Sutton Forest Quarries Pty Ltd

ABN 66 158 999 994

Biodiversity Offsets Assessment

Specialist Consultant Studies Compendium

Volume 2, Part 11

Prepared by

Niche Environment and Heritage Pty Ltd

March 2018

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Biodiversity Offsets Assessment

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

* Note: This figure was finalised prior to a late modification to the footprint of the northeastern barrier – the east-west section shown on this figure has been removed – see EIS Figure 2.1.

KEY DEFINITIONS AND ABBREVIATIONS

BBAM: BioBanking Assessment Methodology

BAM: Biodiversity Assessment Method

BC Act: Biodiversity Conservation Act 2016

BCC: BioBanking Credit Calculator

BVT: Biometric Vegetation Type

DEE: Commonwealth Department of the Environment and Energy

DGRs: Director-General's Requirements

Direct impacts: those that directly affect the habitat and/or individual plants and animals and cannot be avoided or mitigated.

DoE: Commonwealth Department of Environment (formerly DSEWPaC and now DEE)

DP&I: NSW Department of Planning and Infrastructure

DP&E: NSW Department of Planning and Environment (formerly DP&I)

EIS: Environmental Impact Statement

EP&A Act: *Environmental Planning and Assessment Act 1979* (NSW)

EPBC Act: *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

FBA: Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Projects (for State Significant Infrastructure and Development)

ha: hectares

Indirect impacts: those that affect species, populations or ecological communities in a manner other than through direct loss or disturbance. These can usually be avoided or mitigated.

Local population: the population of a particular species that occurs in the study area.

Locality: the area within 10 kilometres of the study area.

Local occurrence: refers to the distribution of a threatened ecological community within the study area and areas of contiguous habitat.

MNES: Matters of National Environmental Significance (from the EPBC Act).

OEH: NSW Office of Environment and Heritage

Resilience: the capacity of an ecosystem to regenerate

SEPP: State Environmental Planning Policy

Study area: For the purposes of the Biodiversity Offsets Assessment (this report), the study area is defined as the area within the 'Site Boundary' in **Figure 2.** It constitutes the development area and the adjacent proposed Biodiversity Offset Area.

TEC: Threatened Ecological Community

Threatened Biodiversity: threatened species, populations and ecological communities as listed on the TSC and/or EPBC Acts.

TSC Act: *Threatened Species Conservation Act 1995* (NSW)

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EXECUTIVE SUMMARY

Niche Environment and Heritage Pty Ltd (Niche) was commissioned R.W. Corkery & Co. Pty Limited (RWC) to provide an assessment of the offsetting requirements associated with the proposed development of the Sutton Forest Sand Quarry by Sutton Forest Quarries Pty Ltd (the Project).

Summary of impacts

The Project would result in the removal of approximately 63.2 hectares of native vegetation, with a further 4.0 hectares indirectly impacted through edge effects. None of this impacted vegetation is considered to be a Threatened Ecological Community (TEC) as listed on the *NSW Threatened Species Conservation Act 1995* (TSC Act) (now the Biodiversity Conservation Act 2016). Based on the flora and fauna assessment by Kevin Mills and Associates (KMA 2018) and additional ecological survey by Biosis (2018), this native vegetation is known habitat for the following threatened species:

1. Glossy Black-cockatoo;
2. Scarlet Robin;
3. Varied Sittella;
4. Gang-gang Cockatoo;
5. Powerful Owl; and
6. Four microbat species - Eastern False Pipistrelle, Eastern Bent-wing Bat, Large-eared Pied Bat and Greater Broad-nosed Bat; and
7. *Phyllota humifusa* (dwarf phyllota) - three individuals will be removed by the Project.

Sutton Forest Quarries is considering a variety of options to satisfy offsetting obligations resulting from residual impacts to native vegetation and threatened flora from the Project. These options are summarised in a preliminary Biodiversity Offset Strategy (Section 2.14 of the EIS (RWC, 2018)) and include a combination of an on-site offset area, off-site offset area and other options available under the Biodiversity Offset Scheme of the Biodiversity Conservation Act 2016. The assessment to date has focused on the on-site offset area, however, it is acknowledged that following the commencement of the Biodiversity Conservation Act 2016 in August 2017 and the finalisation of transitional arrangements for BioBanking Agreements, any offset area would need to be secured under a Biodiversity Stewardship Agreement and the credits calculated for the on-site offset area would need to be adjusted or recalculated during the preparation of a final biodiversity offsetting strategy. While the assessment of offsetting credits generated by the on-site offset area may not be technically applied in a future offsetting agreement, it is understood this assessment would be useful to OEH for consideration of the Applicant's capability to satisfy the offsetting obligations of the Project.

The on-site Biodiversity Offset Area which will be 101.5 hectares (approximately 7.7 hectares of which is rehabilitated cleared or temporary impact areas). The native vegetation of the Biodiversity Offset Area constitutes the same habitat for the threatened fauna listed above and a large population (105 plants) of *Phyllota humifusa* has been recorded within this area (KMA 2018). Further, KMA (2018) notes that many thousands of individuals of this species are present south of the Hume Highway. The Biodiversity Offset Area also has known occurrences of the Montane Peatlands and Swamps TEC and the threatened plant *Eucalyptus aquatica* (Broad-leafed Sallee - at least 250 plants recorded) (KMA 2018).

NSW offsetting assessment summary

Niche has conducted two BioBanking scenarios (development and offset) to quantify the offset requirement of the Project in terms of biodiversity credits (ecosystem and species credits). This assessment has been conducted through application of the BioBanking Assessment Methodology (BBAM) and BioBanking Credit Calculator (Version 4) (OEH, 2014a) and under the provisions of the *NSW OEH*

interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects.

The assessment concludes that the proposed on-site Biodiversity Offset Area would generate 1,117 ecosystem credits and that after the retirement of all credits that can be generated within the on-site Biodiversity Offset Area (like-for-like outcome), a deficit of 2,854 ecosystem credits remains (approximately 73 per cent of the overall requirement of 3,901 credits). A total of 746 species credits for *Phyllota humifusa* are generated within the on-site Biodiversity Offset Area, which leaves a surplus of 692 species credits after retirement of the 54 credits required to offset the impacts to the three individuals within the development footprint. A total of 1,775 species credits for *Eucalyptus aquatica* are also generated by the on-site Biodiversity Offset Area, none of which are required to be retired as the development does not impact this species.

The remaining 73 per cent of the offset requirement may be met through a combination of:

- the retirement of the required number and class of like-for-like biodiversity credits,
- the retirement of the required biodiversity credits in accordance with the variation rules,
- the funding of a biodiversity conservation action that would benefit the relevant threatened species or ecological community,
- the payment of an amount into the Biodiversity Conservation Fund determined in accordance with the offsets payment calculator to satisfy the requirement to retire biodiversity credits.

In order to satisfy the offsetting requirements for the Project, Sutton Forest Quarries Pty Ltd. has purchased an approximately 200 hectare property located to the west of the Site. Comprehensive surveys of this location have not been undertaken, however a preliminary review of the available aerial photography suggests that vegetation present on the offset site is likely to be suitable to be used as a like-for-like offset for areas being impacted by the Project and the vegetation appears to be in relatively good condition. Of course, this would be confirmed through field surveys.

Offsetting under the EPBC Act

KMA (2018) has recommended that a Referral to the Commonwealth is not necessary for this proposal. Niche similarly believes that it is unlikely that the Project will be deemed a Controlled Action by the Commonwealth, as all potential impacts to EPBC Matters of National Environmental Significance (MNES) are unlikely to be considered significant and on-site mitigation measures will aid the protection of the local population of the EPBC listed *Phyllota humifusa* (vulnerable).

As such, an offsetting assessment using the EPBC Act Offsets Assessment Guide is considered an unlikely requirement.

1 INTRODUCTION

1.1 Scope

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by R.W. Corkery & Co. Pty Limited (RWC) to conduct a Biodiversity Offsets Assessment for the proposed Sutton Forest Sand Quarry. Sutton Forest Sand Quarry will be operated by Sutton Forest Quarries Pty Ltd and is located just west of the Hume Highway near Sutton Forest in NSW (**Figure 1**).

The Project is described in detail in Section 2 of the Environmental Impact Statement (referred to hereafter as 'EIS' and cited as RWC 2018).

The DGRs for the proposed Sutton Forest Sand Quarry, issued on 7 February 2014 require that the Applicant provide:

> *"a comprehensive offset strategy to ensure the development maintains or improves biodiversity values in the medium to long term."*

KMA (2018) and Biosis (2018) concluded that although impacts to individual species would not be significant, the removal of habitat would be a significant residual impact requiring consideration of biodiversity offsetting. In accordance with the DGRs, the Applicant engaged Niche Environment and Heritage to assess the biodiversity-related impacts and calculate the credits required to be offset. The credits available within the proposed on-site Biodiversity Offset Area were also calculated.

An initial biodiversity offset assessment was prepared in 2014 following the 2014 field surveys to map vegetation within the Site and proposed on-site Biodiversity Offset Area. This assessment was undertaken in accordance with the BioBanking Assessment Methodology (BBAM) available at the time (DECCW, 2009). This report is an update of the original assessment following modifications to the layout of the Site. In order to provide accurate calculations of offset credit requirements the assessment has applied the updated BBAM and the most recent version of the Bio-Banking Credit Calculator (version 4) (OEH, 2014a).

The *Framework for Biodiversity Assessment - NSW Biodiversity Offsets Policy for Major Projects* (FBA) (OEH 2014b) was published after the DGRs for the Project had been issued and the assessment is not required to address these guidelines. However it should be noted that the use of the BBAM has resulted in an assessment that is consistent with the objectives and principles of the *NSW Biodiversity Offsets Policy for Major Projects* (OEH, 2014b) (see Section 3.4).

The assessment and approach to establishing the offset (the preliminary Biodiversity Offset Strategy) has been assessed under the provisions of the *NSW OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects* (OEH 2011) and the N*SW offset principles for major projects (state significant development and infrastructure)* (OEH, 2013).

The Applicant has also secured an approximately 200ha property to the west of the Site and is considering the option to secure this as an additional biodiversity offset area. In addition, there are a variety of options available to the Applicant to satisfy offsetting obligations resulting from residual impacts to native vegetation and threatened flora under the Project. These options include the purchase of offsetting credits, contribution towards native species conservation programs or payment into a Biodiversity Conservation Fund. The assessment to date has focused on the on-site offset area, however, it is acknowledged that following the commencement of the Biodiversity Conservation Act 2016, in August 2017 and the finalisation of transitional arrangements for BioBanking Agreements, any offset area would need to be secured under a Biodiversity Stewardship Agreement and the credits

calculated for the on-site offset area would need to be adjusted or recalculated during the preparation of a final biodiversity offsetting strategy. While the assessment of offsetting credits generated by the on-site offset area may not be technically applied in a future offsetting agreement, it is understood this assessment would be useful to OEH for consideration of the Applicant's capability to satisfy the offsetting obligations of the Project. As a result, the biodiversity offset assessment would be updated following receipt of development approval and upon review of the results of surveys of the additional land proposed to be secured for the purposes of offsetting. A final Biodiversity Offset Strategy would be developed in consultation with OEH.

1.2 Purpose of this report

The purpose of this report is to quantify the offset requirement of the Project in terms of biodiversity credits (ecosystem and species credits).

The offsetting assessment was based on survey and assessment information contained in KMA (2018) and Biosis (2018) and a site inspection by Niche to validate vegetation mapping and fill the identified data gaps reflecting the information requirements for the BioBanking assessment.

1.3 Objectives of this assessment

In developing this report, Niche has met the following objectives of the EIS process:

1. Reviewed previous assessments and documentation in relation to the study area, particularly with reference to KMA (2018) and Biosis (2018).
2. Collation and analysis of vegetation mapping, threatened species and biometric data for the study area.
3. Quantified the residual impact on biodiversity such that requirements for biodiversity offsetting may be determined.
4. Quantified and justified the proposed offsetting scenario in relation to the relevant NSW offsetting guidelines and policies under the understanding that an offset under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) will not be required.

2 REVIEW OF FLORA AND FAUNA ASSESSMENT (KMA 2018)

2.1 Native vegetation

The Sutton Forest Sand Quarry would result in the removal of 63.2 hectares of native vegetation. Indirect impacts such as edge effects are not well-defined in KMA (2018), however it is considered that a five metre buffer around the area of direct impact is adequate to account for edge effects, resulting in 4.0 hectares being indirectly impacted.

