

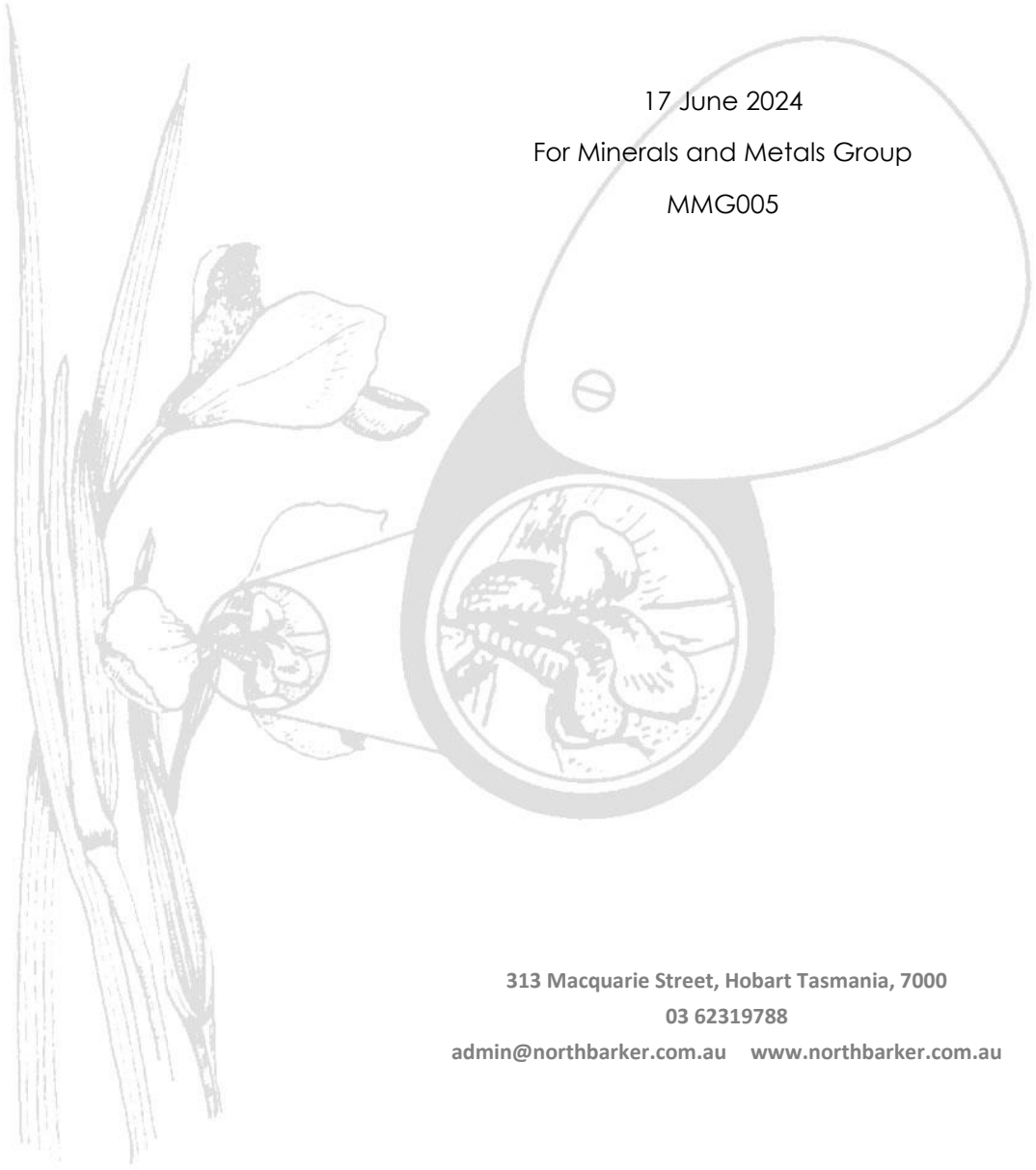


MMG Rosebery  
Bobadil - Tailings Storage Facility  
Stage 11 and 12 Quarry Developments  
**NATURAL VALUES ASSESSMENT**

17 June 2024

For Minerals and Metals Group

MMG005



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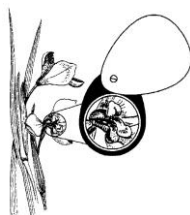
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2.1 Draft	20/12/2023	T. Leaman – address comments from p&s (2/11/23) and include masked owl survey results
2.2 Draft	01/02/2024	T. Leaman – updates to masked owl pre-clearance mitigation
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## SUMMARY

Minerals and Metals Group (MMG) operates an underground polymetallic base metal mine at Rosebery in western Tasmania. MMG is proposing works to its existing tailings storage facility (TSF) known as 'Bobadil', approximately 3 km north of the township of Rosebery. The works are associated with Stage 11 and 12 development of the site and entail the establishment of two quarry sites.

MMG has engaged North Barker Ecosystems Services (NBES) to survey the proposed quarry sites flora and fauna, and to document potential impacts to natural values, with reference to relevant environmental legislation. The relevant values identified within the project footprint are summarised as follows:

### Vegetation

The site's vegetation is typical of western Tasmanian lowlands and habitats on similar geologies. Of the vegetation communities identified, all are of vegetation types that are widespread and well represented in reserves.

### Threatened Flora

No threatened flora species have been identified within the site. Based on an assessment of habitat suitability and extent of occurrence, the likelihood of flora listed at state and/or federal level being present is considered very low within the project area.

A targeted survey for the horned orchid (*Orthoceras strictum*) in January 2023 did not detect any evidence of the species being present.

### Threatened Fauna

Identified fauna habitats within the footprint are also typical of west coast wet forests and scrubs. The landscape is not very productive in terms of nutrients or prey and the relative abundance of animals, particularly large predators, is reflective of this.

There is suitable habitat within the project area for the following threatened fauna species:

#### Grey goshawk

A suspected grey goshawk nest was identified approximately 450 m west of the southern quarry area. This nest should remain unaffected by the proposed works in this case and does not require any specific additional management considerations or permits.

In the unlikely event that disturbance to this nest and the immediate surrounds (within 100 m) cannot be avoided, then a permit from the Department of NRE may be required prior to commencement of vegetation clearing in this area.

