

EGLINTON ESTATES

CLEARING AND REVEGETATION MANAGEMENT PLAN

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1 INTRODUCTION

1.1 Background

The Eglinton Estates Pty Ltd (Eglinton) landholding is located 45km north west of the Perth Central Business District (Figure 1). The land will be developed in accordance with the approved Local Structure Plan (LSP) for residential and commercial purposes and includes Urban Development, the Eglinton District Centre, primary schools and playing fields, the Eglinton Marina and Coastal Village, Regional Open Space and Public Open Space (Figure 2).

Development of the LSP area will result in the clearing of Carnaby's Black Cockatoo (CBC) habitat which is listed as an Endangered species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Subsequently, a Referral under the EPBC Act was submitted in December 2010 for the eastern LSP area. The Referral 2010/5777 was approved subject to environmental conditions by the Commonwealth Environment Minister on 30 April 2013 (Appendix 1).

To offset the clearing of the CBC habitat from the eastern LSP area, Eglinton will provide funds to the Department of Parks and Wildlife (DPAW) for the purchase of an offset site in the Gingin area that contains good quality CBC habitat, create 12.7ha of new CBC habitat in the Yellagonga Regional Park (YRP), plant 1.9ha of known CBC foraging species in Public Open Space (POS) in the Eglinton development and establish 50% of the streetscapes with known CBC foraging species.

1.2 Requirement for a Clearing and Revegetation Management Plan

In accordance with Condition 12 of the EPBC Approval 2010/5777, Eglinton were required to prepare and implement a Clearing and Revegetation Management Plan (CRMP) for the creation and maintenance of CBC habitat at Eglinton and YRP using where possible seed and topsoil from the CBC habitat to be cleared at Eglinton.

The specific intent of the CRMP is to:

- Identify a strategy for preparing a list of suitable CBC foraging species for use in revegetation at YRP, including source locations details of provenance and establishment requirements;
- Identify a strategy for topsoil collection from the Eglinton site and re-use on-site or off site;
- Provide best practice protocols for seed collection from the Eglinton site and YRP;
- Describe methods proposed to create 12.7ha of CBC habitat in YRP, including site preparation, planting methodology, completion criteria, timelines and staging of revegetation works and a monitoring program;
- Describe methods proposed to establish 50% of the streetscapes with CBC foraging species and 1.9ha of CBC foraging species within POS at Eglinton; and
- Outline management strategies for weeds and browsing/grazing pest animals at YRP.

Version 6 of the CRMP was approved by the Department of Environment on the 8 November 2013 (Appendix 2).

1.3 Stakeholder Consultation

This CRMP has been prepared by PGV Environmental in consultation with officers from the Department of Parks and Wildlife (DPAW) and Tranen Revegetation Systems (Tranen).

The core working group and other stakeholders are provided in Table 1.

Table 1: CRMP Working Group

Person	Company/Agency	Role
Core Group		
Paul van der Moezel	PGV Environmental	Eglinton Environmental Consultant
Belinda Heath	PGV Environmental	Eglinton Environmental Consultant
Catherine Prideaux	DPAW Regional Parks Unit	DPAW Lead Contact
Robert Campbell	DPAW Regional Parks Unit	A/Senior Project Officer
Mark Brundett	DPAW Swan Region	Restoration Ecologist
Karen Clarke	DPAW Swan Region	Ecologist
Vanda Longman	DPAW Swan Region	Conservation Officer (Flora)
Renee Evans	DPAW Regional Parks	Acting Manager
Damian Grose	Tranen	Independent Revegetation Expert
David Venning	Tranen	Independent Revegetation Expert
Tasio Cokis	Woodsome Management Pty Ltd	Eglinton Project Manager
Others		
	DPAW Regional Parks Unit	YRP Manager
	YRP Community Advisory Committee	
	Friends of YRP Inc.	
Tracey Scroop	WAPC Bush Forever Officer	
	City of Joondalup	
Sam Wagstaff	Department of Environment	Commonwealth Lead Contact
Chris Newton	Emerge	Eglinton Landscape Consultant
Luke Coyle	Cossill and Webley Civil Engineers	Eglinton Civil Engineering Consultant
Tom Barry	Stockland	Amberton Project Manager

1.3.1 Community Participation

Participation of the local community in implementing the revegetation component at YRP will encourage a sense of ownership of YRP by the community. A community planting day in the first five years of the revegetation will be organised by Eglinton in liaison with DPAW Regional Parks Unit, with opportunities for involvement of the YRP Community Advisory Committee.

Direct community enquiries about the revegetation project will be managed through the DPAW Regional Parks office as the first point of contact.

1.4 CRMP Revision

Eglinton requested a variation to the approval conditions 12 and 13 in correspondence dated 25 May 2015. The variation was approved by the DoE in accordance with the provisions of the EPBC Act on 20 October 2015 (Appendix 3). The original conditions 12 and 13 were replaced with new conditions.

Under approval condition 5, if the person taking the action wants to act other than in accordance with the approved CRMP, the approval holder must submit a revised plan for approval. Until the Minister (or his delegate) has approved the revised plan, the person taking the action must continue to implement the original plan/s.

Condition 12 is relevant to this CRMP, thus the CRMP requires revision to reflect the variation in the approval conditions. The key changes to Condition 12 are shown below in Table 2.

Table 2: Changes to Approval Condition 12

Original Condition 12(a) and 12(b)	New condition 12(a) and 12(b)
a. A commitment to the staged collection of native seed prior to clearing, and collection of topsoil following clearing, from within Carnaby's Black Cockatoo foraging habitat as shown in Attachment B (checked in black, but excluding those areas shaded green in Attachment B), for use in revegetation;	a. A commitment to the staged collection of native seed prior to clearing from within Carnaby's Black Cockatoo foraging habitat as shown in Attachment B (checked in black, but excluding those areas shaded green in Attachment, E), and the collection of topsoil from 33 ha of the project site, from within 73 ha of good or better condition Carnaby's Black Cockatoo habitat as shown in Attachment B (checked in black), for use in revegetation.
b. A commitment to store native seed and topsoil, and transport it to a receiving site(s) where revegetation is being undertaken by the DEC or another receiving party (or parties), and at least 50% of the collected seed and topsoil must be used within 20 km of the proposal site;	b. A commitment to store native seed (excluding that which is required for revegetation on-site and within Yellongonga Regional Park) and transport it to a seed bank or receiving site(s) where revegetation is being undertaken by the DPaw or another receiving party (or parties).

This revised CRMP will be submitted to the DoE for approval and provided to the DPaw for information.

2 EPBC CONDITION OF APPROVAL

2.1 EPBC Conditions Relevant to Carnaby's Black Cockatoo

The Commonwealth Environment Minister approved the clearing of vegetation from east Eglinton subject to a number of conditions of approval (Appendix 1). A variation on this approval was granted on the 20 October 2015 and the original conditions 11 and 12 were replaced with new conditions. Condition 12 below reflects the new condition (Appendix 3).

The following conditions relate directly to the revegetation of CBC habitat at YRP and within POS and streetscapes in the future Eglinton development and possibly another DPAW site within 20km of the development.

Condition 11

To mitigate impacts to Carnaby's Black Cockatoo, the person taking the action must fully implement the revegetation of at least 12.7 ha of native vegetation (including primary feeding plants for Carnaby's Black Cockatoo) in the Yellagonga Regional Park (in consultation with the DPAW) using seed and topsoil collected in accordance with the Clearing and Revegetation Management Plan required under condition 12.

Condition 12

12. *To mitigate impacts to Carnaby's Black Cockatoo, the person taking the action must prepare and submit a Clearing and Revegetation Management Plan (the plan) for the Minister's approval. The plan must include:*

a) A commitment to the staged collection of native seed prior to clearing from within Carnaby's Black Cockatoo foraging habitat as shown in Attachment B (checked in black, but excluding those areas shaded green in Attachment E), and the collection of topsoil from 33 ha of the project site, from within 73 ha of good or better condition Carnaby's Black Cockatoo habitat as shown in Attachment B (checked in black), for use in revegetation.

b) A commitment to store native seed (excluding that which is required for revegetation on-site and within Yellongonga Regional Park) and transport it to a seed bank or receiving site(s) where revegetation is being undertaken by the DPaW or another receiving party (or parties).

c) Detailed protocols for staged collection and use of native seed and topsoil required by conditions 12a, 12d and 12e to be developed in consultation with an independent revegetation expert (approved in writing by the Department) and the DPaW or other receiving party (or parties) including:

- i. The optimal methodology for native seed and topsoil collection from the proposal site*
- ii. How clearing will be staged to best utilise the native seed and topsoil resource for revegetation*

- iii. *How native seed and topsoil will be stored and transported*
- iv. *Measures to manage any topsoil from the site that contains invasive weeds (at a level that makes that soil not suitable for use in revegetation) or soil infestation such as Phytophthora, and*
- v. *On-site supervision and implementation of monitoring mechanisms. d) A commitment to revegetate at least 1.9 ha of native vegetation within Public Open Space on the proposal site.*

e) Methodology for revegetation, both on-site, and in Yellagonga Regional Park (as required under condition 11), using native seed and topsoil collected in accordance with the protocols require by condition 12c, along with:

- i. Survival targets proposed for plantings*
 - ii. Performance indicators and corrective measures*
 - iii. Roles and responsibilities, and*
 - iv. Timeframes for the implementation and management of the above measures.*
- f) A commitment for at least 50% of planting of trees and shrubs in street- scaping to consist of plants known to be primary feeding plants for Carnaby's Black Cockatoo. Site selection for street-scaping must take account of any risk of vehicle strike to Carnaby's Black Cockatoos.*

If the Minister approves the plan, then the approved plan must be implemented.

Condition 14

The person taking the action must not undertake any clearing of habitat for Carnaby's Black Cockatoo (as shown in Attachment B hatched in black apart from of the area outlined in yellow in Attachment D, unless:

- (a) The Clearing and Revegetation Management Plan required under condition 12 has been approved by the Minister; and*
- (b) For each proposed clearing stage, the department has been provided written evidence that the DPAW or other receiving party (or parties) agree(s) to utilise the seed and soil for the purposes of revegetation in accordance with the protocols developed under condition12(c).*

3 CARNABY'S BLACK COCKATOO

3.1 Background

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) is endemic to the south-west of Western Australia. This species is listed as 'fauna that is rare or likely to become extinct' (generally referred to as threatened fauna) under the Western Australian *Wildlife Conservation Act 1950*, Wildlife Conservation (Specially Protected Fauna) Notice 2010(2). It has been given a ranking of Endangered by the Western Australian Threatened Species Scientific Committee. This species is listed as Endangered under the EPBC Act and listed as Threatened under the Western Australian *Wildlife Conservation Act 1950*.

This species is a postnuptial nomad, tending to move west after breeding. For example; most birds breeding in Badgingarra, Dandaragan, Moora and Bindoon regions tend to move west after breeding into higher rainfall areas especially the near coastal *Banksia* scrubs e.g. at Wanagarren Nature Reserve, Nilgen Nature Reserve, Yanchep area and Wanneroo area then many of these move further south onto the southern Swan Coastal Plain including the southern Perth metropolitan area Baldivis, Lake Clifton and Myalup areas (Johnstone and Kirkby, 2012).

Carnaby's Black Cockatoo usually travel in pairs or small flocks, although they are often seen in large flocks (up to 10,000) in non-breeding season (late spring to mid-winter), especially at *Banksia* scrubs and pine plantations on the Swan Coastal Plain. Because of the large-scale post-war clearing of semiarid sandplains, this species has declined in much of the wheatbelt (Johnstone and Kirkby, 2012).

3.1.1 Diet

Carnaby's Black-Cockatoo have been predominantly observed foraging on the seeds of 52 native species. The most common native plant species CBC have been observed foraging upon include the *Banksia* (including *Dryandra* species), *Hakea*, *Grevillea*, *Allocasuarina* and *Eucalyptus* (Carnaby 1948; Saunders 1974a, 1974b, 1980; Higgins 1999). The DPAW has prepared a ranked list of suitable foraging species for CBC (Attachment 2).

The species have been observed feeding on a number of introduced or crop species including Liquidamber (*Liquidamber styraciflua*), Umbrella Tree (*Schefflera actinophylla*), Sunflower (*Helianthus annuus*), Jacaranda (*Jacaranda mimosifolia*), Canola (*Brassica napus*), Wild Radish (*Raphanus raphanistrum*), Geranium species (*Erodium spp.*), Guildford Grass (*Romulea rosea*), *Hibiscus spp.*, White Cedar (*Melia azedarach*), Pinaster Pine (*Pinus pinaster*), Radiata Pine (*Pinus radiata*), Doublegee (*Emex australis*), Almond Tree (*Prunus amygdalus*) (Johnstone and Kirkby, 2012).

On the Swan Coastal Plain, identified important native food plants include *Banksia attenuata*, *B. menziesii*, *B. grandis*, *B. ilicifolia*, *B. sessilis*, *B. prionotes*, *Corymbia calophylla* and *Eucalyptus marginata* (Saunders 1980; Shah 2006; Weerheim 2008). On the Swan Coastal Plain, Carnaby's Black-Cockatoo are frequently observed feeding in pine plantations (Shah 2006). In addition, CBC have been observed feeding on invertebrates, braconid wasps and seed-eating weevils from cones and fruits of some *Acacia spp.* and *Xanthorrhoea preissii* (Shah, 2006).

3.1.2 Nesting Requirements

Carnaby's Black Cockatoo display strong pair bonds and mate for life. They nest in hollows of smooth-barked eucalypts especially Salmon Gum (*Eucalyptus salmonophloia*) and Wandoo (*Eucalyptus wandoo*) but nests have also been found in other eucalypts including York Gum (*Eucalyptus loxophleba*), Flooded Gum (*Eucalyptus rudis*), Tuart (*Eucalyptus gomphocephala*) and the rough-barked Marri (*Corymbia calophylla*) (Johnstone and Kirkby, 2012).

On the Swan Coastal Plain most nests are in Tuart. Eggs are laid on a mat of wood chips at the bottom of a large hollow (mostly top entry hollows) ranging from a few centimetres to 5 m deep; clutch 1–2 (mostly 2 but only one young reared). Incubation lasts 29 days and only the female incubates and broods. The nestling is brooded by the female during which time both rely on the male for food. The female then leaves the nest each day at dawn, sometimes returning mid-morning (with the male) to feed the chick. After about 2–3 weeks she ceases to brood and the chick is fed by one or both parents in the morning and at late evening (DoP, 2012).

3.1.3 Breeding

Breeding occurs mainly from early July to mid-December in the semiarid and subhumid interior from the Three Springs district south to the Stirling Range, west to Cockleshell Gully, Cataby, Regans Ford, Gingin, near mouth of Moore River, Yanchep, Serpentine, Mandurah, Lake Clifton, Bunbury, Nannup and Tone River and east to Manmanning, Kellerberrin, Woolundra, Lake Cronin, Hatters Hill and near Ravensthorpe (Storr-Johnstone Bird Data Bank).

There are limited records of CBC breeding in Tuart on the Swan Coastal Plain. Known locations include Gingin, Boonanarring, Mooliabeenee, near mouth of Moore River, Yanchep, Baldivis, near Mandurah, Lake Clifton and near Bunbury (Storr-Johnstone Bird Data Bank).

Breeding success is largely dependent on suitable feeding habitat adjacent to the nest site to provide the necessary food for the survival of the chick (Johnstone and Kirkby, 2012).

3.2 Occurrence within Yellagonga Regional Park

Carnaby's Black Cockatoo has been recorded in YRP and adjacent areas within the City of Joondalup and City of Wanneroo. YRP currently provides roosting and foraging opportunities and potential nesting trees within close proximity to water sources in Lakes Goollalal and Joondalup. The DPAW have indicated that there is a roosting site approximately 4km to the south of the proposed revegetation areas.

4 CARNABY'S BLACK COCKATOO HABITAT RESTORATION RESEARCH

4.1 Background

The DPAW and others have recently become involved in *Banksia* woodland revegetation projects that have a primary focus of providing CBC foraging habitat. The following projects are related to EPBC offset sites:

- Fiona Stanley Hospital – revegetation of a number of sites within the Beeliar Regional Park;
- Jandakot Airport Holdings Pty Ltd – Regeneration of *Banksia* woodland at Forrestdale Lake and Jandakot Regional Park (18ha); and
- Malaga Wetland Offset Project – Regeneration of 60ha in Melaleuca Park.

Prior to the EPBC offset projects, *Banksia* Woodland restoration projects on the Swan Coastal Plain have largely been focused on revegetation of sand mines and in more recent times cleared pine plantations. Native plant regeneration of abandoned farmland in the Western Australian wheatbelt region is also slow to non-existent, even 45 years after abandonment (Yates & Hobbs 1997; Standish *et al.* 2006; 2008). Natural regeneration after these types of land use is not realistic as the native seed bank within the topsoil has been removed and other factors that limit the regeneration of native species may also encourage the germination of weed species.

Techniques for restoring *Banksia* woodland communities on the sandy soils of the Swan Coastal Plain in the Perth region have been investigated at post-pine harvested sites in the Gngara Sustainability Strategy (GSS) area (Reid *et al.* 2004; Maher *et al.* 2008) and at post-sand mined sites operated by Rocla Quarry Products (Rokich *et al.* 2000, 2002; Turner *et al.* 2006; Rokich & Dixon 2007).

DPAW has established restoration trials in the GSS area annually since 2002 using direct seeding across cleared plantation compartments. The aims of these trials are to determine the most successful and cost-effective techniques for revegetating clear felled pine sites with abundant and diverse native vegetation cover over a broad-scale area. The success of these trials was assessed in 2004 (Reid *et al.* 2004) and 2008 (Maher *et al.* 2008).

4.2 Species Selection

Species selection is now widely recognised as a fundamental and important step in revegetation. The species chosen not only determine the landscape that future generations of people will inherit, but directly influence the success of the revegetation project, the wildlife that will utilise the site, the natural regeneration dynamics, human access and other potential uses and services (including ecosystem services). The vast majority landcare-type projects use local native species. Seed is generally sourced from nearby remnants, although fluctuations in availability and other issues such as remnant condition continue to present ongoing practical and ethical challenges (e.g. genetic mixing and a shortage of seed suppliers).

Species selection is critical for plant survival as well as for maximising the ecological value of the project. Part of the value of each bushland area is in its unique character, and this should be maintained by using plants that occur there naturally and are of local provenance (i.e. are found in the local area). A range of understorey and ground cover species, not just trees, should be planted.

4.2.1 Sourcing Seed for Revegetation

Essential guidance on how to collect, store and use native seed is provided by *FloraBank*, a widely-used national web-based resource consisting of a set of comprehensive information and user-friendly guidelines. This resource aims to improve the availability and quality of native seed for revegetation and conservation purposes in Australia by helping people exchange information and ideas about native seed. It relates also to the use of plant materials (other than seed for revegetation) and encourages practices that protect biodiversity.

Practical guidance is offered by the ten FloraBank guidelines. These relate to:

- Native seed storage for revegetation;
- Basic methods for drying, extraction and cleaning of native seed;
- Improving on basic native seed storage;
- Keeping records on native seed;
- Seed collections from woody plants for local revegetation;
- Native seed collection methods;
- Seed production areas for woody native plants;
- Basic germination and viability tests for native plant seed;
- Using native grass seed in revegetation; and
- Seed collection ranges for revegetation.

The Revegetation Industry Association of WA (RIAWA) have developed seed supply standards which will be applied for the collection of seed from Eglinton and other identified sites (Appendix 3).

For revegetation projects it is important to obtain local provenance seed. The term provenance is used to refer to seed collected from a natural population. It provides a basic approach to describe genetic diversity below the species level. Provenance is also used to describe patterns of genetic variation exhibited by a species over its geographic range. These patterns are often closely associated with the ecological conditions in which the species has evolved. When a number of provenances of a species are planted out at the same site it is usual to find differences in survival and growth performance (and possibly other characteristics) between provenances (FloraBank, accessed July 2013).

Collect seed *as locally as possible* from natural populations for use in revegetation and rehabilitation plantings wherever possible, having regard to a range of plant and planting site characteristics and how they may change as we move further away from the local area to collect seed. This is a precautionary approach, in the absence of detailed information on gene flow and genetic diversity. Naturally occurring remnant vegetation is usually the best source of material for revegetation. Generally, in these natural communities, plants have evolved to suit local environmental conditions and have a desirably broad genetic base. Ecologically and genetically, local seed complements other plants and animals in the area, and poses the least potential threat of genetic contamination (FloraBank, accessed July 2013).

A good storage system will help retain seed viability and protect it from insects, mice and birds. The ideal container is clean, dry, vermin proof and has a good seal. Each container should contain seed from only one species. Containers should be labelled with species name, collection site, collection

date, collector's name, and the number of parent plants from which the seed was collected. It may be desirable to add other information, depending on the project.

The optimum conditions for storing seed is in a fridge with a temperature of 1–5°C and a relative humidity of 4–8%, both with minimal fluctuations. When seed is not stored in a fridge, a sachet of silica gel crystals may be placed in the container (e.g. paper bag) to keep it dry. Eucalypt seed has been known to remain viable for 20 years when stored at 4°C. Most seed can, however, be stored at room temperature (10–20°C) for several years, although with some loss of viability.

