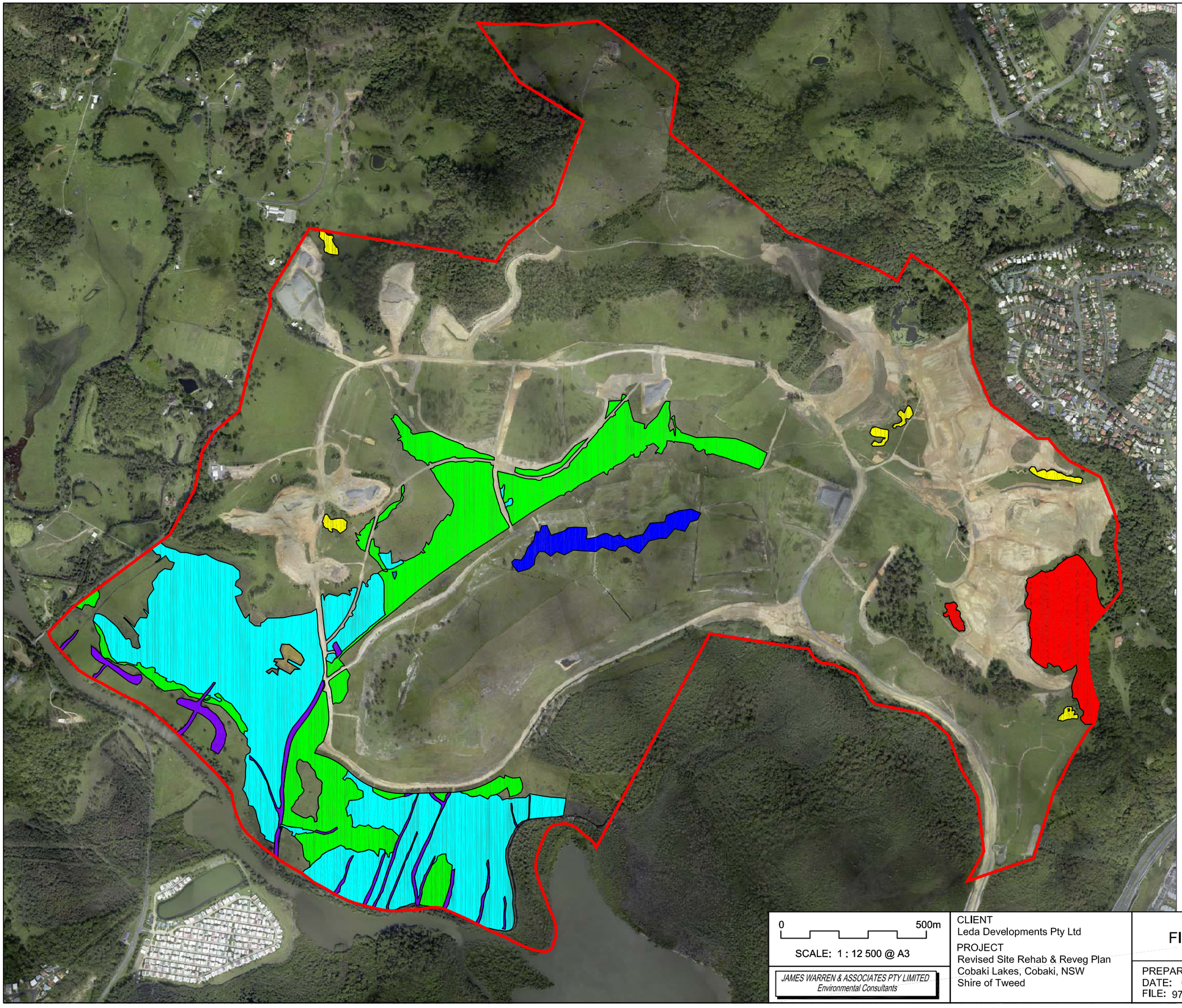

SOURCE:
EEC's - James Warren & Associates Pty Ltd
Aerial - Michel Group Services (Ref: 6400-197.dwg)
- photo taken March 2010

0 500m

SCALE: 1 : 12 500 @ A3

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PROJECT
Revised Site Rehab & Reveg Plan
Cobaki Lakes, Cobaki, NSW
Shire of Tweed

FIGURE 7

PREPARED: BW
DATE: 06 October 2010
FILE: 97038_SRRP_base.dwg

TITLE

ENDANGERED ECOLOGICAL COMMUNITIES

N

LEGEND

- Marblewood (*Acacia bakeri*)
- Fine-leaved tuckeroo (*Lepiderema pulchella*)
- Spiny gardenia (*Randia moorei*)
- Yiel yiel (*Grevillea hilliana*)
- Coolamon (*Syzygium moorei*)
- Brush cassia (*Cassia brewsteri* var. *marksiana*)
- Scented acronychia (*Acronychia littoralis*)
- Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*)
- Proposed Development Areas
- Site Outline

SOURCE:
Flora - James Warren & Associates Pty Ltd
June/July 2004, July 2006, July/Sept 2007 & Feb 2008
Impact Area - Design Forum Architects
(Ref: DA 01.01 E Master Plan.dwg)
Aerial - Michel Group Services (Ref: 6400-197.dwg)
- photo taken March 2010

0 500m

SCALE: 1 : 12 500 @ A3

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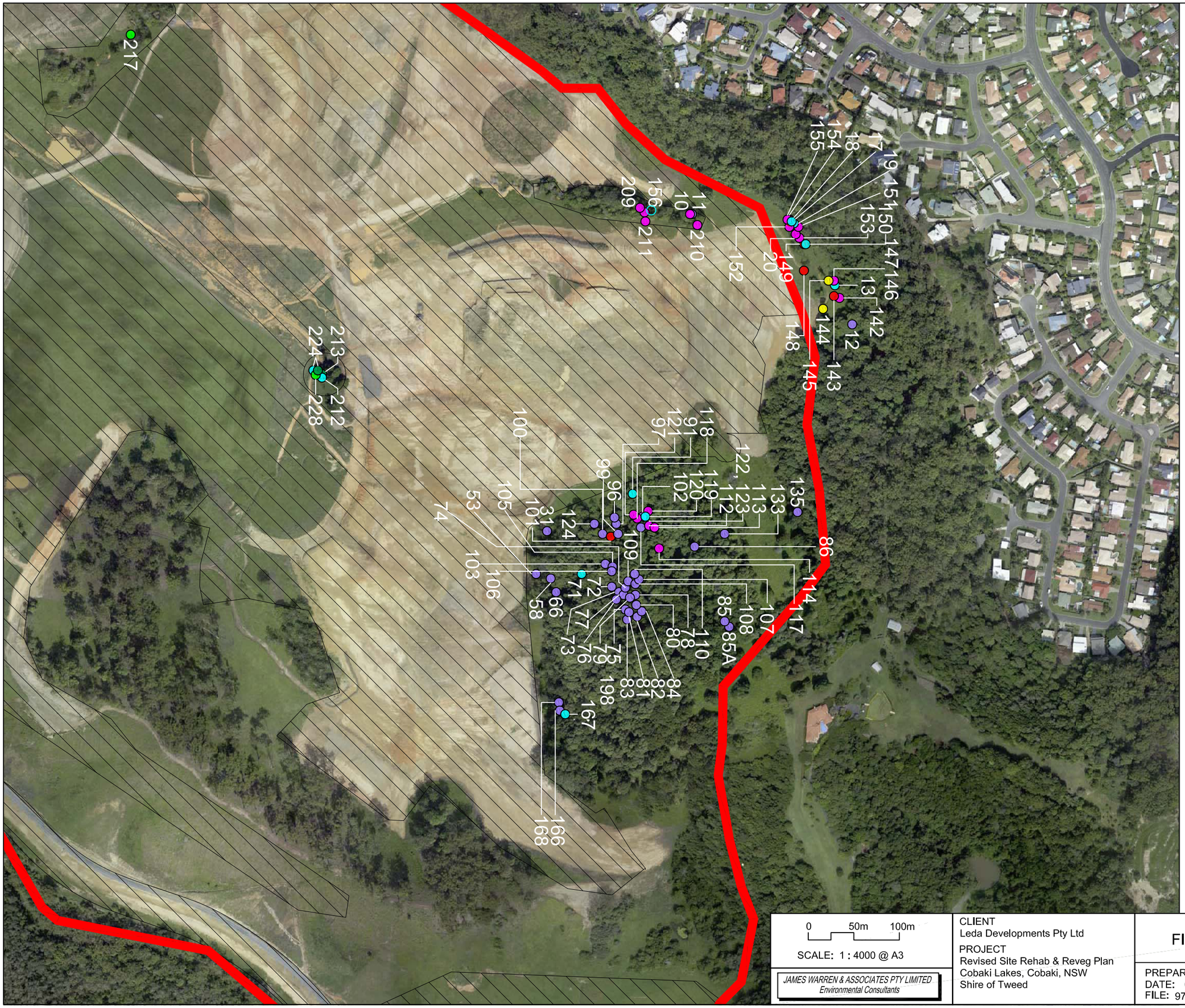
Cobaki Lakes, Cobaki, NSW
Shire of Tweed

