (BOS).

Under the BOS proponents have two primary ways that they can satisfy an offset obligation:

1. They can identify and purchase the required 'like for like' credits in the market and then retire those credits;

OR

2. They can use the Offsets Payment Calculator to determine the cost of the credit obligation, and transfer this amount to the Biodiversity Conservation Fund. The Biodiversity Conservation Trust is then responsible for identifying and securing the credit obligation.

Subsequent to receiving the above comments from OEH and Council, Newland Developers no longer propose to satisfy the *Macadamia tetraphylla* offset credit obligations through payment to the Biodiversity Conservation Trust and have reverted to the original proposal to translocate the four (4) stems. A Revised *Macadamia tetraphylla* Translocation Plan (JWA 2019) has been prepared and is included as **ATTACHMENT 3**.

TSC Issue/Comment 5

> *"Given the considerable revisions that will be required to address OEH requirements, an opportunity for Council to review the revised BDAR, when it is submitted, would be appreciated."*

JWA Response

The Amended BDAR is included as **ATTACHMENT 1**.

I trust the above responses and attachments provide the additional information necessary for Council and OEH to complete their assessment of the proposed Modification to a Part 3A project application under the EP&A Act. Please do not hesitate to contact me if you require any further information.

Yours faithfully,
JWA Pty Ltd

Adam McArthur
Director / Principal Ecologist

Attachment 1 – Amended BDAR (JWA 2019)

JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

AMENDED BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT (BDAR)

Lot 325 DP 1238182 and
Part Lot 1 DP 175234
Altitude Aspire, Terranora

A Report Prepared for
Newland Developers

JULY 2019

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DOCUMENT CONTROL

Document

Title	Biodiversity Development Assessment Report (BDAR)
Job Number	N09031
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Version and Date	Rw5 24/07/19
Client	Newland Developers

Revision History (office use only)

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1	Rw1	DRAFT	05.11.18	Client	1	pdf	email
2	Rw2	DRAFT	10.12.18	Client	1	pdf	email
3	Rw3	FINAL	13.12.18	Client	1	pdf	email
4	Rw4	DRAFT	12.07.19	Client	1	pdf	email
5	Rw5	FINAL	24.07.19	Client	1	pdf	email

Client Issue

Version	Date	Author		Approved by	
		Name	Initials	Name	Initials
Rw1	05.11.18	Matt Jenkins	MJ	Adam McArthur	AM
Rw2	10.12.18	Matt Jenkins / Adam McArthur	MJ / AM	Adam McArthur	AM
Rw3	13.12.18	Matt Jenkins / Adam McArthur	MJ / AM	Adam McArthur	AM
Rw4	12.07.19	Matt Jenkins / Adam McArthur	MJ / AM	Adam McArthur	AM
Rw5	24.07.19	Matt Jenkins / Adam McArthur	MJ / AM	Adam McArthur	AM

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EXECUTIVE SUMMARY

This Amended Biodiversity Development Assessment Report (BDAR) has been prepared to address a small area of additional vegetation clearing, on land formally described as Lot 1 DP175234, associated with an extension of bulk earthworks for the adjacent Altitude Aspire development. This assessment concerns a Modification to a Part 3A project under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

A detailed assessment of composition, structure and function of site vegetation was completed on the 19th of September 2018 and 1st of July 2019 utilising the Biodiversity Assessment Method (OEH 2017). This assessment was completed by a suitably qualified person and accredited assessor under the accreditation scheme prepared under Section 6.10 of the *Biodiversity Conservation Act 20016* (BC Act).

The assessment has determined that one (1) Plant Community Type (PCT), consisting of three (3) very highly degraded vegetation zones, occurs within the development area. Site vegetation is considered to represent modified and previously cleared areas of PCT 1302 White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion. This determination has been made with consideration of soil type, vegetation types occurring in similar locations in the locality, regenerating native species (where present) and community structure and descriptive attributes provided in the BioNet Vegetation Classification. PCT 1302 is representative of the Threatened Ecological Community (TEC) Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions.

One (1) threatened flora species – rough-shelled bush-nut (*Macadamia tetraphylla*), listed as Vulnerable under the *Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act 1999* – was recorded from the subject site. A total of four (4) stems were detected as described in previous assessments associated with the Altitude Aspire development. An additional twenty-two (22) threatened species were considered possible occurrences as either ecosystem credit species (automatically derived from the BAM calculator) or species credit species based on the availability of potentially suitable habitat.

A number of measures to avoid and mitigate impacts on existing flora, fauna and habitat values of the site have been discussed. The proposed development will however result in unavoidable impacts on 1.72 ha of highly degraded, predominantly exotic, vegetation within areas that would have previously supported PCT 1302. This is not considered to represent a Serious and Irreversible Impact on any potential SAII entities.

Impacts to the degraded area of PCT 1302 are not required to be offset as the vegetation integrity score of this community is below those set out in Paragraph 10.3.1.1 of the BAM. Therefore, no ecosystem credits are required. A total of forty-nine (49) species credits for threatened species have been calculated as applicable for the unavoidable loss of site vegetation/habitat as follows:

- Eastern pygmy-possum^ (*Cercartetus nanus*) = 4 credits
- Three-toed snake-tooth skink^ (*Coeranoscincus reticulatus*) = 4 credits

- Coxen's fig-parrot^ (*Cyclopsitta diophthalma coxeni*) = 5 credits
- Pale-headed snake^ (*Hoplocephalus bitorquatus*) = 4 credits
- Green-thighed frog^ (*Litoria brevipalmata*) = 3 credits
- Rough-shelled bush-nut (*Macadamia tetraphylla*) = 8 credits
- Slender marsdenia (*Marsdenia longiloba*) = 4 credits
- Southern Myotis^ (*Myotis macropus*) = 4 credits
- Southern pink underwing moth^ (*Phyllodes imperialis*) (southern subspecies) = 4 credits
- Common Planigale (*Planigale maculata*) = 4 credits
- Mitchell's rainforest snail^ (*Thersites mitchellae*) = 5 credits

^ Whilst these species are considered highly unlikely to occur on site due to the heavily degraded vegetation and habitat features present, they have been retained as candidate species, and assumed to be present, at the request of the Office of Environment and Heritage in correspondence dated 31stMay 2019.

In accordance with the requirements of the NSW Biodiversity Offsets Scheme, proponents have two primary ways that they can satisfy their offset credit obligation:

1. They can identify and purchase the required 'like for like' credits in the market and then retire those credits via the OEH Biodiversity Offsets and Agreement Management System (BOAMS).

OR

2. They can use the Offsets Payment Calculator to determine the cost of their credit obligation and transfer this amount to the Biodiversity Conservation Fund via OEH BOAMS. The responsibility for identifying and securing the offset obligation would then be transferred to the Biodiversity Conservation Trust.

It is considered that the proposed translocation of existing Rough-shelled bush-nut stems and propagation of a minimum of 20-24 additional stems suitably addresses the offset requirement for this species. It is understood that the proponent wishes to satisfy their remaining offset credit obligations via payment to the Biodiversity Conservation Trust.

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1 INTRODUCTION

1.1 Background

JWA Pty Ltd has been engaged by Newland Developers to prepare a Biodiversity Development Assessment Report (BDAR) addressing a small area of additional vegetation clearing, on land formally described as Lot 1 DP175234, associated with an extension of bulk earthworks for the adjacent Altitude Aspire development. This assessment concerns a Modification to a Part 3A project under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

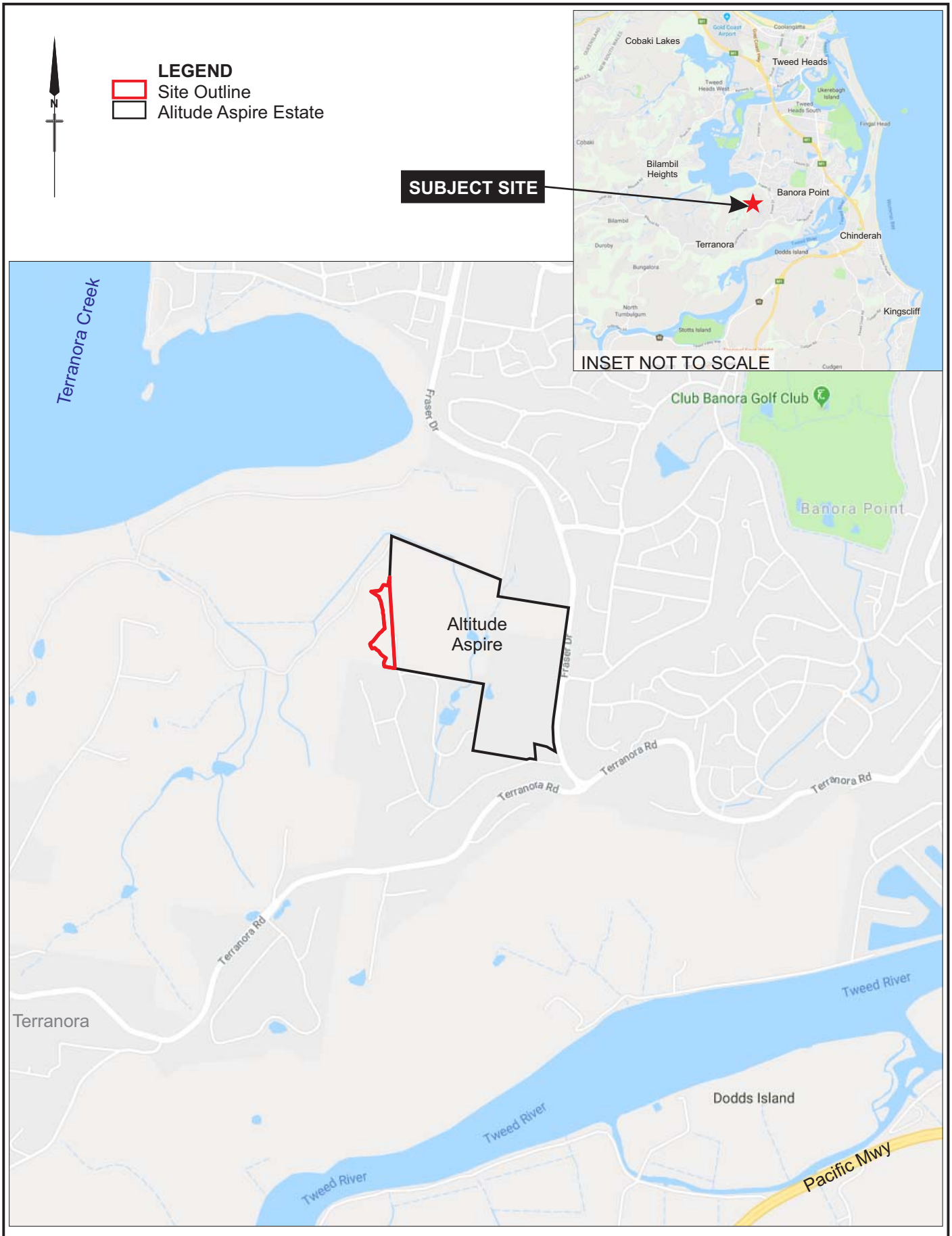
In accordance with the requirements of the *Biodiversity Conservation Regulations 2017* (BCR), this report has been prepared by Mr Matt Jenkins, a suitably qualified person and accredited assessor under the accreditation scheme prepared under Section 6.10 of the *Biodiversity Conservation Act 20016* (BC Act) (Certification No. BAAS18029).

The preparation of this Amended BDAR has involved the following:

- An assessment of the biodiversity values of the additional clearing area utilising the Biodiversity Assessment Method (BAM) (OEH 2017) including:
    - An assessment of the landscape features and site context;
    - Determining the presence of Threatened Ecological Communities (TECs), Plant Community Types (PCTs), and the condition (vegetation integrity) of native vegetation on the subject site;
    - Determining the habitat suitability for Threatened species on the subject site
- An impact assessment of the proposed vegetation removal on biodiversity values in accordance with the requirements of the BAM including:
    - Documenting measures to avoid and/or minimise impacts of the proposed vegetation removal;
    - Assessing direct and indirect impacts on native vegetation and habitat;
    - Discussing measures to mitigate and manage unavoidable impacts;
    - Identification of any serious and irreversible impacts; and
    - Calculating the offset requirement associated with the proposed additional clearing area.

1.2 Locality

The Locality is defined as the area within a 10km radius of the Subject site for the purposes of this assessment. The locality therefore extends from Tugun south to Duranbah and from Glengarrie to the Pacific Ocean (**FIGURE 1**). Prominent features in the locality include the towns of Tweed Heads/Coolangatta, Banora Point, Kingscliff, Tweed River, Terranora Broadwater, Cudgen Lake, Cudgen Creek, Stotts Island Nature



SOURCE: Google Maps SCALE: 1 : 20 000 @ A4 JWA PTY LTD Ecological Consultants	CLIENT Newland Developers Pty Ltd PROJECT Biodiversity Development Assessment Report Lot 1 DP175234, Terranora NSW Tweed Shire Council LGA	**FIGURE 1** PREPARED: BW DATE: 25 October 2018 FILE: N09031_Locality.cdr	TITLE **LOCALITY PLAN**

Reserve, Cudgen Nature Reserve, Tweed Estuary Nature Reserve and Ukerebagh Nature Reserve.

1.3 The Subject Site

The subject site represents the proposed additional clearing limit of works, which covers an area of approximately 1.52 ha and is bounded to the north and west by vegetated and agricultural (grazing) land. Land to east comprises the Altitude Aspire development site and residential properties occur to the south of the subject site. A recent aerial photograph of the site is provided in **FIGURE 2.**

1.4 Planning Context

The subject site is located within the Tweed Shire Council LGA. The subject site is therefore subject to the Tweed Local Environmental Plan 2014 (Tweed LEP) and associated plans, policies and controls. Under the Tweed LEP the site is zoned as R1 – General Residential **(FIGURE 3**).

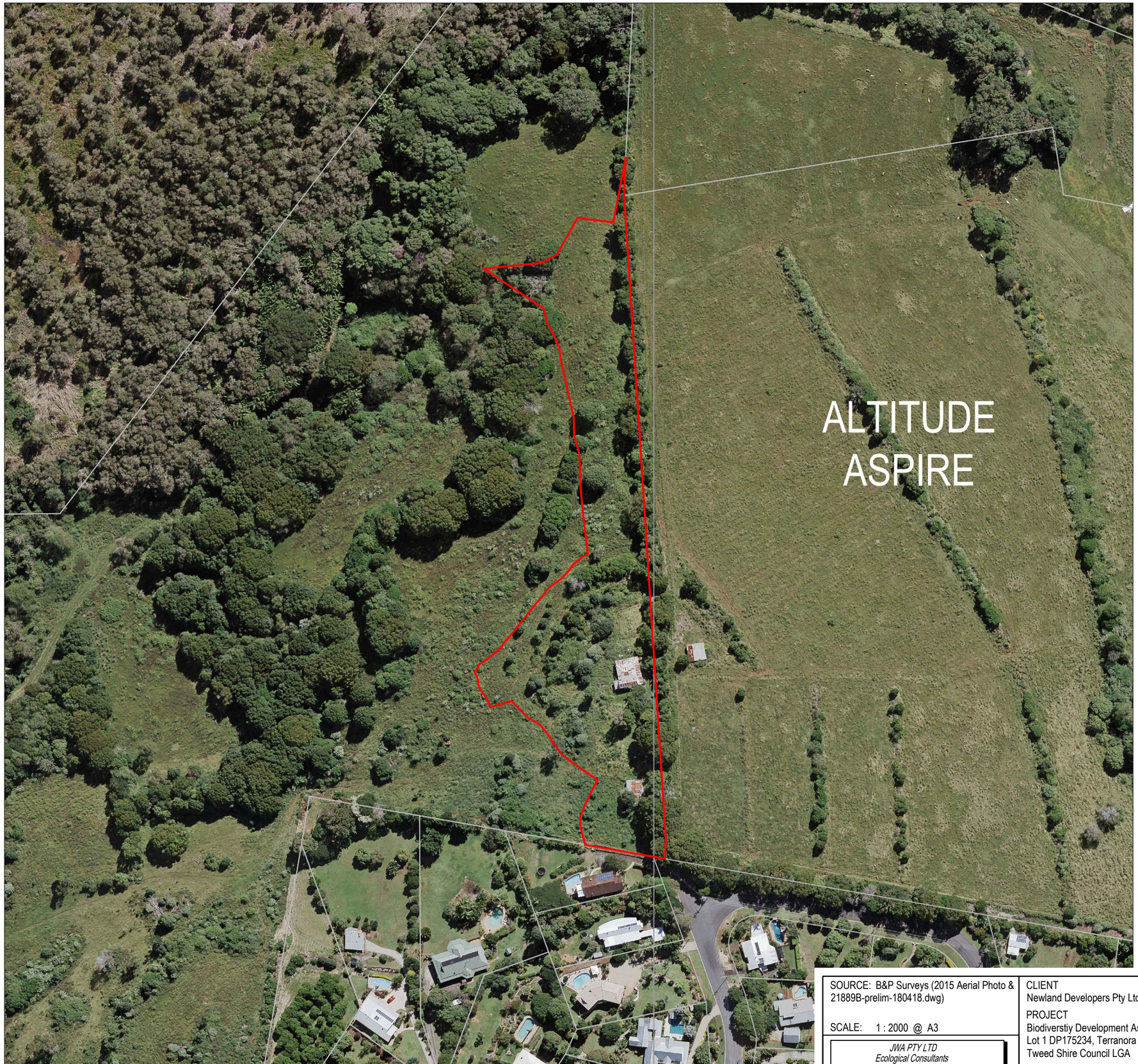
1.5 The Proposed Development

The proposed development represents an extension of bulk earthworks and associated vegetation clearing. The proposed earthworks footprint is shown in **FIGURE 4**.

1.6 Sources of Information

Sources of information used in the assessment, including reports and spatial data are as follows:

- Proposed development layouts provided by the proponent;
- Reports and management plans completed for the Altitude Aspire site;
- Australian Government's Species Profiles and Threats database (SPRAT) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- Environment Australia (2001) A Directory of Important Wetlands in Australia. 3rd Edition. Environment Australia, Canberra.
- NSW OEH's BAM Calculator (BAMC) https://www.lmbc.nsw.gov.au/bamcalc
- NSW OEH's threatened species database http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
- OEH Threatened Species Profiles
- Office of Environment and Heritage (OEH) (2007). Mitchell Landscapes with per cent cleared estimates.
- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.