#### Masked owl

Limited suitable nesting habitat for this species is present within and adjacent to the proposed disturbance footprint. 12 mature eucalypt trees in the northern end of the northern quarry area were assessed for hollow potential applying ground-based and aerial (drone) inspection methods. No large hollows (i.e. > 15 cm diameter) were identified from these inspections and as such it was determined that trees do not currently support masked owl nesting habitat. A pre-clearance protocol for masked owl habitat trees has been recommended.

#### Swift Parrot & Blue-winged Parrot

12 hollow bearing trees within the proposed development impact footprint support potential nesting habitat for the swift parrot and blue-winged parrot, however the likelihood of breeding within these 12 trees by either species is deemed to be low. Nonetheless, precautionary measures are recommended for these species through the

application of specific pre-clearance tree assessment protocols prior to their removal (to be applied at the same time as those for the masked owl).

#### Tasmanian devil

The productivity of the site for this species is particularly low because of the low-lying, wet ground conditions. The likely scale of impact to the habitat of the Tasmanian devil will not be significant given the extent of habitat in the area the suboptimal denning habitat currently known to exist. While it remains possible that one or more natal dens may be present, no obvious preferred structure was identified during targeted surveys. Therefore, a pre-clearance devil den survey will be required for all areas of mapped sub-optimal denning habitat.

#### Wedge-tailed eagle

A known wedge-tailed eagle nest exists to the south of the proposed works area, but it is beyond a 1 km line of sight of the southern quarry. As such, no specific management constraints are required on account of this nest.

Further aerial surveys of suitable nesting habitat within 1 km of the project area were undertaken on 5 April 2023 and no new eagle nests were found within 1 km of the Bobadil TSF.

#### **Weeds & Hygiene**

One species listed as a declared weed under the *Biosecurity Act 2019* (blackberry) was identified near the project footprint. A weed management plan will be required to prevent further spread of this species and to avoid new introductions of other weeds.

Recent field-based assessments of Bobadil have confirmed the presence of the soil-borne fungus *Phytophthora cinnamomi* (PC) from areas within and surrounding the existing TSF. A detailed assessment of existing locations of the pathogen have been undertaken, with findings of the assessment summarised in a report by Quarry Clean (2024).

#### **Legislative implications**

Any likely significant impact on a Matter of National Environmental Importance (MNES) requires referral for consideration by the Commonwealth minister to determine if the proposal will be a Controlled Action requiring closer consideration. Where a project is referred for a significant impact on one MNES, it is necessary to address all MNES that could conceivably be present to demonstrate the likelihood of a significant impact on each. However, no direct or indirect significant impacts to MNES are anticipated as a result of the proposed works.

Obtaining permits to take threatened species or products of wildlife may also be warranted under the Tasmanian Threatened Species Protection Act (TSPA) and/or Nature Conservation Act (NCA) on account of the presence of a grey goshawk nest and mammal (devil or quoll) dens (subject to further survey and assessment).

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# 1 INTRODUCTION

## 1.1 Background

Minerals and Metals Group (MMG) operates an underground polymetallic base metal mine at Rosebery in western Tasmania. MMG is proposing additional works to its 'Bobadil' tailings storage facility, which is located approximately 3 km north of the township of Rosebery.

MMG has engaged North Barker Ecosystems Services (NBES) to survey the site's flora and fauna, and to document potential impacts to natural values, with reference to relevant environmental legislation. This assessment was undertaken to document natural values across the Bobadil study area and to facilitate an assessment of the proposal by the EPA Tasmania.

## 1.2 Project area

The Bobadil tailings storage facility sits north of the Rosebery township and east of Lake Pieman. The proposed works relate to Stage 11 and 12 developments of the existing facility and include the development of two quarry sites (Figure 1). For the purposes of mapping, a 5 m buffer has been applied to project footprint data supplied by MMG. Forested environments within 150 m of the immediate impact footprint of the quarry sites were also considered for their potential to support habitat for threatened species. This consideration was given primarily in relation to identifying suitable nesting habitat for the masked owl with the intention of avoiding potential for impacts to masked owl breeding. This buffer was discussed in a meeting with the EPA/CAS on 04/07/2023 and confirmed in formal correspondence from CAS on 31/07/2023.

The vegetation on the site is predominantly wet eucalypt forest with small areas of surrounding rainforest and scrub communities on lower-lying ground and in drainage lines. The site's elevation is approximately 110–380 m above sea level. Access to the site is via two separate gravel roads from MMG's Rosebery mine.

The geology is predominantly Pleistocene glacial deposits with a small area of Quartzwacke sandstone.

## 1.3 Background Research

The following sources were consulted for biological records from the region:

- Natural Values Atlas<sup>1</sup> – this Department NRE database includes biological records.
- EPBC Protected Matters Search Tool<sup>2</sup>
- TASVEG 4.0 Digital Data – this layer has been ground-truthed.

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<sup>1</sup> NVR report February 2023 (NRE)

<sup>2</sup> EPBC Act Protected Matters report, Commonwealth of Australia (September 2022)