4.3 Topsoil Collection

Research by Rocla has demonstrated that the *Banksia* woodland topsoil seedbank is a major source of seedling abundance and species richness, providing a technique of plant introduction that is effective for restoration purposes while at the same time ensuring introduction of species that tend to normally have low viability or complex and difficult to alleviate dormancy breaking cues e.g. *Hibbertia* spp. and Epacridaceae species. The topsoil also contains beneficial fungi and micro-organisms that enhance seed growth.

The seedbank from *Banksia* woodlands are concentrated in upper topsoil profile (92% seeds in top 10 cm) (Rokich *et al.*, 2000). The re-spread topsoil should also be kept to a minimum as seedlings cannot emerge from great depths (Rokich *et al.*, 2000). Topsoil should be re-spread immediately following stripping. Where this is not practicable topsoil needs to be stockpiled. Stockpiling reduces seedling recruitment and the stockpile is susceptible to 'catching' wind dispersed weed seeds (Rokich *et al.*, 2000) so the period of stockpiling needs to be kept to a minimum.

Research has shown that correct handling of the topsoil seedbank can substantially improve seedling recruitment and establishment. Key factors to consider are depth of topsoil stripping and spreading, seasonal timing of topsoil stripping and spreading operations and the impact of topsoil stockpiling.

Table 3: Topsoil Relocation Projects

Stripping Period	Source Area	Recipient Site(s)	Transfer Protocol and Description	Outcome
2006 (March)	Cockburn Commercial Park (LandCorp)	A degraded area within LandCorp's adjacent 22 ha bushland property to the west side of South Lake (approximately 500m east of source area).	12 months weed control prior to transfer of topsoil. Topsoil from good to very good condition bushland was moved directly to site, not stockpiled, and spread to a depth of 200mm without being handled too much. Seed was spread in June 2006, and then rabbit proof fencing was installed, all in time for winter rain. Selective weed control	The condition of LandCorp's 22 ha site (which included the topsoil transfer site) was considered to be good enough for the land to be transferred to DEC in August 2008. This was as part of Ministerial Statement 661. A trust fund was also set up by LandCorp for DEC's ongoing maintenance of

			undertaken for 2 years following topsoil transfer.	the site following transfer to DEC.
2009 (Aug-Sep) Approval Notice EPBC 2008/4638	Shorehaven, (Alkimos)	Gnangara Pine Plantation at intersection of Old Yanchep Rd – and Kangaroo Rd	Tranen were not involved in this process, but they were involved in the seed recovery. Tranen are therefore unsure of topsoil stripping methodology and timing, but they did make some of their own observations. It is believed that the topsoil was stockpiled in one large pile for several months before being transported to the recipient site.	DEC/DPaW have managed the site post translocation. Believed to have had Monitoring by flora survey and Rapid Bushland Assessment. Only CBC Food plant in reveg. is <i>Acacia saligna</i> . Very few natives and very weedy overall. Report is being written by DPaW. SEWPac was informed that reveg failed and an alternative offset organised (contact Geoff Barrett DPaW)
Summer 2010	Brighton Estate (Butler)	Yanchep National Park – two small quarries total area approximately 0.2 ha.	Soil sourced from Very Good condition area with very low weed cover (<5%). Vegetation stripped and stockpiled then topsoil stripped and stockpiled separately before transport on site. Stripping took place in March in dry conditions. Topsoil was transported to recipient sites as soon as the stripping was complete (i.e. stockpiled no more than a few days). Brush containing unreleased <i>Banksia sessilis</i> seed was then used to physically close the access tracks and provide surface protection, and the sites direct seeded.	No apparent native response from topsoil translocation. Direct seeding yielded some response in open areas, but not all. No seed germination was from the brush material. Low weed germination, but site was maintained by DEC so presume post installation control took place
Summer 2010	Brighton Estate (Butler)	Neerabup Regional Park – degraded area totalling 6 ha.	Soil sourced from Very Good condition area with very low weed cover (<5%). Vegetation stripped and stockpiled then topsoil stripped and stockpiled	Very poor native response from topsoil translocation. High levels of weed germination requiring intensive

			separately before transport on site. Stripping took place in March in dry conditions. Topsoil was transported to recipient sites as soon as the stripping was complete (i.e. stockpiled no more than a few days). Recipient site currently managed by Western Power (WP) with works believed to still be ongoing.	management by WP contractors.
Winter 2010	Honeywood Estate (Wandi)	Fraser Road Reserve and Jandakot Regional Park at Anketell Rd (DEC estate)	Topsoil was stripped in winter 2010 and spread in spring following scalping of the surface layer of weeds at the recipient site (which was formerly a paddock).	AR site surveyed by DEC in 2011 - poor native response and very high levels of weed establishment measured (predominantly veldt grass and pigface, native cover < 5%). New revegetation works undertaken at AR site funded by Jandakot offsets project: new topsoil over ½ of area in 2012, the rest direct seeded in 2013 after weed control. Fraser Rd site is almost entirely weed dominated (native cover < 1%).

4.3.1 Timing

In a study within the Gnangara area (Rokich *et al.*, 2000), seedling recruitment following immediate spread of autumn (dry) topsoil was 73 seedlings per 5m², represented by 18 species (Rokich *et al.*, 2000). Following an immediate spread of a winter strip there were 5 seedlings per 5m², represented by an average 3 species.

In the same study, topsoil that was not immediately respread and that was stockpiled showed substantial declines in establishment rates and diversity that increased over time. In 1-year-old and 3-year-old topsoil the total number of seedlings respectively declined to 55% and 35% of freshly spread topsoil, and species richness declined to 78% and 61%.

4.3.2 Depth of Topsoil Stripping

The *Banksia* woodland seedbank is concentrated in the relatively shallow upper topsoil with 92% of seeds in 10 cm of topsoil occurring in the upper 5cm. Removal of the top 5cm of topsoil is therefore more likely to be successful in *Banksia* woodland restoration. A dilution effect of adding the 5–10cm layer will result in almost halving the total recruitment of soil-buried seeds. Operationally, however, methods stripping the top 5cm or less of topsoil may be difficult to implement on a broad scale basis (Maher, 2009; Rokich and Dixon, 2009).

In the Gngangara study fresh topsoil stripped to a depth of 10cm and respread to the same depth exhibited average seedling recruitment levels of 254 seedlings per 5m² (Rokich *et al.*, 2000). The study also found that the *Banksia* woodland seedbank is concentrated in the relatively shallow upper topsoil, with 92% of seeds in 10cm of topsoil occurring in the upper 5cm.

4.3.3 Depth of Topsoil Spreading

Utilising the majority of the seedbank in ecosystem restoration also depends on the topsoil replacement depth in areas to be restored. The replacement depth in turn is driven by the capacity of seeds to emerge. Depth of burial of seed affects the ability of seedlings to emerge and establish. That is, greater depths of spread will not utilise seeds that are buried deeply. Further, late season emergence will not allow full advantage of winter rains. Correct depth of topsoil spreading within disturbed *Banksia* woodland sites, to a maximum depth of 100mm, will aid in topsoil conservation for restoration purposes (most species cannot emerge from depths greater than 100mm). Furthermore, shallower depths of topsoil spread, will promote seedling survival within post-mined *Banksia* woodland sites (Rokich *et al.*, 2000).

4.3.4 Topsoil Stockpiling

Research by Rocla indicates that the use of direct return topsoil is important for restoration. Stockpiling topsoil substantially decreases seedling recruitment (by up to 70%), and richness potential of the re-spread topsoil by reducing seed viability possibly through decomposition of seed or triggering germination when seed is exposed to the elevated moisture and temperature conditions within the stockpile. Stockpiled topsoil mounds also tend to trap windblown weed seeds such as Veldtgrass (Rokich *et al.*, 2000).

Stockpiling should be avoided where possible to minimise problems with soil quality and additional costs.

4.3.5 Seasonal Timing of Topsoil Operations

To optimise the recovery of species, it is also important to consider the impact of timing of topsoil stripping and spreading. Topsoil is best stripped in dry summer months after summer seed fall, this is also the time when dieback is least active (Dieback Working Group, 1999). Stripping in winter reduces seedling recruitment (Rokich *et al.*, 2000) and increases the risk of spreading dieback (Dieback Working Group, 1999). Likewise, re-spreading in winter also reduces seedling recruitment.

4.3.6 Soil Stabilisers

Wind erosion is a major concern in rehabilitation sites. By minimising wind erosion through the application of soil stabilisers, seedling recruitment levels can generally be enhanced. However, this is dependent upon the type of soil stabilizer employed. Within post-mined *Banksia* woodland sites, polymer gel pre-treatments are unfavourable for seedling recruitment, however paper-mache pre-

treatments slightly (but insignificantly) increase recruitment levels. At this stage, a third pre-treatment, brushing, also inhibits seedling recruitment, however plant growth is enhanced. This is an area of research that continues to be monitored to determine soil stabilizer effects on plant survival.

4.4 Site Preparation

There are a number of site preparation techniques that can be utilised prior to topsoil spreading and planting.

4.4.1 Ploughing, Deep Ripping and Scarifying

Many revegetation projects involve soil cultivation to ease compaction. The structure of the soil at revegetation sites should be assessed to determine the level of compaction which will give an indication of the level of treatment required prior to top soil spreading. Once the topsoil has been spread the site should be ripped as the earthmoving vehicles will compact the soil.

Ploughing was an effective and cost efficient method of soil preparation prior to broadcast seeding. Although deep-ripping generated similar results to ploughing, it was the most expensive treatment. Scarifying the soil was the cheapest treatment, but resulted in lower establishment rates for seedlings (Maher, 2009; Reid *et al.*, 2004). The costs of deep ripping if combined with the top soil spreading operation can be reduced.

4.4.2 Weeds

Seedling establishment of many native woody species is significantly reduced in the presence of annual weed species (Hobbs 2001). Weeds commonly establish after disturbance (Hussey *et al.*, 1997) and often use the disturbance caused by fire as the opportunity to invade an area (Brown & Brooks 2002).

Maher *et al.* (2008) found that weed cover negatively affected species establishment and density at restored trial sites. Higher levels of weed cover reduced the percentage of species that established and density of some species, in particular *Banksia attenuata* and *Eucalyptus tottiana*. However, weed cover did not reduce the density of all species. Some species therefore appear to be more sensitive to competition from weeds.

4.4.3 Fertiliser

Rokich and Dixon (2007) suggest that fertiliser application benefits plant survival and overall plant development within *Banksia* woodland restoration. However, this treatment requires some caution particularly for proteaceous species that are sensitive to phosphorus (Grose, 2013; Lambers *et al.*, 2007).

5 YELLAGONGA REGIONAL PARK

5.1 Background

Yellagonga Regional Park is located approximately 20km north of Perth City and 20km to the south of the Eglinton (Figure 1). The YRP is approximately 13km long from north to south and varies in width from 1 to 1.5km. The YRP comprises 1400 hectares and is primarily focussed on a wetland system that includes Lake Joondalup, Beenyup and Walluburnup Swamps, Lake Goollelal and the surrounding lands reserved in the MRS for “Parks and Recreation”. YRP was recognised in Bush Forever (Site No. 299) due to its regional importance because of its natural, cultural and recreational resources in a rapidly growing suburban area. The Bush Forever description is provided at Appendix 5.

Yellagonga Regional Park provides an important (north/south) link with Neerabup National Park and Yanchep National Park. The YRP contains a wide variety of ecosystems from upland forest, fringing wetland and aquatic vegetation to open water bodies. This rich diversity and complexity of ecosystems has very high conservation value.

The vegetation communities found within the YRP are significant as they are representative of communities once widespread on the Swan Coastal Plain but now significantly cleared. The vegetation on the upland areas surrounding the wetlands was once Jarrah - Marri - Banksia (*Eucalyptus marginata* - *Corymbia calophylla* – *Banksia attenuata*) Open Forest, and Tuart-Jarrah – Marri (*Eucalyptus gomphocephala* - *Eucalyptus marginata* - *Corymbia calophylla*) Open Forest.

Management of YRP is guided by the Yellagonga Regional Park Management Plan 2003-2013 (DEC, 2003). The purpose of the Management Plan is to provide broad direction for the protection and enhancement of the conservation, recreation and landscape values of YRP.

The DPAW manages YRP in consultation with the local governments which control the land within the park, namely the Cities of Joondalup and Wanneroo. Areas of responsibility are identified in the Management Zones section of the YRP Management Plan.

5.2 Yellagonga Regional Park Site Description

5.2.1 Landform

The lakes and wetlands of the YRP lie in an interdunal swale of the Spearwood Dune System. The landform within the YRP is representative of similar geological features found elsewhere on the Swan Coastal Plain, having been formed from large sand dunes that over time have become consolidated and stabilised with vegetation. The landform is characterised by relatively high elevation sloping dunes on the western side of the YRP with generally more gentle slopes on the eastern side.

The eastern and southern portions of the YRP are relatively flat with very gentle slopes leading down to Lake Goollelal and Walluburnup Swamp (DEC, 2003).

5.2.2 Geology and Soils

The Spearwood Sands predominate through the western and southern portions of the YRP. The soil consists of a dark brown sandy surface grading into yellow brown or brown sand. Limestone usually occurs within a metre of the surface although depth tends to be variable. Limestone outcrops at the

surface form interesting features on the western edge of Lake Joondalup where subterranean water flows have formed channels and caves through the limestone. The soil varies in fertility, from relatively fertile and moist on the western edges of Lake Joondalup, to freely draining sands which have low fertility on elevated slopes northwest of Lake Goollelal (McArthur and Bartle, 1980).

The general lack of fertile soils in the YRP is an important consideration in the methods and species used in rehabilitation programmes.

5.2.3 Vegetation and Flora

Disturbance and subsequent weed invasion have modified large areas of local vegetation in the YRP. The wetland vegetation is recognised as having high conservation value but, in many areas, is modified by weed invasion and altered water regimes. Woodlands of Flooded Gum (*Eucalyptus rudis*) and Freshwater Paperbark (*Melaleuca raphiophylla*) would once have encircled the wetland but are now fragmented with few intact areas. The emergent aquatic vegetation of local and introduced rushes covers much of the shallow waters with open water beyond. The YRP Management Plan (DEC, 2003) describes the following vegetation as occurring within the park:

Upland Vegetation

The upland vegetation is adapted to the landforms of the Spearwood System with its low fertility and low water holding capacity and the wet winter, dry summer Mediterranean climate. There are few areas of intact upland vegetation remaining. Significant areas of upland vegetation still retain a tree canopy but local understorey and ground layers are in poor condition with many areas mown and with a parkland appearance. There are three major upland vegetation communities in YRP:

- Jarrah-Marri-Banksia Open Forest

The Jarrah-Marri-Banksia (*Eucalyptus marginata* – *Corymbia calophylla* – *Banksia spp.*) Open Forest mainly occurs on the south west and north east areas surrounding Lake Joondalup and in the south in remnant pockets mainly in the south east portions of the wetlands of Lake Joondalup. The mid-storey species usually comprise Banksias with *Banksia attenuata*, *Banksia menziesii* and *Banksia grandis* with the Sheoak (*Allocasuarina fraseriana*) sometimes present.

- Tuart-Jarrah-Marri Open Forest

The Tuart-Jarrah-Marri (*Eucalyptus gomphocephala* – *Eucalyptus marginata* – *Corymbia calophylla*) Open Forest occurs mainly on the north east side of Lake Joondalup with remnant patches amongst previously cleared areas to the west of the wetlands north of Whitfords Avenue.

- Scattered Tuarts

Scattered Tuarts occur with an understorey of exotic grasses to the east of Walluburnup and Beenyp Swamps and to the north east of Lake Goollelal (Department of Planning and Urban Development, 1992a).

Fringing Wetland Vegetation

The local wetland vegetation on permanently moist soils consists of Flooded Gum (*Eucalyptus rudis*) and freshwater paperbark woodland (*Melaleuca raphiophylla*). Substorey species include *Acacia cyclops* and *Acacia saligna* with rushes extending beneath the overstorey in relatively undisturbed areas. Aggressive grass weeds such as Kikuyu (*Pennisetum clandestinum*), Buffalo (*Stenotaphrum secundatum*) and Couch (*Cynodon dactylon*) are vigorously invading wetland fringes in many areas.

Emergent Aquatic Vegetation

The emergent aquatic vegetation comprises local rushes often invaded by the non-local Bulrush (*Typha orientalis*) which appears to be increasingly impacting on local rush communities. The main emergent aquatic communities comprise:

- *Baumea articulata* occurs in monospecific stands 1-2 metres tall, usually dense when in the open and occurs mainly on inlets within Lake Goollelal and in the north of Lake Joondalup.
- *Baumea articulata* is mixed with the nonlocal Bulrush in various proportions in Beenypup Swamp and on the north east fringes of Lake Goollelal.
- *Typha orientalis* is mixed with the local rush *Schoenoplectus validus*, in dense stands 1.5 to 3 metres tall, to the south and south east of Lake Joondalup and for much of Walluburnup Swamp and the wetlands south to Whitfords Avenue. Stands of mixed *Baumea articulata* and *Schoenoplectus validus* occur to the south of Lake Goollelal.

Flora

Total flora within the YRP has been recorded at 217 taxa including 114 native and 103 weed taxa (DEP 1996, Tauss 1996).

A species list based on plot records from Department of Environment (1996), Gibson *et al.* (1993), Keighery (1996) and Weston *et al.* (1992) is provided at Appendix 6.

No species of Declared Rare Flora have been recorded in the YRP, however several taxa are considered to have significance.

Significant flora within the YRP includes *Jacksonia sericea* (P3) *Conostylis bracteata* (P3), *Hibbertia cuneiformis* (not known to occur naturally north of Port Kennedy), *Amyema miquelii* (uncommon on the Swan Coastal Plain), *Lechenaultia linarioides* and *Ricinocarpos glaucus* (Government of Western Australia, 2000).

Environmental Weeds

The presence of weeds is a major problem within the YRP. The area occupied by weeds continues to grow and unless controlled will lead to the eventual demise of the local vegetation. A survey of weeds found in Yellagonga Regional Park has been carried out (Sage 1997).

Weeds appear to be spreading and are impacting on most native ecosystems in the YRP. In particular Veldt Grass (*Ehrharta calycina*) is impacting on many of the upland areas within the YRP where some sections of the understorey have been largely replaced by the weed. Other major weeds in upland areas include Wild Oat (*Avena fatua*), Two Leafed Cape Tulip (*Moraea miniata*), Bridal Creeper (*Asparagus asparagoides*), Caltrop (*Tribulus terrestris*), Giant Reed (*Arundo donax var. donax*),

Geraldton Carnation Weed (*Euphorbia terracina*), Mossman River Grass (*Cenchrus echinatus*) and Fennel (*Foeniculum vulgare*) (DEC,2003).

Aggressive grass weeds such as Kikuyu, Buffalo and Couch are vigorously invading wetland fringes in many areas. Additionally, Arum Lily (*Zantedeschia aethiopica*), Blackberry (*Rubus fruticosus*) Castor Oil (*Ricinus communis*), Pampas Grass (*Cortaderia selloana*) and Cape Tulip (*Moraea flaccida*) have the potential to significantly impact on the wetland areas of the YRP.

Fauna

Many birds inhabit the woodland and wetland areas of YRP. Of the 122 species recorded in the YRP 18 are known to breed in the area (Royal Australasian Ornithologists Union (RAOU) survey 1996D, Bamford and Bamford, 1990).

Carnaby's Black Cockatoo are known to frequent foraging habitat within YRP.

The presence of foxes, feral cats and the European Rabbit are having an impact on native fauna and flora in the YRP.

Cultural Heritage

The following Aboriginal sites registered with the Department of Indigenous Affairs are located within and adjoining Yellagonga Regional Park:

- S00160 – Lake Joondalup West;
- S01288 – Lake Joondalup North-West;
- S02187 – Lake Joondalup;
- S02321 – Lake Joondalup South-West;
- S02538 – Joondalup Caves;
- S02186 – Lake Goollelal;
- S0437 – West Walluburnup Swamp;
- S02539 – Bonorin Hill;
- S02279 – Wanneroo Scar Tree;
- S02572 – Joondalup Waugal Egg; and
- S02573 – Joondalup Drive Trees.

6 SPECIES SELECTION

6.1 Objective

Condition 11 requires the revegetation at YRP is to include “primary feeding plants for CBC”. Therefore, the plant species mix needs to focus on CBC foraging species that naturally occur in Yellagonga Regional Park (YRP) but also include as many species used by CBC for foraging that would occur at both YRP and Eglinton East.

In addition, for the purposes of long-term management of the revegetation sites, the long-term objective should be to restore a sustainable natural ecosystem appropriate to the YRP landscape, i.e. establish both an overstorey and understorey of native plants that suppresses weed growth and can regenerate naturally after disturbance events such as fire. This will require the inclusion of non-CBC food plants in the species lists.

Table 4: Yellagonga Regional Park Revegetation Site Descriptions

YRP Revegetation Site	Proposed Revegetation	Soil and Landform
1A	Jarraah-Marri-Banksia Open Forest	Upland - Spearwood Soils
1B	Tuart-Jarraah-Marri and Jarraah-Marri-Banksia Open Forest <i>Eucalyptus rudis</i> and <i>Melaleuca raphiophylla</i> on wetland margins.	Upland - Spearwood Soils Mid-lower slopes – Transition Soils Lower slope - Fringing Herdsman wetland soil on east end
2	Tuart-Jarraah-Marri and Jarraah-Marri-Banksia Open Forest <i>Eucalyptus rudis</i> and <i>Melaleuca raphiophylla</i> on wetland margins.	Upland - Spearwood Soils Mid-lower slopes – Transition Soils Lower slope - Fringing Herdsman wetland soil on east end
3	Tuart-Jarraah-Marri and Jarraah-Marri-Banksia Open Forest <i>Eucalyptus rudis</i> and <i>Melaleuca raphiophylla</i> on wetland margins.	Spearwood Soils Mid to lower slopes fringing Herdsman soils on east end

The revegetation sites consist of three soil and landform unit (Table 3):

- Upland - Spearwood Soils;
- Mid-lower slopes –Spearwood soils transitioning to Herdsman Soils; and
- Wetland margin - Herdsman Soils.