FIGURE 8

PREPARED: BW
DATE: 05 April 2013
FILE: 97038_SRRP_base.dwg

TITLE

LOCATION OF THREATENED FLORA



SOURCE:
Flora - James Warren & Associates Pty Ltd
June/July 2004, July 2006, July/Sept 2007 & Feb 2008
Impact Area - Design Forum Architects
(Ref: DA 01.01 E Master Plan.dwg)
Aerial - Michel Group Services (Ref: 6400-197.dwg)
- photo taken March 2010

0 50m 100m

SCALE: 1 : 4000 @ A3

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PROJECT
Revised Site Rehab & Reveg Plan
Cobaki Lakes, Cobaki, NSW
Shire of Tweed

FIGURE 8A

PREPARED: BW
DATE: 05 April 2013
FILE: 97038_SRRP_base.dwg

TITLE

LOCATION OF THREATENED FLORA

N

LEGEND

- Marblewood (*Acacia bakeri*)
- Fine-leaved tuckeroo (*Lepiderema pulchella*)
- Spiny gardenia (*Randia moorei*)
- Yiel yiel (*Grevillea hilliana*)
- Coolamon (*Syzygium moorei*)
- Brush cassia (*Cassia brewsteri* var. *marksiana*)
- Scented acronychia (*Acronychia littoralis*)
- Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*)
- Proposed Development Areas
- Site Outline

SOURCE:
Flora - James Warren & Associates Pty Ltd
June/July 2004, July 2006, July/Sept 2007 & Feb 2008
Impact Area - Design Forum Architects
(Ref: DA 01.01 E Master Plan.dwg)
Aerial - Michel Group Services (Ref: 6400-197.dwg)
- photo taken March 2010

0 50m 100m

SCALE: 1 : 4000 @ A3

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PROJECT
Revised Site Rehab & Reveg Plan
Cobaki Lakes, Cobaki, NSW
Shire of Tweed

FIGURE 8B

PREPARED: BW
DATE: 05 April 2013
FILE: 97038_SRRP_base.dwg

TITLE

LOCATION OF THREATENED FLORA

N

LEGEND

- Marblewood (*Acacia bakeri*)
- Fine-leaved tuckeroo (*Lepiderema pulchella*)
- Spiny gardenia (*Randia moorei*)
- Yiel yiel (*Grevillea hilliana*)
- Coolamon (*Syzygium moorei*)
- Brush cassia (*Cassia brewsteri* var. *marksiana*)
- Scented acronychia (*Acronychia littoralis*)
- Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*)
- Proposed Development Areas
- Site Outline

SOURCE:
Flora - James Warren & Associates Pty Ltd
June/July 2004, July 2006, July/Sept 2007 & Feb 2008
Impact Area - Design Forum Architects
(Ref: DA 01.01 E Master Plan.dwg)
Aerial - Michel Group Services (Ref: 6400-197.dwg)
- photo taken March 2010

0 50m 100m

SCALE: 1 : 4000 @ A3

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Environmental Consultants

CLIENT
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PROJECT
Revised Site Rehab & Reveg Plan
Cobaki Lakes, Cobaki, NSW
Shire of Tweed

FIGURE 8C

PREPARED: BW
DATE: 05 April 2013
FILE: 97038_SRRP_base.dwg

TITLE

LOCATION OF THREATENED FLORA

4 SUPPORTING INFORMATION

4.1 Introduction

JWA have completed various vegetation assessments at the Subject site and have also reviewed literature relevant to revegetation and regeneration activities. Supporting documents are provided in annexures to this plan (**ANNEXURES 1 - 7**) and provide information utilised in preparation of regeneration and revegetation strategies for each management precinct on the Subject site. A brief description of each supporting document is provided below.

4.2 Threatened species profiles

4.2.1 Introduction

The NSW *Threatened Species Conservation (TSC) Act 1995* identifies and protects native plants and animals in danger of becoming extinct. In NSW flora and fauna species listed under Schedule 1 & 2 of the *Threatened Species Conservation Act 1995* are considered to be Threatened species.

The purpose of the TSC Act is to:

- conserve biological diversity and promote ecologically sustainable development;
- prevent the extinction and promote the recovery of threatened species, populations and ecological communities;
- protect the critical habitat of those species, populations and ecological communities that are endangered;
- eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities;
- ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed; and
- encourage the conservation of threatened species, populations and ecological communities through co-operative management.

The Act divides the listed threatened species in to endangered or vulnerable.

Schedule 1 of the TSC Act lists threatened species, populations and ecological communities and species that are endangered or presumed extinct. Schedule 2 lists vulnerable species.

- The TSC Act defines 'endangered' as a species, population or ecological community that is likely to become extinct or is in immediate danger of extinction.
- A 'vulnerable' species is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

4.2.2 Rationale

Eight (8) Threatened flora species have been recorded from the Subject site:

- White yiel yiel (*Grevillea hilliana)* - Endangered (TSC Act 1995);
- Scented acronychia (*Acronychia littoralis)* - Endangered (TSC Act 1995 & EPBC Act 1999);
- Fine leaved tuckeroo (*Lepiderema pulchella)* - Vulnerable (TSC Act 1995,
- Spiny gardenia (*Randia moorei*) - Endangered (TSC Act 1995 & EPBC Act 1999);
- Marblewood (*Acacia bakeri*) - Vulnerable (TSC Act 1995);
- Brush cassia (*Cassia brewsteri* var. *marksiana)* - Endangered (TSC Act 1995);
- Coolamon (*Syzygium moorei*) - Vulnerable (TSC Act 1995, EPBCA 1999); and
- Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*) -Endangered (TSC Act 1995).

For each of the threatened species listed under the TSC Act, the Office of Environment & Heritage (OEH) has developed a species profile, designed to educate the public on the importance of conserving the listed threatened species.

4.2.3 Summary

ANNEXURE 1 contains detailed Threatened species profiles for all Threatened flora species recorded from the Subject site including a botanical description, a discussion of the distribution, habitat and ecology of each species, identification of threats to the species and a discussion of recovery actions (NWPS 2002).

4.3 Ecological Restoration Principles

4.3.1 Introduction

Ecological restoration aims to restore pre-existing indigenous ecosystems and ecological processes on disturbed sites, while maintaining and developing the natural ecosystem ability to self-perpetuate.

4.3.2 Rationale

These ecological restoration principles are the underlying principles behind the overall direction of this regeneration & revegetation plan. The ecological restoration principles aim to restore the vegetation communities to the highest practical extent using natural and assisted revegetation to develop a system that is sustainable in the long term.

4.3.3 Summary

A review of Ecological Restoration Principles has been completed and is included as **ANNEXURE 2.** This assessment forms the basis of restoration principles and approaches

considered in the preparation of each revegetation and restoration plan.