The proposed on-site Biodiversity Offset Area covers 101.5 hectares of land that will be conserved, of which 93.8 hectares is native vegetation and the remainder is cleared land proposed for rehabilitation with native vegetation.

2.2 Threatened flora and fauna surveys

No targeted flora surveys were conducted as a part of the Biodiversity Offsets Assessment by Niche. Calculation of offsets required in relation to threatened flora is based solely on the information supplied in KMA (2018), which detected three individuals of the threatened plant *Phyllota humifusa* within the proposed extraction area. No threatened flora were identified by Biosis (2018).

No targeted threatened fauna surveys or habitat assessments were conducted as a part of the Biodiversity Offsets Assessment by Niche. Calculation of offsets required in relation to threatened fauna is based solely on the information supplied in KMA (2018). All threatened fauna recorded within the development footprint are ecosystem credit species and therefore species credits are not required to be generated in relation to threatened fauna (refer to Section 3.1.5).

The surveys by KMA (2018) and Biosis (2018) are considered adequate to meet the minimum guidelines in DEC (2004) and therefore the information provided in the EIS in relation to threatened flora and fauna is reliable and scientifically rigorous. No additional surveys were required.

2.3 Niche site inspection

Upon review of KMA (2018), some gaps in the survey data and effort were identified in relation to the provision of BioBanking site attribute data necessary to conduct a BioBanking assessment. Nathan Smith, Accredited BioBanking Assessor and Senior Botanist with Niche, conducted an additional survey in February 2014, in the presence of Mr David Schumacher of RWC. The purpose of this survey was to validate the vegetation mapping of KMA (2018) and also to collect enough BioBanking site attribute data to enable a BioBanking assessment of both the development impacts and the proposed on-site Biodiversity Offset Area. This data is supplied in **Appendix 2**.

Other than a shortage of BioBanking site attribute data, the on-site vegetation mapping by KMA (2018) was considered satisfactory, though Niche made some minor additions where stands of trees within cleared areas were evident both on aerial imagery and on the ground.

2.4 Biosis site inspection

An additional site inspection was undertaken on 9 January 2018 by Biosis to survey the vegetation that would be impacted by the proposed alignment of the access road. Biosis undertook two quadrats following the BBAM and updated the vegetation mapping, data included in **Appendix 2**.

2.5 Limitations

2.5.1 Plot data

A sufficient number of BioBanking plots, according to the BioBanking Assessment Methodology (BBAM), were surveyed in each vegetation zone of the development footprint (Table 1). However, it should be noted that there was a shortfall in BioBanking plots in one vegetation type in the on-site Biodiversity Offset Area (Table 1). The shortfall in BioBanking plot data was made up using averages of the existing attribute data within the same Biometric Vegetation Type (BVT). This was considered an appropriate approach considering offsets are not required to be finalised at this stage of the development application. It is anticipated that offsets would be required to be finalised and approved by OEH prior to any clearing being undertaken as part of the Project and further survey and assessment of proposed offset sites would be undertaken.

Table 1: Survey effort

	Veg community	Area (ha)		Plots required		Plots Undertaken
		Development area	Offset area	Development area	Offset area	KMA (2018), Niche and Biosis (2018)
1	Peppermint Tall Forest	0	3.3	1	1	1
2	Sydney Peppermint Forest	8.3	33.6	3	4	4
3	Stringybark Forest	2.9	6.3	1	3	3
4	Scribbly Gum Woodland	26.4	41.3	4	4	5
5	Regrowth Peppermint Forest	29.4	3.7	4	1	6
6	Freshwater Wetland (Swamp)	0	5.8	1	3	1
7	Scribbly Gum Woodland (Poor)	0.2	0	1	0	1

3 NSW OFFSETTING ASSESSMENT

For the purposes of this assessment, Niche has conducted BioBanking credit calculations for both the Sutton Forest Sand Quarry area (Development Site) and the proposed on-site Biodiversity Offset Area as presented in **Figure 3**. A description of both scenarios, which were conducted using Version 4 of the BioBanking Credit Calculator (the Calculator), is provided in this section. The relevant credit reports have been provided in **Appendix 3** (Development Site credits required) and **Appendix 4** (on-site Biodiversity Offset Area credits created).

Figure 6 and **Figure 7** illustrate the landscape assessment factors required by the Calculator. Both the Development Site (the Sutton Forest Sand Quarry) and the BioBank Site (the proposed on-site Biodiversity Offset Area):

- Fall entirely within the same 1,000 hectare assessment circle;
- Are within the Hawkesbury/Nepean Major Catchment Area boundary;
- Are within the Burragorang (Part A) IBRA sub-region; and
- Are dominated by the Nattai Plateau Mitchell Landscape.

3.1 Development Site

The Sutton Forest Sand Quarry would result in the removal of 63.2 hectares of native vegetation. Indirect impacts such as edge effects are not well-defined in KMA (2018), however it is considered that a five metre buffer around the area of direct impact is adequate to account for edge effects, resulting in 4.0 hectares being indirectly impacted. Three individuals of the threatened plant *Phyllota humifusa* fall within the Project footprint (KMA 2018) and Biosis (2018).

The following details the inputs into the BioBanking Credit Calculator Version 4.

3.1.1 Landscape value

Table 2 shows the values used for the change in native vegetation cover as a result of development (see also **Figure 6** and **Figure 7**). This estimate was based on the amount of native vegetation cover within the 1,000 hectare and 100 hectare circles from Tozer *et. al.* (2010) both before and after the proposed impacts (direct and indirect) to native vegetation.

Table 2. Native Vegetation Cover Classes – Development Site

	Native Vegetation Cover Class (%)	
	Circle 1	
	Before Clearing	**After Clearing**
1,000 ha	51 – 55 %	46 – 50 %
100 ha	91 – 95 %	41 – 45 %

3.1.2 Connectivity value

A connectivity assessment was conducted for the Sutton Forest Sand Quarry using the method outlined in OEH (2014a). The following aspects were considered:

- The width of the current and future connecting link; and
- The condition of the current and future connecting link (over-storey and mid-storey/ground cover).

Figure 7 illustrates that the primary connecting link is unaffected by the Development Site and due to its substantial connectivity to bushland within the locality that the connectivity width would remain greater than 500 metres before and after the development (**Table 3**). The average condition of the native over-storey, mid-storey and groundcover throughout the link would remain at benchmark.

Table 3. Connectivity Value – Development Site

	Before Development	After Development
Width	> 500 m	> 500 m
Condition		
Over-storey Condition	PFC at BM*	PFC at BM
Mid-storey/ground cover condition	PFC at BM	PFC at BM

**PFC at BM = Projected Foliage Cover at Benchmark*

3.1.3 Vegetation zones

The vegetation types defined by Niche within the Sutton Forest Sand Quarry study area have been aligned with revised Biometric Vegetation Types (BVTs), Endangered Ecological Communities (EECs), Keith Formations and Keith Classes (**Appendix 1).** Five vegetation zones exist within the Sutton Forest Sand Quarry Development Site (**Table 4**) and these are split between ten management zones, representing direct and indirect impacts. This impact is illustrated in **Figure 4** and **Figure 5**.

Table 4. Vegetation zones of the Sutton Forest Sand Quarry Development Site

Veg Code	Vegetation Type (KMA 2018)	BVT code	Vegetation Zone	EEC	Direct impact (ha)*	Indirect impact (ha)*	Total impact (ha)
2	Sydney Peppermint Forest	HN568	HN568_mod/good_High	Not an EEC	7.7	0.6	8.3
3	Stringybark Forest	HN568	HN568_mod/good_Medium	Not an EEC	2.6	0.3	2.9
4	Scribbly Gum Woodland	HN565	HN565_mod/good	Not an EEC	24.2	2.2	26.4
5	Regrowth Peppermint Forest	HN568	HN568_mod/good_Other	Not an EEC	28.6	0.8	29.4
8	Scribbly Gum Woodland	HN565	HN565_mod/good_Poor	Not an EEC	0.1	0.1	0.2
					63.2	**4.0**	**67.2**

** Each of the direct and indirect impact areas have been entered into the BBCC as separate management zones.*

3.1.4 Threatened species requiring survey

As the BBAM is not being utilised for a formal BioBanking Assessment, the threatened species requiring survey output is not relevant. KMA (2018) and Biosis (2018) conducted adequate surveys for threatened species that have a moderate to high likelihood of occurrence within the Development Site. This survey was determined through an analysis of records on the Atlas of NSW Wildlife, EPBC Act Protected Matters Search Tool and previous reports and surveys from the local area.

3.1.5 Threatened fauna predicted

The Calculator identified 21 threatened fauna (**Table 5**), predicted to occur as ecosystem credit species within the BVTs that may be impacted by the proposed Sutton Forest Sand Quarry. Due to the substantial and rigorous fauna survey effort conducted by KMA (2018) and Biosis (2018), 15 of these are considered unlikely to occur on site. Of those that have been detected on or near the site, Powerful Owl is the species with the highest Offset multiplier, 3.0 (**Table 5**). Therefore, depending on the BVT impacted, Powerful Owl is most likely to be driving the credit calculations.

Table 5. Threatened fauna predicted to occur within the Development Site

Common name	Species	TSC Act	EPBC Act	Offset multiplier	On site
Barking Owl	*Ninox connivens*	V	-	3.0	No
Brown Treecreeper	*Climacteris picumnus subsp. victoriae*	V	-	2.0	No
Diamond Firetail	*Stagonopleura guttata*	V	-	1.3	No
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	2.2	Yes
Eastern Freetail-bat	*Mormopterus norfolkensis*	V	-	2.2	No
Flame Robin	*Petroica phoenicea*	V	-	1.3	No
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	-	2.0	Yes
Glossy Black-cockatoo	*Calyptorhynchus lathami*	V	-	1.8	Yes
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	2.2	Yes
Hooded Robin	*Melanodryas cucullata subsp. cucullata*	V	-	1.7	No
Little Eagle	*Hieraaetus morphnoides*	V	-	1.4	No
Masked Owl	*Tyto novaehollandiae*	V	-	3.0	No
New Holland Mouse	*Pseudomys novaehollandiae*	V	V	2.6	No
Powerful Owl	*Ninox strenua*	V	-	3.0	Yes
Scarlet Robin	*Petroica boodang*	V	-	1.3	Yes
Sooty Owl	*Tyto tenebricosa*	V	-	3.0	No
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	2.6	No
Swift Parrot	*Lathamus discolor*	E	CE	1.3	No
Turquoise Parrot	*Neophema pulchella*	V	-	1.8	No
Varied Sittella	*Daphoenositta chrysoptera*	V	-	1.3	Yes
Yellow-bellied Glider	*Petaurus australis*	V	-	2.3	No

3.1.6 Site values

A breakdown of the plots conducted per vegetation zone is provided in **Appendix 2** and mapped in **Figure 4**. Plots were completed in part by Niche, KMA (2018) and Biosis (plots undertaken in 2018). Nathan Smith conducted the surveys for Niche and is an Accredited BioBanking Assessor.

The default decrease in site score allowed by the Calculator for the management zones directly impacted was accepted. This reduced the site values to zero as all native vegetation within these vegetation zones would be completely removed by the Sutton Forest Sand Quarry.

Within the five management zones impacted by edge effects only (see **Section 3.1.3**), it was assumed that native groundcover would be reduced and that exotic plant cover would increase to a minor extent (albeit under the regime of an on-site weed management). All other attributes were assumed to be unchanged (e.g., over-storey would not be lost in the indirect impact zone).

3.1.7 Threatened species survey results

No threatened fauna as listed on the TSC Act (now BC Act), that require the retirement of species credits, were detected by KMA (2018) during the field surveys. Three individuals of *Phyllota humifusa* fall within the area that would be cleared for the Sutton Forest Sand Quarry (centre of the extraction area) and species credits are required in order to offset impacts to this species.

3.1.8 Development Site credit calculations

Appendix 3 provides the full Development Site Credit Extract derived from the Calculator. A total of 3,901 ecosystem credits are required to offset impacts to 67.2 hectares of native vegetation within the Sutton Forest Sand Quarry, whilst 54 *Phyllota humifusa* species credits are required to offset impacts to three individuals of this species. A breakdown of the ecosystem credit calculation is provided in **Table 6**.

