



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 4860/2
Permit Holder:	Carey Baptist College Inc
Duration of Permit:	21 June 2014– 21 June 2024

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

1. Purpose for which clearing may be done

Clearing for the purpose of constructing a school site and engineering batters.

2. Land on which clearing is to be done

Lot 2 on Diagram 75868 (Forrestdale 6112)

3. Area of Clearing

The Permit Holder must not clear more than 4.45 hectares of native vegetation within the area hatched yellow on attached Plan 4860/2a.

4. Application

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

PART II – MANAGEMENT CONDITIONS

5. Dieback and weed control

When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:

- clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- ensure that no *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
- restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

6. Offset - Revegetation Plan

The Permit Holder must, within the area shaded red on attached Plan 4860/2b, implement and adhere to the offset commitments as outlined in the Stage 1: Revegetation Plan – Lot 2 Nicholson Road, Forrestdale, Revision 4, October 2014 attached as Appendix A to this permit.

PART III - RECORD KEEPING AND REPORTING

7. Records must be kept

In relation to the Offset – Revegetation of areas pursuant to condition 6:

- (a) the location of any area of offsets recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;
- (b) a description of the offset activities undertaken; and
- (c) the size of the offset area (in hectares).

8. Reporting

The Permit Holder must provide to the CEO on or before 30 June of each year, a written report:

- (a) of records required under condition 7 of this Permit; and concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the calendar year.
- (b) If no clearing authorised under this Permit was undertaken between 1 January to 31 December of the preceding calendar, a written report confirming that no clearing under this permit has been carried out, must be provided to the CEO on or before 30 June of each year.
- (c) Prior to 21 March 2024, the Permit Holder must provide to the CEO a written report of records required under condition 7 of this Permit where these records have not already been provided under condition 8(a) of this Permit.

DEFINITIONS

The following meanings are given to terms used in this Permit:

dieback means the effect of *Phytophthora* species on native vegetation;

fill means material used to increase the ground level, or fill a hollow;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

soil disease status means soil types either infested, not infested, uninterpretable or not interpreted with a pathogen.

weed/s means any plant -

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
- (b) published in a Department of Parks and Wildlife Regional Weed Rankings Summary, regardless of ranking; or
- (c) not indigenous to the area concerned.



M Warnock
SENIOR MANAGER
CLEARING REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

18 December 2014

COTERRA ENVIRONMENT

Stage 1: Revegetation Plan

Lot 2 Nicholson Road, Forrestdale

Revision 4, October 2014

CALIBRE | COMMITMENT | COLLABORATION



Stage 1: Revegetation Plan

Lot 2 Nicholson Road, Forrestdale

Revision 4, October 2014

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- Appendix E: Lot 2 Nicholson Road: Phytophthora Dieback Interpretation Report (Source: NPC Consulting)

1.0 INTRODUCTION

1.1 General

Lot 2 Nicholson Road Forrestdale (the site) is located approximately 24 km south-east of Perth, within the City of Armadale (Figure 1). The site is approximately 22ha in size and is currently zoned 'Rural' under the Metropolitan Region Scheme (MRS) and 'General Rural' under the City of Armadale's Town Planning Scheme 4 (TPS4).

Carey Baptist College is proposing to build a new school campus at the site. The school will ultimately provide for students from Kindergarten to Year 12. The overall development footprint of the school is approximately 11.14 ha, which is approximately 50% of the total site area. In order to progress construction, clearing of vegetation onsite will be required.

1.2 DER Clearing Permit Application

A clearing permit application was provided to the Department of Environment and Conservation (DEC; now Department of Environment Regulation (DER)) in January 2012 (CPS 4860/1). Some additional information was provided to DER in May 2012. Additional information requested at this time was as follows:

1. *A map outlining the boundary of the above areas to be retained and vegetated.*
2. *A Revegetation Plan outlining the following:*
 - (a) *Details on how Carey Baptist College Inc will ensure the long term (10-30 years) security of the vegetation site.*
 - (b) *Details on the measureable component of the revegetation and weed removal activities to be undertaken. For example:*
 - (i) *Target density (e.g. > xx% survival rate (planting density xxxx stems/ha using xx native species present to be achieved by 20xx)*
 - (ii) *Target structure (e.g. xx% overstorey, xx% midstorey, xx% understory species, consistent with mapped vegetation type to be achieved by 20xx); and*
 - (iii) *Target composition (e.g. xx native species consistent with mapped vegetation or vegetation to be cleared, x years after establishment);*
 - (iv) *Weed coverage target (e.g. 20% weed coverage remaining after weed control etc.)*
 - (c) *A species list detailing which species will be planted.*
 - (d) *Brief details on mitigation and maintenance activities (i.e. follow up planting if target density is not reached, follow up weeding) and associated timeline.*
 - (e) *Monitoring schedule and details on the monitoring method used to establish if targets are being met (i.e. transects, quadrats, photos, plots etc)*
 - (f) *Timeline for re-vegetation and weed control should be a minimum of 5 years.*

Please also note that Carey Baptist College Inc should commit to at least 5 years of monitoring and maintenance activities due to risk of failure.

The Revegetation Plan for the entire site (Stages 1 and 2) was prepared, in part, to provide the information required to satisfy the above request.

The DER advised in May 2014 that the clearing permit for the Stage 1 clearing area has been granted, conditional upon the implementation of the Revegetation Plan (Revision 1). A copy of the clearing permit approval is provided in Appendix A.

An Application for an amendment to a clearing permit was submitted in September 2014 to DER to increase the clearing area by 1,941m² (0.19ha) to accommodate for engineering batters required around the Stage 1 access way.

1.3 City of Armadale Development Conditions

The City of Armadale have issued a number of conditions in relation to the Development Application approval. These conditions include:

- Condition 1(b) – *A wetland management plan for the Resource Enhancement wetland and the Conservation category wetland buffer, is to be submitted for approval by the Executive Director Development Services prior to the commencement of any site works, and implemented to the satisfaction of the Executive Director Development Services (on advice from the Department of Environment and Conservation).*
- Condition 1(d) – *Submission and implementation of a Weed Control Management Plan, including what weeds are present on the subject lot, what chemicals will be utilised for which weeds and appropriate timing of weed control based on weed species, to the satisfaction of the Executive Director Development Services.*
- Condition 1(g) – *A revegetation plan being prepared, approved and implemented for the revegetation of wetland areas, wetland buffers and other areas of the site outside the development area identified on the Master Plan for the school dated 28 November 2012 with appropriate native species to the satisfaction of the Executive Director Development Services.*
- Condition 1(h) – *A seed bank is to be compiled for native plants existing on Lot 2 for the purpose of growing plants for revegetation and wetland rehabilitation to the satisfaction of the Executive Director Development Services. Collection of seed is to occur in the year prior to any clearing.*
- Condition 1(i) – *Prior to the commencement of subdivisional works a dieback management plan is to be prepared and approved to ensure the protection and management of the sites environmental assets with satisfactory arrangements being made for the implementation of the approved plan.*

As presented in Section 1.2, there is a Revegetation Plan (Rev 1) for the site (Stages 1 and 2), which was approved by the DER as part of the clearing permit process.

To address comments received from The City of Armadale¹ on the previous version(s) of the Revegetation Plan, this document has been amended to only include Stage 1 of the works proposed and also contains information to address the above conditions.

¹ Email: Notes from Tuesdays Meeting RE: Lot 2 Nicholson Rd Wetland/Rehabilitation Plan (32 June 2014)
Letter: Comment on Version 2 of the Lot 2 Nicholson Road Revegetation Plan (29 August 2014) (OUT/11185/14).
Email: Feedback on revegetation plan Lot 2 Nicholson Road submitted 8 October 2014 (15 October 2014)

1.4 Proposed Development

1.4.1 Layout

In consultation with key stakeholders a Concept Plan has been prepared for the site (Figure 2). This plan addresses the natural attributes of the site including wetlands and their associated buffers, remnant vegetation and relevant planning easements and buffers. The Concept Plan comprises of the following:

- Primary School and associated facilities.
- High school and associated facilities.
- Two soccer ovals.
- Football oval.
- Playing courts.
- Car parking and drop-off areas.
- Northern and Southern driveway access points.

Stage 1 of the Concept Plan is highlighted in Figure 2, these areas coincide with the Primary School component of the development.

1.4.2 Onsite Conservation Areas

The conservation areas identified within the Concept Plan include:

- Resource Enhancement Wetland (REW) and associated buffer zone at the eastern end of the site.
- Setback to the adjacent Conservation Category wetland (CCW) and Bush Forever site along the northern and western site boundaries.
- Banksia woodland in the north western corner of the site.

1.4.3 Staging and Timing

Approval for the Stage 1 development to commence was provided by the State Administrative Tribunal in March 2014 in accordance with the City of Armadale conditions.

As such the school construction is anticipated to proceed as follows:

- Construction of Stage 1 commence end of 2014.
- Estimated School opening date: February 2016. This will comprise facilities to initially accommodate students from Kindergarten to Year 2 only. The area of this stage is approximately 3.7ha.
- The school campus is proposed to continue to be constructed in stages over the next ten to fifteen years pending separate Development Application approvals. Facilities to provide accommodation for primary school levels will be constructed first, followed by the secondary school buildings.

The extent of the Stage 1 development area is shown on Figure 2.

1.4.4 Stormwater Drainage

Stormwater drainage will be constructed within both stages of the development. The drainage proposed for Stage 1 will consist of the following:

- Initial stormwater infiltration from buildings and hardstand areas will be at-source through use of soak wells. The soak well network will be connected to the drainage infiltration swale to accommodate higher flow volumes.
- The drainage infiltration swale to be constructed within the REW buffer to accept stormwater flows up to the 1 in 5 year ARI event.
- Overflow from storm events greater than 1 in 5 year ARI will be directed towards the adjacent wetland area.

The drainage infiltration swales to be located within the REW buffer will be constructed with a natural earth base and sides. The layout of the basin and cross sections showing the slope are provided in Appendix B. These areas will then be revegetated as part of the site revegetation program (see Section 3.0).

The Urban Stormwater Management Plan (DWA, 2014; Revision 2) which contains the drainage design details was approved by the City of Armadale in June 2014.

1.5 EPBC Act Referral

The project was referred to the Federal Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in September 2012.

SEWPaC subsequently advised that the project was 'Not a Controlled Action' and that development could proceed without further Federal assessment.

The EPBC Act referral outlined the core components of the proposed revegetation program which are also presented in this document.

2.0 SITE DESCRIPTION

2.1 Topography, Soils and Geology

Topography across the site ranges from approximately 25mAHD at the lower lying eastern and western ends, to 30mAHD within the central portion (Figure 3).

The geology of the Forrestdale area has been mapped at regional scale by Jordan (1986). Most of the site has been mapped as Bassendean Sand (S8) which is characterised as white to pale grey at the surface, yellow at depth, fine to medium-grained, moderately sorted, sub-angular to sub-rounded, minor heavy minerals of eolian origin (Figure 3). Some portions of the site are mapped as Sand (S10) which is as per S8 as a relatively thin veneer over strong, blocky, brown silts and clays.

The geology for the remainder of the site is mapped as Peaty Sand (SP1), described as peaty sand grey to black, moderately sorted quartz sand, slightly peaty, of lacustrine origin (Jordan, 1986). These soils are associated with the lower lying topography on site.

2.2 Hydrology

2.2.1 Wetlands and Surface Water

There are two wetlands mapped by the DEC (now Department of Parks and Wildlife) within Lot 2 (Figure 4). One is a Multiple Use Wetland (UFI 7088) located within the western section of the site and the other is a Resource Enhancement Wetland (Part UFI 7233). There are no wetlands listed under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* within or immediately adjacent to the site.

The closest highly significant wetland to the site is Forrestdale Lake, which is located approximately 650m east of the site. Forrestdale Lake is a Ramsar site and is listed under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*.

The adjacent Bush Forever Site contains large areas of Conservation Category Wetlands. These wetlands extend up to the western and southern boundaries of Lot 2 (Figure 4).

An open shallow drain is present within Lot 2 which intersects the site through the eastern margin of wetland UFI 7233.

2.2.2 Groundwater

The estimated maximum water table contours across the site is approximately 25mAHD (DoW, 2014). This equates to a depth below ground level of approximately 0 to 5m.

There is one Department of Water (DoW) groundwater monitoring bore (WIN site ID 4782) located north of the site, which indicates that since 1975 groundwater has remained fairly consistent at approximately 24mAHD.

2.3 Vegetation and Flora

2.3.1 Overview

Lot 2 contains some remnant vegetation in patches throughout the site. On a regional scale these areas have been mapped as containing vegetation from the Southern River Complex. This complex is described as follows (Hedde et al., 1980):

Open woodland of *Corymbia. calophylla*- *Eucalyptus marginata*- *Banksia* spp with fringing woodland of *E. rudis*- *Melaleuca raphiophylla* along creek beds.

Lot 2, including the wetlands, has been predominantly cleared. The remaining vegetation is currently degraded as a result of its historical agricultural use and its location adjacent to Nicholson Road which has resulted in illegal rubbish dumping, disturbance through maintenance of the road reserve, fire damage, weed encroachment and trespassing.

There are two Bush Forever sites near the landholding. Bush Forever Site No. 344 is located adjacent to the western boundary of Lot 2. Bush Forever Site No. 345 is located further east of Nicholson Road.

The DEC's (2010) Nature Map was searched with a 1 km radius from the site. The preliminary search showed no recorded significant flora within the site, however, *Drakaea micrantha* (Dwarf Hammer Orchard) has been recorded in the vicinity of the site. This species is a Declared Rare Flora under the *Wildlife Conservation Act 1950* [WA] and listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* [Cth].

2.3.2 Vegetation Units

A level 2 Flora and Vegetation Survey was completed by Bennett Environmental Consulting (2011) for the site in October 2011 in accordance with EPA Guidance Statement No 51 (EPA, 2004).

During the survey a total of eight different vegetation units were identified. These consisted of upland and wetland vegetation (Figure 5). These are:

Upland Vegetation

- Ba: Low Woodland A of *Banksia attenuata*, *Banksia menziesii*, *Nuytsia floribunda* and *Eucalyptus todtiana* over Heath B dominated by *Acacia pulchella* var. *glaberrima* over Tall Grass dominated by **Ehrharta calycina* in grey sand.
- Bi: Low Forest A of *Banksia attenuata* and *Banksia ilicifolia* over Tall Grass dominated by **Ehrharta calycina* and **Ehrharta longiflora* in grey sand.
- Et: Low Woodland A of *Eucalyptus todtiana* with occasional *Banksia ilicifolia* over Open Dense Tall Grass dominated by **Eragrostis curvula* over Herbs dominated by **Carpobrotus edulis*, **Erodium botrys*, **Lotus subbiflorus* and **Hypochaeris glabra* in pale grey sand.

Wetland Vegetation

- Mp: Open Low Woodland B of *Melaleuca preissiana* over Dense Thicket of *Kunzea glabrescens* over Open Herbs dominated by *Patersonia occidentalis* and *Drosera glanduligera* in damp dark grey sand.
- Mr: Low Forest A of *Melaleuca raphiophylla* over Dense Herbs dominated by **Zantedeschia aethiopicum* and **Lotus subbiflorus* in very damp grey sand.
- EM: Open Low Woodland A of *Eucalyptus todtiana* and *Melaleuca preissiana* over Low Scrub A or Scrub of *Kunzea glabrescens* and *Pultenaea reticulata* over Herbs dominated by **Carpobrotus edulis* and **Lotus subbiflorus* in grey sand.
- Er: Low Forest A of **Eucalyptus* species (possibly **Eucalyptus robusta*), *Melaleuca preissiana* and **Populus nigra* over Dense Tall Grass dominated by **Eragrostis curvula* in grey sandy loam.
- Ec: Dense Tall Grass of **Eragrostis curvula*, **Paspalum urvillei*, and/or **Pennisetum clandestinum* or Tall Sedges of *Juncus pallidus* or Herbs dominated by **Lotus subbiflorus*, **Moraea flaccida* and **Euphorbia terracina* in damp grey sand.

2.3.3 Vegetation Condition

The condition of remnant vegetation on site varied from Very Good - Good to Completely Degraded, with over half of the site (12.5ha, 56%) being Degraded to Completely Degraded. Vegetation condition mapping is provided on Figure 6.

The areas of overall best condition vegetation (i.e. Good to Very Good) were located in within the central margin of the site. The higher ground within these better condition areas had many *Banksia attenuata* and *Banksia menziesii* deaths, not just from recent fires but also likely as a result of the long hot summers and dry winters experienced over the previous two years (Bennett Environmental Consulting, 2011).

2.3.4 Rare and Priority Flora

No Declared Rare Flora species were found at the site.

One DPaW Priority 2 flora annual sedge species *Schoenus pennisetis* was identified at one location in the north western corner (CS01) of the site (Figure 5). *Jacksonia gracillima*, a DPaW Priority 3 Flora, is a shrub which was identified at two locations on site (walking transect and CS06).

2.3.5 Weed Species

A total of 66 weed species were recorded during the Level 2 flora and vegetation survey (Bennett Environmental Consulting, 2011). The weed species found onsite and their rating for ecological impacts, impact attributes and invasiveness are shown on Table 1.