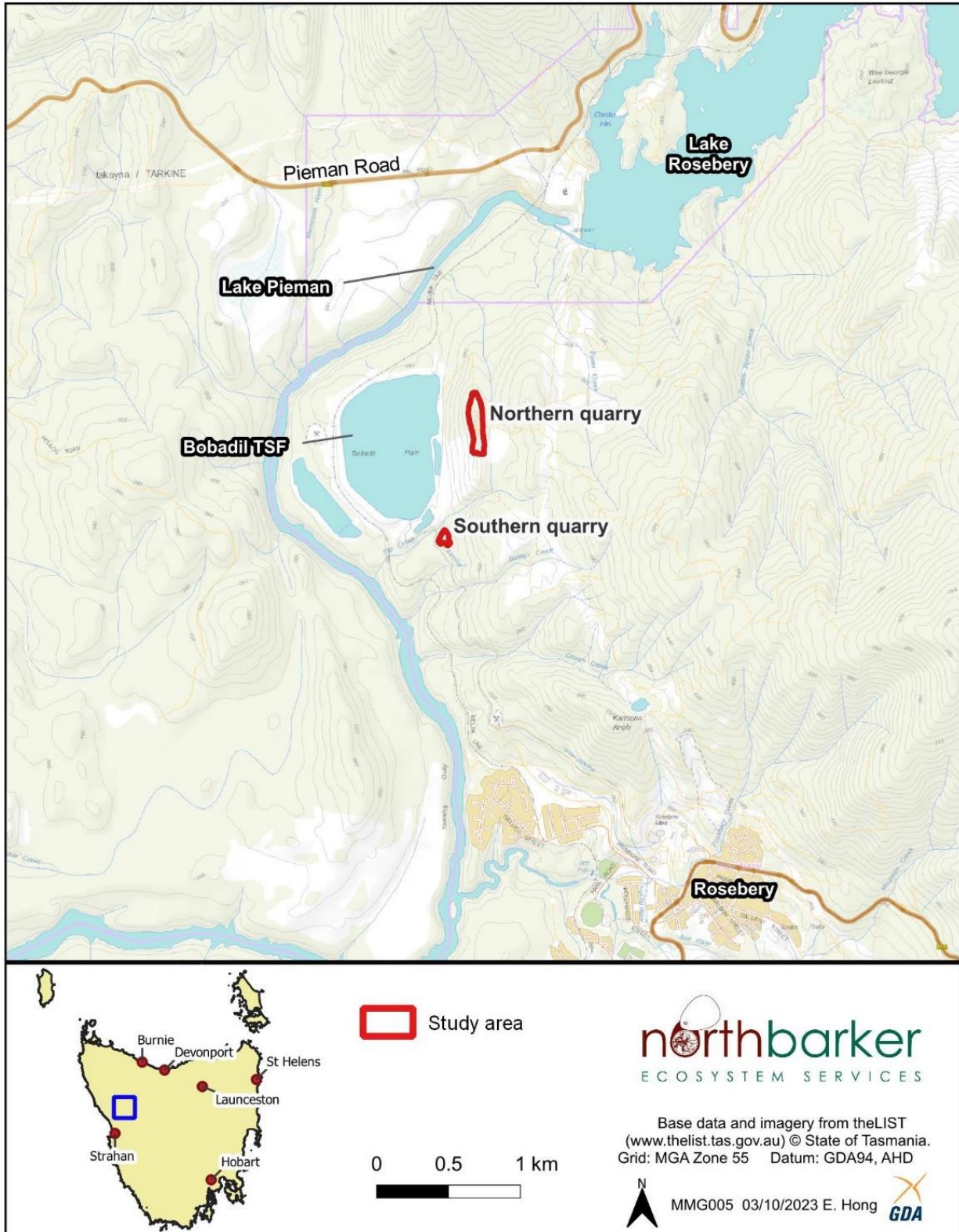


Figure 1: Location of the Bobadil TSF study areas (southern and northern proposed quarries)

## 1.4 Methods

### 2.2.1 Botanical Surveys

Fieldwork was undertaken on foot from 13 to 15 September 2022 by three ecologists from NBES. Areas of potential orchid habitat were surveyed again on 30 and 31 January 2023 by two NBES ecologists. Vegetation was mapped across the site consistent with TASVEG 4.0<sup>3</sup>. Within each community type, a full vascular plant species list was taken from within representative plots (Appendix 1), using a form of the timed meander search procedure.<sup>4</sup> Outside of the plots, additional plant species were noted as encountered. This resulted in a collective species list for each community type (Appendix 3). Observations of habitat suitability for fauna were made concurrently across the area surveyed, with particular reference to suitability of habitat for dens (including natal dens) of the Tasmanian devil (*Sarcophilus harrisii*). Criteria used to determine suitability for denning included relative elevation (higher positions being better for drainage), general drainage (wet soils being less preferable), proximity to drainage lines (used for dispersal), depth to water table, soil friability, penetrative light levels at ground level, structural complexity (opportunities for log shelters) and the presence of rock caves (Table 1).

Locations of critical habitat elements (e.g. dens and hollows), presence of threatened species (Tasmanian *Threatened Species Protection Act 1995* [TSPA] and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*<sup>5</sup> [EPBCA]), pathogens, and environmental and declared<sup>6</sup> weeds were recorded with a handheld GPS. Specific assessments of the Bobadil TSF and surrounding areas for the presence of *Phytophthora cinnamomi* (PC) were undertaken through soil sampling by MMG in January 2024 and followed up by further surveys in March 2024<sup>7</sup>.

Throughout the report, botanical nomenclature follows the current census of Tasmanian plants.<sup>8</sup> Bird species nomenclature follows the currently most widely accepted guide to avian systematics and taxonomy in Australia<sup>9</sup>.

#### Horned Orchid (*Orthoceras strictum*) surveys

Targeted surveys for the horned orchid (*Orthoceras strictum*) were undertaken throughout areas of suitable habitat during 30 and 31 January 2023. The surveys were undertaken by two field ecologists who used meandering transect-based assessments over areas of open buttongrass moorland and scrub to search for any orchid species (specifically areas of mapped as *Leptospermum lanigerum* – *Melaleuca squarrosa* swamp forest(NLM) outside the study area, which will not be impacted in this case).

As it is difficult to identify this species in the field, known sites of the horned orchid were inspected in the Rosebery area prior to visiting the Bobadil site. This enabled the surveyors to determine what developmental stage the species was at when the formal surveys were undertaken and provided a high level of confidence in establishing the visual characters of the target species. A summary of the developmental observations of the species is provided in Appendix 4.

<sup>3</sup> DPIPWE (2013); Harris & Kitchener (2005)

<sup>4</sup> Goff et al. (1982)

<sup>5</sup> *Tasmanian Threatened Species Protection Act 1995; Commonwealth Environment Protection and Biodiversity Conservation Act 1999*

<sup>6</sup> *Tasmanian Biosecurity Act 2019*

<sup>7</sup> Quarry Clean (2024)

<sup>8</sup> Baker & de Salas (2022)

<sup>9</sup> Christidis & Boles (2008)



### 2.2.2 Fauna Habitat Assessment and Surveys

Observations of habitat suitability for fauna (particularly threatened fauna) were made concurrently with the flora ground surveys across the site. Areas of potential habitat were marked using a handheld GPS and notes on the condition and status of the habitat were recorded. Reference and/or targeted searching was undertaken in relation to:

- Potential hollow-bearing trees which may provide suitable habitat for the Tasmanian masked owl (*Tyto novaehollandiae castanops*).
- The suitability of habitat for, and the presence of, dens (including natal dens) of the Tasmanian devil (*Sarcophilus harrisii*), the eastern quoll (*Dasyurus viverrinus*), and the spotted-tailed quoll (*Dasyurus maculatus maculatus*).

