

APPENDIX G

Biodiversity Offset Strategy Stage 2 prepared by Jacobs.

New Grafton Correctional Centre

Infrastructure New South Wales

Biodiversity Offset Strategy

Stage 2

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New Grafton Correctional Centre

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Terms and acronyms used in this document

Acronym	Definition
APZ	Asset Protection Zone
BAR	Biodiversity Assessment Report
BBCC	BioBanking Credit Calculator
BOS	Biodiversity Offset Strategy
BVT	Biometric Vegetation Types
CEEC	Critically Endangered Ecological Community
CSNSW	Correctional Services New South Wales
DPE	Department of Planning and the Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EOI	Expression of interest
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FBA	Framework of Biodiversity Assessment
IBRA	Interim Biogeographic Regionalisation for Australia
INSW	Infrastructure New South Wales
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NGCC	New Grafton Correctional Centre
NP&W Act	<i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Services
NSW	New South Wales
OEH	Office of Environment and Heritage
PCT	Plant Community Types
PMST	Protected Matters Search Tool
Project	Comprises the New Grafton Correctional Centre which will provide up to 1,700 new prison beds, within a maximum and minimum security correctional centre with relevant support services and facilities.
Project Site	Comprised of two properties Lot 26 DP 751376 and Lot 1 DP 1190399 and is located at 313 Avenue Road, Lavadia.
Proposal	Comprises the concept proposal and the Stage 1 works development application.
SEARS	Secretary's Environmental Assessment Requirement
SEPP	State Environmental Planning Policy
SSD	State Significant Development
TEC	Threatened ecological community
TSC Act	<i>Threatened Species Conservation Act 1995</i>

Executive Summary

Infrastructure NSW (INSW), on behalf of Corrective Services NSW, is preparing an Environmental Impact Statement (EIS) for the concept proposal and Stage 1 site clearance and preparatory works for the New Grafton Correctional Centre (NGCC) (the Project). This Biodiversity Offset Strategy (BOS) accompanies the Biodiversity Assessment Report (BAR) for the Project EIS and should be read in conjunction with the BAR, which outlines in detail the impacts assessed and the rationale for the identified offsets under the NSW *Biodiversity Offsets Policy for Major Projects* and Framework for Biodiversity Assessment (FBA).

This BOS documents the process of identifying and evaluating offset options that will be required for the development of the NGCC. Due to residual impacts on biodiversity the project will require offsetting in accordance with the NSW *Biodiversity Offsets Policy for Major Projects* (OEH 2014a). The FBA has been applied to identify residual impacts and offset requirements.

The BAR has identified the number and type of credits that are required to be offset in accordance with the BioBanking Credit Calculator (BBCC) and provides a BioBanking credit report. This relates to:

- 42 ecosystem credits for Coastal freshwater meadows and forblands or lagoons and wetland (NR150) (PCT: 782).
- 539 ecosystem credits for Spotted Gum – Grey Box – Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR244) (PCT: 1209).
- 654 ecosystem credits for Spotted Gum - Grey Ironbark – Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North coast Bioregion (NR246) (PCT: 1211).
- Species credits for nine threatened fauna species identified on the site and predicted to be impacted from clearing for the proposal.

This report presents the second stage of offset investigations by searching for candidate properties. This includes two steps, firstly an updated search of the public BioBanking register for credits available for immediate purchase, followed by review of sites placed on the EOI register that may be suitable but require further site investigation. The last step involved a desktop analysis of rural properties in the local and regional area that are believed to contain remnant forest that matches the offsets required, using regional vegetation and threatened species datasets.

The stage 2 BOS confirms that offsets are available in the local and regional area to meet the offset requirements of the Project. While there are limited credits currently available for immediate purchase, there are a number of properties on the EOI register that are likely to meet the offset requirements in addition to other local properties that are not registered. Thirty EOI properties are identified with potential targeted PCTs based on CRAFTI vegetation mapping in the Clarence Lowlands and Clarence Sandstones IBRA sub-regions.

The best outcome for biodiversity values would be to secure an offset site as close as possible to the Project Site which will also aid in compiling a manageable long-list. Using this approach, a list of 59 potential offset sites was generated totalling 3,503 hectares of the targeted PCTs at a local scale. Each site has at least one biodiversity value including species credit species relevant to the offset requirements of the Project and contains key fauna habitats and / or linked to important fauna corridors.

Overall, the long list comprises 91 potential offset sites with a mix of EOI properties (30), local sites (59) and other relevant sites (2). Sites represent all required biodiversity values suitable to offset impacts for the Project.

EOI sites offer the best opportunity to secure required offsets as landowners have already shown interest in BioBanking their properties. A short list can be derived from the thirty identified EOI properties and should be the focus for progressing to Stage 3 investigations in consultation with OEH.

The report does not provide site survey data for the prospective long-list of potential offset properties. Stage 3 investigations will follow Project approval and will include:

- § Approaching owners from the short-list of EOI properties to identify interest in offsetting and selecting appropriate sites for further investigation in consultation with OEH.
- § Undertaking rapid field assessment on selected short list sites to confirm ecological values and habitat condition to ensure the offset areas provide equivalent or greater values – i.e. improve or maintain biodiversity values.
- § Progressing negotiations with owners and complete detailed BioBanking Assessments at selected short sites, or securing offset properties under an appropriate conservation mechanism.
- § Consideration of options for supplementary measures.

1. Introduction

1.1 Background

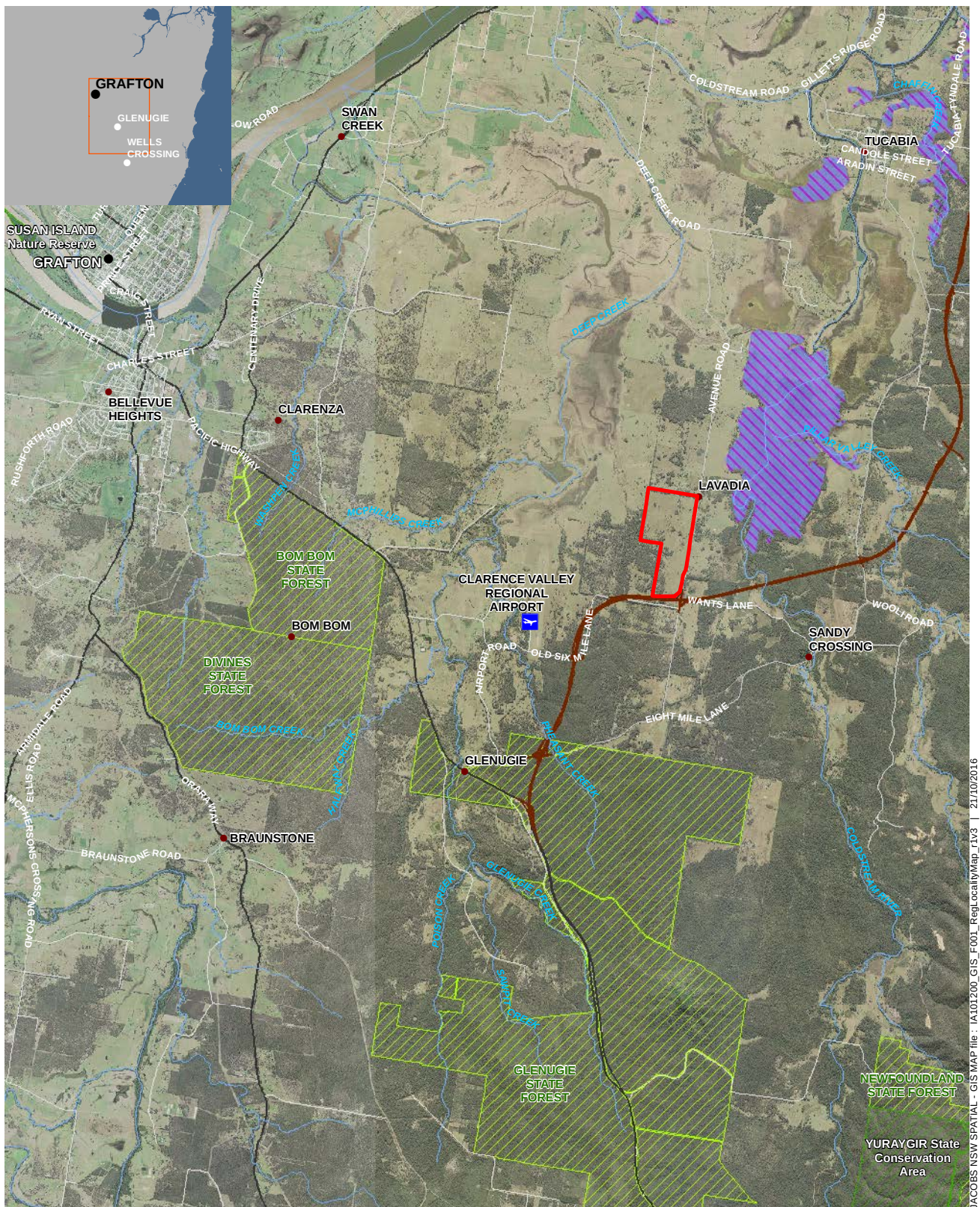
Infrastructure NSW (INSW), on behalf of Corrective Services NSW, is preparing an Environmental Impact Statement (EIS) for the concept proposal and Stage 1 site clearance and preparatory works for the New Grafton Correctional Centre (NGCC) (the Project). This Biodiversity Offset Strategy (BOS) accompanies the Biodiversity Assessment Report (BAR) for the Project EIS and should be read in conjunction with the BAR, which outlines in detail the impacts assessed and the rationale for the identified offsets under the NSW *Biodiversity Offsets Policy for Major Projects* and Framework for Biodiversity Assessment (FBA). This BOS documents the process of identifying and evaluating offset options that will be required for the development of the NGCC.

An offset requirement for a Project is represented as a number and type of biodiversity credits which has been identified in accordance with the FBA. The conservation measures that can be used to provide an offset (subject to provisions in the *NSW Biodiversity Offsets Policy for Major Projects*) include:

- Retirement of biodiversity credits from the biodiversity register established under Part 7A of the NSW *Threatened Species Conservation Act 1995* (TSC Act).
- Ecological rehabilitation of previously mined land (in accordance with section 12.2 of the FBA).
- Supplementary measures as determined in accordance with the *NSW Biodiversity Offsets Policy for Major Projects*.
- A combination of the above.

As such, a review of available biodiversity credits to purchase on the open market is the first step in preparing the BOS and is considered one of the 'reasonable steps' that must be undertaken by INSW to locate appropriate like-for-like offset sites before supplementary measures can be considered. Integral to this step is having an expression of interest for credits on the BioBanking expression of interest register for at least six months.

The Project is located approximately 12.5 kilometres (km) southeast of Grafton, within the Clarence Valley Local Government Area (LGA), refer to Figure 1-1. The Project Site is 195 hectares in size (boundaries shown in Figure 1-2).



JACOBS NSW SPATIAL - GIS MAP file: I:\01200_GIS_F001_RegionalMap_r1v3 | 21/10/2016

Legend

- The Project
- Pacific Highway Upgrade alignment
- SEPP 14 Wetlands
- NPWS area
- State Forest

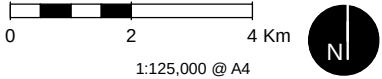
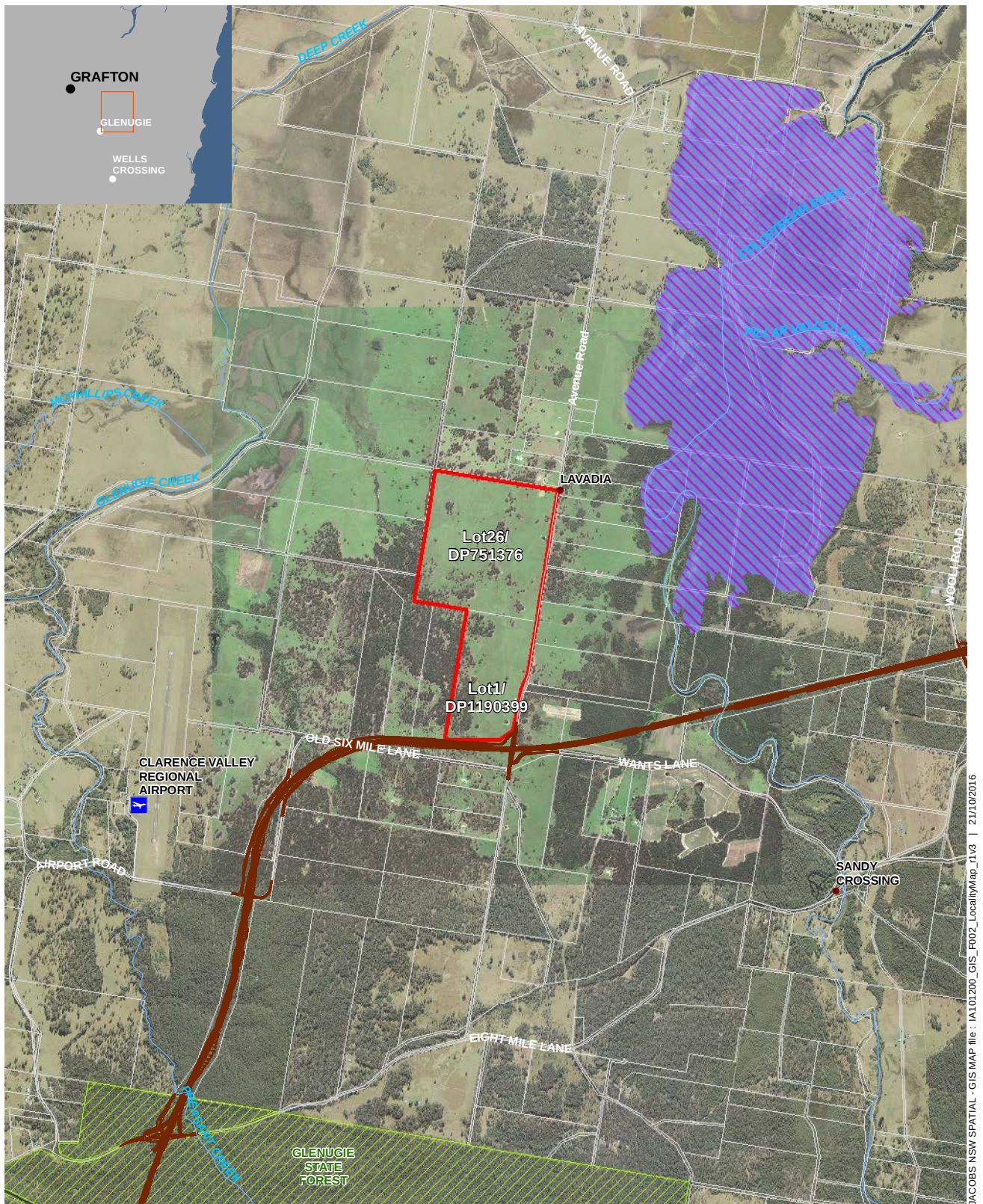


Figure 1-1 | Regional Locality

Data sources
 Jacobs 2015
 LPI 2015
 NSW DPE 2015
 RMS 2013 (W2B Alliance)



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Legend

- The Project
- Pacific Highway Upgrade alignment
- SEPP 14 Wetlands
- State Forest

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Data sources

Jacobs 2015
LPI 2015
NSW DPE 2015
RMS 2013 (W2B Alliance)

Figure 1-2 | The Project

1.2 Offset requirements for the NGCC Project

The process of an informed site selection and documented mitigation strategy has meant that impacts to biodiversity from the Project have been avoided and minimised in the first instance. Although avoidance and mitigation have been applied, residual impacts on biodiversity have been identified, which includes impacts to listed endangered ecological communities and threatened species habitat. Therefore in accordance with the FBA these impacts are required to be offset, with the quantum of biodiversity credits required to be calculated using the BioBanking Credit Calculator (BBCC). The methods and results of this assessment are documented in the BAR.

