Australian Rail Track Corporation

Maitland to Minimbah Third Track Project

Biodiversity Management and Offset Plan

June 2014

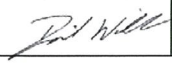
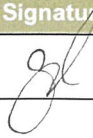
H8R-REP-S2G-ENV-0067

GHD

Level 3 GHD Tower 24 Honeysuckle Drive Newcastle NSW 2300
PO Box 5403 Hunter Region Mail Centre NSW 2310
T: (02) 4979 9999 F: (02) 4979 99T8 E: ntlmail@ghd.com.au

Document Status

Rev No.	Date	Revision Description	Prepared	Reviewed		Approved	
				Name	Signature	Name	Signature
0	10/12/2010		B. Harrington	D. Chubb	*Original Signed*	D. Chubb	*Original Signed*
0	20/1/2011	SEWPaC further comments	B. Harrington	D. Chubb	*Original Signed*	D. Chubb	*Original Signed*
1	18/3/2011	Final	B. Harrington	J. Tipping	*Original Signed*	D. Chubb	*Original Signed*
2	23/3/2011	Revised	B. Harrington	J. Tipping	*Original Signed*	D. Chubb	*Original Signed*
3	15/04/2011	Revised	B. Harrington	J. Tipping	*Original Signed*	D. Chubb	*Original Signed*
4	07/11/13	Revised	A Quin	D Williams	Original Signed	M Parsons	Original Signed

Rev No.	Date	Revision Description	Prepared	Reviewed		Approved	
				Name	Signature	Name	Signature
5	24/06/2014	Final	A Quin	D Williams		G Morton	

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1. Introduction

1.1 Overview

The Hunter 8 Alliance have identified biodiversity offsets on behalf of the Australian Rail Track Corporation (ARTC) as a component of the Maitland to Minimbah Third Track Project (referred to as 'the Project'). The Commonwealth Environment Minister's approval under the *Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act) includes the condition that ARTC must "*submit a Biodiversity Management and Offset Plan to address impacts on listed threatened species and ecological communities to the Minister for approval prior to clearing of any native vegetation*". This Biodiversity Management and Offset Plan (the Offsets Plan) was submitted to DSEWPaC in April 2011 to comply with the Conditions of Approval and to assist the Minister in determining whether the Project will adequately offset impacts on Matters of National Environmental Significance (MNES) under the EPBC Act. This revised Offsets Plan has been submitted for final approval by the Minister. It includes the final impacts of the project following various changes to the project design that have resulted in an overall decrease to the amount of native vegetation that was originally approved for clearance in the Project EA. The proposed offset site has also changed since the draft plan was submitted in 2011.

Construction of the Project will occur in two phases. Construction of Phase One commenced on 1 May 2011. The timing of construction of Phase Two is yet to be determined. Clearing of native vegetation and habitat will also occur over two phases. In line with the proposed staged approach to construction, it is proposed to stage biodiversity offsetting. The Phase One offset will be established initially and precise details of offset contributions for Phase 1 are included in this Offsets Plan. The establishment of the Phase Two offset will be delayed until such time as confirmation of that Phase of construction going forward. An updated version of this Offsets Plan will be prepared and submitted to the Minister for approval at least six months prior to the planned beginning of construction of Phase 2.

Biodiversity impacts associated with Phase One of the Project include the removal of 23.59 hectares of native vegetation. All native vegetation removed occurs as part of Endangered Ecological Communities (EECs) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act). The project disturbance footprint also contains up to up to 74 individuals and approximately 3.04 hectares of hybrid *Eucalyptus glaucina* (Slaty Red Gum) habitat. Slaty Red Gum is listed as a Vulnerable species under the EPBC Act and the TSC Act.

The Hunter 8 Alliance have prepared a Biodiversity Offset Strategy (referred to as 'the Offsets Strategy') to address the biodiversity offsetting requirements of the NSW Department of Planning (DoP). The Offsets Strategy considers a number of options and identified the NSW Biodiversity Banking and Offsets Scheme (BioBanking) as preferred approach to determining biodiversity offsets for the Project. As such, a BioBanking assessment has been completed in order to determine the amount and type of biodiversity offsets included in this Offsets Plan.

An Offsets Package (required under NSW approvals) has been approved for the project that includes the purchase and retirement of biodiversity credits using the BioBanking Assessment Methodology (BBAM) and the Office of Environment and Heritage (OEH) (2011) *Interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects*. The package includes the conservation of two adjoining biobank sites:

- A parcel of land owned, located on Green Wattle Creek Road, Butterwick, which is referred to as the 'Shirbin biobank site' (Lot 11 DP 1160191).
- A property located on Green Wattle Creek Road, Seaham, which is referred to as the 'Garvey biobank site' (Lot 52 DP 752487). This property is directly adjacent to the proposed 'Shirbin biobank site'.

The offsets package for Phase 1 of the Project involves the conservation of approximately 235 hectares of habitat (approximately 57.8 hectares at the Shirbin biobank site and 177.2 hectares at the Garvey biobank site). The location of the offsets site are shown in Figure 2, Figure 3 and Figure 4.

This Offsets Plan has been prepared, based on the information and results outlined in the Offsets Package, to demonstrate that the Project will adequately offset impacts upon listed threatened species listed under the EPBC Act and ecological communities.

1.2 Relationship with Existing Reports

1.2.1 Biodiversity Offsets

This EPBC Act Offsets Assessment draws upon information presented in reports prepared by the Hunter 8 Alliance to address the biodiversity offsetting requirements of the NSW Department of Planning.

The Hunter 8 Alliance approach to biodiversity offsetting was developed through a desktop review of available options and consultation with Government agencies as documented in the following reports:

- Hunter 8 Alliance, (2010a) *Maitland to Minimbah Third Track Project Biodiversity Offsetting Report.*
- Hunter 8 Alliance, (2010b*) Biodiversity Offsets – Decisions Framework*.

During this process, the Hunter 8 Alliance considered various options to offset biodiversity impacts arising from the Project. The preferred approach is to assess, conserve and manage a suitable offset site within the framework of BioBanking. BioBanking provides a quantitative assessment methodology for comparing impacts and offsets and will also ensure that the offset site is securely titled, managed and funded for conservation in perpetuity.

This approach is presented as the Offsets Package for Phase One of the project which has been approved by the NSW Minister for Planning. The Offsets Package is an extension to the offsetting reports listed above and includes more precise details of biodiversity offsets approved for the Project, including a description of the offset sites.

The BioBanking assessment methodology was used to develop the Offsets Package for the Project as follows:

- Use of the BBAM to determine impacts of the development and the Project offsetting requirements in terms of biodiversity credits.
- Identification of a suitable offset sites (the biobanks) containing appropriate biodiversity credits to offset impacts of the development.
- Assessment of the biobanks using the BBAM to determine the biodiversity credits that will be generated if the sites were set aside and managed for conservation.
- Comparison of the biodiversity credit profiles of the development site and biobank sites to demonstrate that the biobank sites are appropriate to offset biodiversity impacts of the Project.

The results of the BioBanking assessments undertaken for the Offsets Package are included in this Offsets Plan.

1.2.2 Ecological Impact Assessment

The assessment has been prepared giving consideration to information contained in the following ecological assessment reports pertaining to the Project:

- Ecotone Ecological Consultants (2010). *Terrestrial Fauna Impact Assessment – Proposed Third Railway Track between Maitland and Minimbah.*
- Hunter 8 Alliance (2010c). *Maitland to Whittingham Third Track Flora and Aquatic Ecological Assessment.*
- Hunter 8 Alliance (2010d) *Maitland to Minimbah Third Track Project Submissions Report Flora and Aquatic Ecology Study*.
- Hunter 8 Alliance (2010e) *Re-signalling between Branxton and Minimbah Review of Environmental Factors*.
- Hunter 8 Alliance (2010f) *Station Lane Overpass and Roadworks, Lochinvar Review of Environmental Factors.*
- Hunter 8 Alliance (2010g) *Hermitage Road Overpass and Roadworks, Belford Review of Environmental Factors.*

These assessment reports are hereafter referred to as the ‘Project ecological assessment’. Ecological values and impacts referred to in this report are referenced from the Project ecological assessment for the development investigation area. These reports contain information relevant to the EPBC Act Offsets Assessment, including a description of the native vegetation types, species and habitats that have been affected by Phase One of the Project. It is recommended that this document be read in conjunction with the Project ecological assessment.

2. Methodology

2.1 Approach

This section explains how the extent and condition of habitat for threatened species and ecological communities was determined, both within the Project disturbance footprint and within the biobank sites.

The extent and condition of native vegetation and threatened species habitat to be removed was determined with reference to the project ecological assessments and the BBAM.

For the purposes of this report, the Hunter 8 Alliance did not undertake any additional field surveys within the development footprint and used the existing data for vegetation types and condition as presented in the Project ecological assessments. Data presented in the Project ecological assessment was deemed to be adequate to be used as the primary data for the BioBanking assessment and credit calculations. This approach was supported by the NSW Office of Environment and Heritage (OEH) BioBanking unit and the Project assessment unit. The 'investigation area' for this assessment is the area that was impacted by the Project as shown in Appendix A.

Field surveys of the biobank sites were conducted in accordance with the BBAM (DECC, 2009).

2.2 Ecological Impact Assessment

The project ecological assessment included the following components:

- Desktop assessment of relevant reports and databases to identify threatened biota that may be present in the study area or affected by the project, including:
  - Department of Environment, Climate Change and Water (DECCW) (now OEH) Atlas of NSW Wildlife.
  - Department of Environment, Water Heritage and the Arts (DEWHA) (now DSEWPaC) online search for Matters of National Environmental Significance (MNES).
- Field surveys for terrestrial flora and their habitats, as summarised in Table 2-1 comprising:
  - Vegetation quadrats and compilation of a flora species list.
  - Mapping of vegetation communities.
  - Targeted threatened flora survey.
- Aquatic ecology assessment as summarised in Table 2-1 including:
  - Rapid Appraisal of Riparian Condition (RARC).
  - Aquatic habitat assessment.
- Terrestrial fauna assessment, as summarised in Table 2-2, including:
  - Diurnal bird transects
  - Diurnal and nocturnal reptile and amphibian searches
  - Spotlighting

- Nocturnal owl and mammal call playback.
- Anabat micro-bat echolocation surveys.

- Compilation of lists of flora and fauna species recorded on-site.
- Assessment of the extent and quality of habitats occurring on-site.
- Assessment of the likelihood of occurrence of threatened fauna listed under the TSC Act and / or the EPBC Act.
- Preparation of assessments of significance of impacts on threatened biota listed under the TSC Act in accordance with the *Part 3A Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) and *Threatened species assessment guidelines: The assessment of significance* (DEC 2007).
- Preparation of assessments of significance of impacts on Matters of National Environmental Significance (MNES) listed under the EPBC Act in accordance with the *Significant Impact Guidelines 1.1: Significant Impact Guidelines Matters of National Environmental Significance* (DEWHA 2009).

The development site location is shown in Figure 1. Vegetation communities, important habitat resources and threatened biota within the investigation area and the Project construction footprint are shown in Appendix A.

Table 2-1 Flora and Aquatic Ecology Survey Effort

Vegetation Community	Investigation Area Survey Effort	Approximate Total Number of Person-hours
Lower Hunter Spotted Gum Ironbark Forest	11 transects and 11 quadrats	21
Hunter Lowland Redgum Forest	16 transects and 16 quadrats	26
Swamp Oak Riparian Forest	9 transects and 9 quadrats	19
Grey Box Spotted Gum Ironbark Forest	9 transects and 9 quadrats	19
Freshwater Wetland	4 transects and 4 quadrats	11
Cleared with Scattered Trees/ Open Pasture/ Weedy Area	8 transects and 8 quadrats	7
Hakea Scrub	1 transect and 1 quadrat	2
Plantation	N/A	N/A

Vegetation Community	Investigation Area Survey Effort	Approximate Total Number of Person-hours
Aquatic Habitat Assessments	42 RARC 52 Aquatic Habitat Assessments	44
Targeted Threatened Flora Survey	20 random meanders	22

Table 2-2 Terrestrial Fauna Survey Effort

Survey Site	Habitat Type	Diurnal Bird Surveys (hours)	Diurnal Herpetofauna Surveys (hours)	Nocturnal Herpetofauna Surveys (hours)	Spotlight Surveys (hours)	Call Playback (hours)	Anabat Recording
1	Open woodland	2	2	1	1	1	3 nights
2	Riparian woodland	2	2	0	0	0	3 nights
3	Open woodland	2	2	1	1	1	2 nights
4	Open woodland	2	2	1	1	1	2 nights
5	Farm dams	0	0	1	3	0	0
S2	Disturbed – remnant forest	0.3	.25	2	2	0	1 hour
S2	Remnant Spotted-gum – Ironbark forest	0.3	1	2	2	1	4 hours
S4	Disturbed / cleared	0.3	1	2	2	1	1 hour
S5a	Varied woodland	0.6	0.5	2	2	0	1.5 hours
S7a	Swamp Oak forest	0.6	0	2	2	1	4 hours
S8	Swamp Oak forest	0.6	0	2	2	0	1 hour
S10	Swamp Oak forest	0.6	0	2	2	0	1 hour

Survey Site	Habitat Type	Diurnal Bird Surveys (hours)	Diurnal Herpetofauna Surveys (hours)	Nocturnal Herpetofauna Surveys (hours)	Spotlight Surveys (hours)	Call Playback (hours)	Anabat Recording
S11	Red Gum open forest	0.6	0	0	0	0	0
S14	Open Spotted-gum – Ironbark forest	0.6	1	2	2	1	3 hours
S16	Remnant Spotted-gum – Ironbark forest	0.6	0.5	2	2	0	3.5 hours

2.3 Determination of Biodiversity Offsets

2.3.1 Desktop Assessment

The preferred offsetting arrangement identified in Hunter 8 (2010a) and (2010b) was to identify a parcel of land that will be conserved under a biobanking agreement. A number of potential sites were considered, including lands managed by indigenous councils and corporations, private land and land administered by the LPMA.

These site options were considered against a number of criteria, including:

- Ecological characteristics (i.e. vegetation types and habitats matching those in the development investigation area).
- Size – based on preliminary BioBanking calculations and estimated offset ratios.
- Ecological outcomes generated from management of the offset site (i.e. potential for improvement).
- Access and land availability/titling arrangements.
- The approval process and associated time frames.

A desktop assessment of potential offset sites was conducted. Potential sites were identified in GIS and plotted on an aerial photo base and available broad-scale vegetation mapping. Landowners were consulted and existing reports were reviewed to obtain additional ecological information about each site, where available. The extent of each vegetation type within each site was calculated and the results were tabulated and used to rank their suitability in terms of the estimated offsetting requirements for the Project.

As a result of this desktop assessment, Hunter 8 identified two preferred offset sites to address impacts arising from Phase 1 of the Project:

- A parcel of land, located on Green Wattle Creek Road, Butterwick, which is referred to as the ‘Shirbin biobank site’ (Lot 11 DP 1160191).

- A property located on Green Wattle Creek Road, Seaham, which is referred to as the 'Garvey biobank site' (Lot 52 DP 752487). This property is directly adjacent to the proposed 'Shirbin biobank site'.

Investigations of suitable offset sites for Phase 2 of the Project are ongoing, but will not be completed until six months prior to the construction of that phase of the Project. Biodiversity offsets for Phase 2 will be included in an updated version of this Offsets Plan as described in Section 6.4.

2.3.2 Site Surveys

Staged site surveys of the Shirbin and Garvey biobank sites were conducted with reference to the BBAM. Survey effort is summarised in Table 2-3 and described below.

Table 2-3 Survey Effort

Date	Study Area	Survey Effort	Survey Methods
Shirbin and Garvey Biobank site preliminary survey			
17 August 2011	Shirbin and Garvey biobank sites	2 ecologists for 2 days	Broad-scale vegetation survey and vegetation mapping.
Shirbin and Garvey Biobank sites detailed survey			
18-25 August 2011	Shirbin and Garvey biobank sites	3 ecologists for 4 days 33 plot / transects	20 m x 50 m BioBanking plot / transect surveys, opportunistic fauna and threatened plant observations.
26 April 2012	Shirbin and Garvey biobank sites	2 ecologists for 1 days 4 plot / transects	20 m x 50 m BioBanking plot / transect surveys.
25 May 2012	Shirbin and Garvey biobank sites	2 ecologists for 1 day 2 plot transects	20 m x 50 m BioBanking plot / transect surveys, opportunistic fauna and threatened plant observations.
20 September 2012	Shirbin and Garvey biobank sites	2 ecologists for 1 day 2 plot transects	20 m x 50 m BioBanking plot / transect surveys, opportunistic fauna and threatened plant observations.

2.3.3 Shirbin and Garvey Biobank Sites Preliminary Survey

The initial desktop mapping was ground-truthed in the field via systematic driven transects across both the Shirbin and Garvey properties and by walking the boundary of vegetation communities. Field ecologists checked mapped vegetation polygons with a hand held Trimble GPS unit loaded with aerial photography and draft vegetation mapping. Necessary adjustments were made by hand on aerial photographs of the site and by capturing waypoints at vegetation community boundaries. The sites were divided into relatively homogenous or discrete zones for assessment. Each zone represented a distinct vegetation type according to the OEH (2012) vegetation types database and broad condition state. Six vegetation zones were identified across the two sites as shown on Figure 5 and Figure 6 in Appendix B.

2.3.4 Shirbin and Garvey Biobank Sites Detailed Survey

Plot and transect surveys were conducted on each site in accordance with the procedures provided in DECC (2009). The site values were determined by assessing ten site condition attributes against benchmark values. Benchmarks are quantitative measures of the range of variability in condition in vegetation with relatively little evidence of alteration, disturbance or modification by humans since European settlement.

Forty one plots were sampled across the Shirbin and Garvey study sites; with 20 of these plots within the Shirbin biobank site and 21 within the Garvey biobank site. The number of plots and transects required was determined based on desktop vegetation mapping. Following the collection of plot data, quadrat floristics were analysed. Final credit calculations were completed using the BioBanking Credit Calculator (Version 2) on 2 October 2012 with results included in the final Offsets package.

A targeted search for Slaty Red Gum was conducted through all areas of suitable habitat within the study area. No Slaty Red Gums were recorded. No systematic targeted surveys for other threatened species were conducted at either the Shirbin or Garvey biobank sites.

2.3.5 BioBanking Assessment and Credit Calculation

Biodiversity credits were determined according to the methodology presented in the DECC (2009) BBAM and Credit Calculator Operational Manual. The credit calculator is the software version of the methodology. Data is entered into the credit calculator based on information collected at the site and from using GIS mapping software.

The methodology establishes two classes of biodiversity credits that may be created:

- Ecosystem credits – these are created or required for all impacts on biodiversity values (including threatened species that can be reliably predicted by habitat surrogates), except the threatened species or populations that require species credits.
- Species credits – these are created or required for impacts on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Threatened species that require species credits are identified in the Threatened Species Profile Database (DECCW, 2010b).

The credit calculator produces a number of reports, including the threatened species predicted to occur, survey effort required at the site and the biodiversity credit profile.

The application of the methodology varied between the development site and the biobank sites. The development site assessment was performed using a streamlined methodology suitable to a Part 3A Project. The biobank sites were assessed using the standard application of the methodology.

The methodology requires site surveys, including plot-based measurement of vegetation and habitat variables. For the development, available and extrapolated data was entered into the BioBanking credit calculator to estimate the number of credits that would need to be purchased and retired if the entire development site was included in an application for a BioBanking Statement. This approach was developed in consultation with the OEH BioBanking Unit. The Project is being assessed under Part 3A of the EP&A Act rather than through a biobanking statement for a development and so the methodology for statements does not strictly apply. Further, OEH has provided guidance for a streamlined methodology that simplifies the assessment of linear infrastructure (Seidel, J., OEH, pers. comm.).

Information was gathered from the project ecological assessment and additional desktop assessment and GIS calculations performed as required. This information was then entered into Version 2 of the credit calculator for the development BioBanking assessment.

Site surveys of the Shirbin and Garvey biobank site were conducted according to the standard application of the methodology. The number of plots and transects required for each of the biobank sites was determined based on desktop vegetation mapping. Following the collection of plot data, quadrat floristics were analysed. Credit calculations we made using the the BioBanking Credit Calculator (V2) on 2 October 2012.

Calculations were completed by Brendon Ryan (BioBanking Assessor Accreditation number 0025).

2.4 Offsets Comparison and Threatened Species Assessment

The BBAM was used to develop this Offsets Plan because it provides for secure titling and funding of the offset site in perpetuity. The BBAM also provides a robust and consistent methodology for calculating the scale and type of offsets that are required to compensate for impacts to native vegetation, threatened plants and habitat for threatened fauna.

The BBAM provides for a robust calculation of offset requirements through:

- Calculation of the extent of native vegetation and habitat resources to be removed at a development site.
- Weighting of offsetting requirements depending on the conservation status of the vegetation to be removed and the threatened species associated with that vegetation.
- Weighting of offsetting requirements depending on the ability of threatened species that will be affected by the development to respond to management actions within offset sites.
- Calculation of gains in biodiversity values depending on the extent of native vegetation and habitat resources to be conserved at a biobank site and the management actions that will be adopted.

The BBAM also predicts the suite of threatened species that are likely to occur within a development or biobank site based on an extensive database of threatened species profiles (OEH, 2012b) and a series of geographic and habitat assessments. This process was combined with the Project ecological assessment and supplementary site surveys to ensure that the suite of threatened species affected by the development was also represented in the offset site.

2.5 Staff Qualifications

The BioBanking credit calculations for this assessment was completed by Brendon Ryan (accredited assessor) and Arien Quin (accredited assessor). This report was written by Arien Quin and Ben Harrington and field surveys included Mark Aitkens, Arien Quin, Matthew Flower and Willow McMinn, qualifications for these ecologists are presented in Table 2-4. The assessment and report was peer reviewed by Daniel Williams (accredited assessor).

Table 2-4 Ecology Personnel and Qualifications

Name	Position / Project Role	Qualifications	Relevant Experience
Daniel Williams	Principal Environmental Scientist /, peer review and planning	B. App. Sc. BioBanking Assessor Accreditation* (# 0082)	13+ years
Arien Quin	Ecologist / desktop assessment, site surveys, reporting	BSc (Botany) BA (BioBanking Assessor Accreditation* (# 0120)	6+ years
Brendon Ryan	Ecologist/ Credit Calculations	BioBanking Assessor Accreditation* (# 0025)	12+ years
Ben Harrington	Ecologist / desktop assessment for development site, reporting	BSc., MSc (Physical Geography) BioBanking Assessor Accreditation* (# 0073)	8+ years
Mark Aitkens	Senior Ecologist / desktop assessment and site surveys	BSc (Env Biology) BioBanking Assessor Accreditation* (# 0101)	15+ years
Matthew Flower	Ecologist/ site surveys	BEnvSc, MSc	7 + years
Willow McMinn	Ecologist/ site surveys	Bsc (Hons)	5+ years

* Refer to DECCW (2010c) list of accredited assessors.

3. Ecological Impacts

3.1 Vegetation and Habitat Resources

The Project ecological assessments noted that the Project area includes both remnant native vegetation and agricultural land, which has been largely cleared. The Project is influenced by a variety of past and present land uses, including rural residential, grazing, rail and highway transportation. Existing infrastructure includes the New England Highway and minor roads, rail, high voltage transmission lines, water and sewer mains.

The Project disturbance footprint impacts an existing rail corridor and adjoining areas of private land. Vegetation within the rail corridor is generally devoid of native species and dominated by noxious and environmental weeds. Native vegetation is generally limited to small areas of Swamp Oak (*Casuarina glauca*) and Hickory (*Acacia implexa)* regrowth.

Vegetation on private land ranges from remnant and regrowth native vegetation with varying degrees of clearing and grazing, through to sites that have been cleared of all native vegetation and are dominated by pasture grasses, vineyards or plantations. Weeds are common throughout the investigation area, particularly along the edges of tracks and cleared land, in riparian areas and adjacent to existing railway infrastructure.

Eight distinct vegetation types were identified in the investigation area, including vegetation consistent with endangered ecological communities (EECs) listed under the TSC Act. The investigation area contains occupied habitat for Slaty Red Gum (*Eucalyptus glaucina*), which is listed as Vulnerable under the TSC Act and the EPBC Act. The investigation area also includes areas of lower ecological value, including cleared land and exotic vegetation. Vegetation types within the investigation area are presented in Table 3-1.

Of these vegetation types, three meet the BioBanking methodology definition of ‘low’ condition vegetation and are not considered to comprise native vegetation for the purposes of the Offsets Plan. Low condition vegetation, including ‘Hakea Scrub’, ‘Cleared with Scattered Trees / Open Pasture / Weedy Area’ and ‘Plantation’ is not considered further in this assessment. This approach is consistent with the Conditions of Approval which states that only intact native vegetation consistent with an EEC requires biodiversity offsets.

The Project ecological assessments included an assessment of habitat resources associated with native vegetation within the investigation area. This summary was used to estimate site attributes as defined by the BBAM by drawing a comparison with the benchmark values for each vegetation type.

Canopy and mid-storey percentage cover were typical of intact examples of these vegetation types. Woodland and forest within the investigation area featured a scattered shrub layer, typically less than two metres in height and composed of a relatively small number of species. Ground cover was dominated by grass and litter cover. Log cover (fallen trees and branches) was moderate and included > 100 millimetre diameter logs. Very small, small and medium sized tree hollows were common at all woodland sites, averaging 28 to 42 hollows per hectare at open woodland sites. No areas of rock on rock, rock overhangs or caves were recorded. Based on these habitat assessments all areas mapped as native woodland and forest were assumed to contain benchmark values of all BioBanking site attributes.

Table 3-1 Vegetation Types within the Investigation Area

Vegetation Type (OEH, 2012a)	ID	Hunter 8 Alliance (2010a) Map Unit	Conservation Significance	Condition (DECC, 2009)
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	HU629	Lower Hunter Spotted Gum Ironbark Open Forest	High - EEC (Lower Hunter Spotted Gum – Ironbark Forest)	Moderate-good
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	HU544	Forest Red Gum Open Forest	High - EEC (Hunter Lowland Red Gum Forest). Contains Slaty Red Gum (*Eucalyptus glaucina*)	Moderate-good
Swamp Oak forest of the central Hunter Valley, Sydney Basin	HU634	Swamp Oak Riparian Forest	High - EEC (Swamp Oak Floodplain Forest)	Moderate-good
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	HU556	Grey Box Spotted Gum Ironbark Open Forest	High - EEC (Central Hunter Ironbark-Spotted Gum –Grey Box Forest)	Moderate-good
Phragmites australis and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin	HU673	Freshwater Wetland	High - EEC (Freshwater Wetland on Coastal Floodplains)	Moderate-good
n/a	n/a	Hakea Scrub	Low – does not qualify as intact native vegetation.	Low
n/a	n/a	Cleared with Scattered Trees / Open Pasture / Weedy Area	Low – does not qualify as intact native vegetation	Low
n/a	n/a	Plantation	Low – does not qualify as intact native vegetation	Low

3.2 Conservation Significance

3.2.1 Threatened Flora Species

The Project ecological assessment identified one threatened flora species in the investigation area: Slaty Red Gum (*Eucalyptus glaucina*), which is listed as a vulnerable species under the TSC Act and EPBC Act. The authors noted that Slaty Red Gum occurred as dense patches within Forest Red Gum Open Forest, and as scattered individuals associated with creeks and drainage lines but was generally absent from ridge tops.

Hunter 8 field botanists conducted a supplementary survey of the investigation area to discriminate between Slaty Red Gum and intergrades. During this supplementary survey, 429 individuals were checked within the Project investigation area. The samples were categorised into confidence levels based on their morphological features (amount of glaucescence present). Seventeen plant samples were sent to the NSW Herbarium representative of the various categories of confidence. None of these 17 specimens were identified as Slaty Red Gum (RBG Sydney, Letter of 8 April 2011). The identifying botanist noted that there were some features of Slaty Red Gum in virtually all specimens, and the specimens were identified as Forest Red Gum (*Eucalyptus tereticornis*) with some genetic influence from Slaty Red Gum (RBG Sydney, Letter of 8 April 2011).

There are approximately 3.04 hectares of occupied Slaty Red Gum habitat and 74 individual *Eucalyptus tereticornis* / *E. glaucina* intergrades (or hybrids) within the Project development footprint.

Consultation with DSEWPaC confirmed that they would still consider native vegetation containing intergrades as habitat for Slaty Red Gum and that this vegetation would require offsets. Offsets for removal of Slaty Red Gum habitat would be provided in the offsets package through conservation of habitat and rehabilitation of degraded habitat as part of the Phase 2 Offsets Package.

The results of the DECCW and SEWPAC database review performed for the ecological assessments (5 October 2009) indicate that an additional twelve threatened flora species listed under the EPBC Act have been previously recorded or have the potential to occur within the locality. The authors conducted an assessment of threatened species habitat requirements and an assessment of their likelihood of occurrence within the investigation area. Based on this habitat assessment and field surveys, no other threatened terrestrial flora listed under the EPBC Act are considered likely to occur within the investigation area.

3.2.2 Endangered Ecological Communities

The Project ecological assessments identified five EECs listed under the TSC Act within the investigation area:

- Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion Bioregions (Lower Hunter Spotted Gum – Ironbark Forest).
- Hunter Lowland Redgum Forest in the Sydney Basin and North coast Bioregions (Hunter Lowland Red Gum Forest).
- Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions (Swamp Oak Floodplain Forest).
- Central Hunter Ironbark - Spotted Gum - Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions (Central Hunter Ironbark- Spotted Gum –Grey Box Forest).
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (Freshwater Wetland on Coastal Floodplains).

No TECs listed under the EPBC Act were identified in the investigation area.

3.2.3 Threatened Fauna Species

The Project ecological assessments included field surveys designed in general accordance with the *Draft Threatened Biodiversity Survey and Assessment Guidelines* (DEC, 2004). A desktop assessment was also conducted, including relevant database searches combined with the author's background knowledge of the fauna habitats and fauna species richness, distribution and abundance.

A total of nine threatened fauna species, all of which are listed as vulnerable species under the TSC Act were identified in the investigation area during field surveys:

- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus t. temporalis*).
- Squirrel Glider (*Petaurus norfolcensis*).
- Eastern Freetail-bat (*Mormopterus norfolkensis*).
- Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*).
- Little Bent-wing Bat (*Miniopterus australis*).
- Large-footed Myotis (*Myotis macropus*).
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).
- Varied Sittella (*Daphoenositta chrysoptera*).
- Grey-headed Flying-Fox (*Pteropus poliocephalus*) - also listed as Vulnerable under the EPBC Act.

Four migratory species listed on the EPBC Act were also recorded within the investigation area during field surveys:

- Latham's Snipe.
- Rainbow Bee-eater.
- Rufous Fantail.
- Wandering Butterfly.

The authors also identified critical foraging habitat for Grey−headed Flying-Fox as defined in the Draft Recovery Plan for the species.

None of the threatened fauna species recorded during the Project ecological assessments are of the type that require species credits within the BBAM (DECCW, 2010b; DECC, 2009). Species credits are required for breeding or roost camps for the Grey-headed Flying Fox however no such camps were identified within the investigation area. Species credits are also required for Large-footed Myotis breeding habitat. The project ecological assessment identified some potentially suitable roosting and breeding habitat for this species but did not specifically map an area of breeding habitat as per the BBAM. The authors concluded that the Project will be unlikely to have an adverse effect on the life cycle of the Large-footed Myotis such that a viable local population will be likely to be placed at risk of extinction. Given the existing assessment of impacts on this species included in the EA, ecosystem credits are considered to be an appropriate means of determining offset requirements for the species within this Offset Plan.

Potential habitat for a further 32 threatened species listed under the TSC Act and 11 threatened and/or migratory species listed under the EPBC Act was identified within the investigation area. This suite of threatened fauna were considered 'subject species' for the impact assessment. Assessments of significance under the EP&A Act and EPBC Act found that the Project will be unlikely to have a significant negative impact on any subject species.

All impacts on potential habitat for threatened species listed under the TSC Act have been addressed using the BBAM.

3.3 Offsetting Requirements

3.3.1 Phase 1 Impacts

Of the vegetation types and habitats described above only intact native vegetation consistent with an EEC requires biodiversity offsets under the Ministers Conditions of Approval. The extent of clearing of EECs for Phase One of the Project is presented in Table 3-2 along with the number of ecosystem credits that will be required to offset this impact according to the BBAM. These EECs contain approximately 74 individuals and 3.04 hectares of habitat for hybrid Slaty Red Gum as well as habitat resources for the threatened fauna species identified above, including 13.08 hectares of critical habitat for Grey-headed Flying Fox.