N

LEGEND

Subject Site

Scale 1:2000 - Lengths in metres

20 0 20 40 60 80 100

SOURCE: B&P Surveys (2015 Aerial Photo & 21889B-prelim-180418.dwg)

SCALE: 1 : 2000 @ A3

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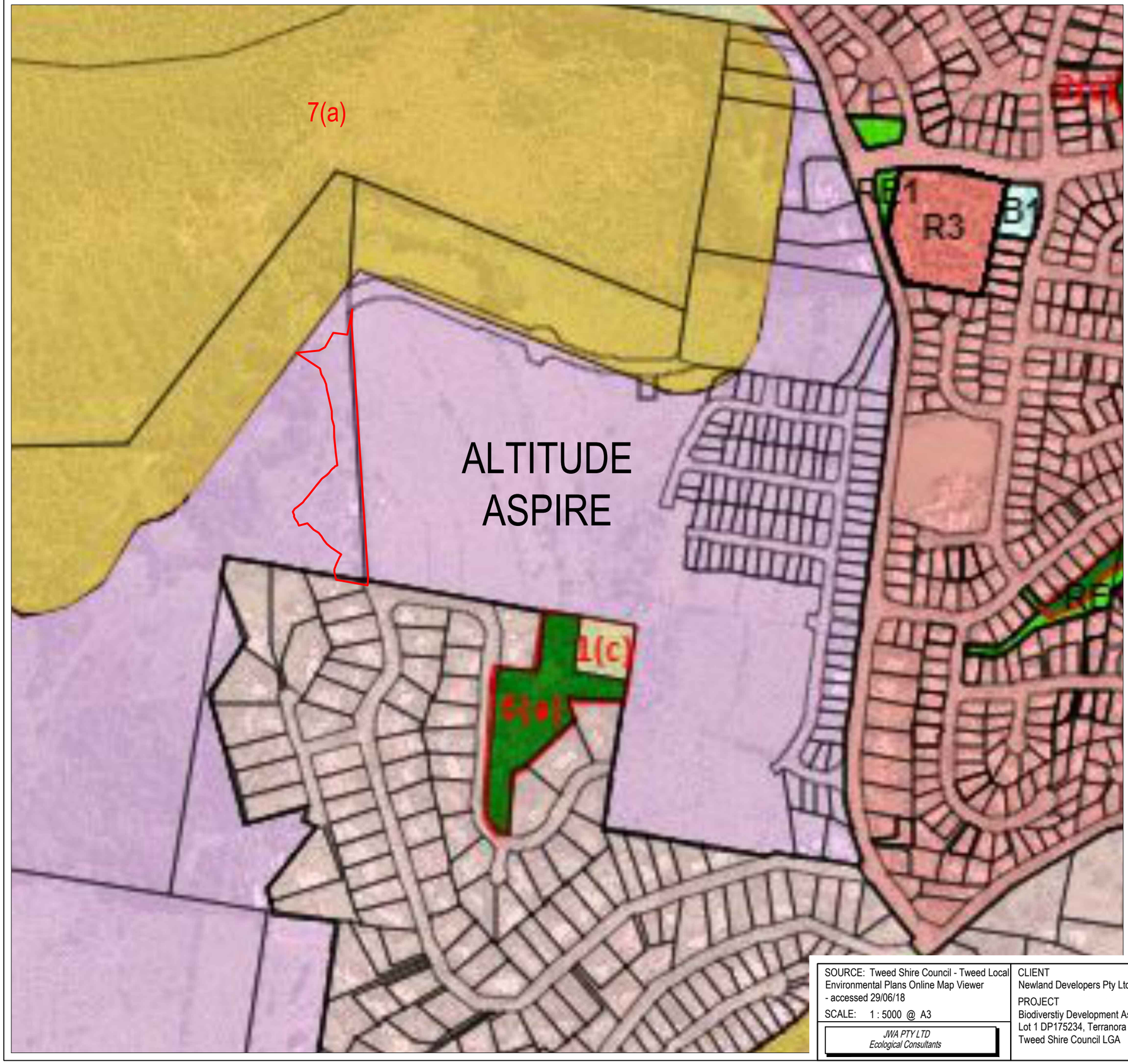
FIGURE 2

PREPARED: BW
DATE: 25 October 2018
FILE: N09031_BDAR.dwg

TITLE

AERIAL PHOTOGRAPH



LEGEND

- Cadastre
- Subject Site

Tweed LEP 2014

- R1 - General Residential
- R2 - Low Density Residential
- R3 - Medium Density Residential
- R5 - Large Lot Residential
- B1 - Neighbourhood Centre
- RE1 - Public Recreation
- DM - Deferred Matter

Tweed LEP 2000

- 1(a) - Rural
- 6(a) - Open Space
- 7(a) - Environmental Protection (Wetlands and Littoral Rainforest)

Scale 1:5000 - Lengths in metres

50 0 50 100 150 200 250 300

SOURCE: Tweed Shire Council - Tweed Local Environmental Plans Online Map Viewer - accessed 29/06/18

SCALE: 1 : 5000 @ A3

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FIGURE 3

PREPARED: BW
DATE: 25 October 2018
FILE: N09031_BDAR.dwg

TITLE

ZONING PLAN

PROPOSED EXTENT OF CUT DAYLIGHTING WITH EXISTING SURFACE

FUTURE ALTITUDE CENTRAL

FUTURE ALTITUDE CENTRAL

EXISTING ROUGH-SHELLED BUSH NUT (*Macadamia tetraphylla*) TO BE TRANSLOCATED
EXISTINING COORDINATES:
EASTING: 550998.720
NORTHING: 6877406.447

EXTENT OF PREVIOUSLY SHOWN EARTHWORKS

MAWSONS PEAK BLVD (FUTURE)

BROADWATER PARKWAY

PARKES LANE

TOWNSEND CRESCENT

TOWNSEND CRESCENT

STAGE 8B

STAGE 11

STAGE 9

STAGE 8A

STAGE 10

PROPOSED PUBLIC RESERVE

LIMIT OF WORKS

MAWSONS PEAK BLVD

LEGEND

- Cut Areas
- Fill Areas
- Stage Boundary
- 10 Existing Surface Contours
- 12 Finished Surface Contours
- Nominal Kerb Line
- Proposed Batter Top
- Proposed Batter Toe
- Site Boundary

0 25m
1 : 1 000

SOURCE: Bradlees Civil Consulting (Ref: SK6524.pdf)

SCALE: 1 : 1000 @ A3

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FIGURE 4

PREPARED: BW
DATE: 25 October 2018
FILE: N09031_Layout.cdr

TITLE
PROPOSED DEVELOPMENT LAYOUT

2 LANDSCAPE FEATURES

2.1 Introduction

This section of the BDAR provides details of landscape features at the development site (in accordance with Sections 4.2 and 4.3 of the BAM) including:

- IBRA bioregions and subregions, NSW landscape region and area (ha);
- native vegetation extent and cleared areas within the buffer area;
- rivers and streams (classified according to stream order);
- wetlands within, adjacent to and downstream of the site;
- connectivity features;
- areas of geological significance and soil hazard features; and
- site context components, including:
    - identification of method applied (i.e. linear or site-based); and
    - percent native vegetation cover in the landscape (development site and biodiversity stewardship site).

2.2 IBRA Bioregions and Subregions, NSW Landscape Region and Area

The subject site is located within the Burringbar-Conondale Ranges subregion of the South East Queensland IBRA bioregion (SEQ03). Mitchell (2002) mapping places the majority of the subject site within the Mount Warning Exhumed Slopes NSW landscape region, which covers an area of 89,287 ha. A small area in the southern extent of the subject site occurs within an area mapped as Lamington Volcanic Slopes NSW landscape region.

A site map showing the above features at a scale of 1:12,500 is provided as **FIGURE 5**.

2.3 Native Vegetation Extent and Cleared Areas in the Buffer Area

Native vegetation and cleared areas occurring within a 1,500 m buffer area to the subject site are shown in **FIGURE 6**. It is estimated that the extent of native vegetation on the subject site and within the buffer area is approximately 224.54 ha. Vegetated areas that are predominantly comprised of camphor laurel (*Cinnamomum camphora*) have been included in this calculation due to the presence of native species in some areas to varying degrees.

2.4 Rivers and Streams

Waterways occurring on and adjacent to the development site can be seen in **FIGURE 5.** The Tweed River, including Terranora Broadwater, is classified as a 4th order stream according to Strahler (1952).

LEGEND

- Subject Site
- IBRA Region - South Eastern Queensland
- IBRA Subregion
  - SEQ03 Burringbar-Conondale Ranges
- NSW (Mitchell) Landscape
  - BTP Byron - Tweed Alluvial Plains
  - LAV Lamington Volcanic Slopes
  - MWE Mount Warning Exhumed Slopes
  - EST/WAT Estuary/Water Added

Scale 1:12 500 - Lengths in metres

100 0 100 200 300 400 500

SOURCE: B&P Surveys (2015 Aerial Photo & 21889B-prelim-180418.dwg)

SCALE: 1 : 12 500 @ A3

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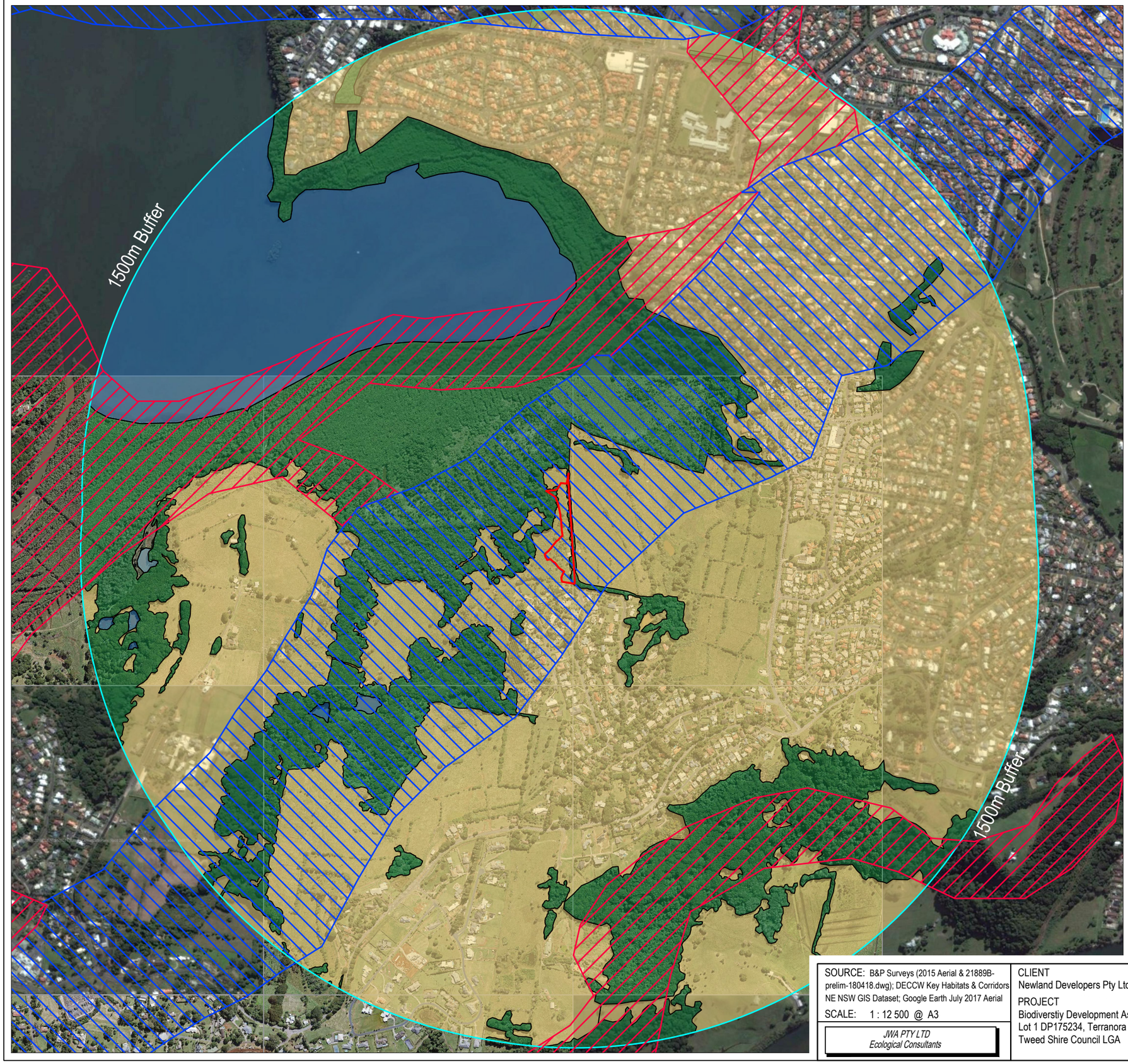
Lot 1 DP175234, Terranora NSW
Tweed Shire Council LGA

FIGURE 5

PREPARED: BW
DATE: 25 October 2018
FILE: N09031_BDAR.dwg

TITLE

IBRA & NSW
LANDSCAPE REGIONS



N

LEGEND

- Subject Site

Vegetation within 1500m Buffer

- Native Vegetation
- Cleared Areas
- Waterbodies

Fauna Corridors of North East NSW

- Regional Corridor
- Sub-regional Corridor

Scale 1:12 500 - Lengths in metres

100 0 100 200 300 400 500

SOURCE: B&P Surveys (2015 Aerial & 21889B-prelim-180418.dwg); DECCW Key Habitats & Corridors NE NSW GIS Dataset; Google Earth July 2017 Aerial

SCALE: 1 : 12 500 @ A3

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FIGURE 6

PREPARED: BW
DATE: 04 July 2019
FILE: N09031_BDAR.dwg

TITLE
NATIVE VEGETATION & CLEARED AREAS WITHIN 1500M BUFFER

2.5 Wetlands Within, Adjacent to and Downstream of the Site

A coastal wetland area as mapped by the State Environmental Planning Policy (Coastal Management) 2018 occurs to the north of the subject site (**FIGURE 7**).

2.6 Connectivity Features

Habitat connectivity in relation to the site is shown in **FIGURE 6.** This includes regional and sub-regional corridors as delineated in the Key Habitats and Corridors mapping prepared by the Department of Environment, Climate Change and Water**.**

2.7 Site Context Components

2.7.1 Introduction

The assessment of site context involved the application of the site-based method. The following landscape attributes were assessed:

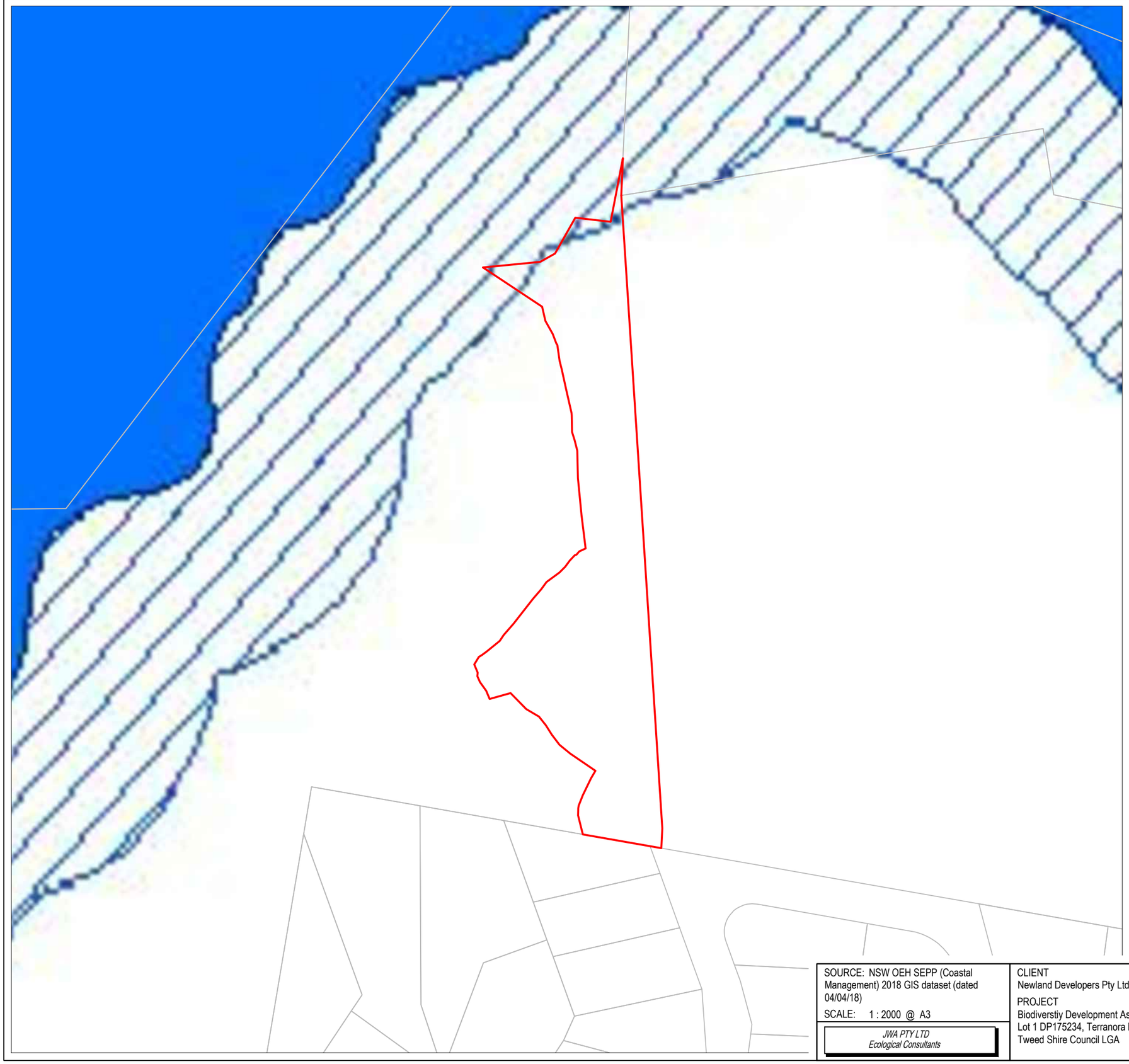
- Percent native vegetation cover in the landscape; and
- Patch size.

2.7.2 Percent Native Vegetation Cover

Native vegetation and cleared areas occurring within a 1,500 m buffer area to the subject site are shown in **FIGURE 6**. It is estimated that the native vegetation cover within the buffer area is 27%. The >10-30% native vegetation cover class has therefore been used to assess the habitat suitability of the subject site for Threatened species in **SECTION 4**. As discussed in **SECTION 2.3**, a significant proportion of the mapped vegetation is dominated by camphor laurel. However, this has been included due to the occurrence of some native components.

2.7.3 Patch Size

Native vegetation (including areas where camphor laurel dominates the canopy) and cleared areas occurring within a 1,500 m buffer area to the subject site are shown in **FIGURE 6.** The patch size in which the subject vegetation occurs has been estimated to be 39.82 ha. The 25-100 ha patch size class has therefore been used to assess the habitat suitability of the subject site for Threatened species in **SECTION 4.**



SOURCE: NSW OEH SEPP (Coastal Management) 2018 GIS dataset (dated 04/04/18)

SCALE: 1 : 2000 @ A3

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FIGURE 7

PREPARED: BW
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TITLE
COASTAL MANAGEMENT SEPP 2018 - COASTAL WETLANDS

3 NATIVE VEGETATION ASSESSMENT

3.1 Introduction

This section of the BDAR identifies native vegetation extent within the development site, including any cleared areas (in accordance with the requirements of Section 5 of the BAM). This section describes Plant Community Types (PCTs) within the development site including:

- vegetation class;
- vegetation type;
- area (ha) for each vegetation type;
- species relied upon for identification of vegetation type and relative abundance;
- justification of evidence used to identify a PCT (as outlined in Paragraph 5.2.1.12 of the BAM);
- Threatened Ecological Community (TEC) status (as outlined in Paragraphs 5.2.1.14–5.2.1.15 of the BAM); and
- estimate of percent cleared value of PCT (as outlined in Paragraph 5.2.1.16 of the BAM).