The outcomes of the BBCC measure the impact of the Project on landscape values and biodiversity values which are reported as ecosystem and species credits. In the case of the NGCC project impacts to two Plant Community Types (PCTs) generate ecosystem credit offsets, details in Table 1-1 and impacts to the habitat of nine threatened species require species credit offsets, details in Table 1-2. Cleared grazing land dominated by exotic grassland comprises 84 % of the Project Site these areas do not require assessment of site value or offsetting. The outputs of the biodiversity credit report from the BBCC are provided in Appendix C.

Table 1-1 Ecosystem credits summary

Plant community type (PCT)	Zone / Loss in site value score	Offset multiplier	Area impacted (ha)	Ecosystem credits required
Coastal freshwater meadows and forblands of lagoons and wetland (NR150) (PCT: 782)	(1) 76.09	3.0	0.7	42
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR244) (PCT: 1209)	(2) 64.06 (3) 63.02	1.0	15.0	539
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR246) (PCT: 1211)	(4) 70.83 (5) 47.40	1.0	14.6	654
Total			29.6	1,193

Table 1-2 Species credits summary

Species	Offset multiplier	Loss of potential habitat (ha)	Species credits required
Black-necked Stork (<i>Ephippiorhynchus asiaticus</i>)	7.7	0.7	54
Brolga (<i>Grus rubicunda</i>)	1.3	0.7	9
Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>)	2.0	29.6	592
Common Planigale (<i>Planigale maculata</i>)	2.6	29.6	770
Emu population, NSW North Coast Bioregion and Port Stephens Local Government Area (<i>Dromaius novaehollandiae</i>)	2.6	30.3	788
Koala (<i>Phascolarctos cinereus</i>)	2.6	29.6	770
Little Bentwing-bat (<i>Miniopterus australis</i>)	1.3	30.3	394
Rufous Bettong (<i>Aepyprymnus rufescens</i>)	2.6	30.3	788
Squirrel Glider (<i>Petaurus norfolcensis</i>)	2.2	29.6	651

2. Proposed offset strategy

This BOS aims to identify and match offsets for the Project in accordance with the FBA. Ecosystem and species credits can be offset in a number of ways, including

- Retiring credits via a BioBanking agreement.
- Financial contribution to supplementary measures.
- Financial contribution to a BioBanking Fund (the BioBanking Fund has not been established and was not an option for the Project at the time of writing).

Where possible, the BOS will need to match ecosystem and species credits on a 'like for like' basis through the retirement of biodiversity credits, in accordance with the credit profiles provided in the projects credit report (refer to Appendix C of the BAR). Where this is not possible, supplementary measures will need to be investigated in consultation with the Department of Planning and Environment (DPE) and Office of Environment and Heritage (OEH).

2.1 Overview of steps required to secure offsets

The *Biodiversity Offsets Policy for Major Projects* (OEH 2014a) outlines four key steps that are to be considered by the proponent before considering supplementary measures. This includes:

1. Checking the BioBanking public register and placing an expression of interest for credits wanted on it for at least six months.
2. Liaising with an OEH office and relevant local councils to obtain a list of potential offset sites that meet the requirements for offsetting.
3. Considering properties for sale in the required area.
4. Providing evidence of why offsets are not feasible, suitable evidence may include:
 - The unwillingness of a landowner to sell or establish a Biobank site.
 - The cost of an offset site itself should not be a factor unless it can be demonstrated the landowner is charging significantly above market rates.

This process is summarised in more detail in **Table 2-1**.

Table 2-1 Description of steps required to secure a matching ecosystem / species credit

Step	Required actions
1) Check the BioBanking public register and place and expression of interest for credits wanted on it for at least six months.	· For the relevant item, check the OEH biodiversity credits register to determine if matching credits have been issued and are available. · Check the OEH Biobank site expression of interest (EOI) register to determine if a landholder may have matching credits that are not yet issued. · Place a 'credits wanted' request on the OEH credits wanted register for the approximate number and types of credits.
2) Liaise with local OEH office and relevant local councils to obtain a list of potential sites that meet the requirements for offsetting.	· Seek candidate properties · Undertake a desktop assessment of vegetation types, tenure and patch size to shortlist potential sites and landholders.

Step	Required actions
3) Considering properties for sale in the required area.	· Test landholder interest · Use the shortlist to contact landholders to determine interest in entering into a BioBanking agreement and selling credits to INSW.
4) Provide evidence of why offset sites are not feasible	· This action would be required after evidence of the above steps has been exhausted.

Once these steps have been followed and offsets cannot be found, INSW must investigate options for supplementary measures and estimate costs. The indicative cost of supplementary measures is estimated using similar credits already sold as part of the BioBanking scheme as a surrogate.

2.2 Proposed stages of the NGCC BOS

The BOS for the NGCC is being developed in stages. Stage 1 is complete and addressed Step 1 checking the public register. This report represents stage 2 and includes an updated search of the public register following by search for candidate properties using available spatial data. Stage 3 will address Steps 3-5 and involve confirming properties that have agreed to enter a BioBanking agreement, ground-truthing, finalising an agreement and completing management action plans.

2.2.1 Stage 1

The first stage of the BOS was submitted with the EIS and BAR and addressed Step 1 presenting the results of initial investigations into the availability of offsets to meet the requirements of the policy. In April 2016 this included:

- Identifying the offset requirements for the Project.
- Searching the OEH BioBanking credits register to determine if matching credits have been issued and are available.
- Searching the OEH Biobank site expression of interest (EOI) register to determine if a landholder may have matching credits that are not yet issued.

A credits wanted request was not placed at this stage on the OEH credits wanted register and INSW is moving straight into Step 2.

2.2.2 Stage 2

This second stage of the BOS addressed Step 2 by:

- Reviewing the availability of credits to purchase on the open market. An updated search of the BioBanking public database to investigate offset availability. This is required as the BioBanking public register is a dynamic database and new biodiversity credits that may be suitable for the Project may have recently been registered or an expression of interest may have been placed since the original searches were undertaken.
- Seeking candidate properties through a desktop analysis and developing a long-list of potential offset sites. This desktop level analysis has been used to identify a long-list of properties that potentially contain the target vegetation types and meet the offset credit requirements for the Project. A 'long-list' of land owners to approach to identify their interest in offsetting has been prepared as part of this task.

2.2.3 Stage 3

Stage 3 is the last component in preparing the final BOS and will address Steps 3-5, where the tasks are concentrated on approaching landowners from the long-list to develop a 'short-list' of landowners interested in developing BioBanking agreement on their land. This would need to be followed with a brief ground-truthing survey on each property to confirm the desktop information is correct and that the credits requirements of the project will be met. This is followed by developing a BioBanking agreement including a site management plan.

We have divided the methodology into individual tasks or phases that can be completed in sequence to complete Stage 3 of the BOS. The proposed methodology for preparation of Stage 3 of the BOS includes the following:

- Approaching owners from the short-list of EOI properties to identify interest in offsetting and selecting appropriate sites for further investigation in consultation with OEH.
- Undertaking rapid field assessment on selected short list sites to confirm ecological values and habitat condition to ensure the offset areas provide equivalent or greater values – i.e. improve or maintain biodiversity values.
- Progressing negotiations with owners and complete detailed BioBanking Assessments at selected short sites, or securing offset properties under an appropriate conservation mechanism.
- Consideration of options for supplementary measures.

2.3 Supplementary measures

If a suitable offset cannot be found and supplementary measures are able to be used to offset the target biodiversity value (according to the variation rules), supplementary measures will be considered to meet the offset requirement. Before supplementary measures are considered, INSW will take reasonable steps to secure like-for-like offset sites. The current stage 2 investigation of potential offset sites for the BOS forms part of these reasonable steps.

A variation of the offset rules and supplementary measures for species credits can also be proposed as a last resort with approval from the consent authority. This may include offsetting species credits for a different species to that impacted after demonstrating that all reasonable steps have been taken. This only applies to threatened species which are not listed on the EPBC Act and / or listed as critically endangered on the TSC Act and is therefore applicable to the species offsets for the NGCC Project.

Supplementary measures must be approved by the OEH and are a last resort measure that are subject to strict rules governing the use of supplementary measures which include calculating the financial contribution of the supplementary measures in accordance with Appendix B of the *NSW Biodiversity Offsets Policy for Major Projects*. The applicability of supplementary measures and likely requirement to use supplementary measures will be included in the BOS if necessary.

3. Stage 2 Offset investigations

3.1 Updated search of the BioBanking public register

An updated search of the BioBanking public database has been undertaken to investigate offset availability. This is required as the BioBanking public register is a dynamic database and new biodiversity credits that may be suitable for the Project may have recently been registered or an expression of interest may have been placed since the original searches were undertaken and reported in stage 1.

The NSW *Biodiversity Offsets Policy for Major Projects* states that *reasonable steps to secure offsets* must include a request on the OEH credits wanted register to advertise credits for at least six months. This was not completed in Stage 1; however INSW is bypassing this step by searching for candidate properties.

3.2 Search for candidate properties

There is currently (and likely to remain) a shortfall in required ecosystem and species credits on the BioBanking Credit Register available for purchase to meet the offsets for this project. As such, INSW will need to take steps to identify a suitable Biobank site or sites that generate the correct type and number of biodiversity credits required to meet the offset requirements of the project before consider using supplementary measures..

The first step in this process is to seek candidate properties through a desktop analysis to develop a long-list of potential offset sites. An updated search of the BioBanking Expression of Interest (EOI) Register was undertaken in the first step in the desktop analysis to identify potential candidate sites. Data used to identify potential offset values from the properties on the EOI Register included:

- Broad-scale regional vegetation mapping i.e. The Comprehensive Regional Assessment Floristic Types Information (CRAFTI) database (Resource and Conservation Division 2001).
- Atlas of NSW Wildlife Database.
- Regional soil landscapes, elevation data and property cadastre.
- National Parks, State Forests and Crown land spatial information.
- Any available ecological data from previous surveys including vegetation mapping and threatened species locations.
- Aerial photographic interpretation was also used to provide additional information where possible such as local wildlife corridors, habitat patch sizes and land-uses.

Chapter 4 details the results of the search for candidate properties.

4. Offset availability

4.1 Step 1 BioBanking public register results

A search of the BioBanking public registers was originally undertaken on the 26 April 2016 in the first stage of the BOS. Retiring credits via a BioBanking agreement was identified in the Stage 1 BOS as the preferred method of securing an offset for the Project. In terms of ecosystem credits, previous searches of the BioBanking Credit Register have indicated that the required credits are not currently available for purchase in the Clarence Lowland IBRA sub-region and wider North Coast bioregion. In terms of species credits, a search of the BioBanking Credit Register confirmed that there are species credits partially available in the Macleay Hastings IBRA sub-region for the Brush-tailed Phascogale and Squirrel Glider.

A second search of the registers was undertaken on the 6 October 2016 to identify any newly registered credits and determine if credits are available for required ecosystem credits and species credits for the North Coast Bioregion. BioBanking public registers included:

- Biodiversity credits register (finds buyers and sellers information in relation to each credit).
- Expression of Interest (EOI) register (finds landowners interested in establishing a Biobank site but have not entered into a Biobank agreement). These credits have not been verified by OEH, and are therefore an estimate of the type and number of credits that could be generated at the site subject to ground-truthing.

4.1.1 Credits currently available

The search of the BioBanking Credit Register confirmed that the required credits are not currently available for purchase in the Clarence Lowland IBRA sub-region and wider North Coast bioregion (Table 4-1). There is possible adequate land area available as evidenced on the EOI Register for all PCTs in the Clarence Lowland IBRA subregion, however liaison with OEH and the registered landholder is required to confirm if site investigations have been undertaken and the relevant PCTs are present on the registered site.

Table 4-1 Ecosystem credits available

Plant community type (BVT code)	Credits required	Credits available on biobanking public register	
		Credits register	EOI register: property ID (IBRA subregion - land area)
Coastal freshwater meadows and forblands of lagoons and wetland (NR150) (PCT: 782)	42	None (including PCT offset options)	- EOI ID: 4 (Clarence Lowlands – 95 ha) - EOI ID: 12 (Clarence Lowlands – 965 ha)
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR244) (PCT: 1209)	569	None (including PCT offset options)	- EOI ID: 12 (NR246 offset option: Clarence Lowlands – 965 ha) - EOI ID: 17 (NR244: Clarence Lowlands – 1569 ha) - EOI ID: 83 (NR246 and NR216 offset option: Clarence Lowlands / Clarence Sandstones – 818 ha)
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR246) (PCT: 1211)	654	None (including PCT offset options)	- EOI ID: 12 (NR246 Clarence Lowlands – 965 ha) - EOI ID: 17 (NR244 offset option: Clarence Lowlands – 1569 ha) - EOI ID: 83 (NR246 and NR216 offset option: Clarence Lowlands / Clarence Sandstones – 818 ha)

A search of the BioBanking Credit Register for the availability of the required species credits confirmed that there are credits partially available in the Macleay Hastings IBRA sub-region for the Brush-tailed Phascogale and Squirrel Glider.

The BioBanking EOI register identified potential sites for eight of the nine species credits required. Although these sites do not include an estimate of the likely credits available, they do include the property identification and land area. These threatened species are assumed to be present by the landowner and have not been verified by a threatened species survey and therefore require a ground-truth survey. The outcome of the OEH registers did not identify any sites suitable for the Brolga.