4.4 Revegetation and Regeneration Approach

4.4.1 Introduction

The revegetation and regeneration approach involves a variety of different methods that have been suggested on a precinct specific basis. The overall methods to be implemented in the rehabilitation of the Subject site are outlined in **ANNEXURE 3**.

This SRRP provides for a combination of regeneration & revegetation techniques. These techniques in combination will ensure restoration of degraded areas and offsets for any vegetation removal, with a particular focus on offsetting the removal of degraded EECs. It is noted that the offsets proposed in this SRRP will not adequately address the necessary offset and as such, the balance of the required offsets will be provided offsite. However, the location of these off-site offsets is still being negotiated and management of these areas will therefore be detailed in subsequent reports. Proposed overall offsets combining regeneration of degraded areas and revegetation works are as follows:

- Freshwater Wetland – Approximately 2 hectares of Freshwater Wetland will be regenerated/revegetated on the Subject site (**FIGURE 5**) to partially offset the loss of 24.12 hectares. Revegetation and management of Freshwater wetlands will occur in accordance with a Freshwater Wetland Compensatory Habitat Management Plan (SMEC 2012). Further offsets will also be provided off-site.

- Swamp sclerophyll forest on floodplain – Approximately 6.77 hectares of Swamp sclerophyll forest will be regenerated/revegetated on the Subject site (**FIGURE 5**) to offset the loss of 3.8 hectares. The proposed offsets will result in a net gain of 3.50ha of this EEC on the Subject site.

- Lowland rainforest on floodplain – Approximately 9.59 hectares of Lowland rainforest on floodplain will be regenerated/revegetated on the Subject site (**FIGURE 5**) to offset the loss of 0.01 hectares. The proposed offsets will result in a net gain of 9.58ha of this EEC on the Subject site.

- Lowland rainforest - Approximately 3.71 hectares of Lowland rainforest will be regenerated/revegetated on the Subject site (**FIGURE 5**) to offset the loss of 0.1 hectares. The proposed offsets will result in a net gain of 3.61ha of this EEC on the Subject site.

In addition, approximately 12.06 hectares of mixed sclerophyll species will be regenerated/revegetated on the Subject site (**FIGURE 5**).

Further offsets are proposed in accordance with the Revised Saltmarsh Rehabilitation Plan (JWA 2013b) as follows:

> ***Saltmarsh***
> The removal of approximately 9.69 hectares of Saltmarsh communities from the Subject site will be ameliorated by regenerating and revegetating

compensatory Saltmarsh communities on the Subject site (**FIGURE 5**). Offsets for the removal of degraded Saltmarsh vegetation from the Subject site will include the following:

1. Large areas adjacent to the existing Saltmarsh communities are currently comprised of a mixture of exotic grasses (approximately 25.88 hectares) and will be restored to a combination of Saltmarsh (approx. 20ha) and Swamp oak (approx. 5.88ha) communities in accordance with the Revised Saltmarsh Rehabilitation Plan (JWA 2013b).
2. Approximately 64.28ha of natural regeneration of Coastal saltmarsh.
3. Re-establishment of saltmarsh species will be completed on the batters along the eastern edge of the Cobaki Parkway after construction is complete.
4. The Revised Saltmarsh Rehabilitation Plan (JWA 2013b) also includes the provision of retreat areas for Saltmarsh communities in the event of sea-level rise.
5. Removal of cattle from the area and subsequent relinquishment of existing use rights is considered an integral component of the rehabilitation process.
6. The entire area of the existing Saltmarsh which is to be retained (i.e. 54.63ha) will be rehabilitated in accordance with the Revised Saltmarsh Rehabilitation Plan (JWA 2013b). This will essentially involve restoring a natural tidal regime to the area.

Swamp oak floodplain forest
In total, approximately 5.88 hectares of Swamp oak floodplain forest will be revegetated (in areas of the Saltmarsh Revegetation Area with higher elevation) on the Subject site (**FIGURE 5**) to offset the loss of 0.73 hectares.

The proposed offsets will result in a net gain of approximately 34.59ha of Coastal saltmarsh and 5.15ha of Swamp oak floodplain forest communities on the Subject site.

At the completion of rehabilitation works, all regeneration and revegetation areas will be protected via a conservation agreement in perpetuity or rezoned to Environmental Protection and dedicated to Council or the relevant State Government Department (subject to their agreement).

4.4.2 Rationale

To determine which areas of vegetation should be the focus of regeneration and revegetation activities, vegetation within each precinct will be mapped and divided into six (6) different categories based on restoration potential. This will ensure that regeneration and revegetation resources will be utilised in the most efficient way by focusing on those areas that contain particular management issues (i.e. weed infestations, lack of canopy cover, poor species diversity) and matching the appropriate restoration methods for those issues.

The areas that are considered to have a restoration potential of:

- Grade 1 - Very Good condition;

- Grade 2 - Good condition; and
- Grade 3 - Moderate condition;

will be managed using only assisted regeneration in the form of exclusion fencing, weed control/eradication, and continued maintenance and monitoring.

The areas that are considered to have a restoration potential of:

- Grade 4 - Poor condition;
- Grade 5 - Very poor condition; and
- Grade 6 – Nil native vegetation;

will be managed using assisted regeneration as described above, as well as revegetation involving plantings of endemic species.

Revegetation works on the Subject site will also include the propagation and replanting of some of Threatened species that occur naturally on the site. **ANNEXURE 4** lists some of the Threatened species that occur on site, comments on the ease of propagation for each species and the fruiting times for each Threatened species.

Any revegetation works including Threatened flora species on the Subject site will require the preparation of a Threatened Species Management Plan and the relevant licence (i.e. A section 132C licence is required for harvesting seeds).

4.4.3 Condition Assessment

An overall condition assessment was completed during a site visit on the 19th March 2008. A detailed condition assessment of the precincts will be produced in each of the precinct plans. The condition assessment has also taken into consideration the likely impacts of earthworks (i.e. portions of the site which are currently vegetated may be impacted by earthworks and have therefore been assigned a poor or very poor condition). An overall condition assessment for the site is included in **FIGURE 9.**

4.4.4 Revegetation Areas

The proposed revegetation areas will use enhancement plantings to embellish and improve areas, which are currently void of any native vegetation community. The areas that will require enhancement plantings (revegetation) are shown in **FIGURE 4.**

4.4.5 Regeneration Areas

The proposed regeneration areas will use natural regeneration techniques to rehabilitate and improve areas with some native flora species. Areas that have the potential to naturally regenerate will be maintained and allowed to regenerate with only minimal maintenance (i.e. weed control). The areas that will be allowed to regenerate naturally are shown in **FIGURE 4.** The areas chosen for natural regeneration are considered to have an adequate soil seed bank that will adequately regenerate with the correct management (i.e. exclusion fencing and weed control).

N

LEGEND

- Grade 1 - Very Good Condition
- Grade 2 - Good Condition
- Grade 3 - Moderate Condition
- Grade 4 - Poor Condition
- Grade 5 - Very Poor Condition
- Grade 6 - Nil Native Vegetation
- Site Outline

SOURCE:
Condition - James Warren & Associates Pty Ltd
Aerial - Michel Group Services (Ref: 6400-197.dwg)
- photo taken March 2010

0 500m

SCALE: 1 : 12 500 @ A3

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Cobaki Lakes, Cobaki, NSW
Shire of Tweed

FIGURE 9

PREPARED: BW
DATE: 05 April 2013
FILE: 97038_SRRP_base.dwg

TITLE

CONDITION ASSESSMENT

4.4.6 Summary

Details of assessment of restoration potential for each management precinct are provided in **ANNEXURE 3.** Also discussed are Weed species assessments, and site regeneration and revegetation strategies (including weed management, propagation techniques, planting program, etc.).

4.5 Identification of Significant Ecological Values

Endangered Ecological Communities, Threatened flora species and habitat for Threatened fauna species will generally be retained within Environmental Protection Areas. Various offset proposals have been designed to compensate for any loss of EEC's or Threatened species habitat. In some areas EEC's and/or Threatened flora species occur within or immediately adjacent to proposed regeneration and/or revegetation areas.

