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MACADAMIA TETRAPHYLLA TRANSLOCATION PLAN

Altitude ASPIRE
TERRANORA, NSW

A Report Prepared for Newland Developers Pty Ltd

JULY 2018

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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.

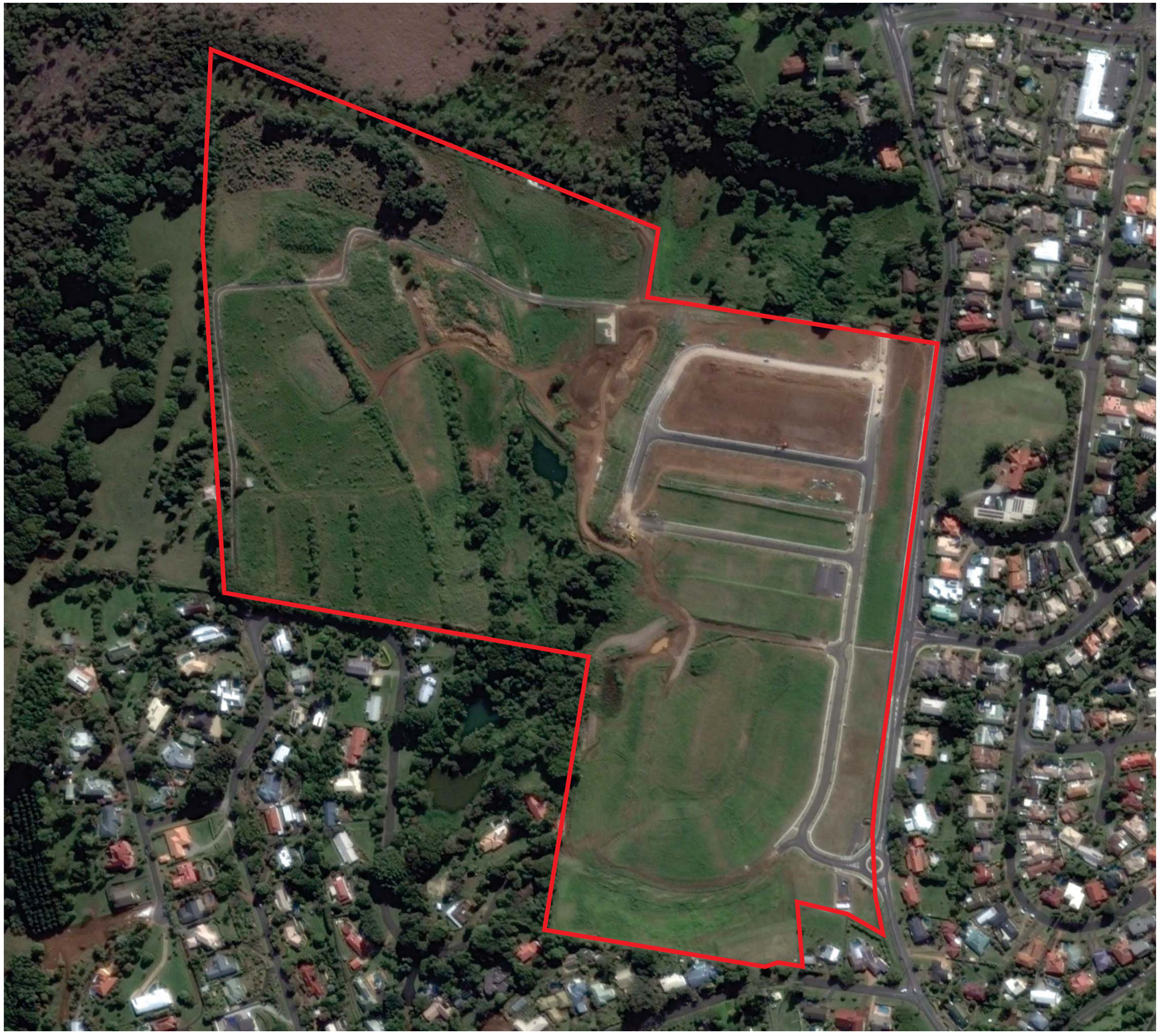
This MTTP should be read in conjunction with the approved VMRP (JWA 2015).

1.2 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 approved VMRP (JWA 2015). The remainder of the site has historically been cleared of native vegetation and is comprised of grazing land and abandoned crops.

1.3 Aim of the MTTP

The aim of this MTTP is provide guidelines for the translocation of four (4) *M. tetraphylla* plants into the Conservation Area on the Altitude Aspire site.



LEGEND

Site Outline

N

0 50m 100m

1 : 4000

SOURCE: Google Earth July 2017 Aerial Photo

SCALE: 1 : 4000 @ A3

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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 (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).

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 be successful. The translocation of reproductively mature *M. integrifolia* (i.e. plantation Macadamias) is almost always successful (K. Wilson pers. com. June 2008).