Table 4-2 Species credits available

Species	Credits required	Credits available on BioBanking public register	
		Credits register	EOI register: property ID, (IBRA sub-region and land area)
Black-necked Stork (<i>Ephippiorhynchus asiaticus</i>)	54	None	- EOI ID: 12 (Clarence Lowlands – 965 ha) - EOI ID 80 (Macleay Hastings - Northern Rivers – 57 ha)
Brolga (<i>Grus rubicunda</i>)	9	None	None
Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>)	592	Partially – 180 credits issued and available (Agreement ID : 167 – Macleay Hastings – 40.7 ha)	- EOI ID: 4 (Clarence Lowlands – 95 ha) - EOI ID: 184 (Upper Hunter - 223 ha)
Common Planigale (<i>Planigale maculata</i>)	770	None	- EOI ID: 7 (Clarence Sandstones – 90ha) - EOI ID: 57 (Macleay Hastings – 79ha) - EOI ID: 157 (Clarence Sandstones - 159 ha)
Emu population, NSW North Coast Bioregion and Port Stephens LGA (<i>Dromaius novaehollandiae</i>)	788	None	- EOI ID: 12 (Clarence Lowlands – 965 ha)
Koala (<i>Phascolarctos cinereus</i>)	770	None - some issued (Agreement ID: 158) but not available	- EOI ID: 29 (Coffs Coast & Escarpment – 50ha) - EOI ID:30 (Sydney Cataract – 16 ha) - EOI ID: 32 Walcha Plateau – 150ha) - EOI ID:57 (Macleay Hastings – 79ha) - EOI ID: 61 (Tomalla – 800 ha) - EOI ID: 128 (Peel – 1,948 ha) - EOI ID: 160 (Burraborang – 95 ha) - EOI ID: 171 (Macleay Hastings – 137 ha) - EOI ID: 184 (Upper Hunter - 223 ha) - EOI ID: 187 (Illawarra – 94 ha) - EOI ID: 222 (Cumberland – 38ha)
Little Bentwing-bat (<i>Miniopterus australis</i>)	394	None	- EOI ID: 4 (Clarence Lowlands – 95 ha) - EOI ID: 12 (Clarence Lowlands – 965 ha) - EOI ID: 16 (Karuah Manning – 436 ha) - EOI ID:17 (Clarence Lowlands – 1,569 ha) - EOI ID: 23 (Upper Hunter – 355 ha) - EOI ID: 30 (Sydney Cataract – 16 ha)
Rufous Bettong (<i>Aepyprymnus rufescens</i>)	788	None	- EOI ID: 4 (Clarence Lowlands – 95 ha) - EOI ID: 7 (Clarence Sandstones – 90ha) - EOI ID: 23 (Upper Hunter – 355 ha) - EOI ID: 157 (Clarence Sandstones - 159 ha)

Species	Credits required	Credits available on BioBanking public register	
		Credits register	EOI register: property ID, (IBRA sub-region and land area)
Squirrel Glider (<i>Petaurus norfolcensis</i>)	651	Partially – 180 credits issued and available (Agreement ID : 167 – Macleay Hastings)	- EOI ID: 4 (Clarence Lowlands – 95 ha) - EOI ID: 56 (Monaro – 180 ha) - EOI ID: 61 (Tomalla – 800 ha) - EOI ID: 128 (Peel – 1,948 ha) - EOI ID: 166 (Cumberland – 1,424 ha)

4.1.2 Data for registered EOI sites identified in desktop investigations

Tables 4-1 and 4-2 identify a number of properties that have registered an EOI on the public register. These properties present the best opportunity to secure offsets where landowners are known to have an interest in biodiversity conservation on their property and can therefore stream-line the consultation process (Steps 3-5). However, there has been no ground-truth survey completed as yet to confirm the credits available on the property.

OEH provided details of 55 EOI properties from within four IBRA sub-regions (Clarence Lowlands, Clarence Sandstones, Yuraygir and Richmond Scenic Rim). Of the 55 EOI sites, seven were identified in the public register (i.e. EOI 4 and 12 with potential ecosystem credits and EOI 4, 12, 16, 30, 32, 56 and 61 with potential species credits) (refer to Table 4-1 and Table 4.2). Thirty EOI properties are identified with potential targeted PCTs based on CRAFTI vegetation mapping in the Clarence Lowlands and Clarence Sandstones IBRA sub-regions. Each potential EOI offset site is given a property ID and are listed in Table 4-3 and illustrated in Figure 4-2.

No details have been reviewed for 15 EOI properties (i.e. EOI 7, 17, 23, 29, 57, 80, 83, 128, 157, 160, 166, 171, 184, 187 and 222) identified in the BioBanking public register search and require further investigation and consultation with OEH.

Table 4-3 Potential offset sites based on EOI register and other factors within the Clarence Lowlands and Clarence Sandstones IBRA subregions

Property ID	EOI	Property size (ha)	Targeted PCTs (ecosystem credits) and estimated area (ha) if known			Species credit species records within 1 km of site or known species credits	Key habitats and landscape connectivity	Other features
			NR150	NR244	NR246			
1	4	15.7 ha	Y	-	-	Black-necked Stork Brush-tailed Phascogale Little Bentwing-bat Rufous Bettong Squirrel Glider	None	4 km from the Project Site Moderately cleared High disturbance Two waterholes (small & large) Adjoins Glenugie Creek
2	5	793 ha	-	-	Y (65.7 ha)	Rufous Bettong Little Bentwing-bat	Key Habitat Dry Corridor Fauna corridors (Brush-tailed Phascogale)	Full biobanking assessment included Highly vegetated Minor disturbance
3	6	202.2 ha	-	-	Y (10 ha)	Black-necked Stork Little Bentwing-bat	Key Habitat Dry Corridor Two fauna corridors (Brush-tailed Phascogale)	Highly vegetated Minor disturbance Adjoins EOI2 Sandstone ridges and hillslopes
4	9	286.5 ha	-	-	Y (90.6 ha)	Rufous Bettong Squirrel Glider Coastal Emu Little Bentwing-bat	Dry Corridor Moist Corridor Near Coastal Corridor Fauna corridor	Highly vegetated Minor disturbance On foothills
5	12	341.9 ha	Y	Y	Y (1.9 ha)	Black-necked Stork Coastal Emu Little Bentwing-bat Rufous Bettong Squirrel Glider	Dry Corridor Moist Corridor Coastal Corridor Fauna corridor	Highly vegetated Minor disturbance On foothills

Property ID	EOI	Property size (ha)	Targeted PCTs (ecosystem credits) and estimated area (ha) if known			Species credit species records within 1 km of site or known species credits	Key habitats and landscape connectivity	Other features
			NR150	NR244	NR246			
6	13	469.9 ha	-	-	Y (145 ha)	Coastal Emu Rufous Bettong	Key Habitat Dry Corridor Moist Corridor Coastal Corridor Fauna corridor (Brush-tailed Phascogale)	Large block Highly vegetated Cleared on flats Hillslopes Potential waterholes
7	16	3.5 ha	-	-	-	Little Bentwing-bat	Coastal Corridor	Small block Highly vegetated Gully – potentially rainforest Adjacent to residential dwellings
8	17	24.1 ha	-	-	Y (7.7 ha)	Coastal Emu Black-necked Stork Brolga Brush-tailed Phascogale Little Bentwing-bat	Key Habitat Dry Corridor	Known Emu habitat Known to have NR246 Highly vegetated Adjoins cleared land and native vegetation Dwelling
9	21	386.4 ha	Y (15 ha)	-	-	Black-necked Stork	Key Habitat Coastal Corridor Near Dry Corridor Near Moist Corridor Fauna corridor (Koala)	Highly vegetated Largely wetland and or swamp forest Minor disturbance

Property ID	EOI	Property size (ha)	Targeted PCTs (ecosystem credits) and estimated area (ha) if known			Species credit species records within 1 km of site or known species credits	Key habitats and landscape connectivity	Other features
			NR150	NR244	NR246			
10	24	40.5 ha	-	-	Y (8.3 ha)	Koala Little Bentwing-bat	Key Habitat Dry Corridor Moist Corridor Fauna corridor (Brush-tailed Phascogale)	Dry forest Highly vegetated Dwelling Minor disturbance
11	25	38.7 ha	Y	-	Y (2.7 ha)	Koala Little Bentwing-bat	Dry Corridor Moist Corridor Fauna corridor (Brush-tailed Phascogale)	Dry forest Highly vegetated Dwelling Minor disturbance Waterhole
12	27	961.7 ha	Y	-	Y (10.3 ha)	Black-necked Stork Coastal Emu Rufous Bettong Brolga Squirrel Glider Brush-tailed Phascogale Little Bentwing-bat	Key Habitat Coastal Corridor Dry Corridor Near Moist Corridor Two fauna corridors (Brush-tailed Phascogale and Yellow bellied Glider and Rufous Bettong)	Very large block Highly vegetated Large waterhole Includes BioBanking assessment report with NR217, 161 and 246.

Property ID	EOI	Property size (ha)	Targeted PCTs (ecosystem credits) and estimated area (ha) if known			Species credit species records within 1 km of site or known species credits	Key habitats and landscape connectivity	Other features
			NR150	NR244	NR246			
13	29	13.1 ha	-	-	Y (0.1 ha)	Brush-tailed Phascogale Coastal Emu Squirrel Glider Koala Little Bentwing-bat Rufous Bettong	Dry Corridor Near fauna corridor	Highly vegetated Adjacent to road and near Pacific Highway Adjacent to cleared land and waterhole Land for Wildlife assessment included.
14	30	53 ha	Y	-	-	Koala Little Bentwing-bat Black-necked Stork Brolga	Coastal Corridor	Cleared land High disturbance Large waterbody
15	32	12.6	-	-	-	Coastal Emu Koala Rufous Bettong	Coastal Corridor	Small block Mostly cleared Dwelling Adjacent to cleared farmland
16	35	760 ha	Y	-	Y (0.1 ha)	Coastal Emu Brolga Brush-tailed Phascogale Koala Squirrel Glider Little Bentwing-bat	Key Habitat Coastal Corridor Dry Corridor Moist Corridor Fauna corridor (Yellow-bellied Glider / Brush-tailed Phascogale)	Large block Potential wetlands / swamp forest Highly vegetated Minor disturbance Adjacent to Pacific Highway

Property ID	EOI	Property size (ha)	Targeted PCTs (ecosystem credits) and estimated area (ha) if known			Species credit species records within 1 km of site or known species credits	Key habitats and landscape connectivity	Other features
			NR150	NR244	NR246			
17	40	79.9 ha	-	-	Y (60.5 ha)	Black-necked Stork	Key Habitat Dry Corridor Fauna corridor (Brush-tailed Phascogale)	Highly vegetated Minor disturbance Adjoins cleared land to the west On flats
18	41	30 ha	-	-	Y (14.6 ha)	Black-necked Stork	Key Habitat Moist Corridor Fauna corridor (Brush-tailed Phascogale and Yellow bellied Glider)	Totally vegetated Hillslopes Potential Koala habitat
19	44	37 ha	-	-	Y (12.4 ha)	Brush-tailed Phascogale Koala Little Bentwing-bat	Near fauna corridor (Brush-tailed Phascogale)	Highly vegetated Dwelling Minor disturbance
20	45	366.6 ha	-	-	Y (13.4 ha)	Coastal Emu Black-necked Stork Koala Squirrel Glider Little Bentwing-bat	Key Habitat Coastal Corridor Dry Corridor Moist Corridor Fauna corridor (Yellow bellied Glider)	Highly vegetated Moderate disturbance (Quarry)
21	49	337.6 ha	-	-	Y (45.7 ha)	Coastal Emu Squirrel Glider	Near Coastal Corridor Dry Corridor Fauna corridor (Brush-tailed Phascogale and Yellow bellied Glider)	Highly vegetated Minor disturbance Hillslopes

Property ID	EOI	Property size (ha)	Targeted PCTs (ecosystem credits) and estimated area (ha) if known			Species credit species records within 1 km of site or known species credits	Key habitats and landscape connectivity	Other features
			NR150	NR244	NR246			
22	50	160.4 ha	-	-	Y (66.7 ha)	Coastal Emu Koala Black-necked Stork Brolga	Key Habitat Near Coastal Corridor Near Moist Corridor Dry Corridor Fauna corridor	Highly vegetated Minor disturbance Hillslopes
23	51	122.5 ha	-	-	Y (34.6 ha)	Squirrel Glider Black-necked Stork Little Bentwing-bat Rufous Bettong	Key Habitat Dry Corridor Fauna corridor (Brush-tailed Phascogale)	Totally vegetated On flats Potential Koala habitat
24	54	20.9 ha	-	-	Y (4.9 ha)	Coastal Emu Rufous Bettong Brush-tailed Phascogale Little Bentwing-bat	Coastal Corridor Near fauna corridor	Highly vegetated Dwelling Adjoins urban and agricultural land
25	56	93.5 ha	-	-	Y (6.3 ha)	Squirrel Glider Black-necked Stork	Key Habitat Dry Corridor Coastal Corridor Fauna corridor (Brush-tailed Phascogale)	Highly vegetated Minor disturbance Dwelling Adjoins Broadwater Creek
26	58	64.4 ha	-	-	Y (7.3 ha)	Coastal Emu Brolga	Dry Corridor Coastal Corridor Fauna corridor (Yellow-bellied Glider / Rufous Bettong)	Highly vegetated On flats Possibly a wetland

Property ID	EOI	Property size (ha)	Targeted PCTs (ecosystem credits) and estimated area (ha) if known			Species credit species records within 1 km of site or known species credits	Key habitats and landscape connectivity	Other features
			NR150	NR244	NR246			
27	59	43.5 ha	Y (21.1 ha)	N	N	Black-necked Stork	None	Forms part of the Clarence River (Turkey Island) Partially cleared
28	61	260.2 ha	-	-	-	Koala Squirrel Glider Black-necked Stork	Key Habitat Dry Corridor Fauna corridor (Brush-tailed Phascogale)	Highly vegetated Minor disturbance Hillslopes
29	71	55.3 ha	-	-	Y (30.8 ha)	Black-necked Stork Coastal Emu	Dry Corridor	Moderately vegetated Dwelling
30	77	45.7 ha	-	-	Y (	Coastal Emu Brush-tailed Phascogale Squirrel Glider Rufous Bettong Little Bentwing-bat	Dry Corridor Fauna corridor (Brush-tailed Phascogale)	Highly vegetated Adjoins native vegetation

4.2 Step 2 Desktop investigations

A preliminary desktop analysis using a step by step process was undertaken for identifying a 'long-list' of potential offset sites within the Clarence Lowlands IBRA sub-region as well as four adjoining IBRA sub regions (i.e. Clarence Sandstones, Yuraygir, Richmond Scenic Rim and Woodenbong) for further investigation. These are properties that are not listed on the public register; however have a high likelihood of containing the offsets required.