Table 1 Weed Species Present Onsite

Species	Ecological Impacts		Invasiveness
	Ecological Impact L - low impact M - medium impact H - high impact U - unknown impact	Impact attributes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. (see explanation below)	Rate of dispersal R - rapid M - moderate S - slow
* <i>Acacia longifolia</i>	H	1,2,4,6,7,8,9	M
* <i>Arctotheca calendula</i>	H	8,9	R
* <i>Asparagus asparagoides</i>	H	6,7,8,9	R
* <i>Avena barbata</i>	H		R
* <i>Azolla filiculoides</i>	L		M
* <i>Briza maxima</i>	U		R
* <i>Briza minor</i>	U		R
* <i>Bromus diandrus</i>	H		R
* <i>Carpobrotus edulis</i>	H	8,9	R
* <i>Cortaderia selloana</i>	H	1,6,7,8,9	R
* <i>Cotula coronopifolia</i>	U		R
* <i>Cotula turbinata</i>	L		M
* <i>Cynodon dactylon</i>	H	9	R
* <i>Cyperus congestus</i>	U		M
* <i>Cyperus tenellus</i>	L		U
* <i>Disa bracteata</i>	U		R
* <i>Dittrichia graveolens</i>	M		R
* <i>Echium plantagineum</i>	H	Increasing	R
* <i>Ehrharta calycina</i>	H	1,2,6,8,9	R
* <i>Ehrharta longiflora</i>	H	1,2,6,8,9	R
* <i>Eragrostis curvula</i>	H		R
* <i>Erodium botrys</i>	U		M
* <i>Eucalyptus robusta</i>	Not listed		
* <i>Euphorbia terracina</i>	H	8,9	R
* <i>Ficus carica</i>	H		M
* <i>Fumaria capreolata</i>	H	7,9	R
* <i>Gladiolus caryophyllaceus</i>	H		R
* <i>Gomphocarpus fruticosus</i>	H	9	R
* <i>Holcus lanatus</i>	H		U
* <i>Hypochoeris glabra</i>	H		R
* <i>Isolepis marginata</i>	U		U
* <i>Juncus acutus</i>	H	1,3,4,7,8,9	R
* <i>Juncus bufonius</i>	U		R
* <i>Juncus capitatus</i>	U		R
* <i>Lolium multiflorum</i>	Not listed		
* <i>Lotus subbiflorus</i>	U		R
* <i>Lupinus angustifolia</i>	H		M
* <i>Lupinus cosentinii</i>	H		M
* <i>Lythrum hyssopifolia</i>	M		R
* <i>Medicago polymorpha</i>	L		
* <i>Moraea flaccida</i>	H	8,9	R
* <i>Nerium oleander</i>	L		R
* <i>Oenothera stricta</i>	L		M

Species	Ecological Impacts		Invasiveness
	Ecological Impact L - low impact M - medium impact H - high impact U - unknown impact	Impact attributes: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. (see explanation below)	Rate of dispersal R - rapid M - moderate S - slow
<i>*Ornithopus sativus</i>	M		R
<i>*Paspalum urvillei</i>	H		M
<i>*Pennisetum clandestinum</i>	H		S
<i>*Persicaria maculosa</i>	L		U
<i>*Populus nigra</i>	L		S
<i>*Ranunculus muricata</i>	L		U
<i>*Raphanus raphanistrum</i>	U		M
<i>*Ricinus communis</i>	M	2,8,9	R
<i>*Romulea rosea</i>	U		R
<i>*Rumex crispus</i>	U		R
<i>*Schinus terebinthifolia</i>	H	3,7,8,9	M
<i>*Solanum americanum</i>	U		R
<i>*Solanum nigrum</i>	M		R
<i>*Sonchus asper</i>	U		R
<i>*Sonchus oleraceus</i>	U	Increasing	R
<i>*Trachyandra divaricata</i>	M	1,4,9	R
<i>*Trifolium campestre</i>	U		U
<i>*Trifolium hirtum</i>	U		U
<i>*Typha orientalis</i>	H	2,3,5,6,7,9	R
<i>*Ursinia anthemoides</i>	U	Increasing	R
<i>*Vulpia bromoides</i>	H		R
<i>*Wahlenbergia capensis</i>	U		R
<i>*Zantedeschia aethiopicum</i>	H	6,7,8,9,10	R

Impact Attributes: 1 - changed fire regime; 2 - changed nutrient conditions; 3 - changed hydrological patterns; 4 - changed soil erosion patterns; 5 - changed geomorphological processes; 6 - changed biomass distribution; 7 - changed light distribution; 8 - loss of biodiversity; 9 - substantially reduces regeneration opportunities of native plants; 10 - allelopathic effects. Increasing means that the weed is increasing its distribution from original known areas.

The common weeds, which were identified as those occurring at a coverage of 5% or greater in at least one of the botanical plots surveyed, are as follows:

- *Arctotheca calendula*
- *Avena barbata*
- *Briza maxima*
- *Bromus diandrus*
- *Carpobrotus edulis*
- *Cynodon dactylon*
- *Cyperus tenellus*
- *Ehrharta calycina*
- *Ehrharta longiflora*
- *Eragrostis curvula*
- *Eucalyptus robusta*
- *Hypochaeris glabra*
- *Isolepis marginata*

- *Juncus bufonius*
- *Lotus subbiflorus*
- *Lupinus angustifolia*
- *Moraea flaccida*
- *Populus nigra*
- *Romulea rosea*
- *Vulpia bromoides*
- *Zantedeschia aethiopicum*

2.4 Fauna and Habitat

A fauna survey was undertaken on 10 August 2012 by Coterra Environment. The survey identified a number of waterbird and bushland bird species utilising and / or occurring within the site, though no conservation significant species were identified. Mammals identified at the site included the western grey kangaroo (*Macropus fuliginosus*) and the European rabbit (*Oryctolagus cuniculus*), which appears to have colonised many of the drier areas of the site. One reptile, a tiger snake (*Notechis ater*), was identified during the site visit.

A black cockatoo habitat assessment was undertaken as part of the fauna survey. Results are summarised as follows:

- The Level 2 Flora and Vegetation Survey (Bennett Environmental Consulting, 2011), identified four vegetation types within the site containing plant species that provide potential black cockatoo foraging habitat (Ba, Bi, Et, EM) (Figure 5).
- Two black cockatoo species were identified through database searches as potentially occurring within the site, or having been previously recorded in the vicinity:
 - Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)
 - Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)
- No potential breeding habitat trees were found within the site.
- No potential roosting habitat trees were found within the site (no trees were considered sufficiently tall or structurally complex to provide core roosting habitat).
- Three types of foraging habitat were identified within the site, and the locations of these habitat areas are mapped in Figure 7:
 - Good quality *Eucalyptus todtiana* foraging habitat
 - Good quality *Banksia* sp. foraging habitat
 - Poor quality *Banksia* sp. foraging habitat
- A thorough search was undertaken for cockatoo feeding signs, though there was no evidence of cockatoos utilising the area for feeding across the entire site.
- No signs of black cockatoos were noted during the field survey.

The DER clearing application preliminary assessment report stated that foraging evidence of Carnaby's Black Cockatoo was noted within the clearing application area. As identified above, this was not observed during the Cockatoo habitat survey undertaken in August 2012.

2.5 Dieback

Phytophthora dieback refers to the plant disease caused by the pathogen *Phytophthora cinnamomi*. Dieback is a significant threat to vulnerable plants and plant communities in areas receiving at least 400mm annual rainfall. Plants under threat from the disease include the Eucalyptus (Myrtaceae) particularly Eucalyptus marginata, Banksia family (Proteaceae), Heath family (Epacridaceae) and Pea family (Papilionaceae) (DEC, 2012).

As identified in Section 2.3.3, a number of Banksia deaths are evidence onsite. The cause is unknown and maybe related to a decline in groundwater levels and/or dieback.

In September 2014, NPC Consulting (Dieback mapping and management consultants) undertook a Dieback Assessment for the site which included:

- Site inspection to undertake dieback assessment
- Collection of 3 samples for soil and root testing of dieback
- Preparation of an interpretation map
- Preparation of a report outlining the findings of the assessment. A copy of the full Dieback Interpretation Report is provided in Appendix E.

Sample results (two out of three samples were positive) confirmed field investigations which indicated that *Phytophthora cinnamomi* is present in the remnant Banksia Woodland area situated in the centre of the site (NPC Consulting, 2014, Appendix E). This remnant vegetation is approximately 4 hectares in size and consists of the Vegetation Unit (Ba) (Figure 5).

NPC Consulting (2014) discussed that there was a poor to average expression of the disease observed and grasses and weeds were present throughout the site. The impact of the disease was considered variable with significant changes in biomass and biodiversity and the greater presence of non-susceptible species in part particularly within the REW area and areas with little or no vegetation (i.e. paddocks/cleared areas) (refer to Appendix E, Figure 1).

It is recommended that the area categorised as being Temporarily Uninterpretable be protected (Appendix E, Figure 1). The reasons for this are that healthy indicator species appear to be present even though current deaths are fire related and that vegetation outside of Lot 2 immediately to the north may well be free of the disease and possibly protectable. The Concept Plan design for the development has allocated this area for protection including fencing and revegetation (as part of Stage 2A), refer to Figure 9.

For Excluded areas of the property which are not protectable because of the high level of historical disturbance, current use of the property and the likelihood of disease being present. The Banksia woodland area is also not protectable. This is due to the disease being present on site (NPC Consulting, 2014:6).

Management measures proposed for the site are provided in Section 6.0.

2.6 Land Uses

2.6.1 Dampier to Bunbury Gas Pipeline

The Dampier to Bunbury high pressure natural gas pipeline (DBNGP) traverses the site. The pipeline is located within an easement and is managed by DBP Transmission. The location of the pipeline is shown on Figure 8.

Western Australian Planning Commission (WAPC) Planning Bulletin 87 - *High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region*, notes that while the corridor/easements may be used as public open space there are restrictions on the landscaping and amenities that may be installed. Line of sight should be preserved along the length of the pipeline where possible, and this typically restricts landscaping/revegetation to grasses, groundcovers and low shrubs (WAPC, 2007).

2.6.2 Jandakot Regional Park / Bush Forever

The site is located adjacent to conservation areas which form part of the Jandakot Regional Park. The adjacent bushland reserve also forms part of Bush Forever Site 344 – Denis De Young Reserve and Gibbs Road Swamp Bushland, Banjup/Forrestdale (WAPC, 2000) (Figure 8).

This conservation area is described as containing:

- Vegetation from the Southern Rivers Complex and the Bassendean Complex – Central and South (Hedde et al., 1980).
- Upland vegetation: *Banksia attenuata* and *B. menziesii* Low Woodland; *Banksia attenuata* Low Woodland with scattered *B. menziesii*, *B. ilicifolia* and *Eucalyptus todtiana*
- Wetland vegetation: *Melaleuca preissiana* Low Woodland to Forest sometimes over *Baumea juncea* Sedgeland; *Melaleuca raphiophylla* Low Open Forest; *Pericalymma ellipticum*, *Astartea aff. fascicularis*, *Aotus intermedia* and *Calothamnus lateralis* Closed Heath; *Pericalymma ellipticum* Closed Heath; *Baumea juncea* and *B. articulata* Sedgelands.
- Vegetation condition: >60% Excellent to Very Good, <40% Good to Degraded, with areas of severe localised disturbance.

3.0 REVEGETATION PROGRAM: STAGE 1

Revegetation (including Stages 1 and 2, Figure 9) is proposed across approximately 10.9ha of the site by the time the full development is complete. The revegetation program is proposed to include pre-planting weed control, site preparation, seedling planting and post-installation monitoring. The program has been designed with specialist input from Tranen Revegetation Systems to ensure the species selection and the proposed revegetation methodology is appropriate for the site conditions.

The details of the proposed program for Stage 1 are summarised below.

3.1 Area Proposed for Revegetation

Stage 1 revegetation area includes approximately 5.4ha within the REW and buffer zone at the eastern end of the property over 5 individual 1 year stages (Stages 1A to 1E). This re-vegetation will predominantly consist of wetland species, but where appropriate, species which can also be utilised by Cockatoos will also be used.

The location of Stage 1 revegetation area and the future Stage 2 revegetation area is shown on Figure 9.

It is noted that an emergency fire access track is located within the Stage 1C revegetation area. Revegetation of this track will not occur until the second access road (located within Stage 1E) is opened. The track will be maintained in its current condition until that time.

Revegetation will also not be undertaken within the alignment of the proposed second access road, or immediate surrounds which may be disturbed by the construction program, until after this road is installed. It is likely that this will occur close to the time the 1E area works are commencing so significant delays in this regard are not anticipated.

3.2 Site Preparation and Initial Weed Control

Weeds are prevalent across much of the degraded areas of the site. African Lovegrass (*Eragrostis curvula*) is one of the main weeds present within the revegetation areas. Based on the difficulty of eradicating this weed, pre-planting weed control will include removal of the weeds and the upper 50mm of the topsoil in areas currently without native. The specific extent of topsoil removal will be determined at the commencement of each revegetation stage taking into account the current native vegetation status and avoiding topsoil removal in areas with native vegetation values. This process will expose 'clean' soil and promote successful revegetation.

Revegetation planting areas without existing native vegetation will be ripped to a depth of 400mm prior to planting to enhance water infiltration and promote faster plant establishment. In low lying areas ripping and mounding to 200mm above the natural soil profile will be undertaken to raise the planting beds to assist to avoid seedlings being inundated and drowned.

In areas where native vegetation is present and proposed for retention, targeted weed control will be undertaken rather than topsoil removal. Broad scale ripping will not be undertaken in these areas.

3.3 Species Selection

The following species have been selected for use in the rehabilitation based on their natural presence in the local area, and their habitat. As presented in Section 2.5, Dieback is present on site, therefore where possible Dieback resistant species should be used for revegetation. Examples of resistant species are provided in Table 2.

Table 2 Revegetation Species List

Species	Growth Form	Upland Habitat	Lowland / Wetland Habitat	Used by Carnaby's Black Cockatoo	Species resistant to Dieback*
<i>Acacia huegelii</i>	Shrub	Y			Y
<i>Acacia pulchella</i> var. <i>glaberrima</i>	Shrub	Y			Y
<i>Adenanthos cygnorum</i>	Shrub	Y			
<i>Allocasuarina fraseriana</i>	Tree	Y			
<i>Anigozanthos humilis</i>	Herb	Y			
<i>Anigozanthos manglesii</i>	Herb	Y			
<i>Aotus procumbens</i>	Shrub		Y		
<i>Astartea scoparia</i>	Shrub		Y		
<i>Banksia attenuata</i>	Tree	Y		Y	
<i>Banksia ilicifolia</i>	Tree	Y	Y	Y	
<i>Banksia menziesii</i>	Tree	Y		Y	
<i>Conostylis aculeata</i>	Herb	Y	Y		Y
<i>Conostylis juncea</i>	Herb	Y			
<i>Daviesia preissii</i>	Shrub	Y			
<i>Dianella divaricata</i>	Herb	Y	Y		
<i>Eucalyptus rudis</i> subsp. <i>rudis</i>	Tree		Y	Y	Y
<i>Eucalyptus todtiana</i>	Tree	Y		Y	
<i>Gompholobium tomentosum</i>	Shrub	Y			Y
<i>Haemodorum laxum</i>	Herb	Y			
<i>Haemodorum spicatum</i>	Herb	Y			
<i>Hibbertia racemosa</i>	Shrub	Y	Y		Y
<i>Hypocalymma angustifolium</i>	Shrub	Y	Y		Y
<i>Isolepis cernua</i>	Rush / sedge		Y		
<i>Jacksonia furcellata</i>	Shrub	Y		Y	
<i>Jacksonia sternbergiana</i>	Shrub	Y			
<i>Juncus pallidus</i>	Rush / sedge		Y		
<i>Kennedia prostrata</i>	Shrub	Y			Y
<i>Kunzea glabrescens</i>	Shrub		Y		
<i>Lechenaultia floribunda</i>	Shrub	Y	Y		
<i>Melaleuca preissiana</i>	Tree		Y		Y
<i>Melaleuca raphiophylla</i>	Tree		Y		
<i>Melaleuca teretifolia</i>	Shrub		Y		
<i>Melaleuca viminea</i>	Shrub		Y		
<i>Patersonia occidentalis</i>	Herb	Y	Y		
<i>Pultenaea reticulata</i>	Shrub		Y		
<i>Stirlingia latifolia</i>	Shrub	Y			

Species	Growth Form	Upland Habitat	Lowland / Wetland Habitat	Used by Carnaby's Black Cockatoo	Species resistant to Dieback*
<i>Xanthorrhoea brunonis</i>	Shrub	Y			

*Source: Groves et.al (no date)

Species which will be planted within the Stage 1 area which will provide Carnaby's Black Cockatoo habitat include the tree species *Banksia ilicifolia* and *Eucalyptus rudis*. Habitat establishment in this area is limited given the wetland characteristics. More habitat opportunities are available outside of Stage 1 area which contains upland vegetation zones.

Where feeding habitat is replaced through revegetation, this could be considered only a short to medium term loss of Carnabys Black Cocaktoo habitat. Depending on the species involved and the quality of establishment, revegetation of feeding habitat can begin providing food resources for black cockatoos in eight years (Lee *et al.* 2010).

3.4 Seed Collection

Seed collection will be one of the methods utilised to gain stock for use in the revegetation program. Seeds will be collected from suitable species included on the list above by qualified revegetation personnel and stored in a seed bank system for later usage onsite.

Seed collection is generally undertaken in between October and February. As such, the first seed collection event is proposed to commence in November 2014, prior to clearing and earthworks within the approved clearing area (Figure 10).

In areas where vegetation is proposed to be cleared in the future seed collection may utilise up to 100% of the available seeds. In areas where vegetation retention is proposed, seed collection will still be permitted but restricted to a maximum of 20% from any one plant.

Seeds collected from the site will be utilised in the revegetation (either through direct seeding or propagation and planting), but will also be supplemented with purchased tubestock. This will ensure adequate numbers of revegetation stock are available and will allow for purchase of plant which have proved difficult to grow from onsite seeds, or which are propagated by other methods.

The seed collection program is proposed to be undertaken for two years to develop the seed bank for future use at the site.

3.5 Plant Density

Revegetation Stages 1A to 1E are located within the eastern REW area (Stage 1). The target density outside the REW and buffer area will be 4 plants/m².

It is noted that the DER approval (Appendix A and Coterra (2014) Revegetation Plan – [Rev 1] requires revegetation within Stage 1 to achieve 4 plants/m². However, to comply with the City of Armadale Subdivision and Development Guidelines (2014)

the following revegetation densities have been proposed for the REW and buffer (not including the drainage swale):

- 400-600 rushes/sedges per 100m square (i.e. on average 4 to 6 sedge plants/m²).
- 150 to 200 Embankment shrubs per 100 square meters (i.e. on average 1.5 to 2 Embankment Shrub plants/m²).
- 10 to 20 fringing plants per 100 square meters (i.e. on average 1 to 2 fringing Trees plants/ 10m²).

Indicative planting zones representing the above criteria are provided in Figure 10². Refer to Table 2 for a revegetation planting list for examples of selected species for the site.

Shrubs and trees are not appropriate species to be planted within the drainage filtration swales of the REW buffer zone. It is recommended that sedges be planted in these areas at a target density of 4 sedges/m².

Planting will also not be undertaken in designated firebreak areas. These areas are generally identified as a 3m wide track along the property boundary. Full details are provided in the Lot 2 Nicholson Road Fire Management Plan.

Tubestock planting may be reduced if direct seeding is used, but the above density targets will still be used to access success of the program once the seed stock has germinated.

3.6 Post-planting Weed Control

Following planting of the seedlings in autumn/spring, follow-up weed control within the planting stage extent will be undertaken over the subsequent 12 months as required. The annual weed control program will be planned in detail following receipt of the annual monitoring report which will identify weed species and coverage in the revegetation zones.

The need for additional weed control in each revegetation stage would be assessed during the annual monitoring event. Recommendations would be outlined in the summary monitoring report.

