



## Hornsby Quarry and Old Man's Valley: Vegetation Survey and Mapping



**Hornsby Shire Council**

6 March 2017

# Hornsby Quarry and Old Man's Valley: Vegetation Survey and Mapping

Hornsby, NSW

**Kleinfelder Document Number:** NCA16R50372

**Project No:** 20172978

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**Prepared for:**

**HORNSBY SHIRE COUNCIL**

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HORNSBY NSW 2077

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**Document Control:**

Version	Description	Date	Author	Reviewer(s)
1.0	Draft	30 January 2017	P. Fagan	A. Mulcahy
2.0	Final	6 March 2017	P. Fagan	D. Pederson

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## EXECUTIVE SUMMARY

Kleinfelder was commissioned by Hornsby Shire Council to undertake detailed vegetation mapping for the Hornsby Quarry and Old Man's Valley lands, Hornsby, NSW. Council is currently developing concept designs for the future landform and use of the site. The vegetation mapping will be used to inform the planning, design and assessment of major earthworks on the quarry site as part of a future Environmental Impact Statement (EIS).

The study area is approximately 59.59 ha in size and contains approximately 42.88 ha of vegetation. Vegetation mapping was undertaken across the study area using a combination of aerial photo interpretation (API) from up-to-date high resolution imagery, and field validation consisting of rapid data points, vegetation boundary walking, and floristic plots. The vegetation community classification developed by Smith and Smith (2008) for the Hornsby LGA was used as the basis for the vegetation classification and mapping.

In addition to mapping the extent of different vegetation communities across the study area, the relative condition of each vegetation community was also mapped. Vegetation condition classes were delineated and assigned in accordance with the Biobanking Assessment Methodology (BBAM) 2014, and in consideration of key variables including native understorey cover, exotic plant cover, and disturbance severity. One of the primary aims of the assessment was also to determine the presence and extent of the Blue Gum Diatreme Forest on the site, as this community forms part of the Blue Gum High Forest critically endangered ecological community (CEEC) listed under both the Threatened Species Conservation Act 1995 (TSC Act) and the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The relative conservation significance of each vegetation patch was then assessed and categorised based on consideration of the condition mapping, legislative status, suitability of habitat for threatened species, and habitat connectivity.

Four vegetation communities were identified in the study area during the surveys. A summary of the vegetation communities and associated condition is provided below. The Blue Gum Diatreme Forest identified within the study area constitutes the Blue Gum High Forest CEEC listed under the TSC Act and the EPBC Act. All of the mapped condition classes of the Blue Gum Diatreme Forest in the study area were assessed as forming part of both the TSC Act and EPBC Act-listed CEEC due to the presence of key diagnostic species and EPBC Act condition criteria.

Vegetation Type	Vegetation Condition	Conservation Status		Area (ha)
		TSC Act	EPBC Act	
Blackbutt Gully Forest	Moderate-good (high)	-	-	14.64
	Moderate-good (poor)	-	-	2.02
Blue Gum Diatreme Forest	Moderate-good (high)	CE	CE	4.35
	Moderate-good (medium)	CE	CE	0.90
	Moderate-good (poor)	CE	CE	10.38
Native Rehabilitation / Regeneration	-	-	-	4.93
Exotic Vegetation	-	-	-	5.66
<b>Total</b>				<b>42.88</b>

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# 1. INTRODUCTION

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## 1.1 PROJECT BACKGROUND AND SCOPE

Kleinfelder was commissioned by Hornsby Shire Council to undertake detailed vegetation mapping for the Hornsby Quarry and Old Man's Valley lands, Hornsby, NSW (**Figure 1**). Council is currently developing concept designs for the future landform and use of the site. The vegetation mapping will be used to inform the planning, design and assessment of major earthworks on the quarry site as part of a future Environmental Impact Statement (EIS).

The purpose of this assessment is to provide a fine-scale vegetation community and condition map of the study area suitable for planning and assessment purposes. Specifically, the scope of the assessment includes:

- Identifying and mapping the extent of vegetation communities across the study area;
- Mapping the condition of each vegetation community in the study area in accordance with the Biobanking Assessment Methodology (BBAM) 2014;
- Assess the legislative status of each vegetation type against threatened ecological communities listed under the *Threatened Species Conservation Act 1995 (TSC Act)* and the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*; and
- Assess and categorise the relative conservation significance of each vegetation patch in the study area based on consideration of vegetation condition, legislative status, suitability of habitat for threatened species, and habitat connectivity.

## 1.2 SITE DESCRIPTION AND LOCAL CONTEXT

The study area is approximately 59.59 ha in size and contains approximately 42.88 ha of vegetation. The study area is located immediately to the west of the Hornsby CBD (**Figure 1**) and is zoned RE 1 – Public Recreation under the Hornsby Local Environmental Plan (LEP) 2013. The most prominent feature within the study area is Hornsby Quarry located in the central part of the study area, which is a former rock quarry that ceased operations in 2001 and was acquired by Council in 2002. The quarry is more than 100 m deep with steep, exposed sides. Due to serious safety concerns, the site is currently closed to the public and is fully fenced.

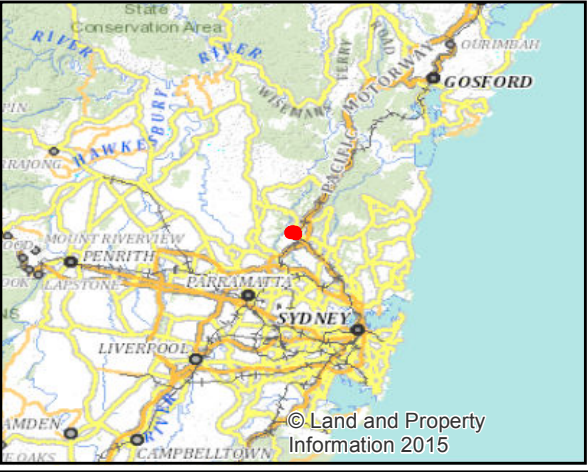
The study area also includes the Hornsby Quarry Road Construction Spoil Management Project area, which forms part of the NorthConnex Project (**Figure 2**). This project will involve partially filling the Hornsby Quarry void with excess spoil from the NorthConnex tunnel project. This process of partially filling the quarry forms part of a broader plan by Council to rehabilitate

Hornsby Quarry to create a public recreation space. A section of the Great North Walk also extends through the southern and western parts of the study area (**Figure 2**).



**Regional Context**

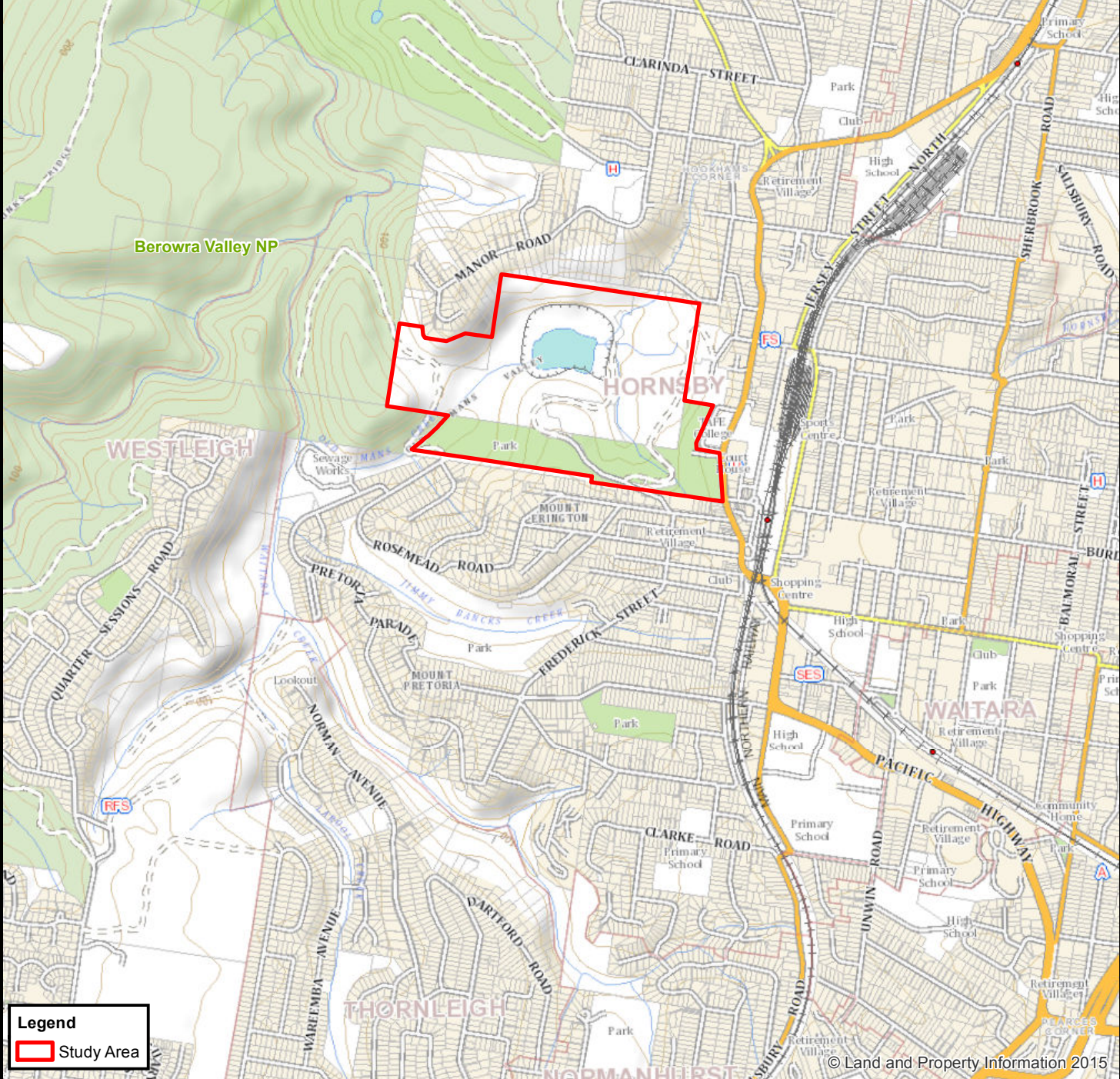
0 5 10 20 30 40 50 km



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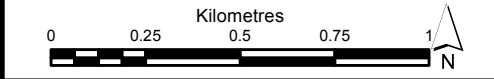
Berowra Valley RP