Targeted surveys were considered and/or undertaken for the following species:

#### **Tasmanian wedge-tailed eagle – *Aquila audax fleayi* (e/EN) and white-bellied sea-eagle – *Haliaeetus leucogaster* (v/-)**

Habitat suitability was assessed as per the FPA assessment guidelines for using the wedge-tailed eagle Habitat Model<sup>10</sup>. A targeted eagle nest search was undertaken for all areas of eagle nesting habitat within 1 km of the study area in April 2023<sup>11</sup>.

#### **Tasmanian masked owl – *Tyto novaehollandiae castanops* (e/VU)**

Potential hollow-bearing tree habitat was determined from desktop assessments prior to the subsequent field assessment. Remote assessment was conducted using the Forest Practices Authority (FPA) 'mature habitat availability map'.<sup>12</sup> Habitat is assessed using the FPA classifications,<sup>13</sup> whereby: potential habitat is considered to be all areas with at least 20% mature eucalypt crown cover unless mapping indicated there are no senescent trees in the area. Significant habitat is considered to be all areas of dry forest (TASVEG dry eucalypt forest and woodland) with at least 20% mature eucalypt crown cover.

To account for inaccuracies in desktop assessments (see limitations outlined in FPA 2011 and 2014), the results were ground-truthed during field assessments. Field assessments were conducted concurrently with flora and vegetation assessments by traversing the study area, noting the presence of trees greater than 1 m diameter at breast height<sup>14</sup> and/or trees containing hollows with >15 cm diameter entrances. Ground surveys included examination of habitat for suitability in accordance with the FPA guidelines, and examination of hollow-bearing trees for evidence of occupation (including pellets, scratching, white-wash and prey remains).

Specific assessments of potential masked owl habitat trees were undertaken by FINN Environmental on 14 April 2023 and NBES/MMG in August 2023. This included an assessment of hollow availability within trees >1 m DBH using ground-based ocular assessments and aerial inspection methods (photos taken from a camera-mounted drone).

Subsequently, masked owl call detections surveys were undertaken throughout the study area for a minimum of eight weeks during the masked owl breeding period (1 September to 31 January inclusive) in accordance with NRE recommendations<sup>15</sup>. A total of three songmeters (SM4s) were deployed throughout the study area from 6/9/23 to 13/11/23 at a maximum

<sup>10</sup> Forest Practices Authority (2014a)

<sup>11</sup> NBES (2023)

<sup>12</sup> Forest Practices Authority (2011)

<sup>13</sup> Forest Practices Authority (2014b)

<sup>14</sup> Forest Practices Authority (2014b)

<sup>15</sup> CAS recommendations - Department NRE (31 July 2023)

spacing of 400 m (ie approximate 200 m call capture radius) to ensure all areas within at least 150 m of the proposed impact area were surveyed. Songmeters were programmed to record a total of four hours per day comprised of two hours immediately after sunset and two hours prior to sunrise to align with peak masked owl call periods<sup>16</sup>. Field data was retrieved at the end of the survey period and subjected to an acoustic analysis using Raven Pro 1.6.1 to screen for call signatures of the masked owl (including the predominant screech and chatter call types<sup>17</sup>).

### **Tasmanian devil – *Sarcophilus harrisii* (e/EN) and spotted-tailed quoll – *Dasyurus maculatus* (r/VU)**

The Tasmanian devil occupies a wide range of habitats across Tasmania and exploits landscapes with a mosaic of pasture and forest with high prey densities. It is attracted to roadkill hotspots, which provide a concentrated scavenging resource. Devil populations have declined substantially since the first observations of the infectious cancer known as devil facial tumour disease (DFTD). DFTD has now spread across much of Tasmania. The reduced population is also likely to be more sensitive to additional threats such as death by roadkill, competition with cats and foxes, and loss or disturbance of areas surrounding traditional dens where young are raised. These demographic pressures mean that the protection of breeding opportunities is particularly important for the species.

The spotted-tailed quoll occurs throughout Tasmania as well as the eastern mainland of Australia. On the mainland, its numbers have declined, and Tasmania is now its stronghold. The spotted-tailed quoll is most abundant in areas containing rainforest, wet forest, and blackwood swamp forest. Highest-quality habitat is extensive unfragmented fertile lowland wet forest vegetation. The home ranges of female quolls vary in size depending on site productivity.<sup>18</sup>

Commonwealth guidelines for surveying Tasmanian devils and quolls<sup>19</sup> have a focus on detecting the presence of a species. The NRE Guidelines<sup>20</sup> are designed to assess impacts of development proposals and focus on potential denning opportunities, recognising the importance of limiting demographic pressures. This is particularly relevant to the Tasmanian devil in an era of increased mortality resulting from DFTD.

Regardless of the broad-scale habitat suitability survey approach, presence/absence was surveyed concurrently with other survey efforts. To determine presence or absence,<sup>21</sup> the area was searched for scats and prints during the daytime, with particular attention given to potential dispersal routes (such as tracks) and soft substrate. Scats in particular are often detected in latrine sites such as at track junctions and creek crossings.<sup>22</sup>

Characteristics of natal dens for these species include a dry, structurally stable inner chamber, a chamber that is sufficient in size for the mother and litter but is not so large as to be undefendable (which includes an entrance that is a tight fit for the mother), and the presence of nooks and crannies for the young to hide in.<sup>23</sup> Preferable habitat characteristics are considered to include direct sun near the den entrance, shelter from predators around the den mouth, a dearth of predators in the area (excluding other devils), an adequate prey base,

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<sup>16</sup> Todd et al (2018)

<sup>17</sup> Todd et al (2017)

<sup>18</sup> Bryant & Jackson (1999)

<sup>19</sup> DSEWPaC (2011)

<sup>20</sup> DPIPWE (2015a)

<sup>21</sup> DSEWPaC (2011); DPIPWE (2015a)

<sup>22</sup> DSEWPaC (2011)

<sup>23</sup> Mooney (unpublished data)

habitat heterogeneity, complex shelter elements (such as cliffs, caves, earth banks and log piles), and friable soil for digging the burrows.<sup>24</sup> Some of these traits are fine-scale habitat attributes, whereas others are at a landscape scale (or have plausible proxies at the landscape scale). Thus, during surveys, to determine the denning potential, observers considered the presence of burrows/potential den sites, as well as higher level traits such as hydrology, soil and vegetation structure. Whilst it was not an aim of this assessment to undertake a systematic search for all possible den structures, our general survey covered more than the minimum of 30% visual coverage recommended in the Department of NRE Guidelines.<sup>25</sup>

The distribution of potential natal denning habitat was modelled on the basis of vegetation communities within the site and their likelihood of containing suitable habitat features as described above. A breakdown of this classification methodology and associated rationale is provided in Table 1. It should be stressed that this is a model only and therefore indicates the distribution of potentially viable habitat at a landscape scale. It is not suited to the identification of small, localised features.