Therefore, three plant species lists will need to be developed for upland, mid-lower slope and fringing wetland areas.

6.2 Methodology

To develop these species list the following steps will occur:

6.2.1 Plant species at Eglinton East in Carnaby's Black Cockatoo Habitat:

Determine Eglinton East plant communities delineated as Carnaby's Black Cockatoo Feeding Habitat by comparing Figure 9 (PGV Environmental 2010) and "Carnaby's Black Cockatoo Habitat and Vegetation Condition" map (PGV Environmental 2013):

- BaBm - *Banksia attenuata* and *B. menziesii* Low Woodland
- BaBmXp - *Banksia attenuata* and *B. menziesii* Low Woodland over *Xanthorrhoea preissii*
- BaBmJf *Banksia attenuata* and *B. menziesii* Low Woodland over *Jacksonia furcellata*
- Ds *Banksia sessilis* (previously *Dryandra sessilis*) Open to Closed Heath
- DsHt *Banksia sessilis* and *Hakea trifurcata* Open to Closed Heath
- CqDs *Calothamnus quadrifidus* and *Banksia sessilis* Open to Closed Heath*

*ATA Environmental (2005) Vegetation Associations

Determine plant species present in each of these communities using PGV Environmental 2013 "Alkimos-Eglinton Composite Flora List", original references and site visits if required. Identify key species likely to be "primary feeding plants for Carnaby's Black Cockatoo".

6.2.2 Plant species at Yellagonga Regional Park once in Carnaby's Black Cockatoo Habitat

Determine plant communities once present at designated revegetation sites in YRP using available references, historical aerial photography and site visits if required. During the initial site visit (7th June 2013) within the remnant vegetation adjacent to the revegetation sites the following plant communities were identified:

- Marri (*Corymbia calophylla*) forest (with occasional Jarrah and Tuart),
- *Banksia prionotes* forest (with some *B. ilicifolia*, *B. menziesii* and *B. attenuata*) and;
- Flooded gum (*Eucalyptus rudis*) and Freshwater Paperbark (*Melaleuca rhaphiophylla*) woodland.

Determine plant species present in each of these communities using available references and site visits if required. Identify key species that are major components of these ecosystems and those listed as "feeding plants for Carnaby's Black Cockatoo".

6.2.3 Selecting plant species suitable for revegetation at YRP

The species list for the revegetation sites will be developed in consultation with DPAW with final approval to be obtained from DPAW. The final list will be compiled using the Eglinton plant species list and the YRP plant species lists and focusing on:

- Primary feeding plants for Carnaby's Black Cockatoo; and

- Restoring a sustainable natural ecosystem at Yellagonga Regional Park with species appropriate to the landscape.

The following key CBC species will be included in the final list of species to be used in revegetation at YRP (Table 5).

Table 5: Key Yellagonga Regional Park CBC Foraging Species

Plant	Common Name	Priority for planting for Carnaby's*
<i>Acacia saligna</i>	Orange Wattle	Low
<i>Banksia attenuata</i>	Slender Banksia	High
<i>Banksia dallanneyi</i>	Couch Honeypot Dryandra	Low
<i>Banksia grandis</i>	Bull Banksia	High
<i>Banksia littoralis</i>	Swamp Banksia	High
<i>Banksia menziesii</i>	Firewood or Menzies' Banksia	High
<i>Banksia prionotes</i>	Acorn Banksia	High
<i>Banksia sessilis</i>	Parrot Bush	High
<i>Corymbia calophylla</i>	Marri	High(feeding, roosting, breeding)
<i>Eucalyptus gomphocephala</i>	Tuart	High (feeding, roosting or breeding)
<i>Eucalyptus marginata</i>	Jarra	Medium (feeding, roosting)
<i>Eucalyptus rudis</i>	Flooded Gum	Low (roosting only)
<i>Hakea lissocarpa</i>	Honeybush	Medium
<i>Hakea prostrata</i>	Harsh Hakea	High
<i>Hakea ruscifolia</i>	Candle Hakea	Medium
<i>Jacksonia furcellata</i>	Grey Stinkwood	Medium
<i>Xanthorrhoea preissii</i>	Grass Tree	Medium

*Groom 2011 (Plants Used by Carnaby's Black Cockatoo, DEC)

The agreed species list will have consideration of the most likely revegetation technique for success using data from DPAW's Banksia Woodland Restoration Project to Identify:

- Those likely to grow from propagules (seeds, rhizomes, tubers) from the Eglinton East transferred topsoil,
- Those that can be grown from seed (of appropriate local provenance) either by nursery propagation and then planting or by direct seeding,
- Those that can be grown from cuttings or division (of plant material of appropriate local provenance) by nursery propagation and then planting and
- Recalcitrant species requiring more specialised propagation.

7 SEED COLLECTION PROTOCOLS

7.1 Species Selection and Source Areas

Before determining the areas for seed collection, the target species, desired quantities, and intended purpose for use first need to be established (see section 6). Where there are some areas of common vegetation communities, the majority of the YRP revegetation sites require species that are not present in the Eglinton clearing areas. Therefore to satisfy the approval conditions for this project there are two separate purposes for seed collection:

- Collection of on-site resources prior to clearing; and
- Provision of provenance genetic material for the rehabilitation of the identified offset sites.

Rehabilitation of the Yellagonga offset sites cannot be satisfied using Eglinton resources exclusively, therefore alternate seed sources are required. YRP is the preferred location for the alternate seed source area as it will provide suitable provenance seed. Suitable locations within the YRP will be determined in consultation with the DPAW.

DPAW have indicated that Neerabup National Park and possibly Neerabup Lake (for wetland species) would also be appropriate for seed collection. These areas are within the same landforms and the vegetation is likely to be of better condition than within YRP.

Seed recovery rates are normally constrained by commercial seed collection license conditions. For collections in DPAW managed land, license conditions state that no more than 20% of the reproductive material from any one plant may be harvested. This is to ensure individual plants, and ecosystem function, are not affected by the collection operations. However, as the Eglinton site will be cleared, long term survival is not a concern, and therefore 100% of the material can be harvested. Therefore on-site recovery of target species will be a priority, and collections at Yellagonga will only be undertaken to target species for which there is expected to be a shortfall.

Liaison with the City of Joondalup and the City of Wanneroo will be required if seed is to be collected on land managed by these local authorities.

7.2 Methodology

In general seed collection is normally undertaken in the hotter months (November to February), but some species may retain seed through the cooler months (i.e. Myrtaceae species) or produce seed outside of this main season. The seed will be collected in accordance with RIAWA Seed Supply Standards and Guidelines (Appendix 7).

Before collections commence, a seed production survey will be carried out to locate and record different seed producing species across the recovery sites, determine the likelihood and extent of seasonal production, and approximate the dates of collection based on seasonal factors. Species flower and set seed at different times in the season and also hold seed for different periods, so collection events need to be planned for the course of the season, based on the target species and quantities.

Seed recovery methods usually only vary by species, but in this case the source location will also influence the methodology. Picking techniques are normally selected to maximise recovery rates and reduce collection timeframes, based on the constraints of the 20% rule of the commercial seed collection license conditions. Where this rule does not apply (e.g. Eglinton clearing areas) the methodology may be modified to increase the rate of return for time spent.

Each lot of seed will be batched separately in the field, and immediately labelled with hand written tags to ensure that relevant collection information is correctly recorded. This information will include as a minimum the species name (or sample number if not positively identified), collection date, location, and number of specimens the material was recovered from. Seed will be catalogued daily and entered into a centralised database for future tracking.

Seed will be dried until it dehisces and then processed to the highest industry standards to extract the seed. Seed will be sealed in individual bags, then placed in a seed bank in vermin proof containers, with temperatures maintained below 26°C and relative humidity below 60%, which are the industry standards for short to medium term seed storage.

DPAW is currently developing provenance seed collection guidelines as a 'necessary operations' document for use when there is no management plan for a particular reserve. This guideline will be reviewed on completion to ensure consistent approach at YRP. In general it is recommended that seed collection occurs in the same soil type and landform as the recipient site.

7.3 Collection Scheduling

Although the revegetation program may not be undertaken for several years, the seed collection program is a high priority, and has commenced for the species identified in Table 4 that are available from the Eglinton Sites. Seed collection from the species that do not occur on Eglinton will commence once the final species list has been compiled and the seed collection license has been issued.

Different seasonal environmental factors (i.e. temperatures, rainfall, etc.) influence the production rates of different species. For example some species produce large quantities of seed under drought stress, whilst others only set seed when not subject to stress. Therefore to optimise species richness and recovery rates, collections will be staged over several years, to reduce the influence of environmental factors on the rehabilitation program.

The timing of seed collection in relation to propagation requirements for each stage of development needs to be considered. An allowance of 2 man days of seed collection per hectare has been made for each stage. Native seed will be collected from all areas of CBC habitat identified in Figure 4 of this CRMP and the Attachment B of the EPBC Approval which forms Appendix 1 of the CRMP.

All seed collection needs to be undertaken by suitably licensed operators and statutory returns recording all seed collected are to be submitted to DPAW on a quarterly basis.

8 TOPSOIL COLLECTION STRATEGY

Topsoil translocation has the potential to be the most successful rehabilitation method, as the topsoil contains seed stores built up over a number of years, soil micro-organisms, and nutrients that may be beneficial to ecosystem re-establishment. However, the topsoil may also transfer problems to the recipient site such as the seed of undesired species, plant pathogens (e.g. *Phytophthora*), and therefore needs to be managed selectively.

To optimise the outcome of topsoil translocation the collection depth, timing of spreading, and stockpiling duration are all important. Done correctly, topsoil translocation can lead to very high plant densities due to years of accumulated seed, and can also lead to greater species diversity due to it containing seed and rootlets of species that may be difficult to harvest or propagate commercially. However, this can also include weeds as well as natives, and the selection of the source material is just as important as the translocation methodology.

Whilst it is unlikely that Dieback will occur in the calcareous Eglinton soils it is important to consider the risks of spreading dieback and weeds with topsoil replacement. Closer to the timing of clearing activities, indicator species should be inspected for signs of dieback stress. Any areas deemed to be possibly infected with dieback should be excised from the topsoil removal process to negate the risk of spreading dieback into the regeneration site. Dieback transfer could seriously impact achievement of the success criteria.

8.1 Approval Condition 12

Approval condition 12(a) states the following:

*A commitment to the staged collection of native seed prior to **clearing** from within Carnaby's Black Cockatoo foraging habitat as shown in Attachment B (checked in black, but excluding those areas shaded green in Attachment, E), and the collection of topsoil from 33 ha of the project site, from within 73 ha of good or better condition Carnaby's Black Cockatoo habitat as shown in Attachment B (checked in black), for use in revegetation.*

It is anticipated that the 33ha of topsoil collected from the project area will be used at Yellagonga Regional Park and onsite at Eglinton.

8.2 Timing

To obtain optimum results with respect to seed germination, plant establishment, and species diversity, topsoil should where ever possible be recovered in summer/autumn (dry conditions), and directly respread without stockpiling. If stockpiling cannot be avoided the good quality top soil must be kept separate from other topsoil. Ideal topsoil stockpiles maximise surface area to increase oxygen transfer within the soil. Long, narrow (2-3 m wide), and short (2 m tall) stockpiles achieve this best. The stockpiles will be rotated frequently (i.e. monthly) if stored for extended periods to maintain oxygen levels within the centre of the stockpile. This keeps the soil 'alive'. Stockpiling wherever possible will be avoided by preparing the recipient site well in advance of topsoil stripping.

8.3 Stripping Depth

For optimum results, if topsoil is available it will be recovered to a depth of 5cm, in late summer/autumn (dry conditions), and directly respread without stockpiling to a depth of 5 cm. If the recipient site is larger than the source, the spreading depth can be reduced to increase the extent of coverage of the limited resources.

8.4 Staging and Source Areas

The indicative staging plan for the east Eglinton development is spread over 17 years, with final stages being completed in 2031 (Table 5). The staging plan for the development will be driven by market conditions and may change throughout the course of the project. Eglinton will keep DPAW informed of any changes in the staging of the development.

The indicative area of CBC habitat within each of these stages is shown in Table 5. The vegetation condition of the CBC habitat ranges from Completely Degraded to Very Good condition (Figure 6). CBC habitat in less than Good to Very Good condition is not suitable for topsoil relocation.

Table 6: Indicative Staging Plan

Stage (year)	Indicative CBC Habitat (ha)
2014-15	18.96ha
2015-16	17.77
2016-17	16.65
2017-18	0.86
2018-19	17.20
2019-20	13.45
2020-21	3.38
2021-22	11.14
2022-31	15.33
Other	8.73
Total	123.47

The condition of the CBC habitat was last mapped in 2004 and ranged from Completely Degraded to Very Good (Appendix 9). Based on the 2004 vegetation condition mapping there was approximately 72.85ha of CBC habitat in Good to Very Good condition within the referral area. Table 7 provides a breakdown of the CBC habitat in Good to Very Good condition for each stage of development.

Table 7: Area of CBC Habitat in Good to Very Good Condition for Each Indicative Stage of Development

Development Stage	Good	Very Good	Total area
2014-15	0.0002	7.1051	7.1053
2015-16	2.5573	13.4604	16.0177
2016-17	0.0003	14.1243	14.1246
2017-18	-	-	0

2018-19	0.1865	2.8023	2.9888
2019-20	0.0001	2.0918	2.0919
2020-21	2.2217	0.4686	2.6903
2021-22	1.4778	4.4384	5.9162
2022-31	3.0064	11.6949	14.7013
Other	0.9958	6.2183	7.2141
Total	10.4461	62.4041	72.8502

The recent site visit (6 June 2013) by PGV Environmental, Tranen and the DPAW noted that the overall condition of the CBC habitat varied from the 2004 mapping, with some areas in better condition and others in worse condition.

The vegetation condition within the CBC habitat areas at Eglinton will be re-assessed for each stage of development, to ensure that only top soil that is in Good or Very Good condition is used for relocation. The vegetation condition will be re-assessed using a modified version of the Keighery Scale (1994) that will include measures for native flora composition and cover/abundance of weeds from the Kaesehagen Scale (1994) as shown in Table 8.

Table 8: Vegetation Condition Scale

Rating	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing. 75% to 80% native flora composition 5% to 10% cover/abundance of weeds
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing. 50% to 75% native flora composition 10% to 20% cover/abundance of weeds
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Source (Keighery, 1994 and Kaesehagen, 1994)

The resultant mapping will then be used to calculate the amount of potential top soil suitable for relocation. If the volume of top soil suitable for relocation is greater than what is required at YRP and onsite at Eglinton, the proponent will inform the DoE.

DPAW have indicated at this point in time (August 2013) they do not have any other receival sites within 20km of Eglinton.

8.5 Methodology

Due to the extended timeframe for the project, the condition of the CBC habitat and seed bank within the topsoil is likely to vary due to weed, dieback and possible fire impacts. The following methodology for assessing the suitability of the topsoil in the Eglinton CBC habitat will be adopted at each stage of development for the life of the project.

8.5.1 Vegetation Condition Review

For each stage of development, the vegetation condition of the CBC habitat will be reviewed against the mapping undertaken in 2004 to determine if the condition has varied from the baseline.

Top soil will only be sourced from CBC habitat areas that are rated as Good to Very Good at the time of clearing.

DPAW have indicated that top soil from areas within a 20m buffer of Marmion Ave will not be accepted for use at Yellagonga Regional Park due to the degraded nature of the CBC habitat.

8.5.2 Weed Assessment

For each stage of development the extent of weed incursion within the Eglinton CBC habitat will be rated using the scale shown in Table 5. The areas that contain significant invasive weed incursions will not be included in the topsoil relocation process. Invasive weed species include:

- Veldt Grass (*Ehrharta calycina*)
- Lovegrass (*Eragrostis curvula*)
- Pigface (*Carpobrotus edulis*)
- Lupins (*Lupinus cosentinii*)
- Thistle (*Cirsium spp.*)
- Geraldton Carnation Weed (*Euphorbia terracina*)

Undertaking the weed assessment for each stage of development will minimise the potential for transporting weed material in the topsoil. The weed assessment for each stage will be undertaken with regard to seasonal growth patterns where possible.

8.5.3 Dieback Survey

The presence of dieback is unlikely in the Eglinton calcareous soils however to minimise the risk of transporting the disease a dieback assessment will be undertaken for each stage of development by a suitably qualified consultant to determine if the *Phytophthora cinnamomi* is present in the soil.

Should dieback be identified in the stage of development, the topsoil from the CBC habitat will not be transported to other sites.

8.5.4 Topsoil Volume

The area of good quality topsoil from CBC habitat for each stage will be calculated based on the following agreed criteria:

- CBC habitat to be in Good or Very Good condition;
- Weed cover within the CBC habitat is to not include a high density of invasive weeds; and
- The topsoil within the CBC habitat is to be dieback free.

The volume of topsoil will be calculated on a stripping depth of 50mm.

8.5.5 Relocation Site Identification

The volume of total collected topsoil, relocated topsoil and location of the receival site(s) will be provided to the Department in the annual Compliance Report required under Condition 3 of the 2010/5777 EPBC Approval to demonstrate the ongoing requirement to use at least 33ha of Good to Very Good top soil within Yellagonga Regional Park and onsite at Eglinton.

9 EGLINTON CLEARING AND REVEGETATION MANAGEMENT PLAN

9.1 Objectives

The key objectives are:

- Seed collection from CBC habitat;
- Identify good quality topsoil for re-use as per criteria set out in section 8;
- Establish 1.9ha of primary CBC foraging species within the POS areas identified in Attachment D of the EPBC Approval;
- Establish 50% of the streetscapes in the development with primary CBC foraging species; and
- Provide any excess seed and good quality topsoil to the DPAW (or others) for use in revegetation projects within 20km radius of the Eglinton site.

9.2 Seed Collection

All seed collection from CBC foraging species will be undertaken in accordance with the seed collection protocols provided in Section 7. The seed collection protocols have been prepared in consultation with Tranen Revegetation Systems and the DPAW using best industry practice and meet the requirements of the Western Australian Revegetation Industry Association Standards and the Florabank Standards (see section 4.2.1).

Seed collection from CBC foraging species at Eglinton will be undertaken for each stage of subdivision prior to any native vegetation clearing including UXO searches. Seed will be collected from both early and late flowering known CBC foraging species to maximise the chances of CBC foraging on the revegetation sites at the earliest possible time.

If there is an excess of seed from the project area this will be offered to the DPAW for use in their revegetation projects.

9.3 Vegetation Removal

The removal of vegetation from each subdivision is guided by a specific Vegetation and Fauna Management Plan (VFMP) as required by the City of Wanneroo.

The VFMP details specific pre-clearing protocols such as protection of vegetation to be retained, fauna management, vegetation clearing, mulching woody material, waste management, dust and erosion management and contract staff management requirements.

9.4 Topsoil

Topsoil (33ha) will be stripped to a depth of 50mm from areas of CBC habitat identified as suitable through the process detailed in section 8.

The topsoil will be kept separate from other topsoil and used in landscaping and streetscaping where appropriate.

If there is an excess of suitable topsoil other than that required for use at YRP and onsite the Department will be informed in the compliance assessment report.

9.4.1 Public Open Space

The Public Open Space areas identified in Figure 5 are largely for drainage and recreation purposes and as such will be completely cleared and re-contoured as part of subdivision works. Approximately 10% of each of the POS areas (1.9ha overall) will be landscaped with known primary CBC foraging species.

The detailed landscape and engineering design for the POS areas will be prepared at each relevant stage of subdivision.

9.4.2 Fencing

It is unlikely that the POS areas identified in Figure 5 will retain any native vegetation. If however the subdivision and civil design indicates that CBC foraging habitat within the POS areas can be retained these areas will be fenced and curtailed prior to preconstruction activity.

Areas identified as having good quality topsoil are to be surveyed and pegged

9.5 Revegetation Onsite

The purpose of the revegetation areas on the Eglinton site is to create foraging habitat for CBC that is suitable for drainage and active recreational POS.

The landscape design for POS areas AA, AC, AD, AF, and T will be prepared as part of the subdivision works for each relevant stage of development. The landscape concept design and planting schedule for each POS will be provided to the Department in the annual Compliance Report required under Condition 3 of the 2010/5777 EPBC Approval to demonstrate that 10% (1.9ha overall) of the POS areas has been landscaped with known primary CBC foraging species.

Ten percent of each of these POS areas will be revegetated with primary CBC foraging species providing an overall 1.9ha of future foraging habitat. The revegetation will largely focus on tube stock plantings and relocation of salvaged Grass Trees.

Management of these areas is to be undertaken by the Proponent during inception and development stages. Following completion, management and maintenance of the open space areas is to be handed over and undertaken by the City of Wanneroo.

9.5.1 Species List

The indicative CBC foraging species list for the revegetation works at Eglinton has been prepared in consultation with the project's Landscape Architects. The species have been further supplemented with suitable species from the *Plants used by Carnaby's Black Cockatoo* (DEC, 2011) (Appendix 4). The indicative species list is shown below in Table 9.