A detailed comparison of impacts and biodiversity offsets is included in Section 5

Table 3-2 Extent of Clearing of NSW Endangered Ecological Communities for Phase One of the Project

Vegetation Type (DECCW, 2010a)	EEC Type	Extent of Impacts	Biodiversity Credits Required
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Lower Hunter Spotted Gum – Ironbark Forest	4.26 ha	342
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Hunter Lowland Red Gum Forest	8.82 ha	485
Swamp Oak forest of the central Hunter Valley, Sydney Basin	Swamp Oak Floodplain Forest	5.62 ha	390
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Central Hunter Ironbark- Spotted Gum –Grey Box Forest	4.87 ha	338
Phragmites australis and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin	Freshwater Wetland on Coastal Floodplains	0.02 ha	1
Total		**23.59 ha**	**1,556**

3.3.2 Phase 2 Impacts

Biodiversity impacts associated with Phase Two of the Project include the removal of approximately 6.90 hectares of native vegetation, all of which comprises habitat for threatened fauna and qualifies as a number of EECs listed under the TSC Act. The extent of clearing of native vegetation and habitats for Phase 2 of the project is presented in Table 3-3. The project disturbance footprint also contains up to 47 individual Slaty Red Gum – Forest Red Gum intergrades and 2.07 hectares of Slaty Red Gum habitat as summarised in Table 3-4. A detailed comparison of impacts and biodiversity offsets will be included in the revision to this Offsets Plan that will be implemented prior to construction of Phase 2.

Table 3-3 Extent of Clearing of NSW Endangered Ecological Communities for the Phase Two Development Footprint

Vegetation Type (DECCW, 2010a)	EEC Type	Extent of Impacts	Ecosytem Credits Required
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin [HU544]	Hunter Lowland Red Gum Forest	2.81 ha	155
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin [HU629]	Lower Hunter Spotted Gum – Ironbark Forest	2.18 ha	175
Swamp Oak forest of the Central Hunter Valley, Sydney Basin [HU634]	Swamp Oak Floodplain Forest	1.91 ha	133
Total		**6.90**	**463**

Table 3-4 Extent of Clearing of Slaty Red Gum Individuals and Habitat within Development Footprint

	EEC Type	Extent of Impacts	Offsetting Required
Slaty Red Gum	Vulnerable, TSC Act and EPBC Act	1.49 hectares of habitat and an additional 45 individuals for Phase One, and 0.58 hectares and 2 individuals for Phase Two*	At least 12 hectares of occupied habitat for Slaty Red Gum, including re-establishment of 6 ha of degraded habitat**

* Areas of Slaty Red Gum habitat fall within mapped areas of vegetation types. An offset site containing occupied habitat for Slaty Red Gum has not yet been identified and so impacts for the entire Project will be included in the revised Offsets Plan that will be prepared for Phase Two.

** Specific offsetting requirement for Slaty Red Gum as defined in the Ministers Conditions of Approval.

4. Site Descriptions

4.1 Shirbin Biobank Site

4.1.1 Approach

The Hunter 8 Alliance conducted surveys of the Shirbin biobank site, including collection of plot data using the BioBanking methodology. Vegetation condition and habitat resources within the Shirbin biobank have been quantified using these plot data. This data has been included in the BioBanking credit calculations (refer Section 2.3.5).

4.1.2 Site Location

The Shirbin biobank site is dominated by intact native vegetation in good condition covering an area of approximately 160 hectares. It adjoins a large patch of contiguous remnant native vegetation that covers an area of approximately 4,300 hectares. The majority of this vegetation occurs on private property. Historical land uses appear to include timber harvesting and grazing. Disturbed areas include dirt tracks, firebreaks and cleared grazing lands.

The township of Butterwick lies to the west of the biobank site. The surrounding area contains relatively little development at present and so the Shirbin Biobank site is almost completely surrounded by native vegetation. Broad, vegetated fauna movement corridors connect the site with other patches of native vegetation to the north, east and south.

The site occurs within the North Coast bioregion, the Hunter Central Rivers CMA and Upper Hunter CMA sub-region. The Mitchell Landscape for the site is Scone - Gloucester Foothills.

4.1.3 Vegetation and Habitat Resources

Based on vegetation types and broad condition classes, five distinct vegetation zones occur within the biobank site, including vegetation consistent with one EEC listed under the TSC Act. Vegetation zones within the Shirbin biobank site are presented in Table 4-1 and shown on Figure 5.

The most extensive vegetation zone within the Biobank site is Grey Ironbark – Spotted Gum – Grey Box open forest in good condition. This vegetation appears to comprise approximately 70-year-old regrowth though there are occasional pre-European aged trees. Spotted Gum – Broad-leaved Ironbark grassy open forest is the next most dominant vegetation type. This vegetation is in good condition although some areas have low to moderate infestations of Lantana (*Lantana camara*). Aside from Lantana, the Shirbin biobank site is relatively weed-free although there are localised patches of wind and bird-borne environmental weeds along the edges of tracks and cleared land.

The full list of species recorded within the Shirbin biobank site is provided in Appendix G.

Areas of moderate and good condition vegetation within the biobank site meets benchmark condition for most variables (over-, mid- and understorey vegetation cover, weed cover, length of fallen logs and over storey regeneration). The site contains relatively few hollow-bearing trees.

Overall, the Shirbin biobank contains a mixture of near-intact, regenerating and small areas of disturbed native vegetation that would benefit from conservation and active management.

The site contains a number of small freshwater and small, channel confined, intermittent drainage lines that contained occasional pools of surface water at the time of the survey. These are in good to very good condition and feature mostly intact geomorphology, good in-stream and fringing vegetation with very few exotic species occurring, very good riparian vegetation and good in-stream leaf litter and woody debris.

There are no escarpments, cliff lines, large boulders and extensive areas of caves, overhangs or fissures within the site. The BioBanking summary of habitat resources at the site is presented in Appendix E.

The BioBanking summary of habitat resources at the site was completed with reference to the above observations.

4.1.4 Native Species

Flora species

A total of 181 plant species were recorded during field surveys at the Shirbin biobank site, of which 177 are native. No threatened flora species were recorded at the site. The full list of species recorded is given in Appendix G. It should be noted, however, that flora composition changes over time and that some species are not easily detectable when not flowering. These surveys may not have detected the full range of species likely to occur at this site.

The cover and diversity of plant species recorded in all four vegetation zones that were sampled are indicative of healthy, relatively undisturbed native vegetation. All plots had scores for plant species richness that were at or above benchmark values for appropriate vegetation types. Overall, the site contains a diverse assemblage of native flora and is likely to support viable patches of all vegetation types and ecological communities present.

Table 4-1 Shirbin Biobank Vegetation

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin (HU 544)	Moderate-Good	High - EEC (Hunter Lowland Red Gum Forest in the Sydney Basin and NSW North Cost Bioregion).	This vegetation type is an open forest dominated by *Eucalyptus tereticornis* (Forest Red Gum), *E. globoidea* (White Stringybark) and *Eucalyptus moluccana* (Grey Box) over a sparse mid-story of *Acacia floribunda* (White Sally Wattle), *Breynia oblongifolia* (Coffee Bush), *Bursaria spinosa* (Blackthorn) and *Persoonia linearis* over a highly diverse ground layer dominated by a variety of native herbs and grasses. Very high native species richness was encountered and this is consistent with the Hunter Lowlands Red-gum vegetation type.

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
			BioBanking habitat attribute data was collected in plots and confirms that this vegetation is near-intact and in moderate to good condition. Canopy, shrub and understorey vegetation cover is highly variable and includes vegetation equivalent to undisturbed remnants as well as sub-mature regrowth. There are good quantities of woody debris and leaf litter, but relatively few hollow-bearing trees. This vegetation type has very good potential for achieving gains in biodiversity values through management within a biobank site. Improvement in biodiversity value could be achieved through development of vegetation structure and habitat resources (particularly in stands of immature regrowth), removal of exotic plants, remediation of a drainage line, including removal of a severe weed infestation and through management of pest fauna.
Grey Ironbark – Spotted Gum – Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU 556)	Moderate-Good	Not and EEC	This vegetation type is an open forest of *Corymbia maculata* (Spotted Gum), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus crebra* and *Eucalyptus globoidea* (White Stringybark) with scattered occurrences of Grey Box (*E. moluccana*). The mid-storey characterised by *Notelaea longifolia* (Large Mock Olive), *Breynia oblongifolia*, (Coffee Bush) and *Acacia brownii* (Heath Wattle) over a highly diverse ground-layer of native, grasses and herbs. Common species within the ground cover include *Entolasia stricta* (Wiry Panic), *Imperata cylindrica* (Blady Grass), *Dichondra repens*, (Kidney Weed), *Dianella caerulea* (Blue Flax Lily), *Glycine microphylla*, and *Pandorea pandorana* (Wonga Wonga Vine). This vegetation closely matches that described by the Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project as 'Spotted Gum/ Narrow-leaved Ironbark shrub/grass open forest' (HCCREMS, 2009).

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
			BioBanking habitat attribute data was collected in plots and confirms that this vegetation is near intact and in good condition. Canopy, shrub and understorey vegetation cover was equivalent to undisturbed remnants. There are good quantities of woody debris and leaf litter, but relatively few hollow-bearing trees. This vegetation type has good potential for achieving gains in biodiversity values through management within a biobank site. Improvements in biodiversity value could be achieved through continuing development of vegetation structure and habitat resources, removal of exotic plants and management of pest fauna.
Fig – Whalebone Tree – Stinging Tree Dry Rainforest (HU 514)	Moderate-Good	Not and EEC	This vegetation occurs along creeklines where it is dominated by dense thickets of *Backhousia myrtifolia* (Grey Myrtle) and *Melaleuca styphelioides* (Prickly-leaved Tea-tree) with occasional *Eucalyptus carnea* (Thick-leaved Mahogany) emerging from the canopy layer. The mid story is characterised by *Pittosporum multiflorum* (Orange Thorn). The groundlayer is relatively sparse with a dense layer of leaf litter. Common species include *Lepidosperma laterale*, *Cayratia clematidea* (Native Grape) and *Dianella caerula* (Blue Flax Lily). This vegetation type also contained a high diversity of ferns, vines and climbers. In some areas, this community has dense infestations of *Lantana camara* (Lantana) and occasional *Olea europaea* (African Olive). The floristics of these areas is characteristic of that described by the Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project as 'Lily Pilly - Grey Myrtle - Rasp Fern warm temperate rainforest of Barrington foothills and Central Coast' (HCCREMS, 2009). No equivalent NSW Vegetation Type match exists for this community nor is it appropriate to merge this vegetation with the adjoining vegetation types.

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
			The sparse eucalypt canopy suggests that this vegetation has been exposed to fire and as such could explain the absence of more diagnostic rainforest species. However, the absence of recruiting eucalypts and grassy understory combined with a dominance of *Pittosporum multiflorum* and various vine and fern species suggests that the vegetation is on a successional pathway to a rainforest vegetation type. HCCREMS (2009) does not identify an equivalent NSW Vegetation Type for this community. The most similar NSW Vegetation Type is Fig – Whalebone Tree-Stinging Treed Dry Rainforest of the North Coast and northern Sydney Basin. This vegetation type has good potential for achieving gains in biodiversity values through management within a biobank site. Improvements in biodiversity value could be achieved through, removal of exotic plants and management of pest fauna.

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU 629)	Moderate-Good	Not and EEC	This vegetation is characterised by *Corymbia maculata* (Spotted Gum), *Eucalyptus paniculata* (Grey Ironbark) and *E. canaliculata* (Grey Gum) to 25 metres high with occasional occurrences of *Eucalyptus fibrosa* (Broad-leaved Ironbark). The mid-storey is characterised by *Leucopogon juniperinus* (Prickly Beard Heath). The ground-layer is typically grassy with a diverse array of herbs and climbers. Common species within the ground-layer include *Entolasia stricta* (Wiry Panic), *Pratia purpurascens* (Whiteroot), *Hardenbergia violaceae* (Purple Coral Pea), and *Eustrephus latifolius* (Wombat Berry). This vegetation closely matches that described by the Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project as 'Spotted Gum/ Broad-leaved Mahogany/ Red Ironbark moist shrubby open forest' (HCCREMS, 2009). BioBanking habitat attribute data was collected in plots and confirms that this vegetation is near intact and in moderate to good condition. Canopy, shrub and understorey vegetation cover is highly variable and includes vegetation equivalent to undisturbed remnants as well as sub-mature regrowth. There are good quantities of woody debris and leaf litter, but relatively few hollow-bearing trees. This vegetation type has very good potential for achieving gains in biodiversity values through management within a biobank site. Improvement in biodiversity value could be achieved through development of vegetation structure and habitat resources (particularly in stands of immature regrowth), removal of exotic plants, remediation of a drainage line, including removal of a severe weed infestation and through management of pest fauna.

4.2 Garvey Biobank Site

4.2.1 Approach

The Hunter 8 Alliance conducted surveys of the Garvey/Shirbin biobank site, including collection of plot data using the BioBanking methodology. Vegetation condition and habitat resources within the Shirbin/Garvey biobank have been quantified using these plot data. These data are included in the BioBanking credit calculations (refer Section 2.3.5).

4.2.2 Site Location

The Garvey biobank site is dominated by intact native vegetation in good condition covering an area of approximately 205 hectares. It adjoins the Shirbin biobank which is situated immediately west of the site. The site also adjoins a large patch of remnant native vegetation that covers an area of approximately 4,300 hectares with the majority of this land occurring within private property. Historical land uses appear to include timber harvesting and grazing. Disturbed areas include dirt tracks, firebreaks and cleared grazing lands.

The township of Dunns Creek lies to the west of the biobank site and Butterwick to the southwest. The surrounding area contains relatively little development at present and so the Garvey Biobank site is almost completely surrounded by native vegetation. Broad, vegetated fauna movement corridors connect the site with other patches of native vegetation to the north, east and south.

The site occurs within the North Coast bioregion, the Hunter Central Rivers CMA and Upper Hunter CMA sub-region. The Mitchell Landscape for the site is Scone - Gloucester Foothills.

4.2.3 Vegetation and Habitat Resources

Based on vegetation types and broad condition classes, five distinct vegetation zones occur within the biobank site, including vegetation consistent with one EEC listed under the TSC Act. Vegetation zones within the Garvey biobank site are presented in Table 4-2 and shown on Figure 6.

The most extensive vegetation zone within the biobank site is Grey Ironbark – Spotted Gum – Grey Box open forest in good condition. This vegetation appears to comprise approximately 70-year-old regrowth though there are occasional pre-European age trees. Spotted Gum – Broad-leaved Ironbark grassy open forest is the next most dominant vegetation type. This vegetation is in good condition although some areas have low to moderate infestations of Lantana (*Lantana camara*). Aside from Lantana, the Garvey biobank site is relatively weed-free although there are localised patches of wind and bird-borne environmental weeds along the edges of tracks and cleared land.

The full list of species recorded within the Garvey biobank site is provided in Appendix H.

Areas of moderate and good condition vegetation within the biobank site are equivalent to undisturbed vegetation for the majority of biobank site attribute variables (over-, mid- and understorey vegetation cover, weed cover, length of fallen logs and over storey regeneration). The site contains relatively few hollow-bearing trees. Overall, the Garvey biobank contains a mixture of near-intact, regenerating and disturbed native vegetation that would benefit from conservation and active management.

The site contains a number of small freshwater and small, channel confined, intermittent drainage lines that contained occasional pools of surface water at the time of the survey. These are in good condition and feature mostly intact geomorphology, good in-stream and fringing vegetation with very few exotic species occurring, very good riparian vegetation and good in-stream leaf litter and woody debris.

There are no escarpments, cliff lines, large boulders and extensive areas of caves, overhangs and fissures within the site. The BioBanking summary of habitat resources at the site is presented in Appendix F.

4.2.4 Native Species

Flora species

A total of 170 plant species were recorded during field surveys at the Garvey biobank site, of which 166 are native. No threatened flora species were recorded at the site. The full list of species recorded is provided in Appendix H. It should be noted, however, that flora composition changes over time and that some species are not easily detectable when not flowering. These surveys may not have detected the full range of species likely to occur at this site.

The cover and diversity of plant species recorded in all four vegetation zones that were sampled are indicative of healthy, relatively undisturbed native vegetation. The majority of plots had scores for plant species richness that were at or above benchmark values for appropriate vegetation types. Overall the site contains a diverse assemblage of native flora and is likely to support viable patches of all vegetation types and ecological communities present.

Table 4-2 Garvey Biobank Vegetation

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin (HU 544)	Moderate-Good	High - EEC (Hunter Lowland Red Gum Forest in the Sydney Basin and NSW North Cost Bioregion).	This vegetation type is an open forest dominated by *Eucalyptus tereticornis* (Forest Red Gum), *E. globoidea* (White Stringybark) and *Eucalyptus moluccana* (Grey Box) over a mid-story of *Acacia floribunda* (White Sally Wattle), *Breynia oblongifolia* (Coffee Bush), *Bursaria spinosa* (Blackthorn) and *Persoonia linearis* over a highly diverse ground layer dominated by a variety of native herbs and grasses. Very high native species diversity was encountered and this is consistent with the Hunter Lowlands Red-gum vegetation type BioBanking habitat attribute data was collected in plots and confirms that this vegetation is near-intact and in moderate to good condition. Canopy, shrub and understorey vegetation cover is highly variable and includes vegetation equivalent to undisturbed remnants as well as sub-mature regrowth. There are good quantities of woody debris and leaf litter, but relatively few hollow-bearing trees. This vegetation type has very good potential for achieving gains in biodiversity values through management within a biobank site. Improvement in biodiversity value could be achieved through development of vegetation structure and habitat resources (particularly in stands of immature regrowth), removal of exotic plants, remediation of a drainage line, including removal of a severe weed infestation and through management of pest fauna.
Grey Ironbark – Spotted Gum – Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU 556)	Moderate-Good-Good	Not an EEC	This vegetation type is an open forest of *Corymbia maculata* (Spotted Gum), *Eucalyptus siderophloia* (Grey Ironbark) and *Eucalyptus globoidea* (White Stringybark) over a sparse mid-storey dominated by *Notelaea longifolia* (Large Mock Olive), *Breynia oblongifolia*, (Coffee Bush) and *Acacia brownii* (Heath Wattle) over a high diverse ground-layer of native, grasses and herbs. Common species within the ground later include *Entolasia stricta* (Wiry Panic), *Imperata cylindrica* (Blady Grass), *Dichondra repens*, (Kidney Weed), *Dianella caerulea* (Blue Flax Lily), *Glycine microphylla*, and *Pandorea pandorana* (Wonga Wonga Vine). This vegetation closely matches that described by the Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project as 'Spotted Gum/ Narrow-leaved Ironbark shrub/grass open forest' (HCCREMS, 2009). BioBanking habitat attribute data was collected in plots and confirms that this vegetation is near-intact and in good condition. Canopy, shrub and understorey vegetation cover was equivalent to undisturbed remnants. There are good quantities of woody debris and leaf litter, but relatively few hollow-bearing trees.

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
			This vegetation type has good potential for achieving gains in biodiversity values through management within a biobank site. Improvements in biodiversity value could be achieved through continuing development of vegetation structure and habitat resources, removal of exotic plants and management of pest fauna.
Grey Ironbark – Spotted Gum – Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU 556)	Moderate-Good-Poor	Not and EEC	This vegetation type is an open forest of *Corymbia maculata* (Spotted Gum), *Eucalyptus siderophloia* (Grey Ironbark) and *Eucalyptus globoidea* (White Stringybark) over a sparse mid-storey dominated by *Notelaea longifolia* (Large Mock Olive), *Breynia oblongifolia*, (Coffee Bush) and *Acacia brownii* (Heath Wattle) over a ground-layer of native, grasses and herbs. Common species within the ground later include *Entolasia stricta* (Wiry Panic), *Imperata cylindrica* (Blady Grass), *Dichondra repens*, (Kidney Weed), *Dianella caerulea* (Blue Flax Lily), *Glycine microphylla*, and *Pandorea pandorana* (Wonga Wonga Vine). This vegetation closely matches that described by the Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project as 'Spotted Gum/ Narrow-leaved Ironbark shrub/grass open forest' (HCCREMS, 2009). BioBanking habitat attribute data was collected in plots and confirms that this vegetation is in moderate-good- poor condition. Within this vegetation type the canopy, shrub and understorey vegetation is disturbed and there is a high abundance of exotic species present. . This vegetation type has good potential for achieving gains in biodiversity values through management within a biobank site. Improvements in biodiversity value could be achieved through revegetation, removal of exotic plants and management of pest fauna.

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU 629)	Low	Not an EEC	This vegetation is characterised by *Corymbia maculata* (Spotted Gum), *Eucalyptus siderophloia* (Grey Ironbark) and *E. canaliculata* (Grey Gum) to 25 metres high over a sparse mid-storey dominated by *Leucopogon juniperinus* (Prickly Beard Heath). The ground-layer is typically grassy with a diverse array of herbs and climbers. Common species within the ground-layer include *Entolasia stricta* (Wiry Panic), *Pratia purpurascens* (Whiteroot), *Hardenbergia violaceae* (Purple Coral Pea), and *Eustrephus latifolius* (Wombat Berry). This vegetation closely matches that described by the Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project as 'Spotted Gum/ Broad-leaved Mahogany/ Red Ironbark moist shrubby open forest' (HCCREMS, 2009).BioBanking habitat attribute data was collected in plots and confirms that this vegetation is in moderate-good- poor condition. Within this vegetation type the canopy, shrub and understorey vegetation is disturbed, there is relatively low native species diversity and a high abundance of exotic species present. . This vegetation type has very good potential for achieving gains in biodiversity values through management within a biobank site. Improvement in biodiversity value could be achieved through development of vegetation structure and habitat resources (particularly in stands of immature regrowth), removal of exotic plants, remediation of a drainage line, including removal of a severe weed infestation and through management of pest fauna.
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin (HU 629)	Moderate-Good	Not and EEC	This vegetation is characterised by *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Red Ironbark) and *E. punctata* (Grey Gum) to 25 metres high over a sparse mid-storey dominated by *Leucopogon juniperinus* (Prickly Beard Heath). The ground-layer is typically grassy with a diverse array of herbs and climbers. Common species within the ground-layer include *Entolasia stricta* (Wiry Panic), *Pratia purpurascens* (Whiteroot), *Hardenbergia violaceae* (Purple Coral Pea), and *Eustrephus latifolius* (Wombat Berry). This vegetation occurs in the eastern section of the Garvey biobank site on southeast facing slopes. Floristically this vegetation type is similar to MU5 however there are notable differences in the structure and relative abundance of species with this vegetation type having a much shrubbier understory, less grasses and dominated by *Eucalyptus fibrosa* (Red Ironbark) (rather than *E. siderophloia* which is the dominant ironbark species in MU 5). Floristically this vegetation type most closely fits the description in the Hunter, Central and Lower North Coast Vegetation Classification and Mapping Project for 'Spotted Gum- Red Ironbark- Large-fruited Grey Gum Shrub – Grass Open Forest' (HCCREMS, 2009). This vegetation has the same BioMetric equivalent to MU 5 ('Spotted Gum - Broad-leaved Ironbark grassy open forest of the lower Hunter Valley, Sydney Basin')

Vegetation Type (OEH, 2012c)	Condition	Conservation Significance	Description
			BioBanking habitat attribute data was collected in plots and confirms that this vegetation is near-intact and in moderate to good condition. Canopy, shrub and understorey vegetation cover is highly variable and includes vegetation equivalent to undisturbed remnants as well as sub-mature regrowth. There are good quantities of woody debris and leaf litter, but relatively few hollow-bearing trees. This vegetation type has very good potential for achieving gains in biodiversity values through management within a biobank site. Improvement in biodiversity value could be achieved through development of vegetation structure and habitat resources (particularly in stands of immature regrowth), removal of exotic plants, remediation of a drainage line, including removal of a severe weed infestation and through management of pest fauna.

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Threatened Fauna Species

No threatened fauna species were identified at either the Shirbin or the Garvey biobank sites.

This offsets package only includes ecosystem credits to offset impacts arising from the development. The biobank owners may choose to undertake a targeted survey for threatened species. If threatened species that are not ecosystem predicted were found to occur on the site these credits may be sold to a third party at a later date.

Both the Shirbin and Garvey biobank sites contain critical habitat for the Grey-headed Flying Fox as defined in the DECCW (2009b) Recovery Plan for the species. Specifically, the site: would provide habitat resources for the Singleton breeding camp and associated population of >30,000 individuals; contains large numbers of Spotted Gum (*Eucalyptus maculata*) that flower during winter and spring (during food bottlenecks); and large numbers of Forest Red Gum (*Eucalyptus tereticornis*) that flower during summer and autumn (during the breeding season) (DECCW, 2009b).

5. Biodiversity Offsets Comparison

5.1 Approach

BioBanking includes a methodology for calculating offset ratios, trading biodiversity values and protecting areas with higher conservation values. The BBAM has greater flexibility when applied to Part 3A Projects. The DECCW (2010f) interim policy provides a framework for determining biodiversity offsets for Part 3A Projects using a modified form of the BBAM. The Hunter 8 Alliance has prepared an Offsets Package for the Project using the OEH (2011) interim policy, including detailed justification of variations to the credit trading rules and associated decision-making criteria. Variations to the credit trading rules may include: converting ecosystem credits for one vegetation type to another vegetation type within the same vegetation formation and in the same bioregion; or converting ecosystem credits to a regional conservation priority (OEH 2011). The precise mix of credits that will be used to offset impacts of the Project will be determined in consultation with OEH once biobanks for both Phase 1 and Phase 2 of the Project have been identified. This Offsets Plan will be modified to include the final suite of credits for both Phase 1 and Phase 2 at least six months prior to the construction of Phase 2 as stated in Section 6.4.

The following section compares the native vegetation types and habitat resources for EPBC Act and TSC Act listed biota that will be removed within the Phase One development site with those that will be conserved within the Shirbin and Garvey biobank sites. The Shirbin and Garvey biobank sites will yield sufficient ecosystem credits to offset impacts of Phase 1 within the trading rules provided in the OEH (2011) interim policy. Additional offset contributions will be required for Slaty Red Gum to comply with the Ministers Conditions of Consent. Offset contributions for Slaty Red Gum will be included with the Phase 2 offsets.

5.2 Vegetation and Habitat Resources

The investigation area for the development site includes both remnant native vegetation and agricultural land, which has been largely cleared. The location of the development footprint is shown in Appendix A. The Project disturbance footprint has affected an existing rail corridor and adjoining areas of private land. Eight distinct vegetation types were identified in the investigation area, including vegetation consistent with (EECs) listed under the TSC Act. Vegetation types within the development investigation area are shown in Appendix A. Only EECs and habitat for threatened species is addressed in this Offsets Plan.

The Shirbin and Garvey biobank sites adjoin one another and are both dominated by intact native vegetation in good condition. Historical land uses within the sites appear to include timber harvesting and grazing. Disturbed areas include dirt tracks, firebreaks and cleared grazing lands.

The township of Dunns Creek lies to the west of the biobank sites and Butterwick to the southwest. The sites adjoin a large patch of contiguous remnant native vegetation that covers an area of approximately 4,300 hectares. The majority of this vegetation occurs on private property. Broad, vegetated fauna movement corridors connect the site with other patches of native vegetation to the north, east and south.

Based on vegetation types and broad condition classes, four distinct vegetation zones occur within the Shirbin biobank site, including vegetation consistent with one EEC listed under the TSC Act. Vegetation zones within the Shirbin biobank site are presented in Table 5-1 and mapped on Figure 6 in Appendix B.

Table 5-1 Shirbin Biobank Vegetation Zones

Threatened Species Sub Zone	Vegetation Zone	Area (hectares)
TSSZ 1	HU544_Moderate/Good (Forest Red Gum Open Forest)	19.80
TSSZ 2	HU556_Moderate/Good (Grey Ironbark – Spotted Gum – Grey Box Open Forest)	82.56
TSSZ 3	HU541_Moderate/Good (Fig – Whalebone Tree – Stinging Tree Dry Rainforest)_EEC	13.65
TSSZ 4	HU629_Moderate/Good (Spotted Gum – Broad-leaved Ironbark Grassy Open Forest)	43.31
TSSZ 5	Highly disturbed areas – road verges table drains, road embankments, ploughed paddocks etc	1.88
TOTAL		**161.20**

There are five distinct vegetation zones within the Garvey biobank site, including vegetation consistent with one EEC listed under the TSC Act. Vegetation zones within the Garvey biobank site are presented in Table 5-2 and mapped on Figure 6 in Appendix B.

Table 5-2 Garvey Biobank Vegetation Zones

Threatened Species Sub Zone	Vegetation Zone	Area (hectares)
TSSZ 1	HU544_Moderate/Good (Forest Red Gum Open Forest)	6.13
TSSZ 2	HU556_Moderate/Good_High (Grey Ironbark – Spotted Gum – Grey Box Open Forest)	95.30
TSSZ 3	HU556_Moderate/Good_Poor (Grey Ironbark – Spotted Gum – Grey Box Open Forest)	8.11
TSSZ 4	HU629_Moderate/Good_High (Spotted Gum – Broad-leaved Ironbark Grassy Open Forest)	91.98

Threatened Species Sub Zone	Vegetation Zone	Area (hectares)
TSSZ 5	HU629_Low (Spotted Gum – Broad-leaved Ironbark Grassy Open Forest)	2.66
TOTAL		**204.18**

The most extensive vegetation zone within both of the biobank sites is Grey Ironbark – Spotted Gum – Grey Box open forest in good condition. This vegetation appears to comprise approximately 70-year-old regrowth though there are occasional pre-European age trees. Spotted Gum – Broad-leaved Ironbark grassy open forest is the next most dominant vegetation type. This vegetation is in good condition although some areas have low to moderate infestations of Lantana (*Lantana camara*). Aside from Lantana, both of the biobank sites are relatively weed-free although there are localised patches of wind and bird-borne environmental weeds along the edges of tracks and cleared land.

The Shirbin biobank site covers an area of approximately 161 hectares and the Garvey Biobank site covers an area of approximately 204 hectares. To offset vegetation impacts associated with Phase One of the project, approximately 235 hectares of habitat would be conserved at the biobank sites (approximately 57.8 hectares at the Shirbin biobank site and 177.2 hectares at the Garvey biobank site as shown in Appendix B, Figures 5 and 6). A comparison between native vegetation to be removed for the Phase One development and to be conserved within the Shirbin and Garvey biobank sites is presented in Table 5-3. The majority of vegetation types within the Phase One development footprint are represented in the biobank sites. The biobank sites will conserve approximately ten times as much native vegetation than has been removed by Phase One of the development. And an offsets ratio of greater than 2:1 will be achieved for three of the four main vegetation types to be cleared.

Not all vegetation types to be removed at the development site will be offset by equivalent vegetation types within the biobank site. Neither Swamp Oak Forest of the Central Hunter Valley, Sydney Basin or *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands is represented at either of the biobank sites.

The OEH (2011) policy includes specific variation criteria that may be applied to the offsetting requirements of the BBAM for Tier 3 outcomes. These criteria were applied to the Project in accordance with this policy under NSW legislative requirements.

5.3 EPBC Act Listed Threatened Biota

Threatened Flora

The Project ecological assessment identified one threatened flora species in the investigation area: Slaty Red Gum (*Eucalyptus glaucina*), which is listed as a vulnerable species under the TSC Act and EPBC Act. Supplementary survey of this species by Hunter 8 field botanists were undertaken to discriminate between Slaty Red Gum and intergrades. During this investigation 429 individuals within the Project investigation area were sampled. These samples were then categorised into confidence levels based on their morphological features (i.e. amount of glaucescence present). Seventeen plant samples that were representative of the various categories of confidence were sent to the NSW Herbarium for identification. Results from the Herbarium concluded that none of these samples were pure Slaty Red Gums although there were some features of Slaty Red Gum in virtually all specimens, and the specimens were identified as Forest Red Gum (*Eucalyptus tereticornis*) with some genetic influence from Slaty Red Gum (RBG Sydney, Letter of 8 April 2011). In total, there are approximately 54 individual Slaty Red Gum and 1.59 hectares of Slaty Red Gum habitat in the Phase One development footprint

Consultation with DSEWPaC has revealed that they would still consider native vegetation containing intergrades as habitat for Slaty Red Gum that would also require an offset. Offsets for removal of Slaty Red Gum habitat would be provided in the offsets package through conservation of habitat and rehabilitation of degraded habitat as part of the Phase Two Offsets Package as described in Section 6.4.

A total of 2.07 hectares of habitat for Slaty Red Gum including 47 identified at intergrades will be impacted by the project. This includes 1.59 hectares of Slaty Red Gum habitat and 45 individuals impacted during Phase One of the Project and 0.58 hectares of Slaty Red Gum habitat and 2 individuals likely to be impacted during Phase Two of the Project.

Threatened Ecological Communities

No threatened ecological communities listed under the EPBC Act were identified in the investigation area for the Phase One development or are otherwise of relevance to this assessment.

Threatened Fauna

The Project ecological assessments included targeted field surveys for threatened fauna in conjunction with relevant database searches and assessments of fauna habitats and fauna species richness, distribution and abundance.

One EPBC Act listed fauna species was recorded: the Grey-headed Flying Fox (*Pteropus poliocephalus)* which is listed as Vulnerable under the EPBC Act. The authors also identified critical foraging habitat for Grey−headed Flying−Fox as defined in the Draft Recovery Plan for the species (DECCW 2009b).

Potential habitat for a further 11 threatened and/or migratory species listed under the EPBC Act was identified within the investigation area for the development. This suite of listed fauna was considered ‘subject species’ for the impact assessment. Assessments of significance under the EPBC Act found that the Project will be unlikely to have a significant negative impact on any of these listed fauna species.

