Pacific National

Greta Provisioning Facility
Amended Biodiversity Offset Package

March 2017

Executive summary

GHD was commissioned by Pacific National (the Proponent) to oversee the provision of biodiversity offsets for the proposed development of a Train Support Facility at Greta, in the Hunter Valley, New South Wales (the Project). The Project comprised the construction of a series of rail sidings, maintenance facilities and staff car parking on a 49 ha site.

The Project was assessed and approved under Part 3A of the *Environment Planning and Act Act 1979* and resulted in impacts on native biota. An ecological impact assessment of the Project was performed and identified and quantified the impacts on native biodiversity values along with proposed measures to avoid and mitigate these impacts (SKM, 2010a, 2010b). The outcome of this assessment was that the Project would result in residual impacts equating to the removal of approximately 19.8 ha of vegetation, including the removal of endangered ecological communities (EECs) and habitat for threatened species (DoP, 2011a). The impact area was updated to 20.5 ha of native vegetation removal to account for subsequent modifications to the development site layout (GHD, 2012).

Biodiversity offsets are required to compensate for residual impacts on EECs, threatened species and their habitats and clearing of native vegetation. A biodiversity offset comprises one or more appropriate actions put in place to counterbalance specific impacts on native biota and their habitats. Appropriate actions are considered to be long-term management activities that aim to improve biodiversity conservation. This can include legal protection of land (i.e. an offset site) to ensure security of management actions and remove threats (DECC, 2008).

A biodiversity offset package was prepared and approved for the Project which included the conservation and management of the 'Greta biobank' and the 'Branch Lane biobank' under biobanking agreeements. Due to the size, context and management requirements of the Greta biobank it is not practical for Pacific National to implement the biobanking agreement or to dispose of the site to a third party. Therefore, Pacific National will apply to the NSW Office of Environment and Heritage (OEH) to dissolve the biobanking agreement over the Greta biobank. Alternative biodiversity offsets will be required to replace the offsets associated with the Greta biobank and to compensate for the impacts of the Project.

Pacific National have arranged to purchase additional biodiversity credits from the Branch Lane biobank to meet the Project's offset requirement. This amended offset package has been prepared to demonstrate that the suite of offsets proposed are appropriate and would comply with the interim offset policy, the Part 3A conditions of approval and the *Environment Protection Biodiversity Conservation Act 1999* conditions of approval for the Project.

The amended offset package comprises the purchase and retirement of 1,103 biodiversity credits from the Branch Lane biobank to compensate for impacts arising from the Project as calculated using the BioBanking methodology. The Branch Lane biobank site has attributes that make it highly suitable as an offset site, including continuity with a patch of native vegetation and habitat resources for threatened biota.

The BBAM was varied with reference to the *Interim policy for assessment of biodiversity offsets for Part 3A Projects* (OEH 2011). This framework specifies the assessment process and decision-making criteria for using BioBanking so that a Part 3A Project may achieve an 'improve or maintain', 'no net loss' or 'mitigated net loss' outcome.

The Project resulted in direct impacts to Red Flag areas and the amended offset package required a variation to the offset type (i.e. not all vegetation types would be directly offset) and so achieved a 'mitigated net loss' as defined in the interim policy (OEH, 2011). Variation criterion f) was applied to convert ecosystem credits to a regional conservation priority in a

regional conservation plan. Additional ecosystem credits were presented to compensate for the removal of EECs within the development area. More credits will be purchased and retired than were presented in the original offset package, ensuring that this amended offset package will achieve a biodiversity conservation outcome greater than the original proposal. All threatened fauna species predicted to occur in ecosystem credits associated with the development area are also predicted to occur at the Branch Lane biobank site.

Given the overall surplus of biodiversity credits, and the high conservation significance of the Branch Lane biobank site, the amended offsets package for the Project would achieve conservation outcomes that more than compensate for the impacts of the Project.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.3 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

1.1 Overview

GHD was commissioned by Pacific National (the Proponent) to oversee the provision of biodiversity offsets for the proposed development of a Train Support Facility at Greta, in the Hunter Valley, New South Wales (the Project). The Project comprised the construction of a series of rail sidings, maintenance facilities and staff car parking on a 49 ha site, referred to in this report as the 'subject site' and shown on Figure 1. The subject site is a former rural property containing a mix of near-intact and regenerating bushland and cleared land.

The Project was assessed and approved under Part 3A of the EP&A Act and resulted in impacts on native biota. An ecological impact assessment of the Project was performed and identified and quantified the impacts on native biodiversity values along with proposed measures to avoid and mitigate these impacts (SKM, 2010a, 2010b). The outcome of this assessment was that the Project would result in residual impacts equating to the removal of approximately 19.8 ha of vegetation, including the removal of endangered ecological communities (EECs) and habitat for threatened species (DoP, 2011a). The impact area was updated to 20.5 ha of native vegetation removal to account for subsequent modifications to the development site layout (GHD, 2012).

Biodiversity offsets are required to compensate for residual impacts on EECs, threatened species and their habitats and clearing of native vegetation. A biodiversity offset comprises one or more appropriate actions that are put in place to counterbalance specific impacts on native biota and their habitats. Appropriate actions are considered to be long-term management activities that aim to improve biodiversity conservation. This can include legal protection of land (i.e. an offset site) to ensure security of management actions and remove threats (DECC, 2008). A Biodiversity Offset Package (referred to as 'the offset package') was prepared by GHD to provide biodiversity offsets to compensate for impacts arising from the Project (GHD 2012).

The offset package was prepared to address Condition 12. of the NSW *Environmental Planning and Assessment Act 1979* (EPA Act) Conditions of Approval for the Project which states: "Prior to commencement of construction, or unless otherwise agreed to by the Director-General, the Proponent shall develop and submit a Biodiversity Offset Package for the approval of the Director-General. The package shall detail how the ecological values lost as a result of the Project will be offset, and the final offset measures that will be used to meet the offset requirements".

The Project is a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and so the offset package was also prepared in accordance with the Commonwealth Conditions of Approval dated 13 May 2011, which includes the following conditions:

- 12. The person taking the action must submit a Biodiversity Offset Package for the Minister's approval.
- 13. The Biodiversity Offset Package outlined in Condition 12 must also provide for the conservation and management in perpetuity of an area of habitat for listed threatened species and ecological communities equal or greater in size to that determined by the NSW Biodiversity Banking and Offsets Scheme methodology.

The 'NSW Biodiversity Banking and Offsets Scheme (BioBanking) methodology' (BBAM) was used to determine the number of biodiversity credits required to offset impacts of the Project and the biodiversity credits that would be generated by the conservation of two biobank sites, comprising:

- A portion of the subject site outside of the development footprint, referred to in this report as the 'former Greta biobank', as shown on Figure 1.
- A privately owned site at The Branch, referred to in this report as the 'Branch Lane biobank', as shown on Figure 2.

These biobank sites contain an appropriate suite of vegetation types, threatened biota and habitat resources to offset biodiversity impacts arising from the Project.

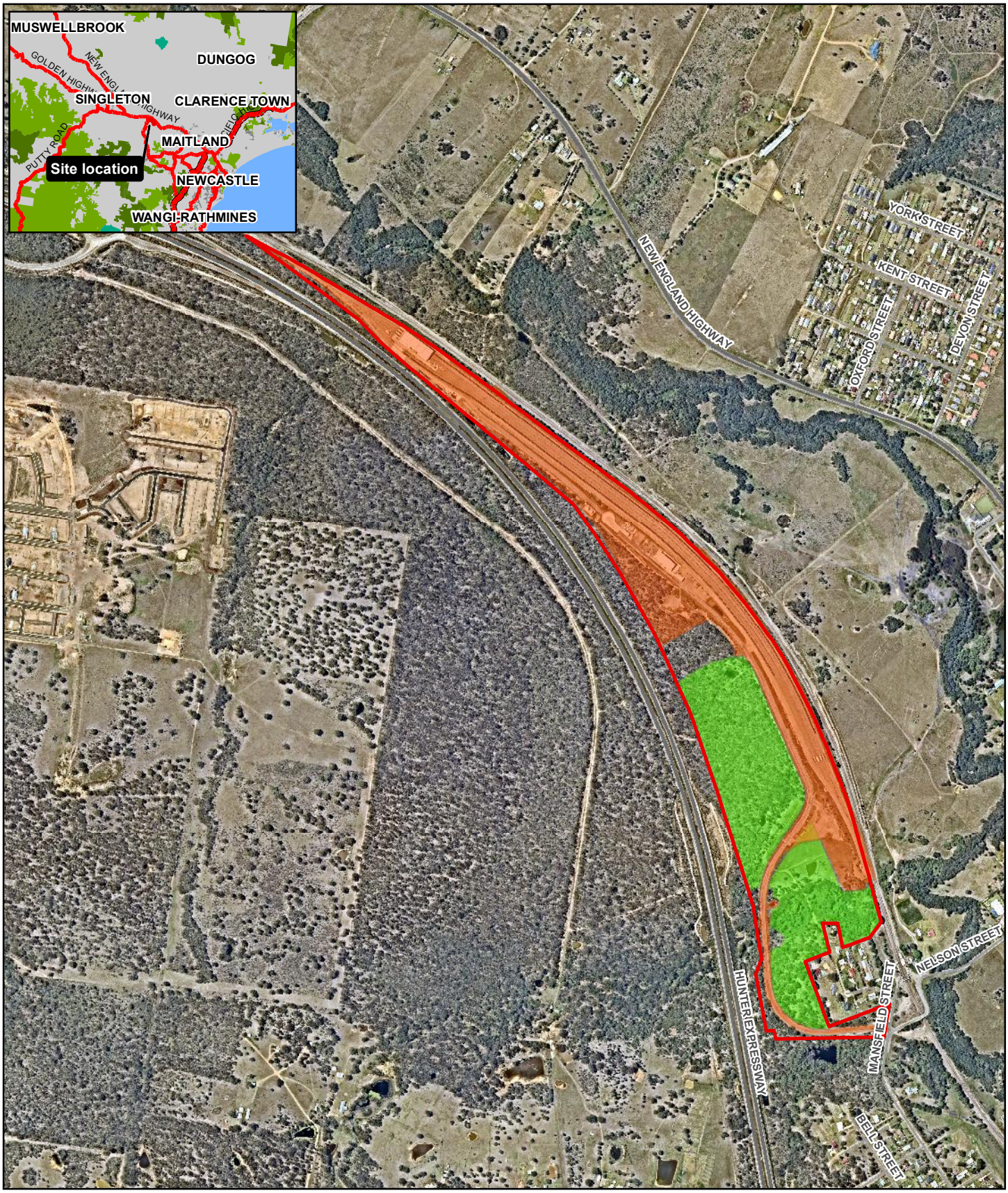
BioBanking operates on an '*improve or maintain'* principle and includes a methodology for calculating offset ratios, trading biodiversity values and protecting areas with higher conservation values. The BBAM does not strictly apply to Part 3A Projects. The *Interim policy for assessment of biodiversity offsets for Part 3A Projects* (OEH 2011) (the interim offsets policy) provides a framework for determining biodiversity offsets for Part 3A Projects using a modified form of the BBAM. This framework specifies the assessment process and decision-making criteria for using BioBanking so that a Part 3A Project may achieve an 'improve or maintain', 'no net loss' or 'mitigated net loss' outcome. The offsets package was prepared in accordance with the interim offsets policy and included detailed justification of the outcome and associated decision-making criteria.

The Project resulted in direct impacts to Red Flag areas and the offset package required a variation to the offset type (i.e. not all vegetation types would be directly offset) and so achieved a 'mitigated net loss' as defined in the interim offsets policy (OEH, 2011). Variation criterion f) was applied to convert ecosystem credits to a regional conservation priority in a regional conservation plan. Additional ecosystem credits were presented to compensate for the removal of EECs within the development area. All threatened fauna species predicted to occur in ecosystem credits associated with the development area were also predicted to occur at the Branch Lane biobank site (GHD 2014).

The offset package was approved by the then NSW Department of Planning and the then Commonwealth DSEWPaC in 2012. The BioBanking calculations presented in the offset package were used to support biobanking agreements for the biobank sites and Pacific National purchased the suite of biodiversity credits presented in the offset package.

Due to the size, landscape context and management requirements of the Greta biobank it is not practical for Pacific National to implement the biobanking agreement or to dispose of the site to a third party. Therefore, Pacific National will apply to the NSW Office of Environment and Heritage (OEH) to dissolve the biobanking agreement over the Greta biobank. Alternative biodiversity offsets will be required to replace the offsets associated with the Greta biobank and to compensate for the impacts of the Project.

Pacific National have arranged to purchase additional biodiversity credits from the Branch Lane biobank to meet the Project's offset requirement. This 'Amended Biodiversity Offset Package' report ('amended offset package') has been prepared to demonstrate that the suite of offsets proposed are appropriate and would comply with the interim offset policy, the Part 3A conditions of approval and the EPBC Act conditions of approval for the Project.



LEGEND

- Subject site
- Development area (27.6 hectares total area; 20.5 hectares vegetation clearing)
- Former Greta biobank site (20.3 hectares)

Paper Size A4

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Pacific National
Greta Provisioning Facility
Amended Biodiversity Offset Package

Job Number 22-18608
Revision A
Date 15 Mar 2017

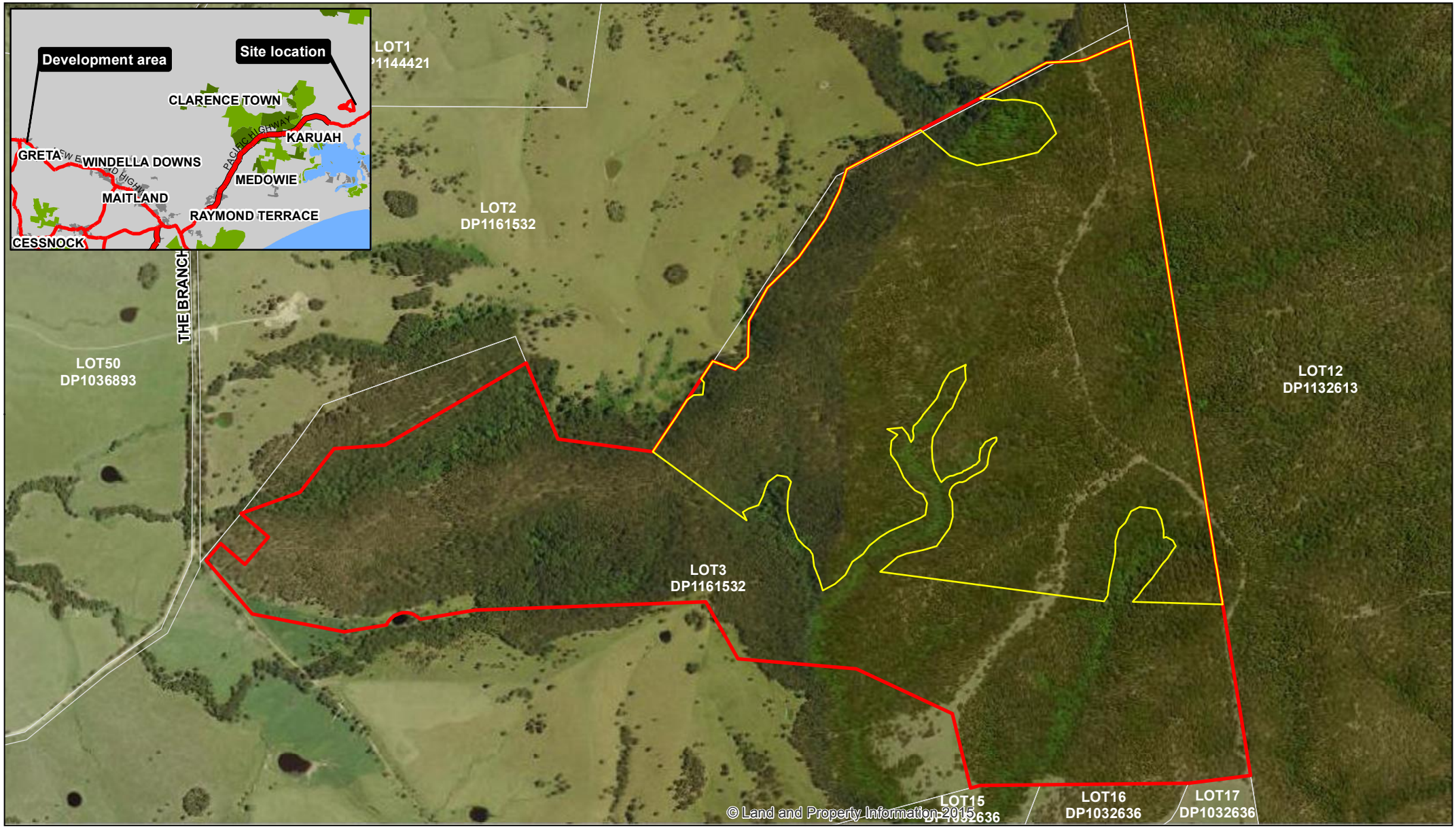
Subject site location and layout

Figure 1

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

G:\22\18608\GIS\Maps\Deliverables\22_18608_Greta_SiteLocation.mxd

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:afoddy



Paper Size A4

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Branch Lane biobank site boundary
- EPBC Act offset area
- Lots