Berowra Valley NP



**Legend**  
 Study Area

© Land and Property Information 2015



PROJECT REFERENCE: 20172978  
 DATE DRAWN: 30/01/2017 12:58 Version 1  
 DRAWN BY: GJoyce  
 DATA SOURCE: LPI - 2015

**Locality**  
 Hornsby Shire Council  
 Vegetation Survey  
 Hornsby Quarry and Old Man's Valley  
 Hornsby, NSW 2077

**FIGURE:**  
**1**

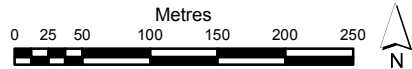


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**Legend**

- ▭ Study Area
- ▭ Berowra Valley National Park
- ⋯ Great North Walk
- Watercourse
- Contours (50m)
- Major Roads
- Local Road



PROJECT REFERENCE: 20173145  
 DATE DRAWN: 06-Mar-17 10:56 Version 1  
 DRAWN BY: amarshall  
 DATA SOURCE:  
 LPI - 2015  
 Nearmap - 2016

**Study Area**

Hornsby Shire Council  
 Vegetation Survey  
 Hornsby Quarry and Old Man's Valley  
 Hornsby, NSW 2077

FIGURE:

**2**

The majority of the land within the northern and central parts of the study area have been subject to historical clearing and disturbance primarily from previous quarry operations. An aerial photo from 1955 (**Figure 3**) was obtained and shows that these parts of the study area were extensively cleared. An aerial photo from 1982 (**Figure 4**) was also obtained which shows a number of areas, particularly to the north and south-west of the main quarry void, that have been subject to major earthworks during the quarry operations. Aerial photos from 1985 (**Figure 5**) and 1989 (**Figure 6**) have also been included as a reference to historical disturbance of the site.

### 1.3 SOILS


The following soil landscape types described by Chapman and Murphy (1989) in the *Soil Landscapes of the Sydney 1:100,000 Sheet* are mapped within the study area (**Figure 7**):

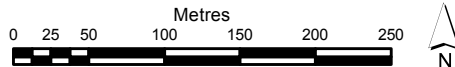
- Hornsby (ho): Jurassic volcanic breccia, sedimentary breccia, olivine basaltic breccia, metamorphosed sandstone country rock and some volcanic tuffs located on diatremes and other intrusions. Gently undulating rises to steep low hills. Diatremes often located in sandstone valley floors. Deep Yellow Podzolic Soils on volcanic breccia on upper and midslopes, Yellow- Brown Earths and Red Podzolic Soils on sandstone colluvium, and Deep structured loams in drainage lines.
- Hawkesbury (ha): Hawkesbury Sandstone of medium to coarse- grained quartz sandstone with minor shale and laminate lenses. Rugged, rolling to very steep hills on Hawkesbury Sandstone. Shallow discontinuous Lithosols/Siliceous Sands, Earthy Sands, Yellow Earths and some Yellow Podzolic Soils. Yellow and Red Podzolic soils associated with shale lenses.
- Lucas Heights (lh): Interbedded shale, laminate and fine to medium grained quartz sandstone. Gently undulating crests and ridges on plateau surfaces. Moderately deep, hard-setting Yellow Podzolic Soils and Yellow Soloths; Yellow Earths on outer edges of crests.

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**Legend**

 Study Area



PROJECT REFERENCE: 20173145  
 DATE DRAWN: 30/01/2017 14:55 Version 1  
 DRAWN BY: GJoyce  
 DATA SOURCE:  
 LPI - 2009

**1955 Aerial Photo**

Hornsby Shire Council  
 Vegetation Survey  
 Hornsby Quarry and Old Man's Valley  
 Hornsby, NSW 2077


FIGURE:

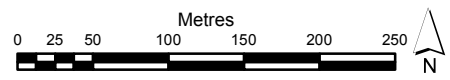
**3**

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**Legend**

 Study Area



PROJECT REFERENCE: 20173145  
 DATE DRAWN: 06-Mar-17 09:39 Version 1  
 DRAWN BY: amarshall  
 DATA SOURCE:  
 LPI - 2009

**1982 Aerial Photo**

Hornsby Shire Council  
 Vegetation Survey  
 Hornsby Quarry and Old Man's Valley  
 Hornsby, NSW 2077

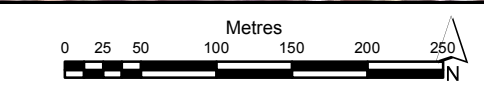
FIGURE:

**4**

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**Legend**  
 Study Area



PROJECT REFERENCE: 20173145  
 DATE DRAWN: 06-Mar-17 10:18 Version 1  
 DRAWN BY: amarshall  
 DATA SOURCE:  
 LPI - 2009

**1985 Aerial Photo**

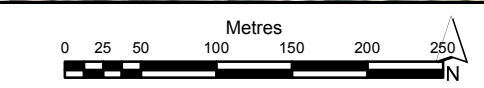
Hornsby Shire Council  
 Vegetation Survey  
 Hornsby Quarry and Old Man's Valley  
 Hornsby, NSW 2077

FIGURE:  
**5**

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**Legend**  
 Study Area

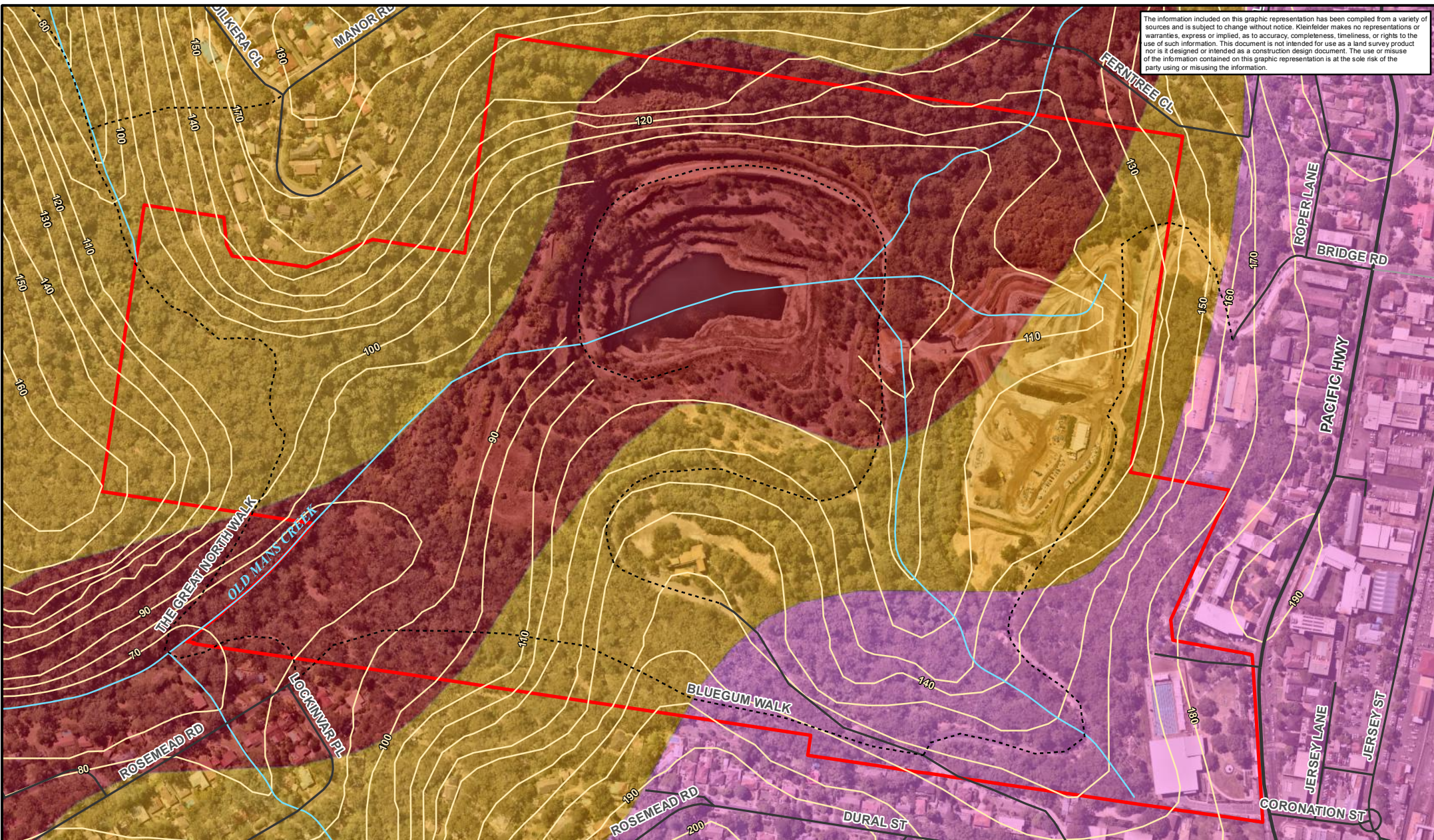


PROJECT REFERENCE: 20173145  
 DATE DRAWN: 06-Mar-17 10:18 Version 1  
 DRAWN BY: amarshall  
 DATA SOURCE:  
 LPI - 2009