Further detailed assessment of the ecological values of proposed regeneration and revegetation areas will be completed during the preparation of detailed Regeneration and Revegetation Plans be completed for each of the thirteen (13) rehabilitation/management precincts at the Operational Works stage. The detailed Regeneration and Revegetation Plans will include the following details:

- location and extent of EEC's;
- location of Threatened flora species; and
- location of fauna habitat features.

Measures to retain and protect these significant ecological values will be discussed where necessary. Amelioration measures for impacts on these features may also be determined on a case by case basis.

4.6 Weed Control Methods

4.6.1 Introduction

Exotic weed invasion is a minor management issue affecting the Subject site. Weeds can suppress the natural process of succession that enables forest to expand and repair damage caused by natural or human disturbance.

4.6.2 Rationale

Much of the Cobaki Lakes site is subject to minor invasion by exotic weeds. The control of weeds is an essential component of an effective program to ensure the long term survival of retained vegetation including the dry sclerophyll forest, sub-tropical rainforest remnants and revegetation plantings.

Some of the weeds that are currently occurring at Cobaki Lakes include:

- Camphor Laurel (*Cinnamomum camphora*)
- Lantana (*Lantana camara*)

- Purple top (*Verbena bonariensis*)
- Wild tobacco tree (*Solanum mauritianum*)
- Black-berry nightshade (*Solanum nigrum*)
- Brazilian nightshade (*Solanum seaforthianum*)
- White passionflower (*Passiflora subpeltata*)
- Cork/Small passionfruit (*Passiflora suberosa*)
- Mickey mouse plant (*Ochna serrulata*)
- Large-leaved privet (*Ligustrum lucidum*)
- Small-leaved privet (*Ligustrum sinense*)
- Umbrella tree (*Schefflera actinophylla*)
- Redhead cotton bush (*Asclepias curassavica*)
- Narrow- leafed cotton bush (*Gomphocarpus fruticosus*)
- Balloon cotton bush (*Gomphocarpus physocarpus*)
- Crofton weed (*Ageratina adenophora*)
- Mistflower (*Ageratina riparia*)
- Blue billygoat weed (*Ageratum houstonianum*)
- Thickhead (*Crassocephalum crepidioides*)
- Brazilian fire weed (*Erechtites valerianifolia*)
- Flatweed (*Hypochoeris radicata*)
- Fireweed (*Senecio madagascariensis*)
- Bindii (*Soliva pterosperma*) and
- Stinking roger (*Tagetes minuta*)

Weed removal and eradication programs must be completed for successful regeneration to occur.

4.6.3 Summary

A detailed weed removal plan will be provided for each precinct. The weed control methods to be implemented during primary and follow up weeding are discussed in detail in **ANNEXURE 5.**

4.7 Maintenance

4.7.1 Introduction

Regular maintenance or follow up work is an essential part of the regeneration process.

4.7.2 Rationale

Maintenance to be completed is essential for the long-term condition and health of the regeneration and revegetation areas. Regular maintenance is required to ensure that primary weeding has the best chance of success.

4.7.3 Summary

Regular maintenance will be a vital component of the continuing regeneration of each management precinct. **ANNEXURE 6** outlines maintenance requirements and timing of maintenance works.

4.8 Monitoring

4.8.1 Introduction

A monitoring program is to be put in place by the proponent and will be continued for three (3) years after completion of regeneration and revegetation works in each precinct.

4.8.2 Rationale

Monitoring is necessary to demonstrate that work carried out has achieved the desired outcomes, and to evaluate the relative success of the different methods used.

4.8.3 Summary

ANNEXURE 7 outlines the monitoring requirements for each management precinct, including timing, basic indicators to be monitored, and reporting of results.

5 SUMMARY

This plan (and supporting documents) contains an overview of regeneration and revegetation strategies that will be implemented on the Cobaki Lakes development site. This plan should be read in conjunction with detailed plans prepared for each management precinct. Each precinct plan will contain:

- A detailed set of directions on the most appropriate methods of:
    - Weed control;
    - Regeneration techniques; and
    - Monitoring procedures.
- Measurable performance criteria.

By achieving the objectives outlined in these plans via the suggested strategies, all conservation areas are to be successfully regenerated or revegetated.

Areas with an intact canopy considered to be of good to medium condition will be subject to regeneration works. Revegetation will occur in areas considered to be in poor to very poor condition. This will provide improved and extended habitat for a variety of flora and fauna within the locality.

The Performance Objectives within each plan will contain measures designed to allow the applicant to demonstrate that revegetation objectives are being achieved, to allow Council to sign off on the success of the program.

REFERENCES

JWA (2008). Response to the Director General's Environmental Assessment Requirements COBAKI LAKES VOLUME 1 – Ecological Assessment. A Report to Leda Manorstead Pty Ltd

JWA (2009). Vegetation Management Plan. Cobaki Lakes – Preferred Project Report. A report to Leda Manorstead Pty Ltd.

James Warren & Associates (JWA) (2010) Revised Freshwater Wetland Rehabilitation Plan. Cobaki Lakes – Preferred Project Report. A report to Leda Manorstead Pty Ltd.

JWA (2013a) Revised Assessment of Significance (7-part test). Cobaki Lakes. A report prepared for Leda Manorstead Pty Ltd.

JWA (2013b) Revised Saltmarsh Rehabilitation Plan. Cobaki Lakes. A report prepared for Leda Manorstead Pty Ltd.

SMEC (2012) Freshwater Wetland Compensatory Habitat Management Plan. Report for LEDA Manorstead Pty Ltd. SMEC Australia Pty Ltd.

ANNEXURE 1 - THREATENED SPECIES PROFILES

Coolamon

Scientific name: *Syzygium moorei*
Conservation status in NSW: Vulnerable
National conservation status: Vulnerable

Description
Durobby, also known as Coolamon, is a tree growing up to 40m tall, with dense dark foliage. The bark is red-brown, light grey or pinkish grey with soft papery scales. Its paired leaves are thick, oval-shaped or slightly elongated, 8-20cm long and usually rounded at the tips. Flowers are showy, pink to red, fluffy, and clustered directly on older leafless branches and the trunk of the tree. The white fleshy fruits are edible but tasteless. They have a diameter of up to 6cm and enclose a single seed.

Distribution
Found in the Richmond, Tweed and Brunswick River valleys in north-east NSW and limited occurrence in south-east Queensland.

Habitat and ecology

- Coolamon is found in subtropical and riverine rainforest at low altitude. Often occurs as isolated remnant paddock trees.

Threats

- Clearing and fragmentation of habitat for development, agriculture and road-works.
- Weed infestation and general degradation of rainforest habitats.
- Grazing and trampling of seedlings and saplings by domestic stock, particularly around remnant paddock trees.
- Illegal collection for horticulture.

Recovery strategies

Priority actions are the specific, practical things that must be done to recover a threatened species, population or ecological community. The Department of Environment and Conservation has identified **10 priority actions** to help recover Coolamon in New South Wales.

What needs to be done to recover this species?

- Buy plants only from licensed nurseries.
- Fence rainforest remnants and isolated paddock trees to exclude grazing stock.
- Control weeds in known and potential habitat.
- Protect areas of suitable habitat from clearing or development.
- Expand and connect remnants of suitable habitat and encourage regeneration of habitat around isolated paddock trees.

Fine-leaved tuckeroo

Scientific name: *Lepiderema pulchella*
Conservation status in NSW: Vulnerable

Description
Fine-leaved Tuckeroo is a small rainforest tree growing to 15m tall. It has hairless, light-green glossy leaves, 7–15cm long, which are made up of 4–14 narrow leaflets with wavy or toothed margins. The flowers are 2–3mm long and yellowy-orange. The 8–10mm long fruit is orange. This opens into three lobes revealing shiny dark-brown seeds with a yellow fleshy covering at the base. The fruit is ripe in December.

Distribution
The NSW north coast north of Brunswick Heads, and in Queensland. Most records in NSW are from the Tweed Valley, and the majority of known populations are on private land.

Habitat and ecology

- Lowland subtropical rainforest in NSW.
- Found on infertile metasediments and on fertile basalts in the Tweed Valley.