This Section also includes the results of a vegetation integrity assessment of the development site, including:

- mapping vegetation zones (in accordance with Subsection 5.3.1 of the BAM);
- patch size;
- assessing vegetation integrity using benchmark data (in accordance with Subsection 5.3.3 of the BAM);
- survey effort (as described in Subsection 5.3.4 of the BAM); and
- determining the vegetation integrity score (in accordance with Appendix 6 of the BAM) including:
    - composition condition score;
    - structure condition score;
    - function condition score; and
    - vegetation integrity score.

3.2 Methodology

3.2.1 Site Assessment

Site vegetation was assessed on the 19th of September 2018 and 1st of July 2019 using a plot-based vegetation survey based on 20 m x 20 m and 20 m x 50 m plots in accordance with the BAM. The information contained in **TABLE 1** below was collected.

TABLE 1
VEGETATION SURVEY DATA COLLECTED AT THE SUBJECT LAND

Attribute	Survey requirement
Stratum (and layer)	Stratum and layer in which each species occurs
Growth form	Growth form for each recorded species
Species name	Scientific name and common name
Cover	Estimate the % foliage cover across the plot of each species rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2…), or whole numbers up to 5% (1,2,3…), or to the nearest 5% where greater than 5% cover (5,10,15,20,25…)
Abundance rating	For species with cover less than or equal to 5%, count or estimate the number of individuals or shoots of each species within the plot, using the following intervals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000, 1500, 2000, etc. Numbers above 20 are estimates only, and the recorded abundance is the upper end of each class (e.g. 50 represents an estimated abundance of between 20 and 50). For species with cover greater than 5%, abundance estimates are not required (but may be recorded if desired)

As site vegetation was highly disturbed, including areas devoid of native species, three vegetation zones, representing varying levels of disturbance/modification were assessed. One (1) plot/transect was surveyed within each vegetation zone. The location of plots is shown in **FIGURE 8.**

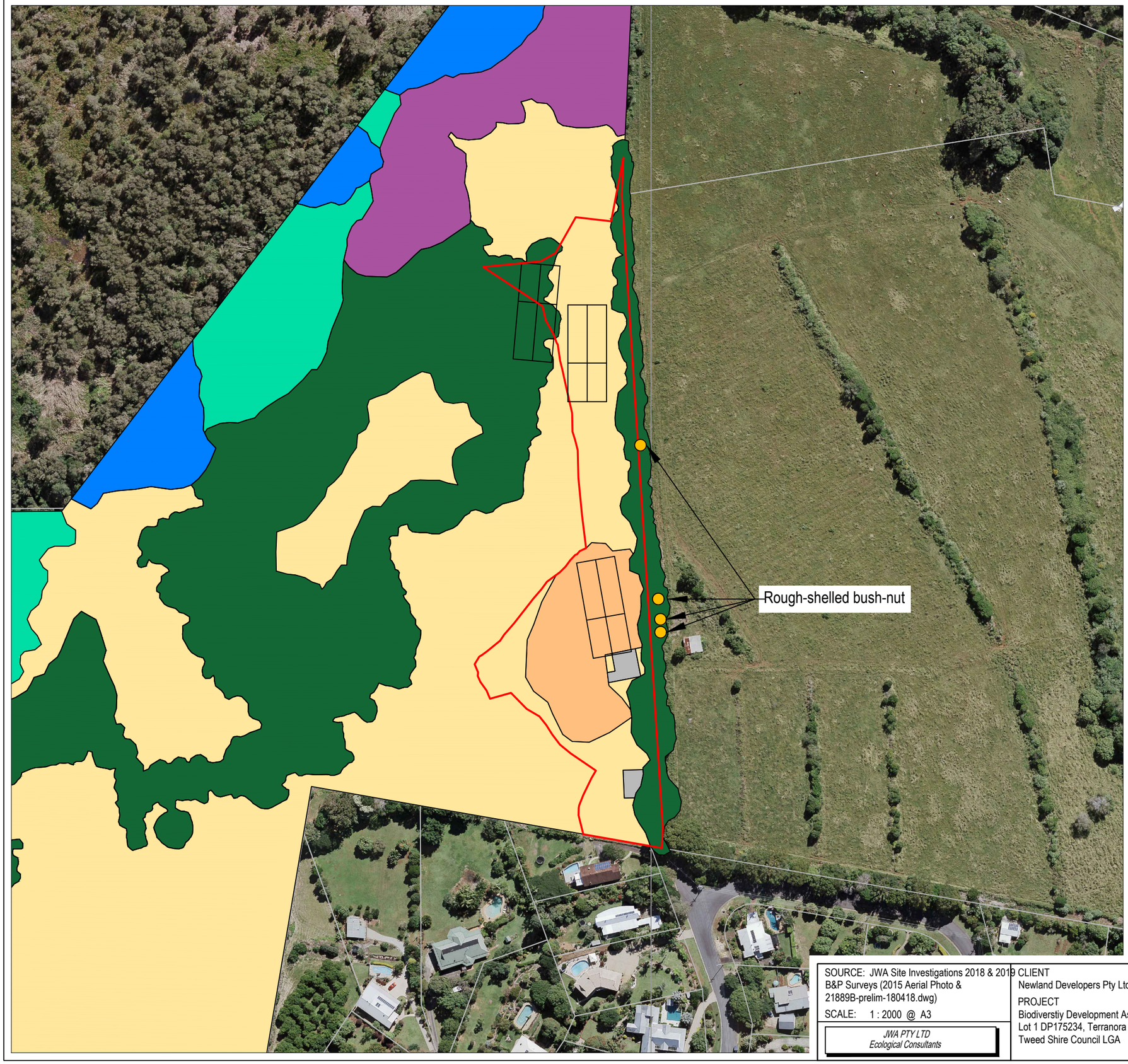
3.2.2 Identifying PCTs and TECs

Identification of PCTs and potential TECs on the subject site was completed by comparing data collected from site to:

1. detailed descriptions of PCTs and relevant geographic distributions within the BioNet Vegetation Classification;
2. detailed descriptions of TECs on the OEH website and in the relevant NSW Scientific Committee Determinations;
3. survey data and/or individual species records held in BioNet; and
4. existing maps of native vegetation in the area i.e. Tweed Vegetation Management Strategy (Ecograph 2004).

3.2.3 Vegetation Integrity Assessment (Site Condition)

The survey plots were established around a central 50m transect as follows:



N

LEGEND

- Survey Plot
- Subject Site

Threatened Flora Records

- Rough-shelled bush-nut (*Macadamia tetraphylla*)

Vegetation Communities

- Community 1 - Tall closed forest (*Cinnamomum camphora*)
- Community 2 - Tall open / closed swamp sclerophyll forest (*Melaleuca quinquenervia*)
- Community 3 - Tall open/closed swamp sclerophyll forest (*Archontophoenix cunninghamiana* / *Melaleuca quinqunervia*)
- Community 4 - Tall open moist sclerophyll forest (*Lophostemon confertus* +/- *Corymbia intermedia*)
- Community 5A - Substantially cleared land / pasture with scattered exotic regrowth
- Community 5B - Substantially cleared land / pasture with scattered exotic regrowth
- Existing Buildings

Scale 1:2000 - Lengths in metres

20 0 20 40 60 80 100

SOURCE: JWA Site Investigations 2018 & 2019
B&P Surveys (2015 Aerial Photo & 21889B-prelim-180418.dwg)

SCALE: 1 : 2000 @ A3

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TITLE
VEGETATION COMMUNITIES & SURVEY PLOT LOCATION

a) One (1) 400 m^2 plot (standard 20 m x 20 m) was used to assess all of the composition and structure attributes. The plot used for the floristic vegetation survey (**FIGURE 8**) was also used as a vegetation integrity plot.

b) One (1) 1,000 m^2 plot (standard 20 m x 50 m) was used to assess the function attributes: number of large trees, tree regeneration, stem size class, length of logs, high threat exotic weed cover and number of trees with hollows.

c) Five (5) 1 m^2 sub-plots are used to assess average litter cover (and other optional groundcover components) for the plot.

The composition, structure and relevant function attributes listed in **TABLE 2** below were assessed.

TABLE 2
GROWTH FORM GROUPS AND ATTRIBUTES USED TO ASSESS THE COMPOSITION, STRUCTURE AND FUNCTION COMPONENTS OF VEGETATION INTEGRITY

Growth form groups used to assess composition and structure	Attributes used to assess function
a) Tree	a) Number of large trees
b) Shrub	b) Tree regeneration
c) Grass and grass like	c) Tree stem size class
d) Forb	d) Total length of fallen logs
e) Fern	e) Litter cover
f) Other	f) High threat exotic weed cover
	g) Hollow bearing trees

3.3 Results

3.3.1 Vegetation Zones

3.3.1.1 Location and Area

Surveys of the subject site recorded three (3) Vegetation Zones as described below and shown in (**FIGURE 8**):

1. Tall closed forest (*Cinnamomum camphora*). This zone occurs as a row of trees along a fence line/driveway on the eastern boundary of site and a disturbed patch occurring in the north-west portion of the site. The mapped extent of this vegetation zone covers a total area of approximately 0.53 ha on the subject site, including canopy overhanging the eastern boundary.

5(a). Exotic pasture and high threat weeds. This zone represents cleared land that is generally devoid of native plant species. This zone covers a total area of approximately 0.76 ha.

5(b). Exotic landscape species, pasture and mixed regrowth. This zone represents highly disturbed land in the southern portion of the subject site. This zone covers a total area of approximately 0.43 ha.

3.3.1.2 Description

Vegetation Zone 1

This community is highly disturbed with a closed canopy of camphor laurel to a height of approximately 12-14m. Other species occurring in low numbers in the canopy include red kamala (*Mallotus philippensis*), foambark (*Jagera pseudorhus*) and blackwood (*Acacia melanoxylon*).

The midstorey and ground layers of the vegetation community are also highly disturbed and sparse to absent in most areas. The threatened species[1] rough-shelled bush-nut (*Macadamia tetraphylla*) occurs adjacent to the eastern boundary of the subject site as shown in **FIGURE 8.**

The midstorey is dominated by the weed species[2] Mickey mouse plant* (*Ochna serrulata*), lady-of-the-night* (*Cestrum nocturnum*) and lantana* (*Lantana camara*). Other occurrences in the midstorey include red kamala, macaranga (*Macaranga tanarius*), guioa (*Guioa semiglauca*), umbrella tree* (*Schefflera actinophylla*), cockspur thorn (*Maclura cochinchinensis*), rough lemon* (*Citrus x taitensis*), common guava* (*Psidium guajava*) and giant devil's fig* (*Solanum chrysotrichum*).

The ground layer is heavily dominated by climbing asparagus fern* (*Asparagus plumosus*) and areas of broadleaf paspalum* (*Paspalum mandiocanum*), elephant grass* (*Pennisetum purpureum*) and Chinese burr* (*Triumfetta rhomboidea*). Scattered occurrences of annual ragweed* (*Ambrosia artemisiifolia*), spiked mavalstrum* (*Malvastrum americanum*), *Cyclosorus interruptus* and rough maidenhair fern (*Adiantum hispidulum*) also occur.

Vegetation Zone 5(a)

Vegetation is predominantly devoid of canopy and midstorey strata and is dominated by introduced grasses including guinea grass* (*Megathyrsus maximus*) and giant paramatta grass* (*Sporobolus fertilis*) and a range of agricultural and environmental weeds such as annual ragweed*, Chinese burr*, lantana* and spear thistle* (*Cirsium vulgare*).

Vegetation Zone 5(b)

This zone contains vegetation as described above for zone 5(a) with some areas of regrowth/escaped garden plantings primarily consisting of high threat exotic species. Regrowth is dominated by camphor laurel* and cat's claw creeper* (*Dolichandra unguis-cati*) with occurrences of climbing asparagus fern and *Bouganvillea* sp*. A diverse range of exotic species were recorded within the survey plot. A small number of commonly occurring native species were observed in some areas, albeit in very low abundance. These included red kamala, macaranga and guioa. Only red kamala was recorded within the survey plot for this vegetation zone.

Complete plant species lists are provided in **APPENDIX 1.**

[1] Listed as Vulnerable under the *Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act 1999.*

[2] Weed species are indicated by the use of an asterisk*.

3.3.2 Applicable PCT and TEC

In accordance with Paragraph 5.2.1.4 (a) the most likely PCT that would have occurred prior to disturbance has been determined, as the subject vegetation has been highly modified to the extent that it has reduced species richness and is missing structural layers.

The vegetation described above is considered to most likely represent a very highly degraded/modified form of PCT 1302 White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion. This determination has been made with consideration of soil type, vegetation types occurring in similar locations in the locality, regenerating native species (where present) and community structure and descriptive attributes provided in the BioNet Vegetation Classification.

PCT 1302 is representative of the TEC - Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions. Although highly degraded and missing structural layers and other diagnostic features of this TEC, Vegetation Zone 1 has been considered to represent this TEC for the purposes of the BAMC assessment, as recommended by the Office of Environment and Heritage in correspondence dated 31st of May 2019.

3.3.3 Vegetation Integrity (Site Condition) Score

3.3.3.1 Background

To determine the vegetation integrity score, the composition score, structure score and function score were calculated by entering the collected plot survey data (**APPENDIX 1**) into the online BAM Calculator. The relevant BAM Calculator workings are summarised below.

3.3.3.2 Composition Condition

Vegetation Zone 1

Item	Tree	Shrub	Grass & Grass Like	Forb	Fern	Other
Benchmark	25	13	2	3	6	13
Observed mean ($\bar{x}$)	5	1	1	0	2	3
Unweighted composition score (UCS_i)	8.6	0.8	59.1	0	27.6	8.6
Weighted composition score (WCS_i)	3.4	0.2	1.8	0	2.6	2
Dynamic weighting (w_i)	0.39	0.2	0.03	0.05	0.09	0.23

Composition condition score =10

Vegetation Zone 5(a)

Item	Tree	Shrub	Grass & Grass Like	Forb	Fern	Other
Benchmark	25	13	2	3	6	13
Observed mean ($\bar{x}$)	0	0	1	0	0	0
Unweighted composition score (UCS_i)	0	0	59.1	0	0	0
Weighted composition score (WCS_i)	0	0	1.8	0	0	0
Dynamic weighting (w_i)	0.39	0.2	0.03	0.05	0.09	0.23

Composition condition score = 1.8

Vegetation Zone 5(b)

Item	Tree	Shrub	Grass & Grass Like	Forb	Fern	Other
Benchmark	25	13	2	3	6	13
Observed mean ($\bar{x}$)	1	0	0	0	0	1
Unweighted composition score (UCS_i)	0.2	0	0	0	0	0.6
Weighted composition score (WCS_i)	0.1	0	0	0	0	0.1
Dynamic weighting (w_i)	0.39	0.2	0.03	0.05	0.09	0.23

Composition condition score = 0.2

3.3.3.3 Structure Condition

Vegetation Zone 1

Item	Tree	Shrub	Grass & Grass Like	Forb	Fern	Other
Benchmark	168	28	1	1	25	48
Observed mean ($\bar{x}$)	30	0.5	0	0	0.1	0.5
Unweighted composition score (USS_i)	6.6	0	0	0	0	0
Weighted composition score (WSS_i)	4.1	0	0	0	0	0
Dynamic weighting (w_i)	0.62	0.1	0	0	0.09	0.18

Structure condition score = 4.1

Vegetation Zone 5(a)

Item	Tree	Shrub	Grass & Grass Like	Forb	Fern	Other
Benchmark	168	28	1	1	25	48
Observed mean ($\bar{x}$)	0	0	0.5	0	0	0
Unweighted composition score (USS_i)	0	0	59.1	0	0	0
Weighted composition score (WSS_i)	0	0	0.2	0	0	0
Dynamic weighting (w_i)	0.62	0.1	0	0	0.09	0.18

Structure condition score = 0.2

Vegetation Zone 5(b)

Item	Tree	Shrub	Grass & Grass Like	Forb	Fern	Other
Benchmark	168	28	1	1	25	48
Observed mean ($\bar{x}$)	0.1	0	0	0	0	0.2
Unweighted composition score (USS_i)	0	0	0	0	0	0
Weighted composition score (WSS_i)	0	0	0	0	0	0
Dynamic weighting (w_i)	0.62	0.1	0	0	0.09	0.18

Structure condition score = 0

3.3.3.4 Function Condition

Vegetation Zone 1

Item	Number of Large Trees	Litter Cover	Coarse Woody Debris	Stem Size Class	Regeneration Stems <5cm DBH	High Threat Weed Cover
Benchmark	6	81	48	4	Present	
Observed mean ($\bar{x}$)	0	91.6	40	4	1	90
Weighted function score (WFS_i)	0	15	19.3	15	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 64.3

Vegetation Zone 5(a)

Item	Number of Large Trees	Litter Cover	Coarse Woody Debris	Stem Size Class	Regeneration Stems <5cm DBH	High Threat Weed Cover
Benchmark	6	81	48	4	Present	
Observed mean ($\bar{x}$)	0	9	0	0	0	86.2
Weighted function score (WFS_i)	0	0.3	0	0	0	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 0.3

Vegetation Zone 5(b)

Item	Number of Large Trees	Litter Cover	Coarse Woody Debris	Stem Size Class	Regeneration Stems <5cm DBH	High Threat Weed Cover
Benchmark	6	81	48	4	Present	
Observed mean ($\bar{x}$)	0	44	12	3	1	100
Weighted function score (WFS_i)	0	10	2.9	13.8	15	
Weighting (w_i)	0.35	0.15	0.2	0.15	0.15	

Function condition score = 41.7

3.3.3.5 Final Vegetation Integrity Score

Vegetation Zone	Vegetation Integrity Score (out of 100)
1	13.8
5(a)	0.5
5(b)	0.1

4 THREATENED SPECIES ASSESSMENT

4.1 Introduction

This section of the BDAR assesses habitat suitability for Threatened species (in accordance with Section 6 of the BAM). In particular, this section of the BDAR identifies:

- ecosystem credit species associated with PCTs on the development site (in accordance with Section 6.2 of the BAM) including:
    - list of species derived; and
    - justification for exclusion of any ecosystem credit species predicted.
- species credit species on the development site (in accordance with Sections 6.3 to 6.5 of the BAM) including:
    - list of candidate species;
    - justification for inclusions and exclusions based on habitat features;
    - indication of presence based on targeted survey or expert report;
    - details of targeted survey technique, effort, timing and weather;
    - species polygons; and
    - biodiversity risk weighting for the species.

4.2 Ecosystem Credit Species

TABLE 3 lists the ecosystem credit species that have been derived from the BAM Calculator. Details of required habitat components, geographic limitations, and applicable sensitivity classes for each species is also provided.

No derived ecosystem credit species were removed from the assessment as some habitat components (i.e. breeding, foraging or roosting habitat) were present in the assessment area. However, these habitat components were marginal for most species, due to the highly disturbed nature of vegetation communities occurring on the subject site.