Pacific National
Greta Provisioning Facility
Amended Biodiversity Offset Package

Job Number 22-18608
Revision A
Date 15 Mar 2017

Branch Lane biobank site boundary

Figure 2

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Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:afoddy

1.2 Purpose of this report

The purpose of this amended offsets package is to:

- Consider the NSW and Commonwealth conditions of approval for the Project related to the requirement for biodiversity offsets.
- Describe the process by which the impacts of the Project on biodiversity values will be offset through the conservation of habitat at a biobank site in the region of the Project.
- Describe the impacts of the Project on biodiversity values.
- Describe the proposed offset site, including identification of the additional offset area at the Branch Lane biobank that is linked to the biodiversity credits that would be presented in lieu of credits from the Greta biobank.
- Update the credit profiles of the development and biobank site to match the new vegetation/ecosystem credit types for the Hunter CMA region.
- Compare the development credit requirement with the credits that would be purchased from the biobank in accordance with the assessment process and variations to the biodiversity credit trading rules presented in the Part 3A offset policy.
- Demonstrate that the amended biodiversity offsets presented for the Project:
  - Comply with the EPA Act conditions of approval and the interim biodiversity offset policy (OEH, 2011).
  - Comply with the OEH principles for the use of biodiversity offsets in NSW.
  - Comply with the EPBC Act conditions of approval.
  - Are equivalent or better than the approved offset package.

1.3 Scope and limitations

This report has been prepared by GHD for Pacific National and may only be used and relied on by Pacific National for the purpose agreed between GHD and Pacific National as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Client arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Client and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points at the project site and Branch Lane biobank. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Methodology

2.1 Desktop Assessment

This amended offset package has been prepared giving consideration to information contained in the following:

- GHD (2010a, 2010b) *Pacific National Greta Provisioning Facility, Biodiversity Offset Startegy*.
- GHD (2012a) *Pacific National Greta Provisioning Facility, Biodiversity Offset Package*.
- GHD (2012b) *Greta Provisioning Facility EPBC Act Biodiversity Offset Assessment*.
- Sinclair Knight Mertz (SKM) (2010a) Train Support Facility, Greta, NSW Ecological Impact Assessment.
- Monteath and Powers Pty Ltd (2010a) *Environmental Assessment for Pacific National Train Support Facility at Greta in the Cessnock City Council Local Government Area*
- Monteath and Powers Pty Ltd (2010b) *Submissions and Preferred project report for or Pacific National Train Support Facility at Greta in the Cessnock City Council Local Government Area*.
- SKM (2010b) *Addendum Report Train Support Facility Greta, NSW Ecological Impact Assessment.*
- DoP (2011b) *Director General's Environmental Assessment Section 75I of the Environmental Planning and Assessment Act 1979*.

Biodiversity values described in this report are referenced from the biodiversity offset assessments and ecological impact assessments for the Project listed above. This amended offset package relies on the information presented in these reports for a description of vegetation type and condition, conservation significance, impact assessment and BioBanking credit calculation inputs for the development area and the former Greta biobank.

2.2 Offset Calculations

The biodiversity offset strategy for the Project included a desktop application of the BioBanking methodology based on the Project ecological assessment. Available and extrapolated data were used to determine impacts of the development and the Project offsetting requirements in terms of biodiversity credits using Version 1.2 of the credit calculator (GHD, 2010a, 2010b).

The BioBanking assessment methodology was then used to finalise the offset package for the Project as follows (GHD, 2012):

- Site survey of the former Greta biobank site and the Branch Lane biobank site using the BioBanking plot/transect methodology and additional targeted surveys appropriate to biodiversity values at the sites.
- Supplementary site survey of the Greta study area to determine if any Slaty Red Gum (*Eucalyptus glaucina)* or its hybrids are present and would be removed by the

development. Slaty Red Gum is listed as a vulnerable species under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the species and associated hybrids are listed as vulnerable under the EPBC Act.

- Assessment of the biobanks using the BioBanking methodology and Version 2.0 of the credit calculator to determine the biodiversity credits generated at the sites.
- Comparison of the biodiversity credit profiles of the development site and biobank site to demonstrate that the biobanks are appropriate to offset biodiversity impacts of the Project.
- Finalisation of the offsets package using the OEH (2011) policy and associated variation criteria.

The BioBanking assessment has been revised and updated in this amended biodiversity offset package as follows:

- Updating the development credit requirement and the credits available at the Branch Lane biobank to match the new vegetation/ecosystem credit types for the Hunter CMA region, including:
  - Cross-referencing the original vegetation/ecosystem credit types with candidate new vegetation/ecosystem credit types using the 'status and lineage' data in the Vegetation Information System (VIS) (OEH, 2017).
  - Selection of the vegetation/ecosystem credit types that are the 'best fit' for the vegetation at the development area and the former Greta biobank based on the information presented in the original offset package and ecological assessment reports, the VIS and diagnostic species lists in *Hunter, Central & Lower North Coast Vegetation Classification & Mapping Project Volume 2: Vegetation Community Profiles* (Somerville, 2009).
- Comparison of the development credit requirement with the credits that would be purchased from the Branch Lane biobank in accordance with the assessment process and variations to the biodiversity credit trading rules presented in the interim offset policy (OEH, 2017).

2.3 Staff Qualifications

This report, including all offset calculations, was prepared by Ben Harrington. The assessment was peer reviewed by Jayne Tipping and Daniel Williams. Staff qualifications are presented in Table 1.

Table 1 GHD Ecology Personnel and Qualifications

Name	Position / Project Role	Qualifications	Relevant Experience
Ben Harrington	Senior Ecologist / desktop assessment, offset calculations and reporting	BSc, MSc (Physical Geography) BioBanking Assessor Accreditation*	14+ years
Daniel Williams	Principal Environmental Scientist / Peer review	B. App. Sc. BioBanking Assessor Accreditation*	17+ years
Jayne Tipping	Principal Ecologist / Peer review	BSc, MEnvLaw	23+ years
* Refer to DECCW (2010c) list of accredited assessors.			

3. Existing Environment

3.1 Development Area

3.1.1 Approach

The following section describes the natural environment of the development area as a guide to the quantum of biodiversity offsets that are required to address residual impacts of the Project. This description is based on information presented in the Project environmental assessment included in SKM (2010a, 2010b), Monteath and Powys (2010) and DOP (2010), and supplementary site surveys conducted by GHD ecologists and documented in the approved offset package (GHD, 2012).

3.1.2 Site Context

The subject site, including the 'development area' and 'former Greta biobank site' is located at Lot 1 DP 1129191 and has frontage onto Mansfield Street, Greta, NSW. It is geographically located in the Hunter Valley in the Local Government Area of Cessnock near the Township of Greta. The development area is located on the south-western side of, and adjacent to the Great Northern Railway and adjacent to the Hunter Expressway. The regional location of the subject site is shown in Figure 1 along with the boundaries of the development area and the former Greta biobank within the subject site.

The majority of the subject site contains intact native vegetation in good condition. It occurs within an approximately 50 hectare parcel of land containing vegetated open space and railway infrastructure that is administered by Pacific National. Historical land uses appear to include timber getting, grazing, stock keeping, and construction of railway infrastructure adjoining the site. Disturbed areas include stock fences, a horse racing/exercising track, dirt tracks, farm dams, borrow pits and construction lay down areas. The southern portion of the site is affected by mine subsidence.

The main Hunter east-west railway lies to the north and east of the subject site and beyond that rural-residential land and the township of Greta. The train line to the east of the site would comprise a hostile gap for many fauna species known or likely to occur at the site. The Hunter Expressway lies immediately to the west of the site and would comprise a barrier to east-west terrestrial fauna movement opportunities. In this context, there is a narrow (approximately 50 metres to 300 metres wide) north-south fauna movement corridor running through the subject site.

3.1.3 Vegetation and Habitat Resources

SKM (2010a, 2010b) vegetation mapping was ground-truthed during the GHD site survey and matched to DECCW (2010b) NSW Vegetation Types and BioBanking condition classes. Three vegetation zones (i.e. vegetation types and broad condition classes) were identified in the subject site, including vegetation consistent with two EECs listed under the TSC Act. Vegetation zones within the subject site are presented in Table 2 and mapped on Figure 3.

The vegetation zones at the development area have been updated to match the new vegetation/ecosystem credit types for the Hunter CMA region for this amended offset package. The original vegetation/ecosystem credit types were matched to candidate new vegetation/ecosystem credit types using the 'status and lineage' data in VIS (OEH, 2017). The new vegetation/ecosystem credit types that are the 'best fit' were selected as follows:

- The original 'Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley' (HU556) is equivalent to 'Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter' (HU815) based on geographic location (Central Hunter), geology and geomorphology (rolling low hills on conglomerate) and diagnostic species (Somerville, 2009; OEH, 2017) at high cover/abundances, including *Corymbia maculata, Eucalyptus crebra, Daviesia ulicifolia, Bursaria spinosa, Aristida vagans, Aristida ramosa, Microlaena stipoides* and *Lomandra multiflora* (SKM, 2010a, 2010b; GHD, 2012).
- The original 'Forest Red Gum - Grey Gum dry open forest on hills' is equivalent to 'Grey Gum - Rough-barked Apple shrubby open forest of the lower Hunter' (HU805) based on based on geographic location (Central Hunter), geology and geomorphology (rolling low hills on conglomerate) and diagnostic species (Somerville, 2009; OEH, 2017) at high cover/abundances, including *Eucalyptus punctata, Angophora floribunda, Persoonia linearis, Acacia parvipinnula, Leptospermum trinervium, Melaleuca nodosa, Lissanthe strigosa, Leucopogon juniperinus, Grevillea montana, Microlaena stipoides, Imperata cylindrica, Aristida vagans and Cheilanthes sieberi* (SKM, 2010a, 2010b; GHD, 2012).

The most extensive vegetation zone is Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest in moderate/good condition. This vegetation appears to be approximately 50 year old regrowth though there are occasional pre-European age trees. There are some areas of moderate condition vegetation comprising younger regrowth associated with disturbed areas such as easements, quarries and laydown areas.

Grey Gum - Rough-barked Apple shrubby open forest at the site includes a variety of condition classes influenced by a variety of past and present land uses, including clearing for grazing and rail infrastructure. There is an area of low condition Grey Gum - Rough-barked Apple shrubby open forest that is dominated by native grasses and environmental weeds with very occasional native shrubs and trees. There are localised patches of wind and bird-borne environmental weeds along the edges of tracks and cleared land and adjacent to existing railway infrastructure.

The site contains a number of farm dams dominated by Common Reed (*Phragmites australis*) and Cumbungi (*Typha orientalis*).

There is a small, channel confined, intermittent drainage line in the south of the subject site that did not contain surface water at the time of the survey. This drainage line is in moderate condition with mostly intact geomorphology, moderate in-stream and fringing vegetation, moderate riparian vegetation and good in-stream leaf litter and woody debris. The drainage line features severe infestation with noxious and environmental weeds, including Lantana (*Lantana camara)*. The access road within the proposed development footprint would remove riparian habitat and alter the structure and flow-regime of this drainage line.

Areas of moderate and good condition vegetation within the development footprint are equivalent to undisturbed vegetation for the majority of BioBanking site attribute variables (over-, mid- and understorey vegetation cover, weed cover, quantities of woody debris and over storey regeneration). The site contains moderate numbers of hollow-bearing trees.

The Project ecological assessment identified areas of lower ecological value, comprising cleared land and land currently used for access which featured minimal native vegetation (SKM, 2010a, 2010b). These areas were not mapped as native vegetation and were not included in vegetation clearing estimates for the Project (DoP, 2010). Offsetting of Low condition vegetation is not required in BioBanking assessments of development sites. Low condition vegetation may be included in BioBanking assessments of biobank sites since these areas may be actively managed and allowed to regenerate into native vegetation. Therefore, for the purposes of this assessment cleared areas within the subject site have been identified as Low condition forms of the native vegetation type that was likely to be present before clearing, as shown on Figure 3.