Table 6. Ecosystem credit requirement

Veg Code	Vegetation Type (KMA 2018)	BVT code	Vegetation Zone	EEC	Total impact (ha)	Total credits required
2	Sydney Peppermint Forest	HN568	HN568_mod/good_High	Not an EEC	8.3	417
3	Stringybark Forest	HN568	HN568_mod/good_Medium	Not an EEC	2.9	155
4	Scribbly Gum Woodland	HN565	HN565_mod/good	Not an EEC	26.4	1,680
5	Regrowth Peppermint Forest	HN568	HN568_mod/good_Other	Not an EEC	29.4	1,645
6	Scribbly Gum Woodland	HN565	HN565_mod/good_Poor	Not an EEC	0.2	4
					67.2	**3,901**

3.2 The On-site Biodiversity Offset Area

The on-site Biodiversity Offset Area covers 101.5 hectares of land that will be conserved, of which 93.9 hectares is native vegetation and the remainder is cleared land (7.6 ha).

The following details the inputs into the BioBanking Credit Calculator Version 4.

3.2.1 Landscape value

Table 7 shows the values used for the change in native vegetation cover as a result of the management of the proposed offset area. No change is likely at a landscape scale.

Table 7. Native vegetation cover classes – offset area

	Native Vegetation Cover Class (%)	
	Circle 1	
	Before Management	**After Management**
1000 ha	51-55 %	51-55 %
100 ha	66-70 %	66-70 %

3.2.2 Connectivity value

Long Swamp Creek, located along the northern boundary of the on-site Biodiversity Offset Area is a 4th and 3rd order stream. Therefore the on-site Biodiversity Offset Area is within a strategic location (riparian buffer on one side of a 4th order stream). This gains the on-site Biodiversity Offset Area a strategic value score of 12. The other connectivity values are therefore not required to be entered into the calculator. The on-site Biodiversity Offset Area generates an overall landscape score of 21.

3.2.3 Vegetation zones

An alignment of the vegetation zones at Sutton Forest Sand Quarry with revised BVTs, EECs, Keith Formations and Keith Classes has been provided in **Appendix 1**. The vegetation zones within the proposed on-site Biodiversity Offset Area are provided in **Table 8** and mapped in **Figure 4** and **Figure 5**.

Table 8. Vegetation zones within the on-site Biodiversity Offset Area

Veg Code	Vegetation Type (KMA 2018)	BVT code	Vegetation Zone	EEC	Offset area (ha)
1	Peppermint Tall Forest	HN584	HN584_mod/good	Not an EEC	3.3
2	Sydney Peppermint Forest	HN568	HN568_mod/good_High	Not an EEC	33.6
3	Stringybark Forest	HN568	HN568_mod/good_Medium	Not an EEC	6.3
4	Scribbly Gum Woodland	HN565	HN565_mod/good	Not an EEC	41.3
5	Regrowth Peppermint Forest	HN568	HN568_mod/good_Other	Not an EEC	3.7
6	Freshwater Wetlands (Swamp)	HN602	HN602_mod/good	Montane Peatlands and Swamps	5.8
7	Cleared Land (to be revegetated)	HN565	HN565_Low	Not an EEC	4.0
-	Southern Barrier (east portion to be revegetated)	HN565	HN565_Low	Not an EEC	0.1
-	Southern Barrier (west portion to be revegetated)	HN568	HN568_Low	Not an EEC	1.2
-	Fines Storage Area 1 (to be revegetated)	HN568	HN568_Low	Not an EEC	1.7
	Fines Storage Area 1 (to be revegetated)	HN565	HN565_Low	Not an EEC	0.6
					101.50

3.2.4 Threatened fauna predicted to occur within the offset area

The following is the list of threatened fauna predicted to occur within the BVTs of the on-site Biodiversity Offset Area:

- Barking Owl, *Ninox connivens*
- Brown Treecreeper *Climacteris picumnus* subsp. *victoriae*
- Diamond Firetail *Stagonopleura guttata*
- Eastern False Pipistrelle, *Falsistrellus tasmaniensis*
- Eastern Freetail-bat, *Mormopterus norfolkensis*
- Flame Robin *Petroica phoenicea*
- Gang-gang Cockatoo *Callocephalon fimbriatum*
- Glossy Black-cockatoo, *Calyptorhynchus lathami*
- Greater Broad-nosed Bat, *Scoteanax rueppellii*
- Hooded Robin *Melanodryas cucullata subsp. cucullata*
- Little Eagle *Hieraaetus morphnoides*
- Masked Owl, *Tyto novaehollandiae*
- New Holland Mouse *Pseudomys novaehollandiae*
- Powerful Owl, *Ninox strenua*
- Scarlet Robin, *Petroica boodang*
- Spotted Harrier Circus assimilis
- Spotted-tailed Quoll, *Dasyurus maculatus*
- Swift Parrot, *Lathamus discolour*
- *Turquoise Parrot Neophema pulchella*
- *Varied Sittella Daphoenositta chrysoptera*
- Yellow-bellied Glider, *Petaurus australis*

It is noted that each of the above species are also predicted to occur within the Development Site (see **Table 5**).

3.2.5 Threatened species requiring survey

The following is a list of threatened species for which survey is recommended by the Calculator(i.e., for which species credits can be generated upon detection within the Offset Area):

- Bargo Geebung, *Persoonia bargoensis*
- Blue Mountains Water skink, *Eulamprus leuraensis*
- Booroolong Frog, *Litoria booroolongensis*
- Broad-headed Snake, *Hoplocephalus bungaroides*
- Broad-leaved Sally, *Eucalyptus aquatica*
- Brush-tailed Rock-wallaby, *Petrogale penicillata*
- Bynoes Wattle, *Acacia bynoeana*
- Cambage Kunzea, *Kunzea cambagei*
- Cotoneaster Pomaderris, *Pomaderris cotoneaster*
- Covenys Zieria, *Zieria covenyi*
- Deanes Boronia, *Boronia deanei*
- Dense Cord-rush, *Baloskion longipes*
- Downy Wattle, *Acacia pubescens*
- Dwarf Phyllota, *Phyllota humifusa*
- Eastern Pygmy-possum, *Cercartetus nanus*
- Flockton Wattle *, Acacia flocktoniae*
- Giant Burrowing Frog, *Heleioporus australiacus*
- Giant Dragonfly*, Petalura gigantean*
- Green and Golden Bell Frog, *Litoria aurea*
- Hairy Geebung, *Persoonia hirsuta*
- Hibbertia puberula, *Hibbertia puberula*
- Klaphakes Sedge, *Carex klaphakei*
- Koala*, Phascolarctos cinereus*
- Kowmung Hakea, *Hakea dohertyi*
- Littlejohns Tree Frog, *Litoria littlejohni*
- Mittagong Geebung, *Persoonia glaucescens*
- Needle Geebung, *Persoonia acerosa*
- Red-crowned Toadlet, *Pseudophryne australis*
- Regent Honeyeater, *Anthochaera Phrygia*
- Rosenbergs Goanna, *Varanus rosenbergi*
- Smooth Bush-Pea, *Pultenaea glabra*
- *Solanum amourense*
- Southern Brown Bandicoot (eastern), *Isoodon obesulus subsp. obesulus*
- Squirrel Glider, *Petaurus norfolcensi*
- *Veronica blakelyi*
- Wingecarribee Gentian, *Gentiana wingecarribiensis*
- Woronora Beard-heath, *Leucopogon exolasius*

Note that species credits can be generated for any species listed on the TSC Act within a Biodiversity Offset Area at any time in the future, if detected.

3.2.6 Site values

A breakdown of the plots conducted per vegetation zone is provided in **Appendix 2** and mapped in **Figure 4**. Plots were completed in part by Niche and KMA (2018). Nathan Smith conducted the surveys for Niche and is an Accredited BioBanking Assessor.

The maximum increase in site score allowed by the Calculator was accepted for the on-site Biodiversity Offset Area for all vegetation zones due to the likely improvement due to management (e.g., improvement in native groundcover and reduction in exotic plant cover due to revegetation and weed management). Substantial improvement could also be made from the redistribution of fallen logs and tree hollows from within the development area to the offset area.

3.2.7 Threatened species survey results

All threatened fauna detected by KMA (2018) throughout the study area are predicted by the BVTs (i.e., ecosystem credits). None are capable of generating species credits.

Two threatened plants were observed within the on-site Biodiversity Offset Area by KMA (2018), including:

- At least 250 individuals of *Eucalyptus aquatica*. The observed individuals are wholly within the on-site Biodiversity Offset Area and are therefore not likely to be impacted by the Project. There is no requirement to offset this species.
- A population of 105 plants of *Phyllota humifusa* recorded in the far north-western corner of the on-site Biodiversity Offset Area.

3.2.8 Proposed on-site Biodiversity Offset Area credit calculations

Appendix 4 provides the full BioBanking Credit extract from the calculator and **Table 9** shows that a total of 1,117 ecosystem credits are generated within the proposed on-site Biodiversity Offset Area. In terms of species credits, 746 credits are created for *Phyllota humifusa* and 1,775 credits are created for *Eucalyptus aquatica*.

Table 9. Ecosystem Credit Calculations – proposed offset area

Veg Code	Vegetation Type (KMA 2018)	BVT code	Vegetation Zone	EEC	Offset Area (ha)	Credits Created
1	Peppermint Tall Forest	HN584	HN584_mod/good	Not an EEC	3.3	40
2	Sydney Peppermint Forest	HN568	HN568_mod/good_High	Not an EEC	33.6	363
3	Stringybark Forest	HN568	HN568_mod/good_Medium	Not an EEC	6.3	66
4	Scribbly Gum Woodland	HN565	HN565_mod/good	Not an EEC	41.3	433
5	Regrowth Peppermint Forest	HN568	HN568_mod/good_Other	Not an EEC	3.7	45
6	Freshwater Wetlands (Swamp)	HN602	HN602_mod/good	Montane Peatlands and Swamps	5.8	70
7	Cleared Land (to be revegetated, including Southern Barrier (east portion) and Fines Storage Area 1 (to be revegetated)	HN565	HN565_Low	Not an EEC	4.7	58
-	Southern Barrier (west portion to be revegetated) and Fines Storage Area 1 (to be revegetated)	HN568	HN568_Low	Not an EEC	2.9	42
					101.5	**1,117**

3.3 Offsetting under the Biodiversity Conservation Act 2016

The project was assessed under the TSC Act, but due to the transitional arrangements ending on 25 February 2018, the offsets will be secured using the requirements of the NSW Biodiversity Offset Scheme (BOS) which has been established through the *Biodiversity Conservation Act 2016* (BC Act). Measures to offset or compensate for impacts under the BOS are described in the *Biodiversity Conversion Regulation* 2017, and can include a combination of one or more of the following:

- the retirement of the required number and class of like-for-like biodiversity credits

- the retirement of the required biodiversity credits in accordance with the variation rules
- the funding of a biodiversity conservation action that would benefit the relevant threatened species or ecological community, and that is equivalent to the cost of acquiring the required like-for-like biodiversity credits as determined by the offsets payment calculator
- for state significant development or infrastructure mining projects ecological rehabilitation of the impacted mine site can generate the same type and number of credits (determined in accordance with the ancillary rules)
- the payment of an amount into the Biodiversity Conservation Fund determined in accordance with the offsets payment calculator instead of retiring biodiversity credits.

Appendix 5 is a table of the complete ecosystem credit offsetting requirements and the subsequent status of the credit supply after each round of offsetting. The removal of three individuals of the threatened plant *Phyllota humifusa* requires 54 species credits to be retired from the 746 credits generated on the on-site Biodiversity Offset Area. It should be noted however, that the credit requirements and credit calculations under the BBAM and BAM (Biodiversity Assessment Method under the BC Act; OEH 2017) differ, and the credit requirement detailed in the preliminary Biodiversity Offset Strategy would need to be converted from BBAM biodiversity credits to BAM biodiversity credits. This would be done for the final Biodiversity Offset Strategy using a conversion calculator that is currently in development by OEH.

In order to demonstrate that the Company has the capability to satisfy its offsetting obligations, the Applicant has developed a preliminary Biodiversity Offset Strategy (described in full in Section 2.14 of the EIS).