Threats

- Invasion of habitat by introduced weeds.
- Clearing and fragmentation of habitat for development.
- Collection of seed for horticulture.

What needs to be done to recover this species?

- Buy plants only from licensed nurseries
- Remove weeds in known and potential habitat.
- Protect areas of lowland subtropical rainforest from clearing or fragmentation.
- Seek a permit from the DEC before collecting seed from wild plants.

Marblewood

Scientific name: *Acacia bakeri*
Conservation status in NSW: Vulnerable

Description
Marblewood is a tree of 5–30m with wrinkled bark and a rounded canopy that is much darker and denser than that of most wattles. Its curved leaves are broad and dark green, with three to four prominent longitudinal veins, and thickened veins around the edges. The flower heads are small, round, and pale or golden yellow, and are followed by large bunches of flat, brown seed-pods containing several black seeds.

Distribution
Restricted to coastal south-east Queensland and north-east NSW, where it occurs north from Mullumbimby. Most plants are on private property.

Habitat and ecology

- In or near lowland subtropical rainforest, adjacent eucalypt forest or regrowth of both. Usually occurs in the understorey but may occur as a large canopy tree.

Threats

- Loss of habitat through land development and agriculture.
- Invasion by weeds, particularly Lantana.
- Fire, which kills adult trees and encourages weed growth.
- Visitor impacts in high use areas.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Control fire in areas of known or potential habitat.
- Ensure walking tracks in tourist areas do not disturb known habitat and stay on established tracks in rainforest areas.
- Assist in control and removal of weeds from rainforest areas.
- Protect areas of rainforest and adjoining eucalypt forest from clearing and development.

Spiny gardenia

Scientific name: *Randia moorei*
Conservation status in NSW: Endangered
National conservation status: Endangered

Description
Spiny Gardenia is a tall shrub or small tree to about 8m tall, often with coppice shoots and root suckers at the base. The paired leaves are mostly oval-shaped, and can be 2-6cm long and 1-3cm wide. The underside of the leaf is paler than the upper surface, and often has small pits in the angles of the veins. Flowers are small and white, with a strong sweet smell, and develop into round yellow to orange berries 6-9mm long which eventually turn black. There are many seeds set in the pulp of each fruit.

Distribution
From Lismore in north-east NSW north to the Logan River in south-east Queensland. Sparsely distributed, with most records in the Tweed and Brunswick areas.

Habitat and ecology

- Subtropical, riverine, littoral and dry rainforest. In NSW, Hoop Pine and Brush Box are common canopy species.

Threats

- Clearing and fragmentation of habitat for development, agriculture and roadworks.
- Invasion of habitat by introduced weeds.
- Trampling by visitors.
- Fire.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Keep to established tracks to avoid trampling on small plants.
- Protect rainforest areas from fire.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of suitable habitat from clearing or development.
- Expand and connect remaining remnants of habitat.

Yiel yiel

Scientific name: *Grevillea hilliana*
Conservation status in NSW: Endangered

Description
White Yiel Yiel is a rainforest tree 8–30m tall. The young leaves are deeply lobed and mostly 25–40cm long and 15–30cm wide, while the adult leaves are often without lobes. The lower surface of both the young and the adult leaves is silvery and silky. The white to pale-green flower heads are cylindrical, 8–22cm long and appear mainly during May to July.

Distribution
North from Brunswick Heads on the north coast of NSW and in Queensland. The only populations currently known in NSW are near Brunswick Heads and on the slopes of Mt Chincogan in Byron Shire and, in Tweed Shire in remnant patches of habitat, particularly around Terranora.

Habitat and ecology

- White Yiel Yiel grows in subtropical rainforest, often on basalt-derived soils.

Threats

- Risk of extinction because populations are small and distribution is restricted.
- Loss of habitat through clearing for development.
- Habitat degradation through invasion by introduced weeds.
- Seed collection for horticulture.

What needs to be done to recover this species?

- Buy plants only from licensed nurseries.
- Prevent weeds and garden plants from invading habitat.
- Protect remnant rainforest areas from development.
- Seek a permit from the DEC before collecting seed from wild plants.
- Report new occurrences to the DEC.

Scented Acronychia

Scientific name: *Acronychia littoralis*
Conservation status in NSW: Endangered

Description
Scented Acronychia is a small tree to 6m high with 5-16cm long oval-shaped glossy leaves on a short stalk. The lower surface of the leaves is paler than the upper surface and there are many oil dots visible. They have a pleasant aromatic smell when crushed. The small four-petalled yellowish flowers are produced in summer on a stalk growing from the junction of the leaf and stem. The fruit that follows is creamy-lemon in colour and 10-20mm in diameter. It is a flattened oval shape and has four lobes with shallow fissures between them.

Distribution
Scented Acronychia is found between Fraser Island in Queensland and Port Macquarie on the north coast of NSW.

Habitat and ecology

Scented Acronychia grows in littoral rainforest on sand.

Threats

- Destruction of habitat as a result of coastal development.
- Damage caused by inappropriate use of four-wheel drive vehicles.
- Invasion by introduced weeds, particularly Lantana, Bitou Bush and exotic vines.
- Dieback caused by exposure to salt-laden winds.
- Recovery strategies

What needs to be done to recover this species?

- Always stay on designated four-wheel drive tracks.
- Assist with control and removal of weeds.
- Protect remaining areas of habitat.
- Initiate and support rehabilitation and regeneration of littoral rainforest, including planting of local rainforest species to protect Scented Acronychia from exposure to salt-laden winds.

Brush Cassia

Scientific name: *Cassia brewsteri var. marksiana*
Conservation status in NSW: Endangered

Description
Brush Cassia can be a spectacular tree when in bloom. It is similar to the Golden Shower Tree (Cassia fistula) of street-plantings but has smaller leaves and darker flowers. The golden-yellow summer flowers are fragrant and hang in large clusters from the fresh, lime-green foliage. Brown, cylindrical fruits, which develop in winter, are segmented and contain hard yellow-brown seeds, each enclosed in a cardboard-like envelope. The tree may grow to 25m tall but most are 5–10m. Defoliating caterpillars often give it a briefly scruffy look.

Distribution
Occurs north from Brunswick Heads, around Murwillumbah, and north into south-east Queensland as far as Beenleigh.

Habitat and ecology

- Found in littoral and riverine rainforest, and in regrowth vegetation on farmland and along roadsides.
- It prefers more fertile soil-types and is often found in low and flat sites.

Threats

- Widening and maintenance of roads.
- Clearing and development of land.
- Browsing and trampling by stock.
- Invasion of habitat by introduced weeds.
- Damage to trees, and inhibition of regeneration, by seed-collectors.

What needs to be done to recover this species?

- Buy Brush Cassia plants only from appropriately licensed nurseries.
- Identify populations along roadsides and protect them during road-works.
- Protect from stock by fencing.
- Remove weeds from known and potential habitat.
- Protect known and potential habitat from clearing and development.
- Expand and connect remaining areas of habitat.

Green-leaved Rose Walnut

Scientific name: *Endiandra muelleri subsp. bracteata*
Conservation status in NSW: Endangered

Description
A tree up to 30m tall with brown bark, often with loose round plates. Twigs and branchlets are covered in hairs. The moderately glossy leaves are oval or drawn out towards the tips, and measure 6–12cm long and 3–5cm wide, with three to five pairs of side veins. Flushes of new growth are pinkish-green. Flowers are small, yellowish and hairless, and are held in small clusters. The fleshy fruits are egg-shaped, 2.5–3cm long and black when ripe.

Distribution
Occurs in Queensland and in north-east NSW south to Maclean. It is sparsely distributed within this range.

Habitat and ecology

- Subtropical rainforest or wet eucalypt forest, chiefly at lower altitudes.

Threats

- Clearing and fragmentation of habitat for coastal development, agriculture and road-works.
- Infestation of habitat by weeds.
- Frequent fire.
- Trampling by visitors.

What needs to be done to recover this species?