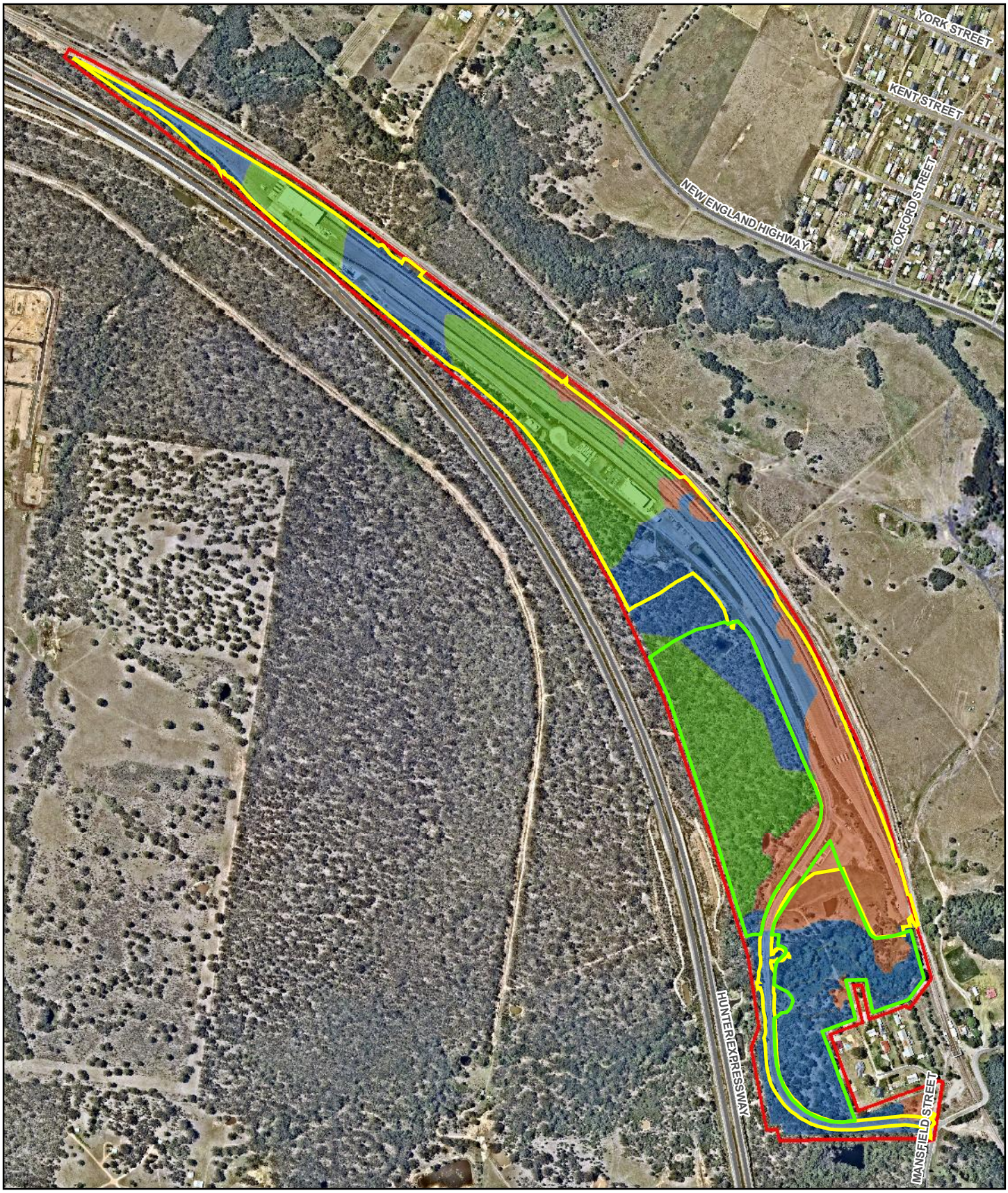
Table 2 Vegetation zones at the Greta Development Area

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous NSW Vegetation Type (DECCW, 2010b)	Previous Veg. Type ID	Condition	Extent at Development Area (hectares)	Conservation Significance	Description (SKM, 2010a)
Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter	HU815	Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	HU556	Moderate/ good	9.8	EEC listed under the TSC Act (Central Hunter Spotted Gum – Ironbark – Grey Gum Forest)	This community is associated with higher elevated slopes of the study area. It supports an open canopy ranging between 15-20 m dominated by Spotted Gum (*Corymbia maculata*) and Narrow-leaved Ironbark (*E. crebra*) along with occasional Grey Box (*E. moluccana*). The mid-storey contains Bulloak (*Allocasuarina luehmannii*) and the understorey features a mix of shrub and groundcover species, including Black Thorn (*Bursaria spinosa*), Gorse Bitter-pea (*Daviesia ulicifolia*), Needlebush (Hakea sericea), Narrow-leaved Geebung (*Persoonia linearis*), Rice Flower (*Pimelea linifolia* subsp. *linifolia*), Purple Wiregrass (*Aristida ramosa*), Three-awn Spear-grass (*A. vagans*), Weeping Grass (*Microlaena stipoides*) Many-flowered Mat-rush (*Lomandra multiflora*) and Poverty Raspwort (*Gonocarpus tetragynus*). No BioBanking habitat attribute data was collected in the development area and so all data was entered as benchmark values.
Grey Gum - Rough-barked Apple shrubby open forest of the lower Hunter	HU805	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	HU544	Moderate/good	10.7	EEC listed under the TSC Act (Hunter Lowland Red Gum Forest)	This community is associated with lower elevated areas of the study area, including open depressions and slopes surrounding drainage lines. It supports an open canopy ranging between 15-20 m dominated by Forest Red Gum (*Eucalyptus tereticornis*) and Narrow-leaved Ironbark along with Rough-barked Apple (*Angophora floribunda*), Grey Gum (*E. punctata*) and Spotted Gum.

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous NSW Vegetation Type (DECCW, 2010b)	Previous Veg. Type ID	Condition	Extent at Development Area (hectares)	Conservation Significance	Description (SKM, 2010a)
							Some areas support a high abundance of regenerating trees with larger trees interspersed. A moderate abundance of small-medium sized trees (4-8 m high) are present, including *Melaleuca decora*, Prickly-leaved Paperbark (*Melaleuca nodosa*) and Bulloak. Dominant shrub species include Gorse Bitter - pea, Needlebush, Narrow - leaved Geebung, Coffee Bush, Rice Flower, *Acacia falcata*, Silver - stemmed Wattle (*Acacia parvipinnula*) and *Leptospermum trinervium*. Groundcover species include Weeping Grass and Barbed - wire Grass, with other grasses occurring in lower abundance forbs such as Rough Raspwort (*Haloragis heterophylla*), White Root, Mat - rush (*Lomandra longifolia*) and Blue Bottle - daisy (*Lagenophora stipitata*). No BioBanking habitat attribute data was collected in the development area and so all data was entered as benchmark values.
Grey Gum - Rough-barked Apple shrubby open forest of the lower Hunter	HU805	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	HU544	Low	-*	EEC listed under the TSC Act (Hunter Lowland Red Gum Forest)	Regenerating shrubland adjoins cleared land and features a moderate density of the shrub Needlebush with regenerating Eucalypt species. These areas are considered to be regenerating examples of the surrounding forest types. Cleared land, features a derived grassland of Couch (*Cynodon dactylon*) and speargrasses (*Aristida* spp.) with very occasional seedlings

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous NSW Vegetation Type (DECCW, 2010b)	Previous Veg. Type ID	Condition	Extent at Development Area (hectares)	Conservation Significance	Description (SKM, 2010a)
							of native trees and shrubs and occasional native herbs. Low condition vegetation that was not included in BioBanking calculations.
		Total			**20.5***		

* only the 20.47 hectares of intact native vegetation within the development area requires biodiversity offsets in this assessment.



LEGEND

- Subject site
- Former Greta biobank site (20.3 hectares)
- Development area (27.6 hectares total area; 20.5 hectares vegetation clearing)
- Grey Gum - Rough-barked Apple shrubby open forest (HU805, Low condition)
- Grey Gum - Rough-barked Apple shrubby open forest (HU805, Moderate/good condition)
- Spotted Gum - Narrow-leaved Ironbark - Red Ironbark shrub - grass open forest (HU815, Moderate/good condition)

Paper Size A4

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Job Number 22-18608
Revision A
Date 15 Mar 2017

Subject site vegetation zones

Figure 3

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:afoddy

3.1.4 Conservation Significance

Threatened Flora Species

Field surveys conducted for the ecological impact assessment of the Project did not reveal any threatened plants (SKM, 2010a; 2010b). GHD ecologists undertook a supplementary targeted survey for Slaty Red Gym (*Eucalyptus glaucina*) at the development area in 2010 (GHD, 2010a). Slaty Red Gum is listed as a vulnerable species under the TSC Act and the species and associated hybrids and intergrades are listed as vulnerable under the EPBC Act. A flowering Slaty Red Gum was observed approximately 10 kilometres from the subject site and a voucher specimen was collected to assist with field identification of the species. No Slaty Red Gum were observed in the subject site. A large number of Forest Red Gum (*Eucalyptus tereticornis*) were observed, including some with physical characteristics that suggested genetic influence of Slaty Red Gum. A second site survey was conducted in April 2011 targeting intergrades between *E. glaucina* and *E. tereticornis* and revealed 11 likely Slaty Red Gum intergrades within the former Greta biobank site.

Based on the results of SKM, (2010a; 2010b) and subsequent GHD site surveys the project would not remove any Slaty Red Gum individuals. Detailed design ensured that the final development area for the Project did not contain any Slaty Red Gum intergrades. Therefore no specific offsets for Slaty Red Gum intergrades have been included in this offsets package.

Threatened Ecological Communities

The development area contains two endangered ecological communities (EECs) listed under the TSC Act:

- Central Hunter Spotted Gum – Ironbark – Grey Box Forest
- Hunter Lowland Red Gum Forest in the Sydney Basin and North coast Bioregions (SKM, 2010b; GHD, 2012).

The majority of the area of these EECs across the site comprises intact forest in good condition and would provide habitat for a diverse range of native flora and fauna species, including rare and threatened species.

No EECs listed under the EPBC Act were identified in the subject site or are otherwise of relevance to this assessment.

Threatened and Migratory Fauna Species

A total of five threatened fauna species have been recorded at the development area:

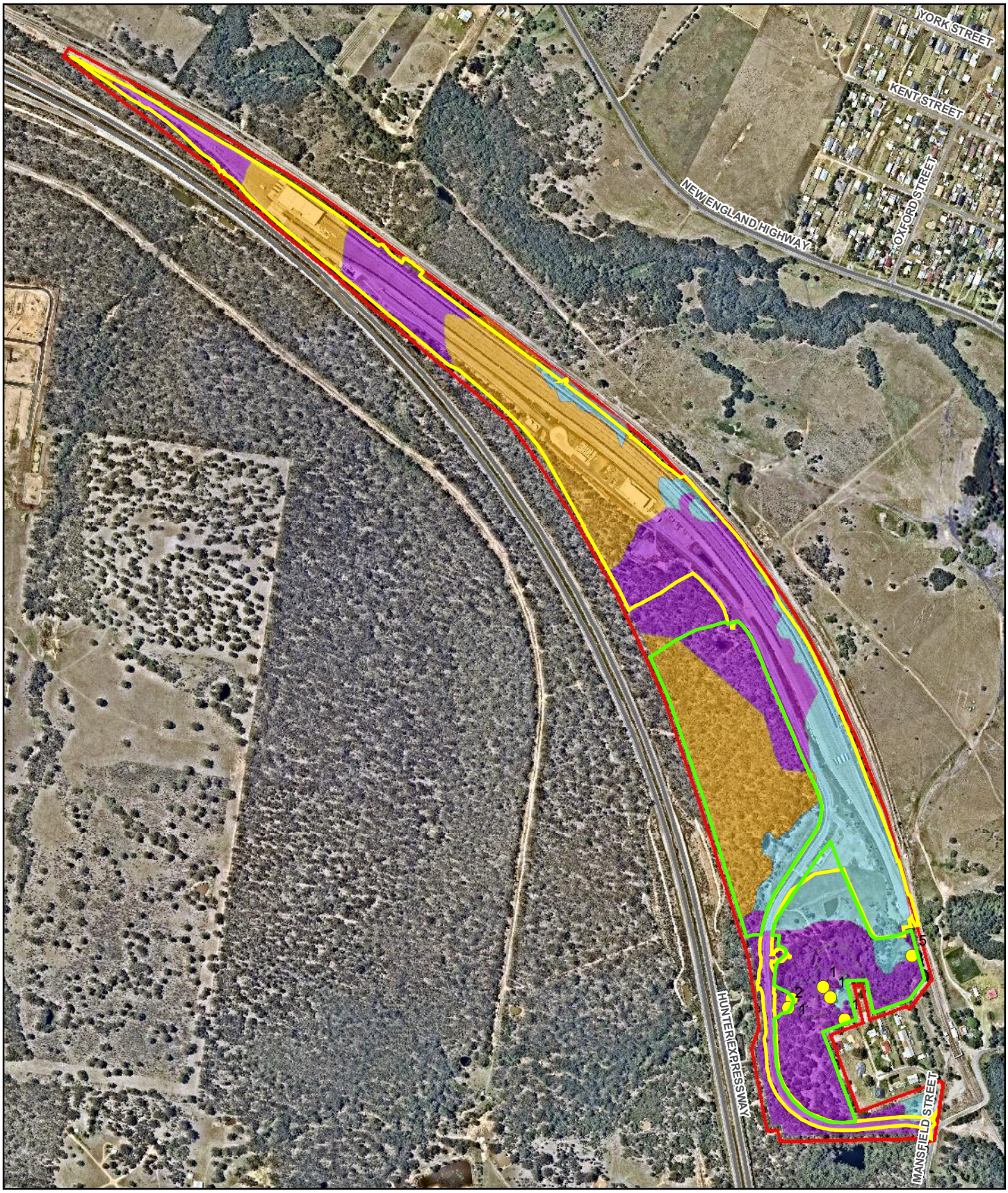
- The Squirrel Glider (*Petaurus norfolcensis*).
- The Grey - crowned Babbler (eastern subsp) (*Pomatostomus t. temporalis*).
- The Speckled Warbler (*Pyrrholaemus saggitatus*).
- The Varied Sitella (*Daphoenositta chrysoptera*).
- The Little Lorikeet (*Glossopsitta pusilla*) (SKM, 2010a, 2010b; GHD, 2012).

Each of these species is listed as a vulnerable species under the TSC Act. The Varied Sitella and the Little Lorikeet were not listed as threatened species at the time of the original ecological assessment but were identified as threatened species in the subsequent offset package (GHD, 2012).

The development area contains critical foraging habitat for the Grey−headed Flying−Fox (*Pteropus poliocephalus*) as defined in the Draft Recovery Plan (DECCW, 2009b) for the species and habitat resources for a number of other threatened or migratory fauna species (SKM, 2010a).

The Project was determined a controlled action by the Minister's delegate as it was considered that the action was likely to have a significant impact on threatened and migratory species listed under the EPBC Act (GHD, 2012). The amended offsets package considers the removal of habitat for the following threatened and migratory species listed under the EPBC Act:

- The Swift Parrot (*Lathamus discolor*).
- The Spotted-tail Quoll (*Dasyurus maculatus*).
- The Regent Honeyeater (*Xanthomyza phrygia*).
- The Grey-headed Flying-fox.
- Migratory birds of woodland, forest and grasslands.



LEGEND

- Subject site
- Former Greta biobank site (20.3 hectares)
- Development area (27.6 hectares total area; 20.5 hectares vegetation clearing)
- Likely Slaty Red Gum hybrid (Number of individuals)

Endangered Ecological Communities (TSC Act)

- Central Hunter Ironbark – Spotted Gum – Grey Box Forest (Moderate/good condition)
- Hunter Lowlands Red Gum Forest (Low condition)
- Hunter Lowlands Red Gum Forest (Moderate/good condition)

Paper Size A4

0 37.5 75 150 225 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Amended Biodiversity Offset Package

Subject site threatened flora and ecological communities

Job Number 22-18608
Revision A
Date 15 Mar 2017

Figure 4

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G:\22\18608\GIS\Maps\Deliverables\22_18608_Greta_Biota.mxd

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:afoddy

3.2 Branch Lane Biobank

3.2.1 Approach

The following section describes the natural environment of the Branch Lane biobank site to support the biodiversity offsets that would be provided to offset residual impacts of the Project. This description is based on information presented in the approved offset package (GHD, 2012) and BioBanking agreement application for the site (GHD, 2013).