Recommended weed control techniques for the common species present at the site are summarised below:

Table 3 Recommended Weed Control Methods

Species	Common Name	Recommended Control Method
<i>Arctotheca calendula</i>	Cape Weed	Spray with Lonrel in early growth stages and Glyphosate at any growth stage.

² It should be noted that the REW does not contain open water and is a seasonal system. Planting zones have been determined by topography, vegetation unit mapping (current occurrence of vegetation present), groundwater contour levels and historical aerial photography. The interface of these zones may be amended once ground works (revegetation) commences.

Species	Common Name	Recommended Control Method
<i>Avena barbata</i>	Bearded Oat	Spray at 3-5 leaf stage with Fusilade 10mL/10L (500mL/ha).
<i>Briza maxima</i>	Blowfly grass	Prevent seed set – hand pull or spray at 3-5 leaf stage with Fusilade.
<i>Bromus diandrus</i>	Great Brome	Hand pull or Spray at 3-5 leaf stage with Fusilade 10mL/10L (500mL/ha).
<i>Carpobrotus edulis</i>	Pigface	Roll up large mats removing all root and stem fragments; spray with glyphosate.
<i>Cynodon dactylon</i>	Couch	Shade out; spray with Fusilade or glyphosate. Undertake works in late spring/summer then in autumn.
<i>Cyperus tenellus</i>	Tiny Flat-sedge	Glyphosate 1% plus pulse (Roundup Biactive in wet areas)
<i>Ehrharta calycina</i>	Perennial Veldgrass	Cut out; spray with Fusilade. Do not slash.
<i>Ehrharta longiflora</i>	Annual Veldgrass	Hand pull; spray with Fusilade.
<i>Eragrostis curvula</i>	African Lovegrass	Cut out small plants; spray with glyphosate.
<i>Eucalyptus robusta</i>	Swamp Mahogany	Young saplings – hand pull isolated plants, or basal bark (spray stem with mix of 16 mL triclopyr per 1 L diesel). Larger trees – cut and paint stump with 16 mL triclopyr per 1 L diesel. Regrowth – foliar spray 1.5% glyphosate.
<i>Hypochaeris glabra</i>	Flat weed	Wipe rosettes with glyphosate. For dense infestations use Lontrel.
<i>Isolepis marginata</i>	Tiny or Coarse Club-rush	Glyphosate 1% plus pulse (Roundup Biactive in wet areas)
<i>Juncus bufonius</i>	Toad Rush	Glyphosate 1% plus pulse (Roundup Biactive in wet areas)
<i>Lotus subbiflorus</i>	Hairy bird's-foot trefoil	Lontrel 4 g / 10 L plus wetting agent, or glyphosate 2% plus pulse.
<i>Lupinus angustifolia</i>	Narrowleaf Lupin	Hand remove scattered plants. Spray dense infestations with metsulfuron-methyl or Lontrel.
<i>Moraea flaccida</i>	One Leaf Cape Tulip	Spot spray with metsulfuron methyl or chorsulfuron. Spray just on flowering – Sept/Nov.
<i>Populus nigra</i>	Lombardy Poplar	Basal bark – 25% trichlor; injection – 70% glyphosate, foliar spray regrowth.
<i>Romulea rosea</i>	Guildford Grass	Spot spray with metsulfuron methyl. Spray just on flowering – Aug/Oct.
<i>Vulpia bromoides</i>	Squirrel's Tail Fescue	Prevent seed set; hand pull; spray with Select prior to boot stage.
<i>Zantedeschia aethiopicum</i>	Arum Lily	Spot spray with metsulfuron or chorsulfuron. Apply spray anytime between June and September.

Sources: Brown & Brooks, 2002; D Grose (Tranen Revegetation Systems) *pers comm.*, March 2013

3.7 Timing and Staging

The revegetation program for Stage 1 will be staged over approximately 5 years to coincide with progressive development of the campus. The Stage 1 area has been divided into five roughly equal zones. Stage boundary locations are shown on Figure 9.

Based on the above, the timing of the stages in relation to timing of the campus development is summarised as follows:

Stage 1 campus development (construction to commence in 2014)

- Stage 1A revegetation (commence in Year 1; 2015) – 1 ha
- Stage 1B revegetation (commence in Year 2; 2016) – 1 ha
- Stage 1C revegetation (commence in Year 3; 2017) – 1 ha
- Stage 1D revegetation (commence in Year 4; 2018) – 1 ha
- Stage 1E revegetation (commence in Year 5; 2019) – 1.4ha

The following timing is proposed for the revegetation stages of the project:

Table 4 Proposed Timing

Activity	Timing
Revegetation area fence installation	Prior to site works commencing
Removal of existing weeds and 50mm topsoil in selected areas	Summer/autumn prior to revegetation works in each revegetation stage
Ripping of planting zone	Autumn prior to planting in each revegetation stage
Install seedlings	Autumn/winter in each revegetation stage
Ongoing weed control	Autumn and spring (as required) in each revegetation stage
Monitoring	Spring throughout the revegetation program duration and for three years post-program i.e. spring in the year of planting plus 2 additional years (see Section 4.0 and 6.2)

Should Carey Baptist College wish to combine some of the revegetation stages to compress the overall timeframe, the above list of actions will still be undertaken for each of the combined stage areas.

3.8 Delineation and Access Control

The eastern revegetation area, which coincides with the REW buffer will be fenced using rural style fencing³ along the western boundary (at the interface with the school site). The fencing will be installed in two stages, with the first stage to extend along the length of the Stage 1 development area, and the second stage to complete the alignment to the southern site boundary. An access gate will be provided to the emergency access track which is located within Stage 1C to prevent unauthorised access to the wetland. An access gate will also be provided at the Nicholson Road end of the track for emergency access only.

Proposed fencing locations are outlined on Figure 9.

In addition the permanent fencing outlined above, construction stages will have temporary fencing erected at the stage boundary to prevent inadvertent vehicle access outside of the construction area.

³ Proposed fencing to be 4m x 1.2m of ringlock with one pine post for every three star pickets and pine box strainers (TBC).

Timing of permanent rural style fence installation will occur once adjacent clearing has been undertaken. Clearing will progress in the direction of retained vegetation to assist with fauna movement away from the areas being cleared. Fence installation after the clearing has occurred will ensure fauna are not trapped within the cleared areas.

4.0 MONITORING AND ASSESSMENT

4.1 Monitoring

An annual report will be produced by the 30th June detailing the quantities of seedlings planted during the annual monitoring period of 1st June to 30th May. This can then be used as the baseline data for future assessments.

Assessments into planting success will be undertaken each spring during the establishment period, and for three years after this phase is complete. The following indicators will be assessed:

- Range of species present in revegetation zones and health of planted vegetation
- Presence of weeds in the revegetation zone (including an estimated density / percentage cover)
- Comments on estimated mortality for planted vegetation to allow for survival rate to be estimated
- Collection of photography from designated locations to build up a photographic record of progress for the site.

The monitoring methodology will utilise establishment of permanent monitoring quadrats within each revegetation stage, as well as establishment of photo point monitoring locations.

A summary monitoring report will be produced annually and submitted to DER and the City of Armadale by the 30th June which outlines the findings of the above program.

4.2 Performance Targets

The following performance targets have been set for the revegetation program (Stage 1).

Table 5 Performance Targets

Characteristic	Minimum Target / KPI
Plant density and Structure	<u>Stage 1 (outside REW Wetland and Buffer)</u>
	<ul style="list-style-type: none"> ▪ 4 plants / m²
Plant density and Structure	<u>Stage 1 (inside REW Wetland and Buffer, not including the drainage swales) (refer to Figure 10)</u>
	<ul style="list-style-type: none"> ▪ 400-600 rushes/sedges per 100m square (i.e. on average 4 to 6 sedge plants / m²) ▪ 150 to 200 Embankment shrubs per 100 square meters (i.e. on average 1.5 to 2 Embankment Shrub plants / m²) ▪ 10 to 20 fringing plants per 100 square meters (i.e.

Characteristic	Minimum Target / KPI
	on average 1 to 2 fringing Trees plants/ 10m ² . Vegetation condition to achieve on average Good in accordance with the Keighley scale across the REW.
Species composition	75% of revegetation species list
Weed cover	10-15% in all areas

Adherence to these performance targets will be assessed during each annual monitoring event. Should the performance targets not be met in revegetation stages at the end of the first 12 months maintenance period after planting, remedial works which may be implemented include:

- Additional revegetation works to increase plant densities and species representation
- Weed management
- Rubbish removal
- Fauna control
- Continuing/maintaining plant protection measures (e.g. tree guards) and removing when no longer required.

If remedial works are implemented, performance targets would be further assessed for these areas in next annual monitoring event.

5.0 WETLAND MANAGEMENT

The following section identifies wetland management actions, in addition to revegetation works and weed control, which will be undertaken for the onsite Resource Enhancement Wetland (REW) buffer zone.

5.1 Access Management

The REW wetland is located at the front of the school site. As presented in Section 3.8, access to the wetland will be managed through fencing, signage and provision of information/directions to students and parents which will identify that this is a revegetation area and not to be traversed. Fencing along the REW buffer will be regularly inspected and replaced if required.

A firebreak will be maintained around the boundary of the site for safety purposes. This firebreak will be accessible to vehicles for maintenance works as required.

5.2 Construction Earthworks and Final Levels

Pre-development topographic elevation within the Stage 1 area ranges from 25m AHD within the wetland zone to 30m AHD within the school site. Fill will be required to construct the access road across the wetland, and also to raise sections of the school construction site.

As shown in Figure 2, the school access roads traverse the wetland area. Construction of the access roads will require approximately 100-300mm of fill to be placed above the natural land surface to meet engineering requirements. Placement of fill in these locations is not expected to impact the hydrology of the wetland as groundwater flow will not be disturbed.

The western side of the school site does not generally require fill given the existing elevations. Fill will be needed to achieve the required levels on the eastern side of the development. All filling for the school site (excluding the access roads) will remain outside of the wetland buffer zones.

Fill is not proposed to be imported onsite, but rather a cut-to-fill exercise will be undertaken as required.

5.3 Stormwater Drainage

As identified in Section 1.4.4, the REW buffer zone will incorporate an infiltration area for stormwater for flows up to the 1 in 5 year ARI capacity. Stormwater from events of greater intensity, which result in overtopping of the infiltration area, would then follow the natural flow paths within the REW area. This will allow for maintenance of natural hydraulic functioning via allowing a controlled flow of water to the lower lying areas of the landscape. Potential impacts to the adjacent wetland are proposed to be reduced by the following:

- Drainage infiltration swale to only receive flow when soak wells and pipe network provided within the school site reach capacity.

- Drainage infiltration swale elevation designed to remain above maximum groundwater level.
- Gross pollutant traps to be installed prior to drainage discharge to the infiltration swales to assist with removal of litter etc.
- Drainage infiltration swales to incorporate planting of sedges to assist with nutrient uptake and settling of sediments.
- Flow greater than 5 year ARI to overflow to the wetland, as would occur naturally in large storm events.

A copy of the drainage infiltration swale engineering plans which were included within the approved Urban Stormwater Management Plan (DWA, 2014; Revision 2) is provided in Appendix B.

5.4 Effluent Management

The State Appeals Tribunal approval for the site requires connection to reticulated sewer by March 2017. The infrastructure for the reticulated sewer connection will be installed as part of the Stage 1 works so to avoid for need for additional disturbance to the site at a later date. In the interim period an onsite effluent disposal system will be provided for Stage 1.

The interim onsite effluent disposal system will comprise sewer lines connecting the school wet areas to a septic tank and leach drain system, via a pump station. The location of each of these components is shown on the engineering plans provided as part of Appendix C.

The location of the leach drains, which are the discharge point, is proposed to be immediately south-west of the Stage 1 car park. This location is over 50m from the REW buffer zone and over 80m from the wetland boundary itself.

The pump station is located at the southern end of the car park. This has a separation distance of approximately 30m to the REW buffer and 60m to the wetland boundary.

5.5 Acid Sulfate Soils

Project engineers David Wills & Associates undertook an Acid Sulfate Soil investigation for the Stage 1 area in 2013. Net Acidity (SPOCAS) laboratory testing of samples from six test pit locations found all results to be below the assessment criteria of 0.03%.

The report also confirms that dewatering is not proposed for the site.

The DER have reviewed the assessment findings and confirmed that no ASS appears to be present at the site and as such an ASS Management Plan is not necessary (Appendix D).

5.6 Nutrient Management

A Draft Nutrient and Irrigation Management Plan (NIMP) (EPCAD, 2014) has been developed for the entire site (Stages 1 and future Stage 2) of the proposed development (refer to Figure 2). The NIMP also incorporates a Water Resource Operating Strategy for the site. A summary of the key aspects/components of the NIMP are the following:

- During the first 5 years post-approval the wastewater will be managed on site, after this time there will be a requirement to connect into the Water Corporation sewer network via a pressurised main sewer.
- There is a current application with the Department of Water (DoW) to convert reserved groundwater allocation for the site to a Licence to Take Groundwater. It is proposed that two monitoring bores are installed, one within the north-west corner of the site and one near (but not within) the Resource Enhancement Wetland Buffer and two production bores (locations to be confirmed). Water levels in these bores are proposed to be measured quarterly to determine the site water balance.
- Irrigation of landscaped areas (including playing fields, recreational turf and establishment irrigation for shrubs and tree planting) will be sourced via groundwater abstracted from the superficial aquifer through the two production bores.
- There are six Landscape Hydrozones for the proposed development which include; Ovals and Soccer Fields, Lawn areas and Play Grounds, Trees, Shrub Beds, Rehabilitated Vegetation (subject to this Revegetation Plan) and Paving and Play courts. These different zones are designed to identify areas that require different rates of irrigation, irrigation times or times of year, areas that may require only establishment irrigation and areas that require long-term irrigation.
- Nutrient Application will be undertaken under a specific regime, annual soil tests are proposed to obtain a full analysis and any recommendation to changes (if required) to the application regime. Fertilisers will not be applied to areas where surface water is present.

5.7 Fauna Relocation

In order to minimise potential impact on fauna the following management actions are proposed as part of the site construction works:

- Information regarding environmental matters and requirements will be presented to the construction team at the pre-start induction meeting. This information will include clearing methodology required and discussion about what to do if injured fauna or venomous snakes are observed onsite and contact details of appropriate personnel.
- Machinery engines to be started for a period of 5 minutes prior to the commencement of clearing works on each day of the clearing program to assist to encourage fauna to move away from the work area.

- Clearing is to be undertaken in a staged manner in the direction of an area of vegetation that will be retained to provide fauna with maximum opportunities to escape.
- Cleared material is to be removed from the site progressively in the direction of an area of vegetation that will be retained.
- Feral fauna attractants and potential native fauna traps such as open skip bins will be minimised during and post-construction. Contractors will be directed to disposal of food waste within sealed bins to avoid attracting fauna to the area.

Should injured, abandoned or distressed fauna be found onsite the following protocol will to be undertaken:

1. Animal found.
2. Identify animal, if possible (determine if potentially venomous).
3. Contact Project Superintendent or Environmental Consultant for instructions. If these representatives cannot be reached contact the DPaW Wildcare helpline.
4. If unable to stay with the animal, clearly mark its position so it is visible to all personnel that approach the site.
5. First preference is to leave the animal alone until experienced assistance arrived. If this is not possible the following handling and temporary holding instructions may be enacted (only if absolutely necessary and only as a last resort):
 - Nesting birds (and all avifauna) are protected by the *Wildlife Conservation Act 1950-1979* and should be left undisturbed until an appropriate course of action has been followed. Young birds found within a nest should only be removed if considered by a specialist to be abandoned or injured.
 - For any small mammals found at any time on site, the best method of storage and transportation would be within hessian sacks. Mammals may become stressed and agitated in traps or hard containers, sometimes resulting in injury. Mammals transported in hessian sacks remain calmer due to the dark environment and if kept in the shade and on a soft, secure surface can be transported with relatively limited stress and injury.
 - Reptiles can, in most cases, be transported within calico bags of varying size to suit the animal. Plastic carry boxes can also be used with some air holes, leaf litter and sand within them. The animals should always be placed within an area of shade so that they do not overheat.
6. If in any doubt about whether the animal is venomous, do not under any circumstances attempt to handle. Instead, monitor the location of the animal and await arrival of an experienced wildlife officer or reptile handler.

7. Project Environmental Consultant to contact DPaW or wildlife carers as appropriate.

The above protocol is to be included in the construction contractor induction package.

5.8 Educational Opportunities

The wetland areas onsite are viewed by Carey Baptist College as providing key opportunities for environmental education at the school. It is proposed to allow students the opportunity to view and potentially participate in the revegetation and management works to facilitate a greater awareness of the local environmental values of the area. Inclusion of specific items in the school curriculum will be reviewed as the school grows and develops.

6.0 DIEBACK MANAGEMENT

6.1 Background and Site Conditions

As discussed in Section 2.5, dieback has been recorded as being present on site. Proposed management measures proposed for the site will prevent the further spread of Dieback within the north west section of Banksia vegetation (vegetation unit -Bi) which is currently Temporarily Uninterpretable. It is recommended that this area be re-surveyed in 2017 to confirm Dieback status.

6.2 Management

The following actions are proposed in relation to dieback management:

General procedures

- Restrict uncontrolled vehicle access to revegetation areas (see Section 3.8).
- Visitors to the revegetation areas are to ensure that their footwear is free of mud and soil.
- Firebreak maintenance to occur in dry soil conditions.
- Dry soil access is recommended for operations. Clearing should be carried out in summer where possible to significantly reduce the risk infected soil adhering to vehicles and machinery.
- It has been advised that washing down vehicles should not be done in a dry soil environment. Wash downs could spread contaminated water into an otherwise dry environments which is not recommended due to the close proximity of the REW (NPC Consulting, 2014a, *pers.comm*).
- Clearing for Stage 1 is proposed to be undertaken during the spring/summer season (typically dry soil conditions). Therefore, visual inspection of vehicles and machinery will be undertaken. If soil is observed, it will be removed by brush down and or 'high pressure air' blower. This applies to vehicles and machinery exiting Lot 2 (NPC Consulting, 2014a, *pers.comm*). Contractors/workers on site will be responsible for visual inspection and associated cleaning (if required).

Construction Management

- Topsoils scraped and removed from infected areas on site should not be stored/disposed of adjacent to a Protectable Area (refer to Appendix E, Figure 1).
- Prior to entering the site any construction equipment and construction materials (i.e. pipes, bricks etc) must be clean and free of any adhered soil/mud or vegetation matter.
- Construction equipment and materials to stay within the construction zone and avoid moving into bushland areas.