Habitat assessments for threatened fauna were conducted at both the development site and the biobank site using the BBAM (DECC 2009). The BioBanking credit calculator queries a database of threatened biota records against the location of the site, landscape attributes and a series of habitat parameters in order to predict the suite of threatened fauna that are likely to be supported by habitats at the site. The majority of the species predicted to occur in association with habitats at the development site are also predicted to occur in association with habitats at the biobank sites.

Each of the threatened fauna species that are predicted to use habitat within the vegetation types at the site has a 'Tg score' within the BioBanking credit calculator that feeds into the ecosystem credit calculations. The Tg score varies between threatened species depending on the ability of that species and its habitat resources to respond to management actions at a biobank sites. Species which rely on habitat resources that take a long time to develop (hollow-bearing trees) have lower Tg scores. The lower the Tg score the greater the area of offsets that are required to address impacts on that species and all other species associated with the area of habitat. The fauna species with the lowest Tg score determines the overall offset requirement for the site. For the development site the species with the lowest Tg scores are the TSC Act listed forest owls the Barking Owl (*Ninox connivens*), Powerful Owl (*N. strenua*) and Masked Owl (*Tyto novaehollandiae)*. The EPBC Act listed threatened species with the lowest Tg score is the Spotted-tailed Quoll (*Dasyurus maculatus*).

According to the terrestrial fauna assessment conducted for the Project the development site contains breeding, foraging and shelter habitat for all four of these species. For the biobank sites, the species with the lowest Tg scores are the same three TSC Act listed forest owls. The EPBC Act listed threatened species with the lowest Tg score is also the Spotted-tailed Quoll. Based on habitat assessments conducted during the site surveys both of the biobank site contains potential breeding, foraging and shelter habitat for all four of these species. The Tg score and offset calculations presented in the Offsets Plan are based on a robust methodology (DECCW, 2010b; DECC, 2009) and are likely more conservative than will be required to address impacts on EPBC act listed fauna alone.

There is approximately 17.95 hectares of critical foraging habitat for the Grey−headed Flying−Fox in the development footprint for Phase One of the Project. The Ministers Conditions of Approval specifically refer to offsetting requirements for this species. Approximately 25.9 hectares of critical foraging habitat for the Grey−headed Flying−Fox (DECCW, 2009b) is present in the Shirbin biobank site and approximately 195.4 hectares is present within the Garvey Biobank Site (approximately 221.4 hectares in total). Specifically, the sites: would provide habitat resources for the Singleton breeding camp and associated population of >30,000 individuals; contains large numbers of Spotted Gum (*Eucalyptus maculata*) that flower during winter and spring (during food bottlenecks); and large numbers of Forest Red Gum (*Eucalyptus tereticornis*) that flower during summer and autumn (during the breeding season) (DECCW, 2009b).

Offsetting requirements for the Grey−headed Flying−Fox are expressed in ecosystem credits calculated using the BBAM On this basis, the development will require the purchase of 1165 ecosystem credits containing critical foraging habitat for the Grey- Headed Flying Fox and the biobank sites will conserve 1530 credits of this type (283 at the Shirbin biobank site and 1247 at the Garvey biobank site. The offsets at the biobank sites would yield an overall 365 credit surplus within matching vegetation types (Swamp Oak Forest and Freshwater wetlands are not considered foraging habitat for this species). Therefore the critical foraging habitat for the Grey−headed Flying−Fox included in this offsets package is substantially greater than the required number of ecosystem credits calculated with the BBAM.

Table 5-3 presents a comparison between the areas of broad habitat types for EPBC Act listed threatened biota to be removed during Phase One of the Project and to that being conserved within the Shirbin and Garvey biobank sites by combining similar vegetation types and condition classes.

The Shirbin and Garvey biobank sites are dominated by Spotted Gum – Ironbark Forest and Forest Red Gum Forest and will deliver an offset ratio of approx. 12:1 for these vegetation types. These two vegetation types contain important habitat resources for the Grey-headed Flying-fox, Swift Parrot, Regent Honeyeater and Spotted-tailed Quoll. There is no Swamp Oak Riparian Forest or Freshwater Wetland habitat within the biobank sites than will be removed, however these habitat types do not provide any notable habitat resources for the suite of EPBC Act listed biota identified as being of relevance to this Offsets Plan.

The Shirbin and Garvey Biobank sites are almost completely surrounded by native vegetation and features excellent connectivity with extensive areas of similar habitat outside the site. Broad vegetated fauna movement corridors connect the site with other patches of native vegetation in all directions, including around the built up areas of Patterson. The site is connected by vegetated corridors to regional conservation areas, including Uffington State Forest to the north-east.

Table 5-3 Habitat Comparison between Phase One Development and Biobank Sites

Habitat Type	EPBC Act-listed Species Supported	Phase One Development Area (ha)	Shirbin Biobank Site Area (ha)	Garvey Biobank Site Area (ha)	Total Biobank Site Area (ha)	Ratio of Offset
Red Gum Forest (Forest Red Gum - Grey Gum dry open forest in Good - Moderate condition)	Slaty Red Gum, Grey-headed Flying fox, Swift Parrot, Regent Honeyeater, Spotted-tailed Quoll	8.82	19.8	6.1	25.9	3 : 1
Spotted Gum – Ironbark Forest (Grey Ironbark - Spotted Gum - Grey Box open forest and Spotted Gum - Broad-leaved Ironbark grassy open forest in Moderate -Good condition)	Grey-headed Flying fox, Swift Parrot, Regent Honeyeater, Spotted-tailed Quoll	9.13	24.3	171.1	195.4	21 : 1
Total		**17.95**	**44.1**	**177.2**	**221.3**	**12 : 1**

6. Biodiversity Offset Site Management Framework

6.1 Approach

The biobanking scheme is established under the TSC Act. Essentially, it involves:

- an owner of land with biodiversity values entering into a legally binding "biobanking agreement" with the NSW Minister for the Environment (or delegate) to carry out biodiversity management actions on that land, so as to promote specific biodiversity values on that land, in return for biodiversity credits.
- a developer whose project will have impacts on biodiversity purchasing credits, of a number and a kind determined in accordance with the biobanking assessment methodology, from land owners who have generated those credits under biobanking agreements.

The site on which biodiversity management actions will be undertaken, pursuant to the biobanking agreement, is called the biobank site.

To deliver the biodiversity outcomes required by a BioBanking Agreement, the following biodiversity management framework will be implemented at the biobank site:

- ***Conservation*** – A 'conservation covenant', in the form of the biobanking agreement, will be placed over the biobank site in perpetuity. This covenant provides permanent biodiversity protection, on the land title, by requiring the landowner to fulfil the biobanking agreement (including all incorporated management actions).
- ***Vegetation Rehabilitation*** – Existing vegetation will have a targeted weed control program applied to improve the condition of the biobank site. Revegetation activities will increase the extent of native vegetation, through time, of the biobank site. These works will be completed within the first five to ten years of management of the biobank site.
- ***Maintenance and monitoring*** – An annual maintenance and monitoring regime will be applied to the biobank site in perpetuity to ensure improvements in ecological values are maintained. Vegetation condition and the quality of habitat resources will continue to improve with the growth and maturation of native vegetation.

6.2 Conservation Covenant

Entering into a biobanking agreement places a conservation covenant over the land, regardless of zoning. The covenant is the strongest available on private lands and extinguishes all land uses other than conservation. The covenant does not extinguish mining rights and, potentially, public authority development, but the biobanking policy includes mechanisms to ensure any impacts from these activities are again suitably offset as an addition to any offsetting activities required by a given project in its own right. Details of this policy can be provided by OEH BioBanking Unit.

6.3 Rehabilitation and Management Actions

The following rehabilitation and management actions will be implemented at the biobank site/s. A summary of the indicative time line to complete offsetting requirements is also included as Table 7-1.

6.3.1 Planning

The following describes the actions that will be implemented for ongoing management of the area that will be conserved as a biobank site. A Management Actions Plan (MAP) (prepared in accordance with the BBAM), detailing rehabilitation activities and associated management program, has been prepared and included in the final BioBanking agreement for each of the biobank sites. The Management Actions Plan forms the basis of the funds required to be placed in the BioBanking Trust when purchasing the credits and forms part of the contractual obligations for a biobank site owner.. The BioBanking Trust then funds the biobank site owner to implement the management actions plan.

The MAP for each of the biobanking sites is included as Appendix C and Appendix D with a summary of the key management actions described below.

Biobank sites may have two types of management actions applied, these being:

- Standard Management Actions.
- Site Specific Management Actions.

Standard management actions and the site-specific management actions applicable to the biobank site are described below. Site-specific management actions for the additional offset site(s) that will accompany Phase Two of the Project will be included in a revision to this Offsets Plan. Site-specific management actions for the additional offset site(s) will include as a minimum the Slaty Red Gum rehabilitation and management measures described in Section 6.4.

6.3.2 Standard Management Actions

Standard management actions are those actions required on biobank sites to improve vegetation condition when entering into a BioBanking agreement. The standard management actions for all biobank sites are:

- Management of grazing for conservation.
- Weed control.
- Management of fire for conservation.
- Management of human disturbance.
- Retention of regrowth and remnant native vegetation.
- Replanting or supplementary planting where natural regeneration will not be sufficient.
- Retention of dead timber.
- Erosion control.
- Retention of rocks.

BioBanking agreements require all of the above management actions to be carried out.

Targeted Weed Control

The biobank sites will be subject to a targeted weed control program to treat noxious and large woody weeds such as Lantana (*Lantana camara*), African Olive (*Olea europaea*) and Blackberry (*Rubus fruiticosus agg.*). These works may require the use of mechanical tools such as chainsaws and 'high cutters' as well as the use of a variety of herbicides. As such, suitably qualified and experienced contractors only will complete these works. Follow-up weed control will be included in the bush regeneration program. A detailed weed management plan is included in the MAP for each of the biobank sites (refer to Appendix C and D).

Bush Regeneration

A comprehensive bush regeneration program is to be implemented to improve the condition of existing remnant vegetation throughout the biobank sites. Bush regeneration activities will occur during the initial stages of the BioBanking agreement (first five years) and will be completed by appropriately qualified and experienced contractors. Primary bush regeneration activities will focus on noxious weeds, woody weeds and invasive ground covers. Follow-up bush regeneration activities will focus on small perennials, annuals and introduced grasses. It is anticipated that after the first 10 years bush regeneration activities will be limited to the monitoring of weed infestation and treatment as required.

Weed Waste

Weed material from bush regeneration works will be piled and left in situ to break down. All weeds propagules will be collected and 'bagged' on site and disposed of at a suitable waste facility.

Seed Collection

Seed collection will require a 123c licence approval from OEH in accordance with the Threatened Species Conservation Act. Only experienced and qualified staff will perform seed collection activities. All seed collection, management, cleaning and storage will be in accordance with *Florabank Seed Collection Guidelines* (prepared by Greening Australia and now accepted as industry best practice).

All plant material to be used throughout the project will be of local provenance, collected from within a five kilometre radius of the site.

Plant Propagation

Plant propagation refers to the germinating of collected seed and the 'growing on' of plants in enviro cells, hiko cells or forestry tubes. All plants will be produced from local provenance seed. This activity should be managed by a suitably qualified and experienced native plant production nursery.

Revegetation Works

To supplement rehabilitation activities, it is recommended an experienced native plant nursery provide native tube stock to be planted in MU-3 (areas currently classed as 'low condition'). All plants will be of local provenance. Planting schedules for each of the biobank sites are outlined in the MAP's (refer to Appendix C and D).

Broadcasting of Native Seed

To supplement rehabilitation activities, pre-treated acacias, peas and native grass seed, representative of the vegetation type, will be broadcast throughout rehabilitation zones where suitable. This will add further diversity to the site, particularly ground covers, and help improve native plant colonisation.

Maintenance Activities

Maintenance activities will include but not be limited to:

- General maintenance activities such as repairing damaged tree guards, installing replacement plants where required, weeding inside the tree guards and continued follow-up spot weed spraying.
- Watering - plants should be watered in on installation. All plantings should then receive follow-up watering during the first eight weeks to assist plant establishment. Should weather conditions remain dry for an extended period of time, additional watering may be required.
- Newly installed plants will require spot spraying of Round-up® and Biactive herbicides using back packs. Suitably qualified contractors will carry out all spraying.

6.3.3 Specific Management Actions for Shirbin and Garvey BioBank Site

The following vegetation rehabilitation and management actions will be adopted for the Shirbin and Garvey biobank sites. Based on field observations the following management actions will be required to alleviate site-specific threats. Undertaking these actions is over and above the minimal requirements for a biobank site and, therefore, will further improve the number of credits for the biobank site. A number of these measures have already begun to be implemented at the offset site.

- Vegetation Communities – feral animal control:
  - Cat and/or Fox control.
  - Exclude miscellaneous feral species.
  - Control of feral and/or overabundant native herbivores (rabbit, goats, deer).
- Maintain or reintroduce flow regimes (aquatic flora).
- Permanent fencing will be constructed to prevent stock entry into the biobank sites. Fencing will be erected wound the perimeter of the site except where the two biobank sites adjoin.
- Nutrient Control - Fertilisers, pesticides and herbicides will not be applied on the biobank sites, except where required to undertake the management actions.

These items are described in greater detail in the Management Actions Plan (completed during the preparation of the Biobanking Agreement) for each of the biobank sites.

6.3.4 Provision of Management Actions Plan to the Commonwealth

OEH, which manages the preparation of the biobanking agreement for the NSW Government, has indicated that it will provide the draft Management Actions Plan for both the Phase One and Phase Two offset sites to SEWPaC for comment prior to submission to the NSW Environment Minister for finalisation, noting that the biobanking agreement is ultimately one between the biobank site owner and the NSW Government. OEH has also indicated that the biobanking agreement, which contains the Management Actions Plan, will include an obligation for the sharing of information with the Commonwealth Government, including monitoring and reporting information required by the biobanking provisions of the TSC Act.

6.3.5 Reporting

OEH has indicated that, if, at any stage, the biobanking agreement has been breached, OEH will inform SEWPaC of the breach and the enforcement procedures to be undertaken.

6.3.6 Enforcement

The TSC Act provides an extensive range of enforcement measures for a breach of a biobanking agreement. These measures include:

- The NSW Environment Minister directing the biobank site owner to rectify the breach (at the site owner's cost) and "stepping in" to carry out the rectification work if the site owner fails to do so;
- In specified circumstances (such as where there is a serious risk to the biodiversity values which the agreement protects) the NSW Environment Minister obtaining a Court order to transfer the land to another person:
- Any other person (a Commonwealth Government agency, an environmental interest group or the developer) seeking a Court order to remedy or restrain the breach.

OEH has set out its enforcement approach in clear terms in the BioBanking Compliance Assurance Strategy. OEH has indicated that it will ensure the biobank site owner is aware of these provisions.

6.4 Phase Two Offsets

The Offsets Plan describes the biodiversity offset that will be delivered to offset the impacts of construction of Phase One of the Project. The timing of construction of Phase Two is yet to be determined. In line with the proposed staged approach to construction, it is proposed to also stage biodiversity offsetting. The establishment of the Phase Two offset will be delayed until such time as confirmation of that Phase going forward. This section provides a commitment to develop a revised offset plan, including a brief summary of Phase Two impacts, the approach to determining biodiversity offsets, timing and responsibilities.

The preferred approach to the Phase Two offsets is to assess, conserve and manage a suitable offset site within the framework of the NSW BioBanking scheme. The BBAM will be used to revise the Offsets Plan to include Phase Two of the Project as follows:

- Use of the BBAM to determine impacts of the development and the Phase Two offsetting requirements in terms of biodiversity credits.
- Identification of a suitable offset site (a biobank) containing appropriate biodiversity credits to offset impacts of the development, including appropriate vegetation types and 12 hectares of occupied habitat for Slaty Red Gum, including six hectares of degraded habitat that will be subject to active regeneration (as specified in the Conditions of Approval).
- Assessment of the biobank using the BBAM to determine the biodiversity credits that will be generated if the site was set aside and managed for conservation.
- Revision of this Offsets Plan to include a description of the additional biobank/s and comparison of the biodiversity credit profiles of the development site and biobank site/s to demonstrate that the biobank site/s is appropriate to offset biodiversity impacts of Phase Two of the Project.
- Comparison of the vegetation types, habitats, species and EPBC Act listed biota at the development site and biobank site/s to ensure that the revised Offsets Plan meets the Conditions of Approval.

The ARTC will purchase and retire biodiversity credits generated at the Phase Two biobank site which will be managed under a covenant in perpetuity for the purposes of biodiversity conservation. The BioBanking Trust Fund will fund the management of the biobank site and ensure that the site is conserved and actively managed to achieve long term gains in biodiversity values.

The revised Offsets Plan will be submitted to SEWPaC at least six months prior to the predicted date of commencement of construction of Phase Two

7. Delivery of the Offsets Plan

Implementation of the biodiversity offsetting actions outlined in this Offsets Plan will ensure that the Project will deliver appropriate environmental outcomes and comply with the Ministers Conditions of Approval. The timeframes for the completion of the actions outlined in this Offsets Plan are summarised in Table 7-1.

Table 7-1 Timeframes for Completion of Actions in this Offsets Plan

Action	Timeframe
BioBanking assessment of Project development impacts to determine biodiversity offsetting requirements	Completed (refer Section 3)
BioBanking assessment on the Shirbin and Garvey biobank sites to determine the suite of biodiversity credits that will be generated if the site was entered into a BioBanking Agreement.	Completed (refer Section 4)
Ecological assessments and BioBanking credit calculations to demonstrate that the Shirbin and Garvey biobank sites are appropriate to offset impacts arising from Phase 1 of the Project	Completed (refer Section 4)
Completion of biobanking agreement for Shirbin and Garvey biobank sites and purchase and retirement of biodiversity credits to offset impacts from Phase 1 of the Project by ARTC	Approval of the biobanking agreement and purchase of biodiversity credits completed. The retirement of credits will occur once the NSW biodiversity package has been approved.
Completion of biodiversity management planning	Completed (refer to section 6).
Submission of the Management Actions Plan for the Phase 1 site to Commonwealth Environment Minister for comment	MAPs for each of the biobank sites are included as Appendix C and D of this report.
Completion of 'Primary' rehabilitation actions at the Shirbin and Garvey biobank sites	Within first 5 years of establishment of the biobank site
Completion of 'Secondary' rehabilitation actions at the Shirbin and Garvey biobank sites	Within first 10 years of establishment of the biobank site

Action	Timeframe
Completion of maintenance requirements	In perpetuity
Revision of the Biodiversity Offsets and Management Plan to address an alternate site, if required.	This Plan is the revised version of the Offsets Plan submitted in March 2011.
Identification and assessment of suitable biobank site(s) and ecological assessments and BioBanking credit calculations to demonstrate that the biobank site(s) are appropriate to offset impacts arising from Phase 2 of the Project	To be submitted to the Commonwealth Environment Minister for approval at least six months prior to the expected date for the beginning of construction of Phase 2
Identification and assessment of a suitable biobank site containing at least 12 hectares of occupied habitat for Slaty Red Gum, including six hectares of degraded habitat that will be rehabilitated	At least six months prior to the expected date for the beginning of construction of Phase 2
Completion of biobanking agreement for Phase 2 biobank site(s) and purchase and retirement of biodiversity credits to offset impacts from Phase 2 of the Project by ARTC	Within 12 months of commencement of construction of Phase 2.
Completion of biodiversity management planning	Within 12 months of commencement of construction of Phase 2.
Submission to the Commonwealth Environment Minister of the Management Actions Plan for the Phase 2 site for comment	Within 12 months of commencement of construction of Phase 2.
Completion of 'Primary' rehabilitation actions at biobank site(s)	Within first 5 years of establishment of the biobank site(s)
Completion of 'Secondary' rehabilitation actions at biobank site(s)	Within first 10 years of establishment of the biobank site(s)
Completion of maintenance requirements	In perpetuity

8. Conclusions

8.1 Development – Offset Comparison

The Hunter 8 Alliance has identified biodiversity offsets that will compensate for impacts arising from Phase One of the Project upon matters protected under the EPBC Act. Native vegetation and habitat will be conserved at two adjoining offset sites at Butterwick, NSW. The offset sites will be conserved and managed within the framework of BioBanking.

The aim of the Offsets Plan is to demonstrate that impacts of the Phase One development on biodiversity values will be offset by the retirement of biodiversity credits at the Shirbin and Garvey biobank sites determined in accordance with BBAM. The BBAM accounts for a range of factors that contribute to biodiversity value, including landscape attributes such as patch size and connectivity of vegetation, the value of the site as habitat for threatened species, improvement of habitat value with management and the likely response of threatened species at the site to management. Based on a comparison between the credit profile calculated for the development site and for the Shirbin and Garvey biobank sites it is likely that the Offsets Plan is appropriate to offset impacts on native vegetation and habitats arising from Phase One of the project (GHD, 2010c). That is, sufficient biodiversity credits would be generated to offset Phase One development impacts at the Shirbin an Garvey biobank sites.

Biobanking agreements have been entered into for both of these sites and ARTC has purchased the required number of biodiversity credits to offset Phase one of the Project. These credits will be retired upon approval of this Offsets.

The Offsets Plan will yield an overall 100 biodiversity credit surplus, based on the conservation, management and improvement in the biodiversity value of the approximate 57.8 hectare Shirbin biobank site and the 177.2 hectare Garvey biobanks site to offset impacts of clearing of 23.59 hectares of native vegetation. The biobank site contains ecosystem credits appropriate to offset impacts of the development.

The biobank site will yield a shortfall in some of the ecosystem credits required at the development site, including:

- A 390 credit deficit of Swamp Oak forest and a 2 credit deficit of freshwater wetlands, because these vegetation types are not present at the biobank sites;
- A 314 credit deficit of Forest Red Gum Forest because there is not enough of this vegetation type at the biobank sites to fully offset the impacts at the development site.

These shortfalls reflects the inherent difficulty of identifying a viable offset site or sites with all the desired ecological characteristics. This issue is compounded by the nature of the Project; as the development is linear infrastructure that has resulted in impacts on a relatively wide range of vegetation types (five) for the relatively small extent of clearing (23.59 hectares). Despite this difficulty the offset sites that have been identified will achieve an appropriate offset ratio for two out of five vegetation types and contain a large proportion of the ratio requirements of a third.

The majority of threatened fauna species predicted to occur in ecosystem credits associated with the development site are also predicted to occur at the biobank site.

One hundred (100) additional ecosystem credits will be purchased and retired in lieu of ecosystem credits that are not present in the biobank site. The OEH (2011) interim policy for determining offsets for Part 3A Projects states that if appropriate ecosystem credits are not available then they may be converted to a recognised regional conservation priority. Additional ecosystem credits will be retired that are associated with communities that have been recognised as conservation priorities in the DECCW (2009), Lower Hunter Regional Conservation Plan. The Shirbin and Garvey biobank sites will yield a surplus of 100 ecosystem credits associated with conservation priorities to offset the credit deficit for Swamp Oak forest, Forest, Freshwater Wetlands and Red Gum Forest. Therefore within the framework of the BioBanking methodology and the variation criteria of the OEH (2011) policy the biodiversity offsetting requirements of the project development have been more than met by biodiversity credits that will be generated at the Shirbin and Garvey biobank sites.

No Slaty Red Gum were recorded within the biobank sites and therefore offset contributions for this species will be included in the revised Offsets Plan that will accompany Phase 2 of the Project. The revised offset plan will include conservation of a biobank site/s with 12 hectares of occupied habitat for Slaty Red Gum and will include supplementary planting of Slaty Red Gum in a six hectare area of degraded habitat for the species.

8.2 Alignment with Conditions of Approval

The following describes how this Offsets Plan ensures that the Project will meet the Ministers conditions of approval for biodiversity management and offsets as required by Condition 2 of the Approval. The alignment of this Offsets Plan with Condition 2 is presented in Table 8-1.

Table 8-1 Alignment of this Offsets Plan with the Conditions of Approval for Biodiversity Management and Offsets

Condition	How Addressed
2. The person taking the action must submit a Biodiversity Management and Offset Plan to address impacts on listed threatened species and ecological communities to the Minister for approval prior to clearing of any native vegetation. The Biodiversity Management and Offset Plan must include the following:	
a) mapping showing the location of all New South Wales and EPBC listed threatened species and ecological communities in the project area and estimates of the extent of habitat that will be impacted by the project;	Mapping of listed threatened species and ecological communities within the development footprint is included as Appendix A. Estimates of the extent of habitat that will be impacted by the Project were calculated with GIS and are included as Table 3-2.

Condition	How Addressed
b) explain how the extent and condition of habitat for threatened species and ecological communities was determined;	The extent and condition of habitat for threatened species and ecological communities was determined by reference to the project ecological assessments conducted during the preparation of the EA. The project ecological assessments included desktop assessments and field surveys by specialist ecologists as described in Section 2.2 for the extent and condition of habitat within the biobanks site was determined through site surveys and credit calculations conducted according to the BBAM.
c) a proposal or strategy for the conservation of land, the extent and condition of which has been determined to be greater than or equal to that needed to offset the impacts of the proposal using the NSW Biodiversity Banking and Offsets Scheme methodology;	This Offsets Plan was developed using a modified form of the BioBanking assessment methodology. A desktop assessment was used to calculate the development impacts as described in Sections 2.3.1 and 2.3.5. The assumptions included in this assessment were conservative, for instance all vegetation and habitat attributes were assumed to be at benchmark values, whereas some vegetation removed was partially degraded. Two Biobank sites at Butterwick were identified and assessed using the BBAM. The biodiversity credit trading rules have been modified for this Offsets Plan, using the criteria outlined in the OEH (2011) interim policy. As indicated in this Offsets Plan, the biodiversity credits that will be generated from the biobank site are more than that needed to offset the impacts of the proposal using the BBAM. Ecosystem credits for vegetation types that are not present in the biobank sites have been substituted with ecosystem credits for communities that have been recognised as conservation priorities in regional plans and policies in accordance with variation criteria f) in the OEH (2011) policy (refer Sections 5.2 and 8.1).
d) the land referred to in 2(c) must contain at least 12 hectares of occupied habitat for the Slaty Red Gum (*Eucalyptus glaucina*). This must include re-establishment of 6 ha to increase the area of occupancy of the species in locations of known degraded habitat, however, that re-establishment may only occur in locations where experts have definitively determined that the species are known to occur;	The biobank sites included in this Offsets Plan does not contain any occupied habitat for Slaty Red Gum. A second offset site containing occupied habitat will be identified and included in an updated version of this Offsets Plan during Phase Two of the Project..
e) the land referred to in 2(c) must contain critical foraging habitat for the Grey-headed Flying fox (*Pteropus poliocephalus*) to compensate for habitat removed, the extent and condition of which will be determined by the retirement of ecosystem credits calculated with the NSW Biodiversity Banking and Offsets Scheme methodology	The biobank sites contains 221 hectares of critical foraging habitat for the Grey-headed Flying-fox associated with Forest Red Gum – Grey Gum forest, Grey Ironbark-Spotted Gum-Grey Box forest and Spotted Gum – Broad-leaved Ironbark forest. Offsetting requirements for removal of critical foraging habitat for the Grey-headed Flying-fox were calculated using the BBAM by calculating the number of ecosystem credits associated with vegetation types that qualify as critical foraging habitat. Conservation of these vegetation types at the biobank site will yield a total of 1530 ecosystem credits which yields 365 more ecosystem credits than will be required to compensate for the removal of equivalent vegetation for construction of Phase One of the Project.

Condition	How Addressed
f) the land referred to in condition 2(c) must be located within 100 km of the proposed Maitland to Minimbah Third Track project site, unless it can be demonstrated, to the satisfaction of the Minister, that this is not feasible;	The Shirbin and Garvey biobank sites are approximately 18 kilometres from the Maitland end of the Project site and 30 kilometres from the Minimbah end, which is also the farthest portion of the Project site from the biobank.
g) the land referred to in condition 2(c) must be protected by a legal instrument under relevant nature conservation legislation, to ensure that the land is conserved in perpetuity;	The Shirbin and Garvey biobank sites will be protected by a biobanking agreement in accordance with Section 7a of the NSW TSC Act that will ensure that the sites are conserved in perpetuity (refer Section 6.2).
h) measures to manage and protect in perpetuity any land offset, including a description of how weed management and rehabilitation of native vegetation, threatened species habitat and threatened ecological communities will be undertaken and funded in the long-term; and	The Shirbin and Garvey biobank sites will be managed to improve the sites condition and biodiversity values under a biobanking agreement. The agreement will include measures for weed and pest fauna management, site rehabilitation and monitoring as stated in Section 6.3. Management of the biobank sites will be funded in perpetuity by payments from the BioBanking Trust Fund, which is administered and underwritten by the NSW Government.
i) Timeframes for the completion of all actions outlined in the plan, including the acquisition of land to be used as the offset and staging of the delivery of the offset.	Timeframes for completing management actions are shown in Table 7-1
If the project is undertaken in a staged manner, the plan must be updated at least 6 months before the expected date for the beginning of construction for that later stage. With the exception of the land required under condition 2(d), the area of land identified to offset each stage must be commensurate with the impact of that stage as required under condition 2 c). Operation of a constructed stage of the rail line may not commence unless the plan addressing that stage has been implemented.	The Project will be undertaken in a staged manner. Construction of Phase 1 of the Project will commence after approval of this Offsets Plan. This Offsets Plan includes contributions that are appropriate to offset impacts arising from Phase 1 of the Project. Additional offsets will be required for Phase 2. These additional offsets will be identified, assessed and included in an updated version of this Offsets Plan at least six months prior to the expected date of construction of Phase 2 (refer Section 6.4). The additional biodiversity offsets for Phase 2 will include specific contributions for Slaty Red Gum as required under condition 2 c)

9. References

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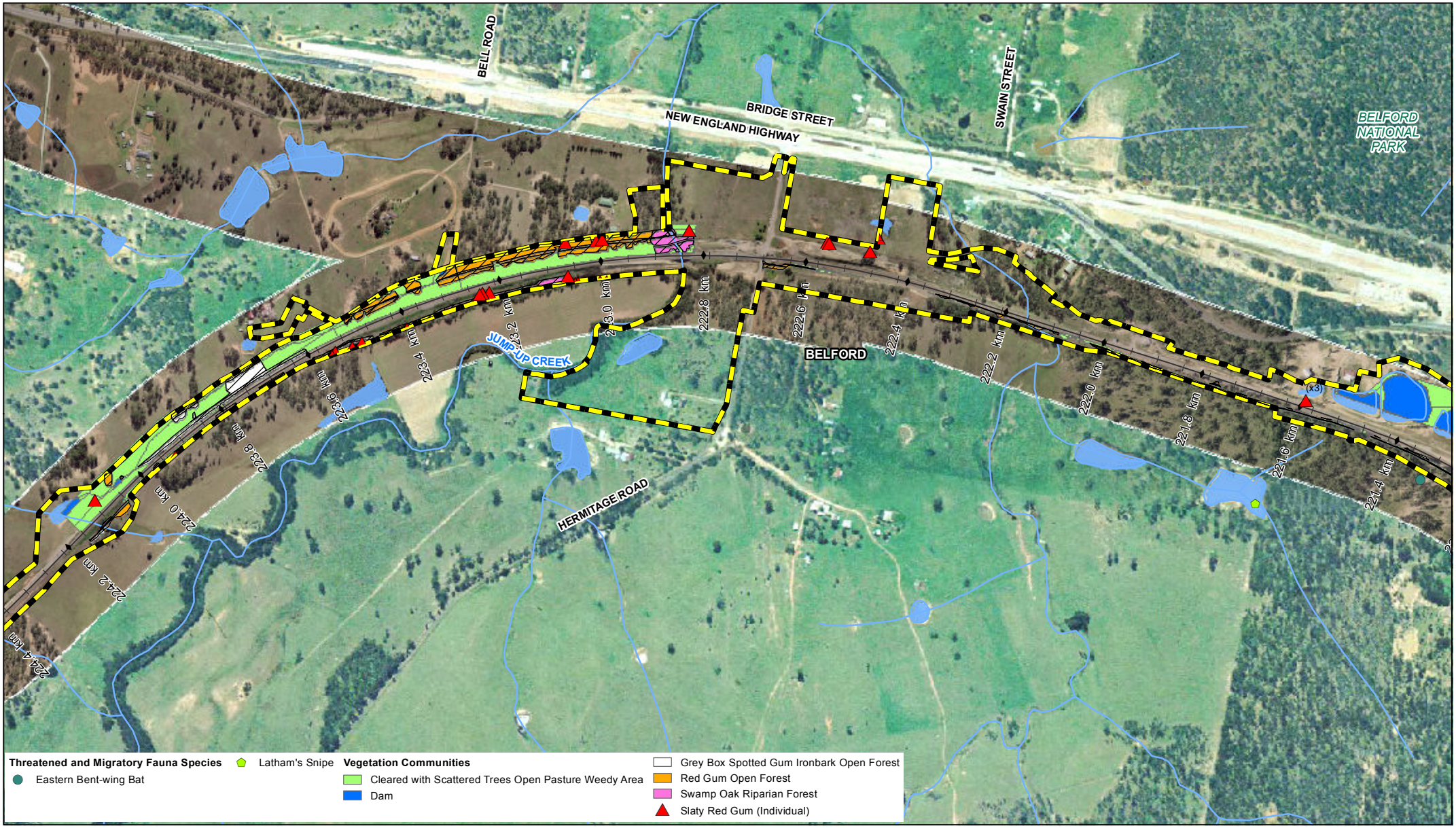
Appendix A