3.2.2 Site Location

The 'Branch Lane biobank site' is located at The Branch in the lower portion of the Hunter CMA in the Local Government Area of Great Lakes City Council near the Township of Karuah. The Branch Lane biobank site is located approximately 60 kilometres east-northeast of the development area. The regional location of the Branch Lane biobank site is shown on Figure 2 along with the location of the development area.

The Branch Lane biobank site contains greater than 90 percent cover of intact native vegetation in good condition. The site is situated within an approximately 300 hectare parcel of rural residential land. Historical land uses appear to include timber getting and grazing. Disturbed areas include cleared land converted to exotic pasture, dirt tracks, borrow pits, log dumps and construction laydown areas.

The Branch contains rural residential land on large lots. The site is bordered to the north, west and south by partially cleared grazing country. Upper slopes, ridges and drainage lines are generally covered by intact native vegetation while lower slopes and flats at the edge of the property boundary have been cleared and converted to exotic pasture. There is native vegetation within rural residential land to the east. There is a gravel road to the west of the site that would not comprise a hostile gap for the majority of fauna species known or likely to occur. Vegetated corridors connect the site with other patches of native vegetation in all directions. Fauna movement would be most restricted to the west, where connected native vegetation is restricted to a narrow riparian corridor. The site is connected by this narrow vegetated corridor to Karuah National Park to the south-west.

3.2.3 Vegetation and Habitat Resources

There are three vegetation zones at the Branch Lane biobank site. PATN analysis completed on the species richness and cover abundance data collected within plots confirmed these three vegetation zones. Vegetation zones within the Branch Lane biobank site are presented in Table 3 and mapped on Figure 5.

As described above for the development area, the vegetation zones at the biobank site have been updated to match the new vegetation/ecosystem credit types for the Hunter. The new vegetation/ecosystem credit type that are the 'best fit' were selected as follows:

- The original 'Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast' (HU630) is equivalent to 'Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest' (HU804) based on geographic location (Hunter Valley margins), geology and geomorphology (rolling low hills on conglomerate) and diagnostic species (Somerville, 2009; OEH, 2017) at high

cover/abundances, including *Corymbia maculata*, *Allocasuarina torulosa*, *Pultenaea villosa, Persoonia linearis, Breynia oblongifolia, Bursaria spinosa, Microlaena stipoides, Themeda australis, Aristida vagans, Pratia purpurascens, Vernonia cinerea, Dianella caerulea, Lomandra multiflora, Lepidosperma laterale* and *Cheilanthes sieberi.*

- The original 'Tallowwood - Brush Box - Sydney Blue Gum moist shrubby tall open forest on foothills of the lower North Coast' (HU642) is clearly the best fit with the new vegetation type of the same name (HU871). This PCT comprises tall open forests dominated by *Eucalyptus microcorys* and *Lophostemon confertus* with a semi-mesic understorey. This description and the associated diagnostic species are a close match for the vegetation described in Table 3.

The most extensive vegetation zone is Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest in good condition. This vegetation appears to be approximately 70 year old regrowth though there are occasional pre-European age trees. There are some areas of moderate condition vegetation comprising younger regrowth associated with disturbed areas such as easements and laydown areas but these were not extensive or distinct enough to warrant treatment as a separate vegetation zone.

The structure and species composition of this vegetation type varies considerably with slope position and aspect. Exposed north and west-facing slopes and ridges support a 'dry' forest with an open shrub layer and grassy understorey, while sheltered east and south-facing slopes support a 'wet' forest with a mid storey of small trees, denser shrub layer and understorey of grasses, herbs, ferns and scramblers. Sufficient plot / transects were sampled to treat this vegetation zone as two separate vegetation types. Subsequent PATN analysis of variation in plant species and cover abundance within and between plots revealed that wet and dry forms were a single vegetation type.

Tallowwood - Brush Box - Sydney Blue Gum moist shrubby tall open forest in good condition occurs in sheltered gullies and drainage lines throughout the site. This is a highly variable and diverse vegetation type with elements of Hunter Valley dry rainforest vegetation type (such as Grey Myrtle *Backhousia myrtifolia*) as well as species of the mid coast of NSW (such as Brushbox *Lophostemon confertus*). PATN analysis did not support splitting this vegetation zone into more than one vegetation type and so a single vegetation type that was the best fit was selected.

The margins of the site at the edge of the property boundaries, where it adjoins surrounding grazing country, contain a derived exotic grassland. These areas have been mapped as Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest in low condition based on surrounding intact vegetation, remnant canopy trees and native understorey species.

An EPBC Act offset area has been identified at the Branch Lane biobank that is linked to the biodiversity credits that will be purchased and retired for this amended offset package (see Figure 5 and Section 5). The offset area for the Project does not include any Low condition vegetation because this would not be appropriate to offset impacts on Moderate/good condition vegetation at the development area.

Intact vegetation within the Branch Lane biobank site is relatively weed-free. There are localised patches of wind-borne environmental weeds in fire breaks, along the edges of tracks and cleared land. These patches of partially disturbed land are dominated by opportunistic native plants such as Indian Weed (*Sigesbeckia orientalis*) and regenerating canopy species and so for the purposes of the BioBanking assessment have not been separated from surrounding moderate/good condition vegetation. There are occasional localised infestations of the bird-borne noxious weed Lantana (*Lantana camara**).

The Branch Lane biobank site contains a number of 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, very good riparian vegetation and good in-stream leaf litter and woody debris. These drainage lines contain habitat for frogs that prefer to breed in creeks, including species associated with rainforest creeks.

There are a number of farm dams in grazing country close to the Branch Lane biobank. There are a number of intermittent flooded depressions within the site associated with drainage works as well as natural features. Dams and flooded depressions contain surface water and wetland plants that would have habitat value for native frogs, bats, birds and reptiles.

Table 3 Vegetation zones at the Branch Lane biobank

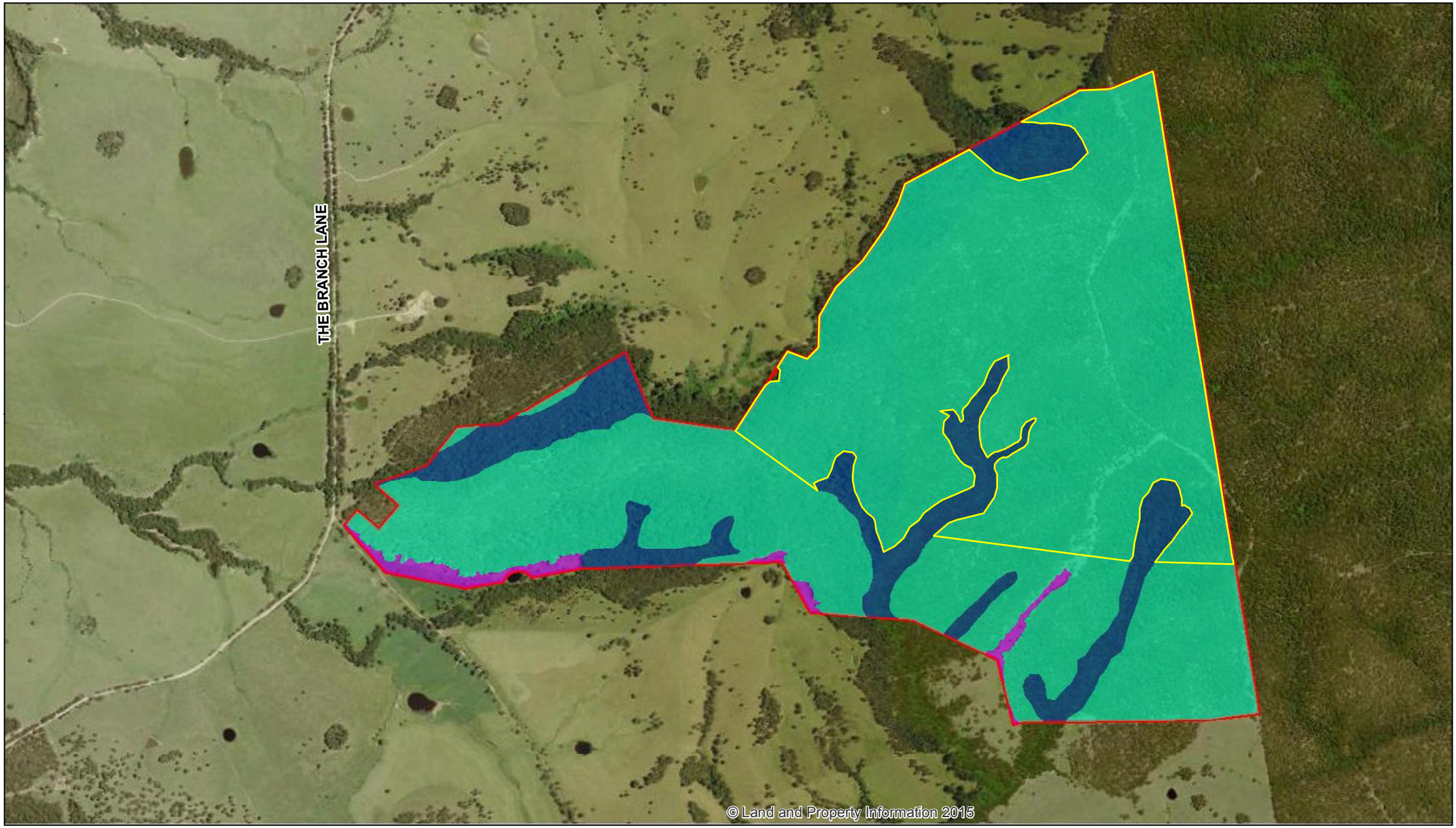
Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous Vegetation Type (DECCW, 2010b)	Previous Veg Type ID	Condition	Area within Biobank Site (ha)	Conservation Significance	Description
Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	HU804	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	HU630	Moderate/good	238.60	Native vegetation not listed as a TEC under the TSC Act or EPBC Act	This vegetation type is associated with mid and upper slopes of the biobank site. The overstorey is 20-30 m tall and dominated by Spotted Gum (*Corymbia maculata*), Grey Gum (*Eucalyptus punctata*) and Grey Ironbark (*E. siderophloia*) with a mixture of other ironbark and stringybark Eucalyptus species sub-dominant. The lower vegetation strata are diverse and structurally complex and vary between dry and wet aspects. The dry form comprises: a sparse mid-storey of Black She-oak (*Allocasuarina littoralis*), *Melaleuca nodosa* and juvenile *Eucalyptus* species; an open shrub layer of Black Thorn (*Bursaria spinosa*), Narrow-leaved Geebung (*Persoonia linearis*), Silver-stemmed Wattle (*Acacia parvipinnula*) and Peach Heath (*Lissanthe strigosa*); a groundcover dominated by grasses such as Three-awn Spear-grass (*Aristida vagans*), Weeping Grass (*Microlaena stipoides*) and Kangaroo Grass (*Themeda australis*); graminoids and sedges such as Many-flowered Mat-rush (*Lomandra multiflora*) and Variable Sword-sedge (*Lepidosperma laterale*); and occasional herbs such as Poverty Raspwort (*Gonocarpus tetragynus*) scramblers such as Glycine species. There is negligible exotic plant cover in this vegetation type. The wet form comprises: mid-storey of Forest Oak (*Allocasuarina torulosa*) and

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous Vegetation Type (DECCW, 2010b)	Previous Veg Type ID	Condition	Area within Biobank Site (ha)	Conservation Significance	Description
							juvenile Turpentine (*Syncarpia glomulifera*) and Eucalyptus species. A locally dense shrub layer of Narrow-leaved Geebung (*Persoonia linearis*), Swamp Wattle (*Acacia elongata*) and Coffee Bush (*Breynia oblongifolia*); shade-tolerant grasses such as Weeping Grass (*Microlaena stipoides*) *Entolasia* spp. and *Oplismenus* spp.; graminoids and sedges such as Spike-headed Mat-rush (*Lomandra longifolia*) and Rough Sword-sedge (*Gahnia clarkii*); and a range of groundcover species such as Maidenhair Fern (*Adiantum aethiopicum*), White Root (*Pratia purpurascens*), Indian Pennywort (*Centella asiatica*) and Glycine species. There is very little exotic plant cover in this vegetation type aside from occasional localised patches of Lantana (*Lantana camara**). BioBanking site value data was collected in plot / transects and confirms that this vegetation is near-intact and in good condition. Species richness and canopy, mid storey and understorey vegetation cover was equivalent to undisturbed remnants. There are good quantities of woody debris and leaf litter and moderate numbers of hollow-bearing trees. This vegetation type has moderate potential for achieving gains in biodiversity values through management within a biobank site. Improvements in biodiversity value could be obtained through continuing development of vegetation

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous Vegetation Type (DECCW, 2010b)	Previous Veg Type ID	Condition	Area within Biobank Site (ha)	Conservation Significance	Description
							structure and habitat resources and management of weeds and pest fauna.
Tallowwood - Brush Box - Sydney Blue Gum moist shrubby tall open forest on foothills of the lower North Coast	HU781	Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	HU642	Moderate/good	38.38	Native vegetation not listed as a TEC under the TSC Act or EPBC Act	This vegetation type is associated with drainage lines and gullies. The overstorey is 20-30 m tall and is dominated by Brushbox (*Lophostemon conferta*) with a highly variable mix of Eucalypts, including Sydney Blue Gum (*E. saligna*), Small-fruited Grey Gum (*E. propinqua*), White Mahogany (*E. acmenoides*) and Spotted Gum (*Corymbia maculata*). There is a dense mid storey of rainforest species, including Grey Myrtle (*Backhousia myrtifolia*), Brush Cherry (*Syzygium australe*), Sandpaper Fig (*Ficus coronata*) and Cabbage Tree palm (*Livistona australis*). The ground cover is dense and highly variable and includes: rainforest shrubs such as Black Plum (*Diospyros australis*), Rough-fruit Pittosporum (*Pittosporum revolutum*); shade-tolerant grasses such as *Entolasia* spp. and Oplismenus spp.; graminoids and sedges such as Spike-headed Mat-rush *(Lomandra longifolia*) and Settlers Flax (*Gymnostachys anceps*); ferns such as Maidenhair fern (*Adiantum aethiopicum*), Black Maidenhair Fern (*Adiantum formosum*) and Gristle Fern (*Blechnum cartilagineum*); and herbs such as Pastel Flower (*Pseuderanthemum variabile*) and White Root (*Pratia purpurascens*). BioBanking site value data was collected in plot / transects and confirms that this vegetation is near-intact and in good

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous Vegetation Type (DECCW, 2010b)	Previous Veg Type ID	Condition	Area within Biobank Site (ha)	Conservation Significance	Description
							condition. Species richness and canopy, mid storey and understorey vegetation cover was equivalent to undisturbed remnants. There are good quantities of woody debris and leaf litter and moderate numbers of hollow-bearing trees. This vegetation type has moderate potential for achieving gains in biodiversity values through management within a biobank site. Improvements in biodiversity value could be obtained through continuing development of vegetation structure and habitat resources and management of weeds and pest fauna.
Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	HU804	Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	HU630	Low	3.23	Native vegetation. not listed as a TEC under the TSC Act or EPBC Act	This low condition vegetation type features a canopy reduced to occasional paddock trees and very sparse shrub layer resulting in a derived grassland structure. The vegetation cover is dominated by the exotic grasses Giant Parramatta Grass (*Sporobolus fertilis*), Pale Pigeon Grass (*Setaria gracilis*), Carpet Grass (*Axonopus fissifolius*) and Paspalum (*Paspalum dilatatum*). There is a diverse range of herbaceous environmental weeds. There is also a moderate diversity but low overall cover abundance of native grasses, herbs and scramblers and very occasional native shrubs and juvenile *Eucalyptus*. BioBanking site value data confirms that this vegetation is in low condition. Canopy, shrub and understorey vegetation cover, woody debris, leaf litter and hollow-bearing trees are all below benchmark values. Species richness and

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous Vegetation Type (DECCW, 2010b)	Previous Veg Type ID	Condition	Area within Biobank Site (ha)	Conservation Significance	Description
							regeneration are at or near benchmark in the majority of plots suggesting the potential for assisted natural regeneration to restore this vegetation zone to moderate/good condition.
		Total			**280.21**		



Paper Size A4

0 60 120 240 360 480

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Branch Lane biobank site boundary
- Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (HU804, Low)
- Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (HU804, Moderate/good)
- Tallowwood - Brush Box - Sydney Blue Gum moist shrubby tall open forest (HU781, Moderate/good)
- EPBC Act offset area

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Branch Lane biobank vegetation zones

Figure 5

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:afoddy

3.2.4 Conservation Significance

Threatened Flora Species

No threatened flora species were recorded during surveys of the Branch Lane biobank site.