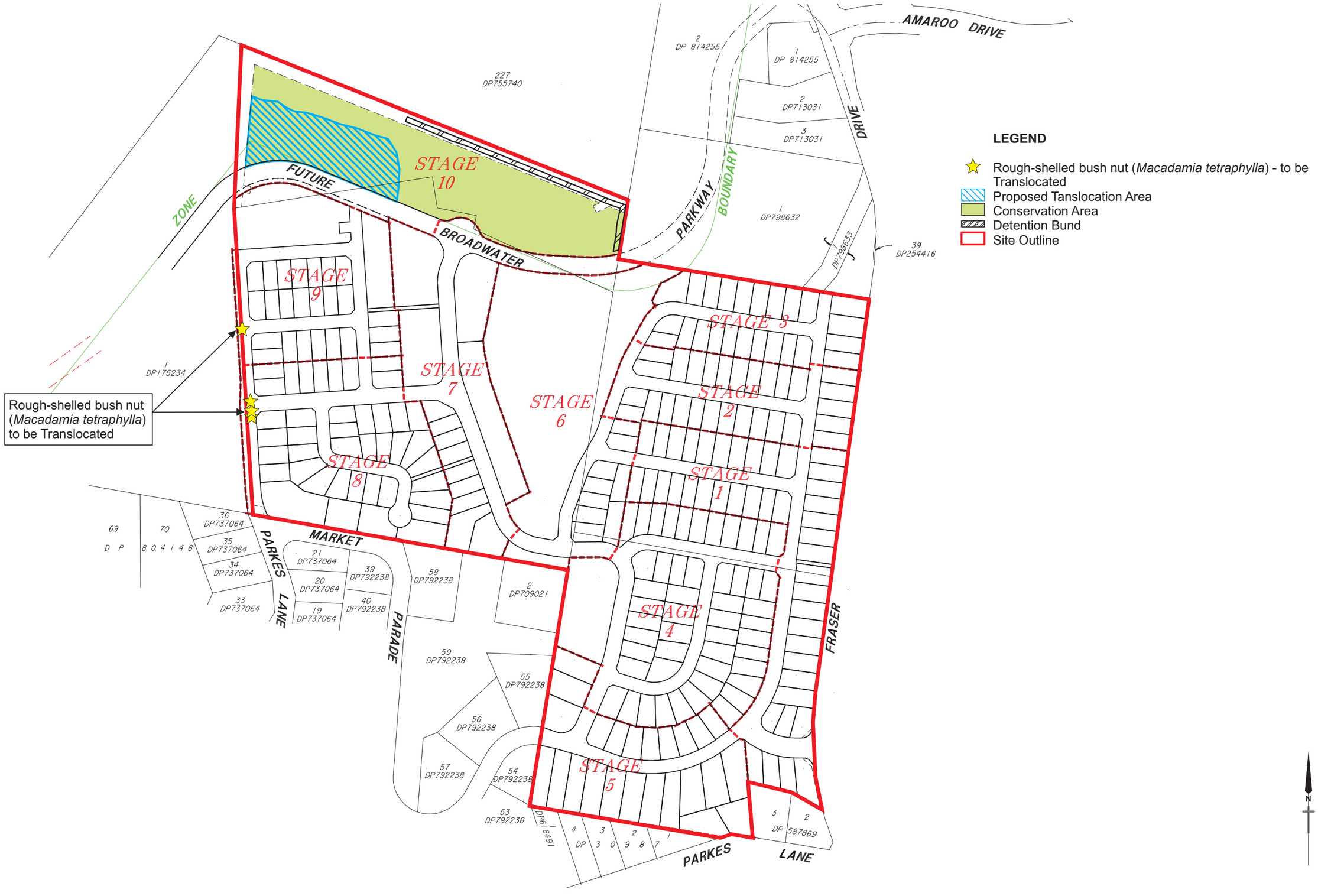
The guidelines for translocation have been prepared in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee *et al*. 2004).

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).

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).



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**

2.3 *Macadamia tetraphylla* Description

M. tetraphylla is one of seven (7) endemic *Macadamia* species (9 in the world) in Australia. *M. tetraphylla* is a member of the Proteaceae family. Plants are small to medium-sized trees growing up to 18m. The leaves are 10-25 cm long and narrowly oblong to oblanceolate. Leaves are in whorls of 4, sometimes 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 Assessment

A proposed Translocation area is shown in **FIGURE 2.** The exact site of translocation will be chosen at the time of site preparation works. The translocation 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 site and will consist of 1.2m star pickets at 4m intervals with four (4) strands of galvanized fencing wire.

The translocation area will be subject to revegetation which will include indigenous species typical of a Lowland Rainforest in accordance with the approved VRMP (JWA 2015).

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.

2.6 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 18m 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 on >50ha, 10-50ha and <10ha indicating the *M. tetraphylla* is found in varying densities. The translocation 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.

The additional 20-24 plants will be produced from cuttings and/or seed taken from a population in close proximity to the Subject Site. At least double this amount will be propagated.

The propagation and planting of additional plants is to ensure there is a net increase of the local population. Additionally, there will be replacement plants available in case of mortality.

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

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

2.7 Post Translocation Management and Monitoring

2.7.1 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 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 area.

Additional habitat performance indicators were identified within the approved VRMP (JWA 2015) and will continue to be monitored and maintained in accordance with that document.

2.7.2 Short Term Performance Indicators

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

- Translocated plants persist within the translocation area and increases in biomass; and
- Translocated plants are able to produce reproductive structures.

2.7.3 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 approved VRMP (2015) outlined the monitoring programs required within the following areas of the Altitude Aspire site:

- Natural Regeneration Areas;
- Revegetation Areas; and
- Freshwater Wetland EEC and SEPP 14 wetland.

Specific Performance Targets for the translocated *M. tetraphylla* and the regeneration and revegetation of the Conservation Area were provided within the approved VRMP (JWA 2015). The *M. tertraphylla* plants to be translocated as part of this plan, and additional *M. tetraphylla* plantings proposed, should be added to the monitoring program detailed in the approved VRMP (JWA 2015).

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 approved VRMP (JWA 2015), 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 VRMP (JWA 2015)

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.

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