4.2.1 Analysis of vegetation datasets

Broad-scale regional vegetation mapping (Resource and Conservation Division 2001) was obtained to identify the distribution of mapped Forest Ecosystems equivalent to the PCTs impacted on the Project Site (refer to Table 4-4). Forest Ecosystem classifications are considered a broad assessment of actual vegetation because much of the dataset has not been ground-truthed and may also have been cleared in the last 15 years. However it is a useful starting point to identify the distribution of possible habitats supporting both ecosystem and species credits. Aerial imagery, soil, topography maps and local knowledge were also used in conjunction with the regional vegetation mapping data to locate potential offset sites.

Table 4-4 CRAFTI Forest Ecosystems used to identify PCT equivalent vegetation for ecosystem credit offset options within Clarence Lowlands, Clarence Sandstones, Yuraygir, Richmond Scenic Rim and Woodenbong IBRA subregions

Identified PCTs on the Project Site	Equivalent Forest Ecosystems (CRAFTI) offset options
Coastal freshwater meadows and forblands of lagoons and wetland (NR150)	FE 141 Swamp
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR244)	FE 21 Lowlands Grey Box FE 75 Lowlands Spotted Gum-Box
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR246)	FE 24 Clarence Lowlands Spotted Gum
Grey Box - Grey Ironbark grassy open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR169)	FE 21 Lowlands Grey Box
Grey Box - Small-fruited Grey Gum shrubby forest of the far north of the NSW North Coast Bioregion (NR171)	FE 62 Grey Box-Northern Grey Gum
Orange Gum (<i>Eucalyptus bancroftii</i>) open forest of the NSW North Coast Bioregion (NR216)	N/A
Red Ironbark open forest of the coastal lowlands of the NSW North Coast Bioregion (NR221)	N/A
Spotted Gum - Grey Box grassy open forest of the Richmond Range of the NSW North Coast Bioregion (NR245)	FE 119 Richmond Range Spotted Gum-Box
Spotted Gum dry grassy open forest of the foothills of the northern NSW North Coast (NR250)	FE 33 Dry Foothills Spotted Gum

The desktop analysis identified seven regional mapped Forest Ecosystems matching the PCTs on the Project Site and mapped over an area of 217,091 hectares. Of this, 67,836 hectares occur in National Parks, State Forests and crown land. The remaining ecosystem credits on private land include approximately 149,255 hectares. An offset site agreement can be made on crown land that adheres to any existing obligations and conditions where management actions are additional to any biodiversity conservation measure or action (OEH, 2014a, DECCW 2009). There is 4,130 hectares of crown land with potential offset options. However much of this land is likely to be unsuitable due to current and past land uses such as special leases with grazing and / or forestry activities, and Defence land.

Two PCT offset options Orange Gum (*Eucalyptus bancroftii*) open forest of the NSW North Coast Bioregion (NR216) and Red Ironbark open forest of the coastal lowlands of the NSW North Coast Bioregion (NR221) were unable to be classified accurately in CRAFTI. NR216 is known to occur in small portions near or adjacent to the

Pacific Highway in Halfway Creek and Mororo, but the actual extent is unknown. NR221 has an unknown occurrence within the relevant IBRA subregions. Due to the limited knowledge regarding these PCTs they have been excluded from the search analysis.

4.2.2 Regional search for available offsets

The search analysis focuses on private land with potential offset options. Of the five sub-regions, the Clarence Lowlands IBRA sub-region provides adequate land area and numerous lots representing the target vegetation types, particularly for direct offsets. The remaining IBRA sub-regions, except for the Yuraygir IBRA sub-region provide adequate offset options if direct offsets cannot be achieved in the Clarence Lowlands (refer to Table 4-5).

As evidenced on the BioBanking EOI Register and IBRA sub-region analysis for targeted dry forest PCTs, the Clarence Lowland and Clarence Sandstones IBRA sub-regions have adequate vegetation area (56,693 ha and 54,000 ha, respectively) for offset options on private land (refer to Table 4-5 and Figure 4-1). Within a 30 kilometre radius of the Project Site, the Yuraygir IBRA sub-region contains majority of mapped Coastal freshwater meadows and forblands of lagoons and wetland (NR150). However, the dry forest PCTs is confined within the Clarence Lowland and Clarence Sandstones IBRA sub-regions. The construction of the Pacific Highway will result in 60 hectares of ineligible land for offset (including 47 lots of which only one would be completing removed). Targeted PCTs were captured within a 30 kilometre radius search area using the following parameters:

- Lot size preferably with > 30ha of PCTs (except for Coastal freshwater meadows and forblands of lagoons and wetland (NR150)).
- Landscape value and connectivity, particularly to NPWS reserves, riparian corridors, key habitats and climate change corridors.
- Removal of any additional roads or tracks in cadastre.
- Removal of other known or potential Biobank / offset sites / NCT covenants (not listed in BioBanking register) for other projects.
- Other projects in the region that have or will result in loss of vegetation.

Table 4-5 Total area and number of lots for targeted PCTs in five eligible sub-regions

PCT	Clarence Lowlands		Clarence Sandstones		Richmond – Tweed, Scenic Rim		Woodenbong		Yuraygir,	
	Area (ha)	No. Lots	Area (ha)	No. Lots	Area (ha)	No. Lots	Area (ha)	No. Lots	Area (ha)	No. Lots
Coastal freshwater meadows and forblands of lagoons and wetland (NR150) (FE 141)	808 ha	233	14 ha	5	67 ha	28	0	0	5 ha	15
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR244) (FE 21 & 75)	5,821 ha (FE 21 = 4,573 ha & FE 75 = 1,248 ha)	755 (FE 21 = 467 & FE 75 = 346)	2,397 ha (FE 21 = 2,002 ha & FE 75 = 395 ha)	184 (FE 21 = 148 & FE 75 = 36)	117 ha (FE 21 = 117 ha)	9	2,076 ha (FE 21 = 2,076 ha)	186	0	0
Grey Box - Grey Ironbark grassy open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR169) (FE 21)										
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR246) (FE 24)	50,037 ha	4,180	49,831 ha	2,374	298 ha	37	21,575 ha	1,282	20 ha	5
Grey Box - Small-fruited Grey Gum shrubby forest of the far north of the NSW North Coast Bioregion (NR171) (FE 62)	0	0	0	0	266 ha	88	439 ha	88	0	0
Spotted Gum - Grey Box grassy open forest of the Richmond Range of the NSW North Coast Bioregion (NR245) (FE 119)	27 ha	13	102 ha	73	0	0	5,841 ha	347	0	0

PCT	Clarence Lowlands		Clarence Sandstones		Richmond – Tweed, Scenic Rim		Woodenbong		Yuraygir,	
	Area (ha)	No. Lots	Area (ha)	No. Lots	Area (ha)	No. Lots	Area (ha)	No. Lots	Area (ha)	No. Lots
Spotted Gum dry grassy open forest of the foothills of the northern NSW North Coast (NR250) (FE 33)	0	0	1,656 ha	114	0	0	2,678 ha	214	0	0
Total	56,693 ha	5,181	54,000 ha	2,750	748 ha	162	32,609 ha	2,117	25	20
*note there is a discrepancy of native vegetation area (approximately 4,854 ha) where the boundaries of properties in the 2011 cadastre spatial data do not have lot numbers or do not accurately match the boundaries of public land such as reserves, roads, easements and other infrastructure. Note: One or more PCTs listed above may occur in the same Lot.										

Table 4-6 Potential offset sites > 30 ha with landscape value within 30 kilometres of the Project Site

PCT	Area (ha)	No. of lots					
		Total	Key habitats	Fauna corridor	Dry corridor	Coastal corridor	Moist corridor
Coastal freshwater meadows and forblands of lagoons and wetland (NR150) (FE 141)	3 ha	5	1	5	2	3	0
Spotted Gum - Grey Box - Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR244) (FE 21 & 75)	1,597 ha	18	12	6	17	1	0
Grey Box - Grey Ironbark grassy open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR169) (FE 21)							
Spotted Gum - Grey Ironbark - Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR246) (FE 24)	18,294 ha	324	237	210	260	40	15
Total	19,891 ha*	342	249	216	277	41	15

*note 60 hectares reduction for Pacific Highway construction

4.2.3 Search for species credits

The search of the BioBanking EOI register identified potential sites for nine species, although does not include an estimate of the likely credits available, but does include the property size. These threatened species are assumed to be present by the landowner and have not been verified by a threatened species survey. The Atlas of NSW Wildlife identified 4,888 records (after 1980) of relevant threatened species in a range of habitats in the 30 kilometre investigation area. The number of records and those within or nearby potential offset sites (Lots) for each species is shown in Table 4-7 and illustrated in Figure 4-1.

Table 4-7 Total number of threatened species records and number of records within 1 kilometre of potential offset sites (Lots)

Species credit species	Total number of records (30 km)	Number of records within 1 km of potential offset sites
Black-necked Stork (<i>Ephippiorhynchus asiaticus</i>)	2267	605
Brolga (<i>Grus rubicunda</i>)^	170	19
Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>)	131	67
Common Planigale (<i>Planigale maculata</i>)	5	2
Emu population, NSW North Coast Bioregion and Port Stephens Local Government Area (<i>Dromaius novaehollandiae</i>)	1154	102
Koala (<i>Phascolarctos cinereus</i>)	442	232
Little Bentwing-bat (<i>Miniopterus australis</i>)	200	56
Rufous Bettong (<i>Aepyprymnus rufescens</i>)	365	193
Squirrel Glider (<i>Petaurus norfolcensis</i>)	154	36

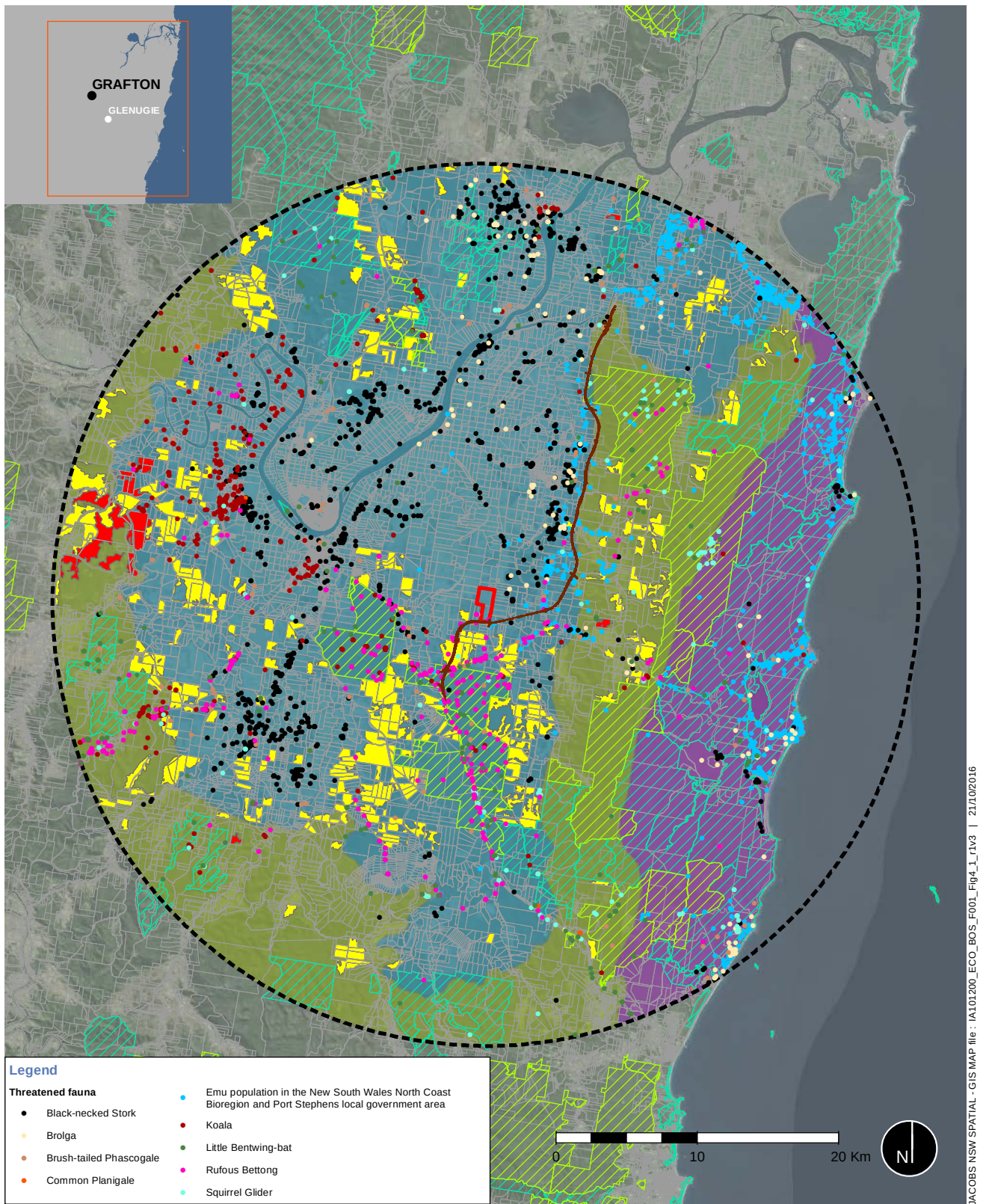


Figure 4-1 | Regional offset options and targeted threatened species (within 30 km radius of site)

4.2.4 Long-list of potential offset sites

The regional vegetation mapping described above was used to search for available offset properties. The best outcome for biodiversity values would be to secure an offset site as close as possible to the Project Site which would also aid in compiling a manageable long-list. With this in mind, a local analysis was conducted focused on potential properties within a 10 kilometre radius of the Project Site in the IBRA Clarence Lowland sub-region.

Additional analysis was undertaken to filter vegetation area with matching soil maps and aerial imagery. All target PCT's are mapped over Triassic to Cretaceous sedimentary rocks with small portions over Quaternary valley fill. In regard to Mitchell Landscapes, the majority of vegetation occurs within Grafton – Whiporie Basin and smaller portions within the Clarence – Richmond Alluvial Plains, Clarence - Manning Basin Range, and Summervale Range (Mitchell, 2002). Aerial imagery (Jacobs 2015; LPI 2010) was used to analyse the condition and type of vegetation cover. No properties with Coastal freshwater meadows and forblands of lagoons and wetland (NR150) were identified using this method.