- Keep to established tracks in areas of habitat to avoid trampling small plants.
- Support local Landcare groups and bush regeneration teams.
- Protect rainforest and wet eucalypt forest from fire.
- Identify populations along roadsides and protect them during road-works.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of suitable habitat from clearing or development.
- Expand and connect remaining habitat remnants.

ANNEXURE 2 - ECOLOGICAL RESTORATION PRINCIPLES

Ecological restoration aims to restore pre-existing indigenous ecosystems and ecological processes on disturbed sites, maintaining and developing the natural ecosystem to self-perpetuate (Perkins 1992). Perkins (1992) put forward a *restoration continuum* spanning from assisted natural regeneration, the least interventionist, to reconstruction (of original communities on cleared sites) and fabrication (of new communities on changed sites). These activities are undertaken in different circumstances in the field, but the boundaries are blurred, allowing practitioners to consider sites on an individual basis, according to the level of disturbance and the restoration potential identified in the site. The aim of ecological restoration is to restore to the highest practicable extent, and to develop a system that is sustainable in the long term.

In disturbed areas that cannot solely rely on natural regeneration potential, revegetation can be undertaken to reconstruct the original forested communities. Cleared sites can be replanted with species grown from seed collected in nearby local native vegetation. The use of seed of local provenance (origin) is a key principle underpinning the integrity of the work, and avoids possible genetic pollution of local woodland when future pollen exchange takes place between remnant and replanted woodland.

Unfortunately the suite of species that is available is often narrow, determined by practicalities of seed collection, the ability to propagate in a nursery and limits on field establishment in the environmental conditions prevailing on cleared land. Conceptually, this is merely establishing a framework into which additional plant and animal diversity can recruit or be reintroduced once the environment is modified (Perkins 1992).

Cleared sites are seldom completely devoid of native species. It is common to observe paddocks supporting threads of the original ground cover vegetation. This is often apparent in paddocks historically sown with exotic grasses to improve pasture. While the introduced grasses are usually dominant, a surprising diversity of native grasses and groundcovers can often persist. They have remained through a history of sustained grazing and are by definition adapted to grazing. The act of excluding livestock or other management activities can threaten native diversity, as biomass from the introduced grasses smothers these plants. Alternative biomass reduction can be achieved with slashing and fire however these have different effects and their own practical limitations.

Total groundcover biomass is reduced under a developing canopy, a phenomenon also evident in re-growing forest communities. The vigour of exotic grasses is greatly diminished and some are unable to grow, leaving room for native plants that are adapted to the woodland ecosystem. Of course some native plants lose vigour in the forest canopy as well. Revegetation is thus forming an important mechanism for grassland manipulation and as a tool for creating a variety of niches in the ground layer. At the same time, revegetation is achieving the obvious objectives of increasing habitat values, restoring normal hydrology and increasing the range of species available to recover in a site after disturbance. Revegetation needs to be used in

combination with other techniques, and these processes will need to be studied in detail before they can be conclusively described as positive.

The mechanism of planting is likely to be a most important strategy in revegetation of the site, not as an end in itself, but as an important tool to ameliorate changed sites and release ecosystem resilience. While prolonged monitoring needs to be maintained in revegetation areas, there are indications that environmental conditions within the site will change in interesting ways as revegetation develops.

Reference

Perkins, I. 1992. *Land and Vegetation Management Plan for the Horsley Park Corridor*.

ANNEXURE 3 - REVEGETATION AND REGENERATION APPROACH

1 INTRODUCTION

To determine which areas of vegetation should be the focus of regeneration and revegetation activities, vegetation within each precinct will be mapped and divided into six (6) different categories based on restoration potential. This will ensure that regeneration and revegetation resources and methods will be utilised in the most efficient way by focusing on those areas that contain particular management issues (i.e. weed infestations, lack of canopy cover, poor species diversity) and matching the appropriate restoration measures for those issues.

The six (6) management categories are based on the McDonald (1996) vegetation restoration system[3] and are shown in **TABLE 1.**

TABLE 1
VEGETATION MANAGEMENT CATEGORIES AND ACTIONS

Management Categories (Based on restoration potential)	**Management Actions**
1 – Very good condition. Structure and composition of vegetation community generally intact. Low evidence of degradation. Likely to recover fully with passive intervention.	Maintenance
2 – Good condition. Structure somewhat altered by low level impacts. Likely to recover fully if casual factors and their secondary impacts are removed by active intervention. Likely to degrade further if no remedial action taken.	Natural or Assisted regeneration
3 – Moderate condition. Structure altered by high level impacts. High level visual impacts may be present. Likely to recover fully if causal factors and their secondary impacts removed by active intervention, but will take longer to recover that a site of higher condition.	Assisted regeneration
4 – Poor condition. Structure and/or composition highly altered. Sufficient biota remains for natural regeneration if causal factors and their secondary impacts are removed and dynamic processes reinstated. Reintroduction of some species (including Threatened species) may be required.	Assisted regeneration/ Revegetation
5 – Very poor condition. Structure and/or composition severely altered. Either insufficient biota remain for natural regeneration (except some ruderal species), or sever weed infestation occurs and is likely to prevent native regeneration.	Assisted regeneration/ Revegetation
6 – Nil native vegetation.	Revegetation

[3] Degradation classification system used in McDonald, M. Christine, 1996. Ecosystem resilience and the restoration of damaged plant communities: A discussion focusing on Australian case studies. Ph.D. Dissertation, University of Western Sydney.

2 WEED SPECIES ASSESSMENT

2.1 Introduction

Within each of the thirteen (13) rehabilitation precincts the occurrence of exotic weed species has been recorded, and an assessment of the overall condition and frequency of weed species has been evaluated.

The weed species presence and the intensity of the invasion are required to prepare the most efficient control program for each individual precinct.

2.2 Methods

With each precinct the vegetation was mapped using a minimum of two (2) 20 x 20 metre survey quadrats to determine percentage cover. Within each quadrat the percentage cover was calculated by 2 scientists and the dominant weed species and prominent native vegetation were recorded.

2.3 Results

The result of each precinct survey effort is recorded in individual precinct plans.

3 SITE REGENERATION STRATEGIES

3.1 Introduction

The majority of vegetation on the Subject site (i.e. rehabilitation/management precincts) has experienced historical and current anthropogenic alterations principally due to impacts from clearing, cattle grazing and fire. This anthropogenic modification has provided opportunities for weed species to invade the natural vegetation communities. Exotic species have persisted and competed with native species for limited resources (e.g. light, nutrients and water). This acts as a limiting factor for regeneration of native species. Therefore, in order to enhance the natural values of the site, weed control and weed removal techniques are required for all identified vegetation management categories at varying levels.

The objectives of the site regeneration strategies for each precinct are to:

- Remove weeds utilising “best practice” protocols;
- Maintain and monitor the site to ensure success; and
- Improve the current ecological values of areas containing habitat for identified significant species.

3.2 Methods

Regeneration methods implemented are to be site specific are detailed in each individual precinct plans. The overall strategies are based on the principles of assisted regeneration and will include:

- Locating and marking clearly all Threatened species;
- Manual hand weeding 2 metres around threatened species;
- Selective Camphor Laurel poisoning;
- Primary weeding
    - C,S & P Woody Weeds
    - Small natives (less than 20cm) are to be weeded around (50 cm), staked, and clearly marked
    - Selective spot spraying or blanket spraying if required
- Follow up weeding and other maintenance to be completed until objectives are achieved;
- Continued monitoring for the life of the project.

A regular maintenance program will be implemented for each of the precincts after primary weeding has occurred. The maintenance to be completed is discussed in **ANNEXURE 6.** The monitoring program is discussed in **ANNEXURE 7.**

4 SITE REVEGETATION STRATEGIES

4.1 Background

Within disturbed areas, competition between native propagules and exotic weeds often favours pioneering exotic species. Thus, in order to enhance the ecological function of areas degraded by exotic species, revegetation works will provide a framework by which indigenous species may reclaim lost habitat via the processes of natural recruitment and succession. Therefore, the aim of revegetation works within each precinct is to restore the historical ecological values of the site through the use of weed removal techniques and the provision of indigenous canopy species.