TABLE 3
ECOSYSTEM CREDIT SPECIES

Species	Habitat Constraints	Geographic limitations	Confirmed Candidate Species	Sensitivity to Gain Class
Barred cuckoo-shrike (*Coracina lineata*)	n/a	n/a	**Yes**	Moderate
Spotted-tailed quoll (*Dasyurus maculatus*)	n/a	n/a	**Yes**	High
Little bentwing-bat (Foraging) (*Miniopterus australis*)	n/a	n/a	**Yes**	High
Eastern bentwing-bat (Foraging) (*Miniopterus*	n/a	n/a	**Yes**	High

Species	Habitat Constraints	Geographic limitations	Confirmed Candidate Species	Sensitivity to Gain Class
schreibersii oceanensis)				
Northern free-tailed bat (*Mormopterus lumsdenae*)	n/a	n/a	**Yes**	High
Eastern freetail-bat (*Mormopterus norfolkensis*)	n/a	n/a	**Yes**	High
Powerful owl (Foraging) (*Ninox strenua*)	n/a	n/a	**Yes**	High
Grey-headed flying-fox (Foraging) (*Pteropus poliocephalus*)	n/a	n/a	**Yes**	High
Superb fruit-dove (*Ptilinopus superbus*)	n/a	n/a	**Yes**	Moderate
Yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)	n/a	n/a	**Yes**	High
Red-legged pademelon (*Thylogale stigmatica*)	n/a	n/a	**Yes**	High

4.3 Species Credit Species

TABLE 4 lists the species credit species that have been derived from the BAM Calculator. Details of required habitat components, geographic limitations, applicable sensitivity classes, whether any targeted surveys were completed, indication of presence based on targeted surveys, indication of where presence was assumed and/or where presence was determined by expert report, and the biodiversity risk weighting for each species is also provided.

Extensive flora surveys have been completed on the subject site and adjacent lands during the original and subsequent ecological assessments. A thorough search for any threatened flora species occurring within subject site habitats was also undertaken at the time of the plot-based vegetation survey. Only the previously recorded rough-shelled bush-nut stems were detected.

TABLE 4
SUMMARY OF SPECIES CREDIT SPECIES ASSESSMENT

Species	Habitat Constraints	Geographic limitations	Confirmed Candidate Species	Sensitivity to Gain Class	Targeted Surveys Completed	Presence Indicated by Targeted Survey	Presence Assumed	Biodiversity Risk (& Weighting)
Marblewood (*Acacia bakeri*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Acalypha (*Acalypha eremorum*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Scented Acronychia (*Acronychia littoralis*)	n/a	Within 5km of coast	**Yes**	High	**Yes**	No	n/a	High (2)
Giant fern (*Angiopteris evecta*)	n/a	n/a	**Yes**	Moderate	**Yes**	No	n/a	High (2)
White lace flower (*Archidendron hendersonii*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	Very High (3)
Hairy jointgrass (*Arthraxon hispidus*)	n/a	n/a	**Yes**	High	No	n/a	**Yes**	High (2)
Needle-leaf fern (*Belvisia mucronata*)	n/a	n/a	**Yes**	Moderate	**Yes**	No	n/a	High (2)
Yellow satinheart (*Bosistoa transversa*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Mark's Cassia (*Cassia marksiana*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Eastern pygmy-possum (*Cercartetus nanus*)	n/a	n/a	**Yes**	High	No	n/a	**Yes**	High (2)
Giant ironwood (*Choricarpia subargentea*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Axe-breaker (*Coatesia paniculata*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Three-toed snake-tooth skink (*Coeranoscincus reticulatus*)	• Leaf and bark litter • Fallen/standing dead	n/a	**Yes**	High	No	n/a	**Yes**	High (2)

Species	Habitat Constraints	Geographic limitations	Confirmed Candidate Species	Sensitivity to Gain Class	Targeted Surveys Completed	Presence Indicated by Targeted Survey	Presence Assumed	Biodiversity Risk (& Weighting)
	timber including logs • Timber and logs on the ground							
Corokia (*Corokia whiteana*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Stinking Cryptocarya (*Cryptocarya foetida*)	n/a	n/a	**Yes**	Moderate	**Yes**	No	n/a	Moderate (1.5)
Smooth tuckeroo (*Cupaniopsis serrata*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Coxen's fig-parrot (*Cyclopsitta diophthalma coxeni*)	n/a	n/a	**Yes**	Very High	No	n/a	**Yes**	Very High (3)
White-flowered wax plant (*Cynanchum elegans*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Missionary nutgrass (*Cyperus semifertilis*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	Very High (3)
Davidson's plum (*Davidsonia jerseyana*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Smooth Davidson's plum (*Davidsonia johnsonii*)	n/a	n/a	**Yes**	Very High	**Yes**	No	n/a	Very High (3)
Gympie stinger (*Dendrocnide moroides*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Thorny pea (*Desmodium acanthocladum*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Red-fruited ebony (*Diospyros mabacea*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Shiny-leaved ebony (*Diospyros yandina*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Small-leaved tamarind	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)

Species	Habitat Constraints	Geographic limitations	Confirmed Candidate Species	Sensitivity to Gain Class	Targeted Surveys Completed	Presence Indicated by Targeted Survey	Presence Assumed	Biodiversity Risk (& Weighting)
(*Diploglottis campbellii*)								
Giant spear lily (*Doryanthes palmeri*)	• Cliffs • Cliff top, steep rock faces or rocky outcrops	n/a	No	High	n/a	n/a	n/a	n/a
Basket fern (*Drynaria rigidula*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Nightcap oak (*Eidothea hardeniana*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	Very High (3)
Hairy quandong (*Elaeocarpus williamsianus*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Crystal creek walnut (*Endiandra floydii*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Rusty rose walnut (*Endiandra hayesii*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Ball nut (*Floydia praealta*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Southern fontainea (*Fontainea australis*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Sweet myrtle (*Gossia fragrantissima*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
White yiel yiel (*Grevillea hilliana*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	Very High (3)
Harnieria hygrophiloides	n/a	Within 5 km of Brunswick Heads township	No	High	n/a	n/a	n/a	n/a

Species	Habitat Constraints	Geographic limitations	Confirmed Candidate Species	Sensitivity to Gain Class	Targeted Surveys Completed	Presence Indicated by Targeted Survey	Presence Assumed	Biodiversity Risk (& Weighting)
Red bopple nut (*Hicksbeachia pinnatifolia*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Pale-headed snake (*Hoplocephalus bitorquatus*)	n/a	n/a	**Yes**	High	No	n/a	**Yes**	High (2)
Isoglossa (*Isoglossa eranthemoides*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Fine-leaved tuckeroo (*Lepiderema pulchella*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	Very High (3)
Short-footed screw fern (*Lindsaea brachypoda*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Green-thighed frog (*Litoria brevipalmata*)	n/a	n/a	**Yes**	Moderate	No	n/a	**Yes**	Moderate (1.5)
Rough-shelled bush-nut (*Macadamia tetraphylla*)	n/a	n/a	**Yes**	High	**Yes**	**Yes**	n/a	High (2)
Slender Marsdenia (*Marsdenia longiloba*)	n/a	n/a	**Yes**	High	No	n/a	**Yes**	High (2)
Coast euodia (*Melicope vitiflora*)	n/a	n/a	**Yes**	High	**Yes**	no	n/a	High (2)
Little bentwing-bat (Breeding) (*Miniopterus australis*)	n/a	n/a	No	Very High	n/a	n/a	n/a	n/a
Eastern bentwing-bat (Breeding) (*Miniopterus schreibersii oceanensis*)	n/a	n/a	No	Very High	n/a	n/a	n/a	n/a
Giant barred frog (*Mixophyes iteratus*)	• Land within 50m of semi permanent and permanent drainages	n/a	No	Moderate	n/a	n/a	n/a	n/a
Southern Myotis (*Myotis macropus*)	• Hollow-bearing trees • Within 200m of	n/a	**Yes**	High	No	n/a	**Yes**	High (2)

Species	Habitat Constraints	Geographic limitations	Confirmed Candidate Species	Sensitivity to Gain Class	Targeted Surveys Completed	Presence Indicated by Targeted Survey	Presence Assumed	Biodiversity Risk (& Weighting)
	riparian zone • Bridges, caves or artificial structures within 200m of riparian zone							
Ripple-leaf muttonwood (*Myrsine richmondensis*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	
Smooth-leaved plum (*Niemeyera chartacea*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Rusty plum (*Niemeyera whitei*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Powerful owl (breeding) (*Ninox strenua*)	n/a	n/a	No	High	n/a	n/a	n/a	n/a
Yellow-flowered King of the Fairies (*Oberonia complanata*)	n/a	n/a	**Yes**	Moderate	**Yes**	No	n/a	Very High (3)
Southern ochrosia (*Ochrosia moorei*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	Very High (3)
Onion cedar (*Owenia cepiodora*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	Very High (3)
Wollumbin dogwood (*Ozothamnus vagans*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Brown Fairy-chain orchid (*Peristeranthus hillii*)	n/a	Within 5 km of coast	**Yes**	Moderate	**Yes**	No	n/a	Moderate (1.5)
Brush sauropus (*Phyllanthus microcladus*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Southern pink underwing moth (*Phyllodes imperialis*) (southern subspecies)	n/a	n/a	**Yes**	Moderate	No	n/a	**Yes**	High (2)

Species	Habitat Constraints	Geographic limitations	Confirmed Candidate Species	Sensitivity to Gain Class	Targeted Surveys Completed	Presence Indicated by Targeted Survey	Presence Assumed	Biodiversity Risk (& Weighting)
Common Planigale (*Planigale maculata*)	n/a	n/a	**Yes**	High	No	n/a	**Yes**	High (2)
McPherson Range pomaderris (*Pomaderris notata*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Grey-headed flying-fox (Breeding) (*Pteropus poliocephalus*)	n/a	n/a	No	High	n/a	n/a	n/a	n/a
Spiny gardenia (*Randia moorei*)	n/a	n/a	**Yes**	Very High	**Yes**	No	n/a	Very High (3)
Scrub turpentine (*Rhodamnia rubescens*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	Very High (3)
Blotched sarcochilus (*Sarcochilus weinthalii*)	n/a	n/a	**Yes**	Moderate	**Yes**	No	n/a	Very High (3)
Rainforest Cassia (*Senna acclinis*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Brush Sophora (*Sophora fraseri*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Small-leaved hazelwood (*Symplocos baeuerlenii*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Red lilly pilly (*Syzygium hodgkinsoniae*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Durroby (*Syzygium moorei*)	n/a	n/a	**Yes**	High	**Yes**	No	n/a	High (2)
Mitchell's rainforest snail (*Thersites mitchellae*)	n/a	n/a	**Yes**	High	No	n/a	**Yes**	Very High (3)
Arrow-head vine (*Tinospora tinosporoides*)	n/a	n/a	**Yes**	Moderate	**Yes**	No	n/a	Moderate (1.5)
Queensland Xylosma (*Xylosma terrae-reginae*)	n/a	Within 5 km of coast	**Yes**	High	**Yes**	No	n/a	High (2)

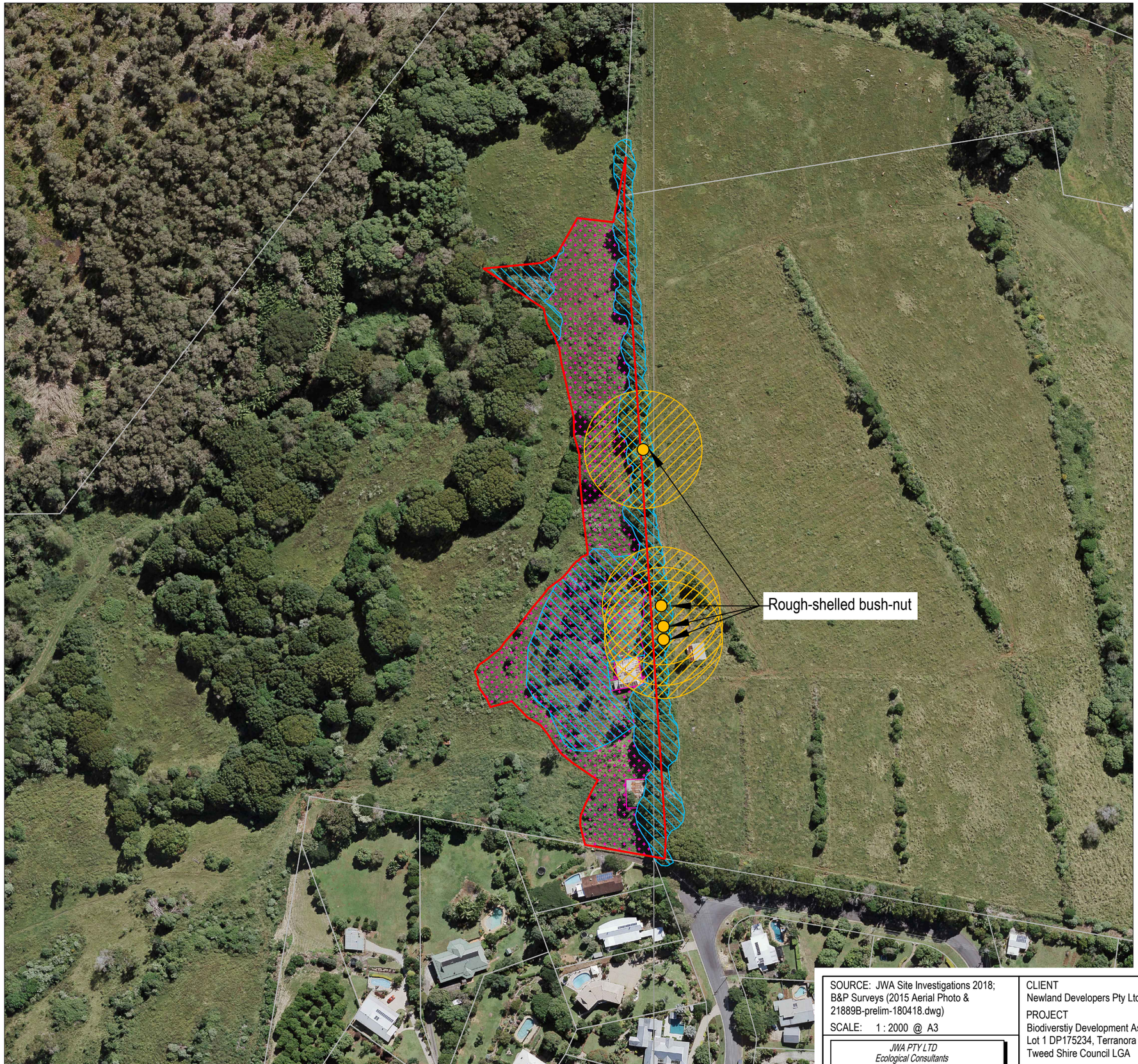
The following species credit species are assumed to be present on the subject site, with the exception of *Macadamia tetraphylla,* which was directly recorded. However, it should be noted that the highly disturbed site vegetation represents marginal habitat for species assumed to be present:

- Hairy jointgrass^ (*Arthraxon hispidus*) assumed to be present as flora surveys were not completed at the appropriate time to detect this species;
- Eastern pygmy-possum^ (*Cercartetus nanus*) assumed to be present;
- Three-toed snake-tooth skink^ (*Coeranoscincus reticulatus*) assumed to be present;
- Coxen's fig-parrot^ (*Cyclopsitta diophthalma coxeni*) assumed to be present;
- Pale-headed snake^ (*Hoplocephalus bitorquatus*) assumed to be present;
- Green-thighed frog^ (*Litoria brevipalmata*) assumed to be present;
- Rough-shelled bush-nut (*Macadamia tetraphylla*) recorded adjacent to the eastern boundary of the subject site;
- Slender marsdenia (*Marsdenia longiloba*) assumed to be present as flora surveys were not completed at the appropriate time to detect this species;
- Southern Myotis^ (*Myotis macropus*) assumed to be present;
- Southern pink underwing moth^ (*Phyllodes imperialis*) (southern subspecies) assumed to be present;
- Common Planigale (*Planigale maculata*) assumed to be present; and
- Mitchell's rainforest snail^ (*Thersites mitchellae*) assumed to be present.

^These species have been retained as candidate species, and assumed to be present, at the request of the Office of Environment and Heritage in correspondence dated 31 May 2019.

Species polygons have been prepared and are provided in **FIGURE 9**. The species polygon for rough-shelled bush-nut includes a 30m buffer around the outside of individual plants in accordance with Paragraph 6.4.1.29 of the BAM. Species polygons for the remaining species are considered to be inclusive of Vegetation Zones 1 and 5(b) except for hairy jointgrass which includes Vegetation Zones 5(a) and 5(b).

A number of species credit species were considered to be highly unlikely to occur on the subject land after an assessment of site habitats. This is primarily due to the absence of suitable habitat components and/or high levels of disturbance and degradation. Species that were removed from the candidate species list, along with the rationale behind the decision to remove them, are provided in **TABLE 5.**



N

LEGEND

- Subject Site

Threatened Flora Records

- Rough-shelled bush-nut (*Macadamia tetraphylla*)

Species Polygons

- Species Polygon for Hairy jointgrass (*Arthraxon hispidus*)
- Species Polygon for Rough-shelled bush-nut (*Macadamia tetraphylla*)
- Species Polygon for:
  - Eastern pygmy-possum (*Cercartetus nanus*);
  - Three-toed snake-tooth skink (*Coeranoscincus reticulatus*);
  - Coxen's fig-parrot (*Cyclopsitta diophthalma coxeni*);
  - Pale-headed snake (*Hoplocephalus bitorquatus*);
  - Green-thighed frog (*Litoria brevipalmata*);
  - Slender marsdenia (*Marsdenia longiloba*);
  - Southern Myotis (*Myotis macropus*);
  - Southern pink underwing moth (*Phyllodes imperialis*) (southern subspecies);
  - Common planigale (*Planigale maculata*); and
  - Mitchell's rainforest snail (*Thersites mitchellae*);

Scale 1:2000 - Lengths in metres

20 0 20 40 60 80 100

SOURCE: JWA Site Investigations 2018; B&P Surveys (2015 Aerial Photo & 21889B-prelim-180418.dwg)

SCALE: 1 : 2000 @ A3

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FIGURE 9

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SPECIES POLYGONS

TABLE 5
SPECIES CREDIT SPECIES REMOVED FROM CANDIDATE SPECIES LIST

Species	Reason for determining that species is unlikely to occur on the subject land
Giant spear lily (*Doryanthes palmeri*)	Subject land does not contain cliffs, rocky outcrops or rock faces.
Harnieria hygrophiloides	Subject land does not occur within 5km of Brunswick Heads township.
Little bentwing-bat (Breeding) (*Miniopterus australis*)	Maternity caves are not present on the subject land. Only five nursery sites/maternity colonies are known in Australia.
Eastern bentwing-bat (Breeding) (*Miniopterus schreibersii oceanensis*)	Maternity caves are not present on the subject land.
Giant barred frog (*Mixophyes iteratus*)	Subject land does not contain, or occur within 50m of, semi-permanent or permanent streams or other water bodies.
Powerful owl (Breeding) (*Ninox strenua*)	Absence of large tree hollows required as a breeding habitat component.
Grey-headed flying-fox (Breeding) (*Pteropus poliocephalus*)	No roosting sites (camps) representing breeding habitat occur on the subject land.