**1989 Aerial Photo**  
 Hornsby Shire Council  
 Vegetation Survey  
 Hornsby Quarry and Old Man's Valley  
 Hornsby, NSW 2077

FIGURE:  
**6**

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**Legend**

- Study Area
- Watercourse
- Main Road
- Local Road
- Distributor Road
- Track
- Contours (10m)

**Soil Landscapes**

- Hawkesbury (ha)
- Hornsby (ho)
- Lucas Heights (lh)

Metres

0 25 50 100 150 200 250

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 Nearmap - 2016

**Soil Landscapes within Study Area**

Hornsby Shire Council  
 Vegetation Survey  
 Hornsby Quarry and Old Man's Valley  
 Hornsby, NSW 2077

FIGURE:  
**7**



## 2. METHODOLOGY

### 2.1 DESKTOP REVIEW

#### 2.1.1 Review of Existing Vegetation Studies

A review of regional vegetation mapping studies that encompass and/or adjoin the study area was undertaken prior to stratification of the study area and field surveys:

- *Native Vegetation Communities of the Hornsby Shire* (Smith & Smith 2008); and
- *Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands* (Tozer et al. 2010).

As the vegetation classification and mapping by Smith and Smith (2008) is the most detailed and relevant mapping for the study area, this was used as the primary basis for the vegetation classification framework used to undertake the mapping. This desktop review was undertaken to assist with the determination of plant community types (PCTs), identify the location(s) of vegetation likely to form part of a listed threatened ecological community (TEC), stratification of the site into 'vegetation zones', and selection of plot / transect locations.

#### 2.1.2 Data Review and Compilation

Searches were conducted to identify spatial datasets that could be used to inform vegetation mapping of the study area. **Table 1** provides details of the data used and its application in the mapping process.

**Table 1: Input datasets used in map production and their application**

Dataset	Application
High resolution aerial photo – 2016	Primary basis for all linework and attribution. This dataset was produced in 2016 by Nearmap © and sourced under licence.
Historical Imagery – 1955, 1982, 1985 and 1989	Historical aerial imagery for the site was used to identify areas that have been subject to historical clearing and disturbance (e.g. significant earthworks) to assist in the mapping and classification of vegetation as either remnant or rehabilitation/regrowth (LPI, 2016).
Near-infrared imagery (50 cm resolution) - 2016	Assisted in clarifying linework and community boundaries in combination with API and field validation. Dataset sourced from Land and Property Information (© LPI 2016).
Soil mapping	Soil mapping of the Sydney region (Chapman and Murphy 1989) was used to assist with vegetation community classification and TEC determinations.
Contours (2 m)	Two metre contours were used to assist in the delineation of boundaries between different vegetation communities through examination of slope and aspect. Data sourced from Land and Property Information (© LPI 2016).
Watercourses	Assisted in the delineation of vegetation communities typically associated with watercourses and gullies. Dataset sourced from Land and Property Information (© LPI 2016).

### 2.1.3 Aerial Photo Interpretation (API)

Prior to field surveys, the spatial distribution of the vegetation and key features across the study area was mapped remotely from aerial photography and near-infrared imagery through systematic visual inspection by an experienced botanist. This process involved digitising polygons around vegetation patches with homogenous combinations of the following parameters: woody cover, growth stage and disturbance severity, at a scale of approximately 1:1,000 using a Geographic Information System (ArcGIS).

## 2.2 VEGETATION SURVEYS AND MAPPING

### 2.2.1 Vegetation Classification

A vegetation classification framework was developed during the field surveys. This involved visiting a selection of the polygons digitised as per Section 2.1.3 across the study area. The identification of vegetation communities was based on floristic and structure data collected using rapid data points (RDPs) and floristic plots/ transects (described in Section 2.1.3). The species composition of each vegetation community was compared to the vegetation descriptions in the *Native Vegetation Communities of Hornsby Shire* (Smith & Smith, 2008) in order to arrive at a community identity.

### 2.2.2 Vegetation Surveys

Vegetation surveys were conducted across the study area on 5, 6, 7 and 8 December 2016, and 19 January 2017. The boundaries of each of the identified vegetation communities within the study area were mapped using a combination of Rapid Data Points (RDPs) and walking transects, using the polygons produced through aerial photo interpretation (API; Section 2.1.3) to assist in targeting survey effort. RDPs involved collecting waypoints over the study area using a hand held Trimble™ GPS unit and recording dominant species, structure and condition within an approximate 50 m radius of the observer. RDPs were also used to mark the location of vegetation community boundaries. Walking transects involved verifying that polygons were homogenous in floristic composition and condition, as well as walking vegetation ecotones and using the recorded tracks to define vegetation community boundaries. The RDPs and survey tracks were then overlaid on an aerial photograph and used to delineate and/or clarify vegetation boundaries.

A total of 12 plots/ transects were conducted across the study area in accordance with the *Biobanking Assessment Methodology 2014* (BBAM 2014) (OEH 2014) (**Figure 8**). Plots/transects were undertaken to collect site condition value data for each of the 10 attributes listed in Table 2, Section 5.3 of the BBAM 2014, and also included the full floristics of the 20

m x 20 m plot. The purpose of collecting the plot/ transect data was to verify the vegetation community and condition classifications.

### **2.2.3 PCT and TEC Determinations**

Each vegetation community identified in the study area was assigned to the closest equivalent PCT from those listed in the Vegetation Information System (VIS) Classification Database (OEH 2016). The closest equivalent PCT for each vegetation community was determined through comparison of the floristic descriptions of PCTs in the database with the plot/transect data collected from the study area. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities in the study area were also compared to the descriptions in the database to determine the most suitable PCT.

Vegetation within the study area was assessed against identification criteria for State and Commonwealth listed threatened ecological communities (TECs) known to occur in the region. Vegetation communities were compared with descriptions provided in the NSW Scientific Committee final determinations (OEH 2017a), NSW Threatened Species Profile Database (OEH 2017b), and the Species Profiles and Threats Database (DotEE 2017).

### **2.2.4 Vegetation Zones and Condition**

Vegetation zones were identified and stratified within the study area in accordance with Section 5.2.2 of the BBAM 2014 (OEH, 2014). A vegetation zone is defined in the BBAM 2014 as a relatively homogenous area that is the same vegetation type and broad condition (i.e. as either moderate to good, or low).

During field surveys, notable variations in vegetation condition within vegetation communities were observed in the study area. As such, in addition to the broad condition state (i.e. moderate to good, or low), vegetation condition was stratified at a finer scale using the standard naming for vegetation condition sub-categories as listed in the biobanking calculator (i.e. moderate-good\_high; moderate-good\_medium; and moderate-good\_poor). This was primarily based on consideration of weed abundance, vegetation structure, native understorey cover, and disturbance history (e.g. historical clearing; loss or major disturbance of the natural soil profile).

### **2.2.5 Floristic Identification and Nomenclature**

Floristic identification and nomenclature was based on Harden (1992, 1993, 2000 and 2002) with subsequent revisions as published on PlantNet (<http://plantnet.rbgsyd.nsw.gov.au>).

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**Legend**

- Study Area
- Berowra Valley National Park
- Quadrats
- Rapid Data Points
- Watercourse
- Main Road
- Local Road

Metres

0 25 50 100 150 200 250

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 LPI - 2009  
 Nearmap - 2016

**Survey Effort**

Hornsby Shire Council  
 Vegetation Survey  
 Hornsby Quarry and Old Man's Valley  
 Hornsby, NSW 2077

FIGURE:  
**8**

## 3. RESULTS AND DISCUSSION

### 3.1 VEGETATION COMMUNITIES

Four vegetation types were identified within the study area during the surveys (**Figure 9**), comprising two natural vegetation communities and two highly modified / exotic vegetation types. Each of the two natural vegetation communities was determined to comprise one plant community type (PCT) as defined in the VIS database. These two natural vegetation communities were also divided into several vegetation zones (i.e. condition types).

Additionally, one map unit was used to classify areas which are devoid (or largely devoid) of vegetation (i.e. the quarry void), and one map unit was used for other unvegetated areas (i.e. existing tracks and other infrastructure). Collectively, the classification framework for the study area consists of six map units.

The Blue Gum Diatreme Forest identified within the study area (including all condition types) constitutes the *Blue Gum High Forest in the Sydney Basin Bioregion* critically endangered ecological community (CEEC) listed under the TSC Act, and the *Blue Gum High Forest of the Sydney Basin Bioregion* CEEC listed under the EPBC Act.

**Table 2** provides a summary of the area of each vegetation community and the vegetation zones within the study area. **Figure 9** shows the distribution of the vegetation communities within the study area. Detailed profiles of each vegetation type are provided in **Tables 3-6**, which include the vegetation zones (condition types), conservation status, equivalent PCTs and floristic description of each vegetation type.