A long-list of potential local offset sites was generated and is shown in Table 4-8 and their location illustrated in Figure 4-2. Each site has at least one biodiversity value representing the offset requirements and contains key fauna habitats and / or linked to important fauna or climate change corridors (Scotts 2003). The investigation area comprises 3,503 hectares of targeted PCTs in 61 lots greater than 30 hectares in size in the locality. Two of these sites are registered as EOI properties. All sites encompass Tucabia (north), Pillar Valley (east), Calamia (south) and Glenugie (west). Any recent land use change or loss of vegetation in the landscape was removed from the potential offset site long-list. Each potential offset site is given a property ID and follows on from EOI sites (refer Table 4-3) and is listed in Table 4-8.

All species credit species are represented in the long-list except for Common Planigale, which only had five records within the regional search area. There is likely to be suitable habitat for this species in the long-list and targeted surveys during site ground-truth would confirm this.

Table 4-8 Properties greater than 30 ha (except NR150) with targeted PCTs and other associated biodiversity values within 10 kilometres of Project Site

Property ID	Area with targeted PCTs (ha)	Key habitats and landscape connectivity	Species credit species records within 1 km of site	Other features
31	45.71 ha	Key Habitat Dry Corridor (Coastal Emu) Dry Corridor (Coastal Emu)	Rufous Bettong Brush-tailed Phascogale	Moderately vegetated Moderate disturbance Dwelling Waterhole
32	30.34 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Brush-tailed Phascogale Koala Squirrel Glider Little Bentwing-bat	High vegetated Minor disturbance Dwelling
33	71.18 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Brush-tailed Phascogale Squirrel Glider Little Bentwing-bat	Moderately vegetated Moderate disturbance Dwelling
34	36.75 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Brush-tailed Phascogale Squirrel Glider	Highly vegetated On a hillslope Dwelling
35	146.29 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Koala Rufous Bettong	Highly vegetated Minor disturbance Dwelling
36	31.19 ha	Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Brush-tailed Phascogale Black-necked Stork Koala	Highly vegetated Minor disturbance Dwelling
37	49.43 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Brush-tailed Phascogale Black-necked Stork	Highly vegetated Minor disturbance Dwelling
38	31.91 ha	Key Habitat Dry Corridor (Coastal Emu)	None	Highly vegetated Dwelling
39	34.84 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	Rufous Bettong Brush-tailed Phascogale	Highly vegetated Minor disturbance Dwelling
40	34.85 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Rufous Bettong Brush-tailed Phascogale	Moderately vegetated Moderate disturbance Dwelling
41	37.15 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Rufous Bettong Brush-tailed Phascogale	Moderately vegetated Moderate disturbance Dwelling

Property ID	Area with targeted PCTs (ha)	Key habitats and landscape connectivity	Species credit species records within 1 km of site	Other features
42	66.33 ha	Key Habitat Dry Corridor (Coastal Emu)	Brush-tailed Phascogale Squirrel Glider Little Bentwing-bat Coastal Emu Rufous Bettong Brush-tailed Phascogale Black-necked Stork Koala	Highly vegetated
43	52.99 ha	Dry Corridor (Coastal Emu)	Squirrel Glider	Highly vegetated
44	36.53 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	Rufous Bettong Black-necked Stork	Highly vegetated
45	38.53 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	Black-necked Stork	Highly vegetated
46	42.23 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	None	Highly vegetated Minor disturbance
47	43.41 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	Coastal Emu	Highly vegetated
48	56.93 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	None	Highly vegetated Waterhole
49	58.08 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	None	Highly vegetated
50	62.99 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	Rufous Bettong	Moderately vegetated Moderate disturbance
51	66.15 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	Rufous Bettong	Highly vegetated Minor disturbance
52	104.27 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Rufous Bettong Black-necked Stork	Highly vegetated Minor disturbance
53	177.59 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Coastal Emu Black-necked Stork	Highly vegetated

Property ID	Area with targeted PCTs (ha)	Key habitats and landscape connectivity	Species credit species records within 1 km of site	Other features
54	35.05 ha	Key Habitat Dry Corridor (Coastal Emu)	Rufous Bettong Black-necked Stork Brush-tailed Phascogale Koala	Highly vegetated Close to main road Close to medium density dwellings Power easement
55	67.38 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Rufous Bettong Black-necked Stork Brush-tailed Phascogale	Moderately vegetated Moderate disturbance Fragmented
56	74.67 ha	Key Habitat	None	Moderately vegetated High disturbance Two waterholes Creek
57	100.32 ha	Key Habitat	Coastal Emu Rufous Bettong Black-necked Stork	Highly vegetated Moderate disturbance Three waterholes
58	33.06 ha	None	Coastal Emu Brush-tailed Phascogale	Highly vegetated Dwelling
59	36.06 ha	Key Habitat	Coastal Emu Brush-tailed Phascogale	Highly vegetated
60	30.17 ha	Key Habitat Dry Corridor (Coastal Emu)	Rufous Bettong Koala	Highly vegetated
61	35.57 ha	Key Habitat Dry Corridor (Coastal Emu)	None	Highly vegetated
62	37.14 ha	Key Habitat Dry Corridor (Coastal Emu)	None	Highly vegetated
63	37.38 ha	Dry Corridor (Coastal Emu)	Rufous Bettong Black-necked Stork Brush-tailed Phascogale	Moderately vegetated Minor disturbance
64	39.13 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Koala Squirrel Glider	Highly vegetated Minor disturbance
65	79.54 ha	Key Habitat Dry Corridor (Coastal Emu)	None	Moderately vegetated Moderate disturbance
66	82.74 ha	Dry Corridor (Coastal Emu)	Black-necked Stork Brush-tailed Phascogale Rufous Bettong Koala	Moderately vegetated Minor disturbance
67	85.09 ha	Key Habitat Dry Corridor (Coastal Emu)	Black-necked Stork Brush-tailed Phascogale Rufous Bettong Squirrel Glider	Moderately vegetated Minor disturbance
68	126.56 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	Black-necked Stork Rufous Bettong	Moderately vegetated Minor disturbance

Property ID	Area with targeted PCTs (ha)	Key habitats and landscape connectivity	Species credit species records within 1 km of site	Other features
69	160.11 ha	Key Habitat Dry Corridor (Coastal Emu) Fauna corridor (Brush-tailed Phascogale)	Black-necked Stork Koala Rufous Bettong	Moderately vegetated Moderate disturbance Waterhole
70	39.06 ha	Dry Corridor (Coastal Emu)	Coastal Emu	Highly vegetated Moderate disturbance Six waterholes Hillslope
71	51.35 ha	Dry Corridor (Coastal Emu)	Coastal Emu Black-necked Stork Brolga Little Bentwing-bat	Moderately vegetated Moderate disturbance
72	35.43 ha	Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong	Highly vegetated Minor disturbance Dwelling
73	36.95 ha	Key Habitat Dry Corridor (Coastal Emu)	Rufous Bettong Squirrel Glider Brush-tailed Phascogale	Highly vegetated Minor disturbance Dwelling
74	39.59 ha	Key Habitat Dry Corridor (Coastal Emu)	Rufous Bettong Squirrel Glider Brush-tailed Phascogale	Highly vegetated
75	40.32 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Brush-tailed Phascogale	Highly vegetated
76	86.01 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Brush-tailed Phascogale	Highly vegetated
77	34.71 ha	Dry Corridor (Coastal Emu)	Squirrel Glider	Highly vegetated Adjacent to another potential offset site for RMS
78	36.87 ha	Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Black-necked Stork Koala	Highly vegetated
79	45.71 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong	Moderately vegetated Moderate disturbance Partly cleared
80	31.69 ha	Dry Corridor (Coastal Emu)	Black-necked Stork Koala Rufous Bettong Little Bentwing-bat	Moderately vegetated High disturbance
81	31.21 ha	Key Habitat	Rufous Bettong	Moderately vegetated Minor disturbance
82	34.25 ha	Key Habitat	Rufous Bettong	Moderately vegetated Minor disturbance
83	35.45 ha	Key Habitat Dry Corridor (Coastal Emu)	Rufous Bettong	Moderately vegetated Moderate disturbance

Property ID	Area with targeted PCTs (ha)	Key habitats and landscape connectivity	Species credit species records within 1 km of site	Other features
84	58.95 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Brush-tailed Phascogale	Highly vegetated
85	30.45 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Koala	Highly vegetated Dwelling
86	38.00 ha	Key Habitat Fauna corridor (Brush-tailed Phascogale) Dry Corridor (Coastal Emu)	Coastal Emu Rufous Bettong Koala Black-necked Stork	Highly vegetated
87	42.90 ha	Key Habitat	Brush-tailed Phascogale Squirrel Glider Rufous Bettong	Moderately vegetated Moderate disturbance
88	219.08 ha	Key Habitat Dry Corridor (Coastal Emu)	Brush-tailed Phascogale Squirrel Glider Rufous Bettong Coastal Emu Koala Little Bentwing-bat Brolga	Large block Known to have correct PCTs Highly to moderately vegetated Moderate disturbance
89	31.39 ha	Key Habitat Dry Corridor (Coastal Emu)	Coastal Emu Black-necked Stork Brolga Rufous Bettong	Large block Moderately vegetated Moderate disturbance
EOI sites in locality (refer to Table 4-3)				
22 (EOI50)	66.7 ha	Key Habitat Near Coastal Corridor Near Moist Corridor Dry Corridor Fauna corridor	Coastal Emu Koala Black-necked Stork Brolga	Moderately vegetated Moderate disturbance Hillslopes Adjacent to another potential offset site for RMS
29 (EOI71)	30.77 ha	Dry Corridor (Coastal Emu)	Black-necked Stork Coastal Emu	Highly vegetated Minor disturbance Dwelling
Other potential offset sites not identified in the above methods				
90 (Crown land)	82 ha	Key Habitat	Black-necked Stork Coastal Emu Brolga	Is in close proximity to Project Site Crown land Highly vegetated Minor disturbance Waterhole
91	3.1 ha (NR150)	Key Habitat Coastal Corridor (Koala) Fauna Corridor (Brolga / Black-necked Stork)	Black-necked Stork Brush-tailed Phascogale	Highly to moderately vegetated Large wetland Moderate disturbance Adjoins Corindi River

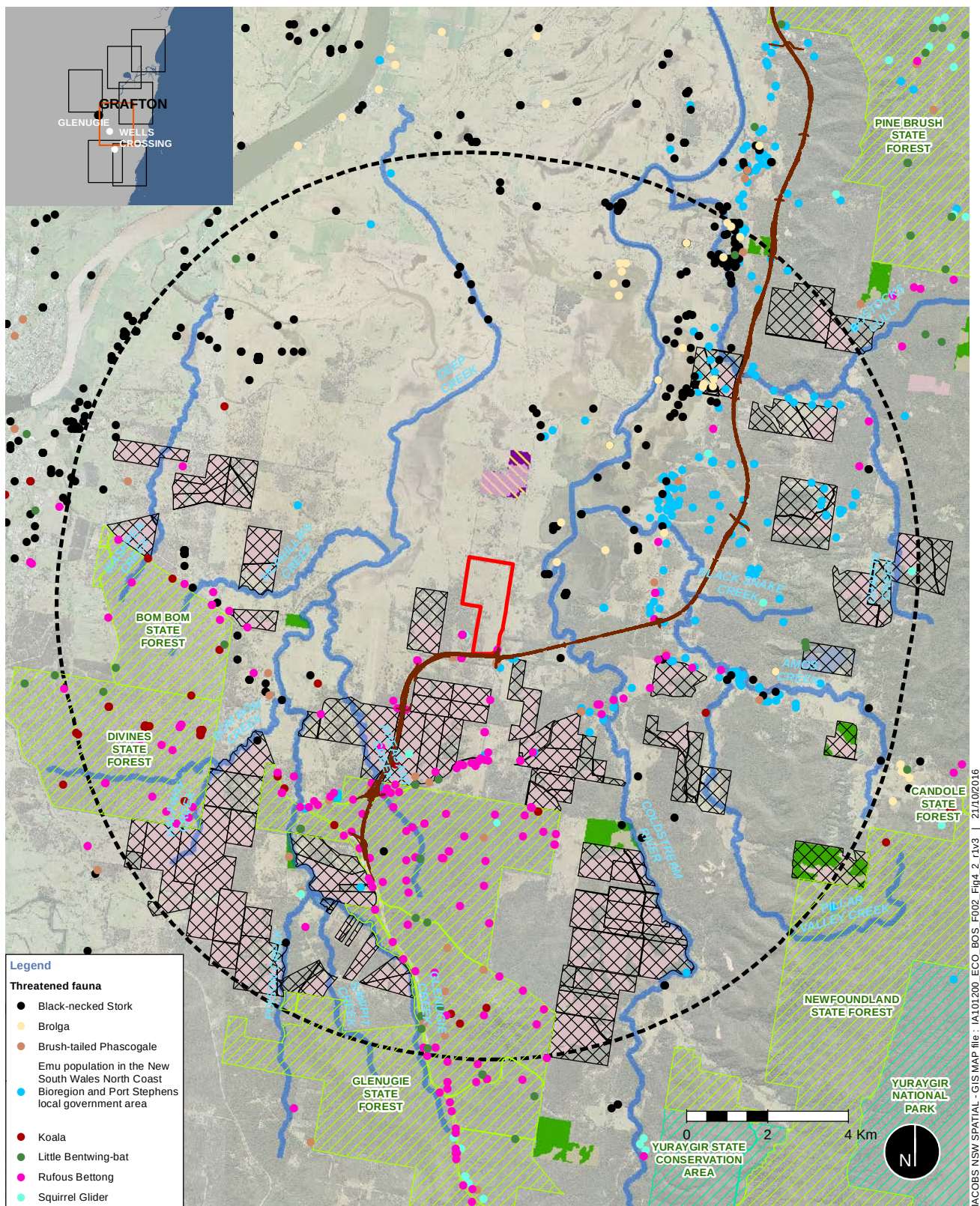
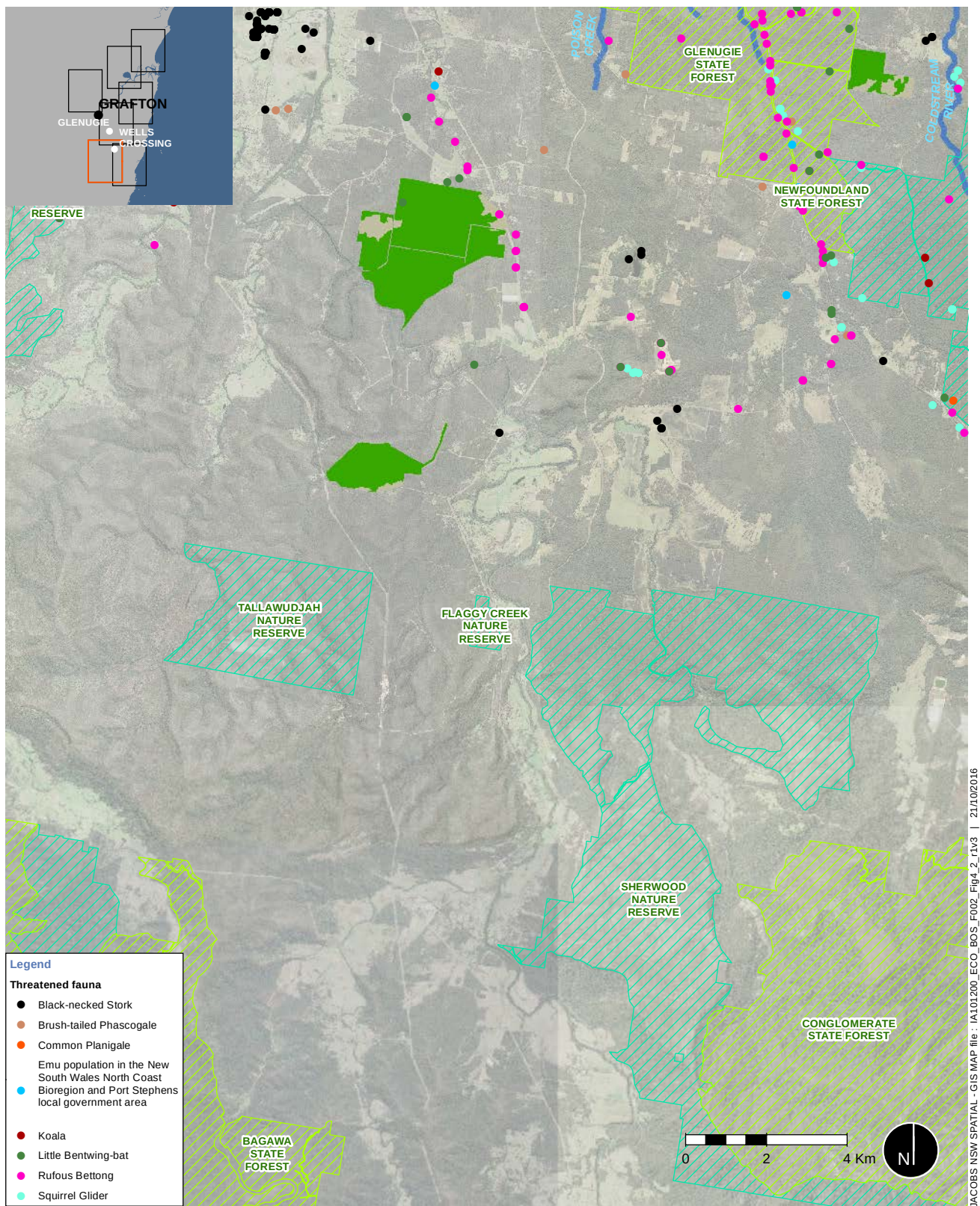