5 AVOIDANCE & MINIMISATION OF IMPACTS

5.1 Introduction

This section of the BDAR discusses methods to avoid and minimise impact of the proposed development including:

- Details of efforts to avoid and minimise impact on biodiversity values (in accordance with Section 8 of the BAM); and
- An assessment of direct and indirect impacts unable to be avoided at the development site (in accordance with Sections 9.1 and 9.2 of the BAM).

The assessment of impacts has considered and included the type, frequency, intensity, duration and consequence of impacts.

5.2 Avoidance and Minimisation Measures

5.2.1 Pre-Construction/Design Phase

5.2.1.1 Locating the Project

The location of the proposed extension of bulk earthworks is limited to grazing land comprising pasture grasses and small areas of highly disturbed vegetation, predominantly consisting of high threat exotic weed species. No works (including temporary and permanent ancillary construction and maintenance facilities) shall be located outside the development footprint.

5.2.1.2 Project Design

As described above, the project design avoids and minimises the clearing of native vegetation and habitat by locating temporary and permanent ancillary construction and maintenance facilities in areas that are in the poorest condition (i.e. have a low vegetation integrity score).

5.2.2 Construction Phase

5.2.2.1 Education of Site Personnel

A construction personnel induction program shall be developed by the Proponent to highlight the presence of significant vegetation and habitat values on the site. The general induction of all construction personnel will cover such matters as:

- Demarcation of the work area;
- Areas on, or adjacent to, the site in which significant vegetation and/or habitat values occur;
- Threats to significant vegetation and habitat values associated with construction activities;
- Requirement to report any incidents within the significant vegetation and habitat areas, and actions required;

- Construction personnel are prohibited from bringing dogs onto the site; and
- Requirements of relevant Management Plans, particularly protocols for vegetation clearing/bulk earthworks and measures to protect retained native vegetation (e.g. erosion and sediment control, slope stabilisation, weed control etc.).

5.2.2.2 Translocation of *Macadamia tetraphylla*

A Vegetation Management and Rehabilitation Plan (VMRP) (JWA 2015) has been prepared and approved as part of the Altitude Aspire development that provides specific translocation measures for one (1) *Macadamia tetraphylla* stem occurring along the eastern boundary of the subject site. Recent site investigations completed by JWA Pty Ltd revealed the occurrence of a total of four (4) *M. tetraphylla* stems (**FIGURE 8**). A Revised *Macadamia tetraphylla* Translocation Plan (MTTP) (JWA 2019) has subsequently been prepared and includes the translocation of these stems, along with an additional minimum 20-24 propagated plants, into suitable nearby habitat within the designated conservation area on the Altitude Aspire site. It is understood that the Revised MTTP has been issued to Tweed Shire Council.

5.2.2.3 Fauna Protection Measures

Vegetation and rocky areas will be inspected for fauna by a suitably qualified ecologist immediately prior to the commencement of clearing/earthworks. Built structures (i.e. abandoned house/sheds) shall be inspected for fauna (particularly microchiropteran bats) immediately prior to demolition. Any fauna detected within proposed clearing areas or buildings to be demolished will be relocated to suitable habitat outside of the subject site. Consideration will be given to appropriate release times and locations for specific fauna groups and a record kept of all species encountered/relocated.

Habitat features such as fallen timber, hollow logs and/or rocks shall be retained if possible or relocated to an appropriate location within retained vegetation or proposed Conservation Areas as replacement habitat for ground-dwelling fauna.

5.2.2.4 Vegetation Protection Measures

During construction activities, temporary high visibility fencing will be erected to assist in the protection of retained vegetation from all construction activities by restricting access from machinery and contractors. This fencing will be erected in accordance with Australian Standard 4970-2009 Protection of Trees and the requirements of the VMRP prepared for the adjacent Altitude Aspire project site. Temporary signage will be provided along all temporary fencing during the construction phase stating "Conservation Area – No Unauthorised Entry".

No machinery, rubbish or spoil will be stored within retained vegetation during the construction phase of the development. Vehicle/equipment wash-down areas or access tracks will not be located in or immediately adjacent to retained vegetation.

5.2.2.5 Stormwater Management, Erosion and Sediment Controls

Protocols for maintaining hydrological processes and minimising erosion and sedimentation have been developed as part of the broader Altitude Aspire development site. Advice received from Meinhardt Urban Pty Ltd, in letter dated 10th July 2019, provides the following in relation to stormwater management and erosion and sediment control:

> *Stormwater management within the Altitude Aspire development has been addressed in the previously approved Stormwater Management Plan prepared by Gilbert and Sutherland dated April 2013 and subsequently amended in the BIOME Report – Bioretention Basin and Drainage Reserve design Report Version 4 dated March 2019. The Erosion and Sediment control in this area is subject to the submission of a Construction Certificate for Earthworks and is currently being documented. Conceptual ESC will be shown in this application.*
>
> *The area contained within Altitude Central (the area west of proposed Townsend Crescent and Parkes Lane) is not covered by the Approved Stormwater Management Plan and is proposed to be Earthworks only with no proposed change of use at this stage. All exposed areas to the west of the Altitude Aspire boundary will be controlled and treated prior to adequate new grass cover being established. The Erosion and Sediment control for this area will be subject to the submission of a Construction Certificate for Earthworks and is currently being documented. Conceptual ESC will be shown in this application. Operational Stormwater management will be the subject of any future Development Application for the Altitude Central area.*

Disturbance of soils shall be minimised as far as possible and appropriate sediment and erosion controls established. Stormwater flows will be managed to replicate (where possible) the natural pre-development flow patterns in terms of frequency, quantity and quality.

5.2.2.6 Weed Control

Weed hygiene protocols have been developed as part of the broader Altitude Aspire development site. These will be applied to the proposed additional clearing/earthworks area subject to this BDAR. Vegetation waste shall be taken to an appropriate waste disposal facility or mulched for reuse on site if fertile weed material is not present.

5.2.3 Post-construction/Operational Phase

5.2.3.1 Appropriate Landscaping

Landscape species should comprise locally occurring native species to reduce the potential for weed invasion.

5.2.3.2 Regeneration and Revegetation Measures

A Vegetation Management and Rehabilitation Plan (VMRP) has been prepared for the Altitude Aspire development outlining specific measures to:

- Enhance the vegetation to be retained within Conservation Areas;
- Revegetate disturbed areas where appropriate with locally-occurring native species to achieve fully structured vegetation communities;
- Provide offsets for the unavoidable loss of Lowland rainforest EEC from the development footprint;
- Rehabilitate the area of degraded Freshwater wetland EEC on the subject site;
- Reduce detrimental edge effects and other disturbance related impacts on the adjacent SEPP 14 Wetland;
- Improve the value of the subject site as habitat for fauna groups;
- Manage weeds using plantings of locally-occurring native species and best practice weed control methods; and
- Contribute a significant area of native habitat (existing and restored) to the Regional Corridor.

The measures prescribed within the Vegetation Management and Rehabilitation Plan should be implemented on the subject site where relevant and appropriate.

5.2.4 Monitoring and Reporting

The VMRP and Revised MTTP prepared for the Altitude Aspire development provide monitoring and reporting requirements and specific measurable performance targets. Monitoring will be completed within the following areas:

- Proposed natural regeneration areas;
- Revegetation areas (including the *M. tetraphylla* translocation receiving area);
- Freshwater wetland EEC and adjacent SEPP 14 Wetland; and
- Stormwater treatment areas and central drainage channel.

6 IMPACT SUMMARY

6.1 Introduction

This section of the BDAR identifies, assesses and summarises the likely direct and indirect impacts of the proposed development. Furthermore, impacts of the proposed development are identified that are:

- considered to be potentially serious and irreversible impacts (in accordance with Section 10.2); and
- require offsets (in accordance with Section 10.3 of the BAM).

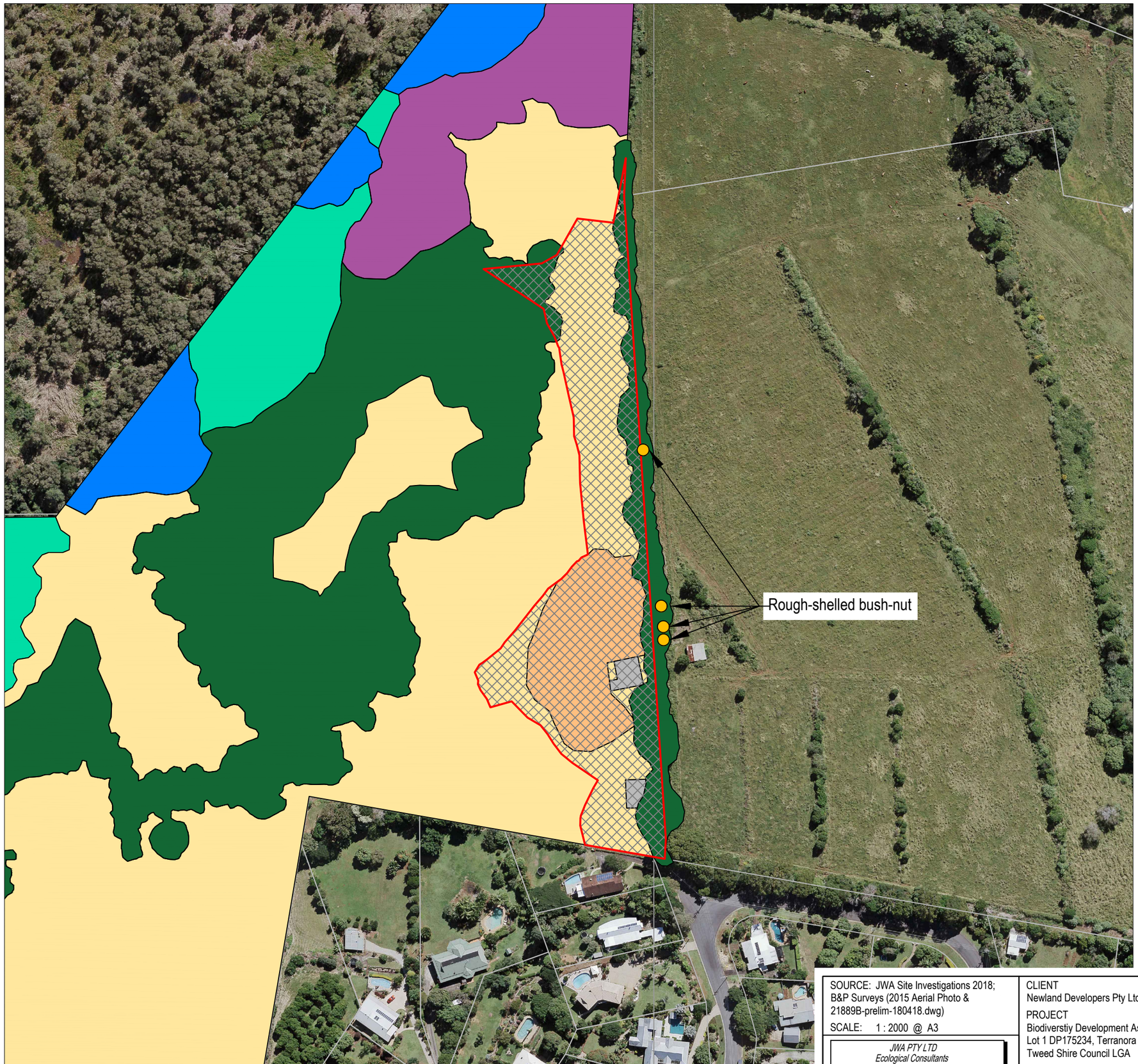
6.2 Direct Impacts on Native Vegetation/Habitat

The proposed development will result in the removal of approximately of 1.72 ha of highly degraded vegetation representing or previously sustaining PCT 1302. Direct impacts on vegetation communities as a result of the proposed additional clearing are shown in **FIGURE 10**.

The direct impacts on Vegetation Zones 1, 5(a) and 5(b) will reduce the vegetation integrity score over these areas (0.53 ha, 0.76 ha and 0.43 ha) from 13.8, 0.5 and 0.1 to 0 respectively.

6.3 Potential Indirect Impacts

The proposed development may contribute to potential indirect impacts on native vegetation and habitat beyond the subject site. A summary of indirect impacts is provided in **TABLE 6**, including a description of the nature, extent and duration of impacts, along with the threatened species, threatened ecological communities and habitats likely to be affected.



N

LEGEND

- Impact Area
- Subject Site

Threatened Flora Records

- Rough-shelled bush-nut (*Macadamia tetraphylla*)

Vegetation Communities

- Community 1 - Tall closed forest (*Cinnamomum camphora*)
- Community 2 - Tall open / closed swamp sclerophyll forest (*Melaleuca quinquenervia*)
- Community 3 - Tall open/closed swamp sclerophyll forest (*Archontophoenix cunninghamiana* / *Melaleuca quinqunervia*)
- Community 4 - Tall open moist sclerophyll forest (*Lophostemon confertus* +/- *Corymbia intermedia*)
- Community 5A - Substantially cleared land / pasture with scattered exotic regrowth
- Community 5B - Substantially cleared land / pasture with scattered exotic regrowth
- Existing Buildings

Scale 1:2000 - Lengths in metres

20 0 20 40 60 80 100

SOURCE: JWA Site Investigations 2018; B&P Surveys (2015 Aerial Photo & 21889B-prelim-180418.dwg)

SCALE: 1 : 2000 @ A3

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FIGURE 10

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DATE: 04 July 2019
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IMPACTS ON VEGETATION COMMUNITIES

TABLE 6
SUMMARY OF INDIRECT IMPACTS

Indirect impact	Likelihood of impact occurring	Extent and nature of impact	Timing and duration of impact	Threatened species and/or ecological communities and habitats affected
Inadvertent impacts on adjacent habitat or vegetation	Low	Accidental damage to vegetation outside the proposed limit of clearing, particularly contiguous vegetation to the west of the subject site	During vegetation clearing works and bulk earthworks	Highly degraded lowland rainforest vegetation representing sub-optimal potential habitat for threatened flora and fauna species
Reduced viability of adjacent habitat due to edge effects, noise, dust or light spill	Low	The viability of subject site and adjacent habitats is currently reduced due to high levels of disturbance, fragmentation of habitat and associated edge effects	The proposed works are unlikely to represent a significant increase to the duration of this impact	n/a
Transport of weeds and pathogens from the site to adjacent vegetation	Low	Subject site and adjacent habitats are currently heavily dominated by weed species. The proposed works would not represent an increase in the current potential for the spread of weeds and pathogens.	There is some potential for weed material to be transported during vegetation clearing works and bulk earthworks	Unlikely to be affected due to the current high degree of weed infestation
Increased risk of starvation, exposure and loss of shade or shelter	Low	Disturbance to small areas of degraded habitat on the subject site (i.e. vegetation, bush rock, logs and leaf litter) represents a minor reduction in shade and shelter sites. However, higher quality habitat will be retained in adjacent areas.	Permanent removal of some shade and shelter sites	Primarily ground-dwelling fauna that are able to occupy low condition, highly modified habitats
Loss of breeding habitats	Unlikely	Potential breeding habitats are not considered to occur on the subject site due to high levels of disturbance and modification of habitat	n/a	n/a
Trampling of threatened flora species	Low	There is some potential for accidental trampling of threatened flora species occurring in offsite habitats associated with human access	Long-term following occupation of the subject site	Threatened flora seedlings potentially occurring within adjacent habitats

Indirect impact	Likelihood of impact occurring	Extent and nature of impact	Timing and duration of impact	Threatened species and/or ecological communities and habitats affected
Inhibition of nitrogen fixation and increased soil salinity	Unlikely	The extent of this impact is expected to be negligible given the current levels of modification and disturbance	n/a	n/a
Fertiliser drift	Nil	Fertiliser spray is not proposed	n/a	n/a
Rubbish dumping	Moderate	There is some potential for rubbish dumping in habitats occurring on or immediately adjacent to future lots	Long-term following occupation of the subject site	Highly degraded lowland rainforest vegetation representing sub-optimal potential habitat for threatened flora and fauna species
Wood collection	Moderate	There is potential for wood collection for firewood from within habitats occurring on or immediately adjacent to future lots	Long-term following occupation of the subject site	Logs on the ground (particularly hollow logs) represent potential habitat for ground-dwelling threatened fauna species such as the common planigale (*Planigale maculata*)
Bush rock removal and disturbance	High	Some areas containing bush rock will be disturbed as a result of the proposed earthworks. There is potential for bush rock removal and/or disturbance from within or adjacent to future lots	Short-term during the proposed works. Long-term following occupation of the subject site	Bush rock represents potential habitat for some ground-dwelling threatened fauna species such as the common planigale (*Planigale maculata*)
Increase in predatory species or pest animal populations	Low - Moderate	There is some potential for a minor increase in the number of domestic animals straying in adjacent habitats. Stray dogs and cats have the potential to prey on native fauna species and may contribute to an increase in feral populations.	Long-term following occupation of the subject site	Threatened fauna species at risk of predation such as the common planigale (*Planigale maculata*)
Increased risk of fire	Low	There is potential for a minor increase in the risk of fire spreading into	Long-term following occupation of the subject	Highly degraded lowland rainforest vegetation

Indirect impact	Likelihood of impact occurring	Extent and nature of impact	Timing and duration of impact	Threatened species and/or ecological communities and habitats affected
		adjacent bushland as a result of inappropriate and/or unauthorised fires on private land	site	representing sub-optimal potential habitat for threatened flora and fauna species
Disturbance to specialist breeding and foraging habitat e.g. beach nesting for shorebirds	Nil	No specialist breeding or foraging habitat is considered to occur on or adjacent to the subject site	n/a	n/a
Alteration to drainage and hydrological regimes	High	It is likely that the proposed earthworks and future development of the subject site would result in minor alterations to the current drainage and hydrological regimes on the subject site and adjoining areas	Long-term following earthworks and installation of infrastructure	Highly degraded lowland rainforest vegetation representing sub-optimal potential habitat for threatened flora and fauna species
Decline in water quality entering adjacent waterways e.g. sediment load, pH, influx of pollutants, nutrient loading	Low	There is some potential for a minor reduction in the quality of water leaving the subject site and entering adjacent waterways (e.g. sedimentation associated with earthworks and nutrients/pollutants associated with future lots)	Short-term during the proposed works. Long-term following occupation of the subject site	Threatened flora, fauna and ecological communities associated with waterways occurring downstream of the subject land

6.4 Prescribed Biodiversity Impacts

6.4.1 Background

In accordance with Clause 6.1 of the BC Regulation:

1) The impacts on biodiversity values of the following actions are prescribed (subject to subclause (2)) as biodiversity impacts to be assessed under the biodiversity offsets scheme:
    a. the impacts of development on the following habitat of threatened species or ecological communities:
        i. karst, caves, crevices, cliffs and other geological features of significance,
        ii. rocks,
        iii. human made structures,
        iv. non-native vegetation,
    b. the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,
    c. the impacts of development on movement of threatened species that maintains their lifecycle,
    d. the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development),
    e. the impacts of wind turbine strikes on protected animals,
    f. the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.
2) The additional biodiversity impacts prescribed by this clause:
    a. are prescribed for the purposes of assessment and biodiversity assessment reports under the Act, but are not additional biodiversity impacts for the purposes of calculating the number and class of biodiversity credits that are required under a biodiversity assessment report to be retired to offset the residual impact on biodiversity values of proposed development, proposed clearing of native vegetation or proposed biodiversity certification of land, and
    b. may be taken into account in the determination of the biodiversity credits required to be retired (or other conservation measures required to be taken) under a planning approval or vegetation clearing approval or under a biodiversity certification of land.