- Should any off-site fill or mulch be required for use within the site this material is to be obtained from a dieback free source. Note: mulch which has been well composted will be free of dieback as the heat created as part of this process kills the dieback pathogen.
- Information in relation to dieback management requirements is to be provided to the construction contractors as part of the site induction.

Revegetation Program Management

- Prior to entering the site any revegetation program equipment and materials must be clean and free of any adhered soil/mud or vegetation matter.
- Plants or mulch used in the revegetation works onsite are to be from a dieback free source.
- Information in relation to dieback management requirements is to be provided to the rehabilitation contractors as part of the site induction.

6.3 Summary

The following table summarises the risks, management actions, timing and responsibilities.

Table 6 Dieback Risk and Management

Action / Risk	Management	Timing	Responsibility
Dieback pathogen to be brought into the site.	Prior to entering the site any construction equipment and construction materials (i.e. pipes, bricks etc) must be clean and free of any adhered soil/mud or vegetation matter.	Prior to and during construction	Construction contractor under supervision of project engineer and site owner.
	Should any off-site fill or mulch be required for use within the site this material is to be obtained from a dieback free source.	During construction	Construction contractor under supervision of project engineer and site owner.
	Prior to entering the site any revegetation program equipment and materials must be clean and free of any adhered soil/mud or vegetation matter.	Prior to and during revegetation works	Revegetation contractor under supervision of environmental consultant and site owner.
	Plants or mulch used in the revegetation works onsite are to be from a dieback free source.	During revegetation works	Revegetation contractor under supervision of environmental consultant and site owner.
Spread of any dieback present onsite into revegetation areas and off	Construction equipment and materials to stay within the construction zone and avoid moving into bushland areas.	During construction	Construction contractor under supervision of project engineer and site owner.

Action / Risk	Management	Timing	Responsibility
site (prior to exit)	Visual inspection of vehicles and machinery will be undertaken. If soil is observed, it will be removed by brush down and or 'high pressure air' blower. This applies to vehicles and machinery exiting Lot 2	During construction	Construction contractor under supervision of project engineer and site owner.
	Restrict uncontrolled vehicle access to revegetation areas.	During and post construction	Site owner
	Visitors to the revegetation areas are to ensure that their footwear is free of mud and soil.	During and post construction	Site Owner
	Firebreak maintenance to occur in dry soil conditions	Ongoing	Site owner
Lack of awareness results in dieback spread	Information to be included in all construction and revegetation induction meetings regarding the risk of dieback spread and responsibilities of all parties involved.	During construction and revegetation work	Site owner and environmental consultant
	Dieback requirements to be included in construction contracts	Prior to construction	Site owner and project engineer

7.0 IMPLEMENTATION

7.1 Roles and Responsibilities

Roles and responsibilities for implementation of the Revegetation Plan are summarised on Table 7.

Table 7 Implementation Summary

Issue	Action	Timing	Responsibility
Site Preparation	Removal of topsoil in areas devoid of native vegetation. Targeted weed control in areas with vegetation to be retained.	Prior to planting of each stage.	Carey Baptist College
Access Control	Installation of fencing and signage to wetland and revegetation areas	Prior to revegetation works commencing within these areas	Carey Baptist College
Seed Collection	Harvesting of seeds onsite for future planting	October to February in Year 1 (2014/2015) and Year 2 (2015/2016)	Carey Baptist College
Revegetation Planting	Planting of seedlings	Autumn/spring at the commencement of each revegetation stage	Carey Baptist College
Weed Control	Ongoing weed control	Autumn/spring (as required) for 3 years post planting of each stage	Carey Baptist College
Assessment of Success	Onsite monitoring Reporting of monitoring results	Monitoring to be undertaken annually in spring for 3 years post planting of each stage. Summary report to be produced annually (by the 30 th June) outlining: <ul style="list-style-type: none"> planting undertaken in the previous 12 months (1st June to 30th May); monitoring results; assessment of progress against KPIs; and any remedial actions implemented. 	Monitoring and Reporting – Carey Baptist College Review of Monitoring Report – DER and City of Armadale
Remedial Actions	Assess need for remedial actions annually. Implement if required.	Assessment undertaken when summary report is being produced. Implementation action undertaken when seasonally appropriate.	Carey Baptist College
Dieback Management	Undertake action to prevent import of dieback to the site and potential spread of dieback within the site as outlined on Table 6.	Throughout project life. After January 2017, Re-survey the Temporarily Uninterpretable area to confirm Dieback status (Appendix E, Figure 1).	Carey Baptist College

7.2 Timing

The recommended Revegetation Project staging and timing is summarised on Chart 1. The timing is based on the anticipated stage program.

Should Carey Baptist College wish to combine some of the stages to compress the overall timeframe this can be achieved with a modification to the program. The DER and City of Armadale will be advised of any such modifications in the annual summary report, which will be issued at the conclusion of each annual monitoring period.

Chart 1 Staging and Timing Summary (Stage 1)

Stage	Task	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
STAGE 1 - WORK TO BE COMMENCED IN 2015								
Preliminary	Seed Collection							
Stage 1A (1ha)	Removal of Topsoil (50mm) in areas without Native Vegetation & Soil Ripping							
	Planting							
	Weed Control (as required)							
	Remedial Works (if required)							
Stage 1B (1ha)	Removal of Topsoil (50mm) in areas without Native Vegetation & Soil Ripping							
	Planting							
	Weed Control (as required)							
	Remedial Works (if required)							
Stage 1C (1ha)	Removal of Topsoil (50mm) in areas without Native Vegetation & Soil Ripping							
	Planting							
	Weed Control (as required)							
	Remedial Works (if required)							
Stage 1D (1ha)	Removal of Topsoil (50mm) in areas without Native Vegetation & Soil Ripping							
	Planting							
	Weed Control (as required)							
	Remedial Works (if required)							
Stage 1E (1.4ha)	Removal of Topsoil (50mm) in areas without Native Vegetation & Soil Ripping							
	Planting							
	Weed Control (as required)							
	Remedial Works (if required)							
Monitoring								
Reporting								

7.3 Long-Term Security of Revegetation Areas

The revegetation areas will remain under the ownership of Carey Baptist College. The fencing installed prior to revegetation works being undertaken will be maintained as required to prevent unauthorised access into these areas.

Passive surveillance of the revegetation areas will be undertaken by maintenance staff at the college, as well as students and teachers utilising adjacent college facilities.

It is proposed to have students of the college participate in the revegetation program. This would involve student participation in:

- Seedling planting (including education regarding native plants of this area (e.g. typical wetland plants, typical banksia woodland plants etc.)
- Identifying the presence of weeds and factors which contribute to their spread
- Discussion of program outcomes

This is envisaged to not only benefit protection of revegetation areas onsite, but also contribute to greater environmental awareness and responsibility within the school catchment and associated local community.

Once revegetation is concluded in each stage, these areas would be available as a continued teaching resource for the school. As they will remain in private ownership, they can be protected from unauthorised usage such as 4WD access.

7.4 Term of the Plan

This plan will be implemented from the year site work commences (anticipated to be 2014) to two years after the last revegetation area plantings are undertaken.

8.0 SUMMARY

This Revegetation Plan addresses the requirements of the DER (as outlined in correspondence dated May 2012) and the City of Armadale (as outlined within the Development Services Committee minutes dated 25 March 2013). The actions proposed in this plan to address these requirements are summarised below.

Table 8 Summary of DER Requirements and Actions

DER Requirement	Action
<i>A map outlining the boundary of the above areas to be retained and vegetated</i>	Figure 9
<i>A Revegetation Plan outlining the following:</i>	
<i>(a) Details on how Carey Baptist College Inc will ensure the long term (10-30 years) security of the vegetation site</i>	Revegetation site security will include: <ul style="list-style-type: none"> • Ownership control • Fencing provision and maintenance • Ongoing surveillance during and post-program • Prevention of unauthorised access during and post-program (Section 7.3)
<i>(b) Details on the measureable component of the revegetation and weed removal activities to be undertaken. For example:</i> <i>(v) Target density (e.g. > xx% survival rate (planting density xxxx stems/ha using xx native species present to be achieved by 20xx)</i> <i>(vi) Target structure (e.g. xx% overstorey, xx% midstorey, xx% understory species, consistent with mapped vegetation type to be achieved by 20xx); and</i> <i>(vii) Target composition (e.g. xx native species consistent with mapped vegetation or vegetation to be cleared, x years after establishment);</i> <i>(viii) Weed coverage target (e.g. 20% weed coverage remaining after weed control etc.)</i>	Target Density and Structure <i>Stage 1A to 1E</i> <ul style="list-style-type: none"> • 4 plants / m² • 30% over-storey, 30% middle-storey, 40% understorey <i>Stages 2C to 2E (future works and subject to additional DA from the City of Armadale)</i> <ul style="list-style-type: none"> • 1 mature tree and 1 shrub / 5m² <i>Stages 2A and 2B (future works and subject to additional DA from the City of Armadale)</i> <ul style="list-style-type: none"> • Vegetation condition to achieve Very Good-Good in accordance with the Keighery scale Target Composition <ul style="list-style-type: none"> • 75% of species listed on Revegetation Species List (Table 2) Weed Coverage Target <ul style="list-style-type: none"> • <20% weeds Timing <ul style="list-style-type: none"> • Revegetation to be undertaken in approximately 10 x 1ha stages • Aim for KPI to be achieved for each stage 12 months after planting was undertaken. • Additional monitoring and maintenance to be undertaken in each stage for a further 2 years from this date. (See Section 4.2)
<i>(c) A species list detailing which species will be planted</i>	Table 2, Section 3.3

DER Requirement	Action
<p><i>(d) Brief details on mitigation and maintenance activities (i.e. follow up planting if target density is not reached, follow up weeding) and associated timeline</i></p>	<p>Remedial works which may be implemented include:</p> <ul style="list-style-type: none"> • Additional revegetation works to increase plant densities and species representation • Weed management • Rubbish removal • Fauna control • Continuing/maintaining plant protection measures (e.g. tree guards) and removing when no longer required. <p>To be undertaken 12 months after planting if required.</p> <p>(See Section 4.2)</p>
<p><i>(e) Monitoring schedule and details on the monitoring method used to establish if targets are being met (i.e. transects, quadrats, photos, plots etc)</i></p>	<p>Annual monitoring of revegetation areas for the following:</p> <ul style="list-style-type: none"> • Range of species present in revegetation zones and health of planted vegetation • Presence of weeds in the revegetation zone (including an estimated density / percentage cover) • Comments on estimated mortality for planted vegetation to allow for survival rate to be estimated • Collection of photography from designated located to build up a photographic record of progress for the site. <p>Monitoring to include establishment of plots and collection of photographs.</p> <p>(See Section 4.1)</p>
<p><i>(f) Timeline for re-vegetation and weed control should be a minimum of 5 years.</i></p>	<p>Revegetation and weed control program for the site to be undertaken for a minimum of 12 years to account for timing of the different stages.</p> <p>(See Chart 1, Section 7.2)</p>
<p><i>Please also note that Carey Baptist College Inc should commit to at least 5 years of monitoring and maintenance activities due to risk of failure.</i></p>	<p>Monitoring and maintenance program is anticipated to be undertaken for a minimum of 12 years to account for timing of the different stages.</p> <p>(See Chart 1, Section 7.2)</p>

Table 9 Summary of City of Armadale Requirements and Actions

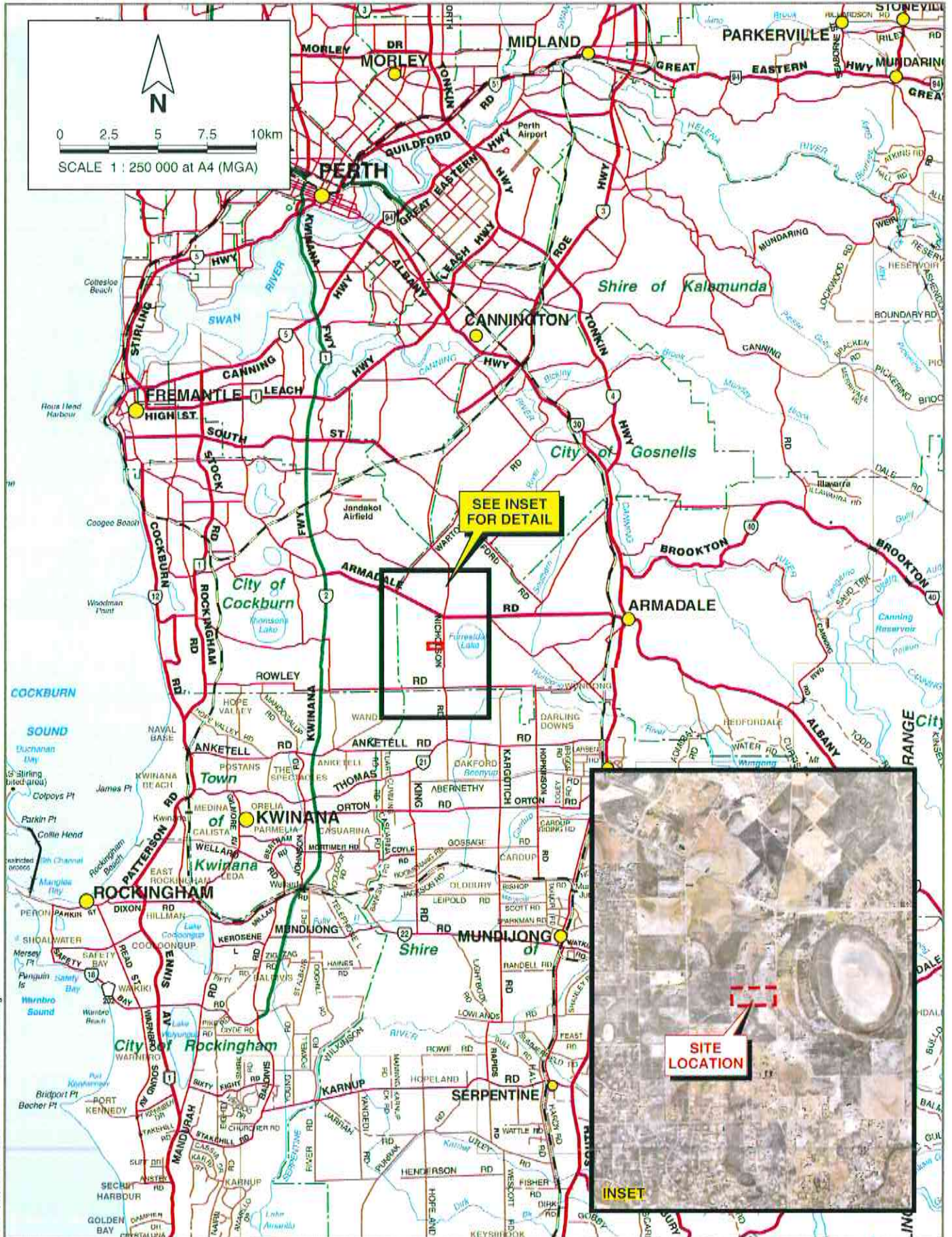
CoA Requirement	Action
<p>Condition 1(b) – <i>A wetland management plan for the Resource Enhancement wetland and the Conservation category wetland buffer, is to be submitted for approval by the Executive Director Development Services prior to the commencement of any site works, and implemented to the satisfaction of the Executive Director Development Services (on advice from the Department of Environment and Conservation)</i></p>	<p>Wetland Management is included as follows:</p> <ul style="list-style-type: none"> • Revegetation and weed control program (Section 3.0) • Access management (Section 5.1) • Drainage management (Section 5.2) • Education (Section 5.3) • Success targets and monitoring (Section 4.0) • Responsibilities (Section 7.1)
<p>Condition 1(d) – <i>Submission and implementation of a Weed Control Management Plan, including what weeds are present on the subject lot, what chemicals will be utilised for which weeds and appropriate timing of weed control based on weed species, to the satisfaction of the Executive Director Development Services</i></p>	<p>Information is provided as follows:</p> <ul style="list-style-type: none"> • Weeds present onsite summarised in Table 1. • Timing and chemical proposed for use in the weed control program provided in Table 3. <p>(See Sections 2.3.5, 3.2 and 3.4)</p>
<p>Condition 1(g) – <i>A revegetation plan being prepared, approved and implemented for the revegetation of wetland areas, wetland buffers and other areas of the site outside the development area identified on the Master Plan for the school dated 28 November 2012 with appropriate native species to the satisfaction of the Executive Director Development Services</i></p>	<p>The revegetation program includes:</p> <ul style="list-style-type: none"> • Identification of revegetation areas • Site preparation and weed control • Species selection • Seed collection • Planting density • Post planting weed control • Timing and staging • Delineation and access control <p>(See Section 3.0)</p> <p>Assessment and monitoring is discussed in Section 4.0</p>
<p>Condition 1(h) – <i>A seed bank is to be compiled for native plants existing on Lot 2 for the purpose of growing plants for revegetation and wetland rehabilitation to the satisfaction of the Executive Director Development Services. Collection of seed is to occur in the year prior to any clearing</i></p>	<p>Seed harvesting is proposed to occur in October – February in Year 1 (2014/2015) and Year 2 (2015/2016).</p> <p>(See Section 3.4)</p>
<p>Condition 1(i) – <i>Prior to the commencement of subdivisional works a dieback management plan is to be prepared and approved to ensure the protection and management of the sites environmental assets with satisfactory arrangements being made for the implementation of the approved plan</i></p>	<p>Dieback management addresses prevention of dieback pathogen entering the site and movement of potential dieback pathogen into revegetation areas.</p> <p>(See Section 6.0)</p>

9.0 REFERENCES

- Bennett Environmental Consulting. 2011. *Botanical Assessment of Lot 2 Nicholson Road Forrestdale*. Prepared for Coterra Environment.
- City of Armadale (2014) Subdivision and Development Guidelines.
- EPCAD (2014) Nutrient and Irrigation Management Plan: Incorporating a Water Resource Operating Strategy. Final Draft Issue 1. Prepared for Cary Baptist College, Perth.
- David Wills and Associates (DWA) (2014) Urban Stormwater Management Plan: Lot 2 Nicholson Road Forrestdale. Revision 2. Prepared for Carey Baptist College, Perth.
- Department of Environment and Conservation. 2010. *NatureMap*. Available: <http://naturemap.dec.wa.gov.au/default.aspx>
- Department of Water. 2010. *Perth Groundwater Atlas* [online]. DoW, Perth. Available: <http://www.water.wa.gov.au/Tools/Maps+and+atlases/Perth+groundwater+atlas/default.aspx#1>
- Environmental Protection Authority. 2004. *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*. EPA Guidance Statement No. 51. EPA, Perth.
- Groves, E., Hardy, G., McComb, J. (no date) Western Australian Natives Resistant to *Phytophthora cinnamomi*. Dieback Working Group.
- Heddl, E.M. Loneragan, O.W, Havel, J.J. 1980. Vegetation Complexes of the Darling System Western Australia, In. *Atlas of Natural Resources, Darling System, Western Australia*.
- Jordan J.E. 1986. *Armadale, part sheets 2033 1 and 2133 IV, Perth Metropolitan Region*. Environmental Geology Aeries. Geological Survey of Western Australia.
- Lee, J., Finn, H. And Calver, M. (2010) Mine-site revegetation monitoring detects feeding by threatened black-cockatoos within 8 years. *Ecological Management and Restoration*. 11: 141-143.
- NPC Consulting (2014) *Phytophthora Dieback Interpretation Report: Lot 2 Nicholson Road Forrestdale*. Prepared for Coterra Environment, October.
- NPC Consulting (2014a) Lot 2 Nicholson Road Dieback Hygiene. Email correspondence, 16/10/2014.
- Western Australian Planning Commission. 2000. *Bush Forever*. WAPC, Perth.
- Western Australian Planning Commission. 2007. *High Pressure Gas Transmission Pipelines in the Perth Metropolitan Region*. Planning Bulletin No. 87. WAPC, Perth.