Development Site Vegetation and Threatened Biota



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N

LEGEND

- Revised Construction Zone - May 2013
- Existing Railway
- Watercourse
- Watercourse Area

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

Job Number 22-1510665
Revision 0
Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 1

Appendix A

G:\22\14471\GIS\Maps\Deliverables\EPBC\EPBC_Fig_1_VegetationMapping_20130905_A.mxd

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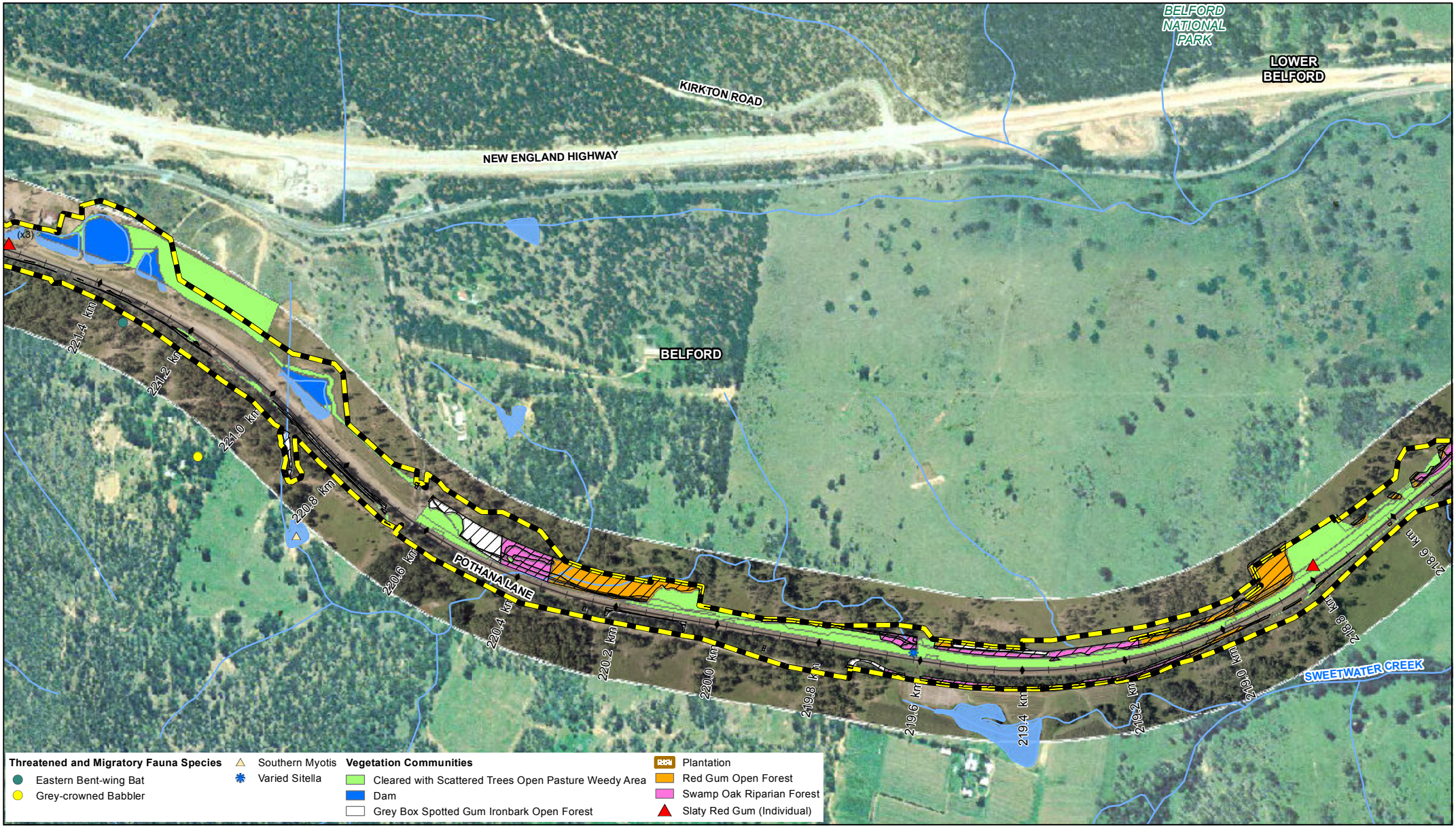

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LEGEND

- Revised Construction Zone - May 2013
- Existing Railway
- Watercourse
- Watercourse Area

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

Job Number	22-1510665
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Date	Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 2

Appendix A

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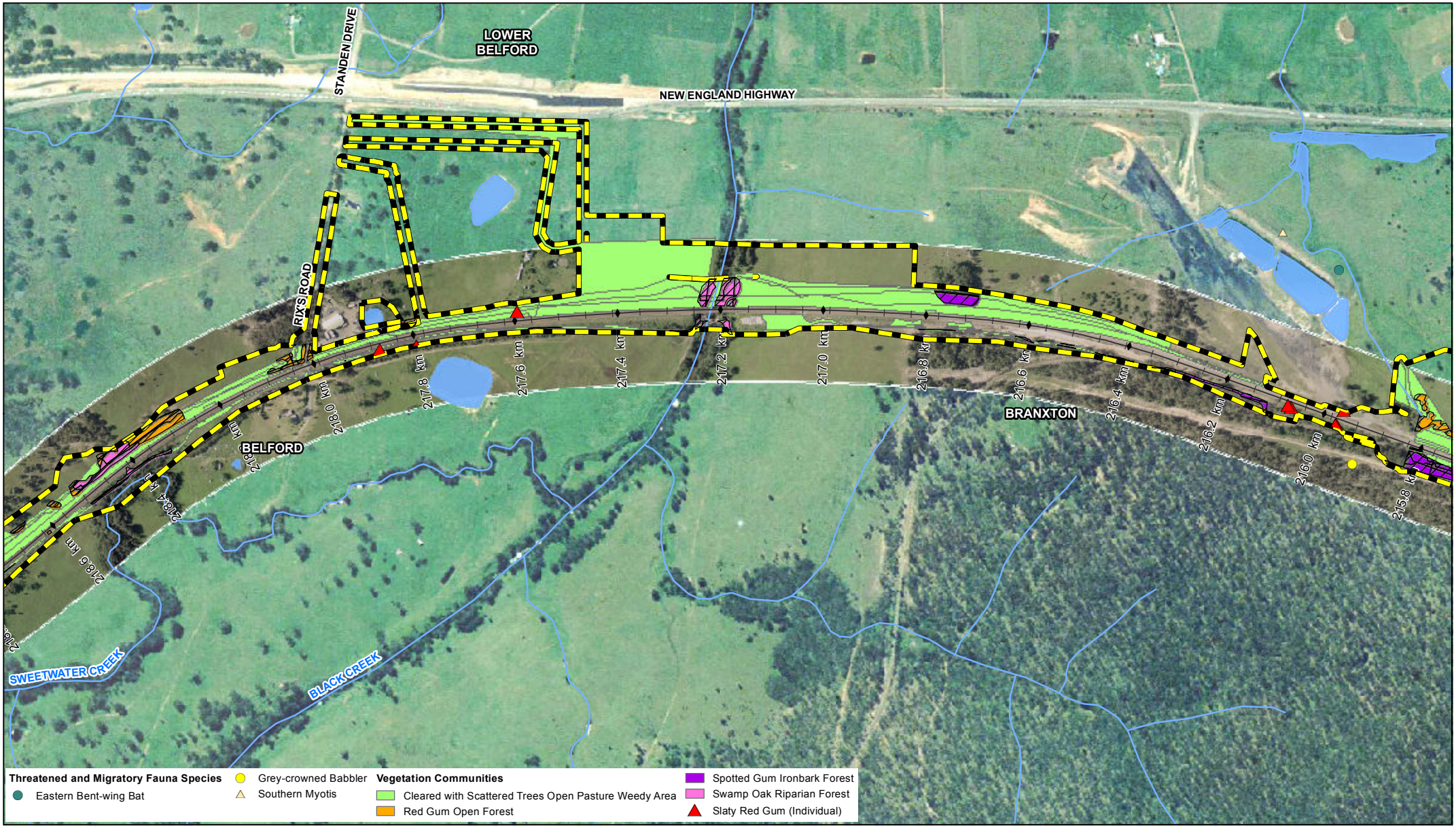

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LEGEND

- Revised Construction Zone - May 2013
- Existing Railway
- Watercourse
- Watercourse Area

Hunter ALLIANCE

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

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Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 3

Appendix A

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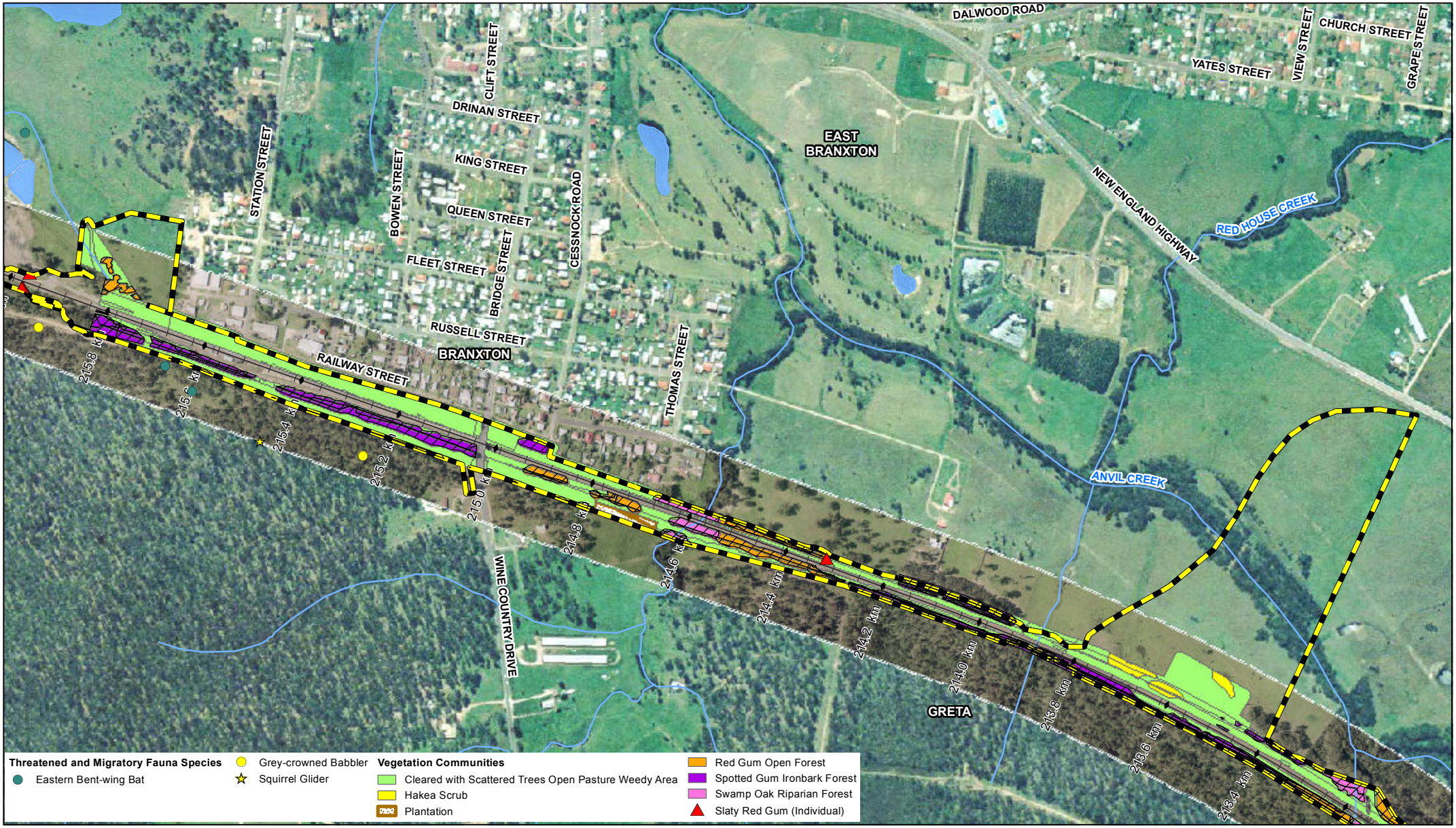

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LEGEND

- Revised Construction Zone - May 2013
- Existing Railway
- Watercourse
- Watercourse Area

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

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Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 4

Appendix A

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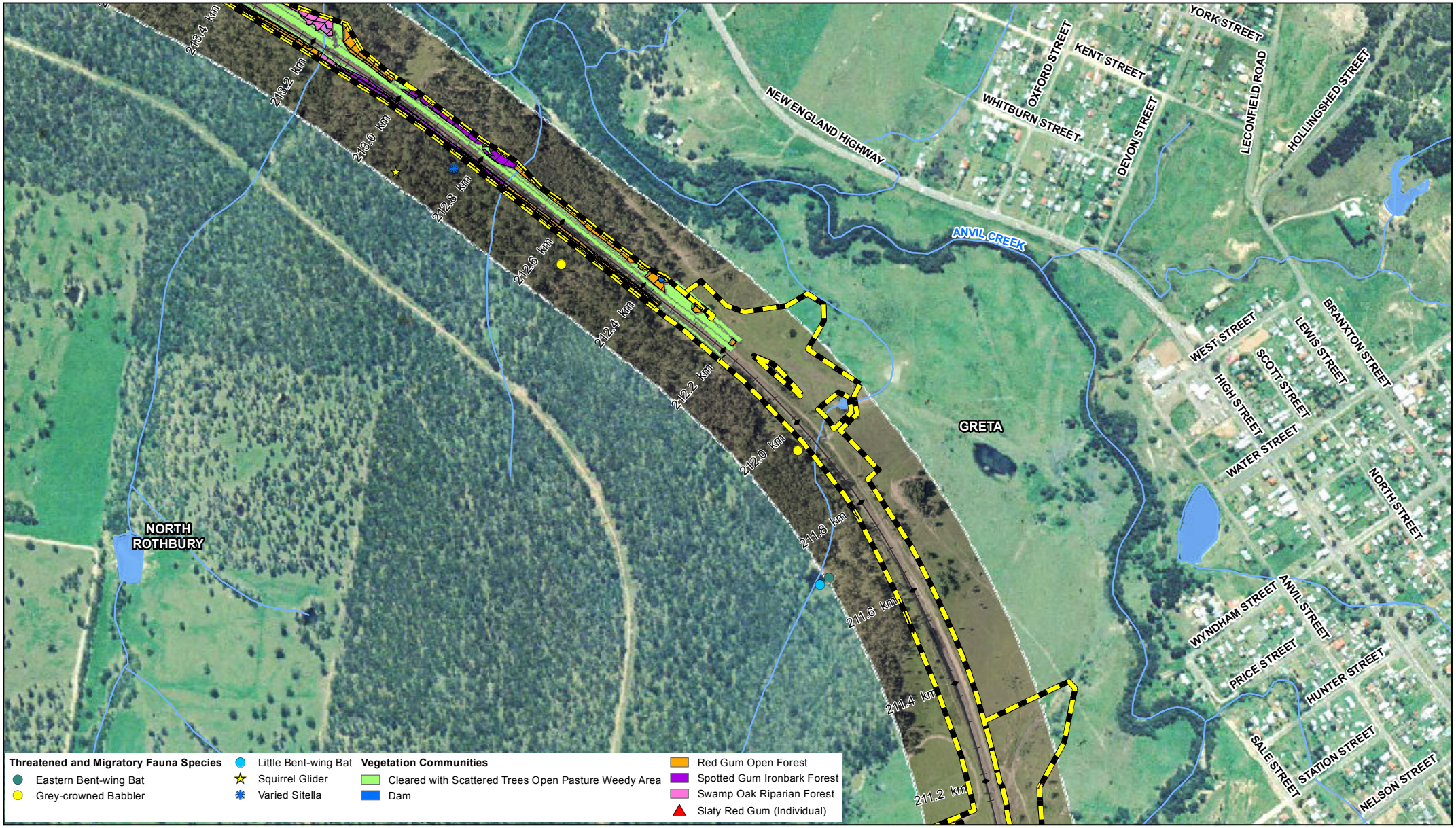

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LEGEND

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- Watercourse
- Watercourse Area

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Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

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Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 5

Appendix A

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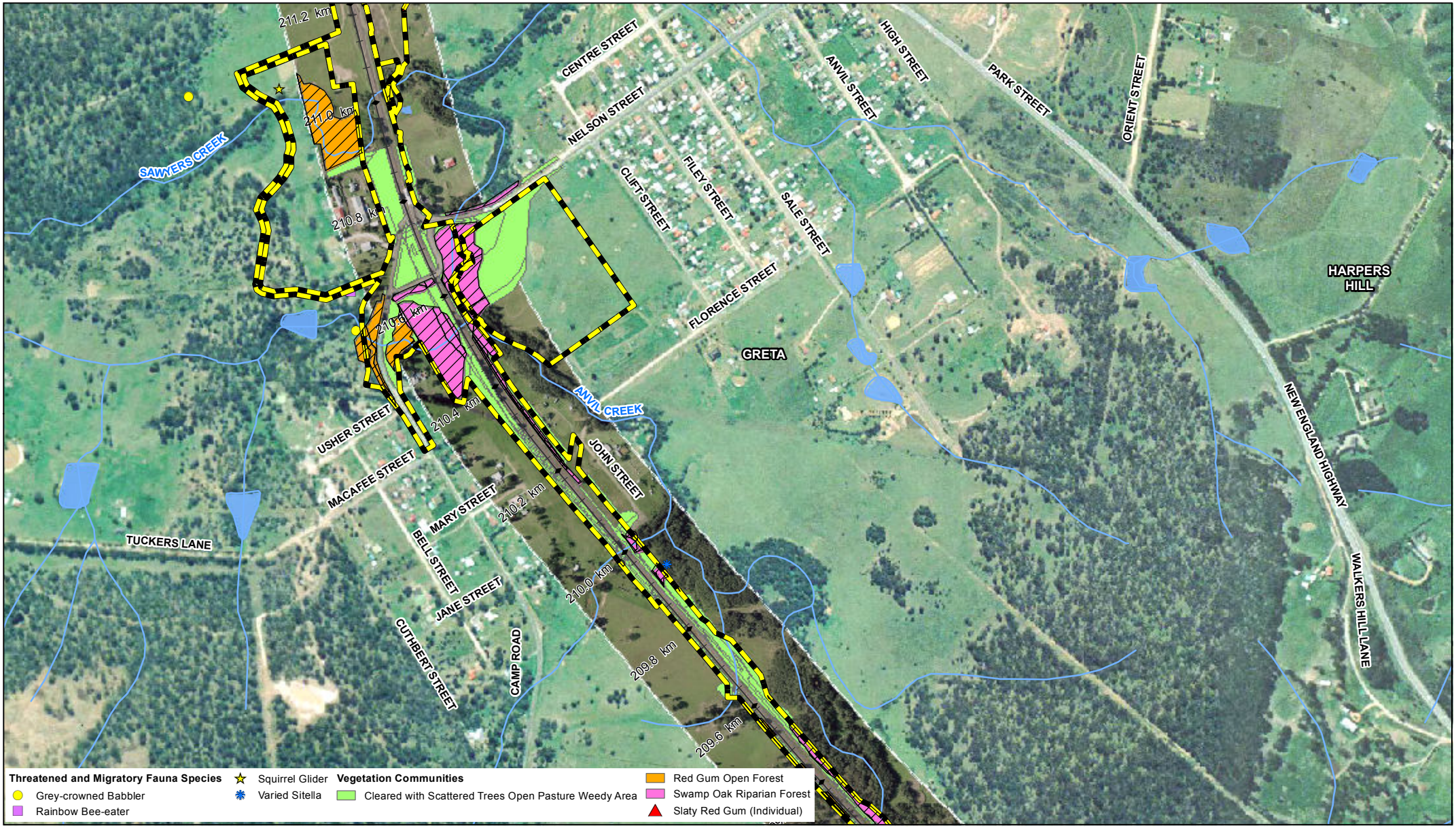

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LEGEND

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- Existing Railway
- Watercourse
- Watercourse Area

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

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Revision 0
Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 6

Appendix A

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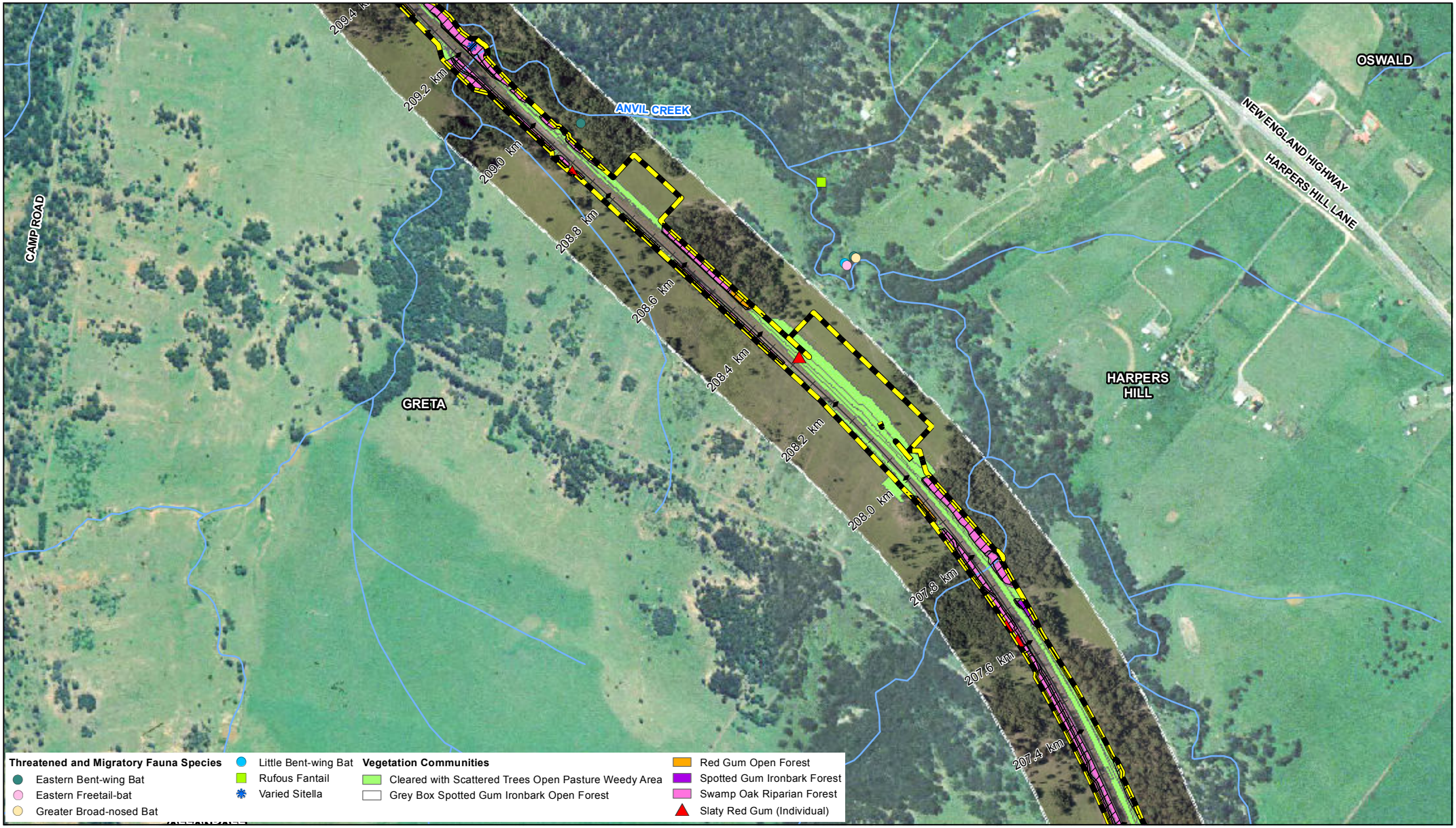

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LEGEND

- Revised Construction Zone - May 2013
- Existing Railway
- Watercourse
- Watercourse Area

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

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Revision 0
Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 7

Appendix A

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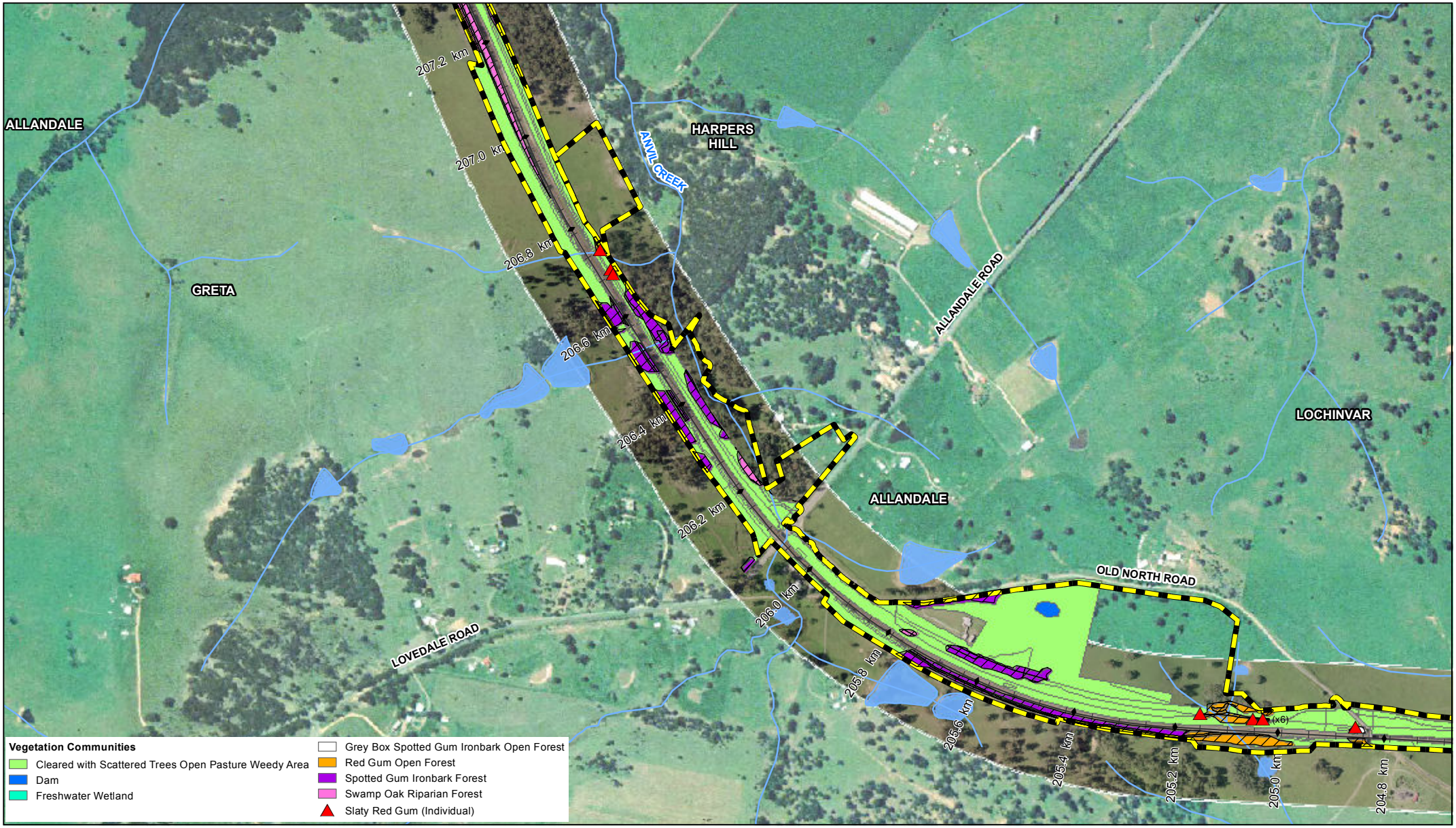

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LEGEND

- Revised Construction Zone - May 2013
- Existing Railway
- Watercourse
- Watercourse Area

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

Job Number 22-1510665
Revision 0
Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 8

Appendix A

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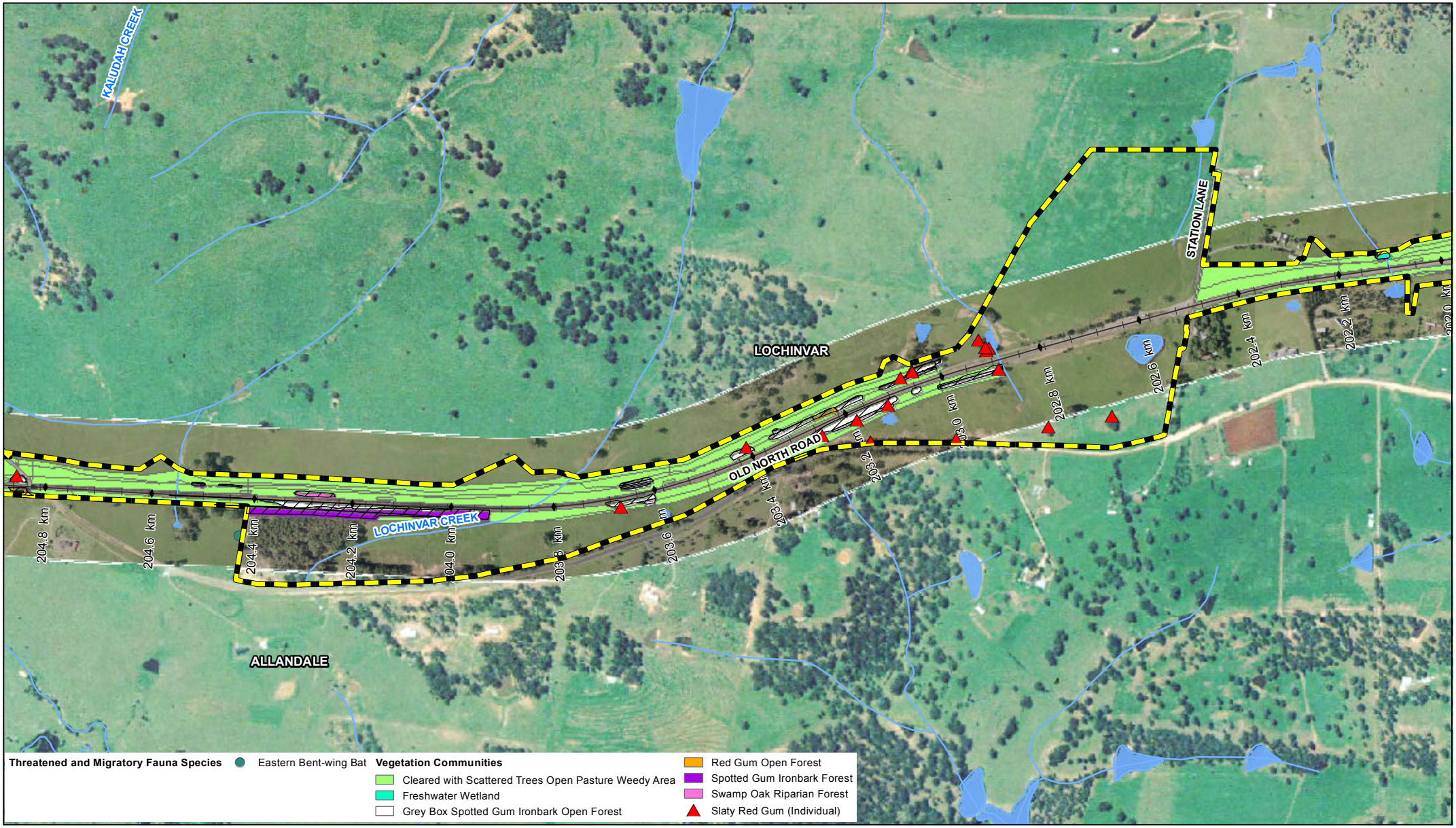

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LEGEND

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Hunter ALLIANCE

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

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Development Site Vegetation And Threatened Biota - Sheet 9