Table 9: Eglinton Indicative Species List for Public Open and Space and Streetscapes.

Species	Common Name	Growth Form
<i>Agonis flexuosa</i>	Peppermint Tree	Tree
<i>Allocasuarina humilis</i>	Dwarf Sheoak	Medium Shrub
<i>Banksia ashbyi</i> 'Dwarf'	Ashby's Banksia	Low Medium Shrub
<i>Banksia attenuata</i>	Slender Banksia	Tree
<i>Banksia blechnifolia</i>	Southern Blechnum banksia	Low Shrub
<i>Banksia menziesii</i>	Firewood Banksia	Tree
<i>Callistemon viminalis</i>	Captain Cook Bottlebrush	Tall Shrub
<i>Corymbia ficifolia</i>	Red Flowering Gum	Tree
<i>Eremophila glabra</i> 'Kalbarri Carpet'	Kalbarri Carpet	Low Shrub
<i>Eucalyptus gomphocephala</i>	Tuart	Tree
<i>Eucalyptus tottiana</i>	Coastal Blackbutt	Tree
<i>Grevillea preissii</i> 'Sea Spray'	Salt Spray	Medium Shrub
<i>Hakea lissocarpa</i>	Honey Bush	Small Shrub
<i>Hakea ruscifolia</i>	Candle Hakea	Medium Shrub
<i>Hakea trifurcata</i>	Two Leaved Hakea	Tall Shrub
<i>Xanthorrhoea preissii</i>	Grass Tree	Grassy or Strappy

9.5.2 Planting Methodology

Plants should be installed as tubestock, 140mm or 200mm as a minimum with a native plant fertiliser tablet, such as Typhoon or similar. All newly planted areas will have a 75mm layer of bark mulch applied.

Plants are to be planted in random mixes at the required spacing in creating a naturalistic specie arrangement as would be generated in nature.

All plants shall be vigorous, well established, hardened off, of good form consistent with species or variety, not soft or forced, free from disease and insect pests, with large healthy root systems and no evidence of having been restricted or damaged. Trees shall have a single leading shoot.

9.5.3 Streetscapes

Native trees suitable for CBC will be utilised in streetscapes throughout the development area. These will be established by the Proponent following construction of roads. The trees will be maintained by Proponent until handover of the street environments to the City of Wanneroo.

To demonstrate that 50% of streetscapes have been planted with CBC foraging species, the landscape masterplan for each stage of development will be provided to the Department in the annual Compliance Report required under Condition 3 of the 2010/5777 EPBC Approval.

To minimise Carnaby's Black Cockatoos striking vehicles, these plantings must not be planted within 30m of roads with a speed limit of greater than 60 km/hour.

Following completion, management and maintenance of streetscape and road reserve areas is to be undertaken by the City of Wanneroo.

9.6 Weed Management

A complete post emergent herbicide programme shall be implemented to control and manage unwanted weeds and grasses. These weeds and grasses will include the following species:

- Crab Grass (*Digitaria spp.*)
- Johnson Grass (*Sorghum halepense*)
- Onion Grass (*Romulea rosea*)
- Medick Clover (*Medicago lupulina*) and
- All broad leaf weeds

9.7 Transfer of Public Open Space to the City of Wanneroo

The POS AA, AC, AD, AF, and T areas will be ceded to the CoW at each relevant stage of subdivision once the POS has been landscaped.

The typical maintenance period for works in relation to a POS area is normally for 2 Year period. This is determined from the date of Practical Completion of the site landscape works by the appointed Contractor. Handover to the CoW may occur at some stage during the second year period.

Should the maintenance be handed to the City of Wanneroo at some time during the second year period the Client shall only be liable to pay for the maintenance as undertaken by the landscape Contractor up to the Council handover date without any penalty.

10 YELLAGONGA REVEGETATION MANAGEMENT PLAN

10.1 Objectives

The primary objective for the YRP revegetation sites is to create future CBC foraging and roosting and habitat. Whilst the primary objective is to create CBC habitat, the project will restore an ecosystem closely resembling the pre-cleared species composition to provide habitat for a range of flora and fauna species.

10.2 Revegetation Sites

The intent of the EPBC conditions is to offset the impacts of clearing CBC habitat at Eglinton through the following activities:

- Create 12.7ha of CBC habitat at YRP;
- Establish 1.9ha of known primary CBC foraging species within drainage and recreation POS at Eglinton;
- Provide 50% of known primary CBC foraging species in streetscaping at Eglinton; and
- Offer any excess good quality topsoil and seed from cleared CBC habitat at Eglinton to the DPAW and or (others).

The DPAW Regional Parks Unit has identified four areas totalling 12.7ha of completely degraded habitat within YRP that are suitable for revegetation with primary known CBC foraging species (Attachment 2). The location of the revegetation sites are shown in Figure 1.

The sites were selected against the following criteria:

- The sites need to be already protected within a conservation park and appropriately zoned to ensure that the sites have long term security of tenure and ongoing management;
- Open areas with no native understorey and with scattered to no trees to allow easy spreading of topsoil and vegetative material; and
- The surrounding vegetation should contain CBC plant food sources and preferably be known as CBC feeding areas.

YRP has different geomorphic values to Eglinton however the revegetation sites would have originally contained CBC habitat. Topsoil from Eglinton will not contain all of the species that would have originally occurred at YRP. To overcome this issue, seed and topsoil collection from Eglinton will need to be supplemented by collection of seed from natural areas within and adjacent to YRP.

The locations of the YRP revegetation sites are shown in Figure 3 and described below in Table 10.

Table 10: Yellagonga Regional Park Revegetation Site Descriptions

Site	Size (ha)	Description	Current Condition
1a	3.49	Extensively cleared with some Marri trees over weeds in the north east corner	Completely Degraded
1b	2.61	Extensively cleared with isolated trees on western boundary (including a large <i>Ficus microcarpa</i> var. <i>hillii</i>) over weeds and wetland fringe	Completely Degraded
2	1.2	Extensively cleared, predominantly weeds and wetland fringe.	Completely Degraded
3	5.4	Extensively cleared with isolated trees and shrubs mid-slope and wetland fringe	Completely Degraded

The condition of the four revegetation sites is rated as Completely Degraded. The sites have been historically cleared and consist of bare paddocks with in some cases isolated remnant trees. The dominant weed species include particularly Guildford Grass (*Romulea rosea*), Lovegrass (*Eragrostis curvula*), Lupins (more on the mid-slopes), Veldtgrass (patchy), Broad leafed daisy (Probably *Taraxacum officinale*) and Pigface (*Carpobrotus edulis*) mostly on the lower parts of Sites 2 and 3, and Couch (*Cynodon dactylon*).

10.2.1 Tenure

The four YRP revegetation sites are owned in freehold by the WAPC and managed by DPAW under a *Conservation and Land Management Act 1984* management agreement.

In future, the four sites will be included in reserves created from the WAPC freehold land. The reserves are to be vested in the Conservation Commission of Western Australia for the purpose of Conservation Park.

10.2.2 Management

The YRP Management Plan identifies that the four sites are to be used for natural environment uses and passive recreation.

10.3 Site Preparation

The four sites are completely degraded and will require the same site preparation techniques.

10.3.1 Weed Control

Weeds are normally the greatest factor affecting revegetation success. If weeds are effectively controlled then the likelihood of the project being a success are significantly improved. Weed control will commence as soon as possible at the offset sites to prevent new weed seed from being generated, and to exhaust the existing weed seed bank, regardless of when revegetation activities commence.

The YRP sites are presently mostly completely degraded, which allows for the boom spraying of broad spectrum herbicides (i.e. glyphosate) targeting the widest range of species. As this technique is indiscriminate, it should only be employed in areas where there is no threat of off-target damage to

remnant native vegetation. In areas unsuitable for boom spraying, targeted spot spraying will be undertaken. As most weeds are likely to exist as seeds in the soil surface layer, an effective method of controlling weeds will be to scalp away the surface topsoil into narrow windrows or into a separate pile to one side. The need for treatment of weeds should therefore be reduced.

Pre-emergent herbicide is effective in killing seeds as they germinate, and may be considered for use in some areas on the approval of DPAW.

Herbicide spraying will only be undertaken by operators who:

- Are appropriately qualified and licensed in herbicide application;
- Have demonstrated experience in the ability to identify, and distinguish between, native and weed species; and
- Are familiar with the most appropriate control measures, timing, herbicides, and application rates for the target species.

10.3.2 Topsoil

As the plant communities and soils at Eglinton are different to those at the YRP revegetation sites it is proposed that topsoil from Eglinton East only be spread on about half of the area proposed for revegetation to allow a comparison of the benefits of topsoil transfer versus direct seeding and planting alone.

The final detailed plan for the revegetation works will identify the areas where top soil will be utilised.

10.3.3 Earthworks

The sites will require ripping to break compaction and promote plant growth

10.3.4 Site Protection

The potential for rapid, widespread and lasting damage to plants and seedlings through fauna predation on the offset sites is high. In 2007 Main Roads WA undertook a trial in nearby Neerabup Regional Park, testing eight different kangaroo deterrent treatments and the effect that these had on planted seedling survival rates (NMCG 2008). The most effective treatment in terms of both plant survival and species richness was the installation of a 1.8 m chain link exclusion fence. Whilst this fence did restrict kangaroo activity, it did not restrict rabbits. Losses in the fenced plot after 10 weeks due to predation were 7%, but in the control plot 50% losses were recorded due to predation in the same period.

To minimise risk and ensure a successful outcome, fauna control measures are required. The Regional Parks Unit uses a standard 1.2m agricultural fence across all of the parks which kangaroos can easily clear. In this circumstance, DPAW has agreed to the construction of a 1.8 m tall chain link fence around the areas to be revegetated. Eglinton will construct the fence with a buried rabbit proof skirt that will provide the greatest level of protection for all plants. Once the site is fenced, rabbit control will be undertaken in accordance with the Regional Parks Pest Animal Control Plan. Eglinton will remove the 1.8m fence when the completion criteria for the revegetation project have been met and the original 1.2m agricultural fence will be reinstated. Should DPAW determine to keep the 1.8m fence in place beyond the five year monitoring period to continue to provide protection from grazing animals, Eglinton will not be responsible for removing the fence.

Although the soil will be exposed following removal of weeds and before native vegetation establishes, soil erosion is expected to be relatively minor during this period. Large established trees surround most of the sites, providing a natural windbreak. In areas that are not protected by trees and are exposed to high winds, shade cloth may be attached to the perimeter fences to provide a barrier to the wind. The western half of Site 1A is located at the top of a ridge that slopes to the east. Parts of this site may be exposed to the summer easterly winds, and temporary internal windbreak fencing may also be required.

10.4 Planting Design, Planting Schedule and Revegetation Timeframes

The planting design and schedule will be prepared once the agreed species list for YRP sites is completed (see section 6).

The detailed planting design and schedule will be submitted to the Department in the annual Compliance Report required under Condition 3 of the 2010/5777 EPBC Approval to demonstrate that the 12.7ha of revegetation at YRP has been designed and the final number of species identified.

10.5 Methodology

10.5.1 Direct Seeding Technique

Direct seeding has the potential to generate high plant densities given that millions of seeds are broadcast over each hectare. However, studies at Rocla restoration sites has found that only 7% of the broadcast mix of diaspores delivered to the site resulted in seedlings (Rokich *et al.*, 2002). Whilst only 7% germinate into seedlings, from Tranen experience many of these will not survive the first summer and a figure closer to 1% is more likely in the longer term.

As seed is very small and fragile, direct seeding is only successfully applicable in select situations. In Tranen experience sites must be free of vegetative litter (i.e. mulch, weeds) to ensure contact between the soil and the seed for germination to occur. In areas where topsoil translocation has taken place, the soil will be free of vegetative litter immediately after transfer, but weed germination is expected in the first autumn. In areas where topsoil is not to be translocated, scalping of the upper 100 mm of soil will occur to remove the vegetative litter and weed seed, to promote conditions conducive to direct seeding success.

Seed to be broadcast on the YRP revegetation sites will receive proven treatments to promote germination, e.g. smoking, boiling, heat variation and scarification.

The seed also can't be buried too deeply otherwise germination will not take place either. Rokich *et al.*, (2000) found that the optimal depth for seedling emergence of *Banksia* woodland species was 1 cm with increased burial depth beyond this resulting in a negative relationship with seedling emergence. Following all other surface preparation activities, the site will be lightly scarified using harrows to create ideal conditions for shallow seed collection and burial.

Based on Tranen experience in *Banksia* woodland with similar completion targets a nominal direct seeding rate of 6 kg/ha should be sufficient where direct seeding is used as a stand-alone revegetation technique, and there are no external impacts. When applied in combination with seedling planting it is recommended that half the seeding only rate is used (3 kg/ha).

10.5.2 Seedling Planting

Seedling planting is the most reliable revegetation technique when seedlings are cared for and planted at the appropriate time of year. In a typical year planted seedling survival rates are expected to be in the order of 60 – 90% (based on monitoring of over one million seedlings planted by Tranen), making it a much more reliable technique than direct seeding.

Seedlings typically grown in Perth vary significantly in size from cell trays (34mm x 34mm x 50mm) to deeper rooted forestry tubes (50mm x 50mm x 120mm). Tubestock size is important for survival, especially in fast drying nutrient and structure poor sandy soils such as those found at the Yellagonga offset sites. Forestry tubes will be primarily used in the revegetation program, as by placing the active roots deeper into the soil profile they are less susceptible to soil moisture fluctuations and survival rates will therefore be optimised.

Assuming a seedling survival rate of 80% (which might be expected during normal weather conditions) and a final plant density requirement of 1.6 plants/m², the seedling planting rate when used as a stand-alone revegetation technique therefore should be 2 plants/m². When used in combination with direct seeding the planting rate can be halved to 1 plant/m².

In a recent study into *Banksia attenuata*, low-phosphorus native plant fertiliser tablets were found to increase growth significantly (Grose, 2013). Therefore all seedlings will have one 10 g low-phosphorus fertiliser tablet buried adjacent to the rootball of each seedling.

The species to be planted will be the predominant *Banksia* species of the area together with the appropriate *Eucalyptus* and *Allocasuarina* species. The strategy is to establish these upper storey species quickly, with reticulation support, continue intensive weed control ahead of direct seeding and then allow a season of germination without non-selective weed control. This will allow the native germinants time to establish and become prominent before non-selective weed control is recommenced. Selective control of grasses will be ongoing.

All species are to be grown in forestry tubes 50 x 50 x 125mm.

10.5.3 Completion Criteria

In order for a site to be considered rehabilitated (or progressing satisfactorily towards being rehabilitated) a number of factors need to be considered in both the short and long term, with the most appropriate factors to this site being:

- Native plant density;
- Species richness;
- Weed competition; and
- Ecological processes (i.e. flowering and reproduction, fauna utilisation, etc.).

By setting target levels for these factors, a quantitative measure of progress can be made. Should the required levels not be achieved, not only will this trigger remedial action, but will also determine the extent of the action required.

Completion criteria need to be practically achievable, without compromising the long term goals of the project. Based on completion criteria for another nearby project, recently developed by Tranen in conjunction with DPaW, the targets shown in Table 11 will be applied.

Table 11: Yellagonga Regional Park Revegetation Sites Completion Criteria

Native species category	Species Richness	Density*	CBC Species*
Trees	100%	... stems per hectare	... stems per hectare
Large shrubs	80%	... stems per hectare	
Other (shrubs, herbs, sedges etc)	60% *	... stems per hectare	

**Density will be determined from the final approved species list and based on the reference sites*

* Note 1: the 60% species richness figure may need to be revised following a formal monitoring survey of nearby remnant bushland reference site, most likely to be within Neerabup National Park. Species observed may be difficult to propagate and may not be commercially available, or may be known to have low seed viability, making them inappropriate for use in the revegetation program. Attempts will be made to return as many species as practicable.

*Note 2: Tree stem density will be equal to or greater than nearby remnant bushland reference site (to be determined by formal survey) with Carnaby's Black-cockatoo foraging and habitat species density to be no less than the Eglinton clearing sites. As a guide the average native stem density (including trees) is likely to be in the order of 1.6 plants/m²;

Weed Species

The listing of a species as a Declared Plant and the rankings assigned to various weeds within the *Environmental Weed Strategy for Western Australia* (Department of Conservation and Land Management, 1999) based on weed distribution, invasiveness and impacts, allows the weeds present at the sites to be prioritised into groups.

Need to provide list of all weed species present at both sites and prioritise in accordance with the weed strategy.

Completion criteria:

- No introduction of new weed species to the rehabilitation sites
- Maintain weed cover to less than 10% across the entire rehabilitation site
- Target priority weed species outlined in the above list aiming for eradication across the entire rehabilitation site (i.e. individual weed cover shall not exceed 5%)

During site visits whilst on ground works are being carried out, informal monitoring of the site will be carried out by the on-ground Project Managers, and the works contractor to ensure that any issue arising such as plant death or grazing can be attended to in a timely manner.

10.6 Monitoring

Monitoring of revegetation activities within the YRP revegetation sites will occur twice annually in spring and autumn for a minimum of five years after planting, to demonstrate progress towards the

completion criteria. Monitoring will include an assessment of weeds present and signs of pest animal species such as rabbits and kangaroos.

Two monitoring methods will be implemented for each site, namely:

- Three photo monitoring points will be set up in each of the four areas to enable comparison of the area over time, and
- Three monitoring plots 10 m x 10 m will be set up in each of the four areas.

An annual report will be provided to the DPAW describing the monitoring outcomes, along with any recommendations on the need for infill planting, weed and/or pest control. This document will also contribute to reporting requirements associated with the Commonwealth environmental approvals process.

In the event Dieback (*Phytophthora cinnamomi* or some other species) is suspected as being the cause of the decline, discussions with the DPAW and Department will occur to review and refine the revegetation plan and completion criteria as appropriate.

10.7 Carnaby's Black Cockatoo Monitoring Program

It is also proposed that at year 2018 an annual CBC monitoring program be undertaken within the revegetation areas at Eglinton and YRP to determine CBC activity.

The DPAW are developing a standard methodology for monitoring CBC, the design and methodology of the monitoring program will be discussed with the DPAW and provided as an addendum to this CRMP.

11 IMPLEMENTATION TIMEFRAME AND RESPONSIBILITIES

11.1 Implementation Schedule

The management actions listed in Table 12 below outline the prescribed actions for implementing the CRMP at YRP and Eglinton. The table addresses the actions listed in the Sections 7, 8, 9 and 10 of this document and outlines relevant timing for implementation. The following phases are referred to in the management action table:

- Pre-construction (PC) refers to the period prior to any clearing of CBC habitat at Eglinton with the exception of the area shown in yellow in Attachment D of the EPBC Approval (Appendix 1);
- Construction (C) refers to the period of initial clearing and stripping of topsoil from the Eglinton site;
- Revegetation (R) refers to the actions to be undertaken at YRP; and
- Ongoing (O) refers to an action that should be ongoing for the life of the project (ie final stage of Eglinton development).

11.2 Responsibility

Eglinton is responsible for a number of preliminary actions that will inform the preparation of the final species list for the YRP sites. The DPAW and Tranen will work closely with Eglinton to finalise the species list which will be provided to the Department in the annual Compliance Report.

The implementation of the CRMP will be the responsibility of Eglinton through their Environmental Consultants and Tranen.

DPAW has indicated (August 2013) they do not have any other receival sites within 20km of Eglinton.

11.3 Timeframe

The timeframe for the project is approximately 17 years with the final stage of the development scheduled for completion in 2031, however this is dependent on market conditions.

The YRP revegetation component will be completed five years post planting.

The indicative schedule for the CRMP is shown below in Table 13.