The preliminary Biodiversity Offset Strategy involves securing the proposed on-site Biodiversity Offset Area with the remaining credits requirements to be satisfied through an additional land-based offset located to the west of the Site, or through other mechanisms available under the BOS. The off-site Biodiversity Offset Area remains subject to field survey and assessment in accordance with the relevant assessment methodology (BAM). Should the ecosystem credits generated by this offset area not be sufficient to meet the Project's offset requirements (Section 3.1), the Applicant would seek alternative methods to meet the Project's offsetting requirements, as described in Sections 3.3.2, 3.3.3 and 3.3.4.

3.3.1 Retirement of like-for-like biodiversity credits

The *Biodiversity Conservation Regulation 2017* stipulates that:

> *In the case of impacts on the habitat of threatened species that are ecosystem credit species or other native vegetation (other than impacts on threatened ecological communities), like-for-like biodiversity credits represent:*
>
> *(a) the same class of native vegetation located in:*
> *(i) the same or an adjoining Interim Biogeographic Regionalisation of Australia subregion as the impacted site, or*
> (ii) *any such subregion that is within 100 kilometres of the outer edge of the impacted site, and*
>
> *(b) the same or a higher offset trading group, and*
>
> *(c) if the impacted habitat contains hollow bearing trees—vegetation that contains hollow bearing trees.*

Therefore, with reference to the "PCT credit status" field in **Appendix 5**, offsetting on a like-for-like PCT basis results in:

1. An initial deficit of 1,193 ecosystem credits for HN565 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest (KMA unit 4 – Scribbly Gum Woodland), which includes credit value for rehabilitation of four hectares of low condition paddock and 0.7 hectares of areas to be cleared and revegetated (southern barrier and Fines Storage Area 1 and associated access);
2. A final deficit of 1,153 ecosystem credits for HN565 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest (KMA unit 4 – Scribbly Gum Woodland), after the surplus of 40 ecosystem credits for HN584 Silvertop Ash - Narrow-leaved Peppermint open forest is retired against HN565 (same Keith class and therefore like for like credit status); and
3. A deficit of 1,701 ecosystem credits for HN568 Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest (KMA units 2, 3 and 5 – the Sydney Peppermint and Stringybark vegetation and derived regrowth); and
4. A surplus of 70 ecosystem credits for HN602 Tableland swamp meadow (KMA unit 6 – Freshwater Wetlands). This vegetation type is not impacted by the development and only exists within the on-site Biodiversity Offset Area. The Freshwater Wetland aligns to the Montane Peatlands and Swamps EEC.

The establishment of the on-site Biodiversity Offset Area would satisfy 32 per cent of HN565 credits (531 credits of 1684 credits required) and 23 per cent HN568 credits (516 credits of 2,217 credits required).

In order to satisfy the offsetting requirements for the Project, Sutton Forest Quarries Pty Ltd has purchased an approximately 200 hectare property located to the west of the Site. Comprehensive surveys of this property have not been undertaken, but a preliminary review of the aerial photography suggests that the vegetation present on the is likely to be a like-for-like offset for the credits required by the Project, and the vegetation appears to be in relatively good condition. However, this would need to be confirmed through field surveys.

The remaining offset requirement (1,153 HN565 credits and 1,701 HN568 credits) could be satisfied by purchasing and retiring of like for like credits from the market. Niche conducted preliminary investigations on the BioBanking Credits Register for both ecosystem and species credits. **Table 10** details the results of these investigations, which show that 10 credits are available on the market that can be retired against HN568, and that no credits are available on the market that could be retired against HN565.

Table 10: Like for like credit availability on the BioBanking Credits Register

PCT	BVT	Like-for-Like options (BAM calculator)			Credit availability	Credit price
		Class	Trading Group	Containing HBT		
1082-Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley,	HN565	South East Dry Sclerophyll Forests (including PCT's 716, 879, 891, 892, 901, 932, 946, 1082, 1084, 1146, 1147, 1148, 1149, 1150, 1151, 1154, 1155, 1157, 1158, 1160, 1161,	South East Dry Sclerophyll Forests - <50% cleared group (including Tier 7 or higher).	Yes	None	NA

PCT	BVT	Like-for-Like options (BAM calculator)			Credit availability	Credit price
		Class	Trading Group	Containing HBT		
Sydney Basin Bioregion		1322, 1338, 1339, 1340)				
1086-Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	HN568	Sydney Hinterland Dry Sclerophyll Forests (including PCT's 612, 621, 624, 1080, 1081, 1086, 1159, 1255, 1327, 1328, 1614, 1622, 1628, 1631, 1634, 1640, 1664, 1666, 1667, 1789, 1790, 1912)	Sydney Hinterland Dry Sclerophyll Forests - <50% cleared group (including Tier 7 or higher).	Yes	PCT1081 (ME038) - 10 credits	None available

The remaining deficit must be satisfied through the following:

1. Purchase and retire ecosystem credits under the variation rules; and/or
2. Set up an off-site Biodiversity Stewardship site, identified in consultation with OEH, that supports like-for-like ecosystem credits or those that can be traded under the variation rules; and/or
3. the funding of a biodiversity conservation action; and/or
4. the payment of an amount into the Biodiversity Conservation Fund.

KMA (2018) recorded 105 individuals of the threatened plant *Phyllota humifusa* (listed as Vulnerable on the TSC Act) within the on-site Biodiversity Offset Area, which generate 746 species credits. The removal of three individuals within the Quarry extraction area requires offsetting with 54 credits, leaving a surplus of 692 *Phyllota humifusa* species credits in the Biodiversity Offset Area once those required for the Project are retired. KMA (2018) states that there are many thousands of plants of this species south of the Hume Highway.

3.3.2 Retirement of biodiversity credits in accordance with the variation rules

As stated above, the remaining offset requirements may be met through application of the variation rules:

> *(a) The proponent who is to retire the biodiversity credits has taken reasonable steps to obtain the requisite like-for-like biodiversity credits and requests the variation of the ordinary offset rules.*

Reasonable steps to seek like-for-like credits are set out in the ancillary rules and include checking the public register of biodiversity credits; lodging an entry in the public register of people looking for biodiversity credits (must be advertised for a minimum of 120 days); and contacting the landholders who are on the public register of biodiversity stewardship site expressions of interest, if they have suitable credits available.

> *(b) In the case of impacts on threatened ecological communities or on the habitat of threatened species that are ecosystem credit species or other native vegetation—the biodiversity credits to be retired need not represent the same threatened ecological*

community or the same class of vegetation or represent a location in the same or adjoining Interim Biogeographic Regionalisation of Australia subregion, so long as:

(i) they represent the same vegetation formation, and

(ii) they are in the same or a higher offset trading group, and

(iii) they represent a location that is in:

(A) the same Interim Biogeographic Regionalisation of Australia region as the impacted site, or

(B) a subregion that is within 100 kilometres of the outer edge of the impacted site, and

(iv) if the impacted habitat contains hollow bearing trees—they represent vegetation that contains hollow bearing trees or artificial hollows.

For Point b) above, no additional PCTs in the same vegetation formation are present on-site offset area, so it is not possible to use the variation rules for credits generated on the Biodiversity Offset Area. Both HN565 and HN568 are within the same vegetation formation (Dry Sclerophyll Forests (shrubby sub-formation)), therefore, the following ecosystem credits are available on the BioBanking Credits Register that could be retired against either the HN656 or HN568 credits required for the Project under the variation rules (same vegetation formation, same or higher offset trading group and same or adjoining IBRA sub-regions):

- 1,042 ecosystem credits available of HN564: Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion. The previous sale of HN564 ecosystem credits was for between $2,500 and $5,000 per credit.
- 88 ecosystem credits available of HN586: Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion. The previous sale of HN564 ecosystem credits was for between $2,000 and $5,500 per credit.
- 330 ecosystem credits available of HN542: Hard-leaved Scribbly Gum - Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion. The previous sale of HN542 ecosystem credits was for between $2,500 and $10,000 per credit.
- 42 ecosystem credits available of HN566: Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion. The previous sale of HN566 ecosystem credits was for between $2,500 and $5,500 per credit.

In summary, it is clear that acquisition and retirement of the required number of ecosystem credits that is in deficit (2,824 ecosystem credits) could be partially satisfied (1,502 credits currently available) through the purchase and retirement of a combination of ecosystem credits that meet the variation rules.

Any remaining credit deficit, following retirement of suitable credits from the Biodiversity Offset Area and the retirement of credits from the BioBanking Credit Register using the variation rules, could be satisfied through the following:

1. the funding of a biodiversity conservation action, and/or
2. the payment of an amount into the Biodiversity Conservation Fund.

3.3.3 Funding of a biodiversity conservation action

Another option for meeting the offsetting obligation under the BC Act is the funding of a biodiversity conservation action that would benefit the relevant threatened species or ecological community. The

funding required would be equivalent to the cost of acquiring the required like-for-like biodiversity credits as determined by the offsets payment calculator. The action funded must be listed in the ancillary rules (yet to be established). For an estimation of the funding amount that would be required, see Section 3.3.4 below.

3.3.4 Payment into the Biodiversity Conservation Fund

Payment of an amount, as determined by the Offsets payment calculator, into the Biodiversity Conservation Fund could also be used as a method to satisfy the offsetting requirement of the Project.

The offset payments calculator estimated that the credit deficit for the Project of 1,153 HN565 credits and 1,701 HN568 credits the would cost:

- HN565: $5,818,024.04 (ex GST)
- HN568: $8,583,225.40 (ex GST).

Both PCTs are priced at $5,045.99 per credit, however neither has previous trades recorded. The price of the credits on the offset payments calculator may change once trades for these PCTs have occurred, but it is not understood whether their price might increase, decrease or remain unchanged.

However, it is important to note that the credit requirement under BAM would be different to that determined under BBAM above. The credit requirement under BAM has typically been half that required under BBAM and, therefore, the costs above are likely to be an overestimate.

3.4 NSW Offsetting Principles for State Significant Development

The NSW Government developed seven principles (OEH 2013) to be used in assessing impacts to biodiversity and determining acceptable offsets for state significant development and state significant infrastructure projects. This section of the report addresses each of these in relation to the impacts and provision of a managed and secured in-perpetuity offset adjacent to the Sutton Forest Sand Quarry. These principles would also need to be satisfied for any off-site offset area or other mechanisms selected to satisfying offsetting obligations.

1. Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.

The proposed Sutton Forest Quarry development is described in detail in Section 2 of the EIS (RWC 2018) and its impacts assessed in KMA (2018) and Biosis (2018). RWC (2018) identifies that the area of disturbance has been minimised as much as possible with a range of activities (e.g., soil and interim fines stockpiling planned within the footprint of the extraction area, thereby avoiding the need to disturb any vegetated areas). Niche was engaged to assess the offsetting requirement, assuming that all avoidance and mitigation measures have been considered in the EIS.

2. Offset requirements should be based on a reliable and transparent assessment of losses and gains.

In relation to this principle, the BioBanking Assessment Methodology (BBAM) (OEH, 2014a), was considered best practice at the time of preparing the report. The BBAM was utilised in this assessment to compare the biodiversity values (expressed in terms of biodiversity credits) of both the Quarry development and the proposed on-site Biodiversity Offset Area. Nathan Smith and Sian Griffiths of Niche Environment and Heritage (both accredited BioBanking Assessors), performed all credit calculations using the BioBanking Credit Calculator (BBCC), including the application of the BBAM and the use of the

NSW interim policy for offsetting SSD (OEH 2011). For the purposes of the offsetting assessment, the survey effort in KMA (2018) meets the draft survey guidelines as required by OEH (DEC 2004) and all data required to operate the BBCC has been supplied. The assessment is therefore transparent and reliable.

3. Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.

Section 3.3 of this report describes how, under the NSW interim policy for offsetting SSD (OEH 2011), the Quarry development meets a "like-for-like" outcome for 27 per cent of the native vegetation impacted through the provision of the adjacent on-site Biodiversity Offset Area. The remaining 73 per cent of the offsetting requirement will be met, either through by purchasing or retiring of ecosystem credits (or land parcel equivalent), or by funding a biodiversity conservation action or payment into a biodiversity conservation fund. By adhering to the interim Policy the final offsetting strategy will be targeted to the biodiversity values being lost, or to higher conservation priorities. It has also been demonstrated that 1,042 ecosystem credits of a vegetation type nominated in the development site Credit Report (HN564) and more than 1,502 ecosystem credits that satisfy the variation rules are available on the BioBanking Credit Register.