6.4.2 Applicability to the Assessment Area

6.4.2.1 Habitat of Threatened Species or Ecological Communities

The assessment area contains basalt rocks and boulders, particularly in the western portion of the subject site associated with PCT 1302. Rocky areas of the site are considered to represent marginal potential habitat for the common planigale (*Planigale maculata*). The removal of rocks and other ground cover from the subject site would represent a long-term impact to shelter and refuge sites for this species if it occurs onsite. However, the local and bioregional persistence of this or any other threatened species (with potential to use these areas as habitat) is unlikely to be significantly affected with consideration of the following:

- Small scale and extent of impact to this habitat feature;
- High degree of modification and disturbance levels within existing habitat;
- Sub-optimal nature of existing habitats on and adjacent to the subject site;
- Relative abundance of comparable habitats in the immediate locality; and
- Retention of habitat features, including the relocation/placement of rocks and other ground cover (e.g. logs, stumps and fallen timber) in conservation areas/retained vegetation.

6.4.2.2 Connectivity

The proposed development will occur on an area that is predominantly cleared and/or highly disturbed. Nevertheless, the subject site is located within a mapped Regional Corridor identified in the Key Habitats and Corridors mapping (DECCW) as shown in **FIGURE 6**. Sub-regional corridor mapping is also shown in **FIGURE 6**. A row of predominantly camphor laurel trees, occurring along a fence-line adjacent to the eastern boundary of the subject site, may facilitate the local dispersal of some disturbance adapted species. However, it is unlikely that this row of trees would provide a significant contribution to regional or sub-regional corridors.

It is noted that there are recent Koala (*Phascolarctos cinereus*) records to the south and south-east of the subject site from within residential areas. Although Koalas are known to utilise rows of trees to disperse through the landscape (e.g. lineal eucalypt windbreaks planted by orchardists) it is unlikely that this row of trees would represent a significant movement corridor given that:

- More suitable dispersal habitat (i.e. larger areas of more intact vegetation) occurs to the south-west, west and north of the subject site (**FIGURE 6**) that could potentially facilitate Koala movements, both in a north-south and east-west direction;
- There are no Koala food trees present among, or adjacent to, the row of camphor laurel trees; and
- Access to the base of trees is impeded by dense exotic vegetation growth and barbed wire (old fence and replacement fence).

Following the removal of vegetation from the subject site, and development of the broader Altitude Aspire project, connectivity will be maintained (consistent with existing levels) via the approved revegetation, regeneration and managed landscape zones. Furthermore, the proposed revegetation and regeneration works will provide additional dispersal habitat along the northern portion of the project site (i.e. adjacent to the Coastal Wetland area). It is therefore unlikely that the proposed removal of predominantly high threat exotic vegetation would result in adverse impacts on connectivity between meaningful habitat areas for threatened species.

6.4.2.3 Movement of Threatened Species that Maintains their Lifecycle

As discussed above, the proposed development will occur on an area that is predominantly cleared and/or highly disturbed and more suitable dispersal habitat will be retained in adjacent areas. The development is therefore not considered to result in any additional impacts on the movements of threatened species that maintains their lifecycles.

6.4.2.4 Water Quality, Water Bodies and Hydrological Processes that Sustain Threatened Species and Threatened Ecological Communities

Although there are likely to be some minor alterations to the existing hydrology of the subject site, it is considered unlikely that the small-scale of proposed additional clearing would impact on water quality, water bodies and/or hydrological processes that sustain threatened species and threatened ecological communities.

6.4.2.5 Impacts of Wind Turbine Strikes

Not applicable to the proposed development.

6.4.2.6 Impacts of Vehicle Strikes

It is considered unlikely that the small-scale of proposed additional clearing would increase the impact of vehicle strikes in the short-term. Future development and occupation of the subject site and adjacent areas (as part of the Altitude Aspire project) may contribute to an increase in the risk of vehicle strikes, particularly in areas where roads are proposed in close proximity to habitat edges.

6.5 Potential Serious and Irreversible Impacts

6.5.1 Background

Serious and irreversible impacts (SAII) are those impacts that:

- Will cause a further decline of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline; or
- Will further reduce the population of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size; or

- Are impacts on the habitat of a species or area of ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution; or
- Are impacts on a species or ecological community that is unlikely to respond to measures to improve its habitat and vegetation integrity and is therefore irreplaceable.

It is the role of the decision-maker to determine whether or not any of the residual impacts of a proposed development, activity, biodiversity certification or vegetation clearing on biodiversity values (that is, the impacts that would remain after any proposed avoid or mitigate measures have been taken) are serious and irreversible

To assist a decision-maker with this task, the BC Act (and the BCR) provides a framework to make this determination. The framework consists of a series of principles defined in the BC Regulation and supporting guidance, provided for under section 6.5 of the BC Act, to interpret these principles.

6.5.2 Applicability to the Assessment Area

Step 1: Identify Relevant Potential Entities
Habitat for the following two (2) SAII entities, as listed within *Appendix 2: List of potential species (and their habitat) that meet the SAII principles and criteria* within *Guidance to assist a decision-maker to determine a serious and irreversible impact* (the guide), has been assumed to be present on the subject site at the request of the Office of Environment and Heritage in correspondence dated 31st of May 2019:

- Coxen's fig-parrot (*Cyclopsitta diophthalma coxeni*); and
- Mitchell's rainforest snail (*Thersites mitchellae*).

Step 2: Evaluate Nature of Impact on a Potential Entity
The likelihood of occurrence of these potential SAII entities on the subject site is considered to be extremely low, given the very high levels of degradation (refer vegetation integrity scores in **SECTION 3.3.3**) and lack of suitable habitat components as follows:

- Coxen's fig-parrot - fig trees or other rainforest species with fleshy fruits do not occur on the subject site.
- Mitchell's rainforest snail - the subject site is not periodically inundated and does not contain a well-developed leaf litter layer or intact forest canopy maintaining a moist microclimate. This is an important habitat component of the species as described in the Approved Recovery Plan (NPWS 2001). Furthermore, the subject site does not contain rainforest or swamp forest on alluvial soils and does not contain a significant proportion of palm or fig trees or areas immediately adjacent to wetlands.

Step 3: Determine if the Impacts Exceed the Threshold
It is understood that thresholds for the potential SAII entities listed above have not been developed. Therefore, an assessment of impact thresholds is not possible.

Step 4: Evaluate a Serious and Irreversible Impact
It is not considered that the proposed works represent a serious and irreversible impact to the above species. This is primarily due to the lack of suitable habitat components for these species as described above. Regardless of the absence of suitable habitat, the high level of mobility of Coxen's fig parrot would further reduce the likelihood of any SAII on this species.

Step 5: Decision-making
Where the decision-maker is of the opinion that a proposal is likely to have a serious and irreversible impact on biodiversity values, the BC Act and the LLS Act sets out the following requirements in relation to any approval or consent of the proposal (**TABLE 7**).

TABLE 7
ROLE OF THE DECISION MAKER FOR DIFFERENT TYPES OF DEVELOPMENT PROPOSALS

Type of proposal	Role of the decision maker
Application for development consent under Part 4 of the Environmental Planning & Assessment Act 1979 (EP&A Act) (other than an application for state significant development or an application for a complying development certificate) See section 7.16(2) of the BC Act	Required to refuse to grant development consent
Application for development consent for state significant development or for approval for state significant infrastructure under the EP&A Act See section 7.16(3) of the BC Act	Required to: • take likely SAII into consideration, and • determine if there are any additional and appropriate measures that will minimise the impact if consent or approval is granted
Part 5 activity (where the proponent has elected to obtain a biodiversity assessment report under Division 2 of the BC Act) See section 7.16(4) of the BC Act	Required to: • take likely SAII into consideration, and • determine if there are any additional and appropriate measures that will minimise the impact if the activity is to be carried out or approved
Biodiversity certification of land See section 8.8(2) of the BC Act	Required to: • take likely SAII into consideration in determining the application, and • determine if there are any additional and appropriate measures that will minimise the impacts
Approval for clearing native vegetation under	Required to refuse to grant approval

Type of proposal	Role of the decision maker
section 60ZF of the LLS Act	
Approval for clearing native vegetation under clause 14 of the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017	Required to refuse to grant approval

6.6 Impacts Requiring an Offset

6.6.1 Ecosystem Credits

Impacts to the degraded area of PCT 1302 are not required to be offset as the vegetation integrity score is below those set out in Paragraph 10.3.1.1 of the BAM. Refer to the BAM Biodiversity Credit Report (**APPENDIX 2**) for further details.

6.6.2 Threatened Species

Impacts on the following threatened species will require offsets:

- Eastern pygmy-possum (*Cercartetus nanus*);
- Three-toed snake-tooth skink (*Coeranoscincus reticulatus*);
- Coxen's fig-parrot (*Cyclopsitta diophthalma coxeni*);
- Pale-headed snake (*Hoplocephalus bitorquatus*);
- Green-thighed frog (*Litoria brevipalmata*);
- Rough-shelled bush-nut (*Macadamia tetraphylla*)*;
- Slender marsdenia (*Marsdenia longiloba*);
- Southern Myotis (*Myotis macropus*);
- Southern pink underwing moth (*Phyllodes imperialis*) (southern subspecies);
- Common Planigale (*Planigale maculata*); and
- Mitchell's rainforest snail (*Thersites mitchellae*).

Impacts on assumed habitat for Hairy jointgrass (*Arthraxon hispidus*) are not required to be offset due to very low vegetation integrity scores (i.e. habitat condition). Refer to the BAM Biodiversity Credit Report (**APPENDIX 2**) for further details.

*It is considered that the proposed translocation of existing Rough-shelled bush-nut stems and propagation of a minimum 20-24 additional stems (refer **SECTION 5.2.2.2**) suitably addresses the offset requirement for this species.

7 BIODIVERSITY CREDIT REPORT

7.1 Ecosystem Credits

No ecosystem credits will be required to offset impacts of the proposed development on a highly degraded area of PCT 1302.

Refer to the BAM Biodiversity Credit Report (**APPENDIX 2**) for further details.

7.2 Species Credits

Threatened species requiring offset and the number of species credits required are provided below in **TABLE 8**. Refer to the BAM Biodiversity Credit Report (**APPENDIX 2**) for further details.

TABLE 8
SPECIES CREDIT SUMMARY

Species	Credits required
Eastern pygmy-possum (*Cercartetus nanus*)	4
Three-toed snake-tooth skink (*Coeranoscincus reticulatus*)	4
Coxen's fig-parrot (*Cyclopsitta diophthalma coxeni*)	5
Pale-headed snake (*Hoplocephalus bitorquatus*)	4
Green-thighed frog (*Litoria brevipalmata*)	3
Rough-shelled bush-nut (*Macadamia tetraphylla*)	8*
Slender marsdenia (*Marsdenia longiloba*)	4
Southern Myotis (*Myotis macropus*)	4
Southern pink underwing moth (*Phyllodes imperialis*) (southern subspecies)	4
Common planigale (*Planigale maculata*)	4
Mitchell's rainforest snail (*Thersites mitchellae*)	5

*It is considered that the proposed translocation of existing Rough-shelled bush-nut stems and propagation of a minimum of 20-24 additional stems (refer **SECTION 5.2.2.2**) suitably addresses the offset requirement for this species.

APPENDIX 1 – PLOT SURVEY DATA

Vegetation composition and structure data assessed within 20m x 20m plots

Plot No: 1 (Vegetation Zone 1)			PCT: 1302		Total number of native species: 13		
Scientific name	**Common name**	**Dominant species for each growth form (x)**	**Stratum/layer in which species occurs**	**Native (N), exotic (E) or high threat exotic (HTE)**	**Percentage foliage projective cover (%)**	**Abundance rating for species with cover <5% (stem count)**	**Notes (e.g. regen stems for trees present within veg zone)**
Tree (TG)				Total number of native trees: 6			
Cinnamomum camphora	Camphor laurel	x	All	HTE	72		Dominant and regenerating
Mallotus philippensis	Red kamala	x	All	N	28		
Jagera pseudorhus	Foambark		Ground	N		6	Regenerating stems
Guioa semiglauca	Guioa		Midstorey	N		1	
Macaranga tanarius	Macaranga		Midstorey	N		3	
Schefflera actinophylla	Umbrella tree		Midstorey	HTE		1	
Acacia melanoxylon	Blackwood wattle		Canopy/ground	N		2	
Schinus terebinthifolius	Broad-leaved pepper tree		Ground	HTE		1	
Shrub (SG)				Total number of native shrubs: 1			
Ochna serrulata	Mickey mouse plant	x	Midstorey/ground	HTE	65		
Lantana camara	Lantana		Midstorey	HTE	5		
Solanum mauritianum	Wild tobacco		Midstorey	E		5	
Citrus x taitensis	Rough lemon		Midstorey	E		3	
Maclura cochinchinensis	Cockspur thorn		Midstorey	N		2	
Psidium guajava	Common guava		Midstorey	E		1	
Solanum chrysotrichum	Giant devil's fig		Midstorey	E		4	
Grass and grass like (GG)				Total number of native grasses and grasslike: 1			
Paspalum mandiocanum	Broadleaf paspalum	x	Ground	HTE	15		
Pennisetum purpureum	Elephant grass		Ground	E	2		

Plot No: 1 (Vegetation Zone 1)			PCT: 1302		Total number of native species: 13		
Scientific name	**Common name**	**Dominant species for each growth form (x)**	**Stratum/layer in which species occurs**	**Native (N), exotic (E) or high threat exotic (HTE)**	**Percentage foliage projective cover (%)**	**Abundance rating for species with cover <5% (stem count)**	**Notes (e.g. regen stems for trees present within veg zone)**
Oplismenus imbecillis	Creeping beard grass		Ground	N		3	
Forb (FG)				Total number of native forbs: 0			
Cestrum nocturnum	Lady-of-the-night	x	Ground	E	12		
Sida rhombifolia	Paddy's Lucerne		Ground	E		1	
Triumfetta rhomboidea	Chinese burr	x	Ground	E	8		
Ambrosia artemisiifolia	Annual ragweed		Ground	E		15	
Oxalis sp.			Ground	E		4	
Gomphocarpus physocarpus	Balloon cotton bush		Ground	E		5	
Malvastrum americanum	Spiked malvastrum		Ground	E		8	
Fern (EG)				Total number of native ferns: 2			
Adiantum hispidulum	Rough maidenhair fern		Ground	N		2	
Cyclosorus interruptus		x	Ground	N		4	
Other (OG)				Total number of native other: 3			
Asparagus plumosus	Asparagus fern	x	Ground/midstorey	HTE	33		
Archontophoenix cunninghamiana	Bangalow palm		Midstorey	N		1	Palm and palm-like growth form
Vigna luteola	Dalrymple vigna		Ground	N		1	
Stephania japonica	Snake vine		Ground	N		1	
Passiflora subpeltata	White passionflower		Ground	E		1	

Plot No: 2 (Vegetation Zone 5a)			PCT: 1302		Total number of native species: 1		
Scientific name	**Common name**	**Dominant species for each growth form (x)**	**Stratum/layer in which species occurs**	**Native (N), exotic (E) or high threat exotic (HTE)**	**Percentage foliage projective cover (%)**	**Abundance rating for species with cover <5% (stem count)**	**Notes (e.g. regen stems for trees present within veg zone)**
Tree (TG)				Total number of native trees: 0			
Corymbia torelliana	Cadaghi	x	Canopy	HTE	3	1	Overhanging plot
Shrub (SG)				Total number of native shrubs: 0			
Lantana camara	Lantana	x	Midstorey	HTE	10		
Solanum chrysotrichum	Giant devil's fig	x	Midstorey	E	8		
Solanum mauritianum	Wild tobacco		Midstorey	E	3	10	
Grass and grass like (GG)				Total number of native grasses and grasslike: 1			
Chloris gayana	Rhodes grass		Ground	HTE	0.1		
Cyperus sp.			Ground	N	0.5	20	
Digitaria didactyla	Queensland blue couch		Ground	E	1		
Megathyrsus maximus	Guinea grass	x	Ground	HTE	65		
Sporobolus fertilis	Giant Parramatta grass		Ground	HTE	8		
Forb (FG)				Total number of native forbs: 0			
Ambrosia artemisiifolia	Annual ragweed	x	Ground	E	20		
Cirsium vulgare	Spear thistle	x	Ground	E	15		
Conyza sumatrensis	Tall fleabane		Ground	E	2	50	
Desmodium uncinatum	Silver-leaf desmodium		Ground	E	0.1	6	
Gomphocarpus physocarpus	Balloon cotton bush		Ground	E	2	20	
Lonicera sp.			Ground	E	0.1	1	
Oxalis sp.			Ground	E	0.5	20	

Plot No: 2 (Vegetation Zone 5a)			PCT: 1302		Total number of native species: 1		
Scientific name	**Common name**	**Dominant species for each growth form (x)**	**Stratum/layer in which species occurs**	**Native (N), exotic (E) or high threat exotic (HTE)**	**Percentage foliage projective cover (%)**	**Abundance rating for species with cover <5% (stem count)**	**Notes (e.g. regen stems for trees present within veg zone)**
Senecio madagascarensis	Fireweed		Ground	HTE	0.1	20	
Sida rhombifolia	Paddy's lucerne		Ground	E	0.5	15	
Triumfetta rhomboidea	Chinese burr	x	Ground	E	10		
Verbena sp.			Ground	E	0.1	3	
Fern (EG)				Total number of native ferns: 0			
Other (OG)				Total number of native other: 0			
Neonotonia wightii	Perennial soybean		Ground	E	3	40	

Plot No: 3 (Vegetation Zone 5b)			PCT: 1302		Total number of native species: 2		
Scientific name	**Common name**	**Dominant species for each growth form (x)**	**Stratum/layer in which species occurs**	**Native (N), exotic (E) or high threat exotic (HTE)**	**Percentage foliage projective cover (%)**	**Abundance rating for species with cover <5% (stem count)**	**Notes (e.g. regen stems for trees present within veg zone)**
Tree (TG)				Total number of native trees: 1			
Cinnamomum camphora	Camphor laurel	x	All	HTE	25		
Mallotus philippensis	Red kamala		Ground	N	0.1	3	Saplings
Shrub (SG)				Total number of native shrubs: 0			
Lantana camara	Lantana		Midstorey	HTE	0.2	1	
Ochna serrulata	Mickey mouse plant	x	Midstorey/ground	HTE	1	15	
Solanum mauritianum	Wild tobacco		Midstorey	E	0.5	20	
Tecoma capensis	Cape honeysuckle		Midstorey	E	0.5	1	
Grass and grass like (GG)				Total number of native grasses and grasslike: 0			
Chloris gayana	Rhodes grass		Ground	HTE	8		
Digitaria didactyla	Queensland blue couch		Ground	E	10		
Megathyrsus maximus	Guinea grass	x	Ground	HTE	40		
Setaria sphacelata	Setaria		Ground	E	0.2		
Sorghum halapense	Johnson grass		Ground	HTE	8		
Forb (FG)				Total number of native forbs: 0			
Bidens pilosa	Cobbler's pegs		Ground	HTE	0.1	5	
Cestrum nocturnum	Lady-of-the-night		Ground	E	0.1	1	
Cirsium vulgare	Spear thistle	x	Ground	E	2	20	
Crassocephalum crepidioides	Thickhead		Ground	E	0.1	10	
Gomphocarpus physocarpus	Balloon cotton bush		Ground	E	0.2	10	
Hypoestes phyllostachya	Polka dot plant		Ground	HTE	0.1	2	
Oxalis sp.			Ground	E	0.1	20	
Sida rhombifolia	Paddy's lucerne		Ground	E	0.5	15	
Solanum nigrum	Blackberry nightshade		Ground	E	0.5	15	