Table 12: CRMP Actions and Timing

Key Tasks	Phase	Action #	Action	Purpose	Priority	Timeframe	Responsibility
Species Selection Strategy	PC	1	Determine Plant Communities once present at YRP revegetation sites.	To restore sustainable ecosystem at YRP	H	2013	Eglinton/PGV/DPAW
	PC	2	Identify CBC foraging species present in each plant community.	To ensure correct provenance of the species being used for revegetation and maximise survival rate	H	2013	Eglinton/PGV
	PC	3	Develop an agreed approach for selecting species for revegetation from Eglinton and YRP species lists.	Restore sustainable ecosystem at YRP	H	2013	Eglinton/DPAW
	PC	4	Identify revegetation technique for each species.	Focus on species that have high rate of return to provide early CBC habitat and are cost effective to establish.	H	2013	Tranen/PGV
	PC	5	Set Completion Targets	To determine end of revegetation project	H	2013	Eglinton/PGV/DPAW
	PC	6	Design monitoring program	To ensure success of revegetation works.	H	2013	Eglinton/PGV/Tranen
	PC	7	Provide the species list and completion criteria in the annual Compliance Report provided to the Department to meet Condition 3 of the EPBC 2010/5777 approval.	Keeping the Department informed and ensuring compliance with EPBC Approval	H	2013	Eglinton/PGV
YRP Planting Schedule	PC	8	Prepare planting design and schedule for YRP sites based on agreed species list	To inform the design of the CBC habitat.	H	2013	Eglinton/Tranen

Key Tasks	Phase	Action #	Action	Purpose	Priority	Timeframe	Responsibility
	PC	9	Discuss with the DPAW and agree on planting design and schedule	To have an agreed approach to the YRP revegetation	H	2013	PGV/Tranen/DPAW
	PC	10	Provide the planting design in the annual Compliance Report provided to the Department to meet Condition 3 of the EPBC 2010/5777 approval.	Keeping the Department informed an ensuring compliance with EPBC Approval	H	2013	Eglinton/PGV
Seed Collection	C	11	Identify seed collection source sites other than Eglinton	The Eglinton development area does not support all species to be utilised in the YRP revegetation.	M	2014	Tranen/DPAW
	O	12	Submit seed collection license applications	To ensure correct Statutory process is applied	H	2014-2015	Tranen
	O	13	Collect seed from Eglinton to be grown for direct planting or used for direct seeding.	Future propagation for revegetation sites	M	2013-2028	Tranen
	O	14	Maintain seed bank for life of project.	To ensure an adequate seed bank is maintained for the revegetation exercise.	M	2013-2028	Tranen
	O	15	Provide any excess seed to the DPAW or others for use in other revegetation projects.	To facilitate other CBC habitat creation.	M	2020- 2028	Eglinton/PGV/DPAW
Topsoil Collection Strategy	PC	16	Develop an agreed approach for identifying CBC habitat areas suitable for topsoil re-use.	Provide best quality topsoil for revegetation projects.	H	2013	Eglinton/PGV/Tranen/DPAW
	C	17	Re-assess CBC habitat condition for each stage of development	To minimise collection of topsoil from poor quality vegetation condition over the life of the project	M	2014-2028	PGV

Key Tasks	Phase	Action #	Action	Purpose	Priority	Timeframe	Responsibility
	C	18	Engage a consultant to undertake dieback assessment for each stage of subdivision.	Minimise risk of transporting Dieback to other sites.	M	2014-2028	Eglinton/PGV
	O	19	Provide written evidence to identify the receival sites and the amount of topsoil that has been relocated to the Department in the annual Compliance Report provided to the Department to meet Condition 3 of the EPBC 2010/5777.	Compliance with EPBC Approval	M	2014-2028	Eglinton/PGV
Eglinton Revegetation Plan	O	20	Collect seed from CBC species for each stage of development. Provide evidence of seed collection to the Department in the annual Compliance Report required to meet Condition 3 of the EPBC 2010/5777	To ensure provenance of the species being used	H	2013-2028	Tranen
	O	21	For each stage of development, the identified high quality topsoil areas will be surveyed and pegged prior to clearing activities.	To ensure only the high quality topsoil is collected for re-use	M	2013-2028	Eglinton/Cossills
	O	22	Re-useable topsoil that is unable to be used immediately will be stockpiled separately from poor quality topsoil for later rehabilitation of disturbed areas (on and offsite). These stockpiles will be kept to a	Maintain seed bank viability	M	2013-2028	Eglinton/Cossils/PGV

Key Tasks	Phase	Action #	Action	Purpose	Priority	Timeframe	Responsibility
			limited size to ensure topsoil quality.				
	O	23	Provide landscape design package for POS areas AA, AC, AD, AF and T in the annual Compliance Report at the relevant stage of subdivision to demonstrate revegetation of 10% of each POS with CBC foraging species. The package will include layout of POS, CBC species to be established, completion criteria as per City of Wanneroo requirements, ongoing maintenance and timeline for transfer of POS to the City of Wanneroo.	To create 1.9 ha of CBC foraging species at Eglinton	M	2013-2031	Eglinton/Emerge/PGV
	O	24	Establish 50% of streetscapes with suitable CBC foraging species.	To establish future CBC foraging species in accordance with the EPBC Approval	M	2013-2031	Eglinton/Emerge/PGV
YRP Revegetation Plan	C	25	Contract a qualified rehabilitation and revegetation contractor to undertake on-ground planning for and revegetation works across the YRP sites.	To ensure success of revegetation works	H	2013	Eglinton/PGV
	PC	26	Prepare revegetation site works plan, schedule and costs.	Detailed plan of works	H	2013	Tranen/PGV
	PC	27	Review site works and revegetation plan with DPAW.	Agreed approach for the revegetation and site works.	H	2013	Eglinton/Tranen/PGV/D PAW

Key Tasks	Phase	Action #	Action	Purpose	Priority	Timeframe	Responsibility
	C	28	Discuss community participation with DPAW. DPAW to keep local community informed of project and to manage communication with Local Groups (note DPAW to manage community process).	Keep community informed about project	M	2013	Eglinton/PGV/DPAW
	C	29	Implement weed management, ripping, and fencing as per site works plan	Site to be prepared prior to first delivery of topsoil	M	2014	Tranen
	R	30	Signs indicating that rehabilitation work is occurring should be erected along the fence lines (e.g. No access – rehabilitation in progress). DPAW Regional Parks Unit standard signs to be used.	Keeping the public informed	L	2013-2019	Eglinton
		31	Minimise the use of herbicides in riparian areas.	Protect wetland ecosystems from herbicide run-off		2014-2019	Tranen
	R	32	Receive and spread topsoil from Eglinton site as per condition 21 and 23.	To maximise seed bank viability in rehabilitation areas	H	2014-2016	Eglinton/Cossils/Tranen
	R	33	Supplement with direct seeding and tubestock.	To maximise species for CBC habitat	M	2014-2018	Tranen
	R	34	Implement vegetation monitoring program.	Monitor success of revegetation	M	2014	PGV/Tranen
	R	35	Undertake short term monitoring of weed control success to identify any outbreaks following weed removal or suppression.	To manage weed outbreaks post planting	L	2014-2016	Tranen

Key Tasks	Phase	Action #	Action	Purpose	Priority	Timeframe	Responsibility
	R	36	Supplement with infill planting when required.	To ensure completion criteria is met	L	2014-2019	Tranen
	R	37	Site maintenance to be carried out. This will include maintenance of tree guards and perimeter fence, weed management and rabbit control as required.	To minimise impacts to new CBC habitat	L	2014-2019	Tranen/DPAW
	R	38	Design a monitoring survey for future CBC activity.	To determine if new habitat is being visited by CBC	L	2016	Eglinton/PGV
	R	49	Discuss community monitoring of CBC activity once YRP phase is complete.	To encourage community ownership of new habitat	L	2016	Eglinton/PGV/DPAW
	O	401	Monitor CBC activity on a biannual basis five years post revegetation.	To determine if revegetation project has met primary objective of providing CBC with foraging opportunities	L	2019-2031	Eglinton/PGV/DPAW
	R	41	Handover YRP sites to the DPAW		L	2019	Eglinton

Table 13: Indicative Timeframes

Key Tasks	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-31
YRP Species List										
Seed Collection										
Topsoil Stripping										
YRP Site Preparation										
YRP Revegetation										
Eglinton Establish CBC Foraging Species in POS and Streetscapes										

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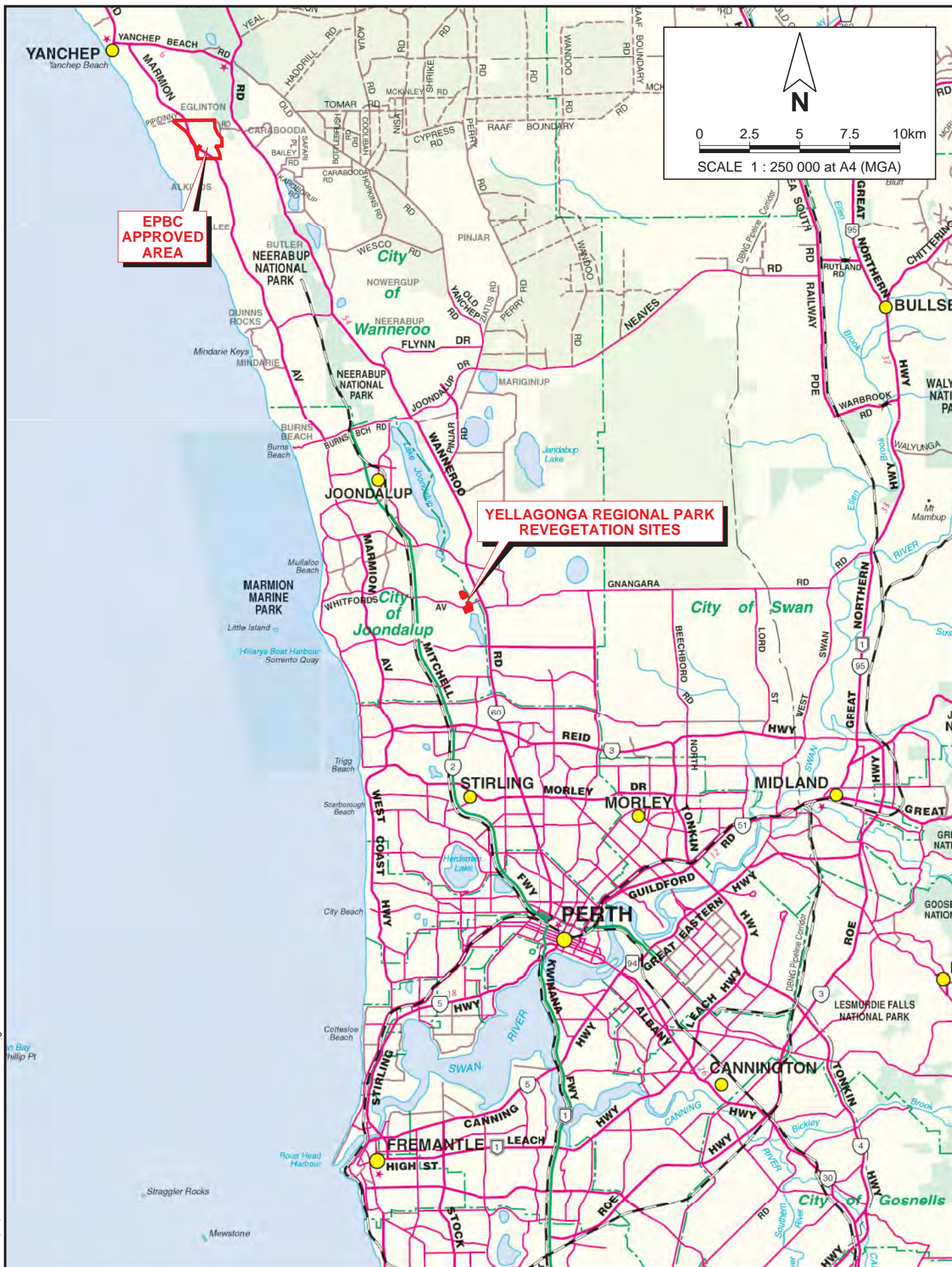
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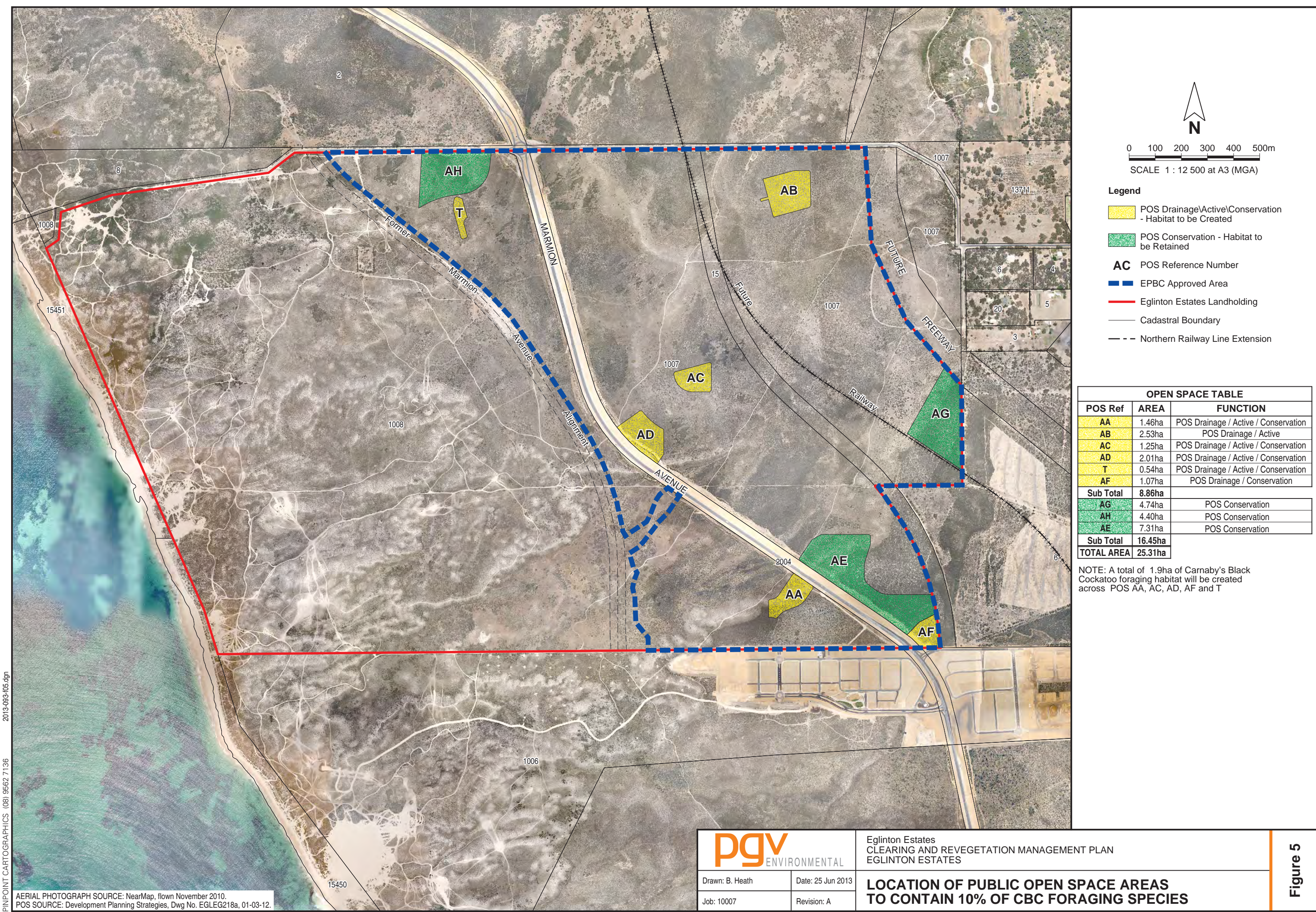
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FIGURES









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PINPOINT CARTOGRAPHICS (08) 9562 7136

AERIAL PHOTOGRAPH SOURCE: NearMap, flown November 2010.
POS SOURCE: Development Planning Strategies, Dwg No. EGLEG218a, 01-03-12.

Eglinton Estates
CLEARING AND REVEGETATION MANAGEMENT PLAN
EGLINTON ESTATES

Drawn: B. Heath

Date: 25 Jun 2013

Job: 10007

Revision: A

LOCATION OF PUBLIC OPEN SPACE AREAS
TO CONTAIN 10% OF CBC FORAGING SPECIES

Figure 5

APPENDIX 1

EPBC Approval 2010-5777



Australian Government

Department of Sustainability, Environment, Water, Population and Communities

Approval

Eglinton Estates Residential Development, Lot 1007 & Part Lot 1008, Pipidinny Road, Eglinton, WA (EPBC 2010/5777)

This decision is made under sections 130(1) and 133 of the *Environment Protection and Biodiversity Conservation Act 1999*.

Proposed action

person to whom the approval is granted Eglinton Estates Pty Ltd

proponent's ACN (if applicable) ABN: 48 009 460 397

proposed action The clearing of approximately 298 ha of native vegetation for the urban development of Lot 1007 and the eastern portion of Lot 1008, Pipidinny Road, Eglinton, WA, [See EPBC Act referral 2010/5777], within the footprint shown as a blue dotted line in Attachment A.

Approval decision

Controlling Provision	Decision
Listed threatened species and communities (sections 18 & 18A)	Approved

conditions of approval This approval is subject to the conditions specified below.

expiry date of approval

This approval has effect until 28 February 2038.

Decision-maker

name and position Barbara Jones
Assistant Secretary
North, West and Offshore Assessment Branch

signature

date of decision 30/4/2013

Conditions attached to the approval

1. Within 30 days after the **commencement** of the action, the person taking the action must advise the **department** in writing of the actual date of **commencement**.
2. The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement the management plans required by this approval, and make them available upon request to the **department**. Such records may be subject to audit by the **department** or an independent auditor in accordance with section 458 of the **EPBC Act**, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the **department's** website. The results of audits may also be publicised through the general media.
3. Within three months of every 12 month anniversary of the **commencement** of the action, the person taking the action must publish a report on their website addressing compliance with the conditions of this approval over the previous 12 months, including implementation of any management plans as specified in the conditions. Non-compliance with any of the conditions of this approval must be reported to the **department** at the same time as the compliance report is published.
4. Upon the direction of the **Minister**, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor must be approved by the **Minister** prior to the commencement of the audit. Audit criteria must be agreed to by the **Minister** and the audit report must address the criteria to the satisfaction of the **Minister**.
5. If the person taking the action wishes to carry out any activity otherwise than in accordance with the management plans as specified in the conditions, the person taking the action must submit to the **department** for the **Minister's** written approval a revised version of that management plan. The varied activity shall not commence until the **Minister** has approved the varied management plan in writing. The **Minister** will not approve a varied management plan unless the revised management plan would result in an equivalent or improved environmental outcome over time. If the **Minister** approves the revised management plan, the revised management plan must be implemented in place of the management plan originally approved.
6. If the **Minister** believes that it is necessary or convenient for the better protection of listed threatened species to do so, the **Minister** may request that the person taking the action make specified revisions to the management plan/s specified in the conditions and submit the revised management plan/s for the **Minister's** written approval. The person taking the action must comply with any such request. The revised approved management plan/s must be implemented. Unless the **Minister** has approved the revised management plan/s, then the person taking the action must continue to implement the management plan/s originally approved, as specified in the conditions.
7. If, at any time after 5 years from the date of this approval, the person taking the action has not **substantially commenced** the action, then the person taking the action must not **substantially commence** the action without the written agreement of the **Minister**.

8. Unless otherwise agreed to in writing by the **Minister**, the person taking the action must publish all management plans referred to in these conditions of approval on their website. Each management plan must be published on the website within 1 month of being approved.
9. To mitigate impacts to Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), the person taking the action must not **clear** any land that is proposed to be **retained** that is also habitat for Carnaby's Black Cockatoo, (as shown in Attachment B).
10. To protect and enhance habitat for **listed threatened species** that is **retained** on the proposal site, the person taking the action must:
 - (a) prepare and submit, within 12 months of the date of this approval, a *Conservation Management Plan* detailing management of habitat for **listed threatened species** that is **retained** on the **proposal site** for the **Minister's** approval. The plan must include:
 - i. measures to physically delineate (through fencing or other means) areas that will be **retained**;
 - ii. erosion and dust control measures during construction;
 - iii. the management of weeds, *Phytophthora* dieback, bushfire and feral animals;
 - iv. identification of any degraded habitat for **listed threatened species** and **revegetation** of those areas;
 - v. a monitoring program for **listed threatened species** and their habitat;
 - vi. performance indicators and corrective actions;
 - vii. roles and responsibilities;
 - viii. time frames for the implementation of the above measures; and
 - ix. how condition 10(b) will be implemented, including who will be responsible for the long-term management of the **retained** land, and how the land will be protected in the long-term.

If the Minister approves the plan, the approved plan must be implemented.

- (b) within 5 years of the **substantial commencement** of the action, the person taking the action must provide the **department** with written evidence, including certificates of title, that the 'POS Conservation' areas (marked in green in Attachment A) has been transferred to the City of Wanneroo for the purpose of conservation.
11. To mitigate impacts to Carnaby's Black Cockatoo, the person taking the action must fully implement the **revegetation** of at least 12.7 ha of native vegetation (including **primary feeding plants** for Carnaby's Black Cockatoo) in the Yellagonga Regional Park (in consultation with the **DEC**) using seed and topsoil collected in accordance with the *Clearing and Revegetation Management Plan* required under condition 12.
12. To mitigate impacts to Carnaby's Black Cockatoo, the person taking the action must prepare and submit a *Clearing and Revegetation Management Plan* (the plan) for the **Minister's** approval. The plan must include:
 - (a) a commitment to the staged collection of native seed prior to **clearing**, and collection of topsoil following clearing, from within Carnaby's Black Cockatoo foraging habitat as shown in Attachment B (checked in black, but excluding those areas shaded green in Attachment B), for use in **revegetation**;
 - (b) a commitment to store native seed and topsoil, and transport it to a receiving site(s) where **revegetation** is being undertaken by the **DEC** or another receiving party (or parties), and at least 50% of the collected seed and topsoil must be used within 20 km of the **proposal site**;

(c) detailed protocols for staged collection and use of native seed and topsoil required by conditions 12(a) and 12(b) to be developed in consultation with an **independent revegetation expert** (approved in writing by the department) and the **DEC** or other receiving party (or parties) including:

- i. the optimal methodology for native seed and topsoil collection from the **proposal site**;
- ii. how clearing will be staged to best harvest utilise the native seed and topsoil resource for **revegetation**;
- iii. how native seed and topsoil will be stored and transported,
- iv. measures to manage any topsoil from the site that contains invasive weeds (at a level that makes that soil not suitable for use in **revegetation**) or soil infestations such as *Phytophora*; and
- v. onsite supervision and implementation monitoring mechanisms.