Threatened Ecological Communities

No threatened ecological communities are present at the Branch Lane biobank site.

Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest at the site is structurally and floristically equivalent to Lower Hunter Spotted Gum – Ironbark Forest which is listed as an EEC under the TSC Act. Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest does not comprise a local occurrence of the EEC because it is not within the geographic range defined in the Scientific Committee determination for Lower Hunter Spotted Gum – Ironbark Forest EEC. Nonetheless, Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest at the site contains many of the species that occur within the EEC and is contiguous with vegetated corridors and reserves to the west of the site that are within the distribution of the EEC. OEH staff have inspected the site and confirmed the functional similarity of vegetation at the site to Lower Hunter Spotted Gum – Ironbark Forest and that the Branch Lane biobank would help contribute to the regional conservation of the species that collectively comprise the EEC (Lewer, S., OEH, pers. comm.).

Threatened Fauna Species

Two threatened fauna species were identified during field surveys of the Branch Lane biobank site (GHD, 2012):

- Grey-crowned Babbler (eastern subspecies) (*Pomastomus temporalis temporalis*)
- Varied Sittella (*Daphoenositta chrysoptera*).

Both of these species are listed as a vulnerable species under the TSC Act. They are not listed as a threatened species under the EPBC Act. Neither of these threatened fauna species are of the type that require species credits within the BioBanking assessment methodology.

The Branch Lane biobank site contains critical habitat for the Grey-headed Flying Fox as defined in the Recovery Plan for the species (DECCW 2009b). Specifically, the site: would provide habitat resources for the Branch breeding camp (DSEWPAC, 2012) and associated population of >30,000 individuals; and contains large numbers of Spotted Gum (*Eucalyptus maculata*) that flower during winter and spring (during food bottlenecks); and large numbers of Grey Gum (*Eucalyptus punctata*) that flower during summer and autumn (during the breeding season) (DECCW, 2009b). The Grey-headed Flying-fox is listed as a vulnerable species under the TSC Act and EPBC Act.

4. BioBanking Credit Calculations

4.1 Approach

The following section presents a summary of the credit calculations that were included in the approved offset package (GHD, 2012) and BioBanking assessment for the Branch Lane biobank (GHD, 2013).

For the assessment of the development area, available and extrapolated data was entered into Version 1.2 of the credit calculator to determine the number and type of credits that would need to be purchased and retired if the entire development area was included in an application for a biobanking statement. The complete BioBanking Credit Report for the development area is included as Appendix A of the approved offset package (GHD, 2012).

For the Branch Lane biobank site, data was collected according to the BBAM and entered into Version 2.0 of the credit calculator to determine the number and type credits generated when a biobanking agreement was obtained for the site. The BioBanking credit report for the Branch Lane biobank site is included as Appendix C of the approved offset package (GHD, 2012)..

The original BioBanking assessments were completed by Ben Harrington (Assessor Accreditation no. 0073) and peer reviewed by Daniel Williams (Assessor Accreditation no. 0082).

The BioBanking credit calculations were reviewed and approved by OEH and DPE as part of the approval of the offset package. The BioBanking credit calculations for the Branch Lane biobank site were further reviewed and approved by the OEH BioBanking unit as part of the approval of the BioBanking agreement application.

As described in Section 3 above, the plant community types and associated ecosystem credit types in the Hunter-Central Rivers CMA Region have been reclassified since the original offset package and associated credit calculations were completed. Vegetation/ecosystem credit types at the development area and Branch Lane biobank have been matched to the new classification. The following section summarises the credit calculations that support this amended offset package.

4.2 Development Area Ecosystem Credits

A total of 1,036 ecosystem credits were calculated for the development impact. The BioBanking credit report for the development area is included as Appendix A and summarised in Table 4.

Table 4 Development Area Ecosystem Credit Profile

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous Veg. Type ID	Area (ha)	Ecosystem Credits Required
Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter	HU815	HU556	9.8	623
Grey Gum - Rough-barked Apple shrubby open forest of the lower Hunter	HU805	HU544	10.7	413

Impacts on Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest and impacts on Grey Gum - Rough-barked Apple shrubby open forest comprise impacts on red flag areas because both of these vegetation types comprise local occurrences of EECs (see Section 0).

4.3 Branch Lane Biobank Ecosystem Credits

A total of 2218 ecosystem credits were generated for the Branch Lane biobank as summarised in Table 5. The BioBanking credit report for the Branch Lane biobank is included as Appendix B. The subset of biodiversity credits that would be purchased and retire to offset the impacts of the Project are presented in Section 5.1.

Table 5 Branch Lane Biobank Ecosystem Credit Profile

Plant Community Type (OEH, 2017a)	Condition	Veg. Type ID	Previous Veg. Type ID	Area (ha)	Ecosystem Credits Generated
Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Moderate/good	HU804	HU630	238.6	1870
Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	Moderate/good	HU781	HU642	38.38	316
Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	Low	HU804	HU630	3.23	32

There is not a perfect match between PCTs within the development area and the Branch Lane biobank site, which reflects the inherent difficulty of identifying a viable offset site or sites with the desired attributes. Despite this, the Branch Lane biobank site is considered a suitable offset site for the development due to:

- The presence of native forest vegetation in good condition and associated habitat resources.
- The functional similarity of vegetation at the site with vegetation to be removed in the development area.
- The presence of two threatened fauna species and the presence of habitat resources for a range of other threatened biota equivalent to those present at the development area.
- The location of the proposed biobank site within a large contiguous patch of vegetation and in an area classified as a regional conservation priority in the *Lower Hunter Regional Conservation Plan* (DECCW 2009c).

5. Biodiversity Offset Assessment

5.1 Offset Package Credit Contribution

The biodiversity credits that are included in this offset package are presented in Table 6. The number and type of biodiversity credits have been determined with reference to:

- The biodiversity credit profile of the development area, which comprises the biodiversity credits that would be required to offset impacts arising from the Project.
- The biodiversity credit profile of the Branch Lane biobank site, which comprises the biodiversity credits generated at the biobank site because it has been set aside and managed for conservation in perpetuity.
- The biodiversity credit trading rules for BioBanking assessments presented in DECC (2009).
- The variation criteria for the biodiversity credit trading rules that may be applied to Part 3A Projects presented in OEH (2011).
- The experience and judgement of GHD ecologists.
- Consultation with OEH on this Project.

Table 6 Offset Package - Comparison between the Development Area Credits Required and Biobank Credits Contribution

Plant Community Type (OEH, 2017a)	Veg. Type ID	Previous Veg. Type ID	Ecosystem Credits Required	Branch Lane Biobank Site Credits Purchased and Retired	Offset Package Credit Comparison
Spotted Gum - Narrow-leaved Ironbark - Red Ironbark shrub - grass open forest of the central and lower Hunter	HU815	HU556	623	657	34 credit surplus, of credits within the same vegetation formation and within a regional conservation priority area according to variation criteria f) of OEH (2011)*
Grey Gum - Rough-barked Apple shrubby open forest of the lower Hunter	HU805	HU544	413	446	33 credit surplus, of credits within the same vegetation formation and within a regional conservation priority area according to variation criteria f) of OEH (2011)**
Total			**1036**	**1103**	**67 credit surplus**

* Spotted Gum - Narrow-leaved Ironbark-Red Ironbark shrub - grass open forest of the central and lower Hunter (HU815) credits in the development area would be traded with credits for Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (HU804) at the Branch Lane biobank site which is also within the Dry Sclerophyll Forest vegetation formation and is within an area identified as a regional investment priority for the Lower Hunter Region (map 3, p35 DECCW 2009c).

** Grey Gum - Rough-barked Apple shrubby open forest of the lower Hunter (HU805) credits in the development area would be traded with Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest (HU804) which is also within the Dry Sclerophyll Forest vegetation and is within an area identified as a regional investment priority for the Lower Hunter Region (map 3, p35 DECCW 2009c).

The BioBanking methodology states that impacts of a development on biodiversity values must be offset by the retirement of biodiversity credits at the biobank site determined in accordance with the offset rules (DECC, 2009). These rules may be altered or may not apply when the Project is being assessed under Part 3A of the EP&A Act using the variation criteria stated in Attachment B of the OEH (2011) Interim offsets policy.

The ecosystem credits that would be presented to offset the impacts of the Project are presented in Table 6.This suite of ecosystem credits partially complies with the ecosystem credit trading rules (DECC, 2009) as follows.

1. The number of ecosystem credits obtained and retired from the biobank site is equal to or greater than the number of credits required at the development site: 1,103 ecosystem credits will be retired from the Branch Lane biobank, which is greater than the 1,036 ecosystem credits required for the development area. Therefore condition 1 is met.
2. The CMA subregion of the biobank site is the same as the subregion of the development site: The development site and biobank site are both in the Hunter CMA sub-region and therefore condition 2 is met.
3. The vegetation types identified in the credit profile at the biobank site are the same as the vegetation types identified in the credit profile of the credits required at the development site: The vegetation types at the Branch Lane biobank site are not listed in the credit profile for the development area. Therefore condition 3 is not met.
4. The vegetation formation identified in the credit profile at the biobank site is the same as the vegetation formation identified in the credit profile of the credits required at the development site: All ecosystem credits that would be traded between the development area and the biobank site in this offset package are within the Dry Sclerophyll Forests (Shrub/grass sub-formation) vegetation formation. Therefore condition 4 is met.
5. The surrounding vegetation cover class identified in the credit profile at the biobank site is equal to, or greater than, the surrounding vegetation cover class in the credit profile of the credits required at the development site: the surrounding vegetation cover class percentages of ecosystem credits required at the development site (> 30%) are matched by credits with equivalent or greater percentages at the Branch Lane biobank site (>70%). Therefore condition 5 is met.
6. The patch size, including low condition class identified in the credit profile at the biobank site is equal to, or greater than, the patch size, including low condition class identified in the credit profile of the credits required at the development site: the patch size, including low condition vegetation of ecosystem credits required at the development site (minimum 100 hectares) are matched by credits with equivalent or greater patch sizes at the biobank site (> 100 hectares). Therefore condition 6 is met.

The inconsistency with condition 3 reflects the inherent difficulty of identifying a viable biobank site or sites with the desired credit profile. Because condition 3 has not been met, the variation criteria stated in Attachment B of the OEH (2011) Interim offsets policy have been applied to this offset package as described below.

Despite not being a match according to the BioBanking ecosystem credit trading rules, the vegetation at the development area and biobank site is structurally and floristically similar. The vegetation at the development area and offset area is all in the ‘Dry Sclerophyll Forests (Shrub/grass sub-formation)’ vegetation formation and the ‘Hunter-Macleay Dry Sclerophyll Forests’ vegetation class. Both sites feature an open forest dominated by Spotted Gum (*Corymbia maculata*), ironbarks (*Eucalyptus fibrosa* or *E. paniculata*) and grey gums (*E. punctata* or *E. propinqua*) with a shrubby mid storey and grassy groundcover.

5.1.1 Variation Criteria for Mitigated Net Loss

The approved offset package and this amended offset package have been prepared in accordance with the *Interim policy for assessment of biodiversity offsets for Part 3A Projects* (OEH, 2011). The Interim offsets policy states that if a Project offset package includes a variation applied to offset type and/or Red Flag areas are only partially protected, then the Project will achieve a 'Tier 3 - mitigated net loss standard' (OEH, 2011). Red Flag areas will not be protected within the development area and not all vegetation types within the development area would be fully offset with matching vegetation types and so this offset package would achieve a Tier 3 - mitigated net loss standard.

The Interim offsets policy (OEH, 2011) includes specific variation criteria which may be applied to the offsetting requirements of the BioBanking methodology for Tier 3 Projects. The application of these criteria to the Project is summarised below.

Variation criterion f) would be applied to convert ecosystem credits to a regional conservation priority in a regional conservation plan because no matching credits are available and variation a) is not possible. Variation criterion a) states that it is possible to convert ecosystem credits for one vegetation type to any vegetation type within the same vegetation formation in the same IBRA bioregion. The development site is in the Sydney Basin Bioregion however, despite being in the same CMA region, the Branch Lane biobank site is in the NSW North Coast Bioregion. Therefore variation criterion a) cannot be applied to the Project.

This offsets package would conserve the Branch Lane biobank which is in an area classified as a regional conservation priority in the *Lower Hunter Regional Conservation Plan* (DECCW 2009c) as a substitute for matching ecosystem credits. DECCW (2009c) identifies specific areas as regional conservation priorities that should be conserved and managed through mechanisms such as BioBanking. The Branch Lane biobank falls within an area identified as a regional investment priority for the Lower Hunter Region through "consolidation of Karuah wetlands and lowland coastal forest habitat" (map 3, p35 DECCW 2009c). The site is continuous with a patch of native vegetation that is connected to Karuah National Park. Conservation and management of the site as a biobank would directly contribute to this regional conservation priority.

The biodiversity offset that would be delivered within this regional conservation priority is the biodiversity credits that would be purchased and retired from the Branch lane biobank as presented in Table 7. The biodiversity credits that are included in this offset package exceed the minimum that would be required to achieve a 'Tier 3 - mitigated net loss standard' (DECCW, 2010a). Tier 3 Projects include those where 'impacts are partially offset' (DECCW, 2010a) i.e. less than the required number of biodiversity credits are retired. As shown in Table 7 greater than the required number of biodiversity credits would be retired as part of this offset package. This additional contribution of credits is considered appropriate because of the conservation significance of the development area and because the credit trading rules have not been met.

5.1.2 Species within Ecosystem Credits

As described in Section 3 the vegetation types and ecosystems within the biobank site are very similar to those within the development area. The list of threatened species that were recorded in site surveys or that are predicted to occur within the development area and at the Branch lane biobank site are presented in Table 7.