Appendix A

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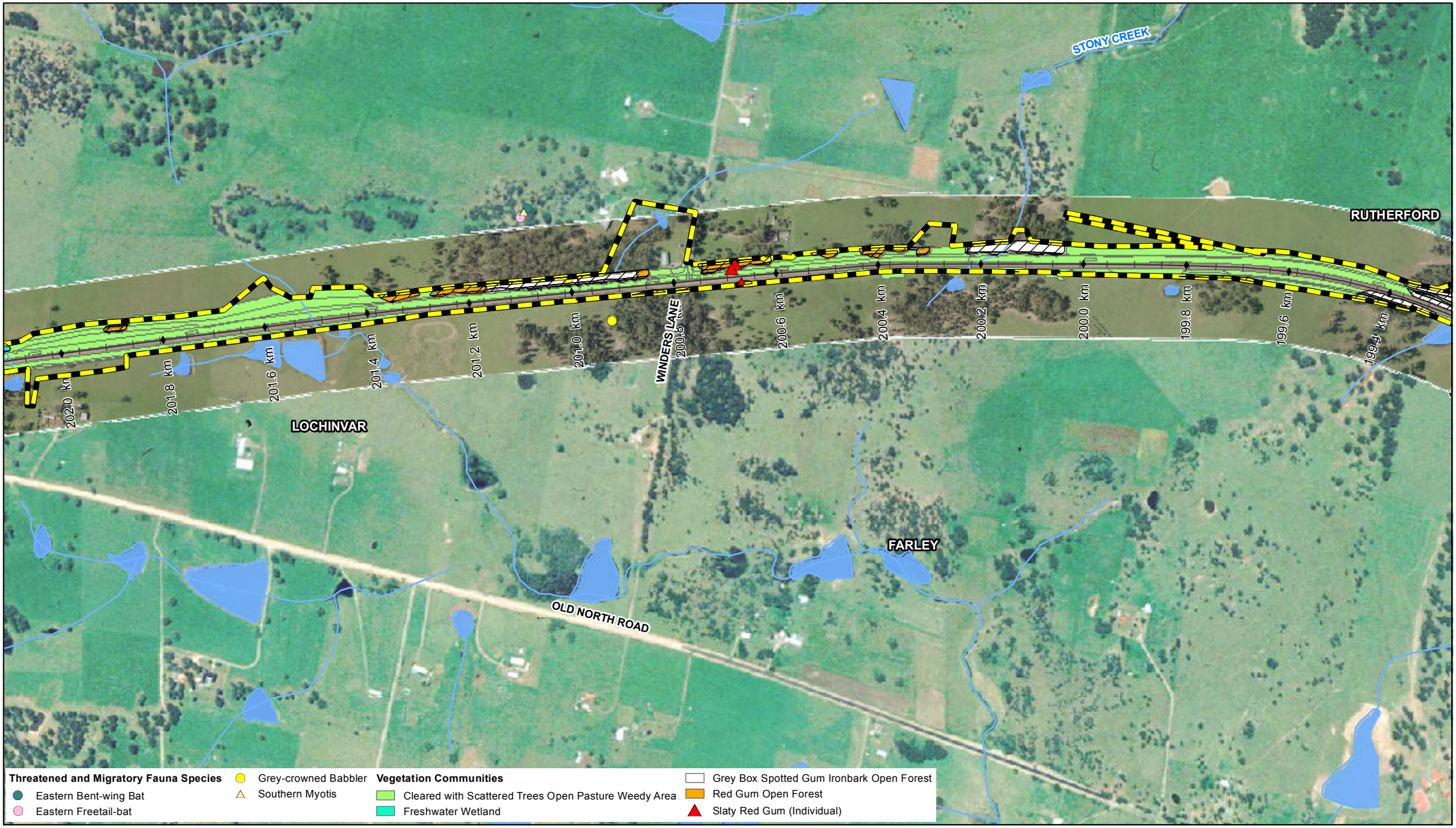

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LEGEND

- Revised Construction Zone - May 2013
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- Watercourse Area

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

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Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 10

Appendix A

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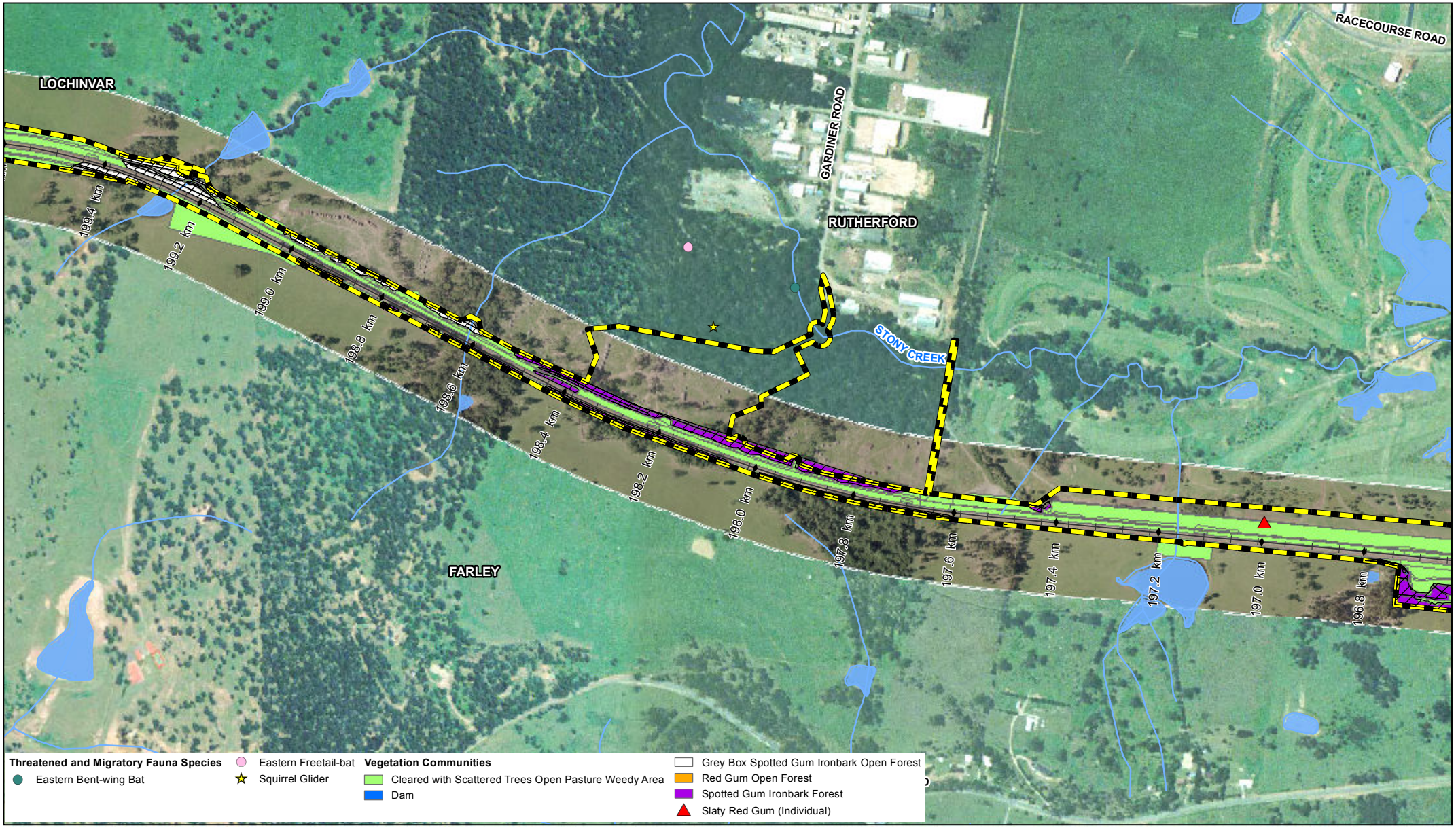

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

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LEGEND

- Revised Construction Zone - May 2013
- Existing Railway
- Watercourse
- Watercourse Area

Hunter ALLIANCE

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

Job Number 22-1510665
Revision 0
Date Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 11

Appendix A

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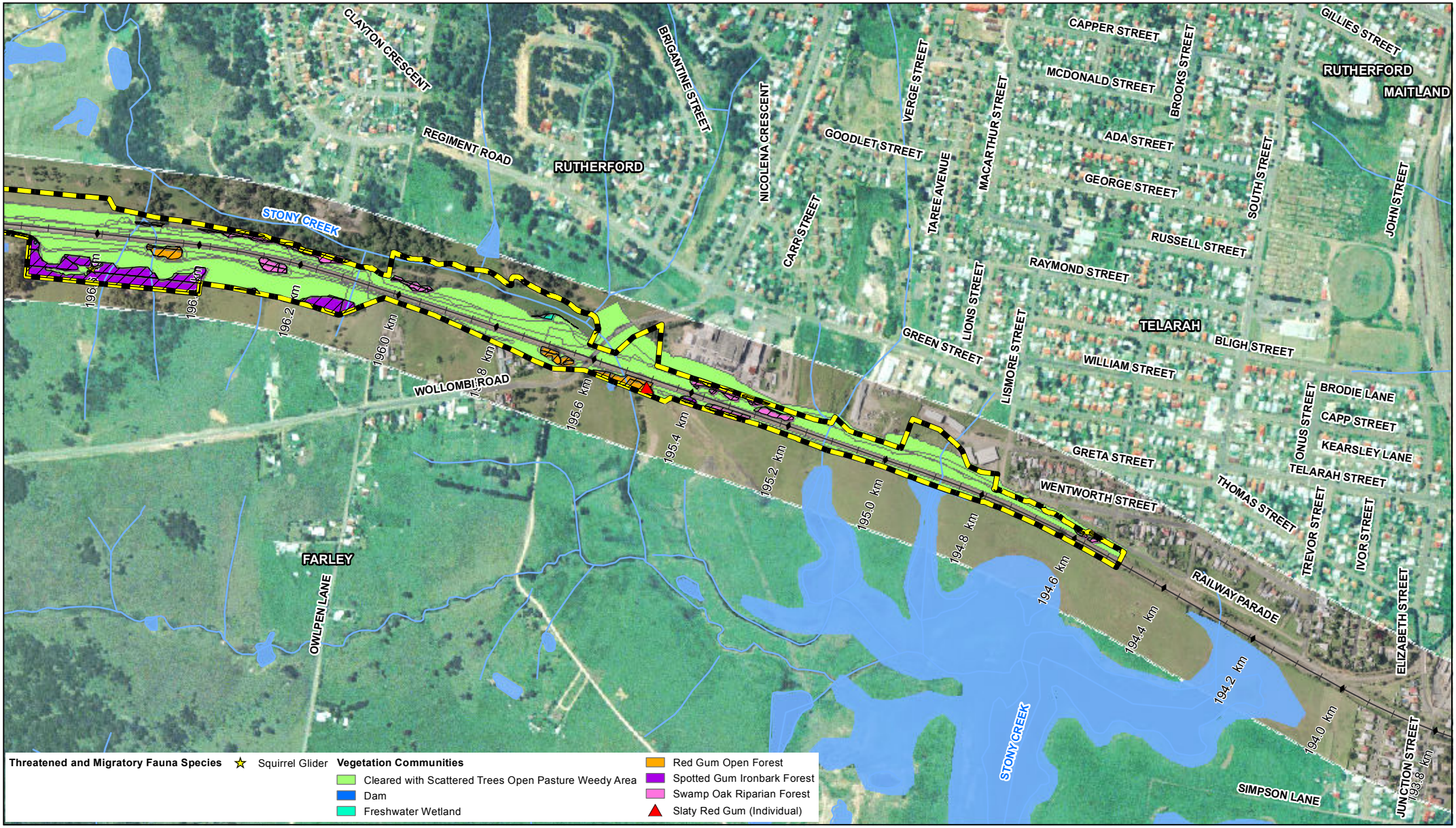
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: Author: gmcdiarmid



1:10,000 (at A4)

0 35 70 140 210 280

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Revised Construction Zone - May 2013
- Existing Railway
- Watercourse
- Watercourse Area

Hunter ALLIANCE

Maitland to Minimbah Third Track
EPBC Act Biodiversity Management

Job Number	22-1510665
Revision	0
Date	Sept 2013

Development Site Vegetation And Threatened Biota - Sheet 12

Appendix A

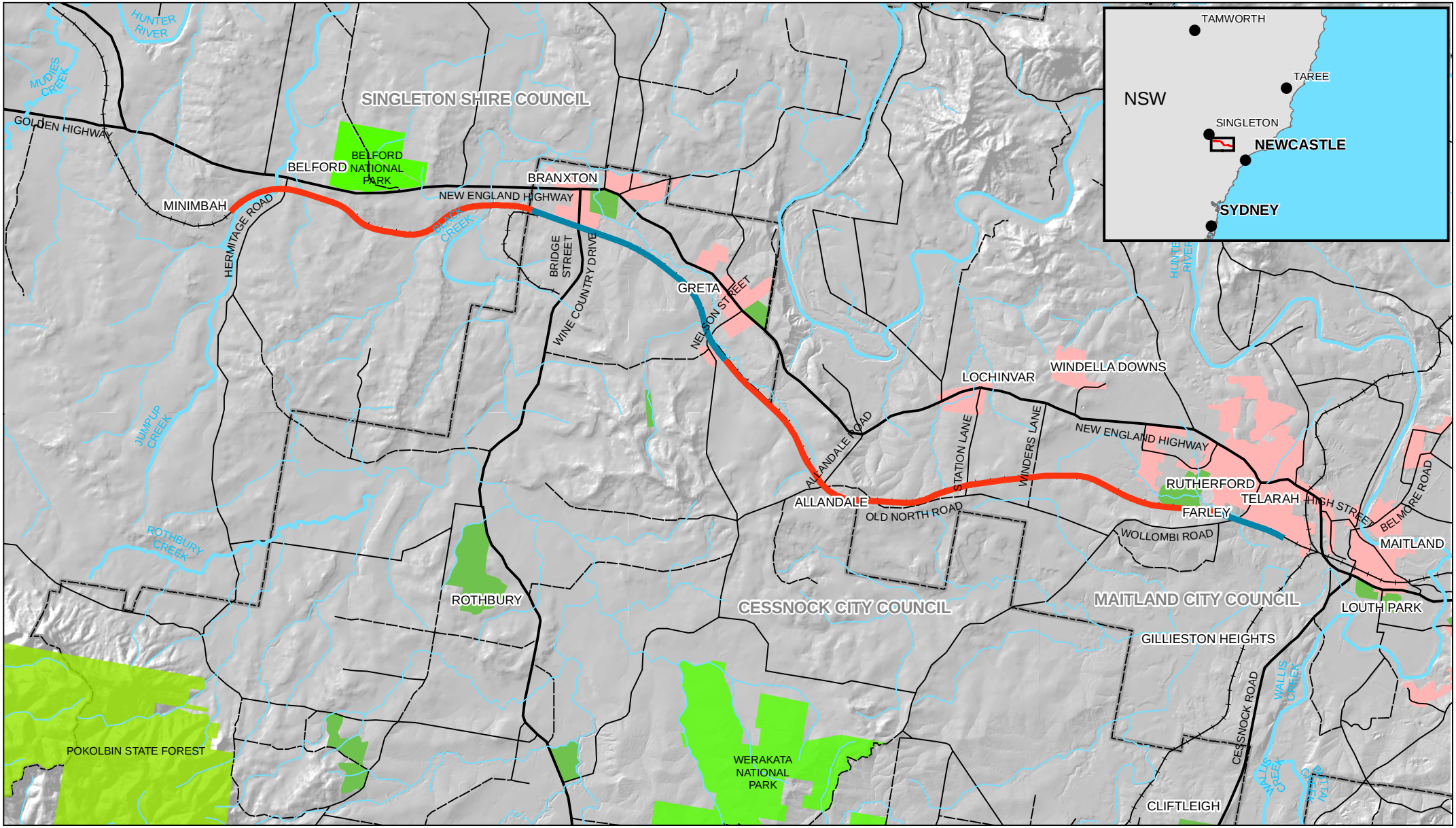
G:\22\14471\GIS\Maps\Deliverables\EPBC\EPBC_Fig_1_VegetationMapping_20130905_A.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data Source: Department of Lands: Aerial - 2005; Fugro: Aerial - 2008. Created by: Author: gmcdiarmid

Appendix B

Figures



1:125,000 (at A4)

0 600 1,200 2,400 3,600 4,800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Australian Geodetic Datum 1966
Grid: Integrated Survey Grid, Zone 56-1

N

LEGEND

- Proposed Project Construction Phase 1
- Proposed Project Construction Phase 2
- Railway
- Watercourse
- Highway
- Unsealed
- Main Road
- Minor Road
- LGA
- Recreation Areas
- State Forest
- National Park
- Built Up Area

Hunt8r ALLIANCE

Maitland To Minimbah Third Track
Phase One Biodiversity Offsets Package

Job Number 22-14471
Revision A
Date May 2011

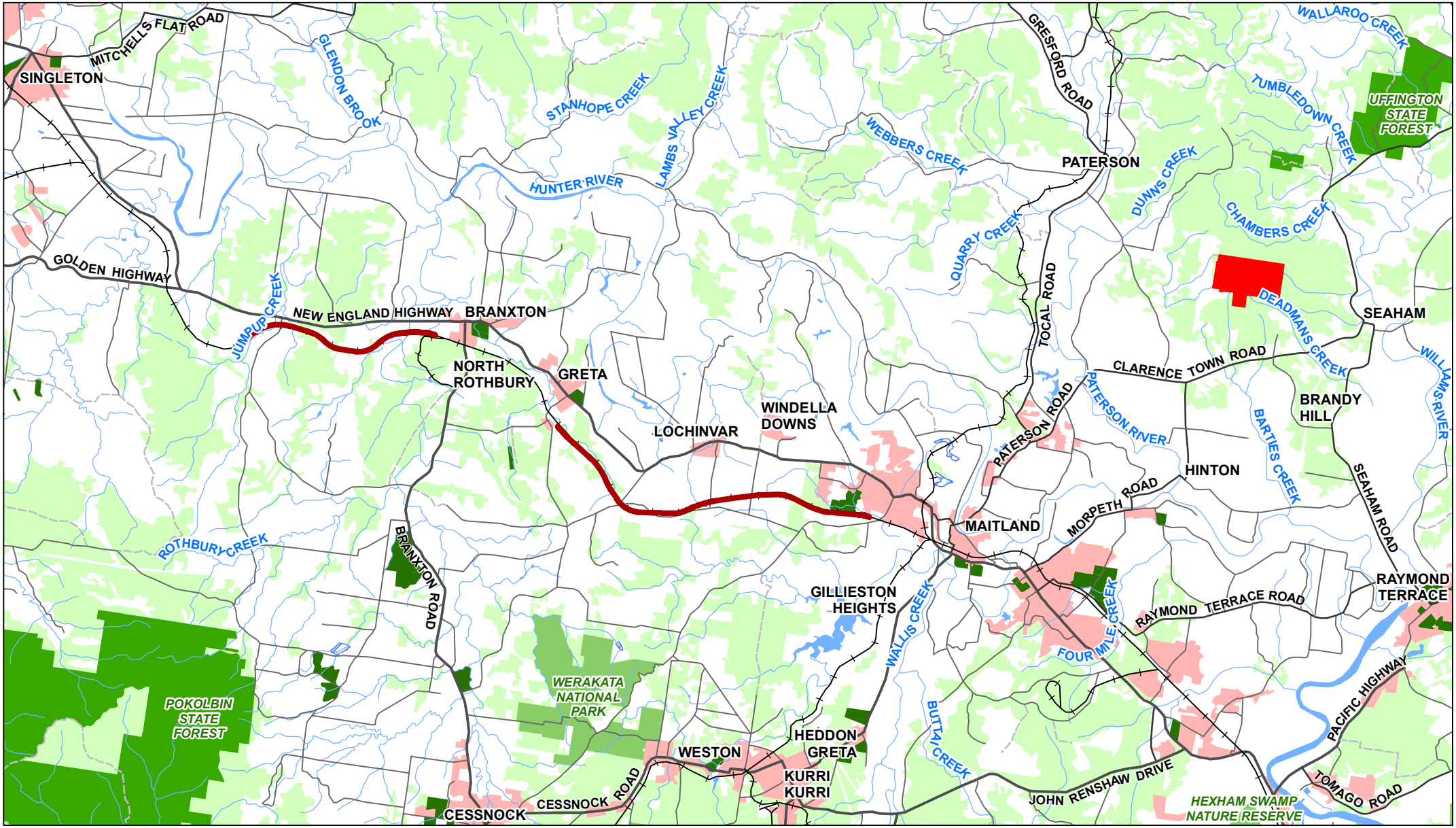
Development Site Location

Figure 1

G:\22\14471\GIS\Maps\Deliverables\BiodiversityOffsetStrategy\BOS_Construction_Phases_20110517.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com.au W www.ghd.com.au

Data Source: GeoScience Australia: 250k Topo Data - Series 3. Created by: msmiljkovski, tmorton, fmackay



1:200,000 (at A4)

0 750 1,500 3,000 4,500 6,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Biobank Sites
- Proposed Project Construction Phase 1
- Rail
- Watercourse
- Principal Road
- Secondary Road
- Minor Road
- Track
- Watercourse Areas
- Built Up Area
- Recreation Areas
- Nature Conservation Reserve
- State Forest
- Forest Or Shrub

Hunt8r ALLIANCE

Maitland to Minimbah Phase 1
Biodiversity Offsets Package

Job Number 22-15106-78
Revision 0
Date 10 APR 2012

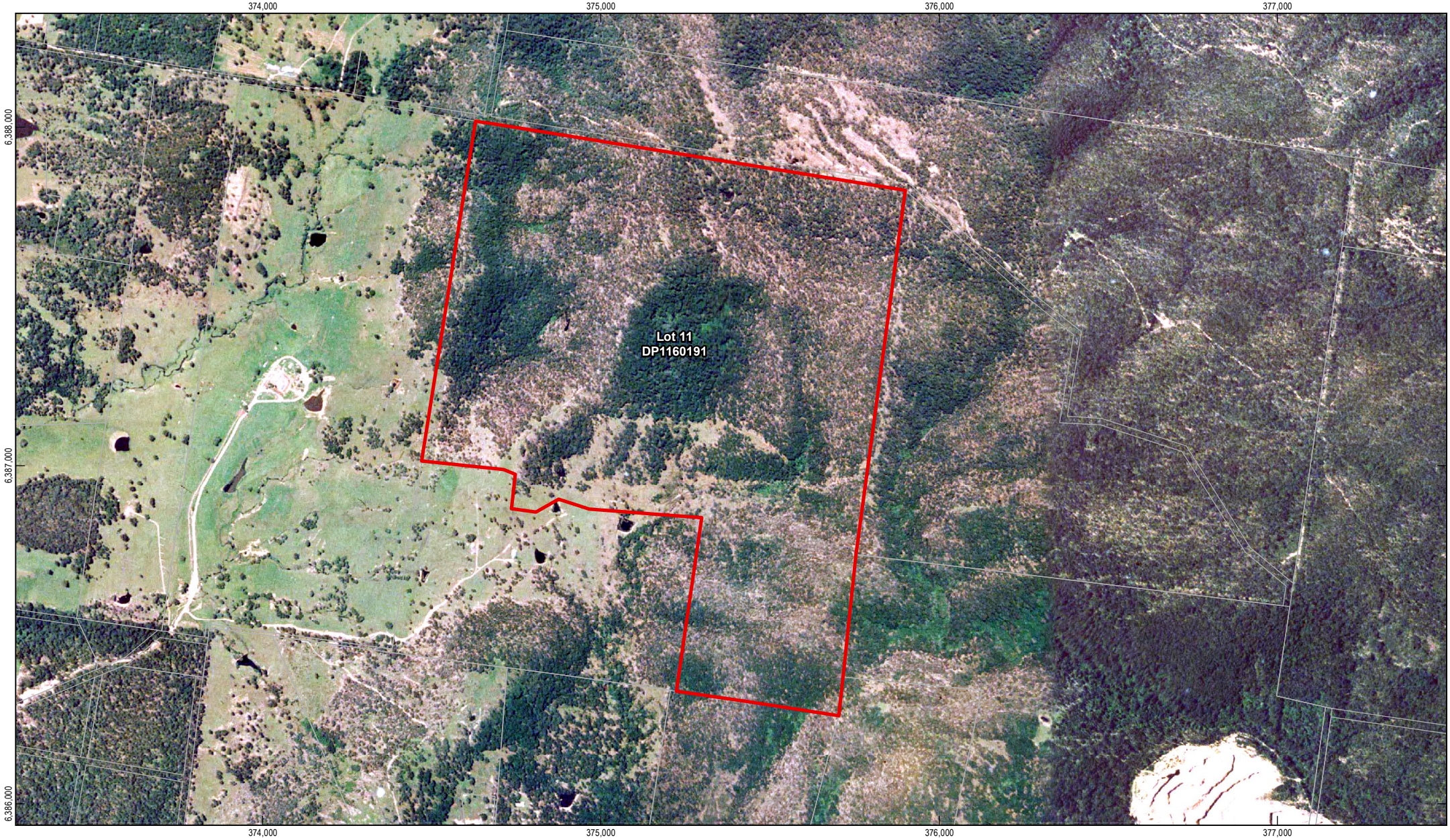
Overview Map of Biobank Location

Figure 2

G:\22\1454501\Biodiversity Offsetting\Offsetting Area Review and Butterwick Site\GIS\Maps\Deliverables\221510678_007_Overview map_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: LPMA: Imagery - 2007, DCDB - 2007; LHCCREMS: Vegetataion - 2007. Created by: fmackay



1:15,000 (at A4)

0 55 110 220 330 440

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Sherbin Biobank Site
- Cadastre

Maitland to Minimbah Phase 1
Biodiversity Offsets Package

Job Number	22-15106-78
Revision	0
Date	10 APR 2012

Shirbin Biobank
Site Location

Figure 3

G:\22\1454501\Biodiversity Offsetting\Offsetting Area Review and Butterwick Site\GIS\Maps\Deliverables\221510678_001_Sherbin_SiteLocation_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: LPMA: Imagery - 2007, DCDB - 2007. Created by: fmackay

1:15,000 (at A4)

0 55 110 220 330 440

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Garvey Biobank Site
- Cadastre

Maitland to Minimbah Phase 1
Biodiversity Offsets Package

Garvey Biobank
Site Location

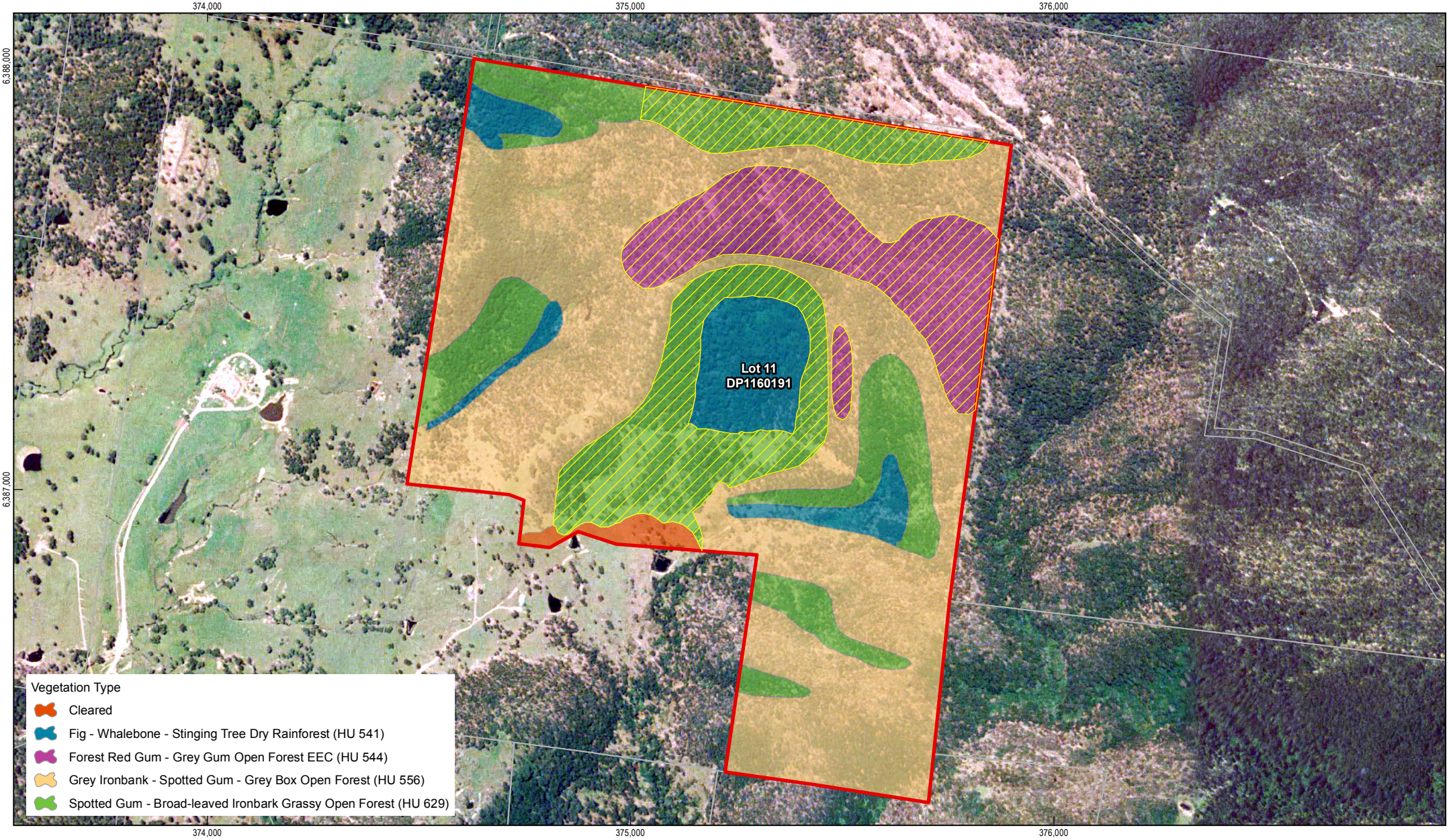
Job Number	22-15106-78
Revision	0
Date	10 APR 2012

Figure 4

G:\22\1454501\Biodiversity Offsetting\Offsetting Area Review and Butterwick Site\GIS\Maps\Deliverables\221510678_002_Garvey_SiteLocation_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com.au **W** www.ghd.com.au

Data Source: LPMA: Imagery - 2007, DCDB - 2007. Created by: fmackay



1:12,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Shirbin Biobank Site
- Cadastre
- Offset Location

Maitland to Minimbah Phase 1
Biodiversity Offsets Package

Job Number 22-15106-78
Revision 0
Date 30 Oct 2013

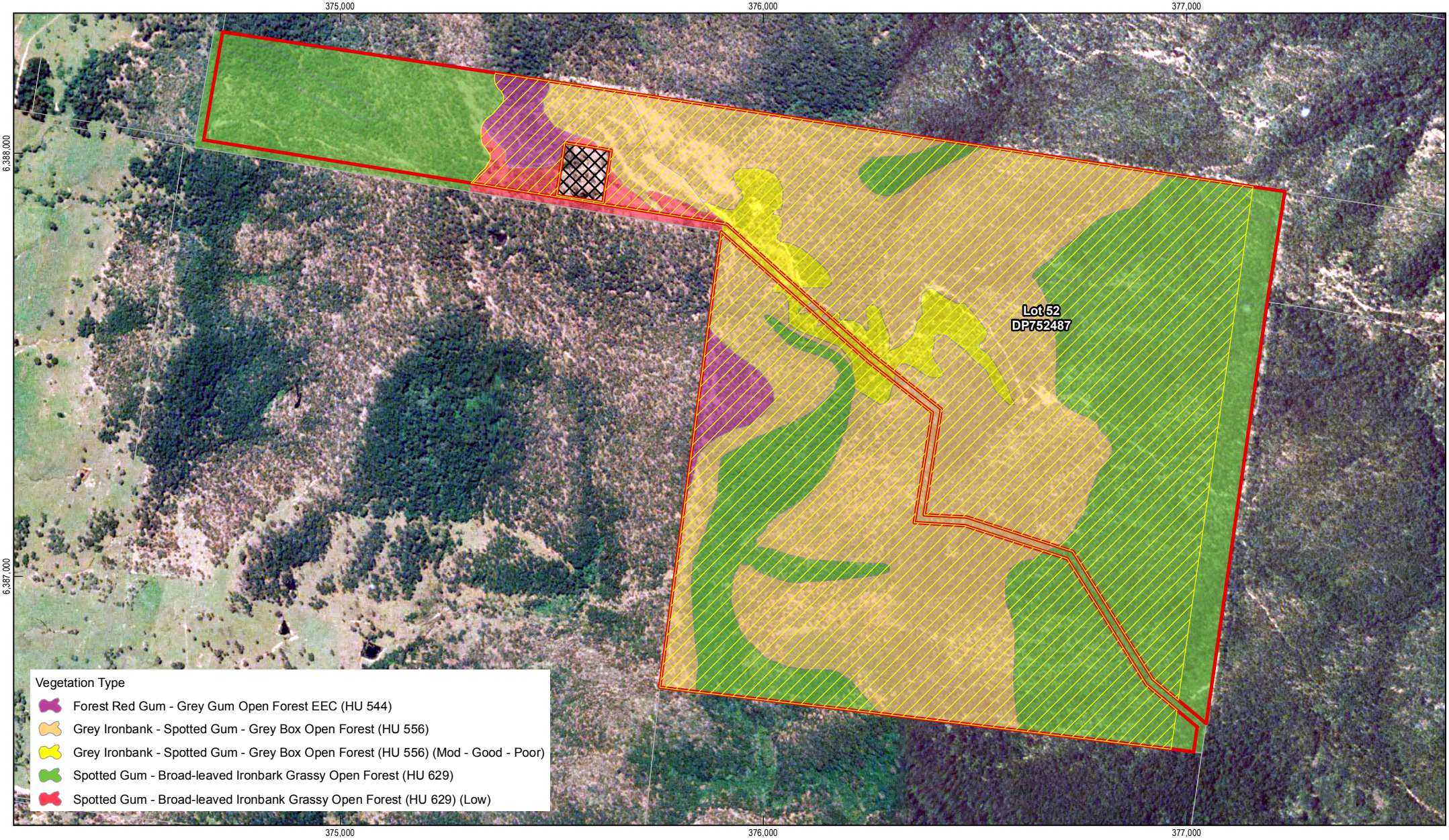
Shirbin Biobank
EPBC Offset Location

Figure 5

G:\22\1454501\Biodiversity Offsetting\Dunns Creek Site supporting info\GIS\Maps\Deliverables\DoSEWPaC\221510678_002_Shirbin_VegSurvey_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data Source: LPMA: Imagery - 2007, DCDB - 2007. Created by: fmackay, tmorton



1:12,000 (at A4)

0 40 80 160 240 320

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Garvey Biobank Site
- Cadastre
- Offset Location
- Potential House Location

Hunt8r ALLIANCE

Maitland to Minimbah Phase 1
Biodiversity Offsets Package

Job Number 22-15106-78
Revision 0
Date 30 Oct 2013

Garvey Biobank
EPBC Offset Location

Figure 6

G:\22\1454501\Biodiversity Offsetting\Dunns Creek Site supporting info\GIS\Maps\Deliverables\DoSEWPaC\221510678_001_Garvey_Offsets_0.mxd

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

Data Source: LPMA: Imagery - 2007, DCDB - 2007. Created by: fmackay, tmorton

Appendix C

Management Action Plan for Shirbin Biobank Site

BioBanking
Biodiversity Banking and Offsets Scheme

Instructions for completing the template for management actions

This template for management actions should be filled in by the landowner and submitted to OEH with an application to establish a biobank site. These standard words and format must be used for the management actions (refer to the *Guide to establishing a biobank site* for guidance).