FIGURES



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PINPOINT CARTOGRAPHICS (08) 9562 7136

COTERRA
ENVIRONMENT

Carey Baptist College
REVEGETATION PLAN
LOT 2 NICHOLSON ROAD, FORRESTDALE

Drawn: K. Bennetts Date: 14 Mar 2013
Job: CBCFOR06 Revision: A

SITE LOCATION

Figure 1



<p>COTERRA ENVIRONMENT</p>	<p>Drawn: K. Bennett</p>	<p>Date: 2 Apr 2014</p>
	<p>Job: C030C0106</p>	<p>Part: A</p>
<p>Carrey Baptist College REVEGETATION PLAN LOT 2 NICHOLSON ROAD, FORRESTDALE</p>		
<p>PROPOSED SCHOOL LAYOUT</p>		

Figure 2

COTERRA ENVIRONMENT

Carey Baptist College
REVEGETATION PLAN
LOT 2 NICHOLSON ROAD, FORRESTDALE

Drawn: K Bennetts
Date: 14 Mar 2013
Revision: A

TOPOGRAPHY AND GEOLOGY

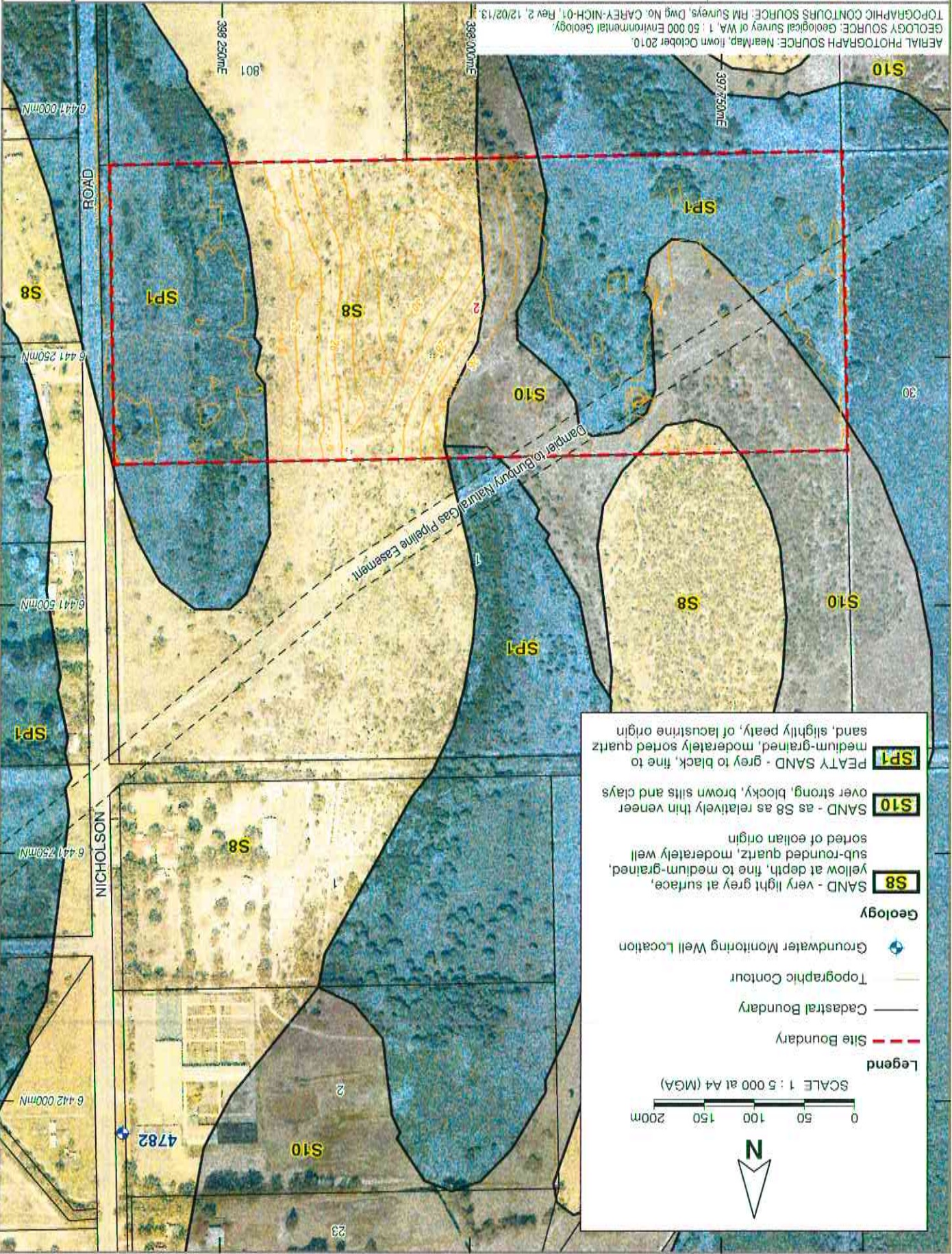
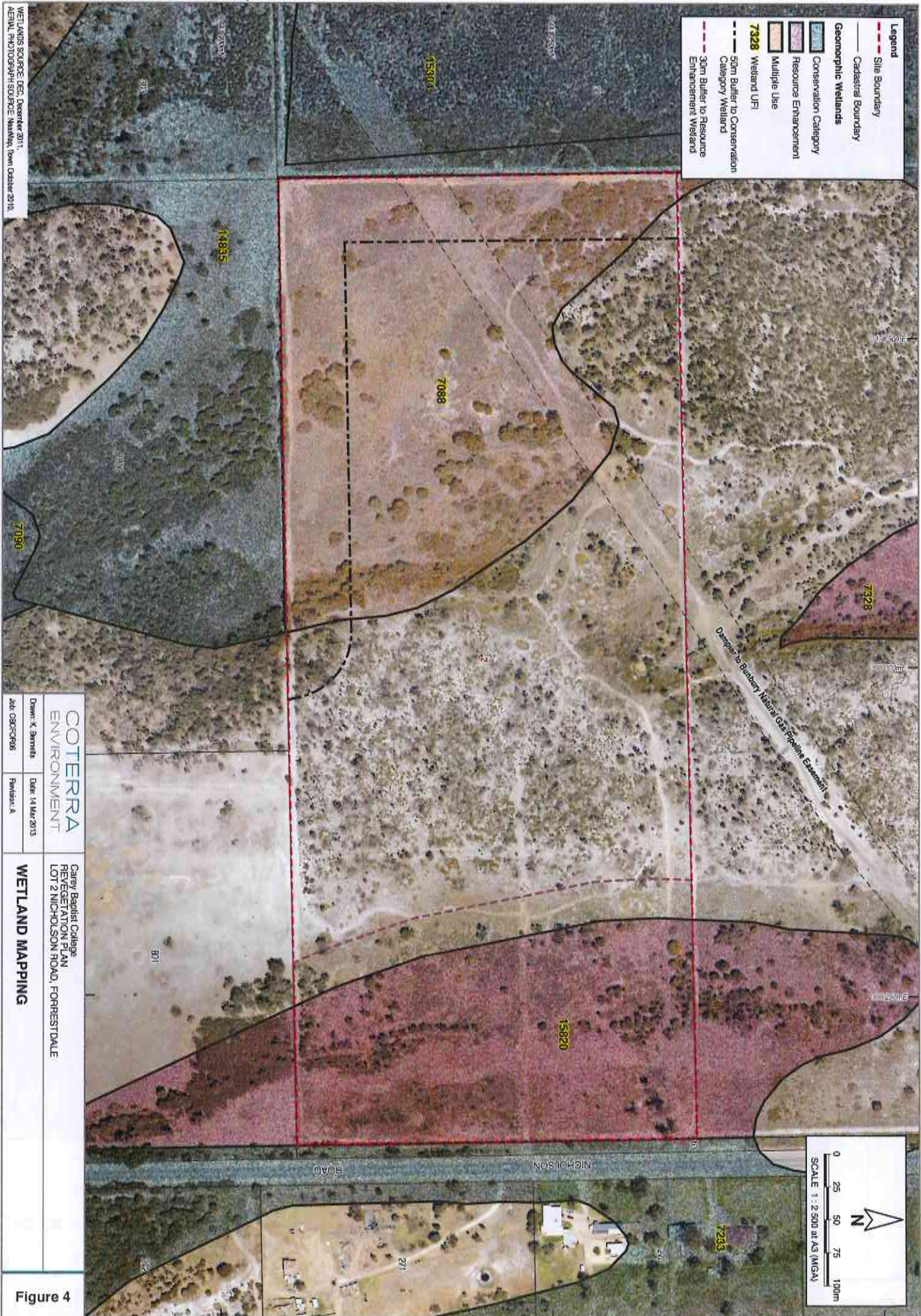


Figure 3

WETLANDS SOURCE: DEC, December 2011.
AERIAL PHOTOGRAPH SOURCE: MaxMay, from October 2010.

Legend

- Site Boundary
- Cadastral Boundary
- Geomorphic Wetlands
- Conservation Category
- Resource Enhancement
- Multiple Use
- 7328 Wetland UFI
- 50m Buffer to Conservation Category Wetland
- 30m Buffer to Resource Enhancement Wetland

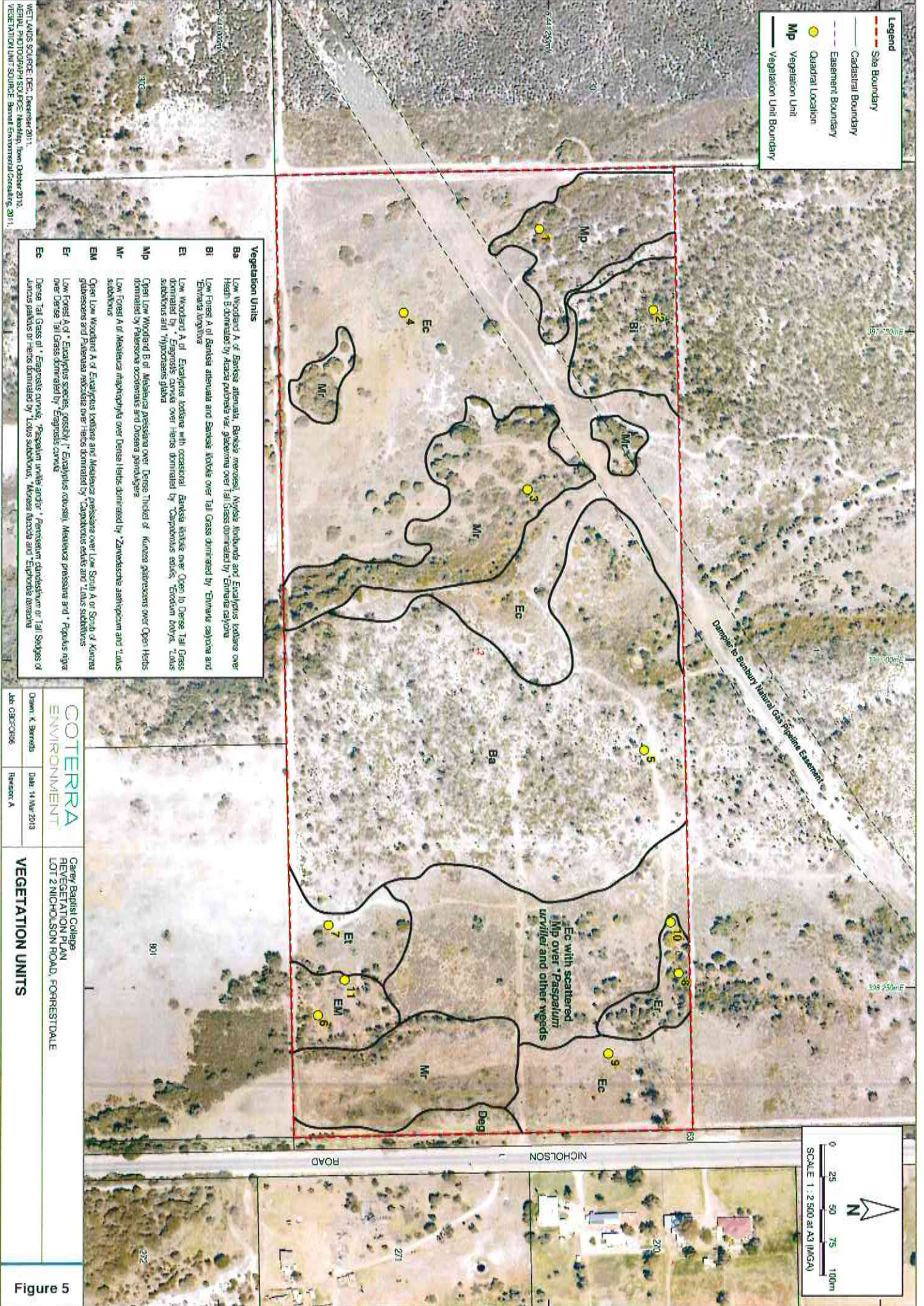


COTERRA ENVIRONMENT	
Drawn: K. Bennett	Date: 14 Mar 2013
Job: 0363CR06	Revision: A

Carey Baptist College
REVEGETATION PLAN
LOT 2 NICHOLSON ROAD, FORRESTDALE

WETLAND MAPPING

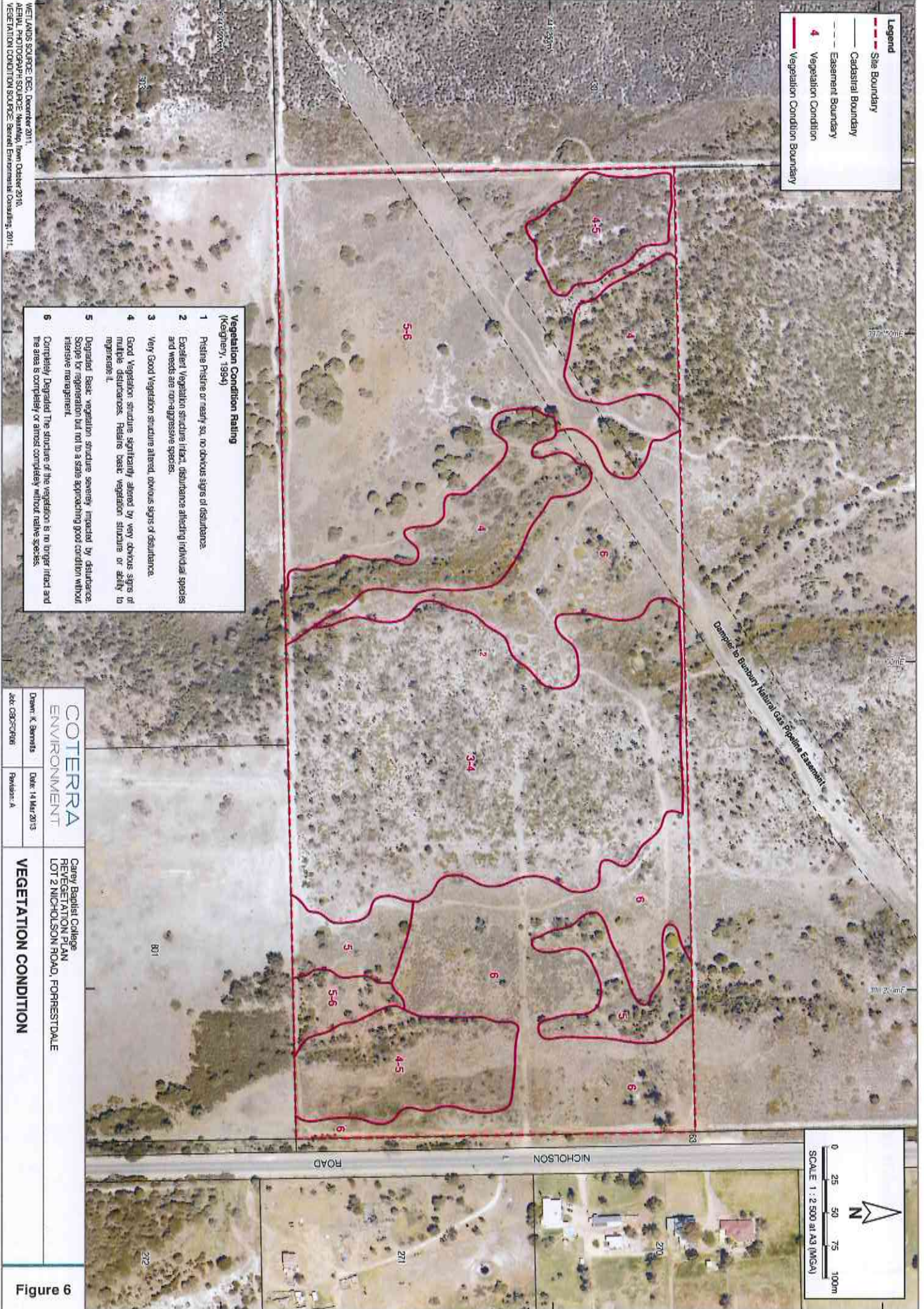
Figure 4



COTERRA ENVIRONMENT
Dawn K. Barneds
Date: 14 Nov 2019
Job: CBCFOR06

Carey Baptist College
REVEGETATION PLAN
LOT 2 MICHOLSON ROAD, FORRESTDALE
VEGETATION UNITS