Detailed discussion of the threatened ecological community determinations within the study area are provided in **Section 3.2**. The relative conservation significance of each area of vegetation in the study area is also assessed and discussed in **Section 3.4**.

**Table 2: Summary of vegetation types within the study area**

Vegetation Type	Vegetation Condition	Conservation Status		Area (ha)
		TSC Act	EPBC Act	
Blackbutt Gully Forest	Moderate-good (high)	-	-	14.64
	Moderate-good (poor)	-	-	2.02
Blue Gum Diatreme Forest	Moderate-good (high)	CE	CE	4.35
	Moderate-good (medium)	CE	CE	0.90
	Moderate-good (poor)	CE	CE	10.38
Native Rehabilitation / Regeneration	-	-	-	4.93
Exotic Vegetation	-	-	-	5.66
Quarry Void	-	-	-	7.43
Excluded areas	-	-	-	9.28
<b>Total</b>				<b>59.59</b>

- Vegetation Community**
- Blue Gum Diatreme Forest (moderate-good\_high) (CEEC)
  - Blue Gum Diatreme Forest (moderate-good\_medium) (CEEC)
  - Blue Gum Diatreme Forest (moderate-good\_poor) (CEEC)
  - Blackbutt Gully Forest (moderate-good\_high)
  - Blackbutt Gully Forest (moderate-good\_poor)
  - Native Rehabilitation / Regeneration
  - Exotic Vegetation
  - Quarry Void / Excluded

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**Legend**

- Study Area
- Berowra Valley National Park
- Watercourse
- Main Road
- Local Road
- DistributorRoad

Metres

0 25 50 100 150 200 250

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PROJECT REFERENCE: 20173145

DATE DRAWN: 06-Mar-17 10:16 Version 1

DRAWN BY: amarshall

DATA SOURCE:  
LPI - 2009  
Nearmap - 2016

**Vegetation Communities**

Hornsby Shire Council  
Vegetation Survey  
Hornsby Quarry and Old Man's Valley  
Hornsby, NSW 2077

FIGURE:

**9**

**Table 3: Blue Gum Diatreme Forest Profile**

Blue Gum Diatreme Forest	
Equivalent Smith and Smith (2008) map unit	Blue Gum Diatreme Forest (BG2).
Equivalent Tozer <i>et al.</i> (2010) map unit	Blue Gum High Forest (WSF 153).
Equivalent Plant Community Type (OEH 2016)	HN596 Sydney Blue Gum – Blackbutt – Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion.
Area (ha) within the study area	15.63 ha
Sample sites	Three plots: 5, 8 and 10.
Vegetation zones (condition types)	<p>The Blue Gum Diatreme Forest within the study area was stratified into three vegetation zones (condition types):</p> <ul style="list-style-type: none"> <li>• Moderate-good (high): two patches of this zone were identified in the south-west part of the study area. These areas are relatively undisturbed with low exotic cover, mature canopy, and an intact and diverse native understorey.</li> <li>• Moderate-good (medium): two very small areas of this zone were identified. These areas have mature native canopy, mixed exotic and native midstorey layer, and a ground layer that has low to moderate native cover.</li> <li>• Moderate-good (poor): the majority of this community in the study area is in poor condition. These areas typically have lower native canopy cover, an exotic midstorey, and a ground layer comprised of either exotic species or bare ground.</li> </ul>
Structure	<p>In its relatively unmodified state (i.e. high condition), this community consists of a tall open forest to approximately 30 metres high, with a sparse to dense midstorey of mesophyllous species and a ground layer typically consisting of ferns, vines, herbs and grasses.</p> <p>The degraded areas of this community in the study area (i.e. medium and poor condition) typically have lower canopy cover and a sparse ground layer as a result of previous disturbance and weed invasion.</p>
Floristic Description	<p>Open forest primarily dominated by <i>Eucalyptus saligna</i> (Sydney Blue Gum). Other tree species occurring less frequently include <i>E. pilularis</i> (Blackbutt), <i>Angophora floribunda</i> (Rough-barked Apple) and <i>Syncarpia glomulifera</i> (Turpentine). Native midstorey and shrub layers are generally sparse and are dominated by <i>Pittosporum undulatum</i>, with other species such as <i>Allocasuarina torulosa</i>, <i>Ficus coronata</i>, <i>Pittosporum revolutum</i>, <i>Ceratopetalum apetalum</i> and <i>Breynia oblongifolia</i> occurring less frequently. Where present, the ground layer is typically dominated by native ferns, herbs, vines and grasses such as <i>Calochlaena dubia</i>, <i>Lomandra longifolia</i>, <i>Pseuderanthemum variabile</i>, <i>Oplismenus aemulus</i>, <i>Entolasia marginata</i>, <i>Microlaena stipoides</i>, <i>Morinda jasminoides</i> and <i>Sarcopetalum harveyanum</i>.</p> <p>In the highly degraded areas of this community (i.e. poor condition), the midstorey is often very dense and is consistently dominated by <i>Ligustrum lucidum</i> (Large-leaf Privet) and <i>L. sinense</i> (Small-leaf Privet). These areas have little to no native ground cover.</p>

<b>Blue Gum Diatreme Forest</b>	
Conservation Status	<p>This vegetation community (including all condition types) forms part of the <i>Blue Gum High Forest in the Sydney Basin Bioregion</i> critically endangered ecological community (CEEC) listed under the TSC Act, and the <i>Blue Gum High Forest of the Sydney Basin Bioregion</i> CEEC listed under the EPBC Act.</p> <p>This determination was made on the basis of floristic composition, geographic location, and soils. See discussion in <b>Section 3.2</b> for further detail.</p>
Distribution in Study Area	<p>This community primarily occurs throughout the central part of study area, with a small patch also occurring in the south-east part of the study area. The high condition areas of this community occur to the south-west of the quarry void.</p>



**Plate 1: Blue Gum Diatreme Forest (moderate-good\_high) in the study area**





**Plate 2: Blue Gum Diatreme Forest (moderate-good\_high) in the study area**



**Plate 3: Blue Gum Diatreme Forest (moderate-good\_medium) in the study area**



**Plate 4: Blue Gum Diatreme Forest (moderate-good\_poor) in the study area**



**Plate 5: Blue Gum Diatreme Forest (moderate-good\_poor) in the study area**

**Table 4: Blackbutt Gully Forest profile**

Blackbutt Gully Forest	
Equivalent Smith and Smith (2008) map unit	Blackbutt Gully Forest (L1).
Equivalent Tozer et al. (2010) map unit	Hinterland Sandstone Gully Forest (DSF 142).
Equivalent Plant Community Type (OEH, 2016)	HN648 Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region.
Area (ha) within the study area	16.66 ha
Sample sites	Seven plots: 2, 3, 4, 6, 7, 9 and 12.
Vegetation zones (condition types)	<p>The Blackbutt Gully Forest within the study area was stratified into two vegetation zones (condition types):</p> <ul style="list-style-type: none"> <li>• Moderate-good (high): this zone includes the majority of this community in the study area. These areas are relatively undisturbed with low exotic cover, mature canopy, and an intact and diverse native understorey.</li> <li>• Moderate-good (poor): one small area of this condition type was identified in the south-east part of the study area. This area has lower native canopy cover, an exotic midstorey, and a ground layer comprised primarily of exotic species.</li> </ul>
Structure	<p>This community consists of a tall open forest to approximately 25 m tall. The midstorey and shrub layers range from sparse to moderately dense, primarily comprise of sclerophyllous species. The ground layer typically consists of grasses, ferns, graminoides, and herbs.</p> <p>The degraded areas of this community in the study area (i.e. poor condition) typically have lower canopy cover and a sparse ground layer as a result of previous disturbance and weed invasion.</p>
Floristic Description	<p>Open forest dominated by <i>Eucalyptus pilularis</i> (Blackbutt), <i>Angophora costata</i> (Smooth-barked Apple) and <i>Syncarpia glomulifera</i> (Turpentine). Other canopy species occurring less frequently include <i>Corymbia gummifera</i> (Red Bloodwood) and <i>E. piperita</i> (Sydney Peppermint). <i>Eucalyptus saligna</i> (Sydney Blue Gum) is also occasionally present in very low abundance in this community; it is generally only present in transitional areas (boundaries) between this community and the Blue Gum Diatreme Forest. Common midstorey and shrub species include <i>Allocasuarina littoralis</i>, <i>Pittosporum undulatum</i>, <i>Acacia linifolia</i>, <i>Banksia serrata</i>, <i>Banksia spinulosa</i>, <i>Callicoma serratifolia</i> and <i>Persoonia linearis</i>. The ground layer is dominated by native grasses, graminoides, ferns and herbs including <i>Lomandra longifolia</i>, <i>Dianella caerulea</i>, <i>Entolasia stricta</i>, <i>Microlaena stipoides</i>, <i>Pratia purpurascens</i>, <i>Pteridium esculentum</i>, <i>Billardiera scandens</i>, and <i>Xanthorrhoea</i> spp.</p> <p>In the degraded areas of this community (i.e. poor condition), the midstorey and shrub layers are dominated by exotic species including <i>Ligustrum lucidum</i>, <i>L. sinense</i>, and <i>Ochna serrulata</i>. The ground layer of these areas is also typically dominated by exotic species including <i>Lonicera japonica</i>, <i>Asparagus asparagoides</i>, <i>Tradescantia fluminensis</i> and <i>Chlorophytum comosum</i>.</p>
Conservation Status	Not listed.
Distribution in Study Area	This community occurs in the southern, western, and north-eastern portions of the study area. A small portion of this community is mapped as poor condition, which occurs in the south-east of the study area. This distribution of this community in the study area is strongly associated with the sandstone-derived soils.