(d) a commitment to **revegetate** at least 1.9 ha of native vegetation within Public Open Space on the **proposal site**;

(e) methodology for **revegetation**, both on-site, and in Yellagonga Regional Park (as required under condition 11), using native seed and topsoil collected in accordance with the protocols required by condition 12(c), along with:

- i. survival targets proposed for plantings;
- ii. performance indicators and corrective measures;
- iii. roles and responsibilities; and
- iv. timeframes for the implementation and management of the above measures.

(f) a commitment for at least 50% of plantings for trees and shrubs in street-scaping to consist of plants known to be **primary feeding plants** for Carnaby's Black Cockatoo. Site selection for street-scaping must take account of any risk of vehicle strike to Carnaby's Black Cockatoos.

If the **Minister** approves the plan, then the approved plan must be implemented.

13. To offset the loss of habitat for Carnaby's Black Cockatoo, within 12 months of the date of this approval, the person taking the action must:

(a) provide monies to the **DEC** to fully fund the acquisition of:

- i. an offset property that contains at least 850 ha of good quality foraging habitat for Carnaby's Black Cockatoo, that is within the 'Regans Ford' locality according to Landgate's WA Atlas; or
- ii. another parcel of land approved in writing by the **department**; and

(b) provide the **department** with a textual description and map clearly defining the location and boundaries of the offset property described in condition 13(a), which must be accompanied with the **offset attributes** and a **shapefile**.

14. The person taking the action must not undertake any **clearing** of habitat for Carnaby's Black Cockatoo (as shown in Attachment B hatched in black) apart from of the area outlined in yellow in Attachment D, unless:

(a) the *Clearing and Revegetation Management Plan* required under condition 12 has been approved by the **Minister**; and

(b) for each proposed clearing stage, the **department** has been provided written evidence that the **DEC** or other receiving party (or parties) agree(s) to utilise the seed and soil for the purposes of **revegetation** in accordance with the protocols developed under condition 12(c).

15. To mitigate impacts to the Graceful Sun Moth (*Synemon gratiosa*) and offset the loss of habitat for that species, the person taking the action must:

- (a) not **clear** any land that is proposed to be **retained** that is also habitat for the Graceful Sun Moth (as shown in Attachment C);
- (b) provide monies to the **DEC** to maintain and improve the quality of at least 180 ha of Graceful Sun Moth habitat within the Wilbinga Conservation Park. This funding must be adequate to fully fund, for a period of 20 years, all management actions deemed necessary by the **DEC** to mitigate known threats to Graceful Sun Moths and their habitat; and improve habitat quality through **revegetation** or restoration. All funding must be provided within 12 months of the date of this approval; and
- (c) prepare and submit, within 6 months of the date of this approval, a *Wilbinga Conservation Park Graceful Sun Moth Habitat Management Funding Plan* (the plan) detailing how condition 15(b) will be satisfied, for the **Minister's** approval. The plan must include:
 - i. what management actions are likely to be funded;
 - ii. the amount of funding that will be provided;
 - iii. written evidence that the **DEC** agree that the funding is adequate for them to undertake the management actions.

If the **Minister** approves the plan, the approved plan must be implemented.

Definitions

Clearing of native vegetation, including the cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning of native vegetation.

Construction includes any preparatory works required to be undertaken including the erection of any onsite temporary structures and the use of heavy duty equipment for the purpose of breaking the ground for buildings or infrastructure.

Substantial commencement of the action is when more than 1 ha of land on the proposal site has been impacted by **clearing** or **construction**.

DEC is the Western Australian Government's Department of Environment and Conservation (or equivalent agency).

Department is the Australian Government Department administering the *Environment Protection and Biodiversity Conservation Act 1999*.

EPBC Act is the *Environment Protection and Biodiversity Conservation Act 1999*.

Independent revegetation expert. A scientist with relevant qualifications and expertise in best-practise **revegetation** (including the use of native seed and topsoil in **revegetation**), who is not affiliated with the person taking the action.

Listed Threatened Species are species listed under the EPBC Act including Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) and the Graceful Sun Moth (*Synemon gratiosa*).

Minister is the Minister administering the *Environment Protection and Biodiversity Conservation Act 1999* and includes a delegate of the Minister.

Offset attributes means an '.xls' file capturing relevant attributes of the Offset Area, including the EPBC reference ID number, the physical address of the offset site, coordinates of the boundary points in decimal degrees, the EPBC protected matters that the offset compensates for, any additional EPBC protected matters that are benefiting from the offset, and the size of the offset in hectares.

Primary feeding plants for Carnaby's Black Cockatoo include: any *Banksia*; any plants identified in a relevant search of the DEC's Plants for Carnaby's Search Tool (at <http://www.dec.wa.gov.au/management-and-protection/threatened-species/5983-plants-for-carnabys-search-tool.html>); or other plants approved in writing by the **Department**.

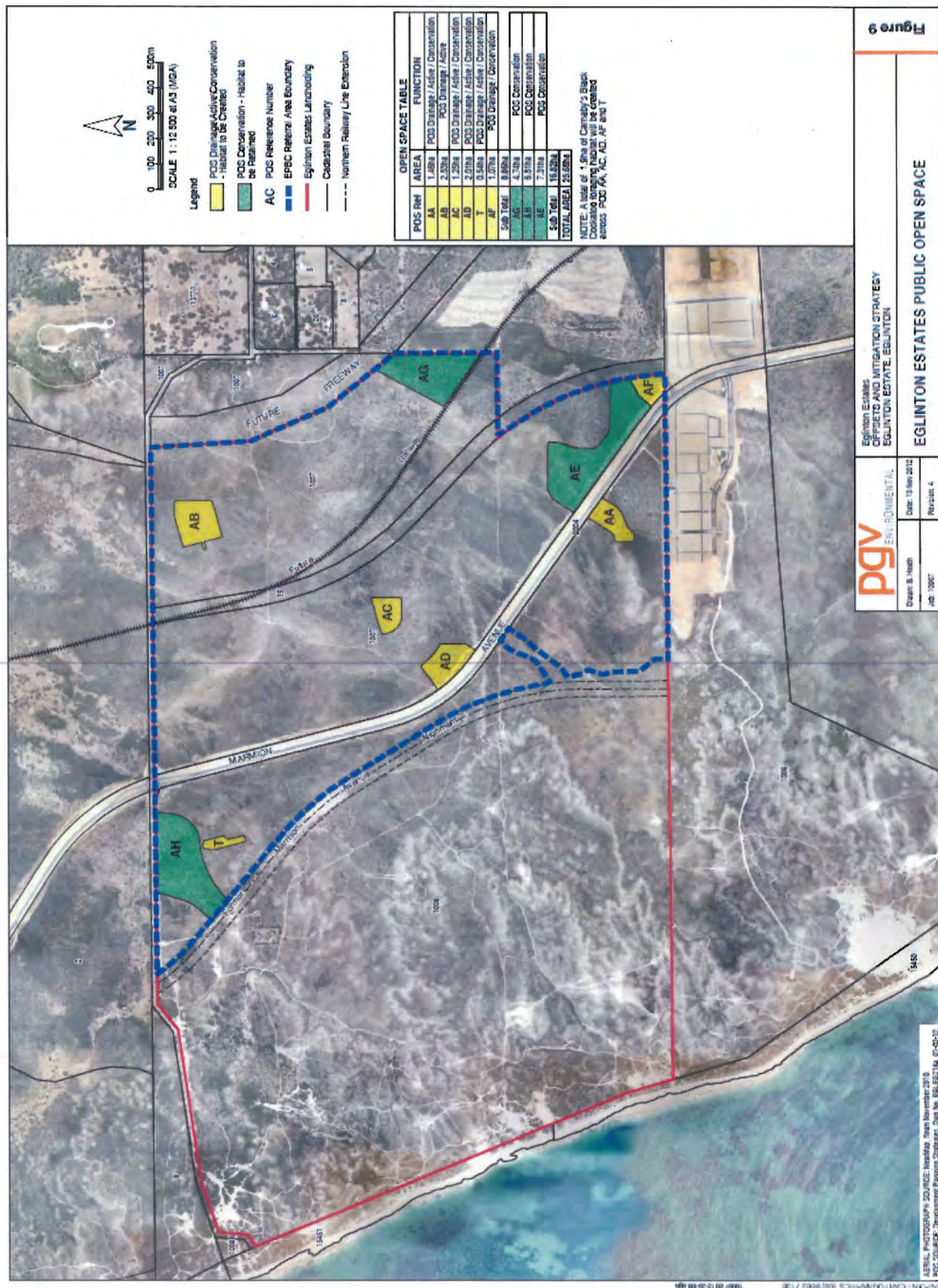
Proposal site is the area shown at Attachment A as EPBC Referral Area Boundary.

Retained land means: the 'POS Conservation' areas marked in green in Attachment A.

Revegetation is the removal of weeds and the long-term establishment of native vegetation.

Shapefile means an ESRI Shapefile containing '.shp', '.shx' and '.dbf' files and other files capturing attributes of the Offset Area, including the shape, EPBC reference ID number and EPBC protected matters present at the relevant site. Attributes should also be captured in '.xls' format.

Attachment A



Legend

- POC Conservation - Habitat to be Retained (10.8.11a)
- AC POC Reference Number
- Local Structure Plan Boundary
- Eglinton Estates Landholding
- EPOC Referral Area Boundary
- Coastal Boundary
- Potential Black Cockatoo Foraging Habitat

Scale
0 100 200 300 400 500m
SCALE 1:10,000 at A3 (MGA)

North Arrow

Project Information

PGV ENVIRONMENTAL	
Drawn & Made	Date: 13 Nov 2015
Job: 10007	Revised: A

**Eglinton Estates OFFSETS AND MITIGATION STRATEGY
EGLINTON ESTATE, EGLINTON**

Figure 6

**CARNABY'S BLACK COCKATOO HABITAT TO BE RETAINED
IN CONSERVATION PUBLIC OPEN SPACE**

Attachment C



Attachment D



APPENDIX 2

CRMP V6 APPROVAL



Australian Government
Department of the Environment

Our reference: EPBC 2010/5777

Contact Officer: Sam Wagstaff
Telephone: (02) 6274 2741 Facsimile: (02) 6274 1878
Email: sam.wagstaff@environment.gov.au

Mr Damian Molony
McGees Property – Perth
Level 2, 26 Clive Street
West Perth WA 6005

Dear Mr Molony

Eglinton Estates Residential Development, Lot 1007 & Part Lot 1008, Pipidinnny Road, Eglinton, WA (EPBC 2010/5777)

I refer to the email dated 1 November 2013 from your consultant to Sam Wagstaff, which attached a copy of the Clearing and Revegetation Management Plan (CRMP version 6), as required under condition 12 of the approval decision dated 30 April 2013.

The CRMP version 6 has been reviewed by officers of the department and has been found to meet the requirements of the condition. On this basis, and as delegate of the Minister for the Environment, I have decided to approve the Plan.

In accordance with condition 12 of EPBC 2010/5777 the approved plan must be implemented. Under condition 5, if the person taking the action wants to act other than in accordance with the approved plan, the approval holder must submit a revised plan for approval. Until the Minister (or his delegate) has approved the revised plan, the person taking the action must continue to implement the original plan/s.

If you have any enquiries please contact Sam Wagstaff on 02 6274 2741.

Yours sincerely

S. Gaddes

Shane Gaddes
Assistant Secretary
Compliance & Enforcement Branch
Environment Assessment and Compliance Division

8 November 2013

CC: Belinda Heath, PGV Environmental

APPENDIX 3

EPBC 2010/5777 VARIATION

APPROVAL



Australian Government
Department of the Environment



Our reference: 2010/5777

Contact Officer: Rochelle Tomkins
Telephone: (02) 6275 9455 Facsimile: (02) 6274 1878
Email: post.approvals@environment.gov.au

Mr Darren Walsh
CEO / Managing Partner
PO Box 243
SUBIACO WA 6904

Dear Mr Walsh

EPBC 2010/5777 – Eglinton Estates: Clearing of Native Vegetation from Lot 1007 and Part Lot 1008 – Variation to Approval Conditions 12 and 13

I refer to your letter of 25 May 2015 to the Department, on behalf of Eglinton Estates Pty Ltd requesting a variation to conditions 12 and 13 of the approval dated 30 April 2013.

Officers of the Post Approvals Section have assessed your request and provided advice regarding the variation. As delegate of the Minister for the Environment, I have decided to approve your request to vary conditions 12 and 13 of the approval in accordance with the provisions of the national environment law, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The variation of conditions of approval does not relieve the person to whom it has been granted from an obligation to comply with any other law of the Commonwealth, state or territory that is applicable to do the action and to have any right, title or interest that is required to access land or waters and to do the action.

Please ensure that you maintain accurate records of all activities associated with, or relevant to the conditions of approval, so that they can be made available to the department on request. Such documents may be subject to audit and used to verify compliance. Summaries of results of audits may be published by the department. Information about the monitoring and audit program can be found on the department's website at www.environment.gov.au/epbc/compliance/auditing.html.

If you have any enquiries please contact Rochelle Tomkins on 02 6275 9455.

Yours sincerely

Kynan Gowland
A/g Assistant Secretary
Compliance & Enforcement Branch
Environment Standards Division

20 October 2015



VARIATION TO CONDITIONS ATTACHED TO APPROVAL

Eglinton Estates Residential Development, Lot 1007 & Part Lot 1008, Pipidinny Road, Eglinton, WA (EPBC 2010/5777)

This decision to vary a condition of approval is made under section 143 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Approved action

Person to whom the approval is granted	Eglinton Estates Pty Ltd ABN: 48 009 460 397
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Approved action	The clearing of approximately 298 ha of native vegetation for the urban development of Lot 1007 and the eastern portion of Lot 1008, Pipidinny Road, Eglinton, WA [See EPBC Act referral 2010/5777], within the footprint shown as a blue dot line in <u>Attachment A</u> .
------------------------	---

Variation

Variation of conditions of approval	The variation is: Delete conditions 12 and 13 attached to the approval dated 30 April 2013 and substitute with the conditions specified below.
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Date of effect	This variation has effect on the date the instrument is signed
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Person authorised to make decision

name and position	Kynan Gowland Assistant Secretary (A/g) Compliance & Enforcement Branch
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Signature	
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Date of decision	20/10/2015
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Condition attached to the approval

12. To mitigate impacts to Carnaby's Black Cockatoo, the person taking the action must prepare and submit a *Clearing and Revegetation Management Plan* (the plan) for the **Minister's** approval. The plan must include:
- a) A commitment to the staged collection of native seed prior to **clearing** from within Carnaby's Black Cockatoo foraging habitat as shown in Attachment B (checked in black, but excluding those areas shaded green in Attachment B), and the collection of topsoil from 33 ha of the project site, from within 73 ha of good or better condition Carnaby's Black Cockatoo habitat as shown in Attachment B (checked in black), for use in **revegetation**.
 - b) A commitment to store native seed (excluding that which is required for revegetation on-site and within Yellongonga Regional Park) and transport it to a seed bank or receiving site(s) where **revegetation** is being undertaken by the **DPaW** or another receiving party (or parties).
 - c) Detailed protocols for staged collection and use of native seed and topsoil required by conditions 12a, 12d and 12e to be developed in consultation with an **independent revegetation expert** (approved in writing by the Department) and the **DPaW** or other receiving party (or parties) including:
 - i. The optimal methodology for native seed and topsoil collection from the **proposal site**
 - ii. How clearing will be staged to best utilise the native seed and topsoil resource for **revegetation**
 - iii. How native seed and topsoil will be stored and transported
 - iv. Measures to manage any topsoil from the site that contains invasive weeds (at a level that makes that soil not suitable for use in **revegetation**) or soil infestation such as *Phytophthora*, and
 - v. On-site supervision and implementation of monitoring mechanisms.
 - d) A commitment to **revegetate** at least 1.9 ha of native vegetation within Public Open Space on the proposal site.
 - e) Methodology for revegetation, both on-site, and in Yellagonga Regional Park (as required under condition 11), using native seed and topsoil collected in accordance with the protocols require by condition 12c, along with:
 - i. Survival targets proposed for plantings
 - ii. Performance indicators and corrective measures
 - iii. Roles and responsibilities, and
 - iv. Timeframes for the implementation and management of the above measures.
 - f) A commitment for at least 50% of planting of trees and shrubs in street-scaping to consist of plants known to be **primary feeding plants** for Carnaby's Black Cockatoo. Site selection for street-scaping must take account of any risk of vehicle strike to Carnaby's Black Cockatoos.

If the **Minister** approves the plan, then the approved plan must be implemented.

13. To offset the loss of habitat for Carnaby's Black Cockatoo, the person taking the action must, by January 2016:
- a) Provide monies to the DPaW to fully fund the acquisition of:
 - i. An offset property (or properties) that contains at least 886 ha of good quality foraging habitat for Carnaby's Black Cockatoo, that is within the 'Regans Ford' or Gingin area, or
 - ii. Another parcel of land approved in writing by the **Department**.

- b) Provide the **Department** with a textual description and map clearly defining the location and boundaries of the offset property (or properties) described in condition 13(a), which must be accompanied with the **offset attributes** and a **shapefile**.

APPENDIX 4

DPAW LIST OF FORAGING SPECIES


Plants Used by Carnaby's Black Cockatoo

List prepared by Christine Groom, Department of Environment and Conservation 15 April 2011

For more information on plant selection or references used to produce this list please visit the Plants for Carnaby's Search Tool webpage at www.dec.wa.gov.au/plantsforcarnabys



Department of
Environment and Conservation

Our environment, our future 

Species	Used for			Priority for planting for Carnaby's	Growth form	Flower colour	Soil type				Sun exposure	Soil drainage				Origin
	Feeding	Nesting	Roosting				Clayey	Gravelly	Loamy	Sandy		Well drained	Poorly drained	Waterlogged	Salt affected	
Acacia baileyana (Cootamundra wattle)*				Low	Tree	Yellow					○ ☀					Australian native
Acacia pentadenia (Karri Wattle)				Low	Tree	Cream					○ ☀					WA native
Acacia saligna (Orange Wattle)				Low	Tree	Yellow					○ ☀					WA native
Agonis flexuosa (Peppermint Tree)				Low	Tree	White					○ ☀					WA native
Araucaria heterophylla (Norfolk Island Pine)				Low	Tree	Green					○ ☀					Exotic to Australia
Banksia ashbyi (Ashby's Banksia)				Medium	Tree or Tall shrub	Yellow, Orange					○ ☀					WA native
Banksia attenuata (Slender Banksia)				High	Tree	Yellow					○ ☀					WA native
Banksia baxteri (Baxter's Banksia)				Medium	Tall shrub	Yellow					○ ☀					WA native
Banksia carlinoides (Pink Dryandra)				Medium	Medium or small shrub	White, cream, pink					○ ☀					WA native
Banksia coccinea (Scarlet Banksia)				Medium	Tree	Red					○ ☀					WA native
Banksia dallanneyi (Couch Honeypot Dryandra)				Low	Medium or small shrub	Orange, brown					○					WA native
Banksia ericifolia (Heath-leaved Banksia)				Medium	Tall shrub	Orange					○					Australian native
Banksia fraseri (Dryandra)				Medium	Medium or small shrub	Orange					○ ☀					WA native
Banksia gardneri (Prostrate Banksia)				Low	Medium or small shrub	Orange					○ ☀					WA native
Banksia grandis (Bull Banksia)				High	Tree	Yellow					○ ☀					WA native
Banksia hookeriana (Hooker's Banksia)				Medium	Tall shrub	Orange					○ ☀					WA native
Banksia ilicifolia (Holly Banksia)				High	Tree	Cream					○ ☀					WA native
Banksia kippistiana (Dryandra)				Medium	Medium or small shrub	Yellow					○ ☀					WA native
Banksia leptophylla				Low	Medium or small shrub	Yellow					○ ☀					WA native
Banksia littoralis (Swamp Banksia)				High	Tree	Yellow					○ ☀					WA native
Banksia menziesii (Firewood or Menzie's Banksia)				High	Tree	Yellow, pink, red					○ ☀					WA native
Banksia mucronulata (Swordfish Dryandra)				Medium	Medium or small shrub	Yellow					○ ☀					WA native
Banksia nivea (Honeypot Dryandra)				High	Medium or small shrub	Orange					○ ☀					WA native
Banksia nobilis (Golden Dryandra)				Medium	Tall shrub	Orange					○					WA native
Banksia praemorsa (Cut-leaf Banksia)				Medium	Tall shrub	Red, yellow, green					○					WA native
Banksia prionotes (Acorn Banksia)				High	Tree	Orange					○					WA native