Figure 5



Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- 4 Vegetation Condition
- 5 Vegetation Condition
- 6 Vegetation Condition

- Vegetation Condition Rating**
(Keighney, 1994)
- 1 Pristine Pristine or nearly so, no obvious signs of disturbance.
 - 2 Excellent Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
 - 3 Very Good Vegetation structure altered, obvious signs of disturbance.
 - 4 Good Vegetation structure significantly altered by very obvious signs of multiple disturbance. Relates basic vegetation structure or ability to regenerate it.
 - 5 Degraded Basic vegetation structure severely impacted by disturbance. Some for regeneration but not to a state approaching good condition without intensive management.
 - 6 Completely Degraded The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

COTERRA ENVIRONMENT	
Drawn: K. Bennett	Date: 14 Mar 2013
Job: CBCF06-106	Revision: A

Carrey Baptist College
REVEGETATION PLAN
 LOT 2 NICHOLSON ROAD, FORRESTDALE

VEGETATION CONDITION

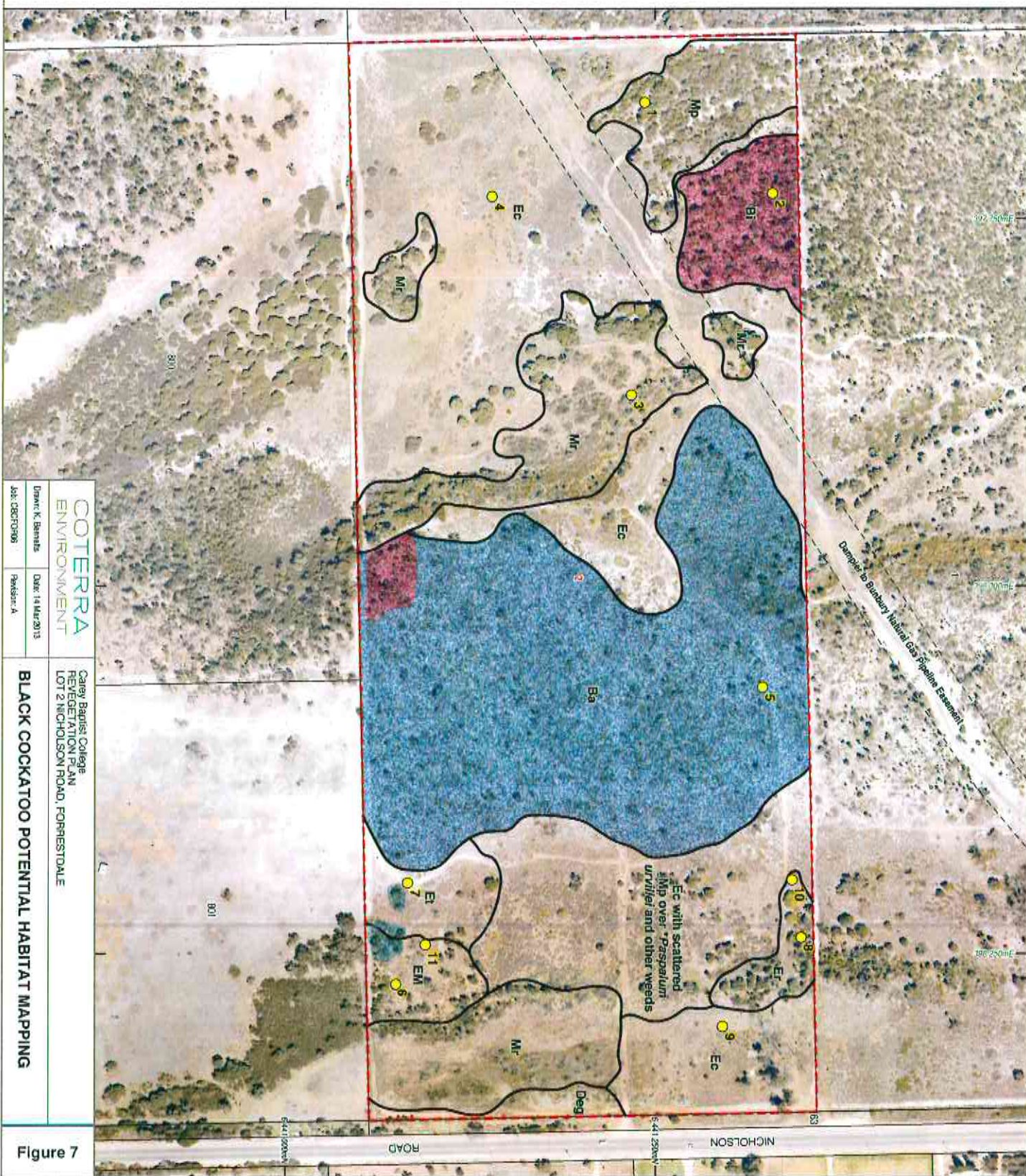
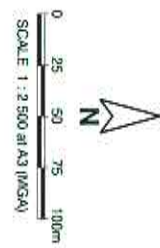
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SCALE 1 : 2 500 at A3 (MGA)

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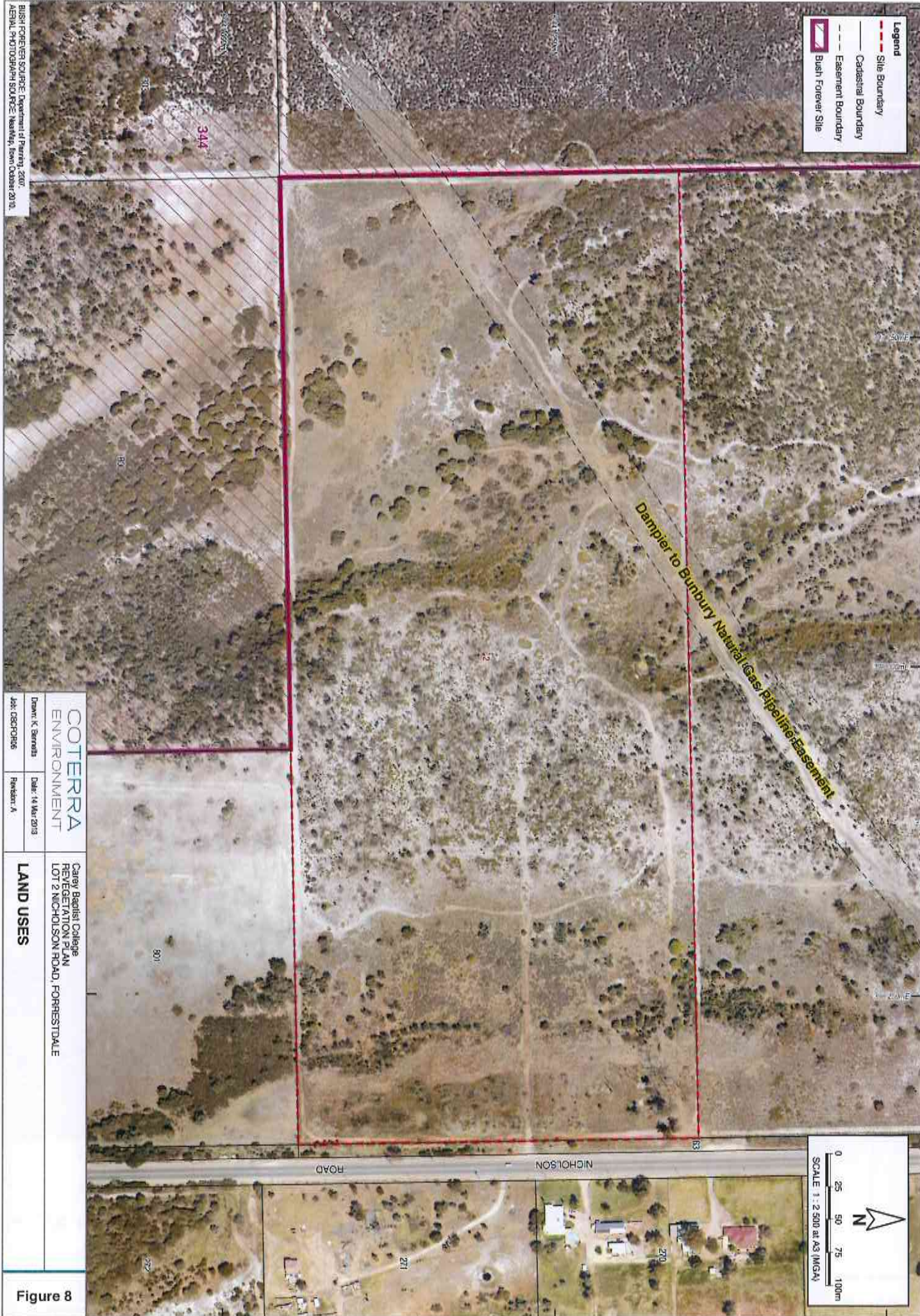
Figure 6

- Legend**
- Site Boundary
 - Cadastral Boundary
 - Essential Boundary
 - Quaternal Location
 - MP Vegetation Unit
 - Vegetation Unit Boundary
- Habitat Mapping**
- Good quality *Eucalyptus toridiana* foraging habitat
 - Good quality *Banksia* sp. foraging habitat
 - Poor quality *Banksia* sp. foraging habitat
- Vegetation Units**
- Ba** Low Woodland A of *Banksia attenuata*, *Banksia menziesii*, *Myrica aspidioides* and *Eucalyptus totiana* over Heath B dominated by *Acacia pulchella* var. *gabruense* over Tall Grass dominated by *Themba calypso*
 - Bi** Low Forest A of *Banksia attenuata* and *Banksia acida* over Tall Grass dominated by *Themba calypso* and *Themba longiflora*
 - Ei** Low Woodland A of *Eucalyptus totiana* with occasional *Banksia totida* over Open to Dense Tall Grass dominated by *Eragrostis curvula* over Heats dominated by *Carpodacus sedis*, *Trodium forbesi*, *Lolus subulvus* and *Hypochaeris glabra*
 - Mp** Open Low Woodland B of *Melaleuca prostrata* over Dense Thicket of *Koeleria glabrescens* over Open Heats dominated by *Fallosurus occidentalis* and *Drosera galeoides*
 - Mf** Low Forest A of *Melaleuca neophytica* over Dense Heats dominated by *Zantedissora arthroporum* and *Lolus subulvus*
 - Em** Open Low Woodland A of *Eucalyptus totiana* and *Melaleuca prostrata* over Low Scrub A or Scrub of *Koeleria glabrescens* and *Fallosurus melaleuca* over Heats dominated by *Carpodacus sedis* and *Lolus subulvus*
 - Er** Low Forest A of *Eucalyptus* species, possibly *Eucalyptus rostrata*, *Melaleuca prostrata* and *Paspalum nigra* over Dense Tall Grass dominated by *Eragrostis curvula*
 - Ec** Dense Tall Grass of *Eragrostis curvula*, *Paspalum univale* and/or *Pennisetum damboisii* over Tall Sedges of *Alnus palustris* or Heats dominated by *Lolus subulvus*, *Melaleuca prostrata* and *Themba calypso*



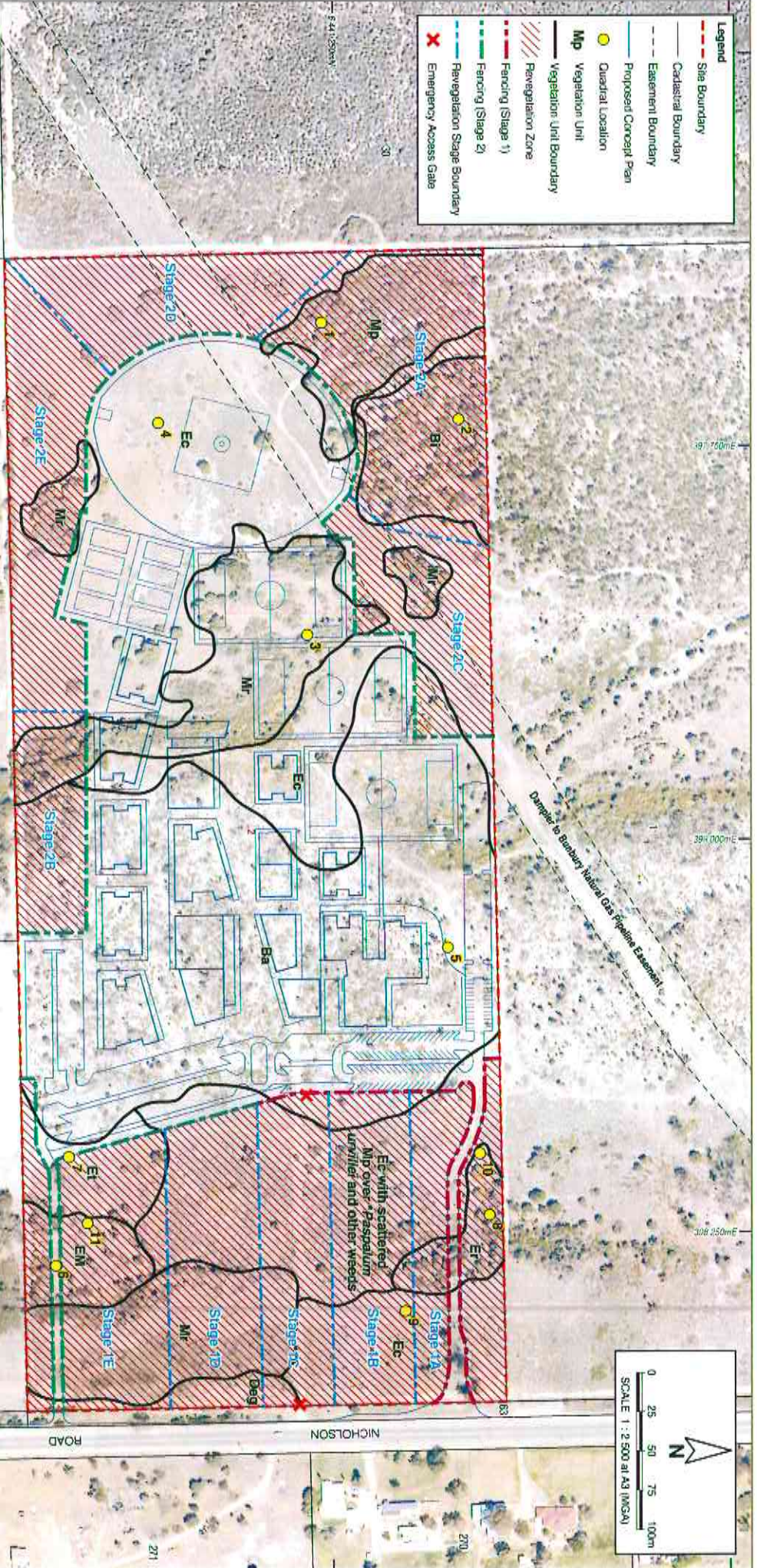
COTERRA ENVIRONMENT		Carey Bantus College REVEGETATION PLAN LOT 2 NICHOLSON ROAD, FORRESTDALE	
Drawn: K. Dennis	Date: 14 Mar 2013	BLACK COCKATOO POTENTIAL HABITAT MAPPING	
Job: CBCF0906	Revised: A		

Figure 7



Legend

- Site Boundary
- Cathedral Boundary
- Easement Boundary
- Proposed Concept Plan
- Quasral Location
- MP Vegetation Unit
- Vegetation Unit Boundary
- /// Revegetation Zone
- Fencing (Stage 1)
- Fencing (Stage 2)
- Revegetation Stage Boundary
- ✕ Emergency Access Gate



Vegetation Units

Ba Low Woodland A of *Banksia alternata*, *Banksia menziesii*, *Myrica aschersonii* and *Eucalyptus tottiana* over Heath B dominated by *Azorella pulchella* var. *glaberrima* over Tall Grass dominated by *Drosera cypripetala*

Bi Low Forest A of *Banksia alternata* and *Banksia nobilis* over Tall Grass dominated by *Drosera cypripetala* and *Drosera longica*

Ei Low Woodland A of *Eucalyptus tottiana* with occasional *Banksia nobilis* over Open to Dense Tall Grass dominated by *Scariosus curvica* over Heals dominated by *Carphoxenus edulis*, *Trichostema laevis*, *Latis subulturna* and *Hypochaeris glabra*

Er Low Woodland B of *Melaleuca prostrata* over Dense Thicket of *Kunzea glabrescens* over Open Heals dominated by *Parasenecio occidentalis* and *Drosera glauviligera*

Mr Low Forest A of *Melaleuca maphrophylla* over Dense Heals dominated by *Zantedeschia aethiopium* and *Latis subulturna*

Em Open Low Woodland A of *Eucalyptus tottiana* and *Melaleuca prostrata* over Low Scrub A or Scrub of *Kunzea glabrescens* and *Ruhovea reticulata* over Heals dominated by *Carphoxenus edulis* and *Latis subulturna*

Ec Dense Tall Grass of *Eragrostis curvica*, *Paspalum juncea* and *Pennisetum clavosetum* or Tall Stages of *Amorpha pallens* or Heals dominated by *Latis subulturna*, *Mitella lasiocarpa* and *Euphorbia hirsuta*

COTERRA ENVIRONMENT

David K. Cooper Date: 23 Sep 2014

Job: CBCFOR06 Revision: A

Carey Baptist College
REVEGETATION PLAN
LOT 2 NICHOLSON ROAD, FORRESTDALE

REVEGETATION AREAS

Figure 9



Figure 10

COTERRA ENVIRONMENT

Carrey Baptist College
REVEGETATION PLAN
LOT 2 NICHOLSON ROAD, FORRESTDALE

Drawn: K. Cooper	Date: 7 Oct 2014
Job: C83C0066	Revision: A

STAGE 1 INDICATIVE PLANTING ZONES FOR REW AND BUFFERS

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Proposed Concept Plan
- Bush Forever Site
- Approved Clearing Area
- Resource Enhancement
- Wetland Boundary
- 30m Buffer to REW

Sedge/Rush Zone: 400-600 rushes/sedges per 100m square (i.e. on average 4 to 6 sedge plants/m²)

Embankment Shrubs: 150 to 200 Embankment shrubs per 100 square meters (i.e. on average 1.5 to 2 Embankment Shrub plants/m²)

Fringing Trees: 10 to 20 fringing plants per 100 square meters

NOTE: Zones presented are indicative and subject to minor amendment once ground works (revegetation) commences and ground finalising.

BUSH FOREVER SOURCE: Department of Planning, 2007.
AERIAL PHOTOGRAPHY SOURCE: MapMap, 10th October 2010.