**Plate 6: Blackbutt Gully Forest (moderate-good\_high) in the study area**



**Plate 7: Blackbutt Gully Forest (moderate-good\_poor) in the study area**

**Table 5: Native Rehabilitation / Regeneration profile**

Native Rehabilitation / Regeneration	
Equivalent Smith and Smith (2008) map unit	No equivalent.
Equivalent Tozer et al. (2010) map unit	No equivalent.
Equivalent Plant Community Type (OEH, 2016)	<p>There is no direct equivalent PCT for this vegetation type as it contains a mixture of endemic and non-endemic species and an exotic understorey, and occurs on highly modified landforms within the study area.</p> <p>However, as this vegetation type is dominated by native plant species, it is likely that the removal of this vegetation would still require offsetting. Should the removal of this vegetation type be proposed, the requirement for offsetting these areas should be determined in consultation with NSW Office of Environment and Heritage (OEH). HN648 is considered to be the closest equivalent PCT for this vegetation type as the floristic composition of most of these areas is more closely aligned with this PCT.</p>
Area (ha) within the study area	4.93 ha
Sample sites	One plot: 1
Structure	<p>This vegetation type typically has an open forest structure with a mixed composition of endemic and non-endemic native trees, over a predominantly exotic understorey. As determined through examination of the 1982 aerial photo of the study area, the majority of the areas mapped as this vegetation type were either cleared or contained regenerating vegetation approximately 35 years ago. As such, the majority of this vegetation type consists of a mature canopy.</p>
Floristic Description	<p>The canopy layer of this vegetation type is typically comprised of a mixture of endemic and non-endemic native species. The dominant canopy species in most areas of this vegetation type is <i>Casuarina cunninghamiana</i> (River Oak), which is not endemic to the area. <i>Eucalyptus pilularis</i> (Blackbutt) and <i>E. saligna</i> (Sydney Blue Gum) are also present in moderate to low abundance; these two species are endemic to the surrounding vegetation communities. Other non-endemic tree species present include <i>E. microcorys</i> (Tallowood), <i>Corymbia maculata</i> (Spotted Gum), <i>Lophostemon confertus</i> (Brush Box) and <i>E. grandis</i> (Flooded Gum). Exotic canopy species also occur in relatively low abundance including <i>Pinus</i> sp. (Pine) and <i>Jacaranda mimosifolia</i> (Jacaranda). The provenance of these canopy species occurring in this vegetation type is unknown; it is unclear if these areas were actively rehabilitated through direct seeding or planting, or whether seed from the adjoining vegetation and urban areas has passively entered the site over time and regenerated / naturalised. Given the most widespread canopy species (<i>Casuarina cunninghamiana</i>) in this vegetation type occurs at various growth stages across the study area, it is likely that this non-endemic species has become naturalised within the site rather than through active revegetation.</p> <p>The midstorey of this vegetation type is largely dominated by <i>Ligustrum lucidum</i> (Large-leaf Privet) and <i>L. sinense</i> (Small-leaf Privet). Native midstorey species are largely absent though the occasional <i>Pittosporum undulatum</i> may be present.</p> <p>Groundcover is largely absent (bare ground). Where present, the ground layer is dominated largely by exotic species, particularly <i>L. lucidum</i> and <i>L. sinense</i> seedlings.</p>
Conservation Status	Not listed.
Distribution in Study Area	<p>This community occurs to the south and south-west of the quarry void, and within the quarry void, in the study area. This vegetation type occurs in highly disturbed parts of the study area where the landform and natural soil profile have been significantly modified through significant earthworks and benching undertaken during quarry construction and operations.</p> <p>It is also noted that other scattered areas of <i>Casuarina cunninghamiana</i> occur across the benches of the quarry void which have not been mapped out separately due to their relatively low cover and low conservation significance.</p>



**Plate 8: Native Rehabilitation / Regeneration in the study area**



**Plate 9: Native Rehabilitation / Regeneration in the study area**

**Table 6: Exotic Vegetation profile**

Exotic Vegetation	
Equivalent Smith and Smith (2008) map unit	No equivalent.
Equivalent Tozer et al. (2010) map unit	No equivalent.
Plant Community Type (OEH, 2016)	No equivalent.
Area (ha) within the study area	5.66 ha
Sample sites	One plot: 11
Structure	<p>This vegetation type consists of two distinct structural variants:</p> <ul style="list-style-type: none"> <li>• A low closed forest/shrubland dominated by exotic woody species over a predominantly exotic ground layer; and</li> <li>• Grassland areas dominated by exotic species.</li> </ul>
Floristic Description	<p>The exotic shrubland/forest is primarily dominated by <i>Ligustrum lucidum</i> (Large- leaf Privet) and <i>L. sinense</i> (Small- leaf Privet). <i>Cinnamomum camphora</i> (Camphor Laurel) is also occasionally present.</p> <p>The exotic grassland areas are typically dominated by <i>Chloris gayana</i>, <i>Sporobolus africanus</i>, <i>Cynodon dactylon</i> and <i>Cortaderia selloana</i>.</p>
Conservation Status	Not listed.
Distribution in Study Area	This vegetation type predominately occurs to the north, east and south-west of the quarry void. It is also noted that small areas of exotic vegetation occur on the benches of the quarry void; these small areas have not been mapped out separately.



**Plate 10: Exotic Vegetation (grassland) in the study area**



**Plate 11: Exotic Vegetation (forest/shrubland) in the study area**

## 3.2 TEC IDENTIFICATION AND DETERMINATION

The Blue Gum Diatreme Forest in the study area is consistent with both the *Blue Gum High Forest in the Sydney Basin Bioregion* critically endangered ecological community (CEEC) listed under the TSC Act, and the *Blue Gum High Forest of the Sydney Basin Bioregion* CEEC listed under the EPBC Act. The *Commonwealth Approved Conservation Advice for Blue Gum High Forest of the Sydney Basin Bioregion* (Threatened Species Scientific Committee [TSSC], 2014) and the NSW Scientific Determination for this CEEC (NSW Scientific Committee 2007) list a number of native species which in combination with specific landscape and soil characteristics define the CEEC. The floristic composition of the vegetation within the study area was examined in conjunction with landscape position, geographic location, and soils information to positively identify areas of this CEEC under both the TSC Act and the EPBC Act.

### Floristic Composition

A number of species characteristic of the CEEC were recorded relatively consistently within the areas mapped as medium and high condition Blue Gum Diatreme Forest in the study area; these include *Eucalyptus saligna* (Sydney Blue Gum), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus pilularis* (Blackbutt), *Pittosporum undulatum* (Sweet Pittosporum), *Breynia oblongifolia* (Coffee Bush), *Pittosporum revolutum* (Wild Yellow Jasmine), *Entolasia marginata*



(Bordered Panic), *Oplismenus aemulus* (Australian Basket Grass), *Lomandra longifolia* (Spiny-headed Mat-rush), *Dianella caerulea* (Blue Flax-lily), *Blechnum cartilagineum* (Gristle Fern), *Calochlaena dubia* (Common Ground Fern), *Pseuderanthemum variabile* (Pastel Flower), *Morinda jasminoides* (Sweet Morinda), *Oxalis perennans*, *Pteridium esculentum* (Common Bracken) and *Eustrephus latifolius* (Wombat Berry).

Many of the aforementioned species were not consistently present in the areas of poor condition Blue Gum Diatreme Forest as a result of the understorey having very high weed invasion (typically consisting of dense stands of *Ligustrum lucidum* (Large-leaf Privet) and *L. sinense* (Small-leaf Privet)). The dominance of *Eucalyptus saligna* (Sydney Blue Gum) and/or *Angophora floribunda* (Rough-barked Apple) in the canopy layer was used as the primary floristic indicator of the *Blue Gum High Forest* CEEC in these areas where only an exotic understorey was present (in combination with soils and landscape position).

### Soils and Landscape Position

Both the Commonwealth *Approved Conservation Advice* (TSSC 2014) and the *NSW Scientific Determination for the Blue Gum High Forest CEEC* (NSW Scientific Committee 2007) indicate the soils, landscape position and geographic location that are used to identify areas of the CEEC. The study area is consistent with the geographic location (i.e. Hornsby LGA) and landscape position (i.e. typically more than 100 m elevation) descriptions for this CEEC. The EPBC Act and TSC Act listed Blue Gum High Forest CEEC also include areas of vegetation located on soils associated with localised volcanic intrusions (diatremes).

The distribution of the areas identified as *Blue Gum High Forest* CEEC in the study area is strongly associated with the volcanic diatreme which is mapped as extending through the central part of the study area (refer to **Figure 7, Section 1.3**). The soils derived from this geology are more fertile than the surrounding sandstone-derived soils, and therefore typically contain a higher abundance of native mesophyllous understorey species. These higher fertility soils are also more prone to weed invasion; hence areas of this community that have been previously cleared/disturbed in the study area are dominated by *Ligustrum* species (Privet), which typically thrive on high fertility soils and areas with high soil moisture.

### Condition Thresholds

Areas of Blue Gum Diatreme Forest in the study area are considered to form part of the EPBC Act-listed *Blue Gum High Forest* CEEC if they meet the following criteria (TSSC 2014):

- Have a canopy cover > 10%; or
- Have a canopy cover < 10% and occur in areas of native vegetation in excess of five hectares.