**Table 1: Natal den habitat suitability classes for the Tasmanian devil and spotted-tailed quoll**

Suitability class for devil maternal natal den	Rationale
<b>Optimal</b>	<p>This category contains areas deemed optimal for denning opportunities based on field observations. Characteristics may include:</p> <ul style="list-style-type: none"> <li>• Areas containing observed burrows, dens, and/or latrines;</li> <li>• Areas with potential denning structures;</li> <li>• Areas of structurally complex wet and dry eucalypt forest with well-drained soils, sheltered rock features, and logs and root discs;</li> <li>• Areas of structurally complex wet eucalypt, mixed forest, and rainforest with features suitable for denning.</li> </ul>
<b>Suboptimal</b>	<p>This category includes areas that contain forest that is potentially suitable but may not be optimal due to relatively simple forest structure and/or poor drainage. Characteristics may include:</p> <ul style="list-style-type: none"> <li>• Apparent lack of denning structures or opportunities;</li> <li>• Areas with some apparent denning opportunity but that have poor drainage and/or may be prone to flooding.</li> </ul>
<b>Unsuitable</b>	<p>This class captures all areas that are deemed unsuitable for denning based on field observations. Characteristics of this class may include:</p> <ul style="list-style-type: none"> <li>• Vegetation that is typically prone to flooding or swampy;</li> <li>• Areas of relatively structurally simple, wet heathland and wet scrub;</li> <li>• Areas with no denning opportunities;</li> <li>• Areas of wetland or those that are entirely cleared where there is no chance of finding a natal den.</li> </ul>

<sup>24</sup> Mooney (unpublished data); DPIPWE (2015a)

<sup>25</sup> DPIPWE (2015a)

## 1.5 Assessment of Conservation Significance

The state and federal governments are committed to achieving a Comprehensive, Adequate and Representative (CAR) reserve system based on TASVEG mapping. The reservation target of a vegetation type relates to its current extent compared with the modelled extent prior to European settlement. This comparison provides an estimate of the proportion lost due to land clearing. Those vegetation types that are rare (generally less than 1000 ha) or have suffered considerable loss (approaching 70 % for vulnerable and 90% for endangered) qualify for listing as 'threatened' on the *Nature Conservation Act 2002 (NCA)*.<sup>26</sup>

For forests, reservation targets were set using the nationally agreed JANIS criteria as part of the Tasmanian Regional Forest Agreement (RFA). These aim to achieve a 15% reservation level of area of extent prior to European settlement (often referred to as pre-1750). The reservation targets reflect the extent of loss, with 'threatened' vegetation types having higher targets. The JANIS principles also include the consideration of the bioregional representation of each vegetation type within the CAR reserve system.

The reservation at state and bioregional level has been calculated for all TASVEG2 communities.<sup>27</sup> This does not include any modelling of pre-1750 levels but is based on a tenure analysis of what is currently mapped.

The most recent bioregional and state analysis reservation against JANIS criteria was completed for the Independent Verification Group for the Tasmanian Forests Intergovernmental Agreement.<sup>28</sup> This analysis calculates areas required to achieve a CAR Reserve system based on the RFA modelling. No similar modelling has been undertaken for the current TASVEG non-forest communities, although native grassland communities have been assessed at the state level.<sup>29</sup>

Vegetation matters of national environmental significance (MNES) are listed on the Commonwealth EPBCA. The conservation significance of individual species is determined at a state and federal level by the Tasmanian TSPA and Commonwealth EPBCA (Appendix 1), the implications of which are considered in accordance with relevant legislation (Section 5).

## 1.6 Limitations

In the current survey, because of seasonal variations in detectability and the difficulty of accurately identifying closely related species, there may be some herb, orchid and/or graminoid species present on the site that have been overlooked as they flower at times of the year other than when the survey was undertaken. We have, however, applied our best endeavours to sample across multiple seasons and particularly during the optimal flowering windows of ephemeral flowering species. To compensate for any potential limitations in species detectability, field data from the present study were supplemented with data from the Tasmanian Natural Values Atlas.<sup>30</sup> All threatened plant species known to occur in the local area (5 km) are considered in terms of habitat suitability on site.

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<sup>26</sup> Schedule 3a NCA (2002)

<sup>27</sup> DPIPWE (2010)

<sup>28</sup> Knight (2012)

<sup>29</sup> Lowland Grassland Review Expert Group (2008)

<sup>30</sup> NRE (2023)

## 2 BIOLOGICAL VALUES

### 2.1 Vegetation

Figure 2 illustrates the distribution of the TASVEG vegetation mapping units recorded on the site. Most of the site is dominated by wet eucalypt forest with areas of modified land where tracks and recent existing earth works have been undertaken. Occasional patches of non-eucalypt forest and rainforest were found restricted to lower lying areas nearby which will remain unaffected by these works.

Our field survey established that the project area is comprised of 3 native TASVEG communities/units as well as one modified land class as follows:

- *Eucalyptus obliqua* forest over leptospermum (WOL) – 0.17 ha
- *Eucalyptus obliqua* over rainforest (WOR) – 0.94 ha
- *Eucalyptus obliqua* forest with broad-leaf shrubs (WOB) – 0.52 ha
- Modified land – Extra-urban miscellaneous (FUM) – 2.33 ha

### 2.2 Community descriptions

#### ***Eucalyptus obliqua* forest over Leptospermum (WOL)**

WOL occurs on rises and slopes with improved drainage in the northern quarry area (Plate 1).