4. Offsets must be additional to other legal requirements on the site proposed.

The proposed on-site Biodiversity Offset Area would be secured under a Biodiversity Stewardship Agreement, and is independent of any existing legal requirements to manage the site for conservation.

5. Offsets must be enduring, enforceable and auditable.

The proposed on-site Biodiversity Offset Area and any additional direct land-based offsets would be subject to good governance arrangements to ensure it is managed and secured as an in-perpetuity offset. Appropriate plans of management would be developed, including monitoring, and legal security would be guaranteed through a Biodiversity Stewardship Agreement. The proposed on-site Biodiversity Offset Area would be secured in perpetuity with such a mechanism.

The entire suite of offset measures have not yet been determined but will be finalised, subject to agreement with OEH. This is consistent with this component of the policy.

6. Supplementary measures can be used in lieu of offsets.

Section 3.3.3 and 3.3.4 of this report describes how financial contributions may be utilised as a part of the final Biodiversity Offset Strategy. Such measures may qualify as supplementary measures, however the entire suite of offset measures have not yet been determined but will be finalised, subject to agreement with OEH.

7. Offsets can be discounted where significant social and economic benefits accrue to NSW as a consequence of the Project.

The social and economic benefits of the Project are described in the EIS (RWC 2018). If the Department of Planning and Environment, as the consent authority, believe that these social and economic benefits are significant, it may be reasonable to reduce or modify the offset requirement.

3.5 NSW Biodiversity Offsets Policy for Major Projects

In 2014 OEH published the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014b). The Project has been assessed in accordance with the BBAM (OEH, 2014a) and the Interim Policy (OEH, 2011) as this was the policy relevant at the time and referenced in the DGRs. However, in order that the assessment

be comprehensive, this section compares the principles of the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014b), with the *NSW Offsetting Principles* (detailed above).

The *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014b)is underpinned by six principles as follows:

Principle 1: Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts

Principle 2: Offset requirements should be based on a reliable and transparent assessment of losses and gains

Principle 3: Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities

Principle 4: Offsets must be additional to other legal requirements

Principle 5: Offsets must be enduring, enforceable and auditable

Principle 6: Supplementary measures can be used in lieu of offsets

Principles 1-6 of the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014b) are consistent with principles 1-6 of the NSW Offsetting Principles for State Significant Development, which have been addressed above in Section 3.4. Therefore it is concluded that the assessment undertaken for the Project is consistent with the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014b).

4 COMMONWEALTH OFFSETTING ASSESSMENT

KMA (2018) and Biosis (2018) has recommended that a Referral to the Commonwealth is not necessary for this proposal. Niche similarly believes that it is unlikely that the Project will be deemed a Controlled Action by the Commonwealth, as all potential impacts to EPBC Matters of National Environmental Significance are unlikely to be considered significant and on-site mitigation measures will aid the protection of the local population of the EPBC listed *Phyllota humifusa* (vulnerable).

As such, an offsetting assessment using the EPBC Act Offsets Assessment Guide is considered an unlikely requirement.

5 CONCLUSION

Niche was commissioned by RWC to assess the offsetting requirement associated with the impacts of a proposal to develop the Sutton Forest Sand Quarry. This report describes the offsetting requirement and how, once it is finalised, a Biodiversity Offset Strategy will meet the NSW offsetting principles for a State Significant Project.

The offsetting assessment was based on survey information contained in KMA (2018) and Biosis (2018) and a site inspection by Niche to validate vegetation mapping and fill the identified data gaps. An additional survey was conducted by Biosis in January 2018 to assess the impacts of the proposed access road.

The Ecological assessment of the impacts of the Sutton Forest Sand Quarry Proposal has found that a residual and unavoidable direct impact occurs to approximately 63.2 hectares of native vegetation with approximately 4.0 hectares indirectly impacted by edge effects. The native vegetation within the proposed areas of disturbance is habitat for a suite of threatened fauna, all predicted within the BVTs on-site. Three individuals of the threatened plant *Phyllota humifusa* occur within the Site, while 105 individuals of *Phyllota humifusa* have been recorded to date within the proposed on-site Biodiversity Offset Area. The on-site Biodiversity Offset Area covers approximately 101.5 hectares (including 7.6 hectares of rehabilitated cleared land and temporarily impacted areas) and provides habitat for the threatened fauna predicted and known to occur on site, and also known occurrences of the threatened plants *Eucalyptus aquatica* and *Phyllota humifusa,* and the TEC, Montane Peatlands and Swamps.

The report clearly demonstrates that, through the provision of the on-site Biodiversity Offset Area, the development can achieve a 27 per cent Like-for-like outcome. It should be noted that Sutton Forest Quarries Pty Ltd has purchased an approximately 200ha property located to the west of the Site in order to satisfy the offsetting requirements for the Project. Comprehensive surveys of this location have not been undertaken, however a preliminary review of the available aerial photography suggests that vegetation present on the offset site is likely to be suitable to be used as a like-for-like offset for areas being impacted by the Project and the vegetation appears to be in relatively good condition.

Whilst the entire suite of offset measures to meet the remaining 73 per cent of the offset liability have not yet been determined, and may include a combination of measures such as the acquisition and retirement of ecosystem credits, an off-site offset area, financial contribution or other supplementary measures agreed in consultation with OEH. This report has identified that suitable mechanisms are readily available to SFQ.

An offsetting assessment using the EPBC Act Offsets Assessment Guide is considered unnecessary as there is unlikely to be significant impacts to MNES from the Project.

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FIGURES

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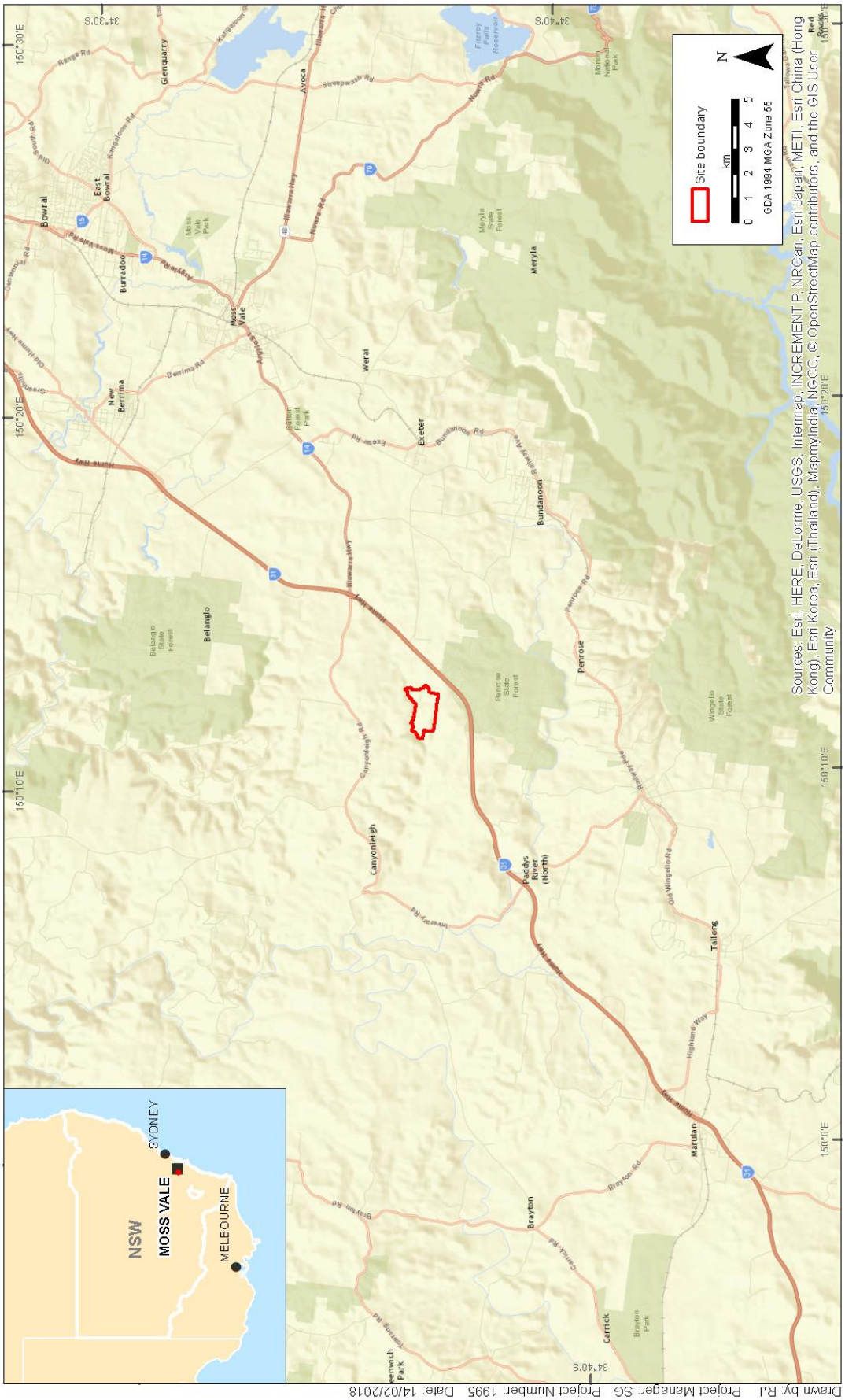
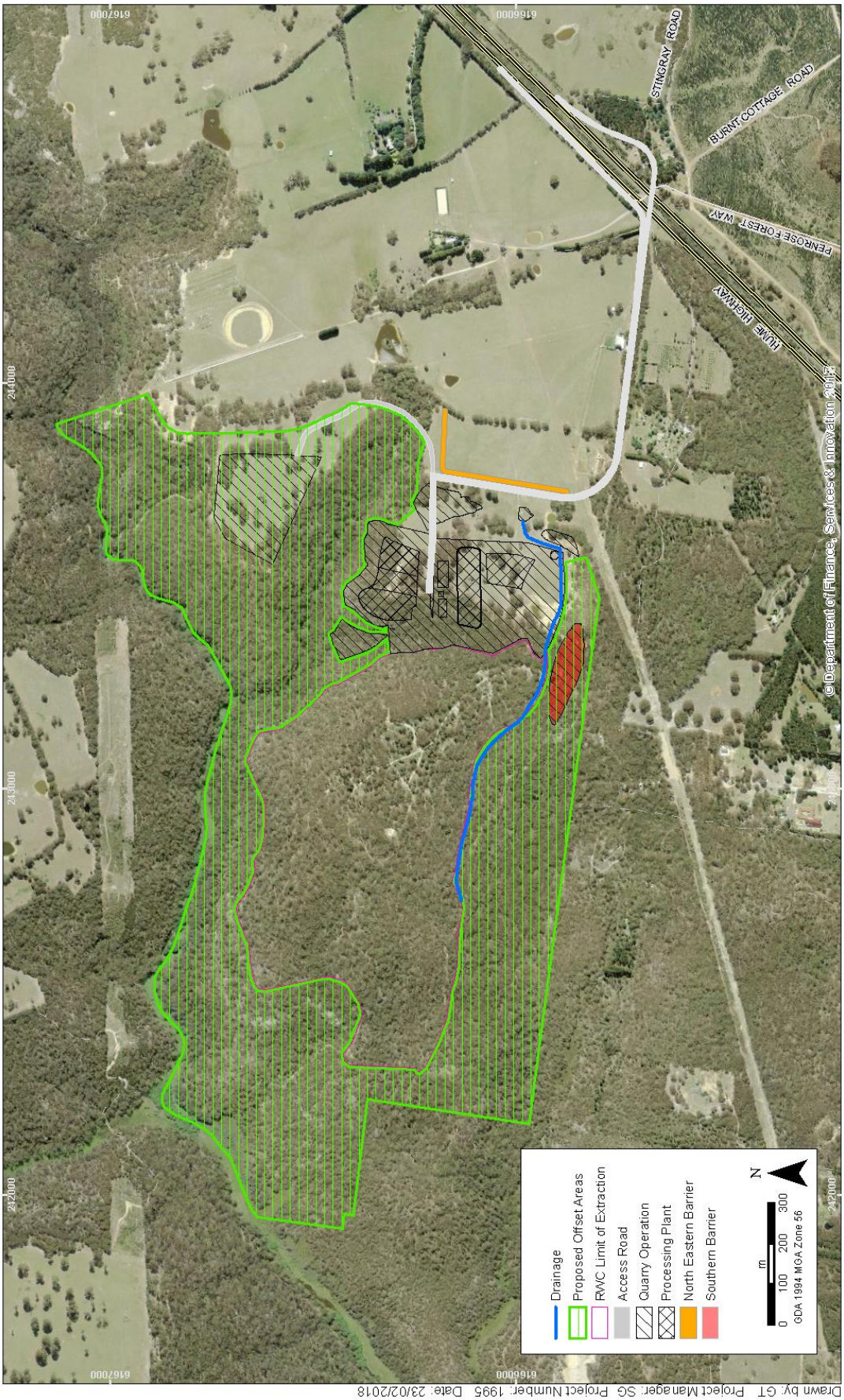