OEH will review the management actions and plans and make any necessary amendments after consultation with the landowner. These management actions will be incorporated into the biobanking agreement as Annexure C.

There are four sections to this template:

1. standard management actions – mandatory
2. additional management actions – only if indicated by the assessment
3. standard management plans (weeds and fire for conservation) – mandatory
4. additional management plans (feral and overabundant herbivores and vertebrate pests) – only if indicated by the assessment.

An additional short section is also included in this template that requires the details of photo points for monitoring purposes. This information will be incorporated into the agreement as Annexure D.

Green boxes like this one provide instructions and examples and will be deleted by OEH before the biobanking agreement is processed.

Yellow highlighted fields need to be customised by the landowner. Usually the landowner needs to provide the information required; sometimes the landowner will need to delete or retain provided options. It is important to ensure that, especially where fields are customised, that the management actions are certain, clear and specific so that it is clear what the requirements of the actions are.

The format and wording of standard and additional management actions must not be changed. Enter site specific information into the yellow highlighted fields as required.

Management actions are divided into passive and active actions. Passive actions have little or no cost and include refraining from doing something, such as not removing fallen logs or bush rock. Passive management actions must be commenced as soon as the biobanking agreement is signed.

If a management action is active, you have to undertake specific activities to improve the site's biodiversity. Active management actions only need to be commenced when 80% of the Total Fund Deposit is met (ie from 'first payment date').

In the table below, the timing column indicates:

- passive actions by the term 'Ongoing from commencement date'
- active actions by a reference to 'Ongoing from first payment date'.

Managing grazing for conservation can be passive or active depending on the biobank site. For example, managing grazing for conservation is a passive management action if the biobank site is already suitably fenced, and it is an active management action if the biobank site needs to be fenced. Both options appear in the timing column and are highlighted yellow. Delete whichever option is not applicable.

Section 1: Standard management actions

Standard management actions		
Item 1	**Management of grazing for conservation**	**Timing**
1.1	Stock must not be permitted to graze in any area of the biobank site.	Ongoing
	If no grazing is to be allowed, replace the above item with: 'Stock must not be permitted to graze in any area of the biobank site.' Then delete the words in item 1.2 and 1.3 (but keep the numbering) and replace with: 'This item is not applicable'. The wording in the adjacent Timing column can also be deleted.	
1.2	This item is not applicable.	
	Insert any requirements specific to the site to accommodate local conditions and allow for flexibility in a framework of reasonable certainty. Delete 'Specific requirements:' if it is not relevant. The landowner can prevent stock from grazing or require stock to graze in specific areas by erecting and maintaining stockproof fencing. Fencing may be permanent or temporary (including electric fences). Indicate the specific type and length of fence to be erected and by when. Soil disturbance may be required (and is permitted) to encourage regeneration of native vegetation in conjunction with management of grazing for conservation.	
1.3	This item is not applicable.	
1.4	If, at any time, the landowner observes stock in any area of the biobank site, the landowner must take necessary measures to remove the stock from the area immediately. These measures include immediate repair to infrastructure, so that stock exclusion is maintained.	Ongoing
Item 2	**Weed control**	**Timing**
2.1	The landowner must implement and, at all relevant times, comply with, the integrated weed management plan included in Section 3 ('**the weed management plan'**) (or such updated integrated weed management plan as has been approved by the Director General under item 2.2 below). To allow for adaptive management, minor alterations can be made to the implementation of the weed management plan and recorded in writing. Minor alterations may include increasing or decreasing the number of sessions of weed control depending on the growth or the suppression of weeds as observed by the landowner. Other more significant alterations to the weed management plan ie. Stopping weed control in areas where weeds have been successfully supressed may need additional approval by OEH.	Ongoing from first payment date.

2.2	The weed management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. Those professionals who may be qualified to do so would be those who hold a Certificate IV or III in Conservation and Land Management (TAFE), The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review. Where the Director General determines from the review that an update of the plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and must cover the matters outlined below and any additional matters specified by the Director General in writing: • a description of the target weed/s at the biobank site and their location/s, linked to each management zone where weeds are present • the method/s of weed control in each zone – including works to be carried out, licensing requirements (ie. Chem Cert or Smart Train accredited) for chemical application and details of who will be carrying out the works. • the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species • the timing of any planting of native plant species required in each management zone to provide alternative habitat for native species affected by weed control activities • methods for monitoring the success of weed control activities • a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the *Noxious Weeds Act 1993*) • additional weed control activities to destroy or remove any new weed species that are found on the site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the weed management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	Ongoing from first payment date.

Item 3	Management of fire for conservation	Timing
3.1	The landowner must implement, and at all relevant times, comply with the fire management plan included in Section 3 (or such updated fire management plan as has been approved by the Director General under item 3.2 below) ('**the fire management plan")**. To allow for adaptive management and weather conditions, minor alterations can be made to the implementation of the fire management plan, and must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from first payment date.
3.2	The fire management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review. Where the Director General determines from the review that an update of the fire management plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and cover the matters outlined below and any additional matters specified by the Director General in writing: • the year the last fire went through, the type of fire and the extent of the fire and location, where known • frequency of natural fires in the area of the biobank site, where known • a description of locations and management zones where ecological burns will be conducted and areas that will not be burnt • the methods that will be used for ecological burns • the fire frequency intervals recommended for the vegetation types and threatened species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act 1997* to ensure minimum frequency between ecological burns • the fire intensity for the recommended vegetation types • the time of year suitable for ecological burns • the diary for recording actions taken in accordance with the fire management plan and minor alterations to fire management plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	Ongoing from first payment date.
3.3	Fires must not be lit on the biobank site other than for the purpose of ecological burning in accordance with the fire management plan or as permitted as a permissible human activity on the biobank site under item 4 of this Annexure or clause 3.6 of this agreement.	Ongoing from commencement date.

Item 4	Management of human disturbance	Timing
4.1	Except as permitted under clause 3 of this agreement or item 4.2 (below), human activities that adversely affect biodiversity values on the biobank site, including repeated disturbance of native animals, must not be carried out, or caused or permitted to be carried out, on the biobank site.	Ongoing from commencement date.
4.2	Human activities that may have a negative impact on biodiversity values on the biobank site are permitted if they are listed as permissible activities under clause 3.6 of this agreement or if they are undertaken as part of the management actions or management plans.	Ongoing from commencement date.
4.3	This item is not applicable. If there is no waste on the biobank site delete the words of this item (but retain the numbering) and replace with: 'This item is not applicable.'	
4.4	The landowner must not store, dispose of, or cause or permit to be disposed of, any waste , as defined under the *Protection of the Environment Operations Act 1997* (NSW) on the biobank site. Note: The storage or disposal of waste on the biobank site may require an approval under the *Protection of the Environment Operations Act* 1997.	Ongoing from commencement date.
4.5	The landowner must take all reasonable steps to remove waste deposited by others on the biobank site, or which is otherwise present on the biobank site. Steps considered reasonable by the landowner include: removing waste from site, and disposing of waste at appropriate waste transfer facilities. This is to be performed at no extra cost to the landowner.	Ongoing from first payment date.
4.6	Fencing and signage must be installed and maintained to deter human disturbance including waste dumping. Signage must be replaced if the writing or images on the sign are no longer clearly visible or are illegible. Signage must be the BioBanking signs available from the OEH. Specific requirements: The site borders private property on four sides. The property to the north and east of the Shirbin property has been nominated as a biobank site. Combining the two sites (although under a separate Biobanking agreement) will negate the necessity for fencing along the northern and eastern boundary of the Shirbin property and will serve to reduce fencing costs. Fencing is also required in several locations adjacent to restoration areas to prevent damage. Permanent fencing to prevent stock entry is to be erected and maintained as shown on the attached Management Zone plan (approximately 1,760m of new fencing and 1,200m of upgraded fencing and 1 gate). Fencing is to comprise suitable stockproof, post and wire fencing. Signage shall consist of one sign, a minimum of 600mm x 400mm. This shall be placed at the designated access point~~s~~ along the fence line (refer to Management Zones Plan for sign placement).	Ongoing from first payment date.

	Signage should be located at points of access and other practical locations interfacing with adjoining properties. For biobank sites that are located fully within a larger private landholding, there should be at least one BioBanking sign to be placed at the main access gate to the site. It is recommended that required signage be installed within 3 months of first payment date.	

Item 5	**Retention of regrowth and remnant native vegetation** Note: An approval under the *Native Vegetation Act 2003* may be required to carry out thinning or any other removal or damage to native vegetation under this item.	**Timing**
5.1	Native vegetation (whether remnant native vegetation or regrowth) on the biobank site must not be cut down, felled, thinned, logged, killed, destroyed, poisoned, ringbarked, uprooted, burnt or otherwise removed, except in accordance with item 5.2 below, or if it is required as part of the management actions or it is essential for the carrying out of permissible development under clause 3.5 of this agreement. Note: Native vegetation on the biobank site may be managed to improve biodiversity values by thinning to benchmark stem densities over no more than 80% of each management zone. Benchmark stem densities has the same meaning as defined in the Vegetation Benchmark Database as published by OEH and updated from time to time. An approval under the *Native Vegetation Act 2003* may be required to carry out thinning or any other removal or damage to native vegetation under this item.	Ongoing from commencement date.
5.2	Native vegetation on the biobank site must not be burnt except in accordance with the fire management plan prepared pursuant to item 3 above.	Ongoing from commencement date.
Item 6	**Replanting or supplementary planting where natural regeneration will not be sufficient**	**Timing**
6.1	This item is not applicable, as there is good potential for natural regeneration to occur. However, should natural regeneration not be sufficient to adequately revegetate these areas then a small contingency fund will be available to carry out supplementary plantings. It is recommended that the site be monitored for the first year after stock access has been completely restricted from the biobank site to estimate the natural resilience of the area.	Planting preferable in autumn or spring for best results.
	Include details regarding site treatment that must be undertaken before planting each area under the 'Specific requirements'. Planting or seeding is only required where natural regeneration is not sufficient to bring back native vegetation. Where no replanting is required, delete the words in every point of this item (but retain the numbering) and replace with: 'This item is not applicable.'	
6.2	As stated in Clause 1.1 stock must not be permitted to graze in any area of the biobank site.	Ongoing.
	If required, different years or heights for specific types of plants can be listed under 'Specific requirements'.	
6.3	Whilst the area is in a condition such that natural regeneration should take place, this growth will be monitored and should it be	Conduct surveys within 12 months of

	felt that natural regeneration is slow, supplementary plantings may be considered.	this area being fenced off to stock.
6.4	This item is not applicable.	
6.5	This item is not applicable.	

The planting schedule should be filled in including:

- **number of plants per area** – for tubestock, the number of plants should be rounded to the nearest 100 if there are more than 1,000 plants or to the nearest 10 if there are 1,000 plants or less; if direct seeding is used leave this field blank
- **planting method** – specify whether plants are to be tubestock, direct seeding or another method
- **timing** – describe as the number of months (or Year if relevant (ie Year 1, Year 2, etc)) for completion of planting from the first payment date.

6.6 Planting schedule at the biobank site

Species' common name	Species' scientific name	Management zone/s of planting	Number of plants per area	Planting method	Timing (months or Year)
		Zone 5 (1.88 ha)			
Canopy (20%)					Year 1
Forest Oak	*Allocasurina torulosa*		60	Tubestock /Hikko	Autumn/ Early Spring
Grey Myrtle	*Backhousia myrtifolia*		60	Tubestock /Hikko	Autumn/ Early Spring
Willow Bottlebrush	*Callistemon salignus*		60	Tubestock /Hikko	Autumn/ Early Spring
Spotted Gum	*Corymbia maculata*		60	Tubestock /Hikko	Autumn/ Early Spring
Forest Redgum	*Eucalpytus tereticornis*		60	Tubestock /Hikko	Autumn/ Early Spring
Grey Ironbark	*Eucalyptus siderophloira*		60	Tubestock /Hikko	Autumn/ Early Spring
Grey Gum	*Eucalyptus punctata*		60	Tubestock /Hikko	Autumn/ Early Spring

		subtotal	**420**		
Midstorey (40%)					
Hickory Wattle	*Acacia falcata*		350	Tubestock /Hikko	Autumn/ Early Spring
White Sally Wattle	*Acacia floribunda*		350	Tubestock /Hikko	Autumn/ Early Spring
Narrow-leaved Geebung	*Persoonia linearis*		350	Tubestock/Hikko	Autumn/ Early Spring
Prickly Leaved Tea Tree	*Melaleuca styphelioides*		350	Tubestock /Hikko	Autumn/ Early Spring
		subtotal	**1,400**		
Understorey (40%)					
Blue Flax Lily	*Dianella caerulea*		750	Tubestock /Hikko	Autumn/ Early Spring
Purple Coral Pea	*Hardenbergia violacea*		750	Tubestock /Hikko	Autumn/ Early Spring
Australian Indigo	*Indigofera australis*		750	Tubestock /Hikko	Autumn/ Early Spring
Spiny-headed Mat-rush	*Lomandra longifolia*		750	Tubestock /Hikko	Autumn/ Early Spring
		subtotal	**3,000**		

Item 7	Retention of dead timber	Timing
7.1	Dead timber (whether standing or fallen and including branches and leaf litter) must not be removed from or moved within the biobank site except for the personal (non-commercial) use by the landowner for firewood for one dwelling only or for repair of fencing (not for construction of fencing). Dead timber used for fencing repair must be documented by the landowner in writing and records must be kept in accordance with the record keeping requirements. The landowner must record the approximate amount of dead timber collected from the biobank site for use in fencing, the location that that dead timber was collected from and the date it was collected (month, year).	Ongoing from commencement date.
7.2	Timber from outside the biobank site may be introduced to and placed on the biobank site to improve biodiversity values. Once the timber has been brought onto the site, it is subject to the requirements of item 7.1 above. Timber brought from outside the biobank site must be documented by the landowner in writing and records must be kept in accordance with the record keeping requirements. The landowner must record the approximate amount of timber brought from outside the biobank site, the location where the timber was placed on the biobank site and the date on which it was placed (month, year).	When required but not required before the first payment date.
Item 8	**Erosion control**	**Timing**
8.1	All reasonable steps must be undertaken to prevent, control and remedy erosion on the biobank site.	Commencing from first payment date.
	If there is no existing erosion, delete the last paragraph.	

Item 9	Retention of rocks	Timing
9.1	The landowner must not remove, or cause or permit to be removed, rocks from the biobank site or move, or cause or permit to be moved, rocks within the biobank site.	Ongoing from commencement date.
9.2	Rocks from outside the site may be placed on the biobank site to improve habitat for threatened species. Rocks, once placed on the biobank site, are subject to item 9.1 above. The landowner must make and retain records of the location of the rocks placed on the site and the date the rocks were brought onto the site in accordance with the record keeping requirements.	When required but not required before the first payment date.

Section 2: Additional management actions

Additional management actions should only be completed when they are required for creating ecosystem credits or species credits. This will be stated on the Biobanking Agreement Credit Report.

Complete the required fields for any additional management actions required for your site. Leave all other additional management actions and OEH will delete them before including this section in your draft biobanking agreement.

Additional management actions		
Item 10	**Control of feral and overabundant native herbivores**	**Timing**
10.1	The landowner must implement, and at all relevant times, comply with the management plan to control feral and overabundant native herbivores included in Section 4 (or such updated management plan as has been approved by the Director General under item 10.2 below) ('**the feral and overabundant native herbivores management plan**'). To allow for adaptive management, minor alterations can be made to the implementation of the feral and overabundant native herbivores management plan, which must be recorded in writing in accordance with Section 3 of this Annexure. Note: A licence under Section 121 of the *National Parks and Wildlife Act 1974* may be required to control overabundant native herbivores.	Ongoing from first payment date.
10.2	The feral and overabundant native herbivores management plan must be reviewed at intervals of no less than 4 years and no more than 6 years. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review. Where the Director General determines from the review that an update of the feral and overabundant native herbivores management plan is required, the Director General will notify the landowner in writing that an update of the plan is required and the landowner must update the plan and submit the amended plan to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Director General in writing: • a description of the feral or overabundant native herbivore/s • consideration of relevant current OEH and other pest management programs and methods • the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best practice management	Ongoing from first payment date.

	• the frequency and timing of the control actions in each management zone • methods for monitoring the success of the pest control actions • a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the biobank site • additional control actions to destroy or remove any new feral and overabundant native herbivore pest species that occur on site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the feral and overabundant native herbivores management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	
Item 11	**Vertebrate pest management – Rabbits and Foxes**	**Timing**
11.1	The landowner must implement, and at all relevant times, comply with the vertebrate pest management plan included in Section 4 (or such updated vertebrate pest management plan as has been approved by the Director General under item 11.2 below) ('**the vertebrate pest management plan**'). To allow for adaptive management, minor alterations can be made to the implementation of the vertebrate pest management plan, but these must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from first payment date.
11.2	The vertebrate pest management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the review commencement must be provided to the Director General in writing within 14 days of the commencement. The findings of the review must be submitted to the Director General within 3 months of commencing the review. Where the Director General determines from the review that an update of the plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Director General in writing: • a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats • consideration of relevant current OEH and other pest management programs • the method/s of vertebrate pest control in each management zone determined in accordance with best management practice • the frequency and timing of vertebrate pest control actions in each management zone	Ongoing from first payment date.

	• methods for monitoring the success of vertebrate pest control actions • a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the biobank site • additional vertebrate pest control actions to destroy or remove any new vertebrate pest species that occur on-site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary.	
Item 12	**Nutrient control**	**Timing**
12.1	Fertilisers, pesticides and herbicides must not be applied on the biobank site, except where required to undertake the management actions. Use of fertilisers for establishing native vegetation through planting or seeding, use of herbicides for controlling weeds or use of pesticides for controlling vertebrate pests or feral herbivores can be undertaken in accordance with best practice management when required to undertake the management actions.	Ongoing from commencement date.
Item 13	**Control of exotic fish species**	**Timing**
13.1	This clause is not applicable.	
Item 14	**Maintenance or reintroduction of natural flow regimes**	**Timing**
14.1	This clause is not applicable.	
14.2	This clause is not applicable.	
14.3	Artificial structures such as dams or levee banks that impede the natural flow regimes on the biobank site must not be constructed unless approved by the Director General in writing for the purpose of restoring natural flows.	Ongoing from commencement date.

Section 3: Standard management plans

Completing the compulsory weed management plan

A table is provided below for the integrated weed management plan. Add additional sections to the table if required.

The plan must include, but is not limited to:

- a description of the target weed/s at the biobank site and their location/s, linked to each management zone where weeds are present
- the method/s of weed control in each management zone
- the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species
- the timing of any planting of native plant species required in each management zone to provide alternative habitat for native species affected by weed control activities
- methods for monitoring weed control activities
- reporting and assessing the results from monitoring
- a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the *Noxious Weeds Act 1993*)
- a diary for recording actions taken in accordance with the integrated weed management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.

When the management plan is reviewed (see item 2.2), weed control activities may be amended, deleted or added to take into account the weed species on the site at that time.

Weed management plan

The weed types, description and location (management zone/s) of weed infestations existing at the commencement date are listed in the weed management plan. The methods of weed control (management actions), monitoring and inspections are also listed.

The landowner must perform the methods of weed control and other weed management activities and monitoring in the weed management plan by the methods described (and in accordance with item 2 of this Annexure) for all weeds. The methods of control will apply to the weeds listed in the table below as well as any other weeds that may be present on the site from time to time.

The template for reporting of monitoring activities and the diary template for weed control management must be filled in to record observations during the implementation of the weed management plan, including any minor variations.

Weed types

Weed	Common name of target weed	Scientific name of target weed	Description of infestation (eg intensity (% cover) & location within zone)	Management zone/s

A	Cobblers Peg	*Bidens pilosa*	Light infestation. Located primarily within the cleared areas and along the cleared tracks.	1,2,4
B	Lantana	*Lantana camara*	Low to moderate infestations of lantana throughout most zones with heavy infestation throughout Zone 3.	All Zones
C	African Olive	*Olea europaea* subsp. *cuspidata*	Light infestation. Located primarily within the cleared areas and along the cleared tracks. African Olive heavier infestation in Zone 3.	1,2,3,4
D	Fireweed	*Senecio madagascariensis*	Light infestation. Located primarily within the cleared areas and along the cleared tracks.	1,2,4
E	Whiskey Grass	*Andropogon virginicus*	Light infestation throughout site.	1,2,4
F	Spear Thistle	*Cirsium vulgare*	Light infestation throughout site.	1,2,4
G	Purpletop	*Verbena bonariensis*	Light infestation throughout site.	1,2,4
H	Narrow-leaved Carpet Grass	*Axonopus fissifolius*	Light infestation throughout site.	1,2,4

Methods of weed control

Management zone/s	**Weed/s**	**Method of weed control**	**Frequency** (months or Year)
3	C	Intensive, targeted weed control to be carried out by qualified contractors and machinery. Methods will include: - cut and paint (using glyphosate) - machinery may include chainsaws for larger stands of African Olive - pulling/crowning of weeds This program runs concurrently with the intensive weed control of Lantana in Zone 3. Costs for intensive weed control of these two types of weeds are shared for the first year.	Intensive weed control throughout the first year which involves 3 days per week for team of two for approximately 14 weeks, throughout fruiting/flowering period (generally spring/early summer). Ongoing maintenance included in the targeted follow-up weed control throughout years 2 to 5 inclusive.
3	B	Intensive, targeted weed control to be carried out by qualified contractors and machinery. Methods will include: - using car mounted spray unit to drive into large areas	Intensive weed control throughout the first year which involves 3 days per

		of infestation and spray with undiluted glyphosate or mix of Garlon® and diesel at flowering/fruiting stage, when most effective. - cut and paint crown/lignotuber with undiluted glyphosate or Garlon and diesel immediately for isolated plants or smaller areas of infestation. This program runs concurrently with the intensive weed control of African Olive in Zone 3. Costs for intensive weed control of these two types of weeds are shared for the first year.	week for team of two for approximately 14 weeks, throughout fruiting/flowering period (generally spring/early summer). Ongoing maintenance included in the targeted follow-up weed control throughout years 2 to 5 inclusive.
All zones, with particular attention given to zones 2 and 3.	C,B	Intensive, targeted follow-up weed control to be carried out by qualified contractors and machinery. Methods will include: - cut and paint (using glyphosate) - spot spraying of scattered Lantana. - machinery may include chainsaws for larger stands of Blackberry and/or African Olive. - 'back pack' spraying using Grazon® (or similar) or glyphosate.	Six sessions per year, for a team of two for four years from the second year. Ongoing management to be included in bush regeneration sessions * Two days per session.
1,2,4	All Weeds	Ongoing bush regeneration activities to be carried out by qualified contractors. Methods will include: - pulling/crowning of weeds. - follow up spraying in large areas of previous infestations. - spot spraying of scattered Lantana, Spear Thistle and Purpletop.	Six sessions per year in the initial three years. Ongoing management to reduce to two sessions annually from years 4 to 6 inclusive, then 1 session per year in perpetuity. * Two days per session.

Native planting required to provide habitat for native species affected by weed control activities

Management zone	**Description of planting required** (reference planting schedule at item 6.6)	**Timing**
3	Locally dense infestations of Lantana may be providing refuge/shelter and foraging substrate for small native birds. Targeted and staged removal to allow for relocation of small native birds and for natural regeneration to take place.	Commencing at the completion of weed control activities described above.

Monitoring and inspections of existing and new weeds			
Management zone/s	**Weed/s**	**Method of monitoring**	**Date/s required**
All	C, D	A monitoring and evaluation program to address weed regrowth and control measures will be undertaken annually by the landholder through the set-up of fixed photo-points across all restoration zones. Photos should be taken by digital camera and recorded in the project file by date and discrete photo-point number. Photo-point locations should be clearly marked on site and/or recorded using a GPS. The photo-point monitoring will be augmented by a completion of a weed management log (included below) describing actions and observations. The photographic records and observations log will completed by the landholder and provided to OEH on an annual basis.	Annually
All	All	Condition mapping (floristic and habitat field survey assessment) to determine vegetation quality and ecological condition. This will be provided to OEH on an annual basis.	Five-yearly by an independent botanical consultant.

Other weed management activities (where required)
In areas where exotic pasture grasses such as Whiskey Grass (*Andropogon virginicus) and, Narrow-leaved Carpet Grass* (*Axonopus fissifolius)* have colonised it is assumed natural regeneration will increase competition on exotic species and they will reduce their occurrence across the site. This is considered the most effective treatment of these weeds as they occur across the site and treating these weeds by hand would be very time consuming and costly to the landholder.

Template for reporting of monitoring activities		
Management zone/s	**Date**	**Observations and assessment of monitoring** This table must include the information for each zone (or groups of zones) which is described in the table titled 'monitoring and inspections of existing and new weeds'.

Diary template for weed control management			
Date	**Management zone/s**	**Description and type of activity undertaken** (e.g. weed control, observation)	**Minor variations** (details and reasons)

Completing the compulsory fire for conservation management plan

A table is provided below for the fire conservation management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a map of the vegetation on the biobank site (with date) and any infrastructure and built assets on the biobank site (the map to be included in the biobanking agreement)
- the year the last fire went through, the type of fire and the extent of the fire and location, where known
- frequency of natural fires in the area of the biobank site, where known
- a description of locations and management zones where ecological burns will be conducted and areas that will not be burnt
- the methods that will be used for ecological burns
- the fire frequency intervals recommended for the vegetation types and threatened species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act 1997* to ensure minimum frequency between ecological burns
- the fire intensity for the recommended vegetation types
- the time of year suitable for ecological burns
- methods for monitoring the outcomes of ecological burns
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the fire management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary in accordance with the record keeping requirements.

Fire for conservation management plan

The plan includes information on all known previous fire events in the 'Fire history' table to demonstrate local fire conditions including intensity and frequency.

The ecological fire requirements for each vegetation type or threatened species on the biobank site are listed in the 'Fire requirements for vegetation types and threatened species' table. These are the fire frequency intervals recommended for the vegetation types and threatened species present on the biobank site. They include any requirement adjustments to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act (RFA) 1997* to ensure the minimum frequencies between ecological burns.

The landowner must carry out ecological burns for each management zone according to the method and frequency described (as informed by the history and requirements sections and in accordance with Section 3 of this annexure). These actions are set out in the 'Ecological burning actions table'. Monitoring and inspections (set out in the 'Fire management monitoring' table) as described must also be implemented. The landowner must also carry out the actions listed in the 'Other fire management activities' table.

The table titled 'Template of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. The landowner must also complete the table titled 'Diary template for fire management activities' to record the management actions undertaken or observations made, including any minor variations.

Fire history for previous 20 years (or longer if known)

Year of fire	Hazard reduction, wildfire or ecological burn and extent of fire	Management zone/s

	Information not known.	

Fire requirements for vegetation types and threatened species

Vegetation type and/or threatened species	Fire frequency required	Time of year for burning	Fire intensity required	Adjustment required due to wildfires or RFA activities
Dry - Open Forest and Woodland	Greater than 8 years, less than 25 years	April to September	Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	In the event that wildfires did not occur for more than 15 years on the property, a prescribed ecological burn would be conducted.
Dry Rainforest	Greater than 15 years, less than 20 years.	April to September	Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	

Ecological burning actions

Management zone/s	Actions	Supervision & extinguishing techniques	Time of year for burning	Frequency (years)
All (excluding riparian zone and Dry Rainforest).	- Consult local Rural Fire Service, Catchment Management Authority (CMA) or local council for advice on whether an approval for burning native vegetation is required and how to obtain an approval. - Burning standing native vegetation is considered 'clearing' under the *Native Vegetation Act 2003* and the CMA will need to determine whether the burn triggers the need for an approval. -The potential impact of the proposed burn on native vegetation, biodiversity,	Rural Fire Service to be present for protection and advice. Asset protection lines to be installed where required	April to September	15 years from the date of the previous ecological burn or a wildfire occurring on the property

	waterways or important cultural heritage sites will be accessed. - Rural Fire Service to be consulted prior to the burn to determine appropriate regime. - Publications such as NSW RFS publication *Standards for Low Intensity Bushfire Hazard Reduction Burning or NSW RFS publication Standards for Pile Burning* should be obtained and read prior to burns.			

Methods for monitoring the outcomes of ecological burns

Management zone/s	Method of monitoring	Date/s required
All (excluding riparian zone and Dry Rainforest).	Visual auditing and noting of observations in a diary record (template provided below).	All
All (excluding riparian zone and Dry Rainforest).	Condition mapping (floristic and habitat field survey assessment) to determine vegetation quality and ecological condition.	All

Other fire management activities (where required)

An appropriate Asset Protection Zone should be identified and maintained around the existing dwelling. Vegetation in this zone should be inspected annually in July/August and maintenance works implemented as necessary before the commencement of the prescribed Bushfire Danger Period – (1 st October to 31 st March or otherwise determined).

Surrounding residents should be notified 1 month prior to an ecological burn occurring.

All existing access tracks should be maintained for ecological burns.

Template for reporting of monitoring activities

Management zone/s	Date	Observations and assessment of monitoring

Diary template for fire management activities			
Date	**Management zone/s**	**Description of activity undertaken or observation made**	**Minor variations** (details and reasons)

Section 4: Additional management plans

If required, complete this control of feral and overabundant native herbivores management plan

A table is provided below for the management plan to control feral and overabundant native herbivores. Add additional sections to the table if required. The plan must include, but is not limited to:

- a description of the feral or overabundant native herbivore/s
- consideration of relevant current OEH and other pest management programs and methods
- the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best practice management
- the frequency and timing of the control actions in each management zone
- methods for monitoring the success of the pest control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the biobank site
- a diary for recording actions taken in accordance with the management plan to control feral and overabundant native herbivores and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.

When the management plan is reviewed (see item 10.2 in Section 1), control activities may be amended, deleted or added to take into account the feral and overabundant native herbivore on the site at the time.

Management plan to control feral and overabundant native herbivores

The management plan for feral and overabundant native herbivores includes information on the management requirements for the feral and overabundant native herbivores at the biobank site listed in the 'Feral and overabundant native herbivores' table. The possible methods of control for each species, used by OEH and other pest management programs, are listed and the suitability of each method is described in the 'Methods considered' table.

The landowner must carry out the methods for control for feral and overabundant native herbivores for each management zone according to the method and frequency as described in the 'Methods for control' table. The methods of control applied to the feral or overabundant native herbivores listed in the 'Feral or overabundant native herbivores' table as well as any other feral or overabundant herbivores that may be present on the site from time to time.

Monitoring and inspections of existing and new feral and overabundant herbivores at the biobank site as described in the 'Monitoring and inspections' table must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of the monitoring activities. The landowners must complete the table titled 'Diary template for feral and overabundant herbivore management' to record the management actions undertaken including any minor variations or observations made.

Feral and overabundant native herbivores

Feral	Name of feral/overabundant	Description of extent	Management

type	native herbivore		zone/s
A	Rabbit	Known to occur on site. Previous sightings by properties owner and results of desktop analysis (NPWS Wildlife Atlas). Evidence of rabbits in the south-western corner during fieldwork investigations.	Throughout property, although specific not known.
B			
C			
D			
E			

Methods considered

Feral type	Name and description of program or method	Describe suitability
A	Monitored and controlled as necessary in accordance with the Rabbit control programs administered by the NPWS. The methods considered include: • Active shooting • Gassing of warrens • Baiting program • Trapping program	All techniques deemed suitable. Shooting was considered appropriate due to the site being isolated from urban areas. Shooting to control feral animals has occurred on the property in the past.