Plot No: 3 (Vegetation Zone 5b)			PCT: 1302		Total number of native species: 2		
Scientific name	**Common name**	**Dominant species for each growth form (x)**	**Stratum/layer in which species occurs**	**Native (N), exotic (E) or high threat exotic (HTE)**	**Percentage foliage projective cover (%)**	**Abundance rating for species with cover <5% (stem count)**	**Notes (e.g. regen stems for trees present within veg zone)**
Solanum seaforthianum			Ground	HTE	0.1	4	
Triumfetta rhomboidea	Chinese burr	x	Ground	E	2	25	
Verbena sp.			Ground	E	0.1	4	
Fern (EG)				Total number of native ferns: 0			
Other (OG)				Total number of native other: 1			
Asparagus plumosus	Asparagus fern	x	Ground/midstorey	HTE	6		
Bougainvillea sp.		x	Midstorey	E	7		
Derris involuta	Native derris		Midstorey	N	0.2	1	
Dolichandra unguis-cati	Cat's claw creeper	x	All	HTE	15		
Macroptilium atropurpureum	Siratro		Ground	E	0.5	10	
Neonotonia wightii	Perennial soybean		Ground	E	1	10	
Passiflora subpeltata	White passionflower		Ground	E	0.1	1	
Sansevieria trifasciata	Mother-in-law's tongue		Ground	E	1	15	

Vegetation function attributes assessed within 50m x 20m plots

Plot No.	**Number of large trees**	**Tree regeneration (Y/N)**	**Tree stem size diversity DBH (cm) <5, 5-9, 10-19, 20-29, 30-49, 50-79, 80+ (presence/absence)**	**Total length of fallen logs >10cm diameter (m)**	**Litter cover (5x1m^2 subplots along 50m transect) average percentage ground cover**	**High Threat Exotic vegetation cover (%)**	**Number of trees with hollows**
1	0	Yes	All classes under 50cm	40	91.6	90	0
2	0	No	No native trees	0	9	86.2	0
3	0	Yes	All classes under 30cm	12	44	103.5	1

APPENDIX 2 – BAM BIODIVERSITY CREDIT REPORT

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00012271/BAAS17014/19/00012272

Proposal Name
Altitude Aspire

BAM data last updated *
04/07/2019

Assessor Name
Matt Jenkins

Assessor Number
BAAS18029

BAM Data version *
12

Proponent Names

Report Created
05/07/2019

BAM Case Status
Open

Assessment Revision
1

Assessment Type
Part 4 Developments (Small Area)

Date Finalised
To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Nil

Species
Cyclopsitta diophthalma coxeni / Coxen's Fig-Parrot
Cyclopsitta diophthalma coxeni / Coxen's Fig-Parrot
Thersites mitchellae / Mitchell's Rainforest Snail
Thersites mitchellae / Mitchell's Rainforest Snail

BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Predicted Threatened Species Not On Site

No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
1302-White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	1.7	0.00

1302-White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion	**Like-for-like credit retirement options**			
	Name of offset trading group	Trading group	HBT	IBRA region
	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions This includes PCT's: 669, 670, 770, 845, 886, 887, 1068, 1201, 1275, 1302, 1525, 1527, 1528, 1529, 1533, 1534, 1535, 1541, 1545	-	Yes	Burringbar-Conondale Ranges, Scenic Rim and Sunshine Coast-Gold Coast Lowlands. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

1302-White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion

Species Credit Summary

Species	Area	Credits
Arthraxon hispidus / Hairy Jointgrass	1.2	0.00
Cercartetus nanus / Eastern Pygmy-possum	1.0	4.00
Coeranoscincus reticulatus / Three-toed Snake-tooth Skink	1.0	4.00
Cyclopsitta diophthalma coxeni / Coxen's Fig-Parrot	1.0	5.00
Hoplocephalus bitorquatus / Pale-headed Snake	1.0	4.00
Litoria brevipalmata / Green-thighed Frog	1.0	3.00
Macadamia tetraphylla / Rough-shelled Bush Nut	4.0	8.00
Marsdenia longiloba / Slender Marsdenia	1.0	4.00
Myotis macropus / Southern Myotis	1.0	4.00
Phyllodes imperialis southern subspecies / Southern Pink Underwing Moth	1.0	4.00
Planigale maculata / Common Planigale	1.0	4.00
Thersites mitchellae / Mitchell's Rainforest Snail	1.0	5.00

Arthraxon hispidus/ Hairy Jointgrass	1302_5a	**Like-for-like credit retirement options**	
		Spp	IBRA region

		Arthraxon hispidus/Hairy Jointgrass	Any in NSW
	1302_5b	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Arthraxon hispidus/Hairy Jointgrass	Any in NSW
Cercartetus nanus/ Eastern Pygmy-possum	1302_1	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Cercartetus nanus/Eastern Pygmy-possum	Any in NSW
	1302_5b	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Cercartetus nanus/Eastern Pygmy-possum	Any in NSW

Cercartetus nanus/ Eastern Pygmy-possum	1302_5b	
Coeranoscincus reticulatus/ Three-toed Snake-tooth Skink	1302_1	**Like-for-like credit retirement options**
		Spp / IBRA region
		Coeranoscincus reticulatus/Three-toed Snake-tooth Skink / Any in NSW
	1302_5b	**Like-for-like credit retirement options**
		Spp / IBRA region
		Coeranoscincus reticulatus/Three-toed Snake-tooth Skink / Any in NSW
Cyclopsitta diophthalma coxeni/ Coxen's Fig-Parrot	1302_1	**Like-for-like credit retirement options**
		Spp / IBRA region
		Cyclopsitta diophthalma coxeni/Coxen's Fig-Parrot / Any in NSW

Cyclopsitta diophthalma coxeni/ Coxen's Fig-Parrot	1302_5b	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Cyclopsitta diophthalma coxeni/Coxen's Fig-Parrot	Any in NSW
Hoplocephalus bitorquatus/ Pale-headed Snake	1302_1	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Hoplocephalus bitorquatus/Pale-headed Snake	Any in NSW
	1302_5b	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Hoplocephalus bitorquatus/Pale-headed Snake	Any in NSW
Litoria brevipalmata/ Green-thighed Frog	1302_1	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Litoria brevipalmata/Green-thighed Frog	Any in NSW

Litoria brevipalmata/ Green-thighed Frog	1302_1	
	1302_5b	**Like-for-like credit retirement options**
		Spp / IBRA region
		Litoria brevipalmata/Green-thighed Frog / Any in NSW
Macadamia tetraphylla/ Rough-shelled Bush Nut	1302_1	**Like-for-like credit retirement options**
		Spp / IBRA region
		Macadamia tetraphylla/Rough-shelled Bush Nut / Any in NSW
Marsdenia longiloba/ Slender Marsdenia	1302_1	**Like-for-like credit retirement options**
		Spp / IBRA region
		Marsdenia longiloba/Slender Marsdenia / Any in NSW
	1302_5b	**Like-for-like credit retirement options**

		Spp	IBRA region
		Marsdenia longiloba/Slender Marsdenia	Any in NSW
Myotis macropus/ Southern Myotis	1302_1	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Myotis macropus/Southern Myotis	Any in NSW
	1302_5b	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Myotis macropus/Southern Myotis	Any in NSW
Phyllodes imperialis southern subspecies/ Southern Pink Underwing Moth	1302_1	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Phyllodes imperialis southern subspecies/Southern Pink Underwing Moth	Any in NSW

Phyllodes imperialis southern subspecies/ Southern Pink Underwing Moth	1302_1		
	1302_5b	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Phyllodes imperialis southern subspecies/Southern Pink Underwing Moth	Any in NSW
Planigale maculata/ Common Planigale	1302_1	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Planigale maculata/Common Planigale	Any in NSW
	1302_5b	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Planigale maculata/Common Planigale	Any in NSW

Planigale maculata/ Common Planigale	1302_5b	
Thersites mitchellae/ Mitchell's Rainforest Snail	1302_1	**Like-for-like credit retirement options** Spp: IBRA region **Thersites mitchellae**/Mitchell's Rainforest Snail: Any in NSW
	1302_5b	**Like-for-like credit retirement options** Spp: IBRA region **Thersites mitchellae**/Mitchell's Rainforest Snail: Any in NSW

Attachment 2 – Correspondence from Brian Lees (Project Director - Meinhardt Urban PTY LTD) dated 10th July 2019

Meinhardt Urban PTY LTD
A.B.N. 29 064 159 191

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Our Ref: 09-374 GC:BL
Your Ref: DA09/0701.03

10 July 2019

The Manager
Newland Developers Pty Ltd
PO Box 417
ROBINA TC QLD 4230
Attn: Shaun Nicholson

Dear Sir,

Altitude Aspire MOD 3
TSC Ref: DA09/0701.03
Stormwater Management and ESCP

We refer to your email request dated 9th July 2019 to provide clarifications to JWA Environmental Consultants regarding the above.

Stormwater management within the Altitude Aspire development has been addressed in the previously approved Stormwater Management Plan prepared by Gilbert and Sutherland dated April 2013 and subsequently amended in the BIOME Report- Bioretention Basin and Drainage Reserve design Report Version 4 dated March 2019.
The Erosion and Sediment control in this area is subject to the submission of a Construction Certificate for Earthworks and is currently being documented. Conceptual ESC will be shown in this application.

The area contained within Altitude Central (the area west of proposed Townsend Crescent and Parkes Lane) is not covered by the Approved Stormwater Management Plan and is proposed to be Earthworks only with no proposed change of use at this stage. All exposed areas to the west of the Altitude Aspire boundary will be controlled and treated prior to adequate new grass cover being established. The Erosion and Sediment Control for this area will be subject to the submission of a Construction Certificate for Earthworks and is currently being documented. Conceptual ESC will be shown in this application. Operational Stormwater management will be the subject of any future Development Application for the Altitude Central area.

We trust this will provide the information required.

Yours faithfully
MEINHARDT

Brian Lees
Project Director

Abu Dhabi • Adelaide • Bahrain • Bangkok • Beijing • Brisbane • Chennai • Danang • Doha • Dubai • Gold Coast • Hanoi
Ho Chi Minh City • Hong Kong • Jakarta • Jeddah • Karachi • Kuala Lumpur • Kuwait • Lahore • London • Macau • Manila
Melbourne • Muscat • New Delhi • Riyadh • Shanghai • Shenzhen • Singapore • Sunshine Coast • Sydney • Tripoli

Attachment 3 – Revised MTTP (JWA 2019)

JWA PTY LTD
Ecological Consultants
ABN 56 066 448 879

REVISED
MACADAMIA TETRAPHYLLA
TRANSLOCATION PLAN

Altitude ASPIRE
TERRANORA, NSW

A Report Prepared for Newland Developers Pty Ltd

AS AMENDED
JULY 2019

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DOCUMENT CONTROL

Document

Title	*Macadamia tetraphylla* Translocation Plan
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Client	Newland Developers Pty Ltd

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Client Issue

Version	Date	Author		Approved by	
		Name	Initials	Name	Initials
RW1	06.06.18	Adam McArthur	AM	Adam McArthur	AM
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RW4	05.11.18	Nicole Davies	ND	Adam McArthur	AM
RW5	09.07.19	Adam McArthur	AM	Adam McArthur	AM
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TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background

JWA has been engaged by Newland Developers Pty Ltd to prepare a *Macadamia tetraphylla* Translocation Plan (MTTP) for the proposed subdivision of land at the southern end of Fraser Drive, Terranora referred to as 'Altitude Aspire'.

Under section 3A of the *Environmental Planning & Assessment Act 1979* (EPA Act 1979), a major projects application was lodged with the Department of Planning. Director General's Environmental Assessment Requirements (DGEARs) were issued dated 23rd November 2009 **(**MP 09_0166**).** A Vegetation Management and Rehabilitation Plan (VMRP) was prepared in response to relevant DGEARs (JWA 2015) and included a methodology for the translocation of a single stem of *Macadamia tetraphylla* from within the development footprint to a designated conservation area.

Works commenced on the site around January 2016. A Part 3A modification application has now been lodged (April 2018) and includes an increase in the extent of bulk earthworks into the adjoining Lot 1 DP 175234 (No. 93 Parkes Lane) to the immediate west of the subject site. The proposed works will impact on four (4) additional stems of *Macadamia tetraphylla.* It is therefore proposed to translocate these additional stems to the designated conservation area on the Altitude Aspire site.

This MTTP should be read in conjunction with the Revised VMRP (JWA 2018) which contains guidelines for the rehabilitation and management of the designated conservation areas on the Altitude Aspire site.

All relocation and subsequent maintenance works discussed in this MTTP are the responsibility of the proponent and should be completed by suitably qualified restoration professionals under the supervision of the site Environmental Officer.

1.2 Revision History

A Part 3A modification application was lodged in April 2018. The following submission from Tweed Shire Council (dated 11th May 2018) was received in relation to the proposed increase in the extent of bulk earthworks in Lot 1 DP 175234 No. 93 Parkes Lane:

> *One individual of a threatened flora species, Macadamia tetraphylla rough shelled bush nut is located within the footprint of the proposed expanded bulk earthworks area at the western edge of the development (see Annexure L, Ecological Assessment, Burchills August 2017). No map has been provided of the location of this individual, however the Modification Report states that removal of the rough shelled bush nut is required to enable bulk earthworks to be carried out and therefore it is proposed that it will be either translocated or offset onsite.*

The Ecological Assessment prepared for the land to the west (Altitude Central) recommends that the rough-shelled bush nut be translocated to a nearby protected area. No indication has been provided in the current application of how this matter is to be dealt with, and none of the plans submitted with the current application indicate the location of the plant. The existing approved Revised Vegetation Management and Rehabilitation Plan for Altitude Aspire contains a translocation protocol that is likely to provide appropriate direction.

In order to address the above impact, it is recommended that the proponent is requested to submit additional information addressing the above. It is suggested that relevant revised plans (e.g. West Boundary Earthworks Extent, Revised Engineering Plans Precinct 1) are submitted that:

i. identify the location of the rough-shelled bush nut, and

ii. are annotated to indicate the required management of the rough-shelled bush nut.

Suggested management is as follows:

i. Prior to the commencement of any works approved under Mod 3 at the western boundary, the rough-shelled bush nut is to be clearly identified and relocated in accordance with Sections 6.5, 6.6 and 6.7 of the Revised Vegetation Management and Rehabilitation Plan prepared by JWA Pty Ltd Ecological Consultants dated April 2013.

ii. Relocation and subsequent maintenance is the responsibility of the proponent and is to be carried out by a suitably qualified restoration professional under the supervision of the site Environmental Officer.

iii. The Revised Vegetation Management and Rehabilitation Plan April 2013 will require revision in order to incorporate the ongoing management requirement.

A *Macadamia tetraphylla* Translocation Plan (MTTP) (JWA 2018) was prepared in response to the above Tweed Shire Council request for further information. Subsequently, Tweed Shire Council again requested further information (dated 27th September 2018) in relation to a proposed increase in the extent of bulk earthworks in Lot 1 DP 175234 No. 93 Parkes Lane:

Macadamia tetraphylla Translocation Plan July 2018 requires revision in order to include the following:

- *Timing for translocation of plants is to be included in the plan, clear, and occur prior to any earthworks in the vicinity.*
- *Timing, responsibility and proposed source population for propagation of additional individuals. It is noted that the plan identifies that only a few local populations are known, and does not discuss the ability of*

these to withstand harvest for propagation. Appropriate licenses will be required for any such work.

- *Relocation and subsequent maintenance is the responsibility of the proponent and is to be carried out by a suitably qualified restoration professional under the supervision of the site Environmental Officer.*

A revised version of the MTTP (JWA 2018) was prepared to satisfy the above issues.

1.3 Current Version

Following preparation of the revised MTTP (JWA 2018), the NSW Office of Environment and Heritage (OEH) requested that a Biodiversity Development Assessment Report (BDAR) be prepared for the MOD 3 area in accordance with the requirements of the *Biodiversity Conservation Act 2016* (BC Act). It was determined that during the preparation of the BDAR that the loss of *Macadamia tetraphylla* from the impact site would generate an offset obligation of eight (8) species credits in accordance with the Biodiversity Offset Scheme (BOS).

Subsequent to the preparation and lodgement of the BDAR, Tweed Shire Council provided comments on the MOD 3 application to the NSW Department of Planning and Environment (dated 19th June 2019) which included:

> *Since Council's previous submission, and in response to submissions by OEH, the applicant has changed their proposed approach to assessment and mitigation of impact on Macadamia tetraphylla and now proposes to address this and other threatened species requirements under the Biodiversity Conservation Act. The revised documentation includes a Biodiversity Development Assessment Report (BDAR) (JWA December 2018).*
>
> *In relation to Macadamia tetraphylla, the BDAR concludes that 8 species credits are required to be purchased or retired as an offset for the removal of 4 individual plants. Translocation of these plants is no longer being proposed. The applicant has indicated an intention to satisfy the credit requirement through payment to the Biodiversity Conservation Trust.*
>
> *As a result of this approach, Council's previous comments on the above plans are no longer relevant at this time, as translocation is not being considered in the current proposal. The following comment is provided in relation to the new information contained in the BDAR and accompanying letter at Annexure G:*
>
> - *It is noted that OEH has already provided comment on the BDAR and identified a number of issues that need to be addressed in order for the BDAR to be considered adequate, including consideration of additional threatened species and vegetation communities.*
> - *We note that under Biodiversity Offsets Scheme the DPE is required to be satisfied that all attempts to avoid and minimise impacts on threatened species and communities have been explored prior to considering offset mechanisms.*

- *The BDAR does not adequately consider measures to avoid and mitigate impact on the Macadamia tetraphylla or other impacted species. The BDAR should be amended to do so.*
- *Translocation of the affected individual Macadamia tetraphylla may still be an appropriate approach to minimise impact on the threatened species, and provide a better biodiversity outcome, while also potentially meeting requirements to avoid and/or minimise impact.*

In response to the Tweed Shire Council provided comments above, Newland Developers no longer propose to satisfy the *Macadamia tetraphylla* offset credit obligations through payment to the Biodiversity Conservation Trust and have reverted to the original proposal to translocate the four (4) stems. This current version of the MTTP has been prepared to satisfy the above issues.