As all areas of the Blue Gum Diatreme Forest mapped in the study area satisfy at least one of the above criteria, all patches of this community have been assessed as forming part of the *Blue Gum High Forest* CEEC listed under the EPBC Act. This includes all areas of poor condition Blue Gum Diatreme Forest, which in places may contain less than 10% native canopy cover, but are well-connected to larger areas of native vegetation.

The NSW Scientific Determination for the *Blue Gum High Forest* CEEC listed under the TSC Act (NSW Scientific Committee 2007) does not state any specific condition criteria for defining patches of vegetation that constitute this CEEC. However, the determination indicates that “*highly modified relics of the community also persist as small clumps of trees without a native understorey. All remnants of the community are now surrounded by urban development*”. As such, a conservative approach was adopted and all areas of the Blue Gum Diatreme Forest community in the study area, including the highly degraded patches with no native understorey, were determined as forming part of the *Blue Gum High Forest* CEEC listed under the TSC Act.

## Other Vegetation Types

### Blackbutt Gully Forest

The areas of Blackbutt Gully Forest within the study area are not considered to form part of the *Blue Gum High Forest* CEEC. While this community is often dominated by *Eucalyptus pilularis* (Blackbutt), which can also be one of the dominant canopy species of the CEEC (TSSC 2014; NSW Scientific Committee 2007), the understorey composition distinguishes this community from the Blue Gum Diatreme Forest. The Blackbutt Gully Forest occurs on sandstone-derived soils and the understorey is characterised by a higher abundance of sclerophyllous shrubs and native grasses. As a result, the proportion of understorey cover represented by diagnostic species of the *Blue Gum High Forest* CEEC is relatively low in the Blackbutt Gully Forest. In contrast, the areas of Blue Gum Diatreme Forest in the study area contain an understorey dominated by mesophyllous species and a ground layer dominated by ferns, herbs and grass species associated with higher soil fertility (e.g. *Oplismenus aemulus*). In combination, changes in understorey floristic composition and soils were used to identify the boundaries between the Blackbutt Gully Forest and the Blue Gum Diatreme Forest CEEC.

### Native Rehabilitation / Regeneration

The areas of Native Rehabilitation / Regeneration within the study area are not considered to form part of the *Blue Gum High Forest* CEEC. While small areas of this vegetation type contain characteristic canopy species (i.e. *Eucalyptus saligna* and *E. pilularis*), the overall floristic composition of these patches and the landform on which they occur is inconsistent with the EPBC Act and TSC Act listing advice for the *Blue Gum High Forest* CEEC.

The canopy layer of this vegetation type is comprised of a mixture of endemic and non-endemic native species. The dominant canopy species in most areas of this vegetation type is *Casuarina cunninghamiana* (River Oak), which is not endemic to the vegetation communities within the study area. Many of the overstorey species present in this vegetation type are commonly planted in the Sydney region, and it is possible that these species were introduced to site from active rehabilitation works or natural seed dispersal from adjoining urban areas.

Historical imagery from 1955, 1982, 1955 and 1989 (**Figures 3 - 6, Section 1.2**) show areas that have been subject to clearing and significant earthworks within the study area. In particular, areas to the south of the quarry void and on the benches of the void itself that were devoid of vegetation in 1982 contain the majority of vegetation mapped as Native Rehabilitation / Regeneration. As such, this vegetation type occurs on highly modified landforms which lack a natural soil profile, including road batters, spoil dumps from quarry operations, and exposed rock (benches).

Given the absence of natural soils (and associated native seedbank), mixed composition of the canopy layer with endemic and non-endemic species, and lack of native understorey vegetation (i.e. weed dominated), the areas of Native Rehabilitation / Regeneration in the study area are not considered to form part of the *Blue Gum High Forest* CEEC.

### 3.3 FLORISTIC SURVEYS

A total of 152 flora species were identified within the floristic quadrat surveys and subsequent identification analysis (see **Appendix 1**). None of the flora species identified during site surveys were listed as threatened under the TSC Act and/or EPBC Act. Of the species identified, ten are considered exotic to the locality. Additionally, nine of these weed species are declared noxious under the *Noxious Weeds Act 1993*, with seven of these noxious weeds declared as noxious in the control area of Hornsby Shire Council. Two of these species are also declared Weeds of National Significance (WONS). These species are detailed in **Table 7** below. The floristic plot data is provided in **Appendix 1**.

**Table 7: Noxious weeds within the survey area**

Species Name	Common Name	Noxious Weeds Class	WONS
<i>Ageratina adenophora</i>	Crofton Weed	4*	x
<i>Ageratina riparia</i>	Mist Flower	4*	-
<i>Asparagus aethiopicus</i>	Asparagus Fern	4	-
<i>Cortaderia selloana</i>	Pampas Grass	3	-
<i>Lantana camara</i>	Lantana	4	x
<i>Ligustrum lucidum</i>	Large- leaf Privet	4	-

Species Name	Common Name	Noxious Weeds Class	WONS
<i>Ligustrum sinense</i>	Small- leaf Privet	4	-
<i>Lonicera japonica</i>	Japanese Honeysuckle	4	-
<i>Ochna serrulata</i>	Mickey Mouse Plant	4	-

\* Species listed under the NW Act but not within the Hornsby Shire Council control area.

### 3.4 CONSERVATION SIGNIFICANCE

The conservation significance of each vegetation patch in the study area has been assessed and categorised based on consideration of a number of factors. Legislative status was the primary criteria through which conservation significance was evaluated, followed by condition of the vegetation, and other ecological values such as number of threatened species likely to be present and the connectivity of the vegetation to other larger areas of vegetation and conservation reserves.

Blue Gum High Forest has very high conservation significance, both within NSW and nationally. This vegetation type is listed as critically endangered under both the TSC Act and the EPBC Act, indicating the highest level of legislative protection. Considering that the extent of Blue Gum High Forest in 1997 was reportedly less than five per cent of that recorded prior to European settlement (DotEE, 2017), conserving remaining areas will be critical to ongoing survival of the community. Additionally, Blue Gum Diatreme Forest is restricted to volcanic diatreme soils, which has a localised distribution in the Sydney Region and may be confined to the Hornsby Local Government Area (Benson & Howell, 1994). As such, the vegetation within the study area has a high conservation significance for this reason also.

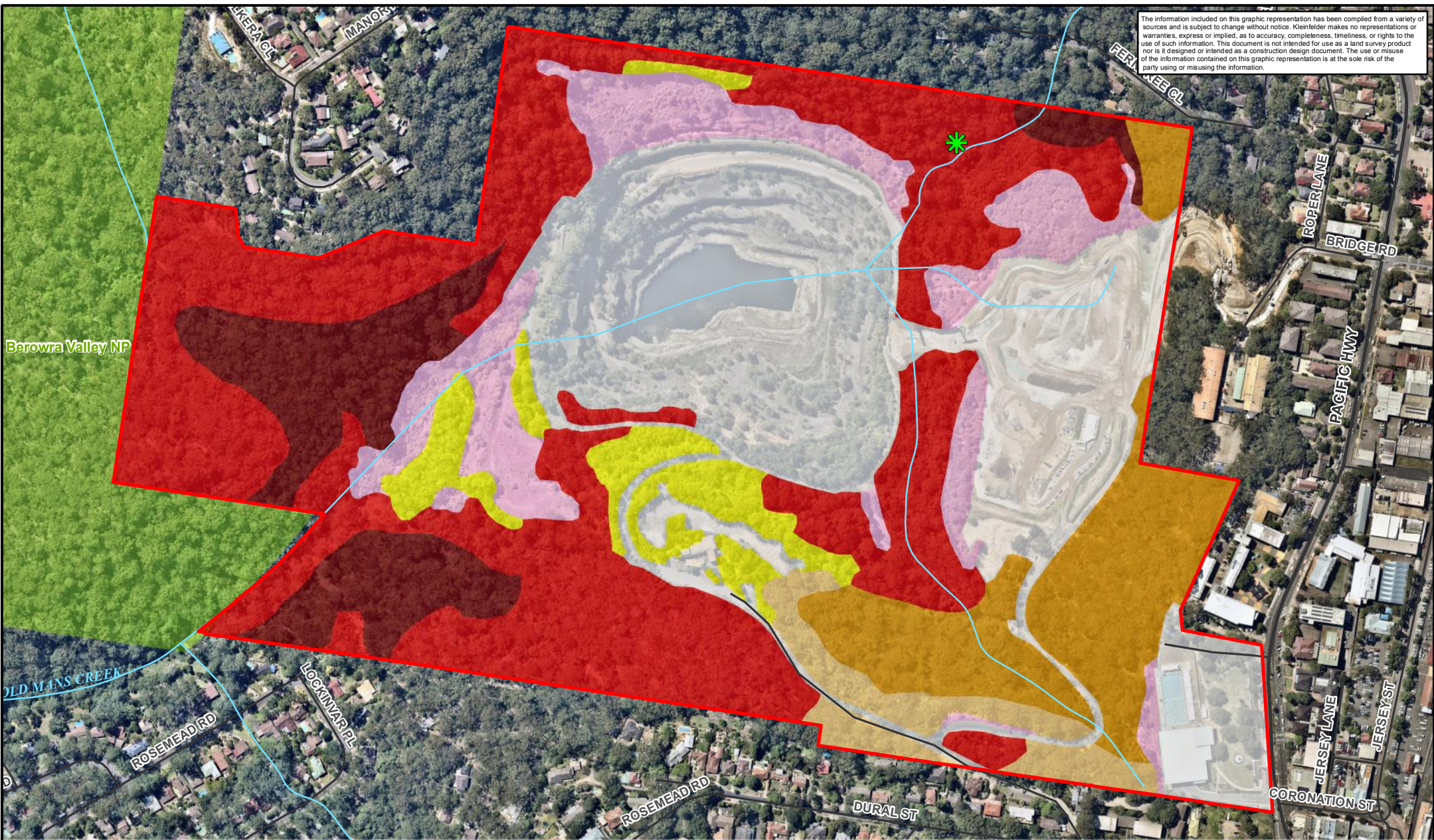
All areas of medium and high condition Blue Gum Diatreme Forest within the study area were assessed as having high conservation significance as this vegetation forms part of the Blue Gum High Forest CEEC listed under the TSC Act and EPBC Act, typically contains a variety of fauna habitat values (e.g. intact native understorey, hollow-bearing trees), and represents suitable habitat for a number of locally occurring threatened fauna species. The poor condition Blue Gum Diatreme Forest within the study area was also assessed as having moderate to high conservation significance. Although this vegetation is significantly degraded with a highly modified understorey, this community still forms part of the Blue Gum High Forest CEEC and represents potential habitat for some threatened fauna species and provides connectivity to moderate and high condition vegetation. It is noted that during the surveys, a pair of Powerful Owls were observed roosting in the north-east part of the study area within the poor condition Blue Gum Diatreme Forest (i.e. privet dominated understorey). The location of this observation is shown on **Figure 10**. Furthermore, the poor condition vegetation patches can be improved through bush regeneration activities and are therefore also of high conservation significance.