Revegetation will be required within areas graded 4, 5 or 6 as described in Table 1**.** Revegetation will commence approximately three (3) months after the primary weeding has been completed. This will allow for any native seedlings to germinate naturally. Each precinct will be regularly monitored. Two (2) months after primary weeding has occurred the site will be assessed for natural recruitment of native species. Any areas that are considered to have low native recruitment potential are suitable for revegetation.

Bi-annual assessment will be made of each of the precincts. In any areas within which the occurrence of native species is considered low, revegetation will be required.

Revegetation will continue on an as needed basis dependent upon the proponent's budgetary constraints.

4.2 Propagation

Seed collected for propagation will come from the site and immediate surrounds as well as local provenance (i.e. from local stock within 20 km of the Subject site). The following details will be collected from each source plant:

- Location (GPS position);
- Date of collection;
- Name of collector;
- Soil type;
- Health of plant; and
- Collection method.

Whenever possible, seed will be removed directly from plants by shaking or cutting branches over a tarpaulin. Secateurs will be sterilised between each use. Seed will be placed in small envelopes with the collection details clearly marked. If the seed is extremely small it will be stored in glass or plastic vials to avoid undue loss.

It is expected that during the seed collection program, a site will be visited on several occasions to ensure optimum seed ripeness. The seed collection program will be prepared in consultation with Council and NSW National Parks and Wildlife Service (NPWS) prior to commencement. The program will be prepared by the Nursery/Revegetation team in consultation with the Horticulturist.

The amount of seed collected will not exceed 5% per plant. Seed will not be collected from isolated populations or rare plants.

The seed will be cleaned, its viability checked and prepared for storage. Seed that has lost viability will not be used in the revegetation works due to the dangers of genetic aberration.

If seed collection proves difficult or impossible, other forms of propagation, such as cuttings, may be attempted.

4.3 Planting Program

All exclusionary fencing will be in place before planting occurs.

Existing native trees and shrubs, which have regenerated since clearance, would be retained. These areas would be enhanced with plantings as deemed appropriate by the Horticulturist.

Planting will occur at the optimum time of the year when there is high soil moisture (between January and May), unless irrigation is available and accessible.

If required, the Horticulturist may make minor alterations to this revegetation strategy depending on the site requirements. The following strategy will be employed:

- Seedling sites will be spot sprayed with Glyphosate one (1) week prior to commencement;
- All seedlings will be soaked in water overnight prior to planting;

- All seedlings will be provided with a wetting agent such as rain-saver[4] crystals;
- Weeds will be controlled, in the short term, through the application of suitable mulch around individual plantings and with spot applications of an appropriate herbicide.
- All seedlings will be protected by a tree guard (commercial tubing or equivalent); and
- Watering will be undertaken after the seedlings have been planted on an 'as need basis'.

The plants growing medium would be soaked prior to planting and the plant cores should be buried to approximately 1-2cm deep.

The seedlings shall be planted on the same day as their transport from the nursery. No seedlings will be left unprotected on the site whilst awaiting planting. Planted seedlings will be marked with a piece of biodegradable tape and staked.

Only nitrogenous fertilisers will be used to avoid the introduction of Phosphorous, Potassium and other micronutrients.

Planting in areas exposed to full sun or westerly sun will be avoided in the peak summer months, where possible.

Planting density may be inconsistent throughout the planting zone, due to occurrence of native seedlings and the condition of the planting medium (in large areas of the Subject site basalt boulders occur as ground cover, and revegetation may not be practical).

[4] Rain-saver is a polymer water crystal that has been specifically developed for plants. The polymer absorbs and holds water and nutrients at a specific tension which makes it available to plant roots but does not release to the soil. Rain-saver has proven very successful in more difficult environments (e.g. Roadside plantings on the Pacific Motorway between Brisbane and the Gold Coast and in frontal dunes at Pottsville (R. Keene *pers. comm.* 2000).

ANNEXURE 4 – PROPAGATION OF THREATENED FLORA SPECIES

To bolster the local populations of Threatened flora species, it is recommended that the revegetation include the replanting of some of the Threatened species that occur naturally on the site. Listed below in **TABLE 1** are some of the Threatened species that occur on site and comments on the ease of propagation for each species. **TABLE 2** lists the fruiting times for each Threatened species.

Comments have been obtained from experienced local sources including:

- Mark Dunphy (Manager of the Firewheel Rainforest Nursery)
- Brett O'Donovan (Manager of Terania Creek Nursery)

TABLE 1
LIST OF THREATENED SPECIES AND COMMENTS ON PROPAGATION

Common Name	Botanical name	Dunphy Comments	O'Donovan Comments
Coolamon	*Syzygium moorei*	Easy	Easy
Fine-leaved tuckeroo	*Lepiderema pulchella*	Easy	OK, usually only 20% of seed germinates
Marblewood	*Acacia bakeri*	Easy, but fruits seasonal	Easy
Spiny gardenia	*Randia moorei*	Easy, fruit may be hard to collect	Poor germination (10-20%). Birds love fruit
White yiel yiel	*Grevillea hilliana*	Easy, wind borne seed can be hard to collect	Hard to get Seed good amount of seed

TABLE 2
FRUITING TIMES OF THREATENED FLORA ON THE SITE

Common Name	Botanical name	Fruiting period (Floyd)
Coolamon	*Syzygium moorei*	Fruit ripe March – May
Fine-leaved tuckeroo	*Lepiderema pulchella*	Fruit ripe December
Marblewood	*Acacia bakeri*	Fruit ripe Jan – April
Spiny gardenia	*Randia moorei*	Fruit ripe Dec – Aug
White yiel yiel	*Grevillea hilliana*	Fruit ripe Feb - July

Section 91 Licence

Under the NSW Threatened Species Conservation Act (TSC Act 1995), a licence is required for activities, which may result in any of the following actions involving threatened plants:

- Picking a threatened species, population or ecological community
- Damaging Critical Habitat
- Damaging the habitat of a threatened species, population or ecological community.

The Director – General cannot compel anyone to apply for a section 91 licence. This is the choice of the potential applicants who must weigh up the risk of not being protected by a licence for actions which may result in the harming or picking of a threatened species, population or ecological community, and/or the damaging of habitat of a threatened species, population or ecological community.

ANNEXURE 5 - WEED CONTROL METHODS

The following are control techniques that are to be utilised during site regeneration works:

- **Cut Stump Method** - This method involves cutting plant stems as close to ground level as possible and immediately painting the cut stump with herbicide. This treatment can also be applied as a basal bark application to the first 15-20 cm (entire circumference) of an uncut stem if the adult bark has not yet developed. Chemical use with this application is dependent on the proximity of the weed to naturally ponding water or waterways and whether or not the chemical is registered for aquatic use.

- **Stem Injection** - Herbicides may be applied directly to the plant via stem injection. This involves applying an herbicide to the plant directly by drilling a hole into the stem and inserting the chemical. Axe cuts for stem injection can also be used. Cuts can be made at regular intervals around the stem and should leave a "pocket" in to which the chemical must be immediately injected. Axe cuts should penetrate the cambium layer, but not the hardwood.

- **Spray Method** - There are two (2) types of spraying methods that will be employed where appropriate:

    - Selective blanket spraying: The area must initially be checked for the presence of any native species. Any weeds within 2 m of the drip zone of existing native species will be removed by hand. Alternatively, native species will be covered with impermeable material (e.g. a tarpaulin) for protection during spraying;
    - Spot spraying: The spray nozzle will be kept close to ground to avoid any overspray. Individual weeds will be spot-sprayed at the site. This method of spraying will be employed as native species are interspersed throughout the exotic grasses; and
    - Herbicides specific to each target species, where appropriate, will be identified prior to the implementation of any works. Herbicides will be applied in accordance with the manufacturer's specifications and when environmental conditions are most preferred (e.g. wind and rainfall).