Location map
Sutton Forest Sand Quarry Biodiversity Offsets Assessment

FIGURE 1

Path: T:\spatial\projects\a1900\a1995_Sutton_Forest_Biodiversity_OffsetMaps\report_2018\nonFBA\1995_Figure_1_StudyArea.mxd



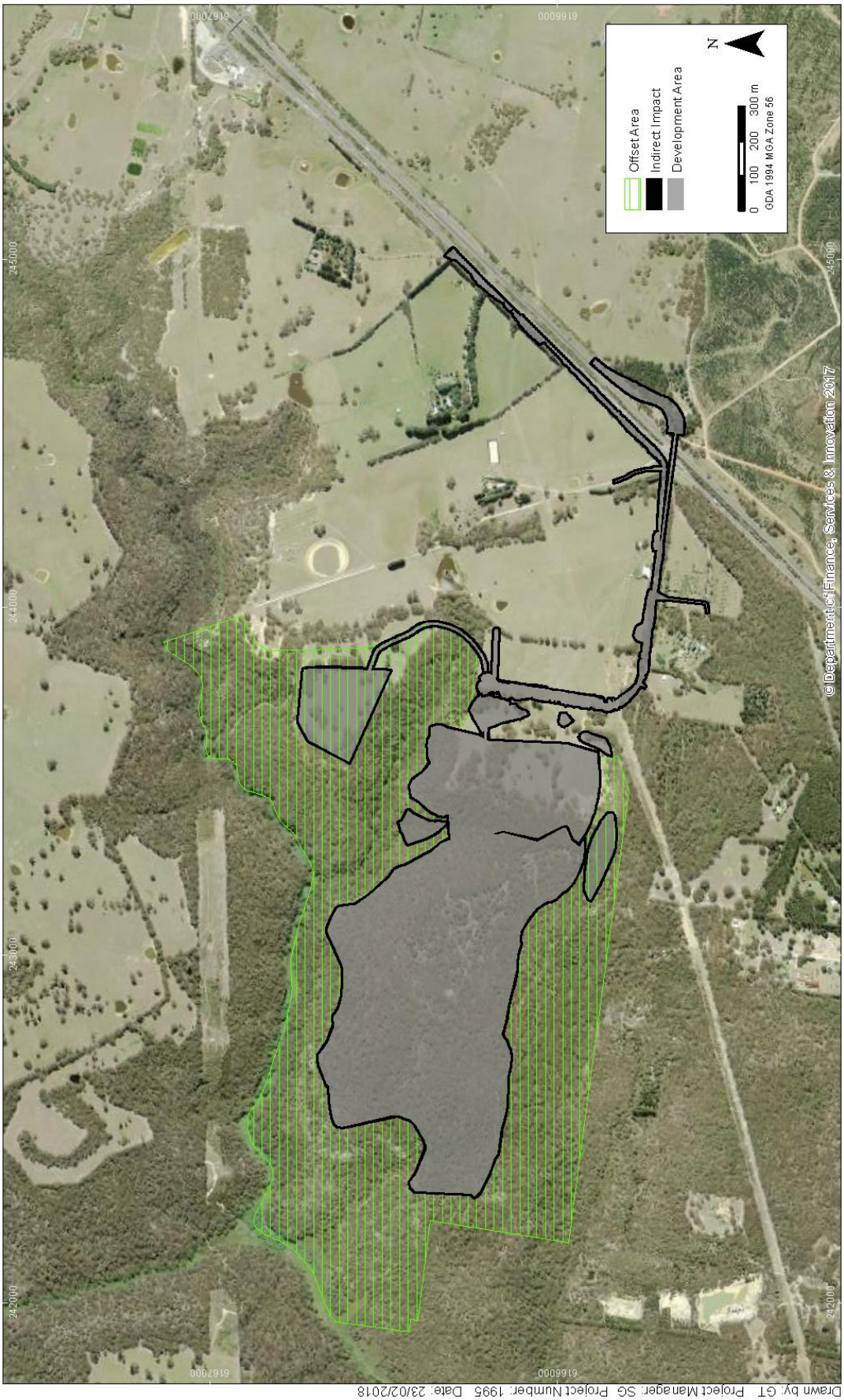
Layout of the proposed Sutton Forest Sand Quarry development within the Subject Area

Sutton Forest Sand Quarry Biodiversity Offsets Assessment

FIGURE 2

Imagery: (c) LPI 2013-12-13

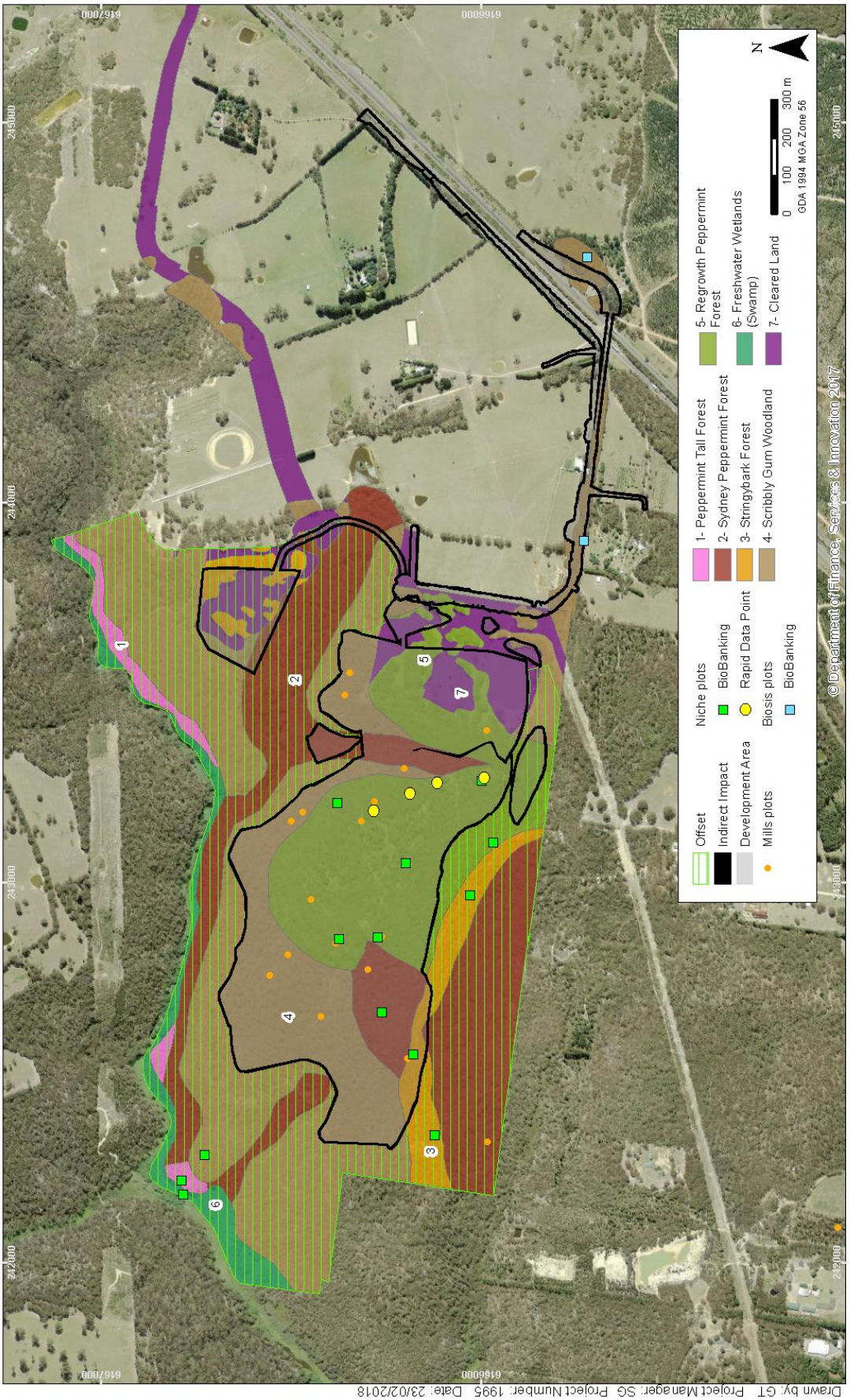
Path: T:\spatial\projects\a1900\a1995_Sutton_Forest_Biodiversity_OffsetMaps\report_2018\nonFBA\1995_Figure_2_SiteMap.mxd

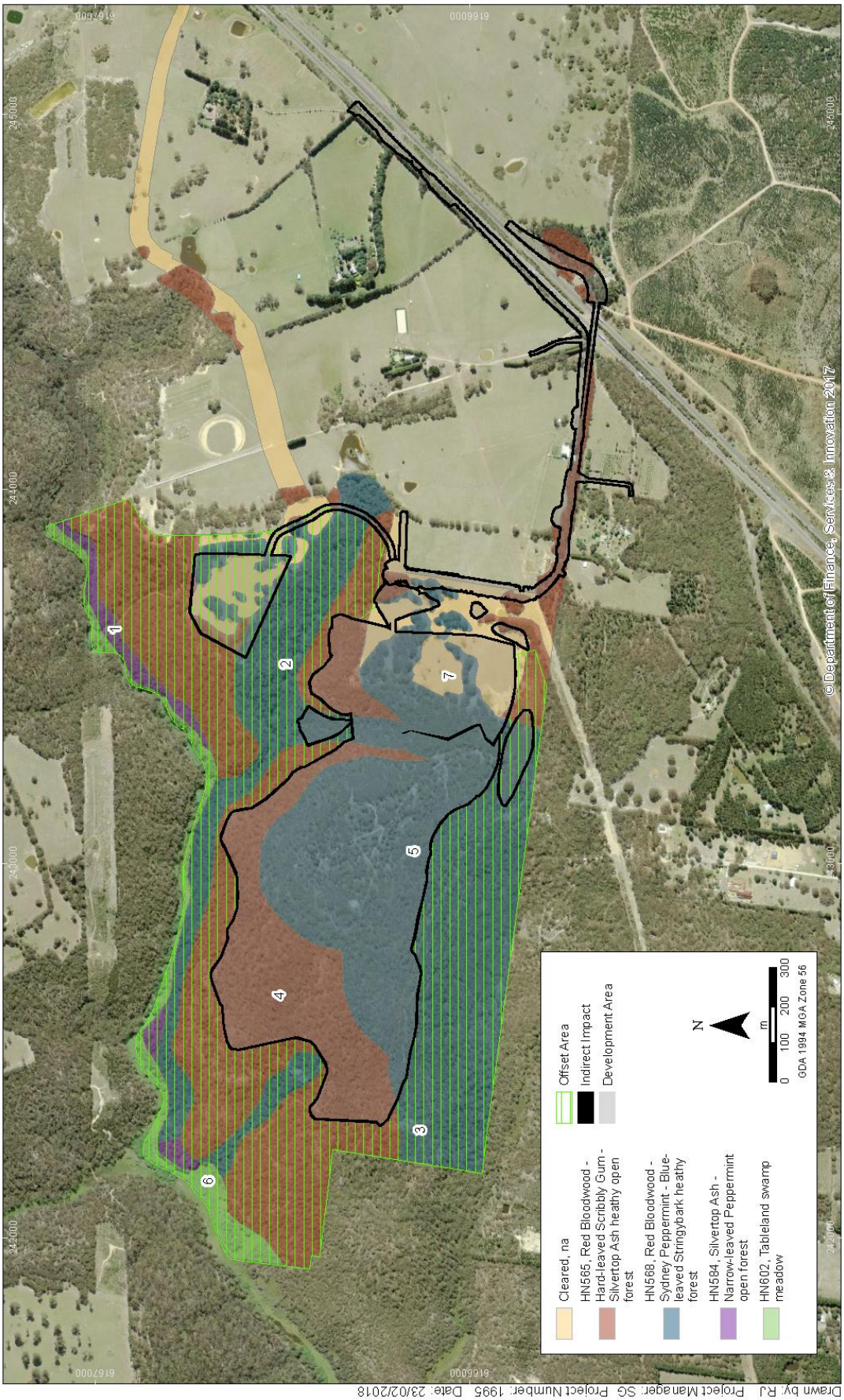


The proposed on-site conservation and retained areas

Sutton Forest Sand Quarry Biodiversity Offsets Assessment

FIGURE 3


Vegetation mapping and survey effort within the study area
Sutton Forest Sand Quarry Biodiversity Offsets Assessment
FIGURE 4
Imagery: (c) 2013-12-13
© Department of Finance, Services & Innovation 2017
N
0 100 200 300 m
GDA 1994 MGA Zone 56
1- Peppermint Tall Forest
2- Sydney Peppermint Forest
3- Stringybark Forest
4- Scribbly Gum Woodland
5- Regrowth Peppermint Forest
6- Freshwater Wetlands (Swamp)
7- Cleared Land
Offset
Indirect Impact
Development Area
Niche plots
BioBanking
Rapid Data Point
Biosis plots
BioBanking
Mills plots
Drawn by: GT Project Manager: SG Project Number: 1995 Date: 23/02/2018
Path: T:\spatial\projects\a1900\a1995_Sutton_Forest_Biodiversity_OffsetMaps\report_2018\nonFBA\1995_Figure_4_Veg.mxd