Figure 4-2a | Local offset options, EOI sites, other potential offset sites and targeted threatened species records RMS 2013 (W2B Alliance)

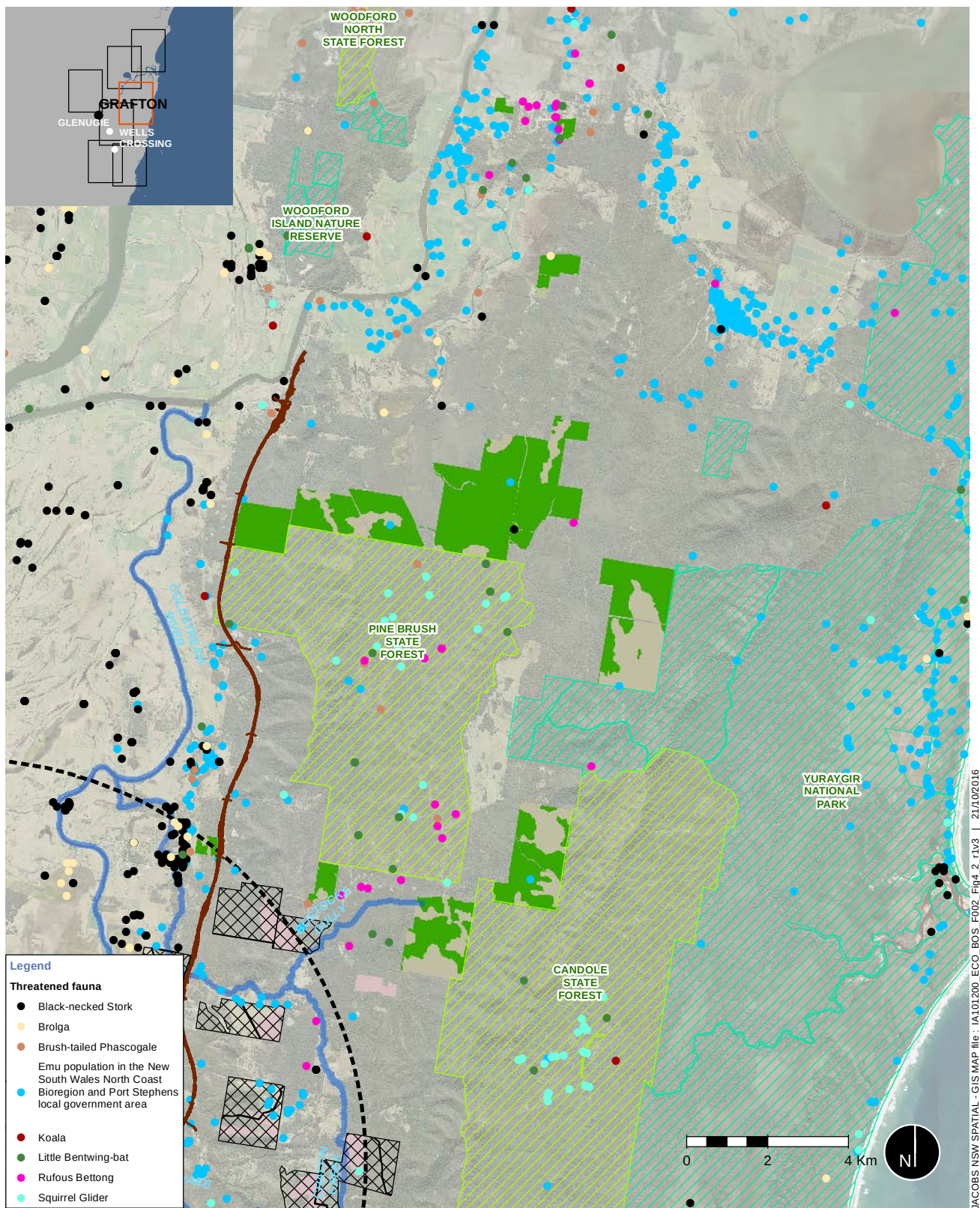


Data sources

Jacobs 2016

LPI 2016

Figure 4-2b | Local offset options, EOI sites, other potential offset sites and targeted threatened species records RMS 2013 (W2B Alliance)

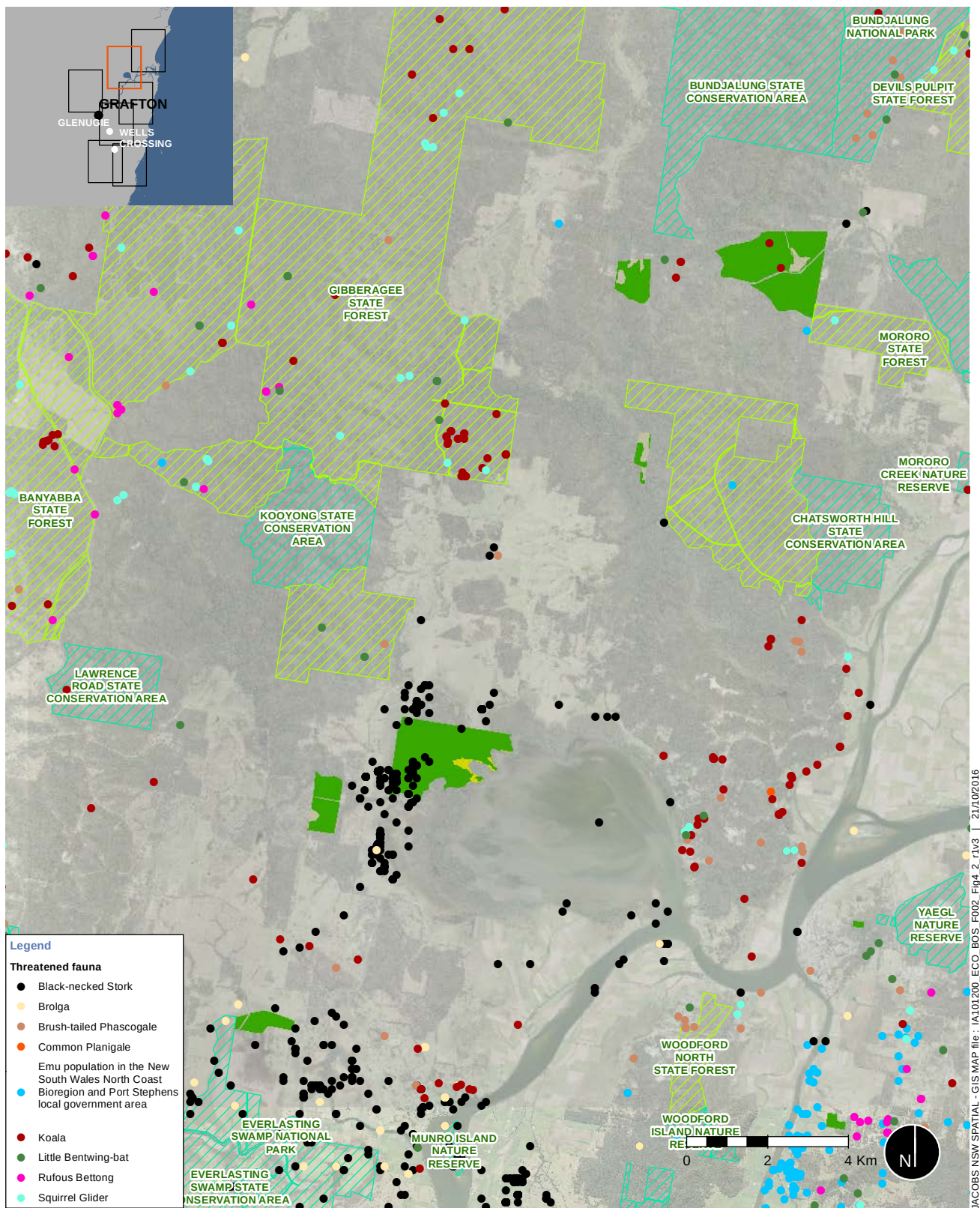


Data sources

Jacobs 2016

LPI 2016

Figure 4-2c | Local offset options, EOI sites, other potential offset sites and targeted threatened species records RMS 2013 (W2B Alliance)

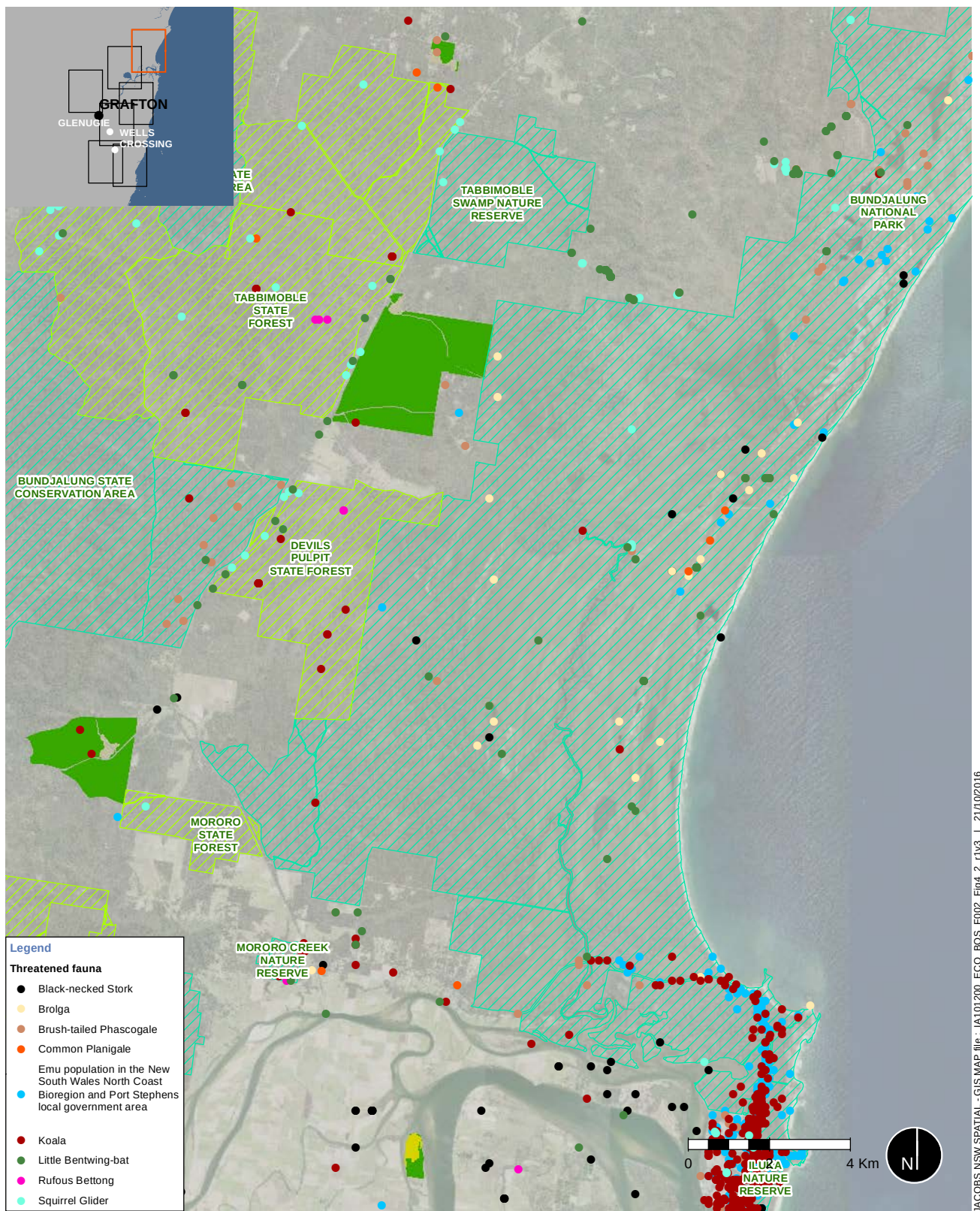


Data sources

Jacobs 2016

LPI 2016

Figure 4-2d | Local offset options, EOI sites, other potential offset sites and targeted threatened species records RMS 2013 (W2B Alliance)