- **Cutting and Chipping** - Manual weeding may involve cutting and chipping, pulling, digging or slashing and is preferred, depending on the growth stage and situation as detailed:

    - Where native plants are growing within a weed infestation and the use of selective herbicide is not possible;
    - Where inadequate foliage is present to allow for successful uptake of herbicide e.g. Mile-a-minute runners typically exhibit this trait; and
    - When hand weeding, the stem must be grasped firmly at the base of the plant and pulled. A trowel, mattock or sharp knife may be needed to loosen the soil. Care must be taken not to leave behind stems or

other plant pieces that may re-shoot. Hand weeding should also be undertaken at times when weeds are not seeding to reduce dispersal and spread. Hand pulling is not recommended for some weed species as they readily sucker if their roots are disturbed e.g. *Lantana camara*. This method will be employed when removing exotic grass species within retained vegetation.

- **Ring Barking -** This method involves removing the lower bark from the stem using a sharp implement to expose the phloem and xylem tissue to the outer environment thereby destroying it.

- **Basal Bark Method** - This method involves applying an herbicide to the lower 35-45 cm bark around the entire stem using a hand-pump backpack sprayer fitted with a shut-off at the wand tip and an adjustable cone nozzle or a small, ATV (All Terrain Vehicle)-mounted sprayer with a shut-off at the wand tip and an adjustable cone nozzle.

ANNEXURE 6 - MAINTENANCE

1 INTRODUCTION

Maintenance or follow up works are vital for the continuing regeneration and revegetation of the precincts. Regular maintenance will be completed by the rehabilitation team. Once canopy closure has been achieved the period of time between maintenance visits will increase.

2 TIMING OF MAINTENANCE

After primary weeding and revegetation works, regular follow up maintenance will be required within each precinct. The Revegetation Team will be required to complete:

- Regular maintenance of the regeneration & revegetation zone, once every three (3) months until canopy closure has been achieved. This is expected to take between two (2) – three (3) years.
- After canopy closure has been achieved, the removal of weed re-growth and other general maintenance tasks will only be completed every six (6) months until completion of the three (3) year maintenance period.

3 MAINTENANCE REQUIREMENTS

The maintenance is to be completed by the rehabilitation team and will include:

- Control of invasive weeds and grasses;
- Ensuring adequate soil nutrient levels within revegetation zones by periodic fertilising;
- Ensuring adequate soil moisture levels within revegetation zones by using irrigation during times of prolong drought;
- Repairing exclusion fencing when required;
- Pruning and thinning to allow for optimal growth and form;
- Staking or propping–up of trees which have fallen or developed a permanent lean;
- Replacing large areas of dead trees;
- Re-mulching and re-fertilising of the revegetation plantings is recommended after the first year.

Continued maintenance after canopy closure will be required only once every six (6) months, and will include:

- Pruning and thinning to allow for optimal growth and form;
- Control of invasive weeds and grasses;
- Repairing or removing fencing when required.

ANNEXURE 7 – MONITORING & REPORTING

1 INTRODUCTION

The Horticulturist and qualified ecologist will inspect the revegetation zones before revegetation commences to ensure suitable preparation. A qualified ecologist will also regularly monitor the condition of each precinct for the three (3) year period after commencement of regeneration and revegetation works in each precinct, to ensure that the proposed planting and revegetation works satisfy the aims and methods of this Plan.

Within regeneration and revegetation areas a qualified ecologist will monitor the abundance of native species, weed abundance, any significant problems and the status of protective fences.

During the monitoring visits an assessment will be made of the health of the seedlings (growth rates, foliage status and survival rates) within revegetation areas to ensure that maintenance of planted individuals has occurred.

At the end of the final stage of the project, a qualified ecologist will determine if the stated objectives of this management plan have been achieved. If not, a report will need to be prepared identifying the works and the time frames required to ensure that the Regeneration and Revegetation Plan meets the stated objectives and that, most importantly, a self-sustaining community is established within all the regeneration precincts.

2 MONITORING BASIC INDICATORS

Revegetated rainforest sites typically progress through two main stages: an initial 'establishment' phase and a longer-term 'building' phase. The 'establishment' phase is the period from when seeds or seedlings are planted until they have 'captured' the site, forming a relatively closed canopy and suppressing grasses and weeds. The establishment phase may last three to five years, depending on site conditions, planting design, maintenance, and so on.

In the 'building' phase, the planted trees mature, reproduce and eventually die, and other species of plants and animals are recruited to the site. In a restoration project, the aim of this phase is typically the development of a floristically and structurally diverse forest that provides habitat for native wildlife (Catterall *et al*. 2006). It may take decades or even centuries for a revegetated site to come to resemble mature rainforest.

The monitoring of basic indicators involves the survey of various aspects of vegetation structure on defined transects and plots, using a standard design. Kanowski and Catteral (Eds 2006) list the following basic indicators (**TABLE 1**) which have been identified from research conducted by the Rainforest CRC on the biodiversity values of reforested sites in tropical and subtropical Australia, and from other relevant work.

TABLE 1 - LIST OF ATTRIBUTES TO BE SURVEYED

Attributes	Definition
Canopy Cover	Projective cover (%) of vegetation >2 m above ground (= shade cast by vegetation >2m above ground, if sun was directly overhead).
Canopy Height	Height attained by the crown of the tallest tree in the canopy. The canopy is the layer of foliage forming the 'roof' of the forest; it may be broken by gaps or incomplete. In some sites, it may be necessary to distinguish canopy trees from emergents (i.e. trees projecting above canopy with crowns exposed on all sides).
Ground Cover	Proportion of ground (%) covered by (a) vegetation <1 m high (score for each of: grass, herbs, ferns, vines and scramblers, trees and shrubs, moss), (b) leaf litter and fine woody debris, (c) coarse woody debris, (d) rock, (e) soil, (f) other.
Trees	Live freestanding woody-stemmed plants >2 m high. Trees are assessed by dbh class (= stem diameter at 1.3 m above ground): <2.5 cm, 2.5-10 cm, 10-20 cm, 20-50 cm, 50-100 cm, >100 cm.
Structural damage to trees	Any significant structural damage to live trees from storms or cyclones is recorded as: 1 = defoliation and smaller branches broken; 2 = larger branches broken, 3 = trunk broken; 4 = tree pushed over at >45^{o} angle or uprooted.
Standing dead trees (stags)	Dead freestanding woody-stemmed plants >2 m high, assessed by dbh class: <2.5 cm, 2.5-10 cm, 10-20 cm, 20-50 cm, 50-100 cm, >100 cm.
Shrubs	Live freestanding woody stemmed plants 1-2 m high.
Special life forms	Plant life forms characteristic of rainforest and/ or particular forest types. Includes: strangler figs, hemi-epiphytes, vines ('slender' <5 cm diameter, 'robust' >5 cm diameter), vine towers, vine tangles, thorny scramblers, clumping epiphytic ferns, other epiphytes, tree ferns, ground ferns, palm trees, understorey palms, cordylines, herbs with long, wide leaves, herbs with strap leaves, cycads (with stems or on ground), other life forms characteristic of a site.
Coarse woody debris	Fallen logs and branches, lying on or within 2 m of the ground and >10 cm diameter. Where present, coarse woody debris usually comprises most of the volume of woody debris. Provides stable habitat for organisms dependent on rotting wood, as the core tends to remain moist.

3 TIMING OF MONITORING VISITS

The monitoring is to be completed by a qualified ecologist. Site visits should occur for each precinct as follows:

- Six (6) weeks after primary weeding;
- Six (6) weeks after initial plant-out;
- Every three (3) months thereafter until plants are sufficiently established; and
- Every six (6) months until project is completed.

4 REPORTING OF MONITORING RESULTS

Following each inspection by the qualified ecologist, a brief report will be prepared. At the end of each year a detailed report will be prepared and will discuss the following:

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

5 COMPLETION OF REPORTING

At the end of the final stage of the project, a qualified ecologist will determine if the stated objectives of the revegetation strategy have been achieved (or close to being achieved). If not, a report will be prepared to identifying the works and the time frames required to ensure that the stated objectives are fulfilled.