Biometric Vegetation Types within the study area

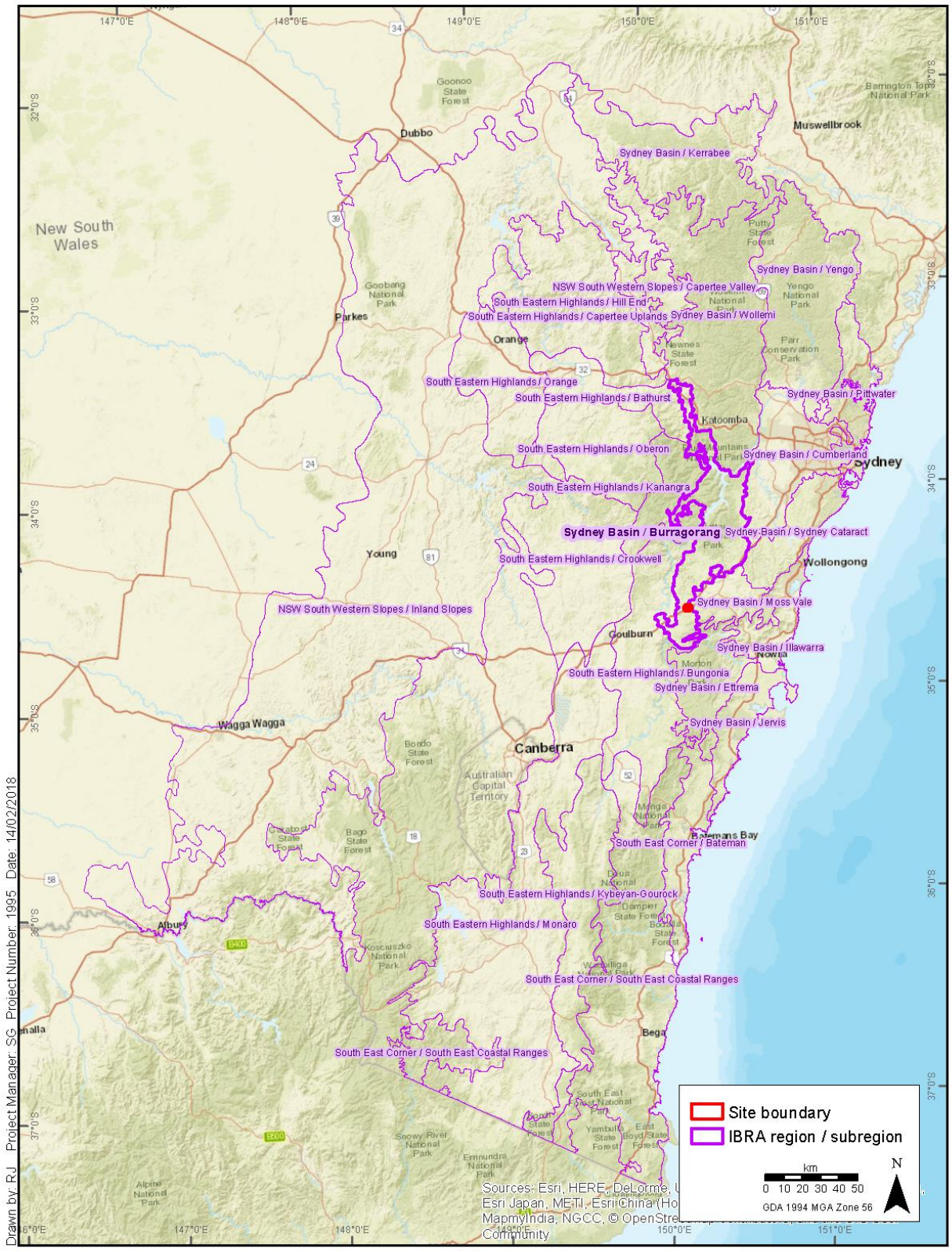
Sutton Forest Sand Quarry Biodiversity Offsets Assessment

FIGURE 5

Imagery: (c) 2013-12-13

niche Environment and Heritage

Path: T:\spatial\projects\a1900\a1995_Sutton_Forest_Biodiversity_OffsetMaps\report_2018\nonFBA\1995_Figure_5_RBVT.mxd

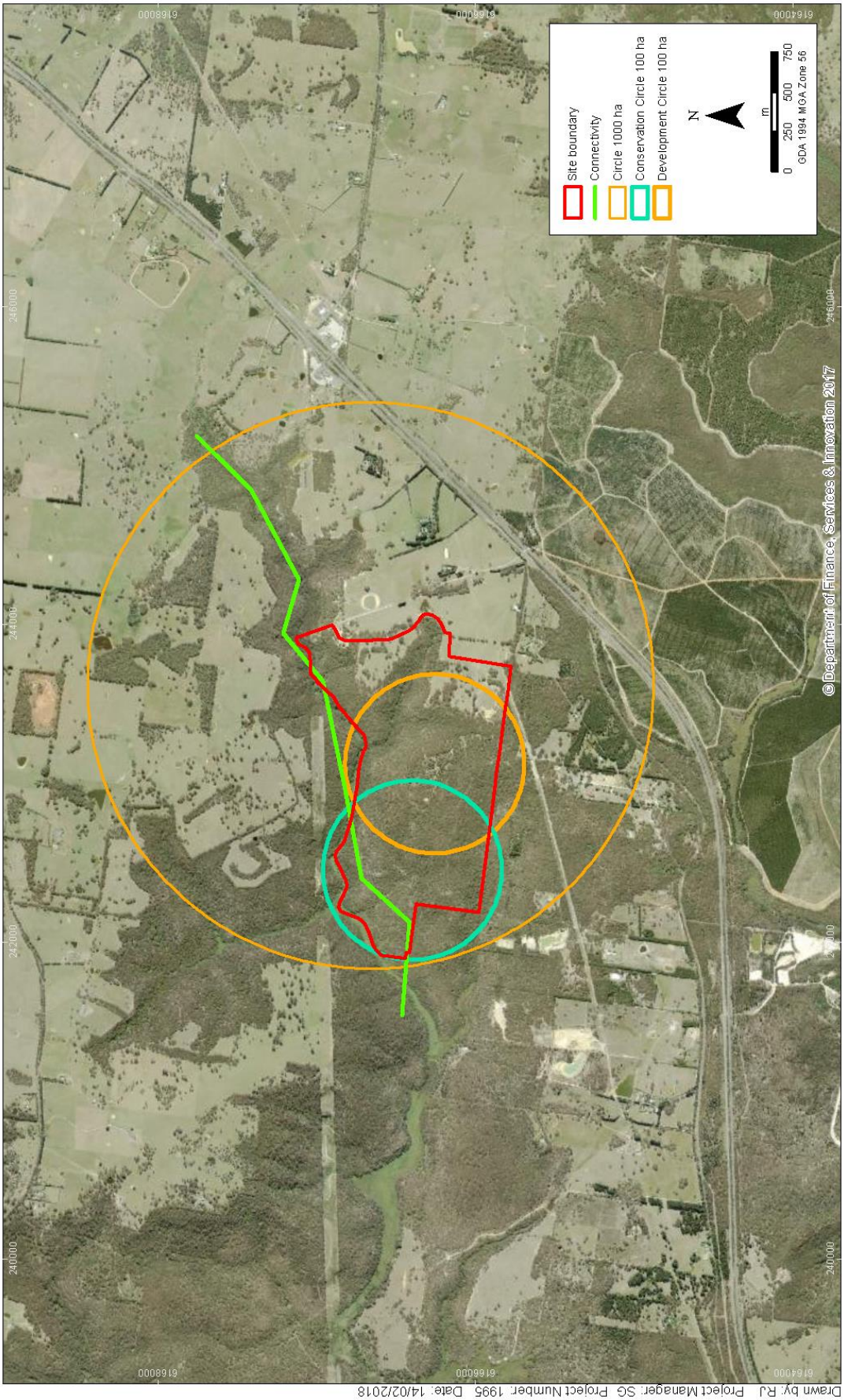


IBRA sub-regions

Sutton Forest Sand Quarry Biodiversity Offsets Assessment

FIGURE 6

Path: T:\spatial\projects\a1900\a1995_Sutton_Forest_Biodiversity_Offset\Maps\report_2018\nonFBA\1995_Figure_6_SubIBRA.mxd



BioBanking Landscape

Sutton Forest Sand Quarry Biodiversity Offsets Assessment

FIGURE 7

Imagery: (c) 2013-12-13

niche Environment and Heritage

Path: T:\spatial\projects\a1900\a1995_Sutton_Forest_Biodiversity_OffsetMaps\report_2018\nonFBA\1995_Figure_7_Biobanking.mxd

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APPENDICES

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Appendix 1: Vegetation community alignment with EEC, RBVT, vegetation formation and vegetation class

Veg Code	Vegetation Type (KMA/Biosis)	BVT code	BVT	PCT	Keith Class	Keith Formation	EEC	Direct and indirect impact (ha)	Offset area (ha)
4	Scribbly Gum Woodland	HN565	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest	PCT1082 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	South East Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	26.4	41.3
8	Scribbly Gum Woodland_Poor	HN565	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest	PCT1082 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	South East Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	0.2	0
1	Peppermint Tall Forest	HN584	Silvertop Ash - Narrow-leaved Peppermint open forest	PCT1155 Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregio	South East Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	0.0	3.3
2	Sydney Peppermint Forest	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest	PCT1086 Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Sydney Hinterland Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	8.3	33.6
3	Stringybark Forest	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest	PCT1086 Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Sydney Hinterland Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	2.9	6.2
5	Regrowth Peppermint Forest	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest	PCT1086 Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Sydney Hinterland Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	29.4	3.7

Veg Code	Vegetation Type (KMA/Biosis)	BVT code	BVT	PCT	Keith Class	Keith Formation	EEC	Direct and indirect impact (ha)	Offset area (ha)
6	Freshwater Wetlands (Swamp)	HN602	Tableland swamp meadow	PCT1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Montane Bogs and Fens	Freshwater Wetlands	Montane Peatlands and Swamps	0.0	5.8
7	Cleared Land (to be revegetated)	HN565	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest	PCT1082 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	South East Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	0.0	4.0
-	Southern Barrier (east portion to be revegetated)	HN565	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest	PCT1082 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	South East Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	0.0	0.1
-	Southern Barrier (west portion to be revegetated)	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest	PCT1086 Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Sydney Hinterland Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	0.0	1.2
-	Temporary fines storage (to be revegetated)	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest	PCT1086 Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Sydney Hinterland Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	0.0	1.7
	Temporary fines storage (to be revegetated)	HN565	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest	PCT1082 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	South East Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrubby subformation)	Not an EEC	0.0	0.6
								67.2	**101.5**