This community is characterised by the dominance of *Eucalyptus obliqua* over a tall shrub layer of *Leptospermum scoparium* and *Melaleuca squarrosa*. Canopy heights can reach more than 35 m. Other species commonly found in the understorey of tall shrubs include, but are not limited to, *Acacia mucronata*, *Cenarrhenes nitida*, *Monotoca glauca*, *Coprosma quadrifida* and *Nematolepis squamea*. The community is somewhat transitional into WOR in places as evidenced by the presence of rainforest tree species such as *Phyllocladus aspleniifolius*, *Eucryphia lucida* and *Atherosperma moschatum*. Ground layer vegetation is dominated by *Gahnia grandis* and *Bauera rubioides* with numerous fern species including *Gleichenia microphylla*, *Notogrammitis billardiarei*, *Blechnum wattsii*, *B. nudum* and *Hymenophyllum rarum*.

This community is well reserved and not recognised as threatened under state or federal legislation.

#### ***Eucalyptus obliqua* over rainforest (WOR)**

WOR occurs predominantly along the margins of Lake Pieman but also along the lower reaches of an unnamed stream immediately east of the footprint (Plate 2).

The community is characterised by a dominant canopy of *Eucalyptus obliqua*. These canopy trees were predominantly large, up to 40 m tall and averaging 1 m DBH, with occasional trees up to 3.5 m DBH. The understorey was generally open, and commonly included *Atherosperma moschatum*, *Anopterus glandulosus*, *Eucryphia lucida*, *Nothofagus cunninghamii*, *Anodopetalum biglandulosum*, *Phyllocladus aspleniifolius* and *Acacia melanoxylon*. Ground ferns such as *Blechnum wattsii* and *Polystichum proliferum* were dense in patches but of low diversity, as were herbs.

This community is well reserved and not recognised as threatened under state or federal legislation.

#### ***Eucalyptus obliqua* forest with broad-leaf shrubs (WOB)**

WOB is common throughout the wider area surrounding Bobadil and is present within the northern quarry site (Plate 3). It is characterised by a canopy dominated by *Eucalyptus obliqua* with a dense, broad-leaf wet sclerophyll understorey. Canopy trees in this community reach a height of 30–35 m and can be considered a similar age class to trees found in WOR, with DBH averaging 1 m and occasional trees reaching a DBH greater than 2 m. In some areas, the understorey is dominated almost entirely by *Nematolepis squamea*, while in other areas *Pomaderris apetala* is dominant. The shrub layer consists of species such as *Aristotelia peduncularis*, *Coprosma quadrifida*, *Pimelea drupacea*, *Monotoca glauca* and *Zieria arborescens*. The ground layer is dominated by herb species such as *Gonocarpus teucrioides* and *Dichondra repens*. Ground and epiphytic fern species are diverse and include *Dicksonia antarctica*, *Blechnum wattsii*, *Histiopteris incisa*, *Rumohra adiantiformis*, *Microsorium pustulatum* and *Notogrammitis heterophylla*.

This community is well reserved and not recognised as threatened under state or federal legislation.

### **Extra-urban miscellaneous (FUM)**

The tailings dam itself, a small area currently used for storage of drill cores and a cleared area have been mapped as Extra-urban miscellaneous (FUM) (Plate 4). These areas are all highly modified and are not anticipated to recover to a native state in the short to medium term.

These areas identified as FUM do not hold any conservation significance and have a very low likelihood of supporting rare and threatened species.



Plate 1. WOL





**Plate 2. WOR**



**Plate 3. WOB**





Plate 4. FUM

Table 2: Extent and reservation status of the native vegetation communities recorded<sup>31</sup>

TASVEG community and extent in project area	current ha	Reservation ha / %	current ha	Reservation ha / %	Status (JANIS)
	TAS	TAS	West Coast	West Coast	
<i>Eucalyptus obliqua</i> forest over <i>Leptospermum</i> (WOL)	441,000	141,400 / 24.4%	53,300	33,900 / 61.9%	Adequately reserved
<i>Eucalyptus obliqua</i> forest with broad-leaf shrubs (WOB)	120,200	53,200 / 44%	100	100 / 100%*	Adequately reserved
<i>Eucalyptus obliqua</i> forest over rainforest (WOR)	93,500	69,700 / 75%	8,100	6,700 / 82%	Adequately reserved

\*Data obtained from analysis of TASVEG mapping (3 June 2020)

<sup>31</sup> DPIPWE (2014)