The areas of high condition Blackbutt Gully Forest on the southern and western parts of the study area were assessed as having moderate to high conservation significance, while the south-eastern patches were assessed as having moderate conservation significance. The patches of this community on the southern and western part of the study area are well-connected to the large expanse of vegetation to the west of the study area (i.e. Berowra Valley National Park), contain a variety of fauna habitat values (e.g. dense native understorey, hollow-bearing trees, rock outcrops/escarpments), and represent suitable habitat for a number of locally occurring threatened fauna species. While the south-eastern patches of Blackbutt Gully Forest also contain high fauna habitat values, their connectivity with adjoining high condition vegetation is lower, and their proximity to roads and adjoining urban areas may affect suitability for some threatened fauna species. The small area of poor condition Blackbutt Gully Forest was assessed as having low to moderate relative conservation significance as this vegetation has been subject to substantial disturbance from past clearing and edge effects (e.g. weed invasion) from the adjoining road. The Blackbutt Gully Forest is not listed under the TSC Act or EPBC Act; however, this vegetation community is regarded as locally significant in Hornsby Shire by Smith and Smith (2008) as it is uncommon and poorly conserved outside of this area.

The Native Rehabilitation / Regeneration vegetation in the study area was assessed as having low conservation significance. While this vegetation type contains several canopy species endemic to the native vegetation communities in the study area (e.g. *Eucalyptus pilularis* and *E. saligna*) and therefore may contribute to the viability of the surrounding vegetation, the overall composition of this vegetation type is not consistent within any natural vegetation communities known from the locality. However, it is noted that this vegetation still has the potential to provide habitat for some locally occurring threatened fauna species. Similarly, the areas of Exotic Vegetation in the study area may also provide potential habitat for some locally occurring fauna species, but as it is dominated by noxious weed species, the relative conservation significance of these areas is considered to be very low.

The conservation significance of the vegetation across the study area is mapped in **Figure 10**.

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**Legend**

- Study Area
- ★ Powerful Owl Observation
- Watercourse
- Main Road
- Local Road
- Distributor Road

**Relative Conservation Significance**

- High
- Moderate - High
- Moderate
- Low - Moderate
- Low
- Very Low
- Nil

Metres

0 25 50 100 150 200 250

N

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PROJECT REFERENCE: 20173145

DATE DRAWN: 06-Mar-17 10:14 Version 1

DRAWN BY: amarshall

DATA SOURCE:  
LPI - 2009  
Nearmap - 2016

**Conservation Significance**

Hornsby Shire Council  
Vegetation Survey  
Hornsby Quarry and Old Man's Valley  
Hornsby, NSW 2077

FIGURE:

10

## 4. REFERENCES

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# APPENDIX 1: FLORISTIC PLOT DATA

NR =Native Rehabilitation / Regeneration

BGF = Blackbutt Gully Forest

BGDF – Blue Gum Diatreme Forest

FPC = Foliage Projective Cover

Ab = Abundance Rating (no. of individuals; numbers > 20 are estimates only)

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12		
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF		
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC
<b>Native Species</b>																									
<i>Acacia floribunda</i> White Sally Wattle							5	5																	
<i>Acacia implexa</i> Hickory Wattle							1	1																	
<i>Acacia linifolia</i> White Wattle							1	3					3	5											
<i>Acacia longifolia</i> Sydney Golden Wattle										1	2														
<i>Acacia longissima</i> Long- leaf Wattle										1	1														
<i>Acacia parramattensis</i> Parramatta Wattle																			2	1					
<i>Acacia ulicifolia</i> Prickly Moses													2	4				1	4						

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Allocasuarina littoralis</i> Black She- oak							5	2			10	3					10	4						
<i>Angophora costata</i> Smooth- barked Apple			20	4	20	5	30	2			5	1	8	30			5	1					10	1
<i>Angophora floribunda</i> Rough- barked Apple									5	3														
<i>Aristida vagans</i> Threeawn Speargrass			1	10																				
<i>Austrostipa pubescens</i> -			1	7																				
<i>Bacopa monnieri</i> Bacopa															1	2								
<i>Banksia serrata</i> Old Man Banksia							20	7					1	1										
<i>Banksia spinulosa</i> Hairpin Banksia			1	1							1	1	2	3										
<i>Billardiera scandens</i> Hairy Apple Berry			1	5									1	4			1	5						
<i>Blechnum ambiguum</i> -															1	20			1	6				

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Blechnum cartilagineum</i> Gristle Fern											20	100			1	1								
<i>Blechnum sp.</i> -																	1	5						
<i>Boronia ledifolia</i> Showy Boronia																	1	1						
<i>Bossiaea ensata</i> Sword Bossiaea													1	3										
<i>Bossiaea obcordata</i> Spiny Bossiaea													1	3										
<i>Brachychiton acerifolius</i> Flame Tree							1	1																
<i>Breynia oblongifolia</i> Coffee Bush					1	3	1	2	1	3														
<i>Brunoniella australis</i> Blue Trumpet									1	20	1	5					1	1						
<i>Callicoma serratifolia</i> Black Wattle					30	25					10	8												
<i>Callistemon salignus</i> Willow Bottlebrush	2	5																						

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Calochlaena dubia</i> Rainbow Fern					70	300	80	200			50	100			1	3	30	50						
<i>Cassinia sp.</i> -			3	6																				
<i>Casuarina cunninghamiana*</i> River Oak	5	1																						
<i>Cheilanthes sieberi</i> -			1	4																				
<i>Clematicissus opaca</i> Pepper Vine																	1	1						
<i>Clematis aristata</i> Old Man's Beard							1	4																
<i>Clematis glycinoides</i> Headache Vine									1	20														
<i>Clerodendrum tomentosum</i> Hairy Clerodendrum																	1	1						
<i>Corymbia gummifera</i> Red Bloodwood													3	20	5	1	5	1						
<i>Corymbia maculata*</i> Spotted Gum	5	1																						

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Cryptostylis erecta</i> Bonnet Orchid			1	5																				
<i>Cyathea australis</i> Black Tree- fern															2	1								
<i>Cyperus sp.</i> -															1	20					1	20		
<i>Cynodon dactylon</i> Common Couch									3	50														
<i>Denhamia silvestris</i> Narrow- leaved Orangebark			1	6																				
<i>Dianella caerulea</i> Blue Flax Lily			1	3			1	3			1	6	1	2			1	5						
<i>Dianella prunina</i> -					1	20																		
<i>Dichelachne micrantha</i> Shorthair Plumegrass			1	5																				
<i>Dichondra repens</i> Kidney Weed									1	30					1	40	1	20						
<i>Dillwynia retorta</i> -													1	2										
<i>Dipodium punctatum</i> -													1	1										

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Dipodium sp.</i> -			1	2																				
<i>Doodia caudata</i> Small Rasp Fern																	1	4	1	4				
<i>Echinopogon caespitosus</i> Bushy Hedgehog Grass									1	20														
<i>Elaeocarpus reticulatus</i> Blueberry Ash											2	2												
<i>Entolasia marginata</i> Bordered Panic			1	3	1	2	1	20	3	50							1	2						
<i>Entolasia stricta</i> Wiry Panic			3	50			1	30					5	40			20	200						
<i>Epacris pulchella</i> Wallum Heath			1	2																				
<i>Eucalyptus pilularis</i> Blackbutt			40	8	40	10	15	2			40	5	1	5			50	8					40	3
<i>Eucalyptus piperita</i> Sydney Peppermint											10	2	6	40										
<i>Eucalyptus saligna</i> Sydney Blue Gum	20	6								30	3					20	2			30	3			