Species	Used for			Priority for planting for Carnaby's	Growth form	Flower colour	Soil type				Sun exposure	Soil drainage				Origin
	Feeding	Nesting	Roosting				Clayey	Gravelly	Loamy	Sandy		Well drained	Poorly drained	Waterlogged	Salt affected	
Banksia quercifolia (Oak-leaved Banksia)				Medium	Tall shrub	Brown					○					WA native
Banksia sessilis (Parrot Bush)				High	Tree	Cream					○					WA native
Banksia speciosa (Showy Banksia)				High	Tree	Yellow					○					WA native
Banksia squarrosa (Pingle)				High	Tall shrub	Yellow					○					WA native
Banksia tricuspis (Lesueur Banksia or Pine Banksia)				Medium	Tree	Orange					○					WA native
Banksia undata (Urchin or Cut-leaf Dryandra)				High	Tall shrub	Yellow					○					WA native
Banksia verticillata (Granite Banksia)				Low	Tree	Yellow					○					WA native
Brassica campestris (Canola, Rape)**				Low	Herb	Yellow					○					Exotic to Australia
Callistemon viminalis (Captain Cook Bottlebrush)				Medium	Tall shrub	Red					○					Australian native
Callitris sp.				Medium	Tree						○					WA native
Carya illinoensis (Pecan)				Low	Tree	Yellow					○					Exotic to Australia
Casuarina cunninghamiana (River Sheoak)*				Low	Tree	Red					○					Australian native
Citrullus lanatus (Pie or Afghan Melon)*				Low	Scrambler, climber or percher	Yellow					○					Exotic to Australia
Corymbia calophylla (Marri)				High	Tree	Cream					○					WA native
Corymbia ficifolia (Red Flowering Gum)				Medium	Tree	Red					○					WA native
Corymbia haematoxylon (Mountain Marri)				Medium	Tree	White					○					WA native
Corymbia maculata (Spotted Gum)				Low	Tree	White					○					Australian native
Darwinia citriodora (Lemon-scented Darwinia)				Low	Medium or small shrub	Red, orange, yellow					○					WA native
Diospyros sp. (Sweet Persimmon)				Low	Tree						○					Exotic to Australia
Eremophila glabra (Tarbush)				Low	Tall shrub	Various					○					WA native
Erodium aureum (Corkscrew Grass or Storksbill)*				Low	Herb	Pink					○					Exotic to Australia
Erodium botrys (Corkscrew Grass or Storksbill)*				Low	Herb	Purple					○					Exotic to Australia
Eucalyptus caesia (Silver Princess)				Medium	Tree	Pink					○					WA native
Eucalyptus camaldulensis (River Red Gum)				Low	Tree	Cream, yellow					○					Australian native
Eucalyptus citriodora (Lemon Scented Gum)				Medium	Tree	Red					○					Australian native
Eucalyptus diversicolor (Karri)				Low	Tree	Cream					○					WA native
Eucalyptus globulus (Tasmanian Blue Gum)				Low	Tree	White					○					Australian native
Eucalyptus gomphocephala (Tuart)				High	Tree	White					○					WA native
Eucalyptus grandis (Flooded Gum, Rose Gum)				Low	Tree	White, cream					○					Australian native
Eucalyptus longicornis (Red Morrell)				Low	Tree	White					○					WA native
Eucalyptus loxophleba (York Gum)				Low	Tree	White					○					WA native
Eucalyptus marginata (Jarrah)				Medium	Tree	White					○					WA native
Eucalyptus occidentalis (Swamp Yate)				Low	Tree	Cream					○					WA native
Eucalyptus patens (Blackbutt)				Medium	Tree	White					○					WA native
Eucalyptus pleurocarpa (Tallerack)				Medium	Tree	White					○					WA native

Species	Used for			Priority for planting for Carnaby's	Growth form	Flower colour	Soil type				Sun exposure	Soil drainage				Origin
	Feeding	Nesting	Roosting				Clayey	Gravelly	Loamy	Sandy		Well drained	Poorly drained	Waterlogged	Salt affected	
Eucalyptus preissiana (Bell-fruited Mallee)				Medium	Tree	Yellow					○					WA native
Eucalyptus robusta (Swamp Mahogany)				Medium	Tree	White					○					Australian native
Eucalyptus rudis (Flooded Gum)				Low	Tree	White					○					WA native
Eucalyptus salmonophloia (Salmon Gum)				High	Tree	White					○					WA native
Eucalyptus salubris (Gimlet)				Medium	Tree	White, cream					○					WA native
Eucalyptus totidiana (Coastal Blackbutt or Prickley Bark)				Medium	Tree	White					○					WA native
Eucalyptus wandoo (Wandoo)				High	Tree	White					○					WA native
Ficus sp. (Fig)				Low	Tree						○ ☀					Australian native
Grevillea armigera (Prickly Toothbrushes)				Medium	Tall shrub	Green, yellow, black					○ ☀					WA native
Grevillea bipinnatifida (Fuschia Grevillea)				Medium	Medium or small shrub	Red					○ ☀					WA native
Grevillea hookeriana (Red Toothbrushes)				Medium	Tall shrub	Red					○					WA native
Grevillea hookeriana subsp. apiculoba (Black Toothbrushes)				Medium	Medium or small shrub	Black					○					WA native
Grevillea paniculata (Kerosene Bush)				Medium	Tall shrub	White					○ ☀					WA native
Grevillea paradoxa (Bottlebrush Grevillea)				Medium	Medium or small shrub	Cream, pink					○					WA native
Grevillea petrophiloides (Pink Poker)				Medium	Tall shrub	Pink					○					WA native
Grevillea robusta (Silky Oak)				Medium	Tree	Orange					○					Australian native
Hakea auriculata				Medium	Tall shrub	White					○ ☀					WA native
Hakea candolleana				Medium	Medium or small shrub	White					○					WA native
Hakea circumalata (Coastal Hakea)				Medium	Medium or small shrub	White, pink					○ ☀					WA native
Hakea commutata				Medium	Medium or small shrub						○ ☀					WA native
Hakea conchifolia				Medium	Medium or small shrub	White, cream, pink					○					WA native
Hakea costata (Ribbed Hakea)				Medium	Medium or small shrub	White					○					WA native
Hakea cristata (Snail Hakea)				Medium	Medium or small shrub	White					○ ☀					WA native
Hakea cucullata (Snail Hakea)				Medium	Tall shrub	Pink					○					WA native
Hakea cyclocarpa (Ramshorn)				Medium	Medium or small shrub	White					○ ☀					WA native
Hakea eneabba				Medium	Medium or small shrub	Yellow					○					WA native
Hakea erinacea (Hedgehog Hakea)				Medium	Medium or small shrub	Cream					○ ☀					WA native
Hakea falcata (Sickle Hakea)				Medium	Tall shrub	White					○ ☀					WA native
Hakea flabellifolia (Fan-leaved Hakea)				Medium	Medium or small shrub	Brown					○					WA native
Hakea gilbertii				Medium	Medium or small shrub	White					○					WA native
Hakea incrassata (Golfball or Marble Hakea)				Medium	Medium or small shrub	Cream					○ ☀					WA native
Hakea lasiantha (Woolly Flowered Hakea)				Medium	Tall shrub	White					○ ☀					WA native
Hakea lasianthoides				Medium	Tall shrub	White					☀					WA native
Hakea laurina (Pin-cushion hakea)				Medium	Tree	Red					○ ☀					WA native
Hakea lissocarpha (Honeybush)				Medium	Medium or small shrub	White					○ ☀					WA native

Species	Used for			Priority for planting for Carnaby's	Growth form	Flower colour	Soil type				Sun exposure	Soil drainage				Origin
	Feeding	Nesting	Roosting				Clayey	Gravelly	Loamy	Sandy		Well drained	Poorly drained	Waterlogged	Salt affected	
Hakea megalosperma (Lesueur Hakea)				Medium	Medium or small shrub	White, cream, pink, red					○					WA native
Hakea multilineata (Grass Leaf Hakea)				Medium	Tall shrub	Pink					○					WA native
Hakea obliqua (Needles and Corks)				Medium	Tall shrub	White					○					WA native
Hakea oleifolia (Dungyn or Olive-leaved Hakea)				Medium	Tree	White					○					WA native
Hakea pandanicaarpa subsp. crassifolia (Thick-leaved Hakea)				Medium	Tall shrub	Cream					○					WA native
Hakea polyanthema				Medium	Medium or small shrub	White					○					WA native
Hakea petiolaris (Sea Urchin Hakea)				Medium	Tall to medium shrub	Cream, pink					○					WA native
Hakea preissii (Needle Tree)				Medium	Tall shrub	Yellow					○					WA native
Hakea prostrata (Harsh Hakea)				High	Tall to mediumshrub	White					○					WA native
Hakea psilorrhyncha				Medium	Tall shrub	Cream					○					WA native
Hakea ruscifolia (Candle Hakea)				Medium	Tall shrub	White					○					WA native
Hakea scoparia (Kangaroo Bush)				Medium	Tall shrub	Cream					○					WA native
Hakea smilacifolia				Medium	Medium or small shrub	White					○					WA native
Hakea spathulata				Medium	Medium or small shrub	Red					○					WA native
Hakea stenocarpa (Narrow-fruited Hakea)				Medium	Medium or small shrub	White					○					WA native
Hakea sulcata (Furrowed Hakea)				Medium	Medium or small shrub	White					○					WA native
Hakea trifurcata (Two-leaved Hakea)				High	Tall shrub	White					○					WA native
Hakea undulata (Wavy-leaved Hakea)				High	Tall shrub	White					○					WA native
Hakea varia (Variable-leaved Hakea)				Medium	Tall shrub	White					○					WA native
Helianthus annuus (Sunflower)*				Low	Herb	Yellow					○					Exotic to Australia
Hibiscus sp. (Hibiscus)				Low	Tall shrub	Various					○					Exotic to Australia
Isopogon scabriusculus				Medium	Medium or small shrub	Pink					○					WA native
Jacaranda mimosifolia (Jacaranda)				Low	Tree	Blue, purple					○					Exotic to Australia
Jacksonia furcellata (Grey Stinkwood)				Medium	Tall shrub	Orange					○					WA native
Lambertia inermis (Chittick)				Medium	Tree	Red, orange, yellow					○					WA native
Lambertia multiflora (Many-flowered Honeysuckle)				Medium	Medium or small shrub	Orange, yellow					○					WA native
Liquidamber styraciflua (Liquid Amber)				Medium	Tree	Green					○					Exotic to Australia
Lupinus sp. (Lupin)*				Low	Herb	Yellow, blue					○					Exotic to Australia
Macadamia integrifolia (Macadamia)				Medium	Tree	White					○					Australian native
Malus domestica (Apple)				Low	Tree	White					○					Exotic to Australia
Melaleuca leuropoma				Medium	Medium or small shrub	Cream, purple, yellow					○					WA native
Melia azedarach (Cape Lilac or White Cedar)**				Low	Tree	Purple					○					Exotic to Australia
Mesomeleana sp.				Medium	Grassy or strappy						○					WA native
Protea repens				Medium	Tree or medium to small shrub	White, cream, pink					○					Exotic to Australia
Protea 'Pink Ice'				Medium	Tree or medium to small shrub	White, cream, pink					○					Exotic to Australia

Species	Used for			Priority for planting for Carnaby's	Growth form	Flower colour	Soil type				Sun exposure	Soil drainage				Origin
	Feeding	Nesting	Roosting				Clayey	Gravelly	Loamy	Sandy		Well drained	Poorly drained	Waterlogged	Salt affected	
Pinus canariensis (Canary Island Pine)				Low	Tree	Brown					○					Exotic to Australia
Pinus caribea (Caribbean Pine)				Low	Tree	Brown					○					Exotic to Australia
Pinus pinaster (Pinaster or Maritime Pine)**				Medium	Tree	Brown					○					Exotic to Australia
Pinus radiata (Radiata Pine)**				Medium	Tree	Brown					○					Exotic to Australia
Prunus amygdalus (Almond Tree)				Medium	Tree						○					Exotic to Australia
Raphanus raphanistrum (Wild Radish)*				Low	Herb	Various					○					Exotic to Australia
Tipuana tipu (Tipu or Rosewood Tree)**				Low	Tree	Yellow					○					Exotic to Australia
Xanthorrhoea preissii (Grass Tree)				Medium	Grassy or strappy	Cream					○					WA native

* Weed

** Potential weed

APPENDIX 5

YELLAGONGA REGIONAL PARK
BUSH FOREVER DESCRIPTION

YELLAGONGA REGIONAL PARK, WANNEROO/WOODVALE/KINGSLEY

Boundary Definition: protected area/bushland/conservation wetland boundary

SECTION 1: LOCATION INFORMATION

Bush Forever Site no. 299

Area (ha): bushland 380.9 (Site also includes open water.)

Map no. 27, 28, 34
NW

Map sheet series ref. no. 2034–I SW, 2034–II

Other Names: Contains Lake Joondalup and Lake Goollelal

Local Authorities (Suburb): City of Joondalup (Woodvale, Edgewater, Joondalup, Wanneroo, Kingsley)

Includes CALM Managed Land: Reserve 31048 (Recreation and Conservation of Flora and Fauna), 21708 (Protection of Flora and Fauna), 43290 (Conservation Park), 21176 (Forestry Purposes Pine Seedling Orchard)

System 6 (1983): M7 area of bushland goes beyond System area boundaries, all bushland described

SECTION 2: REGIONAL INFORMATION

LANDFORMS AND SOILS

Spearwood Dunes

Sands derived from Tamala Limestone (Qts: S7)

Tamala Limestone (Qtl: LS1, LS2)

Wetlands (within the Spearwood Dunes)

Holocene Swamp Deposits (Qrw: Sp1)

VEGETATION AND FLORA

Vegetation Complexes

Karrakatta Complex — Central and South

Cottesloe Complex — Central and South

Wetlands

Herdsmen Complex

Floristic Community Types

Supergroup 2: Seasonal Wetlands

S7 Northern woodlands to forests over tall sedgeland alongside permanent wetlands

Supergroup 4: Uplands centred on Spearwood and Quindalup Dunes

25 Southern *Eucalyptus gomphocephala* — *Agonis flexuosa* woodlands

28 Spearwood *Banksia attenuata* or *B. attenuata* — *Eucalyptus* woodlands

WETLANDS

Wetland Types: lake, sumpland, river

Natural Wetland Groups

Spearwood Dunes

Yanchep (S.1)

Wetland Management Objectives: Conservation (779.7ha), not assessed

Swan Coastal Plain Lakes EPP: 638.1ha + 63.7ha + 8.2ha = 710ha (total)

THREATENED ECOLOGICAL COMMUNITIES

Not assessed, Not determined

SECTION 3: SPECIFIC SITE DETAIL

Landscape Features: open water, vegetated wetland, vegetated uplands

Vegetation and Flora: limited survey (DEP 1996 (Yela 01–03), DPUD 1992b, EPA and WAWA 1990, Tauss 1996)

Structural Units: mapping (DPUD 1996, EPA and WAWA 1990)

Uplands: *Eucalyptus gomphocephala* Closed Forest to Woodland; *Eucalyptus gomphocephala* Tall Open Forest over *Banksia grandis* Low Open Forest; *Eucalyptus calophylla* Closed to Open Forest; *Banksia attenuata* and *Eucalyptus marginata* Woodland; Mixed *Eucalyptus marginata*, *E. calophylla* and *Banksia attenuata* Open Forest

Wetlands: *Eucalyptus rudis* Scattered Open Forest to Low Woodland; *Melaleuca raphiophylla* Low Open to Low Closed Forest; *Melaleuca raphiophylla* and *Banksia littoralis* Open Forest; Closed to Open Sedgeland dominated by *Schoenoplectus validus*, *Baumea articulata*; *B. juncea*, **Typha orientalis*, *Juncus pallidus* and *Lepidosperma longitudinale* or combinations of *Schoenoplectus validus* and *Baumea articulata*; Mixed Herbland (on dry lake bed)

Scattered Native Plants: not assessed

Vegetation Condition: >75% Very Good to Excellent, <25% Good to Degraded, with areas of severe localised disturbance

Total Flora: 217 native taxa, 103 weed taxa (compiled from DEP 1996, Tauss 1996)

Significant Flora: *Jacksonia sericea* (3), *Conostylis bracteata* (3); *Persicaria lapathifolia* (in Herblands on dry lake bed only record in the PMR), *Hibbertia cuneiformis* (most likely a weed, not known to occur naturally north of Site 377), *Amyema miquelii* (uncommon on the Plain), *Lechenaultia linarioides*, *Ricinocarpus glaucus*

Fauna: multiple surveys for birds (122 species) (Bamford and Bamford 1990; RAOU 1996 D, 86 visits). Significant populations of Blue-billed Duck, Musk Duck, Hardhead, Splendid and Variegated fairy-wrens, Broad-tailed, Western and Yellow-rumped Thornbills, Weebill, Scarlet Robin, Golden Whistler and Grey Shrike-thrush. Significant bird species: category 1 (3), category 2 (5), category 3 (17) and category 4 (8). Limited survey for native mammals (6), reptiles and amphibians (6) (DPUD 1991). Significant mammal species: Western Brush Wallaby and Echidna; Quenda (Friend 1996 D). Significant native fish species: Native Goby (*Pseudogobius olorum*) and Pygmy Perch (*Edelia vittata*) (WAWA 1995)

Linkage: adjacent bushland to the north (Site 383, across road), east (Site 164, across road) and west; part of Greenways 4, 2, 5 (Tingay, Alan & Associates 1998a); part of a regionally significant contiguous bushland/wetland linkage (Part A, Map 7)

Other Special Attributes: recommended for protection in study of City of Wanneroo (Trudgen 1996); included within Yellagonga Regional Park (DPUD 1992b)

SECTION 4: INTERNATIONAL AND NATIONAL SIGNIFICANCE

Directory of Important Wetlands in Australia; Entered in the Register of the National Estate; Location for JAMBA/CAMBA species; subject to protection under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

SECTION 5: SELECTION CRITERIA AND RECOMMENDATIONS

Criteria: Representation of ecological communities, Rarity, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation

Recommendation: Site with Some Existing Protection; the care, control and management of this Site for conservation purposes within Yellagonga Regional Park is endorsed (see Table 3, Volume 1).

APPENDIX 6

YELLAGONGA REGIONAL PARK

SPECIES LIST

Species lists based on plot records from DEP (1996), Gibson et al. (1994), Griffin (1993), Keighery (1996) and Weston et al. (1992). Taxonomy and species attributes according to Keighery et al. (2006) as of 16th May 2005.

Wd?	Species Name	Common Name	Family	Major Plant Group	Significant Species	Endemic	Growth Form Code	Growth Form	Life Form	Life Form - aquatics	Common SSCP Wetland Species	BFS No	yela01 (FCT28)	yela02 (FCTs07)	yela03 (FCT25)
	Acacia cyclops	Red-eyed Wattle	Mimosaceae	Dicot		AUST	3	SH	P			299			y
	Acacia huegelii	Huegel's Wattle	Mimosaceae	Dicot		WA	3	SH	P			299	y		
	Acacia saligna	Coojong	Mimosaceae	Dicot		WA	3	SH	P			299		y	
*	Acetosella vulgaris	Sorrel	Polygonaceae	Dicot			4	H	P			299			y
*	Aira caryophyllea	Silvery Hairgrass	Poaceae	Monocot			5	G	A			299	y		
	Alexgeorgea nitens	Alexgeorgea	Restionaceae	Monocot		WA	6	S-R	P			299	y		
	Allocasuarina fraseriana	Fraser's Sheoak	Casuarinaceae	Dicot		WA	1	T	P			299	y		
	Amphipogon turbinatus	Amphipogon	Poaceae	Monocot		WA	5	G	P			299	y		
	Arthropodium capillipes	Summer Lily	Anthericaceae	Monocot		WA	4	H	PAB			299			y
	Astroloma pallidum	Astroloma	Epacridaceae	Dicot		WA	3	SH	P			299	y		
	Austrodanthonia occidentalis	Western Wallaby Grass	Poaceae	Monocot		WA	5	G	P			299	y		
	Austrostipa compressa	Golden Speargrass	Poaceae	Monocot		WA	5	G	P			299	y		
	Austrostipa flavescens	Tall Speargrass	Poaceae	Monocot		AUST	5	G	P			299			y
*	Avena fatua	Wild Oat	Poaceae	Monocot			5	G	A			299			y
	Banksia attenuata	Candle Banksia	Proteaceae	Dicot		WA	1	T	P			299	y		
	Banksia grandis	Bull Banksia	Proteaceae	Dicot		WA	1	T	P			299			y
	Banksia littoralis	Swamp Banksia	Proteaceae	Dicot		WA	1	T	P		y	299		y	
	Banksia menziesii	Firewood Banksia	Proteaceae	Dicot		WA	1	T	P			299	y		
	Bolboschoenus caldwellii	Marsh Clubrush	Cyperaceae	Monocot		AUST	6	S-C	P	AQE		299		y	
	Bossiaea eriocarpa	Common Bossiaea	Papilionaceae	Dicot		WA	3	SH	P			299	y		
*	Briza maxima	Blowfly Grass	Poaceae	Monocot			5	G	A			299	y		y
*	Briza minor	Shivery Grass	Poaceae	Monocot			5	G	A			299	y		
*	Bromus diandrus	Great Brome	Poaceae	Monocot			5	G	A			299			y
	Burchardia congesta	Kara	Colchicaceae	Monocot		WA	4	H	PAB			299	y		
	Caladenia flava subsp. flava	Cowslip Orchid	Orchidaceae	Monocot		WA	4	H	PAB			299	y		
	Centella asiatica	Centella	Apiaceae	Dicot			4	H (PR)	P		y	299		y	
	Centrolepis drummondiana	Sand Centrolepis	Centrolepidaceae	Monocot		AUST	6	S-C	A			299	y		
*	Cerastium glomeratum	Sticky Mouse-ear Chickweed	Caryophyllaceae	Dicot			4	H	A			299	y		
	Conostephium pendulum	Pearlflower	Epacridaceae	Dicot		WA	3	SH	P			299	y		
	Conostylis aculeata	Prickly Conostylis	Haemodoraceae	Monocot		WA	4	H	P			299	y		
	Crassula colorata var. colorata	Dense Stonecrop	Crassulaceae	Dicot		T	4	H	A			299	y		
	Daviesia decurrens subsp. decurrens MS	Daviesia	Papilionaceae	Dicot		WA	3	SH	P			299	y		
	Daviesia triflora	Three-flowered Daviesia	Papilionaceae	Dicot		WA	3	SH	P			299	y		
	Desmocladius flexuosus	Desmocladius	Restionaceae	Monocot			6	S-R	P			299	y		

Species lists based on plot records from DEP (1996), Gibson et al. (1994), Griffin (1993), Keighery (1996) and Weston et al. (1992). Taxonomy and species attributes according to Keighery et al. (2006) as of 16th May 2005.