Five threatened fauna species, all of which are listed as vulnerable under the TSC Act were identified in the development area during SKM (2010a, 2010b) and GHD field surveys (see Table 6). Critical foraging habitat for the Grey−headed Flying-Fox as defined in the Draft Recovery Plan for the species was also identified. Of these species, two were also recorded directly during surveys of the Branch Lane biobank site: the Grey−crowned Babbler and the Varied Sitella. Critical foraging habitat for the Grey−headed Flying-Fox is also present at the

Branch Lane biobank site. The Squirrel Glider is nocturnal and arboreal and so would not be expected to have been detected in the surveys of the Branch Lane biobank site, which did not include nocturnal survey. Habitat assessments confirmed that the Branch Lane biobank site contains suitable foraging and shelter habitat resources for the Squirrel Glider.

None of the threatened fauna species recorded within the development area are of the type that require species credits within the BioBanking assessment methodology (DECCW, 2010c; DECC, 2009). All of these species are predicted to occur with ecosystem credits at the development area and are also predicted to occur in ecosystem credits generated at the Branch Lane biobank site as shown in Table 7. The Branch Lane biobank would provide direct offsets for all of the threatened fauna species known or predicted to occur at the development area.

Table 7 Comparison between Development and Biobank Threatened Fauna Species

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Development area		Branch Lane Biobank Site	
				Recorded	Predicted	Recorded	Predicted
Birds							
Ninox connivens	Barking Owl	V	-		Yes		Yes
Melithretus gularis gularis	Black-chinned Honeyeater	V	-		Yes		Yes
Climacteris picumnus victoriae	Brown Treecreeper	V	-		Yes		Yes
Burhinus grallarius	Bush Stone-curlew	E	-		Yes		Yes
Stagonopleura guttata	Diamond Firetail	V	-		Yes		Yes
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-		Yes		Yes
Calyptorhynchus lathami	Glossy Black-cockatoo	V	-		Yes		Yes
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V	-	Yes	Yes	Yes	Yes
Petroica boodang	Scarlet Robin	V	-		Yes		Yes
Petroica phoenicea	Flame Robin	V	-		Yes		Yes
Melanodryas cucullata cucullata	Hooded Robin	V	-		Yes		Yes
Glossopsitta pusilla	Little Lorikeet	V	-	Yes*	*		Yes
Anseranas semipalmata	Magpie Goose	V	-		Yes		Yes
Tyto novaehollandiae	Masked Owl	V	-		Yes		Yes
Grantiella picta	Painted Honeyeater	V	-		Yes		Yes
Ninox strenua	Powerful Owl	V	-		Yes		Yes
Xanthomyza phrygia	Regent Honeyeater	CE	E		Yes		Yes
Pyrrholaemus sagittatus	Speckled Warbler	V		Yes	Yes		Yes

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Development area		Branch Lane Biobank Site	
				Recorded	Predicted	Recorded	Predicted
Lathamus discolor	Swift Parrot	E	E, M		Yes		Yes
Neophema pulchella	Turquoise Parrot	V	-		Yes		Yes
Daphoenositta chrysoptera	Varied Sitella	V	-	Yes*	*	Yes	Yes
Mammals							
Phascogale tapoatafa	Brush-tailed Phascogale	V	-		Yes		Yes
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-		Yes		Yes
Vespadelus troughtoni	Eastern Cave Bat	V	-		Yes		Yes
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-		Yes		Yes
Mormopterus norfolkensis	Eastern Freetail-bat	V			Yes		Yes
Cercartetus nanus	Eastern Pygmy-possum	V	-		Yes		Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-		Yes		Yes
Nyctophilus timoriensis	Greater Long-eared Bat	V	V				Yes
Pteropus poliocephalus	Grey-headed Flying-fox	V	V		Yes		Yes
Phascolarctos cinereus	Koala	V	V		Yes		Yes
Myotis macropus	Large-footed Myotis	V	-		Yes		Yes
Miniopterus australis	Little Bentwing-bat	V	-		Yes		Yes
Dasyurus maculatus	Spotted-tailed Quoll	V	E		Yes		Yes
Petaurus norfolcensis	Squirrel Glider	V	-	Yes	Yes		Yes
Petaurus australis	Yellow-bellied Glider	V	-		Yes		Yes
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-		Yes		Yes

Key: V – Vulnerable; E – Endangered; EP – Endangered Population; CE – Critically Endangered; M – Migratory

* species was not listed as threatened or included in the credit calculator at the time of the assessment.

5.1.3 Species Credits

No species credits are required as no species of the type which require calculation of species credits have been recorded in the development area during SKM (2010a, 201b) nor GHD targeted surveys.

5.2 Offsets for Matters of National Environmental Significance

The offset package for the Project will conserve offset sites containing native vegetation and habitats equivalent to those within the development area using the framework of BioBanking. The 1103 ecosystem credits that comprise the offset package (see Table 6) are associated with a 141-hectare 'EPBC act offset area' at the Branch Lane biobank as shown on Figure 5. The following section describes how conservation and management of this offset area within the framework of BioBanking will ensure that any impacts on MNES arising from the development are addressed by the offset package.

5.2.1 Threatened Flora

No threatened flora listed under the EPBC Act were identified in the subject site or are otherwise of relevance to this assessment. There is potential habitat for Slaty Red Gum (*Eucalyptus glaucina*), a vulnerable species listed under the EPBC Act, within the subject site however surveys by SKM (2010a, 2010b) and supplementary targeted surveys for *E. glaucina* and potential *E. glaucina* hybrids (GHD, 2012) did not detect any individuals of the species within the development area. No offsets are required for *E. glaucina*.

5.2.2 Threatened Ecological Communities

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

5.2.3 Threatened Fauna

The SKM (2010a, 2010b) 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.

No EPBC Act-listed threatened fauna were directly recorded.

There is potential habitat for the following threatened fauna listed under the EPBC Act within the development area: the Swift Parrot (*Lathamus discolor*), Regent Honeyeater (*Xanthomyza phrygia*), Spotted-tailed Quoll (*Dasyurus maculatus*) and Grey-headed Flying-fox (*Pteropus poliocephalus)* (SKM, 2010a, 2010b). *Eucalyptus* forest within the development area comprises critical foraging habitat for the Grey-headed Flying Fox as defined in the Draft Recovery Plan for the species (DECCW, 2009b).

Habitat assessments for threatened fauna were conducted within the development area and the biobank site using the BioBanking assessment methodology (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 results of this assessment process are presented in Table 7. The development area and Greta biobank site share a common suite of native biota populations and associated habitat resources, including the Swift Parrot, Regent Honeyeater, Spotted-tailed Quoll and Grey-headed Flying-fox. Further, all of the species predicted to occur in association with habitats at the development area are also predicted to occur in association with habitats at the Branch Lane biobank site.

Approximately 20 hectares of critical foraging habitat for the Grey−headed Flying−Fox was removed at the development area and the DSEWPaC Ministers Conditions of Approval (letter of 13 May 2011) specifically refers to offsetting requirements for this species. Critical foraging habitat for the Grey−headed Flying−Fox is also present at the Branch Lane biobank site.

The DSEWPaC Conditions of Approval require that for each hectare of suitable habitat for the Grey Headed Flying Fox, the Regent Honeyeater, the Swift Parrot and other listed threatened species to be impacted (sic) by the action, the proposed offset site or sites must protect a minimum of five hectares of suitable habitat (5:1 ratio). Offsetting requirements for these threatened species are expressed in ecosystem credits calculated using the BioBanking methodology in Table 6. In terms of hectares of habitat, this equates to the conservation of 141 hectares to offset the removal of 20.47 hectares or an offsets ratio of 6.9: 1. This is greater than the required offsetting ratio of 5:1 presented in the Minister's Conditions of Approval.

6. Conclusions

6.1 BioBanking Credit Calculations

A biodiversity offset package was prepared and approved for the Project which included the conservation and management of the 'Greta biobank' and the 'Branch Lane biobank' under biobanking agreeements. Due to the size, context and management requirements of the Greta biobank it is not practical for Pacific National to implement the biobanking agreement or to dispose of the site to a third party. Therefore, Pacific National have made an application to the NSW Office of Environment and Heritage (OEH) to dissolve the biobanking agreement over the Greta biobank. Alternative biodiversity offsets will be required to replace the offsets associated with the Greta biobank and to compensate for the impacts of the Project.

Pacific National have arranged to purchase additional biodiversity credits from the Branch Lane biobank to meet the Project's offset requirement. This amended offset package has been prepared to demonstrate that the suite of offsets proposed are appropriate and would comply with the interim offset policy, the Part 3A conditions of approval and the EPBC Act conditions of approval for the Project.

The amended offset package comprises the purchase and retirement of 1,103 biodiversity credits from the Branch Lane biobank to compensate for impacts arising from the Project as calculated using the BioBanking methodology (see Table 6).

There is not a perfect match between vegetation/ecosystem credit types within the development area and the Branch Lane biobank site, which reflects the inherent difficulty of identifying a viable offset site or sites with the desired attributes. The BioBanking credit trading rules have been varied with reference to the OEH (2011) Interim offsets policy for assessment of biodiversity offsets for Part 3A Projects. This framework specifies the assessment process and decision-making criteria for using BioBanking so that a Part 3A Project may achieve an '*improve or maintain'*, '*no net loss'* or '*mitigated net loss'* outcome.

The Project has resulted in direct impacts to Red Flag areas and this offset package would require a variation to the offset type (i.e. not all vegetation/ecosystem credit types would be directly offset with matching types according to the credit trading rules) and so would achieve a 'mitigated net loss' as defined in the OEH (2011) Interim offsets policy. The Interim offsets policy variation criteria f) has been applied to the offsets package to convert ecosystem credits to a regional conservation priority in a regional conservation plan. The amended offset package will conserve a large, continuous parcel of native vegetation with known populations of at least two threatened species. Additional ecosystem credits have been presented to compensate for the removal of EECs within the development area (a total of 1,103 biodiversity credits from the Branch Lane biobank which exceeds the 1,036 ecosystem credits required for the development area).

All threatened fauna species predicted to occur in ecosystem credits associated with the development area are also predicted to occur at the Branch Lane biobank site.

The offset contribution included in this offset package was calculated using the BioBanking Assessment methodology and includes greater than the required number of biodiversity credits to offset impacts of the Project. The biodiversity values to be conserved are an appropriate match for the impacts of the Project within the framework of the OEH (2011) Interim offsets policy, including representative habitat resources for all threatened biota that will be subject to impacts. Given the overall surplus of biodiversity credits, and the high conservation significance of the Branch Lane biobank site, the amended offset package for the Project would achieve conservation outcomes that more than compensate for the impacts of the Project.

6.2 Matters of National Environmental Significance

The amended offset package will conserve an EPBC Act offset area at the Branch Lane biobank containing native vegetation and habitats appropriate to offset the impacts of the Project on the Swift Parrot, Regent Honeyeater, Spotted-tailed Quoll and Grey-headed Flying-fox. This approach will ensure that any impacts on MNES arising from the development are addressed by the offset package.

No threatened flora or EECs listed under the EPBC Act were identified at the development area or are otherwise of relevance to this assessment. There is habitat for a number of threatened fauna listed under the EPBC Act within the development area, including the Swift Parrot, Regent Honeyeater, Spotted-tailed Quoll and Grey-headed Flying-fox. None of these threatened fauna species are of the type that require species credits within the BioBanking methodology. Offsets for removal of habitat for these species are linked to ecosystem credits associated with the vegetation types that are to be removed and to be conserved at the Branch Lane biobank.

Ecosystem credits required for the development have been matched to an appropriate number and type of ecosystem credits at the Branch Lane biobank. The BioBanking methodology and interim offset policy (OEH, 2011) ensures that vegetation types and habitats within the biobank site are an appropriate match with those within the development area and that the offset ratios are sufficient to improve or maintain biodiversity values. In terms of hectares of habitat, this equates to the conservation of 141 hectares of habitat to offset the removal of 20.47 hectares or an offsets ratio of 6.9: 1.

The offset package includes a detailed comparison of the threatened fauna species that are predicted to occur within the development area and those associated with habitats to be conserved at the biobank site. All threatened biota and their habitats known or predicted to occur in the development area are also predicted to occur in the biobank site.

6.3 Alignment with Offsetting Principles

Table 8 summarises the alignment of the offset package with the DECC (2008) offsetting principles.

Table 8 Comparison of the Offsets Package with the DECC (2008) Offsetting Principals

DECC (2008) Principles for the use of biodiversity offsets in NSW	Attributes of offset package
Impacts must be avoided first by using prevention and mitigation measures.	The approach to avoidance and mitigation of impacts is presented in SKM (2010a, 2010b). There are unavoidable impacts on up to 20.47 ha of native vegetation because the Project development area is constrained by the location of the existing rail corridor and other infrastructure.
All regulatory requirements must be met.	An Environmental Assessment (Monteath and Powys, 2009) incorporating an ecological impact assessment (SKM, 2010a, 2010b) was prepared for the Project in accordance with all regulatory requirements and appropriate guidelines.
Offsets must never reward ongoing poor performance.	The Project involves the construction of important infrastructure and has a sound social and economic justification based on an environmental impact assessment (Monteath and Powys, 2009) incorporating an ecological impact assessment (SKM, 2010a, 2010b).
Offsets will complement other government programs.	The amended offset package has been prepared using the BioBanking methodology and accordingly complements OEH and the NSW Governments approach to biodiversity

DECC (2008) Principles for the use of biodiversity offsets in NSW	Attributes of offset package
	conservation. It complements other government programs and biodiversity conservation initiatives, in general, by contributing to regional habitat connectivity, managing weed and pest species and conservation of threatened species habitat.
Offsets must be underpinned by sound ecological principles.	The amended offset package is underpinned by the BioBanking methodology (DECC, 2009) and Interim Offsets Policy (OEH, 2011).
Offsets should aim to result in a net improvement in biodiversity over time.	The amended offset package would result in a net improvement in biodiversity values over time because it has been developed with the BioBanking methodology and associated management actions for biobank site. Specifically, improvements would result through assisted natural regeneration, revegetation and management of weed and pest species.
Offsets must be enduring - they must offset the impact of the development for the period that the impact occurs.	The amended offset package includes conservation of the Branch Lane biobank site under a biobanking agreement, which will ensure conservation in perpetuity.
Offsets should be agreed prior to the impact occurring.	The original offset package was prepared and agreed with OEH, DoP and DSEWPaC prior to vegetation clearing for construction of the Project.
Offsets must be quantifiable - the impacts and benefits must be reliably estimated.	Impacts and benefits were quantified using the BioBanking methodology.
Offsets must be targeted.	The biobank site has been targeted to achieve, as far as practicable: like for like conservation of vegetation types to be removed; conservation of EECs; conservation of threatened species habitat; conservation of remnant vegetation in the same region as the development area; and viable patches of habitat with good connectivity to other habitat in the locality.
Offsets must be located appropriately.	The Branch Lane biobank site is in the same CMA sub region as the development area. The biobank site would support a very similar suite of native flora and fauna, including threatened biota to the development area. The Branch Lane biobank site is within an area identified as a regional conservation priority (DECCW, 2009c) and is a relatively large, viable patch of habitat with good connectivity to other habitat in the locality.
Offsets must be supplementary.	At the time of the original Offset Package (GHD, 2012) conservation of the Branch Lane biobank site was not achieved by a Covenant or by any other restriction on title. The Branch lane biobank is now subject to a biobanking agreement however the specific biodiversity credits and offset area that comprise this amended offset package are not linked to any other development. Management of the biobank site is not funded by any other scheme.
Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.	This offset package is enforced by the Ministers Conditions of Approval included in the Project Approval. Conservation and management of the Branch Lane biobank is enforced through a biobanking agreement.