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Eustrephus latifolius</i> Wombat Berry					1	6			1	4					1	3	1	10	1	1				
<i>Gahnia aspera</i> Rough Saw- sedge									1	2														
<i>Gahnia erythrocarpa</i> -																							1	3
<i>Gahnia sieberiana</i> Red-fruit Saw- sedge					10	40																		
<i>Gahnia sp.</i> -																							1	3
<i>Geitonoplesium cymosum</i> Scrambling Lily			1	2	1	6	1	10									1	3						
<i>Gompholobium latifolium</i> Golden Glory Pea							1	1																
<i>Gonocarpus teucroides</i> Raspwort							1	1																
<i>Goodenia heterophylla</i> subsp. <i>eglandulosa</i> -																	2	30						

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Hakea sericea</i> Needlebush													5	5										
<i>Hovea linearis</i> -													1	3										
<i>Hibbertia bracteata</i> -													1	4										
<i>Hibbertia dentata</i> Trailing Guinea Flower							1	20			1	30												
<i>Hibbertia scandens</i> Climbing Guinea Flower									1	10														
<i>Hibbertia sp.</i> -																	1	1						
<i>Imperata cylindrica</i> Blady Grass	1	7	5	100			1	3	10	100							1	3			1	50		
<i>Juncus usitatus</i> -	2	30													2	50					1	20		
<i>Lambertia formosa</i> Mountain Devil													5	10										
<i>Lepidosperma filiforme</i> -			1	1																				
<i>Lepidosperma laterale</i> -			1	1									10	50										



Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Lepidosperma</i> sp. -													3	50										
<i>Leptospermum polygalifolium</i> Tantoon													2	6										
<i>Leucopogon lanceolatus</i> -											1	1												
<i>Lomandra filiformis</i> subsp. <i>filiformis</i> Wattle Mat-rush			2	20			1	3									2	10						
<i>Lomandra glauca</i> Pale Mat-rush													5	100										
<i>Lomandra gracilis</i> -													1	1										
<i>Lomandra longifolia</i> Spiny-leaved Mat-rush	2	30	5	30	2	30	10	50	5	20	2	10					5	20			1	2		
<i>Lomandra multiflora</i> subsp. <i>multiflora</i> Many-flowered Mat-rush			3	30			3	20					1	2										
<i>Lomandra obliqua</i> -			1	6									3	50										

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Lophostemon confertus</i> Brush Box	5	1																						
<i>Marsdenia suaveolens</i> Scented Marsdenia									1	1														
<i>Microlaena stipoides</i> Weeping Meadow Grass			1	10					1	20							1	3			1	50		
<i>Micrantheum erocoides</i> -			1	3																				
<i>Morinda jasminoides</i> Sweet Morinda					1	2	1	3	2	10														
<i>Opercularia diphylla</i> -							1	2																
<i>Opercularia varia</i> Variable Stinkweed			1	3	1	2																		
<i>Oplismenus aemulus</i> Basket Grass	1	20			1	4	1	20	5	100					5	200	1	100			1	20		
<i>Oxalis perennans</i> -			1	4											1	4								

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Oxalis</i> sp. -					1	2																		
<i>Pandorea pandorana</i> Wonga Wonga Vine											1	2					1	3						
<i>Panicum simile</i> Two- colour Panic			1	6																				
<i>Passiflora herbertiana</i> Native Passionfruit									2	20														
<i>Patersonia longifolia</i> Purple Flag													2	20										
<i>Patersonia sericea</i> Silky Purple Flag																	1	6						
<i>Pellaea falcate</i> Sickle Fern															1	2								
<i>Persoonia linearis</i> Narrow- leaved Geebung			1	2									1	1										
<i>Pittosporum revolutum</i> Wild Yellow Jasmine							10	10	1	3														
<i>Pittosporum undulatum</i> Sweet Pittosporum	30	20	1	2	10	20	10	8	10	12	20	30			5	30	1	2	3	4	1	3	2	4

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Platysace linearifolia</i> -			3	20									1	4			1	3						
<i>Poa affinis</i> -	3	50															2	30						
<i>Polyscias sambucifolia</i> Elderberry Panax			2	20													1	5						
<i>Polystichum sp.</i> Shield Fern					1	3																		
<i>Poranthera microphylla</i> -									1	2														
<i>Pratia purpurascens</i> Whiteroot							1	2																
<i>Pseuderanthemum variable</i> Pastel Flower	1	2			2	50			1	5														
<i>Pteridium esculentum</i> Common Bracken			5	50					5	20			5	30			1	2			1	5		
<i>Pultenaea retusa</i> Notched Bush- pea			1	3			1	2					1	1										
<i>Pultenaea villosa</i> Hairy Bush- pea													2	10										

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Sarcopetalum harveyanum</i> Pearl Vine							1	1	2	30					1	7	2	30						
<i>Selaginella uliginosa</i> Swamp Selaginella											1	1												
<i>Smilax australis</i> Lawyer Vine					1	8											1	2						
<i>Smilax glycyphylla</i> Sweet Sarsparilla					1	30	1	10			1	30	1	4			1	50						
<i>Solanum sp.</i> -															1	1								
<i>Stephania japonica</i> Snake Vine									2	30					1	1								
<i>Stylidium sp.</i> -													1	1										
<i>Syncarpia glomulifera</i> Turpentine	40	5	20	12	30	12	40	4			30	5	1	1			30	3					15	3
<i>Themeda triandra</i> Kangaroo Grass							1	12																
<i>Veronica plebeia</i> Trailing Speedwell																					1	10		
<i>Vernonia cinerea</i> -			1	1																				

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Xanthorrhoea arborea</i> -					5	20					50	50					20	30						
<i>Xanthorrhoea media</i> Grass Tree			2	7			1	3					10	30										
<i>Xanthosia tridentate</i> Rock Xanthosia			1	1																				
<i>Xylomelum pyriforme</i> Woody Pear													1	1										
<b>Exotic Species</b>																								
<i>Ageratina adenophora</i> Crofton Weed					1	6									5	50	1	1			1	20	1	20
<i>Ageratina riparia</i> Mist Flower					1	10									2	50								
<i>Anagallis arvensis</i> Scarlet Pimpernel																					1	10		
<i>Asparagus aethiopicus</i> Asparagus Fern					1	5															1	20	20	500
<i>Brassica sp.</i> -															1	1								
<i>Bidens pilosa</i> Cobbler's Pegs																					1	50		

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Centaureum erythraea</i> Common Centaury																					1	5		
<i>Chlorophytum comosum</i> Spider Plant																							5	100
<i>Cortaderia selloana</i> Pampas Grass																					1	10		
<i>Cyperus eragrostis</i> Umbrella Sedge														1	20									
<i>Erythrina x sykesii</i> Coral Tree																							5	2
<i>Jacaranda mimosifolia</i> Jacaranda																							1	2
<i>Lantana camara</i> Lantana																					1	2		
<i>Ligustrum lucidum</i> Large- leaf Privet	40	200			20	50									70	1000			90	1000	80	1000	70	100
<i>Ligustrum sinense</i> Small- leaf Privet	40	300			3	15	2	30							80	1000	3	50	40	1000	10	500	2	50
<i>Lonicera japonica</i> Japanese Honeysuckle									1	1					1	1					2	20	1	5

Scientific Name	Q1		Q2		Q3		Q4		Q5		Q6		Q7		Q8		Q9		Q10		Q11		Q12	
	NR		BGF		BGF		BGF		BGDF		BGF		BGF		BGDF		BGF		BGDF		Exotic		BGF	
	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab	FPC	Ab
<i>Ochna serrulata</i> Mickey Mouse Plant					2	20	2	30									5	20	1	3	1	10	2	50
<i>Roldana petasitis</i> -																							1	10
<i>Sporobolus africanus</i> Parramatta Grass																					3	100		
<i>Tradescantia albiflora</i> Trad														10	500								2	100
<i>Solanum mauritianum</i> Wild Tobacco Bush																							1	2
<b>Total Native Species</b>	<b>13</b>		<b>39</b>		<b>22</b>		<b>34</b>		<b>27</b>		<b>20</b>		<b>37</b>		<b>17</b>		<b>38</b>		<b>6</b>		<b>9</b>		<b>5</b>	
<b>Total Exotic Species</b>	<b>2</b>		<b>0</b>		<b>6</b>		<b>2</b>		<b>1</b>		<b>0</b>		<b>0</b>		<b>7</b>		<b>3</b>		<b>3</b>		<b>12</b>		<b>12</b>	
<b>Total Species</b>	<b>15</b>		<b>39</b>		<b>28</b>		<b>36</b>		<b>28</b>		<b>20</b>		<b>37</b>		<b>24</b>		<b>41</b>		<b>9</b>		<b>21</b>		<b>17</b>	

\*species native to Australia but not considered to be native to the locality of Hornsby Shire.



## APPENDIX 2: STAFF CONTRIBUTIONS

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The following staff were involved in the compilation of this report.

Name	Qualification	Title/Experience	Contribution
Aaron Mulcahy	BEnv Sc & Mgt	Senior Ecologist	Report review and field surveys
Gayle Joyce	BSc (Forestry) (Hons)	GIS Specialist	GIS mapping and figure preparation
Philippa Fagan	BEnvSc (Bio. & Cons.)	Ecologist	Report writing and field surveys

## **APPENDIX 3: LICENSING**

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Kleinfelder employees involved in the current study are licensed or approved under the National Parks and Wildlife Act 1974 (License Number: SL100730, Expiry: 31 March 2017) and the Animal Research Act 1985 to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.