Methods of control

Management zone/s	Feral type	Method of control	Frequency and timing
All	A	Baiting and/or active trapping are considered the most appropriate control methods as the level of rabbit infestation appears low. Professional shooting Warrens may also be treated (via gassing) if located on the site. Possible locations will include the south-western corner as evidenced during fieldwork investigations.	Ongoing

Monitoring and inspections

Management zone/s	Feral type/s	Method of monitoring	Date/s required
All	A	Monitoring survey (15 minute random meander through each Management Zone, to score rabbit abundance by noting the density of rabbit faeces) in accordance with the Rapid Assessment Technique (Cooke et al, 2008).	Ongoing

Other management activities (where required)

Template for reporting of monitoring activities

Management zone/s	Date	Current level of impact on vegetation This column must record impact as Negligible, Minimal, Moderate or High	Observations and assessment of monitoring

Diary template for feral and overabundant herbivore management

Date of activity	Management zone/s	Description and type of activity undertaken This column must include details of the feral and overabundant herbivores targeted, control techniques applied and numbers controlled.	Minor variations (details and reasons)

If required, complete this vertebrate pest management plan

A table is provided below for the vertebrate pest management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats
- consideration of relevant current OEH and other pest management programs
- the method/s of vertebrate pest control in each management zone determined in accordance with best management practice
- the frequency and timing of vertebrate pest control actions in each management zone
- methods for monitoring the success of vertebrate pest control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the biobank site
- a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary in accordance with the requirements.

All pest species identified as requiring management on a biobank site must be included in the vertebrate pest management plan.

Separate management plans can be developed for each pest species.

When the management plan is reviewed (see item 11.2 in Section 1), control activities may be amended, deleted or added to take into account vertebrate pest species found on the site at that time.

Vertebrate pest management plan

The management plan for vertebrate pests includes information on the vertebrate pests and their extent existing at the time of the agreement as listed in the 'Vertebrate pests' table. The possible methods of control for each species, used by OEH and other pest management programs are listed and the suitability of each method to the biobank site is described in the 'Methods considered' table.

The landowner must carry out the methods for vertebrate pest control for each management zone according to the method and frequency described in the 'Methods of control' table, The methods of control will apply to the vertebrate pests listed in the 'Vertebrate pests' table as well as any other vertebrate pests that may be present on the site from time to time.

Monitoring and inspections of existing and new vertebrate pests on the biobank site, as described in the 'Monitoring and inspections' table, must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. The landowner must also complete the 'Diary template for vertebrate pest management' to record the management actions undertaken, including any minor variations, and observations made.

Vertebrate pests

Pest	Name of vertebrate pest (e.g. pig, fox, goat, dog)	Description of extent	Management zone/s
A	Fox and/or wild dogs	Known to occur on site. Previous sightings by properties owner and results of desktop	Throughout, property,

		analysis (NPWS Wildlife Atlas).	although specific not known.

Methods considered

Pest type	Name and description of program or method	Describe suitability
A	Monitored and controlled in accordance with strategies outlined in; - Best-practice guidelines for fox control contained within the Predation by the red fox - threat abatement plan (OEH, 2001). The methods considered include: • Baiting • Active shooting	Shooting considered appropriate due to the site being isolated from urban areas. Shooting to control feral animals has occurred on the property in the past. Baiting not considered suitable due to potential indirect impacts to native fauna.

Methods of control

Management zone/s	Pest type	Method of control	Frequency and timing
All	A	Professional shooting	Ongoing commencing no later than the date the balance in the biobank site account is equal to or greater than 80% of the Total Fund Deposit for the first time.

Monitoring and inspections of existing and new vertebrate pests

Management zone/s	Pest type/s	Method of monitoring	Date/s required
All	All	All sightings of feral animals by the landholder are to be recorded in monitoring log, and include the date, the location and the number of animals sighted and any damage noted. Monitoring of damage is essential and can include information on the size of the affected area and feral animal induced impacts.	Ongoing
All	A	Annual spotlight survey of vehicle accessible tracks and fire trails noting number of foxes identified. This survey can be conducted by the landholder.	Ongoing

Other management activities (where required)

Records will be kept of opportunistic pest animal sightings by the landholder in the “Diary template for vertebrate pest management” included below. These records will be submitted to OEH annually for review and discussion of suitable control methods to be employed.

Template for reporting of monitoring activities			
Management zone/s	**Date**	**Current level of impact on vegetation or threatened fauna species** This column must record impact as Negligible, Minimal, Moderate or High	**Observations and assessment of monitoring**

Diary template for vertebrate pest management			
Date of activity	**Management zone/s**	**Description and type of activity undertaken** This column must include details of the vertebrate pests targeted, control techniques applied and numbers controlled.	**Minor variations** (details and reasons)

Photo points

This section of the management actions template is not part of *Annexure C: Management actions* but is required for *Annexure D* of the biobanking agreement which requires information relating to the placement of photo points for monitoring purposes. Fill in the table below so that this information can be included in the appropriate format in the final agreement. A map of the photo point locations is also required to be submitted.

Photo points should be positioned in areas that are likely to show change over time. Some plot locations can be used as photo points but many plot locations (especially in vegetated areas already in very good condition) may not show any change over time. Locate photo points where there will be changes because of management actions such as areas currently in low to moderate

condition, targeted for revegetation and/or intensive weed control.

Photos are required to be taken every 12 months at the same location, direction, height and time of day.

Annexure D: Monitoring, reporting and record keeping requirements

1 Monitoring requirements

1.1 The landowner must ensure that photographs are taken at photo-points at each of the locations and in the direction identified in the table below titled 'Locations of plots and photo points' within 12 months of the commencement date and then at least every 12 months thereafter.

1.2 The photo points are identified on the map entitled Shirbin biobank Photo Points map in Annexure A of this agreement. The purpose of the photographs is to show changes over time. Photographs should be taken at approximately the same direction, location, height and time of day (during daylight hours) in each reporting period (as defined in item 2.2 of this Annexure D) and retained for the life of this agreement. All photographs must be dated, stating the direction in which they were taken and identified with their locations.

Locations of photo points			
Projected coordinate system: (details included in spread sheet attached)			
Photo point reference	Easting	Northing	Direction of photo (magnetic degrees)

Appendix D

Management Action Plan for Garvey Biobank Site

BioBanking
Biodiversity Banking and Offsets Scheme

Instructions for completing the template for management actions

This template for management actions should be filled in by the landowner and submitted to OEH with an application to establish a biobank site. These standard words and format must be used for the management actions (refer to the *Guide to establishing a biobank site* for guidance).

OEH will review the management actions and plans and make any necessary amendments after consultation with the landowner. These management actions will be incorporated into the biobanking agreement as Annexure C.

There are four sections to this template:

1. standard management actions – mandatory
2. additional management actions – only if indicated by the assessment
3. standard management plans (weeds and fire for conservation) – mandatory
4. additional management plans (feral and overabundant herbivores and vertebrate pests) – only if indicated by the assessment.

An additional short section is also included in this template that requires the details of photo points for monitoring purposes. This information will be incorporated into the agreement as Annexure D.

Green boxes like this one provide instructions and examples and will be deleted by OEH before the biobanking agreement is processed.

Yellow highlighted fields need to be customised by the landowner. Usually the landowner needs to provide the information required; sometimes the landowner will need to delete or retain provided options. It is important to ensure that, especially where fields are customised, that the management actions are certain, clear and specific so that it is clear what the requirements of the actions are.

The format and wording of standard and additional management actions must not be changed. Enter site specific information into the yellow highlighted fields as required.

Management actions are divided into passive and active actions. Passive actions have little or no cost and include refraining from doing something, such as not removing fallen logs or bush rock. Passive management actions must be commenced as soon as the biobanking agreement is signed.

If a management action is active, you have to undertake specific activities to improve the site's biodiversity. Active management actions only need to be commenced when 80% of the Total Fund Deposit is met (ie from 'first payment date').

In the table below, the timing column indicates:

- passive actions by the term 'Ongoing from commencement date'
- active actions by a reference to 'Ongoing from first payment date'.

Managing grazing for conservation can be passive or active depending on the biobank site. For example, managing grazing for conservation is a passive management action if the biobank site is already suitably fenced, and it is an active management action if the biobank site needs to be fenced. Both options appear in the timing column and are highlighted yellow. Delete whichever option is not applicable.

Section 1: Standard management actions

Standard management actions		
Item 1	**Management of grazing for conservation**	**Timing**
1.1	Stock must not be permitted to graze in any area of the biobank site.	Ongoing
	If no grazing is to be allowed, replace the above item with: 'Stock must not be permitted to graze in any area of the biobank site.' Then delete the words in item 1.2 and 1.3 (but keep the numbering) and replace with: 'This item is not applicable'. The wording in the adjacent Timing column can also be deleted.	
1.2	This item is not applicable.	
	Insert any requirements specific to the site to accommodate local conditions and allow for flexibility in a framework of reasonable certainty. Delete 'Specific requirements:' if it is not relevant. The landowner can prevent stock from grazing or require stock to graze in specific areas by erecting and maintaining stockproof fencing. Fencing may be permanent or temporary (including electric fences). Indicate the specific type and length of fence to be erected and by when. Soil disturbance may be required (and is permitted) to encourage regeneration of native vegetation in conjunction with management of grazing for conservation.	
1.3	This item is not applicable.	
1.4	If, at any time, the landowner observes stock in any area of the biobank site the landowner must take necessary measures to remove the stock from the area immediately. These measures include immediate repair to infrastructure, so that stock exclusion is maintained.	Ongoing
Item 2	**Weed control**	**Timing**
2.1	The landowner must implement and, at all relevant times, comply with, the integrated weed management plan included in Section 3 ('**the weed management plan**') (or such updated integrated weed management plan as has been approved by the Director General under item 2.2 below). To allow for adaptive management, minor alterations can be made to the implementation of the weed management plan. Any alterations must be recorded in writing in accordance with Section 3 of this Annexure. Minor alterations may include increasing or decreasing the number of sessions of weed control depending on the growth or the suppression of weeds as observed by the landowner. Other more significant alterations to the weed management plan ie. Stopping weed control in areas where weeds have been successfully supressed may need additional approval by OEH.	Ongoing from first payment date.

2.2	The weed management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. Those professionals who may be qualified to do so would be those who hold a Certificate IV or III in Conservation and Land Management (TAFE), The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review. Where the Director General determines from the review that an update of the plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and must cover the matters outlined below and any additional matters specified by the Director General in writing: • a description of the target weed/s at the biobank site and their location/s, linked to each management zone where weeds are present • the method/s of weed control in each zone– including works to be carried out, licensing requirements (ie. Chem Cert or Smart Train accredited) for chemical application and details of who will be carrying out the works. • the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species • the timing of any planting of native plant species required in each management zone to provide alternative habitat for native species affected by weed control activities • methods for monitoring the success of weed control activities • a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the *Noxious Weeds Act 1993*) • additional weed control activities to destroy or remove any new weed species that are found on the site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the weed management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	Ongoing from first payment date.

Item 3	Management of fire for conservation	Timing
3.1	The landowner must implement, and at all relevant times, comply with the fire management plan included in Section 3 (or such updated fire management plan as has been approved by the Director General under item 3.2 below) ('**the fire management plan")**. To allow for adaptive management and weather conditions, minor alterations can be made to the implementation of the fire management plan, and must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from first payment date.
3.2	The fire management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review. Where the Director General determines from the review that an update of the fire management plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must be prepared by an appropriately qualified person and cover the matters outlined below and any additional matters specified by the Director General in writing: • the year the last fire went through, the type of fire and the extent of the fire and location, where known • frequency of natural fires in the area of the biobank site, where known • a description of locations and management zones where ecological burns will be conducted and areas that will not be burnt • the methods that will be used for ecological burns • the fire frequency intervals recommended for the vegetation types and threatened species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act 1997* to ensure minimum frequency between ecological burns • the fire intensity for the recommended vegetation types • the time of year suitable for ecological burns • the diary for recording actions taken in accordance with the fire management plan and minor alterations to fire management plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	Ongoing from first payment date.
3.3	Fires must not be lit on the biobank site other than for the purpose of ecological burning in accordance with the fire management plan or as permitted as a permissible human activity on the biobank site under item 4 of this Annexure or clause 3.6 of this agreement.	Ongoing from commencement date.

Item 4	Management of human disturbance	Timing
4.1	Except as permitted under clause 3 of this agreement or item 4.2 (below), human activities that adversely affect biodiversity values on the biobank site, including repeated disturbance of native animals, must not be carried out, or caused or permitted to be carried out, on the biobank site.	Ongoing from commencement date.
4.2	Human activities that may have a negative impact on biodiversity values on the biobank site are permitted if they are listed as permissible activities under clause 3.6 of this agreement or if they are undertaken as part of the management actions or management plans.	Ongoing from commencement date.
4.3	This item is not applicable. If there is no waste on the biobank site delete the words of this item (but retain the numbering) and replace with: 'This item is not applicable.'	
4.4	The landowner must not store, dispose of, or cause or permit to be disposed of, any waste , as defined under the *Protection of the Environment Operations Act 1997* (NSW) on the biobank site. Note: The storage or disposal of waste on the biobank site may require an approval under the *Protection of the Environment Operations Act* 1997.	Ongoing from commencement date.
4.5	The landowner must take all reasonable steps to remove waste deposited by others on the biobank site, or which is otherwise present on the biobank site. Steps considered reasonable by the landowner include: removing waste from site, and disposing of waste at appropriate waste transfer facilities. This is to be performed at no extra cost to the landowner.	Ongoing from first payment date.
4.6	Fencing and signage must be installed and maintained to deter human disturbance including waste dumping. Signage must be replaced if the writing or images on the sign are no longer clearly visible or are illegible. Signage must be the BioBanking signs available from the OEH. The site borders private property on four sides. The property to the south and west of the Garvey property has been nominated as a biobank site. Combining the two sites (although under a separate Biobanking agreement) will negate the necessity for fencing along a section of the southern and the western boundary of the Garvey property and will serve to reduce fencing costs. Specific Requirements: Permanent fencing to prevent stock entry is to be erected around the perimeter of the property and maintained as shown on the attached Management Zones plan (approximately 4,000 m of new fencing and 1,200 m of upgraded fencing and 2 gates). Fencing is to comprise suitable stockproof, post and wire fencing. Signage shall consist of two signs, of a minimum of 600mm x 400mm. These shall be placed at the designated access points along the fence line (refer to Management Zones Plan attached for sign placement).	Ongoing from first payment date.

	Signage should be located at points of access and other practical locations interfacing with adjoining properties. For biobank sites that are located fully within a larger private landholding, there should be at least one BioBanking sign to be placed at the main access gate to the site. It is recommended that required signage be installed within 3 months of first payment date.	

Item 5	**Retention of regrowth and remnant native vegetation** Note: An approval under the *Native Vegetation Act 2003* may be required to carry out thinning or any other removal or damage to native vegetation under this item.	**Timing**
5.1	Native vegetation (whether remnant native vegetation or regrowth) on the biobank site must not be cut down, felled, thinned, logged, killed, destroyed, poisoned, ringbarked, uprooted, burnt or otherwise removed, except in accordance with item 5.2 below, or if it is required as part of the management actions or it is essential for the carrying out of permissible development under clause 3.5 of this agreement. Note: Native vegetation on the biobank site may be managed to improve biodiversity values by thinning to benchmark stem densities over no more than 80% of each management zone. Benchmark stem densities has the same meaning as defined in the Vegetation Benchmark Database as published by OEH and updated from time to time. An approval under the *Native Vegetation Act 2003* may be required to carry out thinning or any other removal or damage to native vegetation under this item.	Ongoing from commencement date.
5.2	Native vegetation on the biobank site must not be burnt except in accordance with the fire management plan prepared pursuant to item 3 above.	Ongoing from commencement date.
Item 6	**Replanting or supplementary planting where natural regeneration will not be sufficient**	**Timing**
6.1	This item is not applicable, as there is good potential for natural regeneration to occur. . However, should natural regeneration not be sufficient to adequately revegetate these areas then a small contingency fund will be available to carry out supplementary plantings. It is recommended that the site be monitored for the first year after stock access has been completely restricted from the biobank site to estimate the natural resilience of the area.	Planting preferable in autumn or spring for best results.
	Include details regarding site treatment that must be undertaken before planting each area under the 'Specific requirements'. Planting or seeding is only required where natural regeneration is not sufficient to bring back native vegetation. Where no replanting is required, delete the words in every point of this item (but retain the numbering) and replace with: 'This item is not applicable.'	
6.2	As stated in Clause 1.1 stock must not be permitted to graze in any area of the biobank site.	Ongoing.
	If required, different years or heights for specific types of plants can be listed under 'Specific requirements'.	
6.3	Whilst the area is in a condition such that natural regeneration should take place, this growth will be monitored and should it be	Conduct surveys within 12 months of

	felt that natural regeneration is slow, supplementary plantings may be considered.	this area being fenced off to stock.
6.4	This item is not applicable.	
6.5	This item is not applicable.	

The planting schedule should be filled in including:

- **number of plants per area** – for tubestock, the number of plants should be rounded to the nearest 100 if there are more than 1,000 plants or to the nearest 10 if there are 1,000 plants or less; if direct seeding is used leave this field blank
- **planting method** – specify whether plants are to be tubestock, direct seeding or another method
- **timing** – describe as the number of months (or Year if relevant (ie Year 1, Year 2, etc)) for completion of planting from the first payment date.

6.6 Planting schedule at the biobank site

Species' common name	Species' scientific name	Management zone/s of planting	Number of plants per area	Planting method	Timing (months or Year)

Item 7	Retention of dead timber	Timing
7.1	Dead timber (whether standing or fallen and including branches and leaf litter) must not be removed from or moved within the biobank site except for the personal (non-commercial) use by the landowner for firewood for one dwelling only or for repair of fencing (not for construction of fencing). Dead timber used for fencing repair must be documented by the landowner in writing and records must be kept in accordance with the record keeping requirements. The landowner must record the approximate amount of dead timber collected from the biobank site for use in fencing, the location that that dead timber was collected from and the date it was collected (month, year).	Ongoing from commencement date.
7.2	Timber from outside the biobank site may be introduced to and placed on the biobank site to improve biodiversity values. Once the timber has been brought onto the site, it is subject to the requirements of item 7.1 above. Timber brought from outside the biobank site must be documented by the landowner in writing and records must be kept in accordance with the record keeping requirements. The landowner must record the approximate amount of timber brought from outside the biobank site, the location where the timber was placed on the biobank site and the date on which it was placed (month, year).	When required but not required before the first payment date.
Item 8	**Erosion control**	**Timing**
8.1	All reasonable steps must be undertaken to prevent, control and remedy erosion on the biobank site. There is no existing erosion on the site that will require rigorous management. It is envisaged that the 'bare patches' of soil along some of the existing tracks will experience natural regeneration and resiliency over time.	Commencing from first payment date.
	If there is no existing erosion, delete the last paragraph.	

Item 9	Retention of rocks	Timing
9.1	The landowner must not remove, or cause or permit to be removed, rocks from the biobank site or move, or cause or permit to be moved, rocks within the biobank site.	Ongoing from commencement date.
9.2	Rocks from outside the site may be placed on the biobank site to improve habitat for threatened species. Rocks, once placed on the biobank site, are subject to item 9.1 above. The landowner must make and retain records of the location of the rocks placed on the site and the date the rocks were brought onto the site in accordance with the record keeping requirements.	When required but not required before the first payment date.

Section 2: Additional management actions

Additional management actions should only be completed when they are required for creating ecosystem credits or species credits. This will be stated on the Biobanking Agreement Credit Report.

Complete the required fields for any additional management actions required for your site. Leave all other additional management actions and OEH will delete them before including this section in your draft biobanking agreement.

Additional management actions		
Item 10	**Control of feral and overabundant native herbivores**	**Timing**
10.1	The landowner must implement, and at all relevant times, comply with the management plan to control feral and overabundant native herbivores included in Section 4 (or such updated management plan as has been approved by the Director General under item 10.2 below) ('**the feral and overabundant native herbivores management plan**'). To allow for adaptive management, minor alterations can be made to the implementation of the feral and overabundant native herbivores management plan, which must be recorded in writing in accordance with Section 3 of this Annexure. Note: A licence under Section 121 of the *National Parks and Wildlife Act 1974* may be required to control overabundant native herbivores.	Ongoing from first payment date.
10.2	The feral and overabundant native herbivores management plan must be reviewed at intervals of no less than 4 years and no more than 6 years. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the plan that are outlined in the dot points below. Notification of the date of the review commencement must be provided to the Director General in writing within 14 days of the commencement of the review. The findings of the review must be submitted to the Director General within 3 months of commencing the review. Where the Director General determines from the review that an update of the feral and overabundant native herbivores management plan is required, the Director General will notify the landowner in writing that an update of the plan is required and the landowner must update the plan and submit the amended plan to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Director General in writing: • a description of the feral or overabundant native herbivore/s • consideration of relevant current OEH and other pest management programs and methods • the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best practice management	Ongoing from first payment date.

	• the frequency and timing of the control actions in each management zone • methods for monitoring the success of the pest control actions • a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the biobank site • additional control actions to destroy or remove any new feral and overabundant native herbivore pest species that occur on site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the feral and overabundant native herbivores management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.	
Item 11	**Vertebrate pest management – Rabbits and Foxes**	**Timing**
11.1	The landowner must implement, and at all relevant times, comply with the vertebrate pest management plan included in Section 4 (or such updated vertebrate pest management plan as has been approved by the Director General under item 11.2 below) ('**the vertebrate pest management plan**'). To allow for adaptive management, minor alterations can be made to the implementation of the vertebrate pest management plan, but these must be recorded in writing in accordance with Section 3 of this Annexure.	Ongoing from first payment date.
11.2	The vertebrate pest management plan must be reviewed at intervals of no less than 4 years and no more than 6 years by an appropriately qualified person. The review is to consider the efficacy of the management actions in the plan and consider the effectiveness of the matters contained in the current plan that are outlined in the dot points below. Notification of the review commencement must be provided to the Director General in writing within 14 days of the commencement. The findings of the review must be submitted to the Director General within 3 months of commencing the review. Where the Director General determines from the review that an update of the plan is required, the Director General will notify the landowner in writing that an update of the plan is required. The landowner must update the plan and submit it to the Director General for approval within 3 months of receiving written notification from the Director General that an update of the plan is required. The revised plan must cover the matters outlined below and any additional matters specified by the Director General in writing: • a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats • consideration of relevant current OEH and other pest management programs • the method/s of vertebrate pest control in each management zone determined in accordance with best management practice • the frequency and timing of vertebrate pest control actions in each management zone	Ongoing from first payment date.

	• methods for monitoring the success of vertebrate pest control actions • a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the biobank site • additional vertebrate pest control actions to destroy or remove any new vertebrate pest species that occur on-site • measures for assessing and reporting monitoring results • a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary.	
Item 12	**Nutrient control**	**Timing**
12.1	Fertilisers, pesticides and herbicides must not be applied on the biobank site, except where required to undertake the management actions. Use of fertilisers for establishing native vegetation through planting or seeding, use of herbicides for controlling weeds or use of pesticides for controlling vertebrate pests or feral herbivores can be undertaken in accordance with best practice management when required to undertake the management actions.	Ongoing from commencement date.
Item 13	**Control of exotic fish species**	**Timing**
13.1	This clause is not applicable.	
Item 14	**Maintenance or reintroduction of natural flow regimes**	**Timing**
14.1	This clause is not applicable.	
14.2	This clause is not applicable.	
14.3	Artificial structures such as dams or levee banks that impede the natural flow regimes on the biobank site must not be constructed unless approved by the Director General in writing for the purpose of restoring natural flows.	Ongoing from commencement date.

Section 3: Standard management plans

Completing the compulsory weed management plan

A table is provided below for the integrated weed management plan. Add additional sections to the table if required.

The plan must include, but is not limited to:

- a description of the target weed/s at the biobank site and their location/s, linked to each management zone where weeds are present
- the method/s of weed control in each management zone
- the frequency of weed control activities at the site, taking into account management practices where weeds are providing habitat for native species
- the timing of any planting of native plant species required in each management zone to provide alternative habitat for native species affected by weed control activities
- methods for monitoring weed control activities
- reporting and assessing the results from monitoring
- a timetable/measures for inspections to identify new weed species or exotic plant species (including noxious weeds under the *Noxious Weeds Act 1993*)
- a diary for recording actions taken in accordance with the integrated weed management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.

When the management plan is reviewed (see item 2.2), weed control activities may be amended, deleted or added to take into account the weed species on the site at that time.

Weed management plan

The weed types, description and location (management zone/s) of weed infestations existing at the commencement date are listed in the weed management plan. The methods of weed control (management actions), monitoring and inspections are also listed.

The landowner must perform the methods of weed control and other weed management activities and monitoring in the weed management plan by the methods described (and in accordance with item 2 of this Annexure) for all weeds. The methods of control will apply to the weeds listed in the table below as well as any other weeds that may be present on the site from time to time.

The template for reporting of monitoring activities and the diary template for weed control management must be filled in to record observations during the implementation of the weed management plan, including any minor variations.

Weed types

Weed	Common name of target weed	Scientific name of target weed	Description of infestation (eg intensity (% cover) & location within zone)	Management zone/s
A	Cobblers Peg	*Bidens pilosa*	Light infestation. Located primarily within the cleared areas and along the cleared tracks.	1,2,4
B	Lantana	*Lantana camara*	Low to moderate infestations of lantana throughout the site, with largest infestation throughout Zone 3.	1,2,3,4,5
C	Blackberry	*Rubus spp.*	Low to moderate infestations of blackberry throughout the site, with largest infestation throughout Zone 3.	1,2,3,4,5
D	African Olive	*Olea europaea* subsp. *cuspidata*	Light infestation. Located primarily within the cleared areas and along the cleared tracks.	2,4
E	Fireweed	*Senecio madagascariensis*	Light infestation. Located primarily within the cleared areas and along the cleared tracks.	2,4
F	Whiskey Grass	*Andropogon virginicus*	Light infestation throughout site.	1,2,3,4,5
G	Spear Thistle	*Cirsium vulgare*	Light infestation throughout site.	1,2,3,4,5
H	Pampas Grass	*Cortaderia selloana*	Light infestation throughout site.	1,2,3,4,5
I	Pigeon Grass	*Seteria spp.*	Light infestation throughout site.	1,2,3,4,5
J	Purpletop	*Verbena bonariensis*	Light infestation throughout site.	1,2,3,4,5

Methods of weed control

Management zone/s	Weed/s	Method of weed control	Frequency (months or Year)
2,4	C	Intensive, targeted weed control to be carried out by qualified contractors and machinery. Methods will include: - cut and paint (using glyphosate) - machinery may include chainsaws for larger stands - pulling/crowning of weeds This program runs concurrently with the intensive weed control of Lantana in Zone 3. Costs for intensive weed control of these weeds are shared for the first year.	Intensive weed control throughout the first year which involves 2 days per week for team of two for approximately 10 weeks, throughout fruiting/flowering period

			(generally spring/early summer). Ongoing maintenance included in the targeted follow-up weed control throughout years 2 to 5 inclusive.
All Zones	B	Intensive, targeted weed control to be carried out by qualified contractors and machinery. Methods will include: - using car mounted spray unit to drive into large areas of infestation and spray with undiluted glyphosate or mix of Garlon® and diesel at flowering/fruiting stage, when most effective. - cut and paint crown/lignotuber with undiluted glyphosate or Garlon and diesel immediately for isolated plants or smaller areas of infestation. This program runs concurrently with the intensive weed control of Blackberry in Zone 3. Costs for intensive weed control of these weeds are shared for the first year.	Intensive weed control throughout the first year which involves 2 days per week for team of two for approximately 10 weeks, throughout fruiting/flowering period (generally spring/early summer). Ongoing maintenance included in the targeted follow-up weed control throughout years 2 to 5 inclusive
All Zones	B, C, D	Intensive, targeted follow-up weed control (Follow-up Bush Regeneration) to be carried out by qualified contractors and machinery. Methods will include: - cut and paint (using glyphosate) - spot spraying of scattered Lantana. - machinery may include chainsaws for larger stands of Blackberry and/or African Olive. - 'back pack' spraying using Grazon® (or similar) or glyphosate.	Five sessions per year, for a team of two for four years from years 2 to 5 inclusive. Ongoing management to be included in bush regeneration sessions * Two days per session.
1,2,4	All Weeds	Ongoing bush regeneration activities to be carried out by qualified contractors. Methods will include: - pulling/crowning of weeds. - follow up spraying in large areas of previous infestations - spot spraying of scattered Lantana, Spear Thistle, Pampas Grass and Purpletop.	Six sessions per year in the initial three years. Ongoing management to reduce to two sessions annually from

			years 4 to 6 (inclusive), then 1 session per year in perpetuity. * Two days per session.

Native planting required to provide habitat for native species affected by weed control activities

Management zone	**Description of planting required** (reference planting schedule at item 6.6)	**Timing**
All Zones	Locally dense infestations of Lantana and Blackberry may be providing refuge/shelter and foraging substrate for small native birds. Targeted and staged removal to allow for relocation of small native birds and for natural regeneration to take place.	Commencing at the completion of weed control activities described above.

Monitoring and inspections of existing and new weeds

Management zone/s	**Weed/s**	**Method of monitoring**	**Date/s required**
All	B,C	A monitoring and evaluation program to address weed regrowth and control measures will be undertaken annually by the landholder through the set-up of fixed photo-points across all restoration zones. Photos should be taken by digital camera and recorded in the project file by date and discrete photo-point number. Photo-point locations should be clearly marked on site and/or recorded using a GPS. The photo-point monitoring will be augmented by a completion of a weed management log (included below) describing actions and observations. The photographic records and observations log will completed by the landholder and provided to OEH, on an annual basis.	Annually
All	All	Condition mapping (floristic and habitat field survey assessment) to determine vegetation quality and ecological condition. This will be provided to OEH, on an annual basis.	Five-yearly by an independent botanical consultant.

Other weed management activities (where required)

In areas where exotic pasture grasses such as Whiskey Grass (*Andropogon virginicus) and,* Pigeon Grass (*Seteria spp.)* have colonised it is assumed natural regeneration will increase competition on exotic species and they will reduce their occurrence across the site. This is considered the most effective treatment of these weeds as they are occur across the site and treating these weeds by hand would be very time consuming and costly to the landholder.

Template for reporting of monitoring activities		
Management zone/s	**Date**	**Observations and assessment of monitoring** This table must include the information for each zone (or groups of zones) which is described in the table titled 'monitoring and inspections of existing and new weeds'.

Diary template for weed control management			
Date	**Management zone/s**	**Description and type of activity undertaken** (e.g. weed control, observation)	**Minor variations** (details and reasons)

Completing the compulsory fire for conservation management plan

A table is provided below for the fire conservation management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a map of the vegetation on the biobank site (with date) and any infrastructure and built assets on the biobank site (the map to be included in the biobanking agreement)
- the year the last fire went through, the type of fire and the extent of the fire and location, where known
- frequency of natural fires in the area of the biobank site, where known
- a description of locations and management zones where ecological burns will be conducted and areas that will not be burnt
- the methods that will be used for ecological burns
- the fire frequency intervals recommended for the vegetation types and threatened species present, including any required adjustment to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act 1997* to ensure minimum frequency between ecological burns
- the fire intensity for the recommended vegetation types
- the time of year suitable for ecological burns
- methods for monitoring the outcomes of ecological burns
- reporting and assessing the results from monitoring
- the diary for recording actions taken in accordance with the fire management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary in accordance with the record keeping requirements.

Fire for conservation management plan

The plan includes information on all known previous fire events in the 'Fire history' table to demonstrate local fire conditions including intensity and frequency.

The ecological fire requirements for each vegetation type or threatened species on the biobank site are listed in the 'Fire requirements for vegetation types and threatened species' table. These are the fire frequency intervals recommended for the vegetation types and threatened species present on the biobank site. They include any requirement adjustments to the schedule in the event of a wildfire or activities undertaken under the *Rural Fires Act (RFA) 1997* to ensure the minimum frequencies between ecological burns.

The landowner must carry out ecological burns for each management zone according to the method and frequency described (as informed by the history and requirements sections and in accordance with Section 3 of this annexure). These actions are set out in the 'Ecological burning actions table'. Monitoring and inspections (set out in the 'Fire management monitoring' table) as described must also be implemented. The landowner must also carry out the actions listed in the 'Other fire management activities' table.

The table titled 'Template of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. The landowner must also complete the table titled 'Diary template for fire management activities' to record the management actions undertaken or observations made, including any minor variations.

Fire history for previous 20 years (or longer if known)

Year of fire	Hazard reduction, wildfire or ecological burn and extent of fire	Management zone/s

	Information not known.	

Fire requirements for vegetation types and threatened species

Vegetation type and/or threatened species	Fire frequency required	Time of year for burning	Fire intensity required	Adjustment required due to wildfires or RFA activities
Dry - Open Forest and Woodland (Excluding the EEC Forest).	Greater than 8 years, less than 25 years	April to September	Avoid successive fires of intensity sufficient to scorch or consume dominant tree crown	In the event that wildfires did not occur for more than 15 years on the property, a prescribed ecological burn would be conducted.

Ecological burning actions

Management zone/s	Actions	Supervision & extinguishing techniques	Time of year for burning	Frequency (years)
All (excluding riparian zone and EEC Forest).	- Consult local Rural Fire Service, Catchment Management Authority (CMA) or local council for advice on whether an approval for burning native vegetation is required and how to obtain an approval. - Burning standing native vegetation is considered 'clearing' under the *Native Vegetation Act 2003* and the CMA will need to determine whether the burn triggers the need for an approval. -The potential impact of the proposed burn on native vegetation, biodiversity, waterways or important cultural heritage sites will be accessed. - Rural Fire Service to be consulted prior to the burn to determine appropriate regime. - Publications such as NSW RFS publication *Standards for Low Intensity Bushfire Hazard Reduction Burning or NSW RFS publication Standards for Pile Burning* should be obtained and read prior to burns.	Rural Fire Service to be present for protection and advice. Asset protection lines to be installed where required	April to September	15 years from the date of the previous ecological burn or a wildfire occurring on the property

Methods for monitoring the outcomes of ecological burns		
Management zone/s	**Method of monitoring**	**Date/s required**
All (excluding riparian zone and EEC Forest).	Visual auditing and noting of observations in a diary record (template provided below).	All
All (excluding riparian zone and EEC Forest).	Condition mapping (floristic and habitat field survey assessment) to determine vegetation quality and ecological condition.	All

Other fire management activities (where required)
All existing access tracks should be maintained for ecological burns.