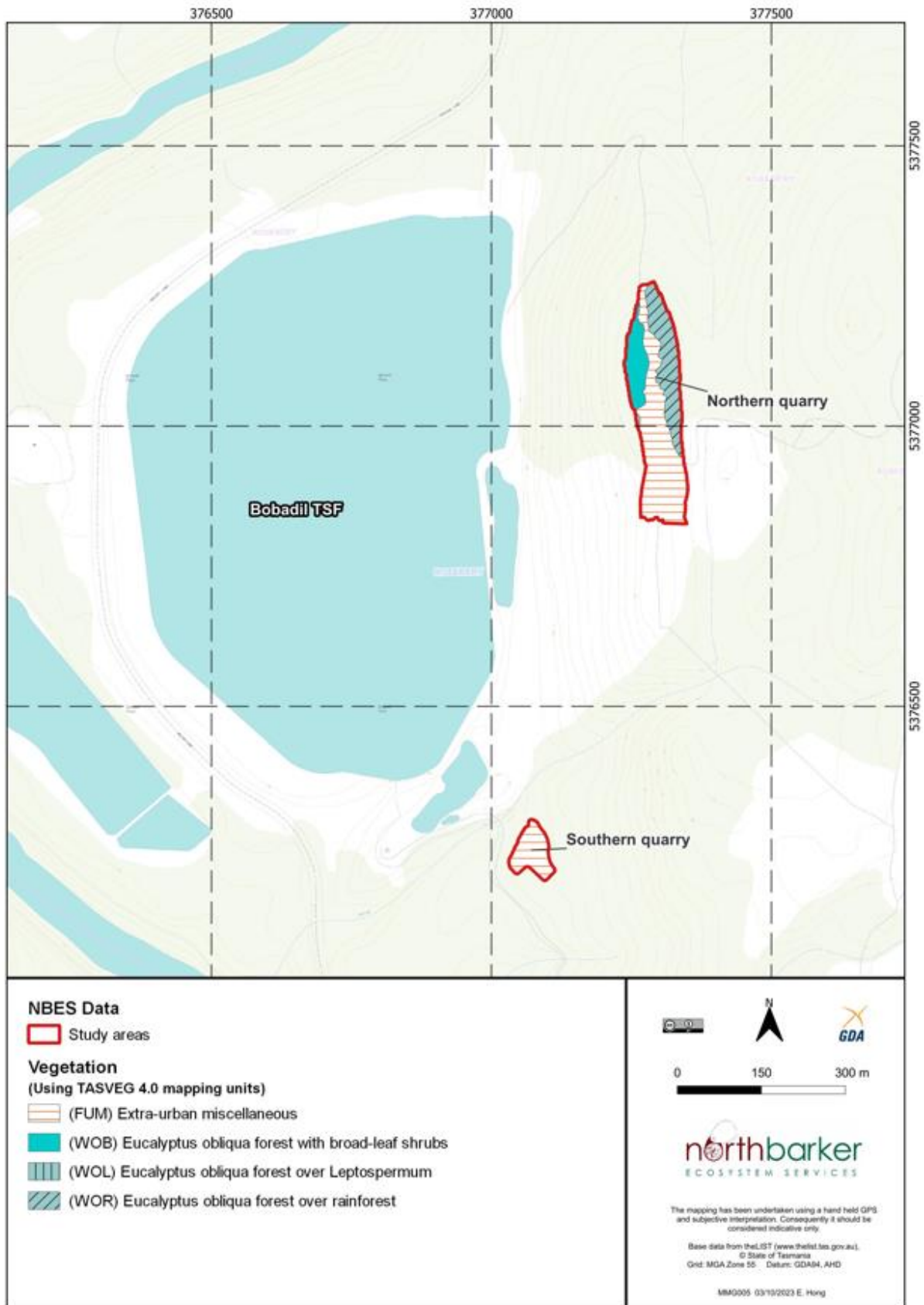


Figure 2: The distribution of TASVEG mapping units

## 2.3 Flora of Conservation Significance

In total, 68 species of vascular plant were recorded on the site (Appendix 2) including two introduced species, one of which is listed as a declared weed species.

No threatened vascular plant species listed under the schedules of the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were recorded from within the project area. None is considered to have a high likelihood of occurrence.

A search of the Natural Values Atlas (NRE database)<sup>32</sup> registered two threatened flora species previously recorded within a 5 km radius of the project area. A further search of the EPBC Protected Matters Search Tool identified one species that has the potential to occur within the project area based on habitat mapping. Table 3 reviews the relevant species and considers the suitability of habitat and likelihood of occurrence.

**Table 3: Flora species of conservation significance previously recorded within a 5 km radius of the site<sup>33</sup>**

Species	Status <sup>34</sup> TSPA / EPBCA	Potential to occur	Observations and preferred habitat <sup>35</sup>
<b>Known within 5000 m</b>			
<i>Orthoceras strictum</i> horned orchid	Rare / -	Low to Moderate	<p>Two records (one of which is from 1968) of this discreet grass-like orchid are known from within 5 km of the site. Suitable habitat for this species is generally associated with buttongrass moorland, sedgy heathland, and open sedgy woodland. Small pockets of vegetation adjacent to the northern quarry area provide potential habitat for this species (mapped NLM vegetation). This habitat is situated immediately east of the southern end of the northern quarry but does not extend within the immediate impact areas.</p> <p>These habitat areas were subjected to a targeted orchid survey on 30 and 31 January 2023 and no evidence of the species was detected.</p> <p>Other know populations of horned orchid in western Tasmania were monitored by NBES during this time to determine its developmental timing in the region (Appendix 4). This has enabled a high degree of confidence in determining that this species is absent from the Bobadil site.</p>

<sup>32</sup> NVA report September 2022 (DPIPWE)

<sup>33</sup> NVA report September 2022 (DPIPWE); EPBC Act Protected Matters report, Commonwealth of Australia (year?)

<sup>34</sup> Tasmanian *Threatened Species Protection Act 1995*; Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

<sup>35</sup> Lazarus et al. (2003); Jones et al. (1999)

<p><i>Schoenoplectus tabernaemontani</i> river clubsedge</p>	<p>Rare / -</p>	<p>None</p>	<p>This species has a very disjunct distribution – and is generally found in eastern Tasmania and on Bass Strait islands, where it occurs on the margins of rivers or wetlands. It was recorded by North Barker at a separate tailings facility (2/5 Dam) in 2014 and was subsequently relocated to Karlsons Knob dam. A recent survey of the translocated plants found them to be in very low numbers at the site.</p> <p>Suitable wetland habitat for this species is not present within the project area in this case.</p>
<p><b>Predicted by EPBC habitat mapping<sup>36</sup></b></p>			
<p><i>Hypolepis distans</i> scrambling ground fern</p>	<p>endangered / Endangered</p>	<p>Low</p>	<p><i>Hypolepis distans</i> is known only from the north-west and King Island in Tasmania. It occurs in wet scrubland bordering <i>Melaleuca ericifolia</i> swamp forest, in disturbance-induced <i>Baloskion tetraphyllum</i> rushland, and in disturbed areas in wet eucalypt forest dominated by <i>Eucalyptus brookeriana</i> and <i>Acacia melanoxylon</i> (blackwood). Soils tend to be high in organic matter with moderate to poor drainage, while all sites are in areas of moderate rainfall below 40 m elevation.</p> <p>Although known populations are sparse and confined to the far north-west and King Island, new subpopulations have been discovered in the past decade, suggesting that targeted surveys may uncover further populations. However, there is a low likelihood that the species is present within the study area given the nearest known sites occur approximately 90 km north of the Bobadil TSF. No suitable habitat for this species (Brooker's Gum, blackwood forest or paperbark swamp forest) will be impacted by the proposed works.</p>