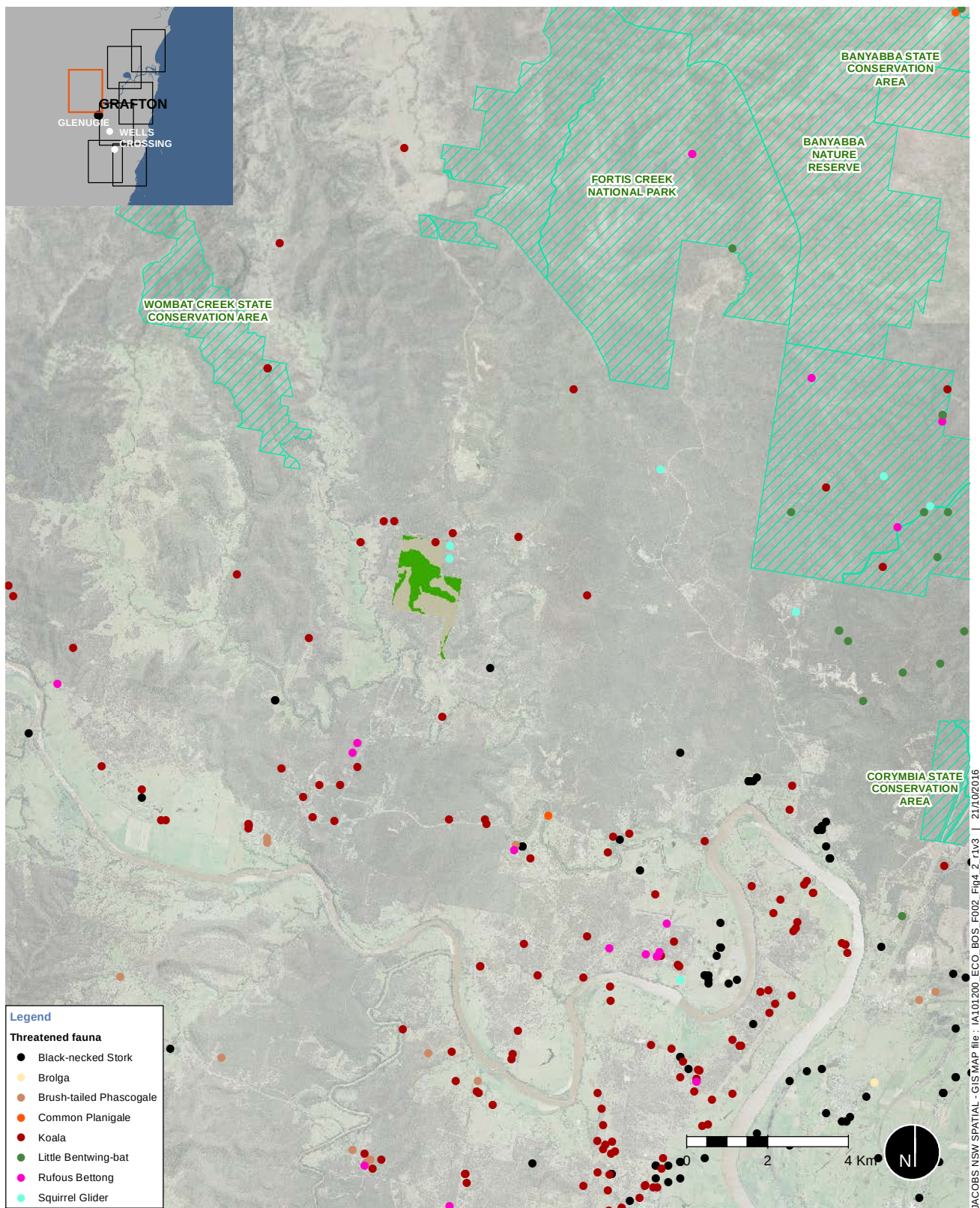


Data sources

Jacobs 2016

LPI 2016

Figure 4-2e | Local offset options, EOI sites, other potential offset sites and targeted threatened species records RMS 2013 (W2B Alliance)

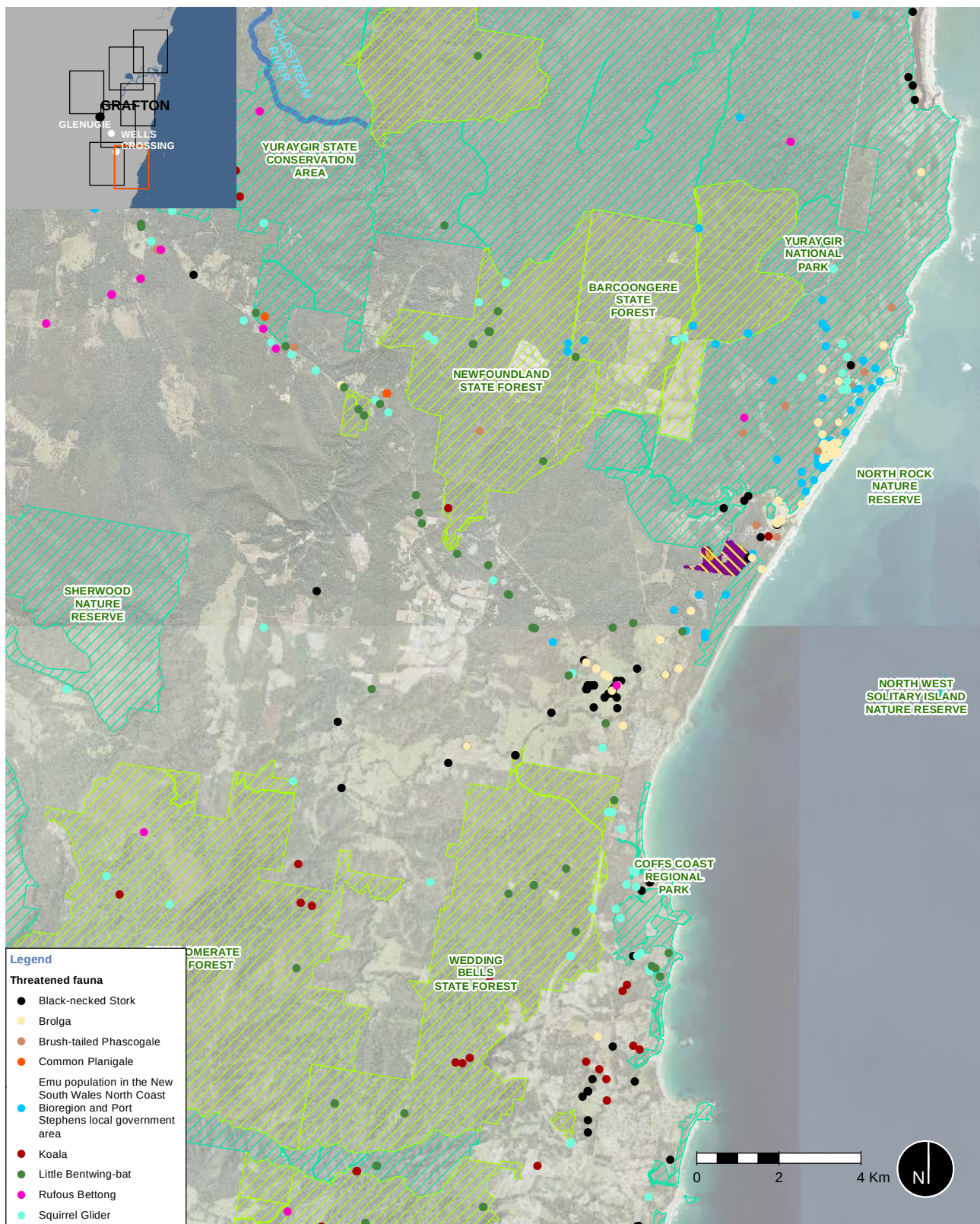


Data sources

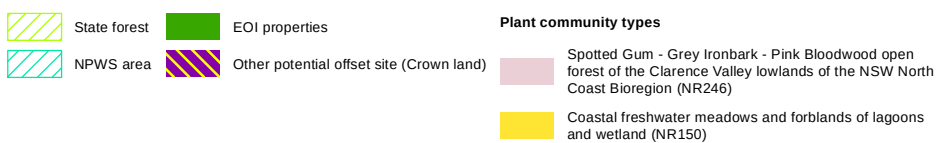
Jacobs 2016

LPI 2016

Figure 4-2f | Local offset options, EOI sites, other potential offset sites and targeted threatened species records RMS 2013 (W2B Alliance)



Legend



Data sources

Jacobs 2016

LPI 2016

Figure 4-2g | Local offset options, EOI sites, other potential offset sites and targeted threatened species records RMS 2013 (W2B Alliance)

5. Long list summary and short list selection

Overall, the long list comprises 91 potential offset sites in a mix of EOI properties (30), local sites (59) and other relevant sites (2). All sites represent biodiversity values suitable to offset impacts for the Project. EOI sites offer the best opportunity to secure required offsets as landowners have already shown interest in BioBanking their properties.

Further analysis of each long list site is required to select a short list for Stage 3. Sites that are mostly vegetated with high condition PCTs, known fauna habitats, minor disturbances and adjoining larger native vegetation patches are more likely to meet the offset requirements and receive the most number of ecosystem and species credits. Short list sites should be selected based on the following:

- Adequate PCT area represented on site that is generally twice the size of impacted PCTs (for ecosystem credits).
- Majority of threatened fauna species records within proximity of site or potential / known habitat based on identified PCTs (for species credits).
- In proximity or adjoining large native vegetation patches (i.e. state forests, NPWS land, other biobank sites).
- Containing key fauna habitat, or supporting a fauna corridor and / or a Climate Change Corridor.

6. Conclusion and next steps

The BAR and BOS has identified the number and type of biodiversity credits that are required to be offset for the NGCC project and provide a BioBanking credit report. The following biodiversity credits are being sought for the residual unavoidable impacts resulting from the Project:

- 42 ecosystem credits for Coastal freshwater meadows and forblands or lagoons and wetland (NR150)
- 539 ecosystem credits for Spotted Gum – Grey Box – Grey Ironbark dry open forest of the Clarence Valley lowlands of the NSW North Coast Bioregion (NR244)
- 654 ecosystem credits for Spotted Gum - Grey Ironbark – Pink Bloodwood open forest of the Clarence Valley lowlands of the NSW North coast Bioregion (NR246)
- Species credits for nine threatened fauna species identified on the site and predicted to be impacted from clearing of habitat for the proposal.

This report presents the second stage of offset investigations by searching for candidate properties. This includes two steps, firstly an updated search of the public BioBanking register for credits available for immediate purchase, followed by review of sites placed on the EOI register that may be suitable although require site investigation to confirm. The last step involved a desktop analysis of rural properties in the local and regional area that are believed to contain remnant forest that matches the offsets required, using regional vegetation and threatened species datasets.

The stage 2 BOS confirms that offsets are available in the local and regional area to meet the offset requirements of the Project. While there are currently limited credits available for immediate purchase, there are a number of properties on the EOI register that are likely to meet the offset requirements in addition to other local properties that are not registered. Thirty EOI properties are identified with potential targeted PCTs based on CRAFTI vegetation mapping in the Clarence Lowlands and Clarence Sandstones IBRA sub-regions.

The best outcome for biodiversity values would be to secure an offset site as close as possible to the Project Site which will also aid in compiling a manageable long-list. Using this approach, a list of 59 potential offset sites was generated totalling 3,503 hectares of the targeted PCTs at a local scale. Each site has at least one biodiversity value including species credit species relevant to the offset requirements of the Project and contains key fauna habitats and / or linked to important fauna corridors.

Overall, the long list comprises 91 potential offset sites with a mix of EOI properties (30), local sites (59) and other relevant sites (2). Sites represent all required biodiversity values suitable to offset impacts for the Project.

EOI sites offer the best opportunity to secure required offsets as landowners have already shown interest in BioBanking their properties. A short list can be derived from the thirty identified EOI properties and should be the focus for progressing to Stage 3 investigations in consultation with OEH.

The report does not provide site survey data for the prospective long-list of potential offset properties. Stage 3 investigations will follow project approval and will include:

- Approaching owners from the short-list of EOI properties to identify interest in offsetting and selecting appropriate sites for further investigation in consultation with OEH.
- Undertaking rapid field assessment on selected short list sites to confirm ecological values and habitat condition to ensure the offset areas provide equivalent or greater values – i.e. improve or maintain biodiversity values.
- Progressing negotiations with owners and complete detailed BioBanking Assessments at selected short sites, or securing offset properties under an appropriate conservation mechanism.
- Consideration of options for supplementary measures.

7. References

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Department of Sustainability, Environment, Water, Population and Communities (2012). *Environment Protection and Biodiversity Conservation Act 1999. Environmental Offsets Policy*, Canberra.

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Morand D.T., 2001, *Soil Landscapes of the Woodburn 1:100,000 Sheet* map and report, NSW Department of Land and Water Conservation, Sydney.

Office of Environment and Heritage (2014a). *Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Projects*. State of NSW and Office of Environment and Heritage, Sydney.

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Office for Environment and Heritage, (2014c). *NSW Biodiversity Offsets Policy for Major Projects*, Office for Environment and Heritage NSW, Sydney.

Resource and Conservation Division (2001) Comprehensive Regional Assessment Floristic Types Information (CRAFTI)

Scotts, D., (2003), Key Habitats and Corridors for Forest Fauna: A Landscape Framework for Conservation in North-east New South Wales, NSW NPWS Occasional Paper 32, National Parks and Wildlife Service, Sydney.

Appendix E. Assessment of Significance - MNES (EPBC Act)

For threatened species and communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* an assessment of significance has been completed in accordance with the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (Department of the Environment, 2013)

E.1 Grey-headed Flying-fox (*Pteropus poliocephalus*)

Lead to a long-term decrease in the size of an important population

There have been no roost camps identified in the Project Site to date and would not directly impact on any known breeding / maternity site.