Table 9 summarises the alignment of the offsets package with the EPBC Act offsetting principles (DSEWPaC, 2007).

Table 9 Comparison of the offset package with the EPBC Act Offsetting Principles DSEWPaC (2007)

Principles for the use of environmental offsets	Attributes of offset package
1. Offsets should be targeted to the matter/s being impacted under the EPBC Act.	The Branch Lane biobank contains 141 hectares of habitat for the Grey-headed Flying Fox, Regent Honeyeater and Swift Parrot to offset the removal of 20.47 hectares of habitat within the development area.
2. A flexible approach has been taken to the design of the offsets	The Branch Lane biobank was chosen as it includes similar vegetation types and habitat to that being impacted by the project, in better condition. The biobank also includes known populations and habitat for threatened species. The biobank will be conserved and managed in perpetuity achieving long-term conservation outcomes.
3. Offsets to deliver real conservation outcomes	The proposed offset package places lands of high ecological value under conservation through the use of a conservation covenant on title, in perpetuity. In addition, the offset includes investment into the BioBanking Trust Fund to commence active rehabilitation and management of this land immediately upon retirement of credits. These works will be completed in accordance with the Management Actions Plan (MAP) attached to the biobanking agreement. The MAP includes specific measures to achieve improvements in the condition of vegetation and the quality of habitat resources for threatened biota. The Branch Lane biobank will have rehabilitation and management activities commence immediately after the sale of the credits.
4. Environmental offsets should be developed as package	The offset package has been prepared using the BioBanking methodology and accordingly complements OEH and the NSW Governments approach to biodiversity conservation. It complements other government programs and biodiversity conservation initiatives, in general, by contributing to regional biodiversity security, habitat connectivity, managing weed and pest species and conservation threatened species habitat.
5. Offsets should, as a minimum, be commensurate with the magnitude of the impact and deliver outcomes considered 'like for like'	The Branch Lane biobank contains 141 hectares of habitat for the Grey-headed Flying Fox, Regent Honeyeater and Swift Parrot to offset the removal of 20.47 hectares of habitat within the development area. The offset that will be delivered is greater than has been calculated with the BioBanking methodology and is greater than the minimum 5:1 offset ratio required by the EPBC Act conditions of approval. The offset package conserves foraging habitat for the Regent Honeyeater, Swift Parrot and Grey-headed Flying-fox within vegetation types that are similar to the vegetation at the development area. There is not a perfect match in terms of the BioBanking ecosystem credit trading rules. However, the vegetation at the development area and offset area is all in the 'Dry Sclerophyll Forests (Shrub/grass sub-formation)' vegetation formation and the 'Hunter-Macleay Dry Sclerophyll Forests' vegetation class. Both sites feature an open forest dominated by Spotted Gum (*Corymbia maculata*), ironbarks (*Eucalyptus fibrosa* or *E. paniculata*) and grey gums (*E. punctate* or *E. propinqua*) and are structurally and floristically similar.

Principles for the use of environmental offsets	Attributes of offset package
6. Offsets should be located as close to the site of impact as possible.	The former Greta biobank site was located immediately adjacent to the development area and was selected in accord with this principle. However due to the size and location of this parcel of land it was not feasible for Pacific National to manage the site as a biobank or to dispose of the property. Further, the conservation outcomes that could be achieved at the former Greta biobank are limited by its position between the Hunter Expressway, rail corridor and urban development. The former Greta biobank does not function as a fauna movement corridor and in this context makes a limited contribution to the maintenance of biodiversity values. The Branch Lane biobank is around 60 kilometres from the development area, which is the closest suitable offset site that could be identified through the process of developing the biodiversity offset strategy and package for the Project over a period of around 18 months (GHD, 2011a, 2012). The offset site is in the same CMA sub region as the development area and will help conserve the same biota and regional conservation priorities as would be affected by the Project. It is close enough to the development area to support similar vegetation in the same vegetation class as described for principle 5 above.
7. Offsets to be delivered in a timely manner and be long lasting	The offset package was developed prior to Project approval and the proposed impacts occurring. The Branch Lane biobank site was conserved in perpetuity under a biobanking agreement within 12 months of the start of construction. Rehabilitation and management actions commenced soon after the agreement was enacted, funded via the purchase of biodiversity credits for the Project. The offset package will apply in perpetuity through the conservation covenant and management activities under the biobanking agreeement.
8. Offsets should be enforceable, monitored and audited.	This offset package is enforced by the Ministers Conditions of Approval included in the Project Approval. Conservation and management of the Branch lane biobank is enforced through the biobanking agreement and OEH's annual monitoring and reporting requirements. Biobanking agreements are subject to strict compliance requirements that are enforceable by OEH through measures that may include compulsory acquisition of the property. Full details of the monitoring and reporting obligations under the NSW BioBanking scheme are included in Section 6.5 of the original offset package (GHD, 2012).

6.4 Alignment with Conditions of Approval

6.4.1 NSW Department of Planning and Industry Conditions

This amended offsets package has been prepared to address Condition 12 for the Project which states: "Prior to commencement of construction, or unless otherwise agreed to by the Director-General, the Proponent shall develop and submit a Biodiversity Offset Package for the approval of the Director-General. The package shall detail how the ecological values lost as a result of the Project will be offset, and the final offset measures that will be used to meet the offset requirements". The alignment of the amended offset package with the specific requirements of Condition 12 is presented in Table 10 below.

Table 10 Comparison of the offset package with DP&I Conditions of Approval

Condition	Offsets Package
The Biodiversity Offset Package shall be developed in consultation with the DECCW and DSEWPC and shall include, but not necessarily be limited to:	Formal consultation during the preparation of the original offset package included (GHD, 2012): - meetings with the OEH (formerly DECCW) and DP&I environmental assessment units; and - and meetings with the DSEWPaC environmental assessment unit. There were additional ongoing informal discussions throughout the preparation of the offset package with OEH representatives from the BioBanking Unit. These discussions involved seeking clarification of the use of the BioBanking methodology and the application of the OEH (2011) Interim Offset Policy (GHD, 2012). Pacific National and GHD consulted with the OEH regional officer responsible for approving this amended offset package (Steve Lewer). Consultation with Steve Lewer confirmed the OEH's expectations for the structure and content of this amended offset package including that it should be prepared in accordance with the Interim Offset Policy (OEH, 2011).Other specific matters discussed included the BioBankingcredit trading rules, offset variation criteria and discussion of the new PCTs in the Hunter Valley. Pacific National consulted with the DoEE (formerly DSEWPaC) about their approval requirements for the amended offset package. The outcome of this consultation is that the DoEE requires the amended offset package: - to deliver at least the same quantum of offset as the original offset package; - and to be approved by OEH.
a) *The identification of the extent and types of habitat that would be lost or degraded as a result of the final design of the project*	Impacts were calculated using the Project ecological assessment results (SKM, 2010a, 2010b), supplementary survey by GHD ecologists (GHD, 2012) and the BioBanking credit calculator as described in Section 3.1 and Section 4.2
b) *the objectives and biodiversity outcomes to be achieved, including those to achieve a neutral or net benefit outcome for all threatened species and endangered ecological communities;*	The amended offsets package comprises the conservation and management of a 141 hectare offset area at the Branch Lane biobank. The biobank site would be appropriately titled, managed and funded in perpetuity to achieve improvements in biodiversity value through the purchase of ecosystem credits. The offset contribution included in this offset package was calculated using the BioBanking Assessment methodology and includes greater than the required number of biodiversity credits to offset impacts of the Project. The biodiversity values to be conserved are an appropriate match for the impacts of the Project within the framework of the interim offsets policy (OEH, 2011), including representative habitat resources for all threatened biota that will be subject to impacts. Therefore the offsets package will achieve a net benefit outcome for all threatened species and endangered ecological communities.

Condition	Offsets Package
c) details of final land offsets that will be obtained and managed to ensure that the objectives and outcomes identified in b) are achieved;	The amended offsets package comprises the conservation of approximately 141 hectares of habitat within an overall 280 hectare offset site at The Branch under a biobank agreement. The specific offset package contribution comprises the purchase and retirement of the 1103 ecosystem credits that are presented in Table 6.
d) details of other biodiversity offset measures that will be implemented to offset any residual habitat/community loss and how these measures will ensure that the objectives and outcomes identified in b) are achieved;	The quantum of offset required was calculated using BBAM and the interim offsets policy (OEH, 2011). Based on this approach the credits that would be purchased and retired at the biobank site would more than compensate for the impacts of the Project. The amended offset package would deliver an improved biodiversity outcome for the region and no additional contributions are required.
e) details of the proposed long term management of any offset sites and the long term funding for management locations;	The Branch Lane biobank site will be managed according to the requirements of the biobanking agreement and MAP for the site.
f) the proposed monitoring requirements for land offsets and other biodiversity offset measures proposed to ensure that objectives and outcomes identified in b) are being achieved, including: *(i) the monitoring of the condition of species and ecological communities at offset locations;* *(ii) the methodology for the monitoring program(s), including the number and location of offset monitoring sites, and the sampling frequency at these sites;* *(iii) contingency procedures or corrective actions to be followed should monitoring indicate that the identified objectives and outcomes are not being achieved; and* *(iv) provisions for the annual reporting of the monitoring results as determined in consultation with the DECCW; and*	The Branch Lane biobank site will be monitored according to the requirements of the biobanking agreement and MAP for the site.
g) progress to date of the implementation of the provisions of the Package and timing and responsibilities for the implementation of outstanding provisions of the Package.	The following provisions of the offset amended package have been completed: - Estimation of biodiversity credits required to offset impacts of the Project development - Calculation of the biodiversity credits that should be purchased and retired at the Branch Lane biobank. - Comparison of development and biobank credit profiles, including application of the OEH (2011) variation criteria and demonstration that the biobank site is appropriate to offset impacts of the Project development area. Conservation and management of the Branch Lane biobank has already commenced based on the enactment of the biobanking agreement and purchase of the ecosystem credits that were included in the original offset package.

Condition	Offsets Package
	The following steps are required to deliver the amended offset package: - Detailed review, assessment and approval by OEH. - Approval by DoEE based on prior approval by OEH. - Pacific National to purchase the additional ecosystem credits specified in this amended offset package. - An application to transfer credits and to retire credits must be made to OEH and approved.
Any land offset must be enduring and be secured by transfer to the DECCW estate or an alternative conservation mechanism which protects and manages the land in perpetuity. *Where land offsets cannot solely achieve compensation for the loss of habitat, additional measures must be provided to collectively deliver an improved or maintained biodiversity outcome for the region.*	The Branch Lane biobank site is secured under a biobank agreement that will ensure that the land is conserved and managed in perpetuity. A biobank agreement provides for protection of the property, funding of management and monitoring of its condition in perpetuity. The amended offset package used the BioBanking methodology and OEH (2011) Interim Offset Policy to calculate the quantum of offset required for removal of habitat. Based on this approach, the credits that would be purchased and retired at the biobank site would more than compensate for the impacts of the Project. Overall the offset package would deliver an improved biodiversity outcome for the region and no additional contributions are required.

6.4.2 Commonwealth Department of Sustainability Water Environment Populations and Communities' Conditions

The offset package for the Project has been prepared to comply with the Minister's Conditions of Approval as stated in the DSWEPaC (undated) letter. The conditions which pertain to the preparation of this offset package are summarised in Table 11 along with a summary of how each condition has been addressed in this amended offset package.

Table 11 Comparison of the offset package with DSEWPaC Conditions of Approval

Condition	Offsets Package
12. The person taking the action must submit a Biodiversity Offset Package for the Minister's approval to provide for the conservation and management in perpetuity of areas defined on the map at Annexure 1 as "Biobank site". The Biodiversity Offset Package must be approved by the Minister in writing prior to substantial commencement of the action and must include: *i. The registration of a conservation covenant under relevant nature conservation legislation on the areas referred to in this condition (Condition 12) within 18 months of the approval of the Biodiversity Offset Package, which must:* *a) provide for the protection of these areas in perpetuity;* *b) prevent any future development activities; and* *c)ensure the active management of the vegetation on-site.* *ii. Measures to be implemented to rehabilitate native vegetation within the areas referred to in this condition (Condition 12);* *iii. A summary of management measures consistent with advice from a suitably qualified expert, to be implemented on the areas referred to in this condition (Condition 12), and a summary of key milestones, monitoring, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the Package; and*	The original offset package included the area identified at Annexure 1 as "Biobank site" as the Greta biobank. The Greta biobank was conserved under a biobanking agreement in accordance with this condition. As described elsewhere in this amended offset package, Pacific National has applied to dissolve the biobanking agreement over the Greta biobank. An alternative offset area at the Branch Lane biobank will be delivered.
13. The Biodiversity Offset Package outlined in Condition 12 must also provide for the conservation and management in perpetuity of an area of	The amended offset package includes the conservation of an area of land greater than that required by the BioBanking methodology as described in Section 5. The offset package includes a total 67 credit surplus above that calculated using the BioBanking methodology.

Condition	Offsets Package
habitat for listed threatened species and ecological communities equal or greater in size to than that determined by the NSW Biodiversity Banking and Offsets Scheme methodology. The Biodiversity Offset Package must be approved by the Minister in writing prior to substantial commencement of the action and must include *i. The identification of the proposed offset site or sites;*	The amended offset package is based on the conservation of the EPBC Act offset area at the Branch Lane biobank as shown in Figure 2 and Figure 5.
ii. The proposed offset site or sites referred to in Condition 13(i) must contain habitat of equal or greater quality to that to be removed within the development footprint for the Grey Headed Flying Fox, the Regent Honeyeater, the Swift Parrot and other listed threatened species likely to be impacted by the action;	The Branch Lane biobank contains habitat of greater quality than that to be removed within the development area because it contains similar vegetation types and habitat resources but is part of a large patch within a contiguous area of habitat of many 1000s of hectares (refer Section 3.2).
iii. For each hectare of suitable habitat for the species described in Condition 13(ii) to be impacted by the action, the proposed offset site or sites must protect a minimum of 5 hectares of suitable habitat (5:1 ratio);	The EPBC Act offset area at the Branch Lane biobank contains 141 hectares of habitat for these threatened biota to offset the removal of 20.47 hectares of habitat within the development area (6.9:1 ratio).
iv. For each Slaty Red gum (Eucalyptus glaucina) *impacted by the action, the proposed offset site or sites must protect a minimum of 4 Slaty Red Gum specimens (4:1 ratio);*	There are no *Eucalyptus glaucina* nor *E. glaucina* hybrids at the development area.
v. The offset site or sites referred to in Condition 13(i) must be located within 50km of the site for the action, unless otherwise agreed to by the Minister;	The Branch Lane biobank is located approximately 60 km from the development area as shown on Figure 2. This is the closest suitable offset site that could be identified through the process of developing the biodiversity offset strategy and package for the Project over a period of around 18 months (GHD, 2011a, 2012). This minor inconsistency with the Condition does not significantly detract from the overall suitability of the Branch Lane biobank site as described in this Offset Package. Further, the Branch Lane biobank is contiguous with native vegetation and habitat that is within 50 km of the development area.
vi. The offset site or sites referred to in Condition 13(i) must be protected by a conservation covenant registered on the title of the offset site or	The Branch Lane biobank is conserved under a biobanking agreement, which will provide for the protection of the site in perpetuity; prevent any future development activities; and ensure the active

Condition	Offsets Package
sites under relevant nature conservation legislation within 12 months of the approval of the Biodiversity Offset Package; vii. The covenant referred to in Condition 13(v) must provide for: *a) The protection of the land in perpetuity;* *b) The prevention of any future development activities; and* *c) The active management of the land;*	management of the vegetation and habitats within the site.
viii. A summary of management measures consistent with advice from a suitably qualified expert, to be implemented on the offset site or sites referred to in Condition 13(i) and a summary of key milestones, monitoring, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the Package.	The management framework for the Branch Lane biobank is described in Section 6 of the original offset package (GHD, 2012) and the MAP (GHD, 2013).