1.4 The Subject Site

A recent aerial photograph of subject site is shown in **FIGURE 1**. Large portions of the site have been developed in accordance with the Major Project approval **(**MP 09_0166). Revegetation works have commenced within the Conservation Area in the north-western portion of the site in accordance with the Revised VMRP (JWA 2018). The remainder of the site has historically been cleared of native vegetation and is comprised of grazing land and abandoned crops.

1.5 Aim of the MTTP

The aim of this MTTP is to provide guidelines for the translocation of four (4) *M. tetraphylla* plants into the Conservation Area on the Altitude Aspire site (i.e. Translocation receiving area). Contingency measures are also provided in the event that translocation is deemed infeasible or is unsuccessful.

LEGEND

Site Outline

N

0 50m 100m

1 : 4000

SOURCE: Google Earth July 2017 Aerial Photo

SCALE: 1 : 4000 @ A3

JWA PTY LTD
Ecological Consultants

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Newland Developers Pty Ltd

PROJECT
Macadamia tetraphylla Translocation Plan
Altitude Aspire
Fraser Drive, South Terranora, NSW
Shire of Tweed

FIGURE 1

PREPARED: BW
DATE: 18 July 2018
FILE: N09031_MTP_Aerial.cdr

TITLE

AERIAL PHOTOGRAPH

2 TRANSLOCATION OF *MACADAMIA TETRAPHYLLA*

2.1 Introduction

One (1) *M. tetraphylla* plant was recorded immediately adjacent to the Altitude Aspire development site in 2017 (Burchills 2017). A subsequent site visit by JWA Ecologists on the 20th June 2018 recorded four (4) *M. tetraphylla* plants in this location. The locations of these plants are shown in **FIGURE 2.**

These plants occur within the extent of the proposed bulk earthworks footprint of the Altitude Aspire development and will therefore require translocation. Translocation may be defined as the deliberate transfer of plants or regenerative plant material (Vallee *et al.* 2004). Translocation methods can include vegetative propagation (cuttings, layering and tissue culture), propagation via seedling germination, transplanting entire plants, the collection and spreading of soil, leaf litter and vegetation containing seeds (brush matting) (Vallee *et al.* 2004).

Management of *M. tetraphylla* will involve a combination of translocation actions, consisting of translocating the existing plants combined with the establishment of at least an additional 20-24 propagated plants (re-stocking) into suitable nearby habitat. Re-stocking refers to an attempt to increase population size or diversity by adding further individuals to an existing population. Upon completion of the translocation project, a total of at least twelve (12) individuals will be established in the translocation area.

Although there is no specific literature on the translocation of *M. tetraphylla*, anecdotal evidence suggests that the translocation of this species will likely be successful. The translocation of reproductively mature *M. integrifolia* (i.e. plantation Macadamias) is almost always successful (K. Wilson pers. com. June 2008).

Procedures for translocation outlined in this MTTP have been prepared in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee *et al*. 2004).

The following people have been consulted for information prior to and during the formulation of this plan:

- Trevor Franklin (Australian Plant Nurseries);
- Brett O'Donnovan (Terania Rainforest Nursery);
- Kim Wilson (Gray Plantation);
- Assoc. Prof. Caroline Cross (University of New England);
- Megan Thomas (Queensland Herbarium); and
- Dr Phil Pisanu (South Australian Dept. of Environment and Heritage).

SOURCE: JWA 2018; Burchills (Ref: Figure_5.1_Vegetation_Associations_Significant_Flora_Locations.pdf); B&P Surveys (Ref: 18779B-G.pdf); Gilbert & Sutherland (Ref: 10849_Bund Location_for_JWA_20130416.pdf)

SCALE: 1 : 4000 @ A3

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PROJECT
Macadamia tetraphylla Translocation Plan
Altitude Aspire
Fraser Drive, South Terranora, NSW
Shire of Tweed

FIGURE 2

PREPARED: BW
DATE: 18 July 2018
FILE: N09031_MTP_Maca.cdr

TITLE
***MACADAMIA TETRAPHYLLA* TRANSLOCATION**

2.2 Legislative Context

M. tetraphylla is currently listed as *Vulnerable* under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Vulnerable* within schedules of the NSW *Biodiversity Conservation Act 2016* (BC Act).

2.3 *Macadamia tetraphylla* Description

M. tetraphylla is one of seven (7) endemic *Macadamia* species in Australia (9 in the world). *M. tetraphylla* is a member of the Proteaceae family. Plants are small to medium-sized trees growing up to 18 m. The leaves are 10-25 cm long and narrowly oblong to oblanceolate. Leaves are in whorls of four (4), sometimes five (5), thick, stiff and hairless. The leaf margins are toothed and prickly. New growth is pinkish-red. The flowers are creamy-pink to purplish and hang in long strings. The fruit is a follicle, globose, 2-3 cm in diameter with 1-2 hard seeds (Harden 1991).

This species grows in subtropical rainforest from Rous near Lismore to Mt Tamborine and is uncommon in the wild (Williams *et al*. 1984; Floyd 1990).

2.4 Biological Assessment of *Macadamia tetraphylla*

2.4.1 Introduction

Little published literature exists on the biology, ecology and distribution of *M. tetraphylla.* The information in the following section is predominantly derived from Australian Herbaria records (AVH 2006) and personal communication with Botanists who are familiar with the species.

2.4.2 Distribution of the Taxon

The majority of records of *M. tetraphylla* are from locations situated in South-east Queensland and Northern NSW. There are eighty-three (83) records held in Herbaria in NSW, Canberra, Victoria and QLD (AVH 2006). Although, isolated occurrences of this species are recorded in remnant rainforest patches, the viability of these small populations is uncertain as little is known about the breeding system or the population size required to sustain *M. tetraphylla* (C. Gross pers. com. July 2008).

Specific information of *M. tetraphylla* populations is unavailable. However, the broad location and size of populations used in research by Dr Pisanu (2001) is as follows:

- Populations with 10-20 adults plants are located in:
    - Lennox Head State Environmental Planning Policy (SEPP) Wetlands;
    - Mullumbimby Creek;
    - Terranora Lakes.
- Populations with greater than 10 adult plants are located in:
    - Amber Drive Lennox Head;

  - Mooball.
- Populations with less than 10 adults are located in:
  - Minyon Falls (FR);
  - Inner Pocket (NR);
  - Limpinwood (NR).

2.4.3 Taxonomic Assessment

Within Australia there are seven (7) species of Macadamia: *M. tetraphylla; M. integrifolia; M. jansenii; M. whelanii; M. grandis and M. claudiensis.* All of these are endemic in eastern Australia. Outside Australia, one (1) species, *M. hildebrandii* is endemic in Sulawesi, Indonesia (Gross 1996).

2.4.4 Propagation Potential

Plants for use in the Macadamia Nut industry are readily propagated from cuttings suggesting this may be possible with *M. tetraphylla*.

M. tetraphylla is self-compatible but does require an insect pollinator. However, seed set is significantly higher after cross-pollination compared to self-pollination (Pisanu 2001). Seeds of *M. tetraphylla* are easily germinated and grown but there is a higher success rate with seed harvested from larger populations compared to smaller populations. This indicates that small populations of *M. tetraphylla* may be affected by inbreeding depression (Pisanu 2001).

2.4.5 Known Habitat and Co-occurring Flora

M. tetraphylla is primarily found on soils derived from the Tweed volcano and its associated lava flows but is also sometimes found on sedimentary deposits along creek lines and on flood plains (Pisanu 2001).

M. tetraphylla grows in subtropical rainforest. Floyd (1990) divides Subtropical rainforest into Warm-subtropical rainforest, Cool-subtropical rainforest and Littoral rainforest and defines floristic alliances within these categories. *M. tetraphylla* occurs in the *Argyrodendron trifoliolatum* Alliance within warm-subtropical rainforest and the *Cupaniopsis anacardioides - Acmena* spp. Alliance within littoral rainforest. Additionally, there is one record for *M. tetraphylla* in dry rainforest in the *Drypetes australasica - Araucaria* Alliance.

2.4.6 Disease Susceptibility and Threatened Processes

No information exists on the susceptibility of *M. tetraphylla* to any particular diseases. However, possible threatening processes to *M. tetraphylla* populations have been identified by DECC (2005). These include:

- Clearing and fragmentation of habitat for coastal development, agriculture and roadworks;

- Risk of local extinction due to low numbers;
- Grazing and trampling by domestic stock;
- Fire;
- Invasion of habitat by weeds; and
- Loss of local genetic strains through hybridisation with commercial varieties.

2.5 Pre-translocation Feasibility Assessment

Prior to translocation of the four (4) *M. tetraphylla* plants an inspection and assessment of the feasibility of the translocation success of each plant will be completed by a qualified and experienced horticulturalist with minimum qualifications in Certificate III in Horticulture, Conservation and Land Management (CaLM) or equivalent experience. A suitably qualified Arborist (minimum AQF Level 5) may also need be consulted on the health, form and structure of the trees.

The feasibility assessment will consider the following in determining the likely long-term success of the translocation process:

- General health, form and structure of the tree

  Conditions of the trees to be translocated including health, form and structure may affect the success of the proposed translocation. As a general rule, trees with poor form/architecture, health or structure should not be considered for translocation under normal circumstances. Preparing a tree for translocation can remove a large portion of the absorbing roots and trees may suffer substantial stress and shock during translocation. A translocated tree should be able to re-establish sufficient roots to sustain itself. If the tree has poor health, the likelihood of survival and recovery will be low.

- Size of root ball / quality of root system

  Larger trees need a bigger root ball to encompass more roots to ensure adequate re-growth, as well as anchorage and stability. Translocation may not be recommended in situations where a reasonable root ball size cannot be achieved. The Structural Root Zone (SRZ) of each tree should be calculated by the Arborist in accordance with Australian Standard AS 4970-2009 Protection of Trees on Development Sites. Translocation of trees where incursion into the SRZ is not recommended. Trees growing on slopes, retaining walls or areas where formation of a root ball of reasonable size is not practicable may not be suitable for transplanting.

- Access to the existing and proposed translocation sites and transportation

  All factors including access to existing and proposed translocation receiving site, maneuvering spaces and transportation to the translocation receiving site (including availability of access to accommodate the tree, topography of proposed route, engineering limitation, etc.) and other site constraints should be considered. Accessibility of the site should consider the movement and set up of the transplanting equipment and the maneuverability of the operation machinery

and vehicles. It is not recommended to significantly prune trees to fit in transport vehicles.

- Size of trees

The size of trees that can be relocated is limited by logistical practicability and resource availability. Furthermore, as a general rule, translocation of smaller trees is likely to be more successful than larger trees of the same species. The logistical requirements and hence associated costs also increase substantially with the plant size.

In the event that translocation of one or more of the *M. tetraphylla* is deemed to have a low chance of success (i.e. ≤50%) by either the horticulturalist or the arborist the plants will not be translocated and additional contingency plantings will be completed instead (refer **Section 2.7**)**.**

2.6 Translocation Area Preparation

A proposed Translocation receiving area is shown in **FIGURE 2.** The exact site of translocation will be chosen at the time of site preparation works. The translocation receiving area will be marked accurately on a map and *in situ* with survey pegs. This area will also be indicated by restricted entry signage outlining the project.

Exclusion fencing will also surround the translocation receiving site and will consist of 1.2m star pickets at 4m intervals with four (4) strands of galvanized fencing wire.

The translocation receiving area will be subject to revegetation which will include indigenous species typical of a Lowland Rainforest in accordance with the Revised VMRP (JWA 2018).

The translocation will be undertaken during favourable site conditions (i.e. morning and afternoon and not during windy conditions) to ensure transpiration rates are minimal.

If soil moisture levels are too low and the ground is too hard where the plants for translocation are growing, the plant may need to be watered several times 1-2 days prior to the actual translocation to lessen the risk of stress or plant mortality during the process.

In general, time in transit will be minimal and the plant will be adequately secured during transit. To minimise transpiration and the root ball drying during transit, the plant will be lightly pruned and wrapped in wet Hessian prior to movement.

2.7 Planting

The translocation holes will be prepared and ready prior to removing the *M. tetraphylla* plants. The holes will be prepared with water and a small amount of sandy loam to promote root growth following translocation.

Planting will give attention to the following (Vallee *et al*. 2004):

- The spatial arrangement and location of the plantings should reflect the capability of *M. tetraphylla* reaching 18 m in height;
- Facilitate cross-pollination via small insects;
- Positioning plants in relation to other vegetation (plants will be planted in close proximity to existing vegetation for shading and protection where possible);
- Positioning plants in relation to other factors (e.g. edge effects) – plants will not be planted in close proximity to the community edge, roads or tracks; and
- Backfilling soil around transplant, firming down and leaving slight depression to facilitate watering.

Little research has been completed on the breeding system or population biology of *M. tetraphylla* with the exception of Pisanu (2001). Pisanu selected experimental populations of three (3) size classes >20, 10-20 and <20 adult plants in areas of >50ha, 10-50ha and <10ha indicating the *M. tetraphylla* is found in varying densities. The translocation receiving area covers approximately 5,000 m^2 indicating that the area is suitable to accommodate the existing stem of *M. tetraphylla* and an additional 20-24 plants.

2.8 Contingency Plantings

An additional 20-24 plants will be produced from cuttings and/or seed taken from the plants to be translocated (if available) or a population in close proximity to the Subject Site. At least double this amount will be propagated to cover additional contingency plantings, at a ratio of 5:1, in the event that translocation of one or more of the *M. tetraphylla* is deemed to be infeasible (refer **Section 2.5.1)**.

An appropriately licensed bush regeneration firm must complete these works. Whenever possible, seed will be removed directly from plants by shaking or cutting branches over a tarpaulin. Secateurs will be sterilised between each use. To ensure local populations can withstand this harvesting, the amount of seed collected will not exceed 5% per plant.

If suitable material cannot be sourced from the plants to be translocated, or from nearby populations, plants may be sourced from nurseries that can prove local provenance.

The propagation and planting of additional plants is to ensure there is a net increase of the local population and in the event that that translocation of one or more of the *M. tetraphylla* is deemed to be infeasible. Additionally, there will be replacement plants available in case of mortality.

When the additional plants are of a suitable age to plant in the translocation receiving area, they will also be planted in accordance with the methodology discussed above.

Additional plants will also be identified with permanent tags to allow them to be distinguishable from the translocated plant.

2.9 Timing

The pre-translocation assessment and the translocation of the plants must occur prior to any earthworks within the vicinity of the plants to be translocated.

The sourcing of seed and propagation of additional plants (if possible) should occur during the fruiting period (i.e. between January and April). Alternatively, the ordering of plants (nurseries that can prove local provenance) should occur as early as possible so that additional plants can be added to the planting area at the time of translocation or as soon as possible thereafter.

2.10 Post Translocation Performance Criteria

2.10.1 Background

The objective of the management program for *M. tetraphylla* is to ensure the short and long-term persistence of a viable population of the species within the translocation receiving area.

The performance criteria for the success and management of *M. tetraphylla* at the Altitude Aspire site are the successful translocation of the *M. tetraphylla* plants into the translocation receiving area. Where translocation of one or more of the *M. tetraphylla* is deemed to be infeasible, contingency plantings must be completed at a ratio of 5:1.

Additional habitat performance indicators were identified within the Revised VMRP (JWA 2018) and will continue to be monitored and maintained in accordance with that document.

2.10.2 Short Term Performance Indicators

Indicators which demonstrate short-term performance of the translocated *M. tetraphylla* include:

- Translocated plants (and/or contingency plantings) persist within the translocation receiving area and increases in biomass; and
- Translocated plants (and/or contingency plantings) are able to produce reproductive structures.

2.10.3 Long-term Performance Indicators

Indicators which demonstrate long-term performance of the translocated *M. tetraphylla* include:

- Survival of translocated plants, or greater than 70% of the additional planted *M. tetraphylla* individuals are surviving; and
- The population is capable of producing flowers and fruit and is likely to survive in the long term (i.e. the flowering of the replanted individuals is consistent with levels of the naturally occurring similar communities in the locality).

3 MONITORING & REPORTING

A well-designed restoration monitoring program will allow project managers to detect results months, years, or decades following implementation of a plan. Monitoring data can be used by project managers to demonstrate the ability of the project to meet stated goals and objectives.

The Revised VMRP (JWA 2018) outlines the monitoring program required within the the Conservation Area on the Altitude Aspire site, which includes the Translocation receiving area. Specific Performance Targets for the regeneration and revegetation of the Conservation Area are provided within the Revised VMRP (JWA 2018). The *M. tetraphylla* plants to be translocated as part of this plan, and additional *M. tetraphylla* plantings proposed, have been added to the monitoring program detailed in the Revised VMRP (JWA 2018).

The monitoring is to be completed by a qualified ecologist. Site visits should occur:

- Six (6) weeks after translocation and initial plant-out;
- Every three (3) months thereafter until plants are sufficiently established (between two (2) - three (3) years); and
- Every six (6) months until the project is completed (estimated 5 years).

In accordance with the requirements of the Revised VMRP (JWA 2018), following each inspection by the qualified ecologist, a report will be prepared that will include tables and photographs from the monitoring visits. The report will discuss the following:

- Works undertaken;
- Progress of regeneration/revegetation areas against performance targets using photos and tables showing the results of the monitoring visits;
- Significant problems encountered (death of seedlings, broken fences, vandalism etc.) and the effect of these on the plantings and aims of the revegetation or regeneration strategy;
- Success or failures of measures implemented to rectify previously identified problems; and
- Measures to be taken to rectify new problems.

All monitoring reports are to be forwarded to Council on an annual basis.

A Final Monitoring Report will be completed at the end of the five (5) year program. The Final report will determine if the Performance Targets of the Revised VMRP (JWA 2018) and this MTTP have been met. If the performance targets have not been met, recommendations will be made for corrective actions and/or additional monitoring.

REFERENCES

AVH (2006) Australia's Virtual Herbarium, [map output]. via Centre for Plant Biodiversity Research, Council of Heads of Australia Herbaria, viewed 30th June 2008, http://www.rbg.vic.gov.au/cgi-bin/avhpublic/avh.cgi?session=121479689627883

DEC (2005) Threatened species, populations and ecological communities of NSW. NSW Department of Environment and Climate Change, viewed 30th June 2008 http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10499

Floyd, A. G. (1990) Australia Rainforest in New South Wales. Volume 2. NSW National Parks and Wildlife Service. Surrey Beatty and Sons.

Gross, C.L. (1996) Macadamia In: Flora of Australia. Volume 17 pp 419 – 425

Harden, G. J. 1991 (ed) Flora of NSW Volume 2. New South Wales University Press.

JWA (2018) Revised Vegetation Management & Rehabilitation Plan, Altitude Aspire Terranora, NSW. A Report Prepared for Newland Developers Pty Ltd.

Pisanu, P (2001) Survivorship of the Threatened Subtropical Rainforest Tree Macadamia Tetraphylla L. Johnson (Proteaceae) in Small habitat Fragments.

Vallee, L., Hogbin, T., Monks, L., Makinson., B., Matthes, M. and Rossetto, M. (2004) Guidelines for the Translocation of Threatened Plants in Australia, Second Edition, Australian Network for Plant Conservation, Canberra.