Wd?	Species Name	Common Name	Family	Major Plant Group	Significant Species	Endemic	Growth Form Code	Growth Form	Life Form	Life Form - aquatics	Common SSCP Wetland Species	BFS No	yela01 (FCT28)	yela02 (FCTs07)	yela03 (FCT25)
	Dianella revoluta var. divaricata	Common Dianella	Phormiaceae	Monocot		WA	4	H	P			299		y	
*	Disa bracteata	South African Orchid	Orchidaceae	Monocot			4	H	PAB			299	y		y
	Drosera erythrorhiza subsp. erythrorhiza	Red Ink Sundew	Droseraceae	Dicot		WA	4	H	PAB			299	y		
	Drosera macrantha subsp. macrantha	Rainbow	Droseraceae	Dicot		WA	4	H	PAB			299	y		
	Dryandra sessilis var. sessilis	Hills Parrotbush	Proteaceae	Dicot		WA	3	SH	P			299			y
*	Ehrharta calycina	Perennial Veldtgrass	Poaceae	Monocot			5	G	P			299	y		
*	Ehrharta longiflora	Annual Veldtgrass	Poaceae	Monocot			5	G	A			299			y
	Eucalyptus calophylla	Marri	Myrtaceae	Dicot		WA	1	T	P			299			y
	Eucalyptus gomphocephala var. gomphocephala	Tuart	Myrtaceae	Dicot		WA	1	T/M	P			299			y
	Eucalyptus marginata subsp. marginata	Jarra	Myrtaceae	Dicot		WA	1	T	P			299	y		
	Eucalyptus rudis subsp. rudis	Flooded Gum	Myrtaceae	Dicot		WA	1	T	P		y	299		y	
	Exocarpos sparteus	Broom Ballart	Santalaceae	Dicot		AUST	3	SH	P-PAR			299		y	
	Geranium retrorsum	Native Geranium	Geraniaceae	Dicot		T	4	H	A/P			299			y
*	Gladiolus caryophyllaceus	Pink Gladiolus	Iridaceae	Monocot			4	H	PAB			299	y		
	Gompholobium tomentosum	Common Gompholobium	Papilionaceae	Dicot		WA	3	SH	P			299	y		
	Haemodorum laxum	Haemodorum	Haemodoraceae	Monocot		WA	4	H	PAB			299	y		
	Hemarthria uncinata var. uncinata	Hemarthria	Poaceae	Monocot		AUST	5	G	P		y	299		y	
	Hibbertia cuneiformis	Cutleaf Hibbertia	Dilleniaceae	Dicot	r,s	WA	3	SH	P			299			y
	Hibbertia huegelii	Huegel's Hibbertia	Dilleniaceae	Dicot		WA	3	SH	P			299	y		
	Hibbertia hypericoides	Common Hibbertia	Dilleniaceae	Dicot		WA	3	SH	P			299	y		
	Homalosciadium homalocarpum	Homahoma	Apiaceae	Dicot		WA	4	H	A			299	y		
	Hovea trisperma var. trisperma	Common Hovea	Papilionaceae	Dicot		WA	3	SH	P			299	y		
	Hypocalymma robustum	Swan River Myrtle	Myrtaceae	Dicot		WA	3	SH	P			299	y		
*	Hypochaeris glabra	Flatweed	Asteraceae	Dicot			4	H	A			299	y		y
*	Isolepis marginata	Coarse Clubrush	Cyperaceae	Monocot		T	6	S-C	A			299	y		y
	Isotropis cuneifolia subsp. cuneifolia	Granny's Bonnets	Papilionaceae	Dicot		WA	4	H-SH	P			299	y		
	Jacksonia furcellata	Grey Stinkwood	Papilionaceae	Dicot		WA	3	SH/T	P			299		y	
	Lagenophora huegelii	Western Lagenophora	Asteraceae	Dicot		AUST	4	H	PAB			299	y		
	Lepidosperma longitudinale	Swamp Swordsedge	Cyperaceae	Monocot		AUST	6	S-C	P		y	299		y	
	Lepidosperma squamatum	Common Lepidosperma	Cyperaceae	Monocot		WA	6	S-C	P			299	y		
	Leporella fimbriata	Hare Orchid	Orchidaceae	Monocot		WA	4	H	PAB			299	y		
	Leucopogon parviflorus	Beard Heath	Epacridaceae	Dicot		WA	3	SH	P			299			y
	Leucopogon propinquus	Beard Heath	Epacridaceae	Dicot		WA	3	SH	P			299	y		
	Lomandra hermaphrodita	Lomandra	Dasypogonaceae	Monocot		WA	4	H	P			299	y		

Species lists based on plot records from DEP (1996), Gibson et al. (1994), Griffin (1993), Keighery (1996) and Weston et al. (1992). Taxonomy and species attributes according to Keighery et al. (2006) as of 16th May 2005.

Wd?	Species Name	Common Name	Family	Major Plant Group	Significant Species	Endemic	Growth Form Code	Growth Form	Life Form	Life Form - aquatics	Common SSCP Wetland Species	BFS No	yela01 (FCT28)	yela02 (FCTs07)	yela03 (FCT25)
	Lomandra preissii	Preiss's Lomandra	Dasypogonaceae	Monocot		WA	4	H	P			299	y		
	Lomandra suaveolens	Lomandra	Dasypogonaceae	Monocot		WA	4	H	P			299	y		
*	Lupinus cosentinii	Sandplain Lupin	Papilionaceae	Dicot			4	H	A			299			y
	Luzula meridionalis	Woodrush	Juncaceae	Monocot		AUST	6	S-J	PAB			299			y
	Macrozamia riedlei	Riedlé's Zamia	Zamiaceae	Cycad		WA	3	SH-H	P			299			y
	Melaleuca raphiophylla	Freshwater Paperbark	Myrtaceae	Dicot		WA	3	SH	P		y	299		y	
	Mesomelaena pseudostygia	Semaphore Sedge	Cyperaceae	Monocot		WA	6	S-C	P			299	y		
	Microlaena stipoides	Weeping Grass	Poaceae	Monocot		T	5	G	P			299	y		
	Microtis media	Common Mignonette Orchid	Orchidaceae	Monocot		WA	4	H	PAB			299	y	y	
*	Moraea flaccida	One-leaf Cape Tulip	Iridaceae	Monocot			4	H	PAB			299			y
	Myoporum caprarioides	Slender Myoporum	Myoporaceae	Dicot		WA	3	SH	P			299		y	
	Opercularia vaginata	Opercularia	Rubiaceae	Dicot		WA	3	SH-H	P			299	y		
*	Orobanche minor	Broom Rape	Orobanchaceae	Dicot			4	H	A-PAR			299			y
*	Pelargonium capitatum	Rose Pelargonium	Geraniaceae	Dicot			4	H-SH	P			299		y	
	Petrophile linearis	Pixie Mops	Proteaceae	Dicot		WA	3	SH	P			299	y		
*	Petrorhagia dubia	Velvet Pink	Caryophyllaceae	Dicot			4	H	A			299			y
	Pimelea argentea	Silver-leaved Banjine	Thymelaeaceae	Dicot		WA	3	SH	P			299			y
	Poranthera microphylla	Poranthera	Euphorbiaceae	Dicot		WA	4	H-SH	P			299	y		
	Pteridium esculentum	Bracken	Dennstaedtiaceae	Fern		AUST	4	H	P			299			y
	Pterostylis nana	Small Snail Orchid	Orchidaceae	Monocot		WA?	4	H	PAB			299	y		
	Ptilotus stirlingii var. stirlingii	Stirling's Mulla Mulla	Amaranthaceae	Dicot		WA	4	H-SH (PR)	P			299			2
	Schoenus curvifolius	Schoenus	Cyperaceae	Monocot		WA	6	S-C	P			299	y		
*	Sonchus asper subsp. glaucescens	Rough Sowthistle	Asteraceae	Dicot			4	H	A			299		y	
*	Sonchus oleraceus	Common Sowthistle	Asteraceae	Dicot			4	H	A			299			y
	Sowerbaea laxiflora	Purple Tassels	Anthericaceae	Monocot		WA	4	H	PAB			299	y		y
	Spyridium globulosum	Basket Bush	Rhamnaceae	Dicot		AUST	3	SH	P			299			y
	Stylidium brunonianum subsp. brunonianum	Pink Fountain Triggerplant	Stylidiaceae	Dicot		WA	4	H	P			299	y		
	Stylidium calcaratum	Book Triggerplant	Stylidiaceae	Dicot		AUST	4	H	A			299	y		
	Stylidium piliferum subsp. piliferum	Common Butterfly Triggerplant	Stylidiaceae	Dicot		WA	4	H	P			299	y		
	Thysanotus arenarius	Limestone Fringed Lily	Anthericaceae	Monocot		WA	4	H	PAB			299			y
	Trachymene pilosa	Small Laceflower	Apiaceae	Dicot			4	H	A			299	y		y
*	Trifolium campestre var. campestre	Hop Clover	Papilionaceae	Dicot			4	H	A			299			y
	Typha domingensis	Native Bulrush	Typhaceae	Monocot		T	6	S-J	PAB	AQE		299		y	
*	Ursinia anthemoides	Ursinia	Asteraceae	Dicot			4	H	A			299	y		

Species lists based on plot records from DEP (1996), Gibson et al. (1994), Griffin (1993), Keighery (1996) and Weston et al. (1992). Taxonomy and species attributes according to Keighery et al. (2006) as of 16th May 2005.

Wd?	Species Name	Common Name	Family	Major Plant Group	Significant Species	Endemic	Growth Form Code	Growth Form	Life Form	Life Form - aquatics	Common SSCP Wetland Species	BFS No	yela01 (FCT28)	yela02 (FCTs07)	yela03 (FCT25)
*	Vicia sativa	Common Vetch	Papilionaceae	Dicot			4	H	A			299			y
*	Vulpia sp. scps	Fescue	Poaceae	Monocot			5	G	A			299	y		
	Wahlenbergia preissii	Preiss's Native Bluebell	Campanulaceae	Dicot		AUST	4	H	A			299	y		
	Waitzia suaveolens var. suaveolens	Fragrant Immortelle	Asteraceae	Dicot		WA	4	H	A			299	y		
	Xanthorrhoea preissii	Balga	Xanthorrhoeaceae	Monocot		WA	3	SH	P			299	y		
	Xanthosia huegelii subsp. huegelii MS	Xanthosia	Apiaceae	Dicot		WA	4	H-SH	P			299	y		

APPENDIX 7

**RIAWA SEED SUPPLY STANDARDS
AND GUIDELINES**

SEED SUPPLY STANDARDS SUB COMMITTEE

SEED SUPPLY STANDARDS REVIEW GUIDELINES – APRIL 06

INDUSTRY ISSUES	STANDARDS
<p>SEED HARVESTING</p> <ul style="list-style-type: none"> Ø <i>Accurate identification of species</i> Ø <i>Appropriate harvest techniques</i> Ø <i>Contamination in the field by weed species</i> Ø <i>Appropriate post harvest-handling techniques</i> 	<ul style="list-style-type: none"> Ø Use experienced personnel ie, botanist and herbarium staff where practical. Presence of at least one skilled collector in any team. Ø Taking of voucher specimens where applicable. Ø Use experienced licensed personnel. Ø Collect to license requirements. Ø Ensure minimal impact on ecological resources. Ø Maintain genetic integrity of seed lots through separation of provenance, accurate records and collection data (refer to Flora Bank Guidelines). Ø Use harvest techniques that avoid the collection of weed species. Ø Target populations for collection that are known to have minimal weed infestation. Ø Vacuum harvesting techniques are only to be used in weed free areas or on readily identifiable species which can easily be cleaned down to pure samples. Ø Ensure collected material is kept dry and cool between collection and return of material for drying and processing. Ø Monitor material to avoid deterioration from excess moisture, humidity and insect predation. Ø Use appropriate bags for seed storage in the field such as calico, hessian, woven wool bales and paper. Ø Refer to Florabank Guidelines 5 & 6 for basic collection methods.
<p>SEED PROCESSING</p> <ul style="list-style-type: none"> Ø <i>Appropriate maturing and drying conditions</i> Ø <i>Contamination of seed lots</i> Ø <i>Physical quality of seed</i> 	<ul style="list-style-type: none"> Ø Spread seeds in well aerated, cool and dry environment as soon as possible. Ø Avoid intense heat (eg plastic tunnels during summer). Ø Monitor material regularly to avoid deterioration, contamination and predation. Ø Ensure all processing equipment is cleaned after each seed lot. Ø Ensure a clean processing environment to avoid contamination of seed lots. Ø Maintain an accurate batch labelling system. Ø Remove dead seeds where possible. Ø Perform a cut-test on each batch to determine potential viability.

SEED STORAGE Ø <i>Provision of appropriate storage conditions</i>	Ø Use cool, dry storage areas and air-conditioning if necessary. Ø Consider the use of freezers for longer-term storage and insect control. Ø Use appropriate measures to ensure seed batches are kept insect free. This may include the use of carbon dioxide, freezing and other low toxicity preparations. Ø Seed should be stored to suit the expected length of time for which it will be held. Ø Refer to Florabank Guideline 3 and also 'Guidelines – Native Seed Storage for Revegetation'.
SEED MARKETING & SUPPLY Ø <i>Seed standard classification</i> Ø <i>Seed labelling</i> Ø <i>Physical seed purity</i> Ø <i>Provenance</i>	Ø Where proven viability or germinability is required, an independent test must be carried out. Ø Minimum labelling standard should include: unique batch number, genus, species, quantity and location of collection (nearest town). Label should identify whether seed is from wild or cultivated populations. Ø Hand written labels are unacceptable for commercial purposes. Ø Seed purity needs to be stated when quoting to ensure client is able to properly assess pricing. Ø Distinction should be made between pure seed, seed with chaff and seed with chaff and foreign matter. Ø Provenance must match the stated client requirements. Ø Refer to Florabank 'Guidelines – Keeping Records On Native Seed'
PAYMENT OF CONTRACTORS & STAFF	Ø Free or volunteer labour should not be utilised in the collection of seed for commercial sale, other than for approved training purposes. Ø All collection staff should be paid award wage as per state and federal legislation.
SEED ORCHARDS	Ø Seed orchards are appropriate for bulking individual species of known provenance. Ø Ensure genetic integrity is maintained in orchard situations. Ø Seed from seed orchards should be labelled as such. Ø Refer to Florabank Guideline 7.

References:

Wildlife Conservation Act (1950)

Florabank Guidelines: <http://www.florabank.org.au/>

APPENDIX 8

TRANEN REVEGETATION SYSTEMS

LETTER

Belinda Heath
Senior Environmental Consultant
PGV Environmental

17 October 2013

Re: Eglinton Conservation and Revegetation Management Plan (CRMP)

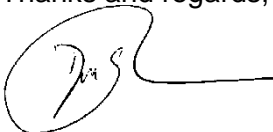
Hi Belinda,

I have reviewed the CRMP for Eglinton submitted to the Federal Department of the Environment, and endorse the proposed methodology and timing. The strategy has both strong scientific and practical foundations that have been developed in conjunction with the Department of Parks and Wildlife. It is expected to deliver a relatively high standard of outcome compared to other recent projects in the greater metropolitan area, of a similar size and nature.

To address the individual points of condition 12c:

- i) The seed collection and topsoil management methodology are based on current known and proven best practice management techniques;
- ii) Clearing staging is spread over 15 years which will allow for flexibility with changes to site conditions, such that negative factors can be mitigated and positive factors used to advantage;
- iii) Seed storage will be to the standards adopted by the Revegetation Industry Association of WA. Topsoil storage will be avoided as much as possible with topsoil transported directly to site during ideal periods as a priority. However, if the timing of clearing is outside of the ideal period, and unavoidable, there are appropriate contingency measures in place so the project will still achieve the success targets that have been committed to.
- iv) Appropriate measures have been incorporated into the management plan to avoid, and if not mitigate the potential for transfer of invasive weeds between the source and recipient sites; and
- v) The relatively high success targets have been set at levels which will not be possible to achieve without high quality management standards during every step of the process, both prior to and post-implementation. Regular monitoring and close supervision of the implementation of the plan are a key part of this process.

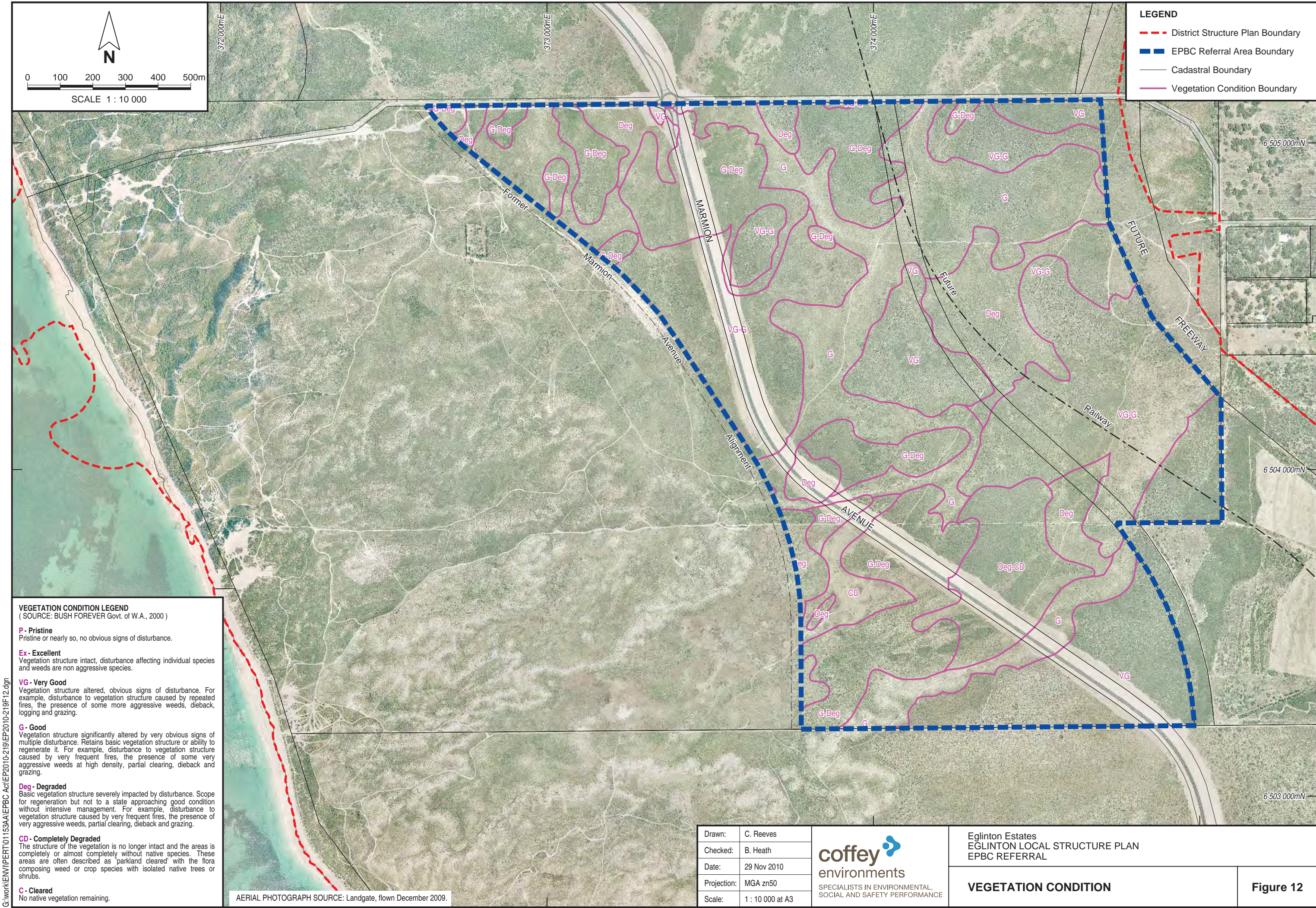
Thanks and regards,



Damian Grose
Planning and Design Director
Tranen Revegetation Systems

APPENDIX 9

Vegetation Condition Mapping (ATA Environmental 2004)



VEGETATION CONDITION LEGEND
(SOURCE: BUSH FOREVER Govt. of W.A., 2000)

P - Pristine
Pristine or nearly so, no obvious signs of disturbance.

Ex - Excellent
Vegetation structure intact, disturbance affecting individual species and weeds are non aggressive species.

VG - Very Good
Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

G - Good
Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

Deg - Degraded
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

CD - Completely Degraded
The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora composing weed or crop species with isolated native trees or shrubs.

C - Cleared
No native vegetation remaining.

AERIAL PHOTOGRAPH SOURCE: Landgate, flown December 2009.

Drawn:	C. Reeves
Checked:	B. Heath
Date:	29 Nov 2010
Projection:	MGA zn50
Scale:	1 : 10 000 at A3



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Eglinton Estates
EGLINTON LOCAL STRUCTURE PLAN
EPBC REFERRAL

VEGETATION CONDITION

Figure 12