Template for reporting of monitoring activities		
Management zone/s	**Date**	**Observations and assessment of monitoring**

Diary template for fire management activities			
Date	**Management zone/s**	**Description of activity undertaken or observation made**	**Minor variations** (details and reasons)

Section 4: Additional management plans

If required, complete this control of feral and overabundant native herbivores management plan

A table is provided below for the management plan to control feral and overabundant native herbivores. Add additional sections to the table if required. The plan must include, but is not limited to:

- a description of the feral or overabundant native herbivore/s
- consideration of relevant current OEH and other pest management programs and methods
- the method/s for feral and overabundant native herbivore control in each management zone, determined in accordance with best practice management
- the frequency and timing of the control actions in each management zone
- methods for monitoring the success of the pest control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new feral or overabundant native herbivores that may adversely affect biodiversity values on the biobank site
- a diary for recording actions taken in accordance with the management plan to control feral and overabundant native herbivores and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative action) and reasons for the minor alterations must be recorded in the diary.

When the management plan is reviewed (see item 10.2 in Section 1), control activities may be amended, deleted or added to take into account the feral and overabundant native herbivore on the site at the time.

Management plan to control feral and overabundant native herbivores

The management plan for feral and overabundant native herbivores includes information on the management requirements for the feral and overabundant native herbivores at the biobank site listed in the 'Feral and overabundant native herbivores' table. The possible methods of control for each species, used by OEH and other pest management programs, are listed and the suitability of each method is described in the 'Methods considered' table.

The landowner must carry out the methods for control for feral and overabundant native herbivores for each management zone according to the method and frequency as described in the 'Methods for control' table. The methods of control applied to the feral or overabundant native herbivores listed in the 'Feral or overabundant native herbivores' table as well as any other feral or overabundant herbivores that may be present on the site from time to time.

Monitoring and inspections of existing and new feral and overabundant herbivores at the biobank site as described in the 'Monitoring and inspections' table must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of the monitoring activities. The landowners must complete the table titled 'Diary template for feral and overabundant herbivore management' to record the management actions undertaken including any minor variations or observations made.

Feral and overabundant native herbivores

Feral	Name of feral/overabundant	Description of extent	Management

type	native herbivore		zone/s
A	Rabbit	Known to occur on site. Previous sightings by properties owner and results of desktop analysis (NPWS Wildlife Atlas).	Throughout, property, although specific not known.
B			
C			
D			
E			

Methods considered

Feral type	Name and description of program or method	Describe suitability
A	Monitored and controlled as necessary in accordance with the Rabbit control programs administered by the NPWS. The methods considered include: • Active shooting • Gassing of warrens • Baiting program • Trapping program	All techniques deemed suitable. Shooting was considered appropriate due to the site being isolated from urban areas. Shooting to control feral animals has occurred on the property in the past.

Methods of control

Management zone/s	Feral type	Method of control	Frequency and timing
All	A	Baiting and/or active trapping are considered the most appropriate control methods as the level of rabbit infestation appears low. Professional shooting Warrens may also be treated (via gassing) if located on the site. Possible locations will include the south-western corner as evidenced during fieldwork investigations.	Ongoing

Monitoring and inspections

Management zone/s	Feral type/s	Method of monitoring	Date/s required
All	A	Monitoring survey (15 minute random meander through each Management Zone, to score rabbit abundance by	Ongoing

		noting the density of rabbit faeces) in accordance with the Rapid Assessment Technique (Cooke et al, 2008).	

Other management activities (where required)

Template for reporting of monitoring activities			
Management zone/s	**Date**	**Current level of impact on vegetation** This column must record impact as Negligible, Minimal, Moderate or High	**Observations and assessment of monitoring**

Diary template for feral and overabundant herbivore management			
Date of activity	**Management zone/s**	**Description and type of activity undertaken** This column must include details of the feral and overabundant herbivores targeted, control techniques applied and numbers controlled.	**Minor variations** (details and reasons)

If required, complete this vertebrate pest management plan

A table is provided below for the vertebrate pest management plan. Add additional sections to the table if required. The plan must include, but is not limited to:

- a description of the target fauna species e.g. pigs, foxes or other species such as feral dogs or goats
- consideration of relevant current OEH and other pest management programs
- the method/s of vertebrate pest control in each management zone determined in accordance with best management practice
- the frequency and timing of vertebrate pest control actions in each management zone
- methods for monitoring the success of vertebrate pest control actions
- reporting and assessing the results from monitoring
- a timetable and measures for inspections to identify new vertebrate pest species that may negatively impact on threatened species on the biobank site
- a diary for recording actions taken in accordance with the vertebrate pest management plan and minor alterations to this plan permitted for adaptive management. The details (management zone/s, date, alternative actions) and reasons for the minor alterations must be recorded in the diary in accordance with the requirements.

All pest species identified as requiring management on a biobank site must be included in the vertebrate pest management plan.

Separate management plans can be developed for each pest species.

When the management plan is reviewed (see item 11.2 in Section 1), control activities may be amended, deleted or added to take into account vertebrate pest species found on the site at that time.

Vertebrate pest management plan

The management plan for vertebrate pests includes information on the vertebrate pests and their extent existing at the time of the agreement as listed in the 'Vertebrate pests' table. The possible methods of control for each species, used by OEH and other pest management programs are listed and the suitability of each method to the biobank site is described in the 'Methods considered' table.

The landowner must carry out the methods for vertebrate pest control for each management zone according to the method and frequency described in the 'Methods of control' table, The methods of control will apply to the vertebrate pests listed in the 'Vertebrate pests' table as well as any other vertebrate pests that may be present on the site from time to time.

Monitoring and inspections of existing and new vertebrate pests on the biobank site, as described in the 'Monitoring and inspections' table, must be implemented.

The table titled 'Template for reporting of monitoring activities' must be completed to record observations during the implementation of the plan and assessment of monitoring activities. The landowner must also complete the 'Diary template for vertebrate pest management' to record the management actions undertaken, including any minor variations, and observations made.

Vertebrate pests

Pest	Name of vertebrate pest (e.g. pig, fox, goat, dog)	Description of extent	Management zone/s
B	Fox and/or wild dogs	Known to occur on site. Previous sightings by properties owner and results of desktop	Throughout property,

		analysis (NPWS Wildlife Atlas).	although specific not known.

Methods considered

Pest type	Name and description of program or method	Describe suitability
B	Monitored and controlled in accordance with strategies outlined in; Best-practice guidelines for fox control contained within the Predation by the red fox - threat abatement plan (OEH, 2001). The methods considered include: • Baiting • Active shooting	Shooting considered appropriate due to the site being isolated from urban areas. Shooting to control feral animals has occurred on the property in the past. Baiting not considered suitable due to potential indirect impacts to native fauna.

Methods of control

Management zone/s	Pest type	Method of control	Frequency and timing
All	B	Professional shooting	Ongoing commencing no later than the date the balance in the biobank site account is equal to or greater than 80% of the Total Fund Deposit for the first time.

Monitoring and inspections of existing and new vertebrate pests

Management zone/s	Pest type/s	Method of monitoring	Date/s required
All	All	All sightings of feral animals by the landholder are to be recorded in monitoring log, and include the date, the location and the number of animals sighted and any damage noted. Monitoring of damage is essential and can include information on the size of the affected area and feral animal induced impacts.	All
All	B	Annual spotlight survey of vehicle accessible tracks and fire trails noting number of foxes identified. This survey can be conducted by the landholder.	All

Other management activities (where required)

Records will be kept of opportunistic pest animal sightings by the landholder in the “Diary template for vertebrate pest management” included below. These records will be submitted to OEH annually for review and discussion of suitable control methods to be employed.

Template for reporting of monitoring activities			
Management zone/s	**Date**	**Current level of impact on vegetation or threatened fauna species** This column must record impact as Negligible, Minimal, Moderate or High	**Observations and assessment of monitoring**

Diary template for vertebrate pest management			
Date of activity	**Management zone/s**	**Description and type of activity undertaken** This column must include details of the vertebrate pests targeted, control techniques applied and numbers controlled.	**Minor variations** (details and reasons)

Photo points

This section of the management actions template is not part of *Annexure C: Management actions* but is required for *Annexure D* of the biobanking agreement which requires information relating to the placement of photo points for monitoring purposes. Fill in the table below so that this information can be included in the appropriate format in the final agreement. A map of the photo point locations is also required to be submitted.

Photo points should be positioned in areas that are likely to show change over time. Some plot locations can be used as photo points but many plot locations (especially in vegetated areas already in very good condition) may not show any change over time. Locate photo points where there will be changes because of management actions such as areas currently in low to moderate condition, targeted for revegetation and/or intensive weed control.

Photos are required to be taken every 12 months at the same location, direction, height and time of day.

Annexure D: Monitoring, reporting and record keeping requirements

1 Monitoring requirements

1.1 The landowner must ensure that photographs are taken at photo-points at each of the locations and in the direction identified in the table below titled 'Locations of plots and photo points' within 12 months of the commencement date and then at least every 12 months thereafter.

1.2 The photo points are identified on the map entitled Garvey Photo Points in Annexure A of this agreement. The purpose of the photographs is to show changes over time. Photographs should be taken at approximately the same direction, location, height and time of day (during daylight hours) in each reporting period (as defined in item 2.2 of this Annexure D) and retained for the life of this agreement. All photographs must be dated, stating the direction in which they were taken and identified with their locations.

Locations of photo points			
Projected coordinate system: (details included in spread sheet attached)			
Photo point reference	Easting	Northing	Direction of photo (magnetic degrees)

Appendix E

Biobanking Credit Report – Shirbin

BioBanking Credit Calculator

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE.

Date of report: 21/09/2012 Time: 1:11:52PM Tool version: 2.0

Biobank details

Proposal ID:	0025/2012/0337B
Proposal name:	Shirbin Biobank Site
Proposal address:	Green Wattle Creek Road Butterwick NSW 2321
Proponent name:	Hunter 8 Alliance
Proponent address:	24 Honeysuckle Drive Newcastle NSW 2300
Proponent phone:	02 4979 9999
Assessor name:	Brendan Ryan
Assessor address:	1 The Companion Way MANYANA NSW 2539
Assessor phone:	9130 2192
Assessor accreditation:	0025

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report
- ☐ Change threatened species response to gain (Tg value)

Ecosystem credits summary

Vegetation type	Area (ha)	Credits required	Red flag
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	19.80	123	No
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	82.56	606	No
Fig - Whalebone Tree - Stinging Tree dry rainforest of the southern North Coast	13.65	126	No
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	43.31	285	No
Highly disturbed areas - road verges, table drains, road embankments, ploughed paddocks etc.	1.88	19	No
Total	161.20	1,159	

Credit profiles

1. Fig - Whalebone Tree - Stinging Tree dry rainforest of the southern North Coast, (HU541)

Number of ecosystem credits required	126
CMA sub-region	Upper Hunter
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

2. Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin, (HU544)

Number of ecosystem credits required	123
CMA sub-region	Upper Hunter
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

3. Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin, (HU556)

Number of ecosystem credits required	606
CMA sub-region	Upper Hunter
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

4. Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin, (HU629)

Number of ecosystem credits required	285
CMA sub-region	Upper Hunter
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

5. Highly disturbed areas - road verges, table drains, road embankments, ploughed paddocks etc., (HU667)

Number of ecosystem credits required	19
CMA sub-region	Upper Hunter
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	

Species credits

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Fig - Whalebone Tree - Stinging Tree dry rainforest of the southern North Coast	Cat and/or Fox control
Fig - Whalebone Tree - Stinging Tree dry rainforest of the southern North Coast	Exclude miscellaneous feral species
Fig - Whalebone Tree - Stinging Tree dry rainforest of the southern North Coast	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Fig - Whalebone Tree - Stinging Tree dry rainforest of the southern North Coast	Maintain or reintroduce flow regimes (aquatic flora)
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Cat and/or Fox control
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Exclude miscellaneous feral species
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Cat and/or Fox control
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Exclude miscellaneous feral species
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Maintain or reintroduce flow regimes (aquatic flora)
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Cat and/or Fox control
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Exclude miscellaneous feral species
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Maintain or reintroduce flow regimes (aquatic flora)

Appendix F

Biobanking Credit Report – Garvey

BioBanking Credit Calculator

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE.

Date of report: 2/10/2012 Time: 12:22:49PM Tool version: 2.0

Biobank details

Proposal ID:	0025/2012/0342B
Proposal name:	Garvey Biobank Site
Proposal address:	Dunns Creek Road Dunns Creek NSW 2321
Proponent name:	RLJ Land Pty Ltd
Proponent address:	73 Janet Street Merewether NSW 2291
Proponent phone:	0407 200 798
Assessor name:	Brendan Ryan
Assessor address:	1 The Companion Way MANYANA NSW 2539
Assessor phone:	9130 2192
Assessor accreditation:	0025

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report
- ☐ Change threatened species response to gain (Tg value)

Ecosystem credits summary

Vegetation type	Area (ha)	Credits required	Red flag
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	6.13	48	No
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	95.30	536	No
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	8.11	84	No
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	91.98	787	No
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	2.66	20	No
Total	204.18	1,475	

Credit profiles

1. Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin, (HU544)

Number of ecosystem credits required	48
CMA sub-region	Upper Hunter
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

2. Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin, (HU556)

Number of ecosystem credits required	620
CMA sub-region	Upper Hunter
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

3. Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin, (HU629)

Number of ecosystem credits required	807
CMA sub-region	Upper Hunter
Minimum percent native vegetation cover class	>70%
Minimum adjacent remnant area class	>100 ha

Species credits

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Cat and/or Fox control
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Exclude miscellaneous feral species
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Cat and/or Fox control
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Exclude miscellaneous feral species
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Maintain or reintroduce flow regimes (aquatic flora)
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Cat and/or Fox control
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Exclude miscellaneous feral species
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Spotted Gum - Broad-leaved Ironbark grassy open forest of dry hills of the lower Hunter Valley, Sydney Basin	Maintain or reintroduce flow regimes (aquatic flora)

Appendix G

Flora Species Lists- Shirbin

Table C -1 Shirbin BioBank Flora Species List

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Acacia brownii	Heath Wattle		x	x		x
Acacia falcata	Hickory Wattle		x	x		x
Acacia floribunda	White Sally Wattle		x	x		x
Acacia implexa	Hickory Wattle		x	x		x
Acacia longifolia	Sydney Golden Wattle			x		
Acacia stricta	Straight Wattle			x		
Acacia sp			x			
Acianthus sp	Mosquito Orchid		x	x	x	x
Ajuga australis	Austral Bungle		x	x		x
Allocasuarina torulosa	Forest Oak		x	x		x
Anagallis arvensis	Scarlet Pimpernel			x		
Aristida ramosa	Purple Wiregrass		x	x		x
Arthropodium spp. aff minus	Vanilla-lily		x	x		
Backhousia myrtifolia	Ironbark				x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Bidens pilosa	Cobblers Pegs	*		x		
Billardiera scandens	Hairy Apple Berry		x	x		
Bossiaea prostrata	Creeping Bossiaea			x		
Brachychiton populneus	Kurrajong		x		x	x
Breynia oblongifolia	Coffee Bush		x	x	x	x
Brunoniella australis	Blue Trumpet		x	x		x
Bursaria spinosa	Sweet Bursaria		x	x	x	x
Caladenia carnea	Pink Fingers		x	x		x
Caladenia picta	White Fingers		x			
Caladenia catenata	White Fingers		x			x
Callistemon salignus	Willow Bottlebrush		x	x	x	x
Calotis dentex	-			x		
Carex appressa	Tall Sedge				x	
Carex inversa	Knob Sedge			x		
Carex sp	-		x	x		
Cayratia clematidea	Native Grape			x	x	x
Centella asiatica	Indian Pennywort		x	x		x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Cheilanthes distans	Bristly Cloak Fern			x		
Cheilanthes sieberi subsp sieberi	Poison Rock Fern		x	x		x
Chorizema parviflorum	Eastern Flame Pea		x	x		
Cissus antarctica	Kangaroo Vine				x	
Cissus hypoglauca	Water Vine				x	
Pittosporum multiflorum	Orange thorn			x	x	x
Clematis glycinoides	Headache Vine			x	x	x
Commelina cyanea	Scurvy Weed				x	
Convolvulus erubescens	Blushing Bindweed		x	x		
Corymbia maculata	Spotted Gum		x	x	x	x
Cymbopogon refractus	Barbwire Grass		x	x		x
Cyperus sp					x	
Daucus glochidiatus	Native Carrot		x	x		
Daviesia genistifolia	Spreading Wattle			x		
Daviesia ulicifolia	Gorse Bitter Pea		x	x		
Desmodium brachypodum	Large Tick-trefoil					x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Desmodium rhytidophyllum	-		x	x		x
Desmodium varians	Slender Tick-trefoil		x	x	x	x
Dianella caerulea	Blue Flax Lily		x	x		x
Dianella caerulea var. producta	Blueberry Lily		x	x		x
Dianella longifolia	Blueberry Lily		x			
Dichelachne crinita	Longhair Plumegrass		x	x		x
Dichondra repens	Kidney Weed		x	x	x	x
Digitaria sp	Umbrella Grass		x	x		
Drosera peltata	Pale Sundew		x		x	
Doodia aspera	Prickly Rasp Fern				x	
Echinopogon caespitosus	Bushy Hedgehog Grass		x	x		x
Echinopogon ovatus	Forest Hedgehog Grass					x
Entolasia marginata	Bordered Panic			x		
Entolasia stricta	Wiry Panic		x	x		x
Eragrostis brownii	Brown's Lovegrass		x	x		
Eremophila debilis	Winter Apple		x	x		

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Eucalyptus globoidea	White Stringybark		x	x		x
Eucalyptus tereticornis	Forest Redgum		x	x		x
Eucalyptus canaliculata	Grey Gum			x		x
Eucalyptus carnea	Thick-leaved Mahogany			x	x	x
Eucalyptus crebra	Narrow-leaved Ironbark		x	x		
Eucalyptus punctata	Grey Gum			x	x	x
Eucalyptus paniculata	Grey Ironbark			x	x	x
Eucalyptus umbra	Broad-leaved White Mahogany			x	x	
Eucalyptus moluccana	Grey Box		x	x		
Euchiton sphaericus	Cudweed		x			
Eustrephus latifolius	Wombat Berry		x	x	x	x
Exocarpos cupressiformis	Native Cherry				x	
Ficus coronata	Sandpaper Fig				x	x
Fimbristylis dichotoma	Common Fringe-sedge		x			
Gahnia aspera	Rough Saw-sedge		x	x		
Galium propinquum	Maori Bedstraw			x		
Galium sp	Galium		x	x	x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Geitonoplesium cymosum	Scrambling Lily		x	x	x	x
Geranium sp	-					x
Glochidion ferdinandi	Cheese Tree		x		x	
Glycine clandestina	Glycine		x	x		
Glycine microphylla	Small-leaf Glycine		x	x	x	x
Glycine tabacina	Glycine		x	x		
Glycine sp	-				x	
Goodenia heterophylla	Ivy Goodenia		x	x		
Haloragis heterophylla	Rough Raspwort			x		
Hardenbergia violacea	Purple Coral Pea		x	x		x
Hypochaeris glabra	Smooth Catsear		x	x		
Hibbertia aspera	Rough Guinea Flower			x		x
Hibbertia dentata	Trailing Guinea Flower					x
Hibbertia obtusifolia	Horey Guinea Flower		x			
Histiopteris incisa	Bat Wing Fern				x	x
Hybanthus monopetalus	Slender Violet-bush			x		
Hydrocotyle tripartita	Pennywort			x		x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Hydrocotyle peduncularis	Pennywort				x	
Hypericum gramineum	Small St. John's Wort		x			
Hypochaeris radicata	Flatweed	*		x		
Imperata cylindrica	Blady Grass		x	x		x
Indigofera australis	Australian Indigo			x		x
Kennedia rubicunda	Dusky Coral Pea			x		
Lagenophora gracilis	Slender Lagenophora		x	x		x
Lantana camara	Lantana	*	x	x	x	x
Lepidosperma laterale	Sword-sedge		x	x		
Leucopogon juniperinus	Prickly Beard-heath		x	x	x	x
Lomandra filiformis subsp. Filiformis	Wattle Mat-rush		x	x		
Lomandra longifolia	Spiny-headed Mat-rush					x
Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush		x	x		x
Luzula sp	-		x			
Maytenus silvestris	Orange Bush			x	x	x
Melaleuca styphelioides	Prickly Leaved Tea Tree				x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Microlaena stipoides	Weeping Grass		x	x	x	x
Morinda jasminoides	Sweet Morinda				x	x
Myrsine sp	-				x	
Myrsine variabilis	Muttonwood				x	x
Notelaea longifolia	Large Mock-olive		x	x	x	x
Olea europaea subsp. *cuspidata*	African Olive	*		x		
Opercularia hispida	Hairy Stinkweed		x	x		x
Oplismenus aemulus	Australian Basket Grass		x	x		x
Oplismenus imbecillis	Creeping Beard Grass			x	x	x
Oxalis perennans	Oxalis		x	x		x
Pandorea pandorana	Wonga Wonga Vine		x	x	x	x
Panicum effusum	Hairy Panic		x	x		
Panicum simile	Two-colour Panic		x			x
Panicum sp	Panic		x	x		
Parsonsia sp	Silkpod		x	x	x	
Parsonsia straminea	Common Silkpod			x	x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Passiflora sp	-				x	
Paspalidium sp	-			x		
Persoonia linearis	Narrow-leaved Geebung		x	x	x	x
Phyllanthus similis	-				x	
Phyllanthus gunnii	Scrubby Spurge				x	x
Pimelea curviflora	-			x		
Pittosporum revolutum	Wild Yellow Jasmine			x	x	x
Plantago debilis	Plantain		x	x		x
Plantago gaudichaudii	Narrow Plantain		x	x		x
Plectranthus sp	-				x	x
Poa sp	-		x	x		x
Polyscias sambucifolia	Elderberry Panax			x		x
Poranthera microphylla	-		x	x	x	
Pratia purpurascens	Whiteroot		x	x		x
Prasophyllum sp	Greenhood		x			
Pterostylis nutans	Nodding Greenhood		x	x		x
Pultenaea parviflora	Sydney Bush-pea			x		

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Pultenaea villosa	Hairy Bush-pea			x		
Richardia brasiliensis	White Eye			x		
Rubus parvifolius	Native Raspberry				x	x
Scolopia braunii	Mountain Cherry				x	
Senecio prenanthoides	Groundsel					x
Senecio Sp E	Groundsel			x		
Senecio spp.	Groundsel		x			
Senecio madagascariensis	Fireweed		x			x
Sigesbeckia orientalis	Indian Weed		x	x	x	x
Smilax australis	Barbwire Vine				x	
Solanum sp	Nightshade			x		x
Solanum brownii	Violet Nightshade					x
Sorgum leiocladum	Wild Sorghum			x		x
Sporobolus creber	Slender Rats Tail Grass		x	x		x
Stackhousia viminea	Slender Stackhousia			x		
Themeda australis	Kangaroo Grass		x	x		x
Verbena sp	-		x			x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Waterborne - Stinging Tree Dry Rainforest (HU 514)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)
Vernonia cinerea	--		x	x		x
Veronica calycina	Hairy Speedwell		x	x		x
Veronica sp	-			x	x	
Wurmbea dioica	Early Nancy		x	x		
Xanthorrhoea latifolia	Grasstree					x

Appendix G

Flora Species Lists- Garvey

Table C -2 Garvey BioBank Flora Species List

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Acacia brownii	Heath Wattle		x	x	x	x
Acacia falcata	Hickory Wattle		x	x	x	x
Acacia floribunda	White Sally Wattle		x	x		x
Acacia implexa	Hickory Wattle		x	x		
Acacia longifolia	Sydney Golden Wattle			x		
Acacia parramattensis	Parramatta Wattle		x		x	x
Acacia parvipinnula	Silver-stemmed Wattle			x	X	
Acianthus sp	Mosquito Orchid		x	x	x	x
Ajuga australis	Austral Bungle			x		
Allocasuarina torulosa	Forest Oak			x	x	
Alphitonia excelsa	Red Ash			x		
Anagallis arvensis	Scarlet Pimpernel		x			
Aristida ramosa	Purple Wiregrass		x	x	x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Aristida vagans	Three-awn Speargrass			x	x	x
Arthropodium spp. aff minus	Vanilla-lily		x	x	x	x
Acacia irrorata	Green Wattle					x
Asperula sp	-			x	x	
Bidens pilosa	Cobbler Pegs		x			
Billardiera scandens	Hairy Apple Berry			x	x	x
Brachychiton populneus	Kurrajong		x	x	x	
Breynia oblongifolia	Coffee Bush		x	x	x	x
Brunoniella australis	Blue Trumpet		x	x	x	x
Bursaria spinosa	Sweet Bursaria			x	x	
Boronia polygalifolia	Dwarf Boronia				x	x
Caladenia carnea	Pink Fingers		x	x	x	x
Caladenia catenata	White Fingers				x	
Callistemon salignus	Willow Bottlebrush		x			x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Callistemon linearis	Narrow-leaved Bottlebrush					x
Calotis dentex	-			x		
Calotis cuneata	Mountain Burr-daisy			x		
Calotis cuneifolia	Purple Burr-daisy			x		
Carex inversa	Knob Sedge		x	x		
Carex sp					x	
Cayratia clematidea	Native Grape			x		
Cheilanthes distans	Bristly Cloak Fern			x		
Cheilanthes sieberi subsp sieberi	Poison Rock Fern		x	x	x	x
Chorizema parviflorum	Eastern Flame Pea			x		x
Pittosporum multiflorum	Orange Thorn				x	
Clematis glycinoides	Headache Vine				x	
Convolvulus erubescens	Blushing Bindweed		x	x	x	x
Conyza sp	Fleabane	*		x		

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Corymbia maculata	Spotted Gum		x	x	x	x
Crowea exalata subsp	Small Crowea					x
Cryptostylis subulata	Large Tongue Orchid				x	
Cymbopogon refractus	Barbwire Grass		x	x	x	x
Cyperus sp	-		x			x
Daucus carota	Wild Carrot			x		
Daviesia ulicifolia	Gorse Bitter Pea		x	x		x
Desmodium rhytidophyllum				x	x	x
Desmodium varians	Slender Tick-trefoil			x	x	x
Dianella caerulea	Blue Flax Lily		x	x	x	x
Dianella caerulea var. producta	Blueberry Lily		x	x	x	x
Dianella longifolia	Blueberry Lily		x	x	x	x
Dianella revoluta	Blueberry Lily			x		
Dichelachne crinita	Longhair Plumegrass		x	x	x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Dichelachne sp				x	x	
Dichondra repens	Kidney Weed		x	x	x	x
Digitaria sp	Umbrella Grass		x	x	x	x
Digitaria parviflora	Small-flowered Finger Grass				x	
Echinopogon caespitosus	Bushy Hedgehog-grass		x	x	x	x
Entolasia stricta	Wiry Panic			x	x	x
Entolasia marginata	Bordered Panic				x	
Eragrostis brownii	Brown's Lovegrass		x			x
Eremophila debilis	Winter Apple			x		
Exocarpos cupressiformis	Native Cherry			x		x
Eucalyptus globoidea	White Stringybark		x	x	x	x
Eucalyptus tereticornis	Forest Redgum		x	x	x	x
Eucalyptus canaliculata	Grey Gum				x	
Eucalyptus carnea	Thick-leaved Mahogany			x	x	
Eucalyptus crebra	Narrow-leaved Ironbark		x	x		

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Eucalyptus fibrosa	Broad-leaved Ironbark			x		x
Eucalyptus punctata	Grey Gum			x	x	x
Eucalyptus paniculata	Grey Ironbark		x		x	
Eucalyptus umbra	Broad-leaved White Mahogany					x
Eucalyptus moluccana	Grey Box		x	x	x	x
Euchiton sphaericus	Cudweed		x	x		
Euchiton sp	-					x
Eustrephus latifolius	Wombat Berry		x	x	x	x
Gahnia aspera	Rough Saw-sedge		x	x	x	
Galium propinquum	Maori Bedstraw					
Galium sp	Galium		x	x		x
Geitonoplesium cymosum	Scrambling Lily			x	x	
Glochidion ferdinandi	Cheese Tree				x	x
Glycine clandestina	Glycine			x	x	x
Glycine microphylla	Small-leaf Glycine		x	x	x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Glycine tabacina	Glycine		x	x	x	x
Goodenia heterophylla	Ivy Goodenia			x	x	x
Hardenbergia violacea	Purple Coral Pea			x	x	x
Hibbertia aspera	Rough Guinea Flower			x	x	x
Hibbertia sp	Guinea Flower			x		
Hibbertia obtusifolia	Hoary guinea flower				x	
Hybanthus monopetalus	Slender Violet-bush			x		
Hydrocotyle tripartita	Pennywort			x	x	x
Hypericum gramineum	Small St. John's Wort			x		
Hypochaeris radicata	Flatweed			x		x
Hypochaeris glabra	Smooth Catsear		x			x
Imperata cylindrica	Blady Grass			x	x	x
Jacksonia scoparia	Winged Broom-pea			x		
Joycea pallida	Silvertop Wallaby Grass					x
Lagenophora gracilis	Slender Lagenophora		x			

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Lantana camara	Lantana	*	x	x	x	
Lepidosperma laterale	Sword-sedge		x	x	x	x
Lepidosperma elatius	-			x		x
Leptospermum polygalifolium	Tantoon				x	
Leucopogon juniperinus	Prickly Beard-heath		x	x	x	x
Lomandra filiformis var. *coriacea*	Wattle Mat-rush			x	x	x
Lomandra longifolia	Spiny-headed Mat-rush			x	x	x
Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush		x	x	x	x
Lomandra sp	-					x
Lomandra micrantha	Small-flowered Mat-rush			x		
Maytenus silvestris	Orange Bush			x	x	
Melaleuca styphelioides	Prickly Leaved Tea Tree		x	x	x	x
Melaleuca nodosa	Prickly-leaved Paperbark				x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Microlaena stipoides	Weeping Grass		x	x	x	x
Notelaea longifolia	Large Mock-olive		x	x	x	x
Olea europaea subsp. *cuspidata*	African Olive	*			x	
Olea europaea	Common Olive	*				x
Opercularia hispida	Hairy Stinkweed			x	x	x
Opercularia sp	-			x		
Oplismenus aemulus	Australian Basket Grass			x	x	
Oplismenus imbecillis	Creeping Beard Grass			x	x	
Oxalis perennans	Oxalis		x	x	x	
Parsonsia straminea	Common Silkpod			x		
Pandorea pandorana	Wonga Wonga Vine			x	x	x
Panicum effusum	Hairy Panic		x	x	x	x
Panicum simile	Two-colour Panic				x	
Panicum sp	-			x		x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Parsonsia sp	Silkpod			x		
Passiflora sp	-				x	
Pittosporum revolutum	Rough Fruit Pittosporum				x	
Persoonia linearis	Narrow-leaved Geebung		x	x	x	x
Phyllanthus hirtellus	Thyme Spurge			x		x
Plantago debilis	Plantain		x	x		
Plantago gaudichaudii	Narrow Plantain		x			
Plectranthus parviflorus	Cockspur Flower		x			
Poa sieberiana	Snowgrass			x		
Poa sp				x		x
Polyscias sambucifolia	Elderberry Panax				x	
Poranthera microphylla	-		x	x		
Pratia purpurascens	Whiteroot		x	x	x	x
Pterostylis nutans	Nodding Greenhood				x	
Pultenaea villosa	Hairy Bush-pea			x	x	x

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Richardia brasiliensis	White Eye			x		
Senecio madagascariensis	Fireweed		x	x		
Senecio prenanthoides	Groundsel		x	x		
Senecio sp	Groundsel		x	x		
Sigesbeckia orientalis	Indian Weed		x	x	x	
Solanum sp	-			x	x	
Solanum stelligerum	Devil's Needles				x	
Sorgum leiocladum	Wild Sorghum					
Sporobolus creber	Slender Rats Tail Grass			x		
Stackhousia viminea	Slender Stackhousia		x			
Themeda australis	Kangaroo Grass		x	x		x
Xanthorrhoea arborea	-				x	
Verbena sp	-		x	x		
Vernonia cinerea	-		x	x		x
Veronica arenaria	-			x		

Species Name	Common Name	Exotic	Forest Red Gum - Grey Gum Open Forest (HU 544)	Grey Ironbark - Spotted Gum - Grey Box Open Forest (HU 556)	Spotted Gum - Broad Leaved Ironbark Grassy Open Forest (HU 629)	Spotted Gum - Broad Leaved Ironbark Grassy Forest for Dry Hills (HU 292 EEC)
Veronica calycina	Hairy Speedwell		x	x	x	
Wurmbea dioica	Early Nancy		x			