APPENDIX A - DER CLEARING PERMIT APPROVAL (MAY 2014)



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 4860/1
Permit Holder:	Carey Baptist College Inc
Duration of Permit:	21 June 2014– 21 June 2024

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

- 1. Purpose for which clearing may be done**
Clearing for the purpose of constructing a school site.
- 2. Land on which clearing is to be done**
Lot 2 on Diagram 75868 (Forrestdale 6112)
- 3. Area of Clearing**
The Permit Holder must not clear more than 4.26 hectares of native vegetation within the area hatched yellow on attached Plan 4860/1a.
- 4. Application**
This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

PART II – MANAGEMENT CONDITIONS

- 5. Dieback and weed control**
When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:
 - (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
 - (b) ensure that no *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
 - (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.
- 6. Offset - Revegetation Plan**
The Permit Holder must, within the area shaded red on attached Plan 4860/1b, implement and adhere to the offset commitments as outlined in the Revegetation Plan – Lot 2 Nicholson Road, Forrestdale, Revision 1, April 2014 attached as Appendix A to this permit.

PART III - RECORD KEEPING AND REPORTING

7. Records must be kept

In relation to the Offset – Revegetation of areas pursuant to condition 6:

- (a) the location of any area of offsets recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;
- (b) a description of the offset activities undertaken; and
- (c) the size of the offset area (in hectares).

8. Reporting

The Permit Holder must provide to the CEO on or before 30 June of each year, a written report:

- (a) of records required under condition 7 of this Permit; and concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the calendar year.
- (b) If no clearing authorised under this Permit was undertaken between 1 January to 31 December of the preceding calendar, a written report confirming that no clearing under this permit has been carried out, must be provided to the CEO on or before 30 June of each year.
- (c) Prior to 21 March 2024, the Permit Holder must provide to the CEO a written report of records required under condition 7 of this Permit where these records have not already been provided under condition 8(a) of this Permit.

DEFINITIONS

The following meanings are given to terms used in this Permit:

dieback means the effect of *Phytophthora* species on native vegetation;

fill means material used to increase the ground level, or fill a hollow;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

soil disease status means soil types either infested, not infested, uninterpretable or not interpreted with a pathogen.

weed/s means any plant -

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
- (b) published in a Department of Parks and Wildlife Regional Weed Rankings Summary, regardless of ranking; or
- (c) not indigenous to the area concerned.



M Warnock
SENIOR MANAGER
CLEARING REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

22 May 2014

Plan 48601/1a



LEGEND

- Road Centrelines
 - Cadastre
 - Local Government Authorities
 - Clearing Instruments
 - Areas Approved to Clear
- Perth Metropolitan Area
Central 15cm Orthomosaic -
Landgate 2012



Geocentric Datum: Australia 1984
NOTE: the data in this map have not been
 projected. This may result in geometric
 distortion or measurement inaccuracies.

M. Wiamodi Date 22/5/14
 M. Wiamodi

Officer with delegated authority under Section 20 of
 the Environmental Protection Act 1986

Information derived from this map should be
 confirmed with the data custodian acknowledged
 by the agency acronym in the legend.



Government of Western Australia
 Department of Environment Regulation
 WA Crown Copyright 2002

Plan 4860/1b



LEGEND

- Road Centrelines
- Clearing
- Local Government Authorities
- Clearing Instruments
- Areas Subject to Conditions

Perth Metropolitan Area
Central 15cm Orthomosaic -
Landgate 2012

Scale 1:5000
(As available when reproduced at 1:5000)

Geocentric Datum Australia 1994
Note: no data in this map have not been projected. This may result in geocentric distortion or measurement inaccuracies.

Michael 22/5/14
M. Williams

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency activities in the legend.

Government of Western Australia
Department of Environment Regulation
100 Town Centre Drive

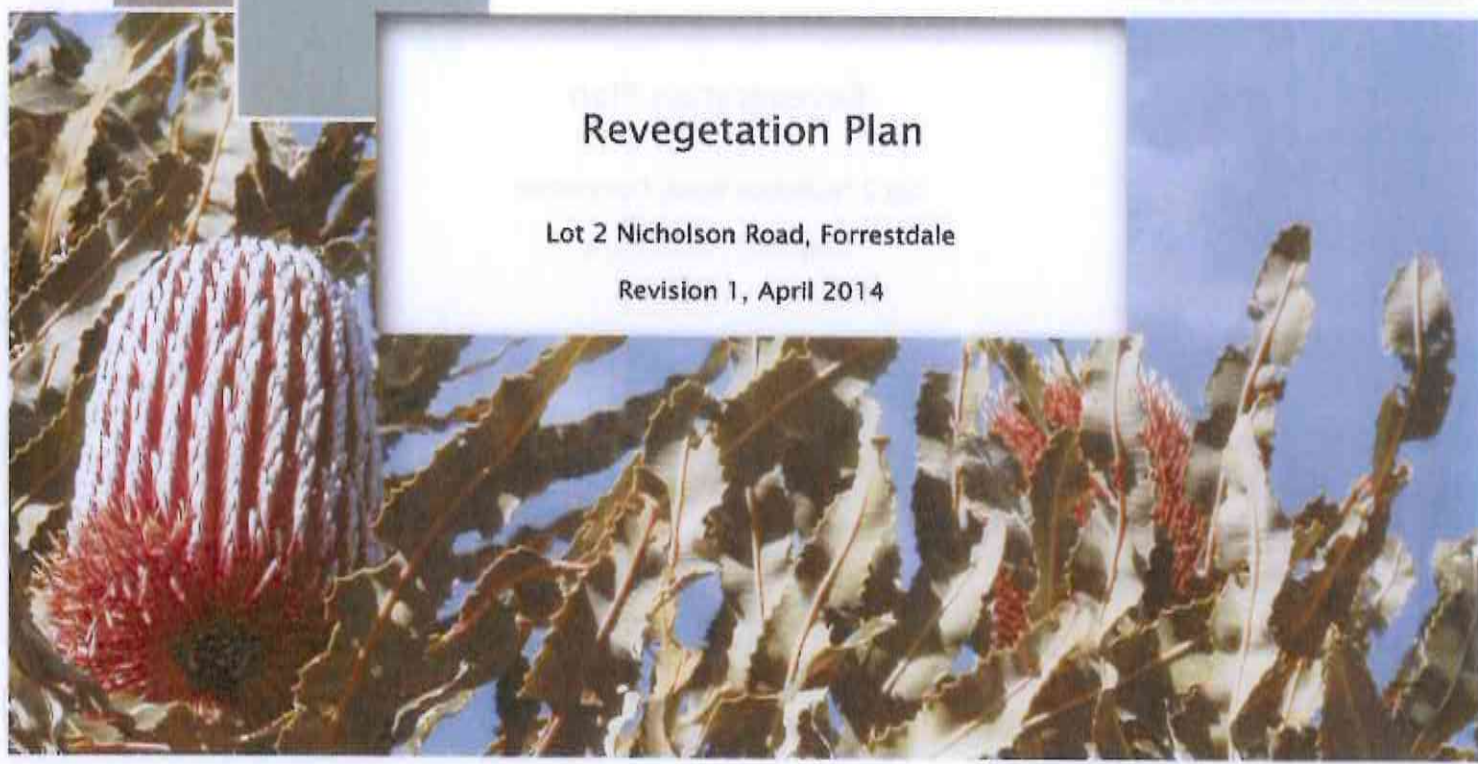
COTERRA ENVIRONMENT

Revegetation Plan

Lot 2 Nicholson Road, Forrestdale

Revision 1, April 2014

CALIBRE | COMMITMENT | COLLABORATION



Revegetation Plan

Lot 2 Nicholson Road, Forrestdale

Revision 1, April 2014

This report was prepared by:

Coterra Pty Ltd trading as COTERRA ENVIRONMENT
ABN: 92 143 411 456

Our Ref: CBCFOR06
Author(s): K. Bennetts
Report Version: Revision 1
Date: April 2014

This report was prepared for:

Carey Baptist College
PO Box 1409
CANNING VALE WA 6970

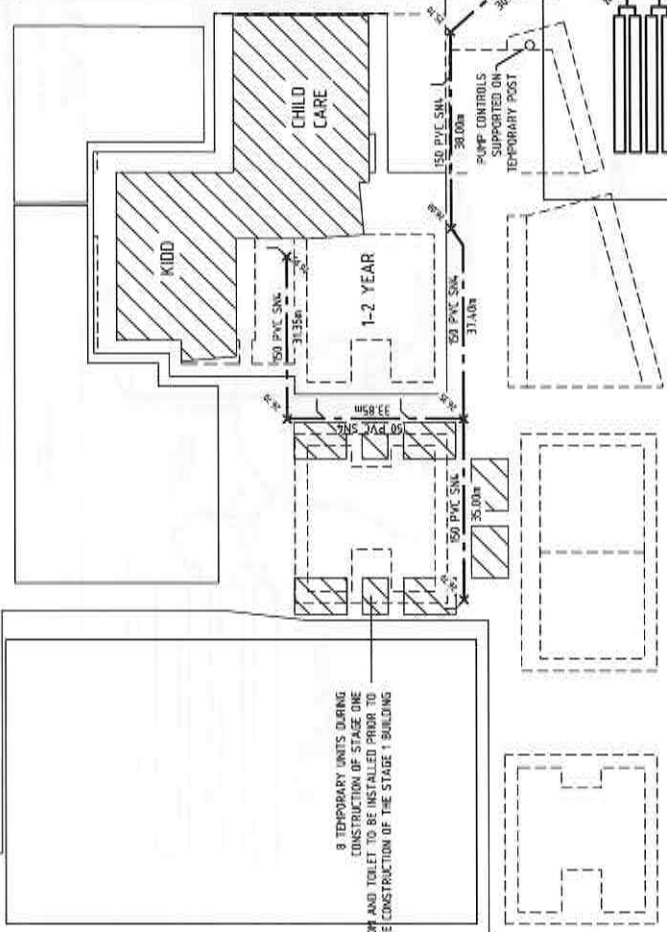
Notice

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**APPENDIX B - DRAINAGE INFILTRATION SWALE DESIGN
(SOURCE: DAVID WILLS & ASSOCIATES)**

**APPENDIX C - INTERIM EFFLUENT DISPOSAL SYSTEM
(SOURCE: DAVID WILLS & ASSOCIATES)**

FUTURE LAYDOWN AREA



SEE DRAWING 10184-C205

8 TEMPORARY UNITS DURING CONSTRUCTION OF STAGE ONE CLASSROOM AND TOILET TO BE INSTALLED PRIOR TO THE CONSTRUCTION OF THE STAGE 1 BUILDING

REFER TO ORIG 10184-C201 FOR SEWER SYSTEM AND PUMP STATION DETAILS

EXTENT OF EARTHWORKS FOR STAGE ONE

LEGEND

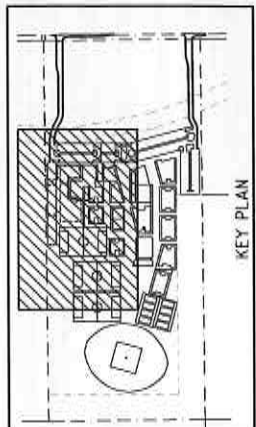
- SEWER PIPE BURET LEVEL
- 50 PVC SNA
- 75 PVC SNA
- 150 PVC SNA
- 300 PVC SNA

NOTE

SEWER TO PUMP STATION IS LAD TO ASS500



PROJECT NO. 10184-C205		DATE 12/15/2011	
PROJECT NAME LOT 2 NICHOLSON ROAD FORRESTHILL		DRAWING NO. A1	
CLIENT CUREY BAPTIST COLLEGE INC		SCALE AS SHOWN	
DESIGNER David Willis and Associates Consulting Engineers		DATE 12/15/2011	
DRAWN BY [Name]		CHECKED BY [Name]	
DATE 12/15/2011		DATE 12/15/2011	
PROJECT LOCATION LOCAL		PROJECT AREA AHB	
<p>10184 C209 C</p> <p>THESE DRAWINGS OR ANY PART THEREOF ARE THE PROPERTY OF DAVID WILLIS AND ASSOCIATES CONSULTING ENGINEERS</p>			



- DRAWING REFERENCES:**
- 99B-C201 MASTER PLAN
 - 99B-C202 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C203 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C204 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C205 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C206 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C207 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C208 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C209 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C210 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C211 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C212 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C213 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C214 BRAC EARTHWORKS PLAN STAGE ONE
 - 99B-C215 BRAC EARTHWORKS PLAN STAGE ONE

**APPENDIX D – DER ACID SULFATE SOIL ASSESSMENT ADVICE
(27 MAY 2014)**

[The following text is mirrored and illegible due to extreme blurriness in the original document. It appears to be a formal letter or report section.]





Government of Western Australia
Department of Environment Regulation

Your ref
Our ref DMO7770
Enquiries Chek Cher
Phone (08) 9333 7598
Fax (08) 9333 7575
Email chek.cher@der.wa.gov.au

Matt Ryding
DWA Consulting Engineers
PO Box 3084
MYAREE LPO WA 6154

Dear Mr Ryding

LOT 2 NICHOLSON ROAD, FORRESTDAL, WESTERN AUSTRALIA

The Department of Environment Regulation (DER) received the report 'Carey Baptist College Future School Site Acid Sulphate Soil Test Results' (the report) prepared by DWA Consulting Engineers (the consultant), on 21 May 2014. DER has completed a review of the information submitted and provides the following advice.

Based on the information provided, DER concurs with the results of the acid sulfate soil (ASS) investigation carried out at the site and agrees that no ASS appear to be present at the site. It is further understood that no dewatering will be undertaken at the site. As such, it is agreed that an ASS management plan is not necessary for the proposed works. Given the likely presence of ASS within the surrounding area, should the site work program change such that dewatering is required, a comprehensive ASS and dewatering management plan will need to be developed and approved by DER prior to the commencement of any dewatering activities.

If you have any further queries, please contact Contaminated Sites Officer, Chek Cher, on 9333 7598.

Yours sincerely

Andrew Miller
**ACTING SENIOR MANAGER
CONTAMINATED SITES**

27 May 2014

Attachment 1: Site Location Figure

Attachment 1: Site Location Figure



LEGEND

- | | | |
|---|---|---|
| <input checked="" type="checkbox"/> Mining Tenements | <input checked="" type="checkbox"/> WIN Surface Water Sites | <input type="checkbox"/> Local Government Authorities |
| <input type="checkbox"/> PDW Protection Zones | <input type="checkbox"/> Perth Metropolitan Area South 15cm Orthomosaic - Landgate 2012 | <input type="checkbox"/> Cadastre |
| <input type="checkbox"/> Reservoir Protection Zones | <input type="checkbox"/> Perth Metropolitan Area Central 15cm Orthomosaic - Landgate 2012 | <input type="checkbox"/> --> Image Index |
| <input type="checkbox"/> Wellhead Protection Zones | <input type="checkbox"/> Perth Metropolitan Area North 15cm Orthomosaic - Landgate 2012 | <input type="checkbox"/> Recently added |
| <input type="checkbox"/> Potential Groundwater Dependiant Ecosystems - DOE 2004 | | <input type="checkbox"/> Coverage |
| <input checked="" type="checkbox"/> Road Centrelines | | |



Scale 1:6740
(Approximate when reproduced at A4)
Geocentric Datum Australia 1994
Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

Prepared by: chekc
Prepared for:
Date: 27/05/2014 10:40:18 AM

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.



Government of Western Australia
Department of Environment Regulation
WA Govn Copy/24 2002

* Project Data. This data has not been quality assured. Please contact map author for details.

**APPENDIX E – LOT 2 NICHOLSON ROAD: PHYTOPHTHORA DIEBACK
INTERPRETATION REPORT**



Phytophthora Dieback Interpretation Report

Lot 2 Nicholson Road

Forrestdale



Lot 2 Nicholson Rd Forrestdale:

Assessment Undertaken:

Map Expiry:

22.0 hectares

11th September 2014

6th October 2017

DIEBACK MAPPING & MANAGEMENT

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1.2	<i>Location and Size of Areas</i>	3
1.3	<i>Historical Land Use and Past Disturbances</i>	3
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1 Introduction

1.1 Background

Dieback disease caused by the pathogen *Phytophthora cinnamomi* is a major threat to the biodiversity of south-western Australia. The spread of this water mould is facilitated by the movement of soil infested with spores, particularly under warm, moist conditions. Consequently, a major component is the strategy to constrain this disease which involves managing access and soil-disturbance activities within native vegetation. Knowledge of the occurrence of the disease in the landscape is therefore an essential prerequisite to formulating suitable hygiene management practices.

NPC Consulting has been requested by Coterra Environment to map the occurrence of *Phytophthora cinnamomi* within the property of Lot 2 Nicholson Road in Forrestdale. The Dieback assessment was undertaken on the 11th September 2014.

1.2 Location and Size of Areas

Lot 2 Nicholson Road is located south of the intersection of Nicholson and Armadale Roads in Forrestdale. The suburb of Forrestdale is located approximately 25 kilometres south of Perth. The property is fenced and gated but is accessible along the northern boundary from Nicholson Road. The property is approximately 22 hectares in size.

1.3 Historical Land Use and Past Disturbances

Lot 2 Nicholson Road is semi-rural private property. The property is situated on the Swan Coastal Plain. The vegetation in this area is generally that of Banksia woodlands. There are some remnants of Banksia woodland on the property however the majority of the property is removed of vegetation. The disturbance in the vegetation is considered moderate to high. It is possible that cattle were kept on the property in the past which has led to the absence of vegetation, particularly in the understorey. Dumping of rubbish appears to be a regular occurrence on this property.

2 Methods

2.1 Interpretation

Field interpretation followed the standard methods and operating procedures described in the document titled "*Phytophthora* Dieback Interpretation Procedures Manual' (DPaW 2014), which is a working draft.

Presence or absence was determined not only through observation but by sampling of recently-dead plant species. Non-differential, hand-held global positioning system (GPS) receivers were used for navigation and to record survey boundaries and waypoints within the areas.

2.2 Demarcation

Infested areas are demarcated using 25 or 50 mm day-glow tape with the knots facing the infestation. Uninterpretable areas are demarcated using 25 mm pink and black striped flagging tape. The excluded category is not demarcated as there is normally a clearly visible boundary between that category and others (i.e. pasture).

2.3 Soil and Tissue Sampling

Soil and tissue sample(s) associated with dead or dying plants were taken to confirm the presence or absence of the *Phytophthora sp.* These soil and plant samples were forwarded to the Vegetation Health Service (DPaW) laboratory at Kensington, where diagnostic baiting was conducted. The samples were used to as evidence for the presence of *Phytophthora cinnamomi* in the area. The sample point locations were recorded with GPS receivers. Appendix 1 summarizes the laboratory results of the sampling.