<sup>36</sup> EPBC Act Protected Matters report, Commonwealth of Australia

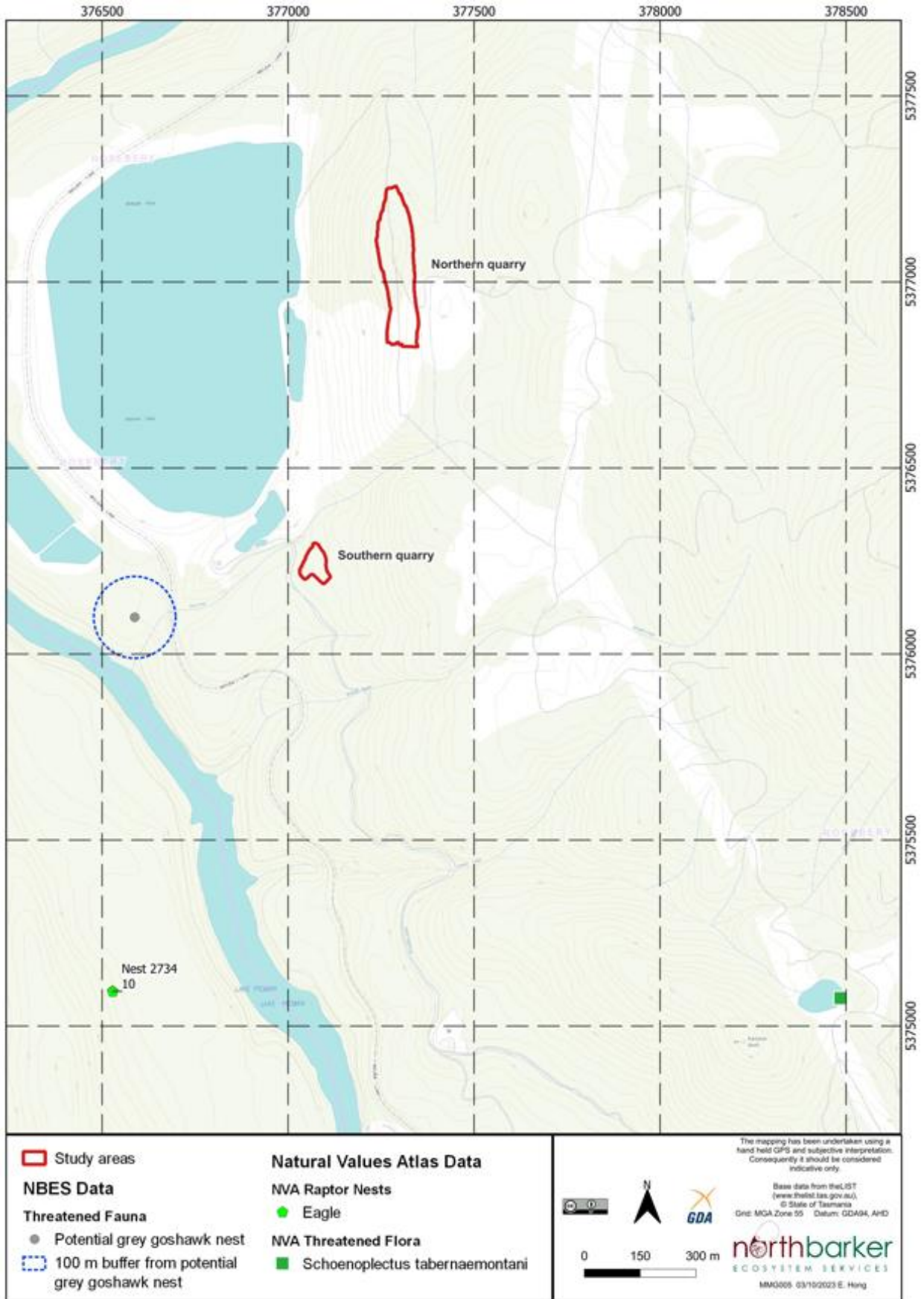


Figure 3: Threatened flora and fauna records (including NVA and NBES field data)

## 2.4 Fauna of Conservation Significance

The Bobadil study area contains limited habitat of optimal value for denning mammals but does include varying amounts of potential habitat for the wedge-tailed eagle/white-bellied sea eagle, masked owl and grey goshawk.

### **Tasmanian devil (*Sarcophilus harrisii*)<sup>37</sup> endangered/Endangered**

This species was listed on the TSPA and EPBCA following the significant impact of devil facial tumour disease (DFTD) on the population. It is primarily a carrion-eater and is generally nocturnal. During the day it will retire to a cave or den, a hollow log, or thick scrub. At night it forages over a range of 10 to 20 hectares. The animals are solitary but not territorial and their individual foraging ranges may overlap considerably. This species is proven to be tolerant of habitat modification by breeding successfully in human domestic environments such as under houses and sheds.

As is generally the case with threatened fauna, greater importance is placed upon the protection of devil breeding habitats rather than their foraging habitats, to maximise reproductive opportunities and success. With this in mind, we have mapped the site in terms of suitability of habitat for devil denning (Figure 4). No area of the site is considered to host optimal denning habitat. The areas mapped as suboptimal were given this rating because of their relatively dry slope position and forest type.

No suitable den structures were observed in the otherwise suboptimal habitat. However, this does not demonstrably rule out the potential for dens to occur elsewhere in this extensive habitat.

### **Spotted-tailed quoll (*Dasyurus maculatus*) rare/Vulnerable**

The spotted-tailed quoll occurs throughout Tasmania and also in mainland eastern Australia. On the mainland, its numbers have declined, and Tasmania is now its stronghold. The spotted-tailed quoll is most abundant in areas containing rainforest, wet forest and blackwood swamp forest. Highest quality habitat is extensive unfragmented fertile lowland wet forest vegetation. The home ranges of females range in size depending on site productivity.<sup>38</sup>

The core range for the spotted-tailed quoll is lowland forested areas of the north bounded by Wynyard, Gladstone and the central and north-eastern highlands. Lower densities of animals occur elsewhere in suitable habitat throughout Tasmania. They are solitary with home ranges that vary typically between 100 ha and 5000 ha; females tend to have smaller, largely exclusive, home ranges, whereas males' home ranges overlap several females' home ranges.<sup>39</sup>

The project area does not occur within a key site or important population (Figure 5) of this species and the native vegetation on site constitutes predominately foraging habitat. The area of mapped suboptimal habitat for Tasmanian devil is also moderately suitable for the dens of the spotted-tailed quoll (*Dasyurus maculatus*). There were no signs of presence of the spotted-tailed quoll during our survey, but it is likely that quolls utilise the site at least for foraging, and the site may represent part of one or more female home ranges.

<sup>37</sup> Information largely taken from Save The Tasmanian Devil website ([www.tassiedevil.com.au](http://www.tassiedevil.com.au)) and DPIWE threatened species website

<sup>38</sup> Bryant & Jackson (1999)

<sup>39</sup> Long & Nelson (2010), cited in the spotted-tailed quoll (Tasmanian population) Species Profile and Threats Database <http://www.environment.gov.au>





Figure 4: The extent of Tasmanian devil denning habitat