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Appendices

Appendix A Development Area BioBanking reports

Biobanking Credit Report

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

Date of report: 16/05/2011 Time: 16:59 Tool Version: 1.2

Development Details

Proposal ID: 0073/2011/D144

Development Name: Greta Provisioning Facility

Development Location: The site for the Pacific National Greta Provisioning Facility, Greta, NSW.

Development Address: Mansfield Street, Greta, NSW

Lot: 1 **Section:** **DP:** 112919

CMA: Hunter/Central Rivers

Proponent Name: Pacific National

Proponent Address: PO Box 2298 Dangar NSW 2309

Proponent Phone: (02) 4927 4919

Assessor Name: Ben Harrington

Assessor Address: Lvl 15 133 Castlereagh Sreet Sydney NSW 200

Assessor Phone: 0407049006

Assessor Accreditation Number 0073

The following information is required to be submitted with this BioBanking Statement (where ticked)

☐ **Local reference data is required for the following vegetation zones**

☐ **An Expert Report for the following species**

☐ **The minimum number of plots were not entered for the following vegetation zones**

Improving or maintaining biodiversity value

The proposal has 1 or more Red Flag areas, as listed below:

Red Flag	Reason
Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin	Vegetation type being > 70% cleared; Vegetation type contains an endangered ecological community;
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin	Vegetation type contains an endangered ecological community;

The development does not improve or maintain biodiversity values and a biobanking statement cannot be issued.

Ecosystem Credits

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 [HU544]	10.7	860	Yes
Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin [HU556]	9.8	789	Yes

Credit Profiles

Group: 1 Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin

Ecosystem credits: 860 credits

Total area of vegetation(s): 10.68 ha

1. Surrounding vegetation cover	2. Patch size, including low condition
Description: Minimum surrounding vegetation cover in which the credits must be obtained. **Minimum percent cover: 30%**	Description: Minimum area of contiguous vegetation in which credits must be obtained. **Minimum area: 25 ha**

3. CMA subregion & vegetation types

Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Border Rivers/Gwydir

CMA Sub-Region(s)	Veg Type(s)
Binghi Plateau	Bendemeer White Gum - Silvertop Stringybark grassy open forest of the Kaputar area and southern New England Tableland edge of the Nandewar Bioregion (BR104)
Bundarra Downs (Part A)	New England Peppermint grassy woodland on granitic substrates of the New England Tablelands (BR175)
Deepwater Downs	
Eastern Nandewars (Part A)	
Eastern Nandewars (Part B)	
Glen Innes-Guyra Basalts	
Kaputar	
Moredun Volcanics	
Nandewar, Northern Complex	
Northeast Forest Lands	
Peel	
Tenterfield Plateau	
Tingha Plateau	
Yarrowyck-Kentucky Downs	

Central West

CMA Sub-Region(s)

Bathurst

Bogan-Macquarie

Capertee

Castlereagh-Barwon

Hill End

Kerrabee

Liverpool Range

Lower Slopes

Oberon

Orange

Pilliga

Talbragar Valley

Upper Slopes

Wollemi

Veg Type(s)

Red Stringybark - Scribbly Gum - Red Box - Long-leaved Box shrub - tussock grass open forest the NSW South Western Slopes Bioregion (Benson 290) (CW176)

Red Stringybark woodland of the dry slopes of the South Western Slopes Bioregion (CW177)

Hawkesbury/Nepean

CMA Sub-Region(s)

Bungonia

Burragorang (Part A)

Capertee (Part A)

Cumberland

Kanangra

Pittwater

Wollemi

Yengo

Veg Type(s)

Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin (HN512)

Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin (HN513)

Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (HN556)

Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin (HN604)

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Barrington	Bendemeer White Gum - Silvertop Stringybark grassy open forest of hills of the southern Nandewar and North Coast (HU504)
Comboyne Plateau	Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (HU519)
Ellerston	Forest Red Gum - Grey Gum dry open forest on hills of the lower Hunter Valley, Sydney Basin (HU544)
Hunter	Slaty Red Gum grassy woodland on hinterland foothills of the southern North Coast (HU619)
Karuah Manning	
Liverpool Range	
Macleay Hastings	
Mummel Escarpment	
Pilliga	
Tomalla	
Upper Hunter	
Walcha Plateau	
Wollemi (Part A)	
Wollemi (Part B)	
Wollemi (Part C)	
Wyong	
Yengo	

Lachlan

CMA Sub-Region(s)	Veg Type(s)
Kanangra	Red Stringybark - White Box grassy open forest of the South Western Slopes (LA183)
Lower Slopes	
Oberon	
Orange	
Upper Slopes	

Sydney Metro

CMA Sub-Region(s)	Veg Type(s)
Cumberland	Broad-leaved Ironbark - Grey Box - Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin (ME004)
Pittwater (Part B)	Broad-leaved Ironbark - Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin (ME002)
	Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin (ME021)
	Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin (ME041)

Murray

CMA Sub-Region(s)	Veg Type(s)
Lower Slopes	Red Box - Blakely's Red Gum sedge woodland on colluvial clay drainage lines in the NSW South Western Slopes Bioregion (Benson 286) (MU566)
Murray Fans	
Murrumbidgee	

Namoi

CMA Sub-Region(s)	Veg Type(s)
Eastern Nandewars	Broad-leaved Stringybark - Mountain Ribbon Gum - Messmate open forest of the North Coast and New England Tablelands (NA119)
Liverpool Plains (Part A)	Broad-leaved Stringybark grassy open forest of the eastern New England Tablelands (NA120)
Liverpool Plains (Part B)	McKie's Stringybark - New England Blackbutt - Rough-barked Apple grassy open forest of the New England Tablelands (NA150)
Liverpool Range	Mountain Gum - Broad-leaved Stringybark shrubby open forest of the eastern New England Tablelands (NA156)
Peel	Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tablelands (NA166)
Pilliga (Part A)	Narrow-leaved Peppermint - Wattle-leaved Peppermint shrubby open forest of the New England Tablelands (NA167)
Pilliga (Part B)	New England Peppermint grassy woodland on granitic substrates of the New England Tablelands (NA172)
Walcha Plateau	

Northern Rivers

CMA Sub-Region(s)

Armidale Plateau

Carrai Plateau

Cataract

Chaelundi

Clarence Lowlands

Clarence Sandstones

Coffs Coast & Escarpment

Comboyne Plateau

Dalmorton

Ebor Basalts

Glen Innes-Guyra Basalts (Part A)

Glen Innes-Guyra Basalts (Part B)

Guy Fawkes

Macleay Gorges

Macleay Hastings

Nightcap

Northeast Forest Lands

Richmond - Tweed (Qld - Scenic Rim) (Part A)

Richmond - Tweed (Qld - Scenic Rim) (Part B)

Rocky River Gorge

Round Mountain

Stanthorpe Plateau

Upper Manning

Walcha Plateau

Wongwibinda Plateau

Woodenbong

Veg Type(s)

Narrow-leaved Peppermint - Mountain Ribbon Gum grassy open forest of the eastern New England Tablelands (NR195)

New England Peppermint grassy woodland on granitic substrates of the New England Tablelands (NR213)

Group: 2 Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin

Ecosystem credits: 789 credits

Total area of vegetation(s): 9.79 ha

1. Surrounding vegetation cover	2. Patch size, including low condition
Description: Minimum surrounding vegetation cover in which the credits must be obtained. **Minimum percent cover: 30%**	Description: Minimum area of contiguous vegetation in which credits must be obtained. **Minimum area: 100 ha**

3. CMA subregion & vegetation types
Credits must be obtained in any one or more of the following CMA Sub-regions and vegetation types:

Hunter/Central Rivers

CMA Sub-Region(s)	Veg Type(s)
Hunter	Grey Ironbark - Spotted Gum - Grey Box open forest on hills of the Hunter Valley, Sydney Basin (HU556)
Wyong	

Species Credits

BioBanking
Biodiversity Banking and Offsets Scheme

Threatened Species Predicted on Site

Proposal ID: 0073/2011/D144

Assessor Name: Ben Harrington

Assessor Accreditation Number: 0073

Tool Version: 1.2

Report Created: 09-May-2011 15:44

Threatened Species reliably predicted to utilize the site. No surveys are required for these species. Ecosystem credits apply to these species.

Barking Owl	**Ninox connivens**
Black-chinned Honeyeater (eastern subspecies)	**Melithreptus gularis gularis**
Brown Treecreeper (eastern subspecies)	**Climacteris picumnus victoriae**
Bush Stone-curlew	**Burhinus grallarius**
Diamond Firetail	**Stagonopleura guttata**
Eastern Bentwing-bat	**Miniopterus schreibersii oceanensis**
Eastern Cave Bat	**Vespadelus troughtoni**
Eastern False Pipistrelle	**Falsistrellus tasmaniensis**
Eastern Freetail-bat	**Mormopterus norfolkensis**
Eastern Pygmy-possum	**Cercartetus nanus**
Flame Robin	**Petroica phoenicea**
Glossy Black-cockatoo	**Calyptorhynchus lathami**
Greater Broad-nosed Bat	**Scoteanax rueppellii**
Grey-crowned Babbler (eastern subspecies)	**Pomatostomus temporalis temporalis**
Grey-headed Flying-fox	**Pteropus poliocephalus**
Koala	**Phascolarctos cinereus**

NSW GOVERNMENT Environment, Climate Change & Water

Large-footed Myotis	**Myotis macropus (formally Myotis adversus)**
Little Bentwing-bat	**Miniopterus australis**
Masked Owl	**Tyto novaehollandiae**
Painted Honeyeater	**Grantiella picta**
Powerful Owl	**Ninox strenua**
Regent Honeyeater	**Xanthomyza phrygia**
Scarlet Robin	**Petroica boodang**
Speckled Warbler	**Pyrrholaemus saggitatus**
Spotted-tailed Quoll	**Dasyurus maculatus**
Swift Parrot	**Lathamus discolor**
Turquoise Parrot	**Neophema pulchella**
Yellow-bellied Glider	**Petaurus australis**
Yellow-bellied Sheathtail-bat	**Saccolaimus flaviventris**

Appendix B Branch Lane biobank BioBanking reports

BioBanking Credit Calculator

BioBanking credit report

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

Date of report: 7/08/2012 Time: 2:12:51PM Tool version: 2.0

Biobank details

Proposal ID:	0073/2012/0080B
Proposal name:	Branch Lane Biobank
Proposal address:	Branch Lane Karuah NSW 2324
Proponent name:	
Proponent address:	TBC TBC NSW
Proponent phone:	(02) 4352 4352
Assessor name:	Ben Harrington
Assessor address:	Level 15 133 Castlereagh St SYDNEY NSW 2000
Assessor phone:	9239 7189
Assessor accreditation:	0073

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
Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	238.60	1,870	No
Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	38.38	316	No
Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	3.23	32	No
Total	280.21	2,218	

Credit profiles

1. Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast, (HU642)

Number of ecosystem credits required	316
CMA sub-region	Karuah Manning
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	>100 ha

2. Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast, (HU630)

Number of ecosystem credits required	32
CMA sub-region	Karuah Manning
Minimum percent native vegetation cover class	31-70%
Minimum adjacent remnant area class	

3. Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast, (HU630)

Number of ecosystem credits required	1,870
CMA sub-region	Karuah Manning
Minimum percent native vegetation cover class	31-70%
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
Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	Cat and/or Fox control
Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	Exclude miscellaneous feral species
Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast	Maintain or reintroduce flow regimes (aquatic flora)
Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	Cat and/or Fox control
Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	Exclude miscellaneous feral species
Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	Feral and/or native herbivore control/ exclusion (eg rabbit, goats, deer etc)
Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast	Maintain or reintroduce flow regimes (aquatic flora)

BioBanking Credit Calculator

Threatened species predicted on site

Proposal ID :	0073/2012/0080B
Proposal name :	Branch Lane Biobank
Assessor name :	Ben Harrington
Assessor accreditation number :	0073
Tool version :	1.1
Report created :	07/08/2012 14:13

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common name	Scientific name	Vegetation type(s)
Barking Owl	Ninox connivens	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Bush Stone-curlew	Burhinus grallarius	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Common Blossom-bat	Syconycteris australis	HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Diamond Firetail	Stagonopleura guttata	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Eastern Bentwing-bat	Miniopterus schreibersii oceanensis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Eastern Cave Bat	Vespadelus troughtoni	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast

Common name	Scientific name	Vegetation type(s)
Eastern False Pipistrelle	Falsistrellus tasmaniensis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Eastern Freetail-bat	Mormopterus norfolkensis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Eastern Pygmy-possum	Cercartetus nanus	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Glossy Black-cockatoo	Calyptorhynchus lathami	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Golden-tipped Bat	Kerivoula papuensis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Greater Broad-nosed Bat	Scoteanax rueppellii	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Grey-headed Flying-fox	Pteropus poliocephalus	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Koala	Phascolarctos cinereus	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast

Common name	Scientific name	Vegetation type(s)
Koala	Phascolarctos cinereus	HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Large-footed Myotis	Myotis macropus (formally Myotis adversus)	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Little Bentwing-bat	Miniopterus australis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Long-nosed Potoroo	Potorous tridactylus	HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Masked Owl	Tyto novaehollandiae	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Powerful Owl	Ninox strenua	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Red-legged Pademelon	Thylogale stigmatica	HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Regent Honeyeater	Xanthomyza phrygia	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Scarlet Robin	Petroica boodang	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Speckled Warbler	Pyrrholaemus saggitatus	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Spotted-tailed Quoll	Dasyurus maculatus	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast

Common name	Scientific name	Vegetation type(s)
Squirrel Glider	Petaurus norfolcensis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Stephens' Banded Snake	Hoplocephalus stephensii	HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Swift Parrot	Lathamus discolor	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Turquoise Parrot	Neophema pulchella	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
Wompoo Fruit-dove	Ptilinopus magnificus	HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Yellow-bellied Glider	Petaurus australis	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	HU630 - Spotted Gum - Grey Ironbark forest dry open forest of the lower foothills of the Barrington Tops, North Coast
		HU642 - Tallowwood - Brush Box - Sydney Blue Gum moist shrubby forest on coastal foothills of the southern North Coast

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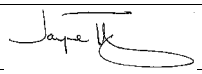
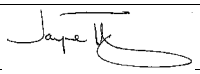
https://projects.ghd.com/OC/Newcastle/amendbiodiversityoff/Delivery/Documents/2218608-REP-B_Greta Stabling Facility_Biodiversity Offset Assessment.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	Ben Harrington	Jayne Tipping				
0	Ben Harrington	Jayne Tipping		Jayne Tipping		24/3/17

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