Grey-headed Flying Fox was observed in large numbers feeding on nectar from flowering Pink Bloodwood in the Project Site. Native vegetation on the Project Site is likely to have productive flowering periods year round where a diversity of *Eucalyptus* and *Corymbia* tree species are present. According to Eby (2008), Pink Bloodwood, Forest Red Gum, Grey Box, Northern Grey Ironbark and Narrow-leaved Red Gum are recognised as significant food tree species in the blossom diet for the Grey-headed Flying Fox.

Therefore it is likely that the impacts of construction and operation of the project would be confined to loss of feeding habitat caused by direct clearing or damage to native vegetation during the construction phase.

The project would directly remove up to 29.6 hectares of foraging habitat. The impact to habitat is considered to be a small portion of the occupancy for feeding life-cycle attributes of the population and represents a small percentage of the total extent of important foraging vegetation types present within a 50 kilometre radius of the Project Site. Given the relative widespread nature of similar high quality foraging habitat in the locality within the feeding range of regional populations, the project is not expected to lead to a long-term decrease in the size of an important population.

Reduce the area of occupancy of an important population

The project would directly remove up to 29.6 hectares of foraging habitat. Foraging habitat mainly comprises nectar producing *Eucalyptus* and *Corymbia* tree species with a combined annual flowering period. This area of habitat is considered to be a small portion of the occupancy for feeding life-cycle attributes of the population and represents a small percentage of the total extent of important foraging vegetation types present within a 50 kilometre radius of the Project Site. The project will reduce the area of habitat available to the species.

Fragment an existing important population into two or more populations

The project is unlikely to fragment existing native vegetation where clearing of 29.6 hectares of foraging habitat would occur on the fringes of a large vegetation patch. Highly mobile species such as bats are expected to be less impacted by fragmentation and the Grey-headed Flying-fox is particularly well adapted to accessing widely spaced habitat resources given its mobility and preference for seasonal fruits and blossom. The project would not fragment an important population of the Grey-headed Flying-fox.

Adversely affect habitat critical to the survival of the species

The draft recovery plan for the Grey-headed Flying-fox (DECCW 2009) identifies critical foraging habitat for this species as:

- Productive during winter and spring, when food bottlenecks have been identified
- Known to support populations of >30,000 individuals, within an area of 50 kilometre radius
- Productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (Sept-May)

- Productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes
- Known to be continuously occupied as a camp site.

The Project Site is considered to have critical foraging habitat for the Grey-headed Flying-fox, given that highly productive nectar food trees are available during most of the year, including important lifecycle stages of the Grey-headed Flying-fox.

The project would directly remove up to 29.6 hectares of foraging habitat. This area of habitat is considered to be a small portion of the occupancy for feeding life-cycle attributes of the population and represents a small percentage of the total extent of important foraging vegetation types present within a 50 kilometre radius of the Project Site. Given the relative widespread nature of similar high quality foraging habitat in the locality within the feeding range of regional populations, the project is not expected to adversely affect this critical habitat area.

Disrupt the breeding cycle of an important population

As stated above there would be a minor impact on critical foraging habitat identified as important during the breeding cycle of the species. However, the project would not directly impact on a known roost camp / breeding or maternity site.

Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The project would directly remove up to 29.6 hectares of quality foraging habitat, however it is highly unlikely that the Grey-headed Flying-fox would decline. Suitable habitat is largely widespread and would remain surrounding the Project Site.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat

There are no recognised invasive species that are harmful to the Grey-headed Flying-fox. The potential for weed invasion into habitat of the species is considered possible with a project of this nature and appropriate controls are required during construction and operation to reduce this threat. The management of invasive species would be managed during the construction.

Introduce disease that may cause the species to decline

There are no known disease issues affecting this species in relation to the project. Infection of native plants by *Phytophthora cinnamomi* has been identified as being spread by construction machinery. This water-borne fungus infects the roots of plants and has the potential to cause dieback. Machinery associated with vegetation clearance and subsequent construction for the project has the potential to transmit the fungus to remaining native vegetation remnants of the species. This is a potential indirect impact to the species through the transmission of pathogens into retained habitat near the project. This can be mitigated through the development and implementation of suitable control measures.

Interferes substantially with the recovery of the species

The project would not conflict with the recovery plans for this species. Although the project would remove 29.6 hectares of critical foraging habitat, similar high quality foraging habitat would remain and is widespread in the locality and within the feeding range of regional populations. Mitigation and offset measures would target the recovery of lost foraging habitat. There are no priority sites for conservation of this species within the project boundary.

E.2 Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Anthochaera phrygia*)

Lead to a long-term decrease in the size of a population

Swift Parrot

The Swift Parrot only breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Swift Parrots will return to some foraging sites on a cyclic basis depending on food availability. Key feed trees include winter flowering species such as *Eucalyptus robusta*, *Corymbia maculata* and *E. tereticornis*. Commonly used lerp infested trees include *E. moluccana* and *E. pilularis*. Although there are a low proportion of key feed trees on the Project Site, the Swift Parrot could forage on occasion within *E. tereticornis*, *Eucalyptus moluccana* as well as *E. siderophloia* on its winter migration.

The species may forage on occasion in the Project Site, but is not likely to depend on the resources present. The project would remove 30.3 hectares of potential foraging habitat for this species. Given that similar foraging habitat is present in the locality, the project is unlikely to impact the foraging cycle of the species such that a viable local population is placed at risk of extinction.

Regent Honeyeater

The Regent Honeyeater is a semi-nomadic species that has three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. There are also minor and sporadic records of breeding in Clarence Valley (Roderick, Ingwersen and Tzaros, 2013). Records from the Clarence Valley are relatively continuous extending over the last 30 years indicating that the region may constitute seasonally important foraging and refuge habitat for transient populations of these species, particularly during inland droughts.

Key habitats for the species in NSW are present on the coast and coastal plains and include *Corymbia maculata*, *C. gummifera*, *Eucalyptus robusta* and *E. tereticornis* forests. Commonly used lerp infested trees include *E. moluccana* and *E. pilularis*.

The Regent Honeyeater does not breed in the locality. The species may forage on occasion on *E. tereticornis* and *E. moluccana* in the Project Site.

The species may forage on occasion in the Project Site, but is not likely to depend on the resources present. The project would remove 30.3 hectares of potential foraging habitat for this species. No breeding habitat would be impacted. The project is unlikely to impact the lifecycle of the species such that a viable local population is placed at risk of extinction.

Reduce the area of occupancy of the species

Both species are wide ranging and highly mobile, semi-nomadic species with patchy and sporadic distribution across coastal NSW. Their presence in the Project Site is seasonally dependent and influenced by drought and rain periods affecting the flowering of preferred tree species. Therefore there is no defined area of occupancy in the Project Site. The project would have minor impacts on a relatively small area of potential foraging habitat for these species, given that there is widespread foraging habitat in the locality.

Fragment an existing population into two or more populations

Both species are highly mobile and semi-nomadic, capable of accessing patchy food resources. There are no defined areas of habitat in the Project Site that are exclusively occupied by these species and the project would not fragment a population of the Swift Parrot and Regent Honeyeater.

Adversely affect habitat critical to the survival of a species

Up to 84 percent of the Project Site has already been cleared, and remaining dry open forest align with the potential foraging habitat of the species. The impacts to vegetation in these areas would directly remove

30.3 hectares of potential habitat along the edges of large vegetation patches, where potential foraging habitat is very widespread through the surrounding locality. The project is unlikely to adversely affect habitat critical to the survival of the Swift Parrot and Regent Honeyeater.

Disrupt the breeding cycle of a population

The Project Site would constitute non-breeding habitat for a proportion of the population of both species

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The project would directly remove up to 30.3 hectares of potential foraging habitat; however it is highly unlikely that the Swift Parrot and Regent Honeyeater would decline. Suitable habitat is largely widespread and would remain surrounding the Project Site.

Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

There are no recognised invasive species that are harmful to the assessed species. The potential for weed invasion into habitat of the species is considered possible with a project of this nature and appropriate controls are required during construction and operation to reduce this threat. The management of invasive species would be managed during the construction.

Introduce disease that may cause the species to decline

There are no currently no diseases affecting this species. Infection of native plants by *Phytophthora cinnamomi* has been identified as being spread by construction machinery. This water-borne fungus infects the roots of plants and has the potential to cause dieback. Machinery associated with vegetation clearance and subsequent construction for the project has the potential to transmit the fungus to remaining native vegetation remnants of the species. This is a potential indirect impact to the species through the transmission of pathogens into retained habitat near the project. This can be mitigated through the development and implementation of suitable control measures.

Interfere with the recovery of the species.

The project would not conflict with the recovery plans for the Swift Parrot and Regent Honeyeater. Although the project would remove 30.3 hectares of potential foraging habitat, similar habitat would remain and is widespread in the locality. Mitigation and offset measures would target the recovery of lost foraging habitat. There are no priority sites for conservation of the Swift Parrot and Regent Honeyeater within the project boundary.

E.3 Koala (*Phascolarctos cinereus*)

Koalas are known to occur throughout the Clarence Valley with recent records at two sites within five kilometres of the Project Site. Although there was no evidence of Koala using the habitats in the Project Site, the habitat assessment tool (DoE 2013) identified the presence of habitat critical to the survival of koalas. Any existing populations are considered to be at a low-density.

In the Project Site there is one primary koala food tree *E. tereticornis* at low proportions, as well as three secondary food tree species at moderate proportions *E. moluccana* *E. seeana*, *E. propinqua*.

Lead to a long-term decrease in the size of an important population

The Koala has been recorded within the five kilometres of the Project Site. Potential habitat is present throughout the locality. These communities include a combination of primary, secondary and supplementary feed trees. The project would directly remove 30.3 hectares of potential koala habitat in the Project Site which is considered to be habitat critical to the survival of koalas. However given the widespread areas of habitat containing feed trees (*E. tereticornis* forests) Koalas would still be able to move through the area despite the loss of some habitat along the edge of these large patches. Given the small area of potential foraging and

breeding habitat that would be impacted, and the continued presence of movement corridors in the area, the project is unlikely to lead to a long-term decrease in the size of an important population of the Koala.

Reduce the area of occupancy of an important population

The project would result in the loss of about 30.3 hectares of potential foraging and breeding habitat. The habitat loss is confined to one location and would involve the loss of all vegetation and potential foraging habitat within the Project Site. Existing connectivity would not be severed. The Project is unlikely to reduce the area of occupancy of an important population of Koalas.

Fragment an existing important population into two or more populations

The project is unlikely to fragment existing native vegetation where clearing of 30.3 hectares of foraging habitat would occur on the fringes of a large vegetation patch. Opportunities for movement across the landscape will remain. The project would not fragment an important population of the Koala.

Adversely affect habitat critical to the survival of the species

According to the Draft Koala Referral Guidelines (DoE 2013), habitat critical to the survival of the Koala includes habitat that is considered to be important for the species' long-term survival and recovery. An impact area that scores five or more using the habitat assessment tool is highly likely to contain habitat critical to the survival of the koala. The assessment tool considers five contributing factors for scoring potential habitat critical to the survival of the Koala, this includes:

- Koala occurrence.
- Vegetation structure and composition.
- Habitat connectivity.
- Key existing threats.
- Recovery value.

The habitat assessment tool has reported a score of 6 on the Project Site which confirms the presence of habitat critical to the survival of koalas, although the population is considered a low-density.

Up to 84 percent of the Project Site has already been cleared, and remaining dry open forest align with the habitat critical to the survival of Koala. The impacts to vegetation in these areas would directly remove 30.3 hectares of potential habitat along the edges of large vegetation patches, where potential foraging habitat is very widespread through the surrounding locality. Most potential Koala habitat in the locality is dominated by a combination of primary, secondary and supplementary feed trees, with primary feed trees likely to be present to the west of the Project Site. The project is unlikely to adversely affect habitat critical to the survival of the Koala.

Disrupt the breeding cycle of an important population

The proposed area of habitat clearing represents a small portion of the potential habitat for the species and any impacts to breeding individuals would be limited to a small proportion of the population given the extensive areas of potential habitat in this location. Furthermore, potential habitat on the Project Site is considered to be in poorer condition compared to surrounding native vegetation, particularly in regards to structural properties of the forest where the Project Site lacks a mid-storey and / or sub-canopy. This may discourage breeding activity on the Project Site.

Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The project would directly remove up to 30.3 hectares of potential foraging habitat; however it is highly unlikely that the Koala would decline. Suitable habitat is largely widespread and would remain surrounding the Project Site.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat

There are no recognised invasive species that are harmful to the assessed species. The potential for weed invasion into habitat of the species is considered possible with a project of this nature and appropriate controls are required during construction and operation to reduce this threat. The management of invasive species would be managed during the construction.

Introduce disease that may cause the species to decline

The project is unlikely to introduce diseases affecting koalas, such as Chlamydia. Infection of native plants by *Phytophthora cinnamomi* has been identified as being spread by construction machinery. This water-borne fungus infects the roots of plants and has the potential to cause dieback. Machinery associated with vegetation clearance and subsequent construction for the project has the potential to transmit the fungus to remaining native vegetation remnants of the species. This is a potential indirect impact to the species through the transmission of pathogens into retained habitat near the Project. This can be mitigated through the development and implementation of suitable control measures.

Interferes substantially with the recovery of the species

The project would not conflict with the recovery plans for the Koala. Although the project would remove 30.3 hectares of potential foraging habitat, similar or better quality habitat would remain and is widespread in the locality. Mitigation and offset measures would target the recovery of lost foraging habitat. There are no priority sites for conservation of the Koala within the project boundary.

Appendix F. Field survey records

BioBanking plots	Easting	Northing
Plot 1	505737	6709710
Plot 2	505979	6709930
Plot 3	506101	6709820
Plot 4	505921	6709370
Plot 5	505753	6708460
Plot 6	505740	6708810
Plot 7	505601	6708700
Plot 8	506027	6710340
Plot 9	506116	6710560
Plot 10	506424	6710380
Plot 11	505379	6709730
Plot 12	505754	6708930
Plot 13	505724	6709190

Fauna Survey sites	Easting	Northing
Site 1	505705	6708880
Site 2	505351	6709718
Site 3	505850	6709381
Site 4	505311	6709905
Site 5	506313	6710667
Site 6	506010	6710313
Site 7	505946	6709911
Site 8	505721	6709735
Site 9	505669	6708580
Site DL1	505710	6709343
Site DL2	505459	6710327
Site FD1	506061	6708592
Site FD2	505773	6708968