Appendix 2: BioBanking site attribute data

Data in red type were collected in the field by Niche

Plot Name (KMA 2016)	Niche Waypoint	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone	Vegetation Type (KMA 2018/Biosis 2018)
A		37								1		243272	6165996	56	Regrowth Peppermint Forest
B	010	41	20	9	6	12	20	0	1	1	13	243046	6166190	56	Regrowth Peppermint Forest
C	009	50	30.5	1	14	20	42	0	8	1	75	242857	6166260	56	Peppermint Forest (largely undisturbed)
D	008	47	21.5	5	8	54	60	0	5	1	59	242841	6166383	56	Scribbly Gum Woodland
E		48								1		242756	6166556	56	Scribbly-Gum - Stringybark Forest
F		27								1		243214	6166281	56	Regrowth Peppermint Forest
G		44								1		243211	6166376	56	Regrowth Peppermint Forest
H	007	46	26	0	22	42	44	0	3	1	121	242965	6166034	56	Stringybark Forest
J		45								1		243300	6166202	56	E. piperita – E. agglomerata Open Forest
K		47								1		243161	6166500	56	E. sclerophylla – E. dives Woodland
L	006	45	29.5	0	26	16	44	0	4	1	76	242662	6166260	56	E. piperita – E. agglomerata Open Forest
M	005	32	20.5	1.5	16	12	44	0	6	1	188	242536	6166194	56	E. agglomerata – E. sieberi – Allocasuarina littoralis Open Forest
N		32								1		243492	6166358	56	E. sclerophylla Woodland
2.1	NPS from "L"	45	30	4.7	9.8	23.5	43.1	0	1	1	109.7	242770	6166298	56	Peppermint - Silver-top Ash open forest
2.2	004	41	45	1	9.8	13.7	19.6	0	1	1	74.5	242330	6166126	56	E.piperita Open Forest, with E. punctata
3.1	NPS from "M"	32	31.6	2.2	21	17.6	56.9	0	0	1	137	242318	6165982	56	E. agglomerata – E. sieberi Open Forest, with Allocasuarina littoralis
4.1	NPS from "E"	48	28	2.2	9.8	21.6	51	0	2	1	59.2	242809	6166507	56	E. sclerophylla - E. sieberi Woodland
4.2	NPS from "J"	45	31.4	1	11.8	19.6	54.9	0	1	1	54.6	242646	6166422	56	E.sclerophylla Woodland/ Open Forest with E. sieberi, E. agglomerata
4.3	NPS from "K"	47	30.4	20.1	11.8	41.2	29	0	1	1	49	243184	6166469	56	E. sclerophylla Woodland
4.4	NPS from "N"	32	25	20.2	9.8	9.8	3.9	0	2	1	49.2	243552	6166345	56	E. sclerophylla Woodland
5.1			46	19	13.7	2	21.6	0	0	1	2.9	243400	6165985	56	Regrowth E. sieberi Open Forest

Plot Name (KMA 2016)	Niche/Biosis Waypoint	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone	Vegetation Type (KMA 2018/Biosis 2018)
5.2			57	1.4	5.9	23.5	31.4	0	0	1	5	242092	6165062	56	Regrowth E.agglomerata, E.piperita, E. sieberi, A. littoralis Open Forest
5.3	NPS from "F"	27	22	3	3.9	19.6	25.5	2	0	1	2.1	243161	6166315	56	Regrowth E.piperita, E. sieberi Open Forest with Pinus radiata*
5.4			33	3.6	9.8	9.8	27.5	0	0	1	2.7	242954	6166447	56	Regrowth E. sieberi Open Forest
	Niche001	9	0	0	26	0	60	40	0	0	0	242179	6166782	56	Freshwater Wetlands (Swamp)
	Niche002	33	25	5	6	22	68	0	3	1	20	242214	6166788	56	Peppermint Tall Forest
	Niche003	21	9	4	0	26	18	0	7	1	35	242283	6166727	56	Scribbly Gum Woodland
	Niche013	28	17.5	2	16	16	54	0	2	1	104	243104	6165947	56	Stringybark Forest
	BiosisQuadrat1	38	37	2	50	10	60	2	1	1	29	243898.3	6165732	56	Scribbly Gum Woodland
	BiosisQuadrat2	21	0	2	94	2	46	14	1	0	0	244645.7	6165723	56	Scribbly Gum Woodland (Poor)

Appendix 3: Development Site Credit Report

BioBanking credit report

NSW GOVERNMENT Office of Environment & Heritage

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

Date of report: 14/02/2018 Time: 2:50:35PM Calculator version: v4.0

Development details

Proposal ID:	0041/2016/3871D
Proposal name:	Sutton Forest Quarry 2018
Proposal address:	
Proponent name:	Sutton Forest Quarry
Proponent address:	Quarry Address Sutton Forest
Proponent phone:	0409 483 727
Assessor name:	Sian Griffiths
Assessor address:	PO Box W36 Parramatta NSW 2150
Assessor phone:	02 4229 5222
Assessor accreditation:	0041

Improving or maintaining biodiversity

An application for a red flag determination is required for the following red flag areas

Red flag	Reason
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	Vegetation type being > 70% cleared; or it contains an endangered ecological community;

The application for a red flag determination should address the criteria set out in the BioBanking Assessment Methodology. Please note that a biobanking statement cannot be issued unless the determination is approved.

Additional information required for approval:

- ☐ Change to percent cleared for a vegetation type/s
- ☐ Use of local benchmark
- ☐ Change negligible loss
- ☐ Expert report...

- [x] Request for additional gain in site value

- [ ] Predicted threatened species not on site

Barking Owl	Ninox connivens
Brown Treecreeper (eastern subspecies)	Climacteris picumnus subsp. victoriae
Diamond Firetail	Stagonopleura guttata
Eastern Freetail-bat	Mormopterus norfolkensis
Flame Robin	Petroica phoenicea
Hooded Robin (south-eastern form)	Melanodryas cucullata subsp. cucullata
Little Eagle	Hieraaetus morphnoides
Masked Owl	Tyto novaehollandiae
New Holland Mouse	Pseudomys novaehollandiae
Sooty Owl	Tyto tenebricosa
Spotted-tailed Quoll	Dasyurus maculatus
Swift Parrot	Lathamus discolor
Turquoise Parrot	Neophema pulchella
Yellow-bellied Glider	Petaurus australis

- [ ] Change threatened species response to gain (Tg value)

Ecosystem credits summary

Plant Community type	Area (ha)	Credits required	Red flag
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	26.60	1,684.00	No
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	40.60	2,217.00	No
Total	67.20	3,901	

Credit profiles

1. Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion, (HN565)

Number of ecosystem credits created 1,684

IBRA sub-region Burragorang (Part A)

Offset options - vegetation types	Offset options - CMA sub-regions
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion, (HN565) Silvertop Ash - Blue-leaved Stringybark shrubby open forest on ridges, north east South Eastern Highlands Bioregion, (HN583) Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion, (HN584)	Burragorang (Part A) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion, (HN568)

Number of ecosystem credits created 2,217

IBRA sub-region Burragorang (Part A)

Offset options - vegetation types	Offset options - CMA sub-regions
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion, (HN568) Yellow Bloodwood - ironbark shrubby woodland of the dry hinterland of the Central Coast, Sydney Basin Bioregion, (HN612) Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion, (HN564)	Burragorang (Part A) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Dwarf Phyllota	Phyllota humifusa	3.00	54

Appendix 4: BioBank Site Credit Report

BioBanking credit report

NSW GOVERNMENT Office of Environment & Heritage

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

Date of report: 7/09/2016 Time: 4:26:15PM Calculator version: v4.0

Biobank details

Proposal ID:	0041/2016/3879B
Proposal name:	Sutton Forest Quarry offset 2016 onsite only
Proposal address:	Quarry address Sutton Forest
Proponent name:	Sutton Forest Quarry
Proponent address:	Quarry Address Sutton Forest
Proponent phone:	0409483727
Assessor name:	Sian Griffiths
Assessor address:	PO Box W36 Parramatta NSW 2150
Assessor phone:	02 4229 5222
Assessor accreditation:	0041

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	46.00	491.00
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	46.50	516.00
Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	3.30	40.00
Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	5.80	70.00
Total	101.60	1,117

Credit profiles

1. Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion, (HN565)

Number of ecosystem credits created	433
IBRA sub-region	Burragorang (Part A)

2. Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion, (HN565)

Number of ecosystem credits created	58
IBRA sub-region	Burragorang (Part A)

3. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion, (HN568)

Number of ecosystem credits created	474
IBRA sub-region	Burragorang (Part A)

4. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion, (HN568)

Number of ecosystem credits created	42
IBRA sub-region	Burragorang (Part A)

5. Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion, (HN584)

Number of ecosystem credits created	40
IBRA sub-region	Burragorang (Part A)

6. Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion, (HN602)

Number of ecosystem credits created	70
IBRA sub-region	Burragorang (Part A)

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Dwarf Phyllota	Phyllota humifusa	105.00	746
Broad-leaved Sally	Eucalyptus aquatica	250.00	1,775

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	Control of feral pigs
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	Exclude commercial apiaries
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	Exclude miscellaneous feral species
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	Fox control
Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion	Slashing
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Control of feral pigs
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Exclude commercial apiaries
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Exclude miscellaneous feral species
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Feral and/or over-abundant native herbivore control
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Fox control
Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion	Slashing
Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	Control of feral pigs

Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	Exclude miscellaneous feral species
Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	Feral and/or over-abundant native herbivore control
Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	Fox control
Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	Slashing
Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Feral and/or over-abundant native herbivore control
Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Fox control
Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Slashing

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Appendix 5: Application of the BOS to ecosystem credits

Veg Code	Vegetation Type (KMA)	BVT code	BVT (Veg zone)	Equivalent PCT	Keith Formation	Keith Class	Total Impact (ha)	Offset Area (ha)	Credits Required	Credits created	PCT Credits Required	PCT Credits Created	PCT Credit Status [1]	Class credit Status [1]	Formation Credit Status [2]
4	Scribbly Gum Woodland	HN565	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest (Moderate/Good)	PCT1082 Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion			26.4	41.3	1680	433					
8	Scribbly Gum Woodland	HN565	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest (Moderate/Good_Poor)				0.2	0	4	0	1684	491	- 1193		
7	Cleared land (including Southern Barrier (east portion to be revegetated) and Temporary fines storage area)	HN565	Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest			South East Dry Sclerophyll Forests	0.0	4.7	0	58				-1153	
1	Peppermint Tall Forest	HN584	Silvertop Ash - Narrow-leaved Peppermint open forest	PCT1155 Silvertop Ash - Narrow-leaved Peppermint open forest on ridges of the eastern tableland, South Eastern Highlands Bioregion and South East Corner Bioregion	Dry Sclerophyll Forests (shrubby Sub-formation)		0.0	3.3	0	40	0	40	40		-2,854
2	Sydney Peppermint Forest	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest (Moderate/Good_High)	PCT1086 Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin Bioregion		Sydney Hinterland Dry Sclerophyll Forests	8.3	33.6	417	363					
3	Stringybark Forest	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest (moderate/Good_Medium)				2.9	6.3	155	66	2,217	516	- 1701	-1701	
5	Regrowth Peppermint Forest	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest (Moderate/Good_other)				29.4	3.7	1645	45					

Veg Code	Vegetation Type (KMA)	BVT code	BVT (Veg zone)	Equivalent PCT	Keith Formation	Keith Class	Total Impact (ha)	Offset Area (ha)	Credits Required	Credits created	PCT Credits Required	PCT Credits Created	PCT Credit Status [1]	Class credit Status [1]	Formation Credit Status [2]
-	Southern Barrier (west portion to be revegetated) and Temporary fines storage area	HN568	Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest				0.0	2.9	0	42					
6	Freshwater Wetlands (Swamp)	HN602	Tableland swamp meadow	PCT1256 Tableland swamp meadow on impeded drainage sites of the western Sydney Basin Bioregion and South Eastern Highlands Bioregion	Freshwater Wetlands	Montane Bogs and Fens	0.0	5.8	0	70	0	70	70	70	70
							67.2	101.5	3,901	1,117					2,854

1 – Like for like credit status

2 – Variation rules offsetting credit status