2.4 Mapping

The field observations, boundaries, waypoints and survey data were downloaded into a Geographic Information System from a Global Positioning System unit (GPS) to generate a map of *Phytophthora cinnamomi* occurrence for the area.

Following DPaW guidelines for determining 'Protectable Areas', boundaries were defined and provided on the Management Map to support hygiene management and planning.

2.5 Vegetation Assessment

The vegetation condition of the property was assessed. This assessment was carried out using methods based upon the condition scale from Keighery B J (1994). These methods are described in Bush Forever Vol. 2 –Directory of Bush Forever Sites.

3 Results

3.1 Disease Distribution

Phytophthora cinnamomi is present in the remnant Banksia Woodland area situated in the middle of the property. This remnant vegetation is approximately 4 hectares in size, extends from north boundary to south boundary and is moderately disturbed. Weeds and grasses are present throughout this area.

3.2 Temporarily Uninterpretable

The small area of vegetation, approximately 0.5 hectares in size, along the northern boundary at the western end of the property contains mostly mature Banksias but has no understorey. This vegetation was part of a larger area that was burnt around January 2014. Due to the fire this area is categorised as Temporarily Uninterpretable (See Glossary of Terms for definition). This category will change in 2-3 years' time, when the vegetation becomes assessable again.

3.3 Excluded

The majority of the property (17.5 hectares) is highly degraded with significant areas where the vegetation has been mostly or completely removed. In these areas weeds and grasses are present. These areas are categorised as Excluded. The Excluded area includes remnant vegetation of mostly Melaleucas scattered around the property. (See Glossary of Terms for definition). It is not possible to determine the presence or absence of the disease in Excluded areas.

3.4 Disease Expression and Impact

The disease expression is considered poor to average within the infested Banksia woodland area. There were very few recent plant deaths at the time of the assessment and as a result only 3 soil and tissue samples were taken. There were greater numbers of older indicator species deaths present. Many of them have suffered from the impact of fire if not prior to from *Phytophthora*.

The impact is variable across the Banksia woodland area. A decrease in biomass and biodiversity is the result of disturbance but may also be from the presence of *Phytophthora*. Higher disturbance and possibly higher Dieback impact areas form a mosaic across the remnant Banksia woodland area.

3.5 Vegetation Condition

Excluded sections of the property east of the Banksia woodland area to Nicholson Road and on the west side of the Banksia woodland area are predominantly 5 or 6 on the Keighrey scale. The vegetation close to the north-west corner which contains mature Banksias is considered a 4-5 whilst the Banksia woodland in the middle of the property is a 4 on the Keighrey scale.

3.6 Soil and Tissue Sampling

Three soil and root tissue samples were taken within the property. These samples were taken only from within the remnant Banksia woodland area. This

is because recent susceptible plants species deaths were present only in this area. Had there been more recent plant deaths at the time of sampling then more samples would have been taken.

The samples were taken to support field based decisions that the area is infested. Two of the three samples returned positive results for *Phytophthora cinnamomi*.

4 Recommendations

4.1 Protectable Areas

It is recommended that the area categorised as being Temporarily Uninterpretable be protected. The reasons for this are that healthy indicator species appear to be present even though current deaths are fire related and that vegetation outside of Lot 2 immediately to the north may well be free of the disease and possibly protectable. This area will become interpretable again in 2-3 years' time.

A recheck should be carried out on the Temporarily Uninterpretable area after January 2017 if operations are ongoing beyond this point but only if this area has not been cleared by this point.

Excluded areas of the property are not protectable because of the high level of historical disturbance, current use of the property and the likelihood of disease being present. The Banksia woodland area is also not protectable. This is due to the disease being present.

4.2 Hygiene Management

There is one hygiene management recommendation for all areas of the property. If BRM is to be sourced from the property it **must not** be used on or adjacent to Protectable Areas away from the property.

The hygiene management recommendations for the Temporarily Uninterpretable area are as follows:

- Clean on Entry and Exit are required (depending on direction of traffic) along the northern boundary of the property at the boundary of the Temporarily Uninterpretable area. Vehicles and machinery need to be cleaned down on entering this area.
- Machinery must be cleaned down prior to clearing this area. Machinery may be cleaned at a depot and transported to site.
- Vehicles and machinery must not traverse from Lot 2 to neighbouring properties as the presence or absence of the disease has not been determined for these areas and no hygiene management recommendations are available.

5 Discussion

5.1 Mapping

The remnant Banksia woodland area has not only experienced a change in biomass and biodiversity, particularly in the understorey and possibly from grazing but has more recently experienced fire approximately 5 years ago. From observing the deaths in the mature Banksias this fire was hot and intense and has eliminated the chronology of plant deaths that would have been present, particularly in the mid to understorey, before the fire. This chronology is generated by the autonomous movement of the disease.

Although there was poor expression and very few recent Banksia or other indicator species deaths observed during the assessment, areas of significant decrease in biomass and biodiversity were observed. Prickly Moses (*Acacia pulchella*) has taken over the understorey in the remnant Banksia woodland. This plant is not susceptible to Dieback but is thriving with a lack of competition, which may have been caused by the presence of *Phytophthora cinnamomi*.

Also, recent deaths appeared in the vegetation in the remnant Banksias after sampling was carried out and the field assessment was completed. These deaths are similar to those sampled, where positive results were retrieved. This is not unusual as spring and autumn are the best times for disease expression, with a mix of moisture and warmth ideal for sporulation of the pathogen.

All these factors suggest that the disease is present although expressing poorer within parts of the remnant Banksia woodland.

5.2 Management

The infested Banksia woodland area has not been demarcated as there is an easily observable boundary between vegetated (Infested) and non-vegetated areas (Excluded) areas. Both of these areas are not protectable and have the same requirements on hygiene management so demarcation is not required.

The Temporary Uninterpretable area has been demarcated. This is to ensure that there is a clear understanding of where this boundary is located for the benefits of accurate Clean on Entry and Exit.

There is a higher risk of the potential for disease to be present within areas that have experienced a high level of disturbance. The Excluded areas of the property are at a higher risk of being infested because of the historical and current disturbances as well as being down slope of an infested area. This is a contributing factor toward identifying Excluded areas as being not protectable.

6 Conclusion

Lot 2 Nicholson Road Forrestdale was assessed for *Phytophthora* Dieback on the 11th September 2014 and finalised on the 2nd October 2014. The property is in most part is highly degraded, has experienced a decrease in biomass and biodiversity and is categorised as Excluded. The Banksia woodland area is infested from the disease caused by *Phytophthora cinnamomi*.

Poor to average expression of the disease observed and grasses and weeds were present throughout. The impact of the disease was considered variable with significant changes in biomass and biodiversity and the greater presence of non-susceptible species in part.

A total of 3 soil and root tissue samples were taken. Two of these returned positive results for *Phytophthora cinnamomi*.

Excluded and Infested areas of the property are not protectable. The Temporarily Uninterpretable area is protectable and hygiene management recommendations apply to this area only.

If BRM is to be sourced from the property it **must not** be used on or adjacent to Protectable Areas away from the property.

A map has been prepared to show disease boundaries and hygiene information. This map is valid until 6th October 2015. No rechecks are required on Excluded or Infested areas. A recheck should be carried out on the Temporarily Uninterpretable area after January 2017 if operations are ongoing beyond this point but only of the area has not already been cleared.

7 References

Department of Parks and Wildlife, DPaW, (2014) "Phytophthora Dieback Interpretation Procedures Manual" (working draft),

Department of Conservation and Land Management (2001) *Phytophthora cinnamomi* and disease caused by it. Volume II Interpreter guidelines for detection, diagnosis and mapping

Botanic Gardens Trust Sydney NSW. *Armillaria root Rot – fact sheet.* http://www.rbgsyd.gov.au/information_about_plants/pests_diseases/fact_sheets/armillaria_root_rot

Keighery B J (1994), *Bush Forever Volume 2, Directory of Bush Forever Sites (Vegetation Condition Scale).*

8 Appendices

8.1 Appendix 1 - Summary of Soil and Tissue Samples

Lot 2 Nicholson Road Sample Summary

Sample No	Plant Sampled	Reference No	Result (POS, NEG)
1	<i>Banksia attenuata</i>	E 398 046 N 6441 122	POS
2	<i>Banksia attenuata</i>	E 398 014 N 6441 175	NEG
3	<i>Banksia attenuata</i>	E 398 059 N 6441 296	POS

Positive sample results are for *Phytophthora cinnamomi*.

8.2 Glossary of Terms

Phytophthora Dieback; is the name given to the disease that is caused by the pathogen. There are multiple species of *Phytophthora* in the south west however it is *Phytophthora cinnamomi* that causes significant destruction in naturally vegetated areas.

Infested; areas that have been deemed by an accredited Dieback Interpreter to have plant disease symptoms consistent with *Phytophthora* Dieback.

Uninfested; areas that have been deemed by an accredited Dieback Interpreter to be free of any visible plant disease symptoms consistent with *Phytophthora* Dieback.

Uninterpretable; areas that do not contain plant species that are susceptible to *Phytophthora cinnamomi*, therefore not allowing the presence or absence of the disease *Phytophthora* Dieback to be determined.

Temporary Uninterpretable; applies to vegetated areas where there are susceptible plant species to the disease present but there has been some type of recent disturbance and determining the presence or absence of the disease is not possible. This includes fire, timber harvesting or other temporary disturbances.

Excluded; applies to areas with little or no vegetation like paddocks and other cleared areas. These areas are identifiable from aerial photographs. The presence or absence of the disease in these areas is also unknown.

Protectable Area; are areas of native vegetation that are disease free or uninterpretable, of a certain size or that will not become infested in the short to midterm. Hygiene management applies to Protectable Areas.

Pathogen; is an organism or other factor that causes disease within a host plant.

Disease; is a combination of a pathogen, host and correct environmental conditions which results in disease symptoms or death of a host.

Environment; is the sum of all external factors which act on an individual organism in its lifetime.

Phytophthora Occurrence Map; is the map produced by the Dieback interpreter (surveyor/assessor) which indicates the boundaries of the categories of Dieback.

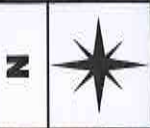
Phytophthora Hygiene Management Plan/Map; is the document/map produced by the Dieback interpreter (surveyor/assessor) which indicates all the relevant hygiene recommendations for a particular area.

Dry soil access; is any access along tracks or operations that are undertaken during the drier months of the year. During these times the risk spread of the disease is minimal.

Susceptible species; refers to plants which will not survive as a result of being infected with the pathogen.

Indicator Species Deaths; is a plant death from a species of plant that is susceptible to the disease and therefore indicates the diseases presence.

Basic Raw Material (BRM); refers to the raw material in the form of rock, gravel, limestone and sand that is sourced from the ground.








Lot 2 Nicholson Road Phytophthora Dieback Occurrence and Hygiene Management Map

Scale 1 : 2750



Legend

-  Site Boundary
-  Temporary Uninterpretable (Disease Unknown)
-  Disease Infested
-  Sample Locations [3]

Hygiene Management: Clean on Entry/Exit - COE
 Protectable Areas - Temporarily Uninterpretable
 Non Protectable Areas - Infested and Excluded
 Property Entry Points - 

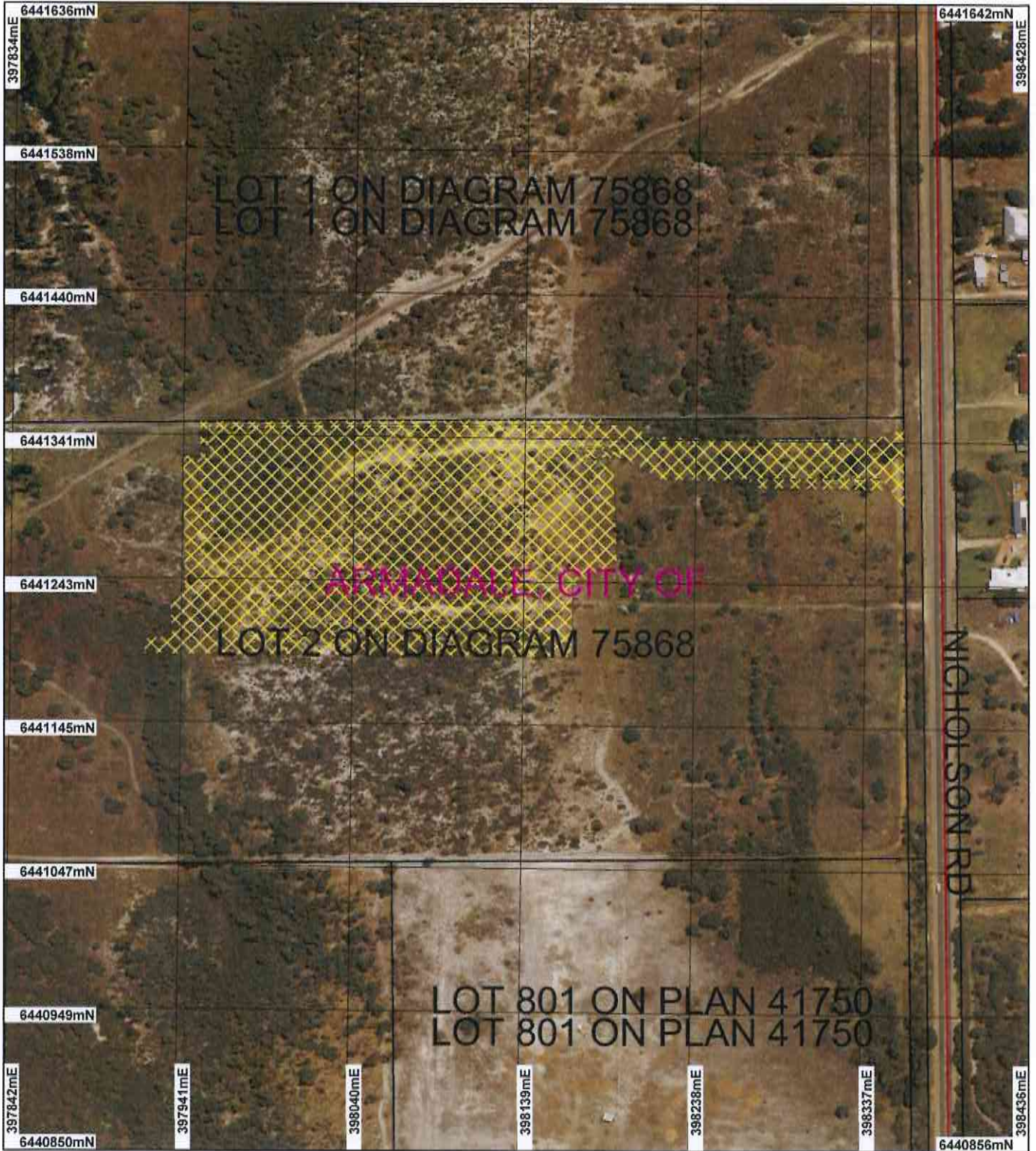


October 2014

Map Limitations
 This map is valid for until the 6th October 2017. Disease infested and excluded areas do not require rechecks. Temporarily Uninterpretable areas do require rechecks. If the Temporarily Uninterpretable has not been cleared by January 2017 then a recheck on this area is recommended after this time.


Figure 1

Plan 4860/2a



LEGEND

- Local Government Authorities
- Road Centrelines
- Cadastre
- Clearing Instruments
- Areas Approved to Clear



0 ~ 100 m

Scale 1:3483
(Approximate when reproduced at A4)


Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

M Warnock 18/12/19 Date

M Warnock
Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.



Government of Western Australia
Department of Environment Regulation
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Plan 4860/2b



LEGEND

- Local Government Authorities
- Road Centrelines
- Cadastre
- Clearing Instruments
- Areas Subject to Conditions



Scale 1:3483
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

M Warnock Date 18/12/14

M Warnock
Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.



Government of Western Australia
Department of Environment Regulation

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Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 4860/2
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: Carey Baptist College Inc

1.3. Property details

Property: LOT 2 ON DIAGRAM 75868 (FORRESTDALE 6112)
Local Government Area: City of Armadale
Colloquial name:

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
4.45		Mechanical Removal	Building or Structure

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 18 December 2014

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description	Clearing Description	Vegetation Condition	Comment
The vegetation under application has been mapped as Beard vegetation association 1001, which Shepherd et al (2001) describes as 'Medium very sparse woodland; jarrah, with low woodland; banksia & casuarinas'.	The clearing of 4.45 hectares of native vegetation within Lot 2 on Diagram 75868, Forrestdale is for the purpose of constructing a school and engineer batters.	Completely Degraded: No longer intact; completely/almost completely without native species (Keighery 1994) To Very Good: Vegetation structure altered; obvious signs of disturbance (Keighery 1994)	The description and condition of the vegetation was determined by supporting information supplied by Coterra Environment (2012) and via a site inspection (DEC 2012a) Historically, the application area has been used for stock grazing and as a result has been previously cleared. Currently the site is unused with uncontrolled access and illegal rubbish dumping evident The condition of vegetation under application ranges from Completely Degraded to Very Good (Keighery, 1994). The majority of vegetation is in a Very Good to Good (Keighery 1994) condition.

3. Assessment of application against clearing principles

Comments

The applicant has applied to amend Clearing Permit 4860/1 to increase the application area from 4.26 hectares to 4.45 hectares (additional 0.19 hectares) for the purpose of establishing engineering batters to assist in the construction of the school.

The assessment against the clearing principles has not changed and can be found in the Clearing Permit Decision Report CPS 4860/1.

Methodology

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments

The City of Armadale (2014) issued planning approval for bulk earthworks for the proposed education establishment for Lot 2 on Diagram 75868, Nicholson Road, Forrestdale on 21 November 2014.

Methodology The City of Armadale (2014)

4. References

- City of Armadale (2014) Application for Planning Approval - Bulk Earthworks for Proposed Educational Establishment (Carey Baptist College) Lot 2 (540) Nicholson Road Forrestdale. Western Australia. DER Ref:A842574
- Coterra Environment (2012) Clearing Permit Application - Lot 2 Nicholson Road, Forrestdale. (DEC Ref: A471366)
- DEC (2012a) Site Inspection Report for Clearing Permit Application CPS 4860/1, Lot 2 Nicholson Road, Forrestdale. Site inspection undertaken 2 March 2012. Department of Environment and Conservation, Western Australia (DEC Ref: A490200).
- Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.
- Shepherd, D.P., Beeston, G.R., and Hopkins, A.J.M. (2001), Native Vegetation in Western Australia. Technical Report 249. Department of Agriculture Western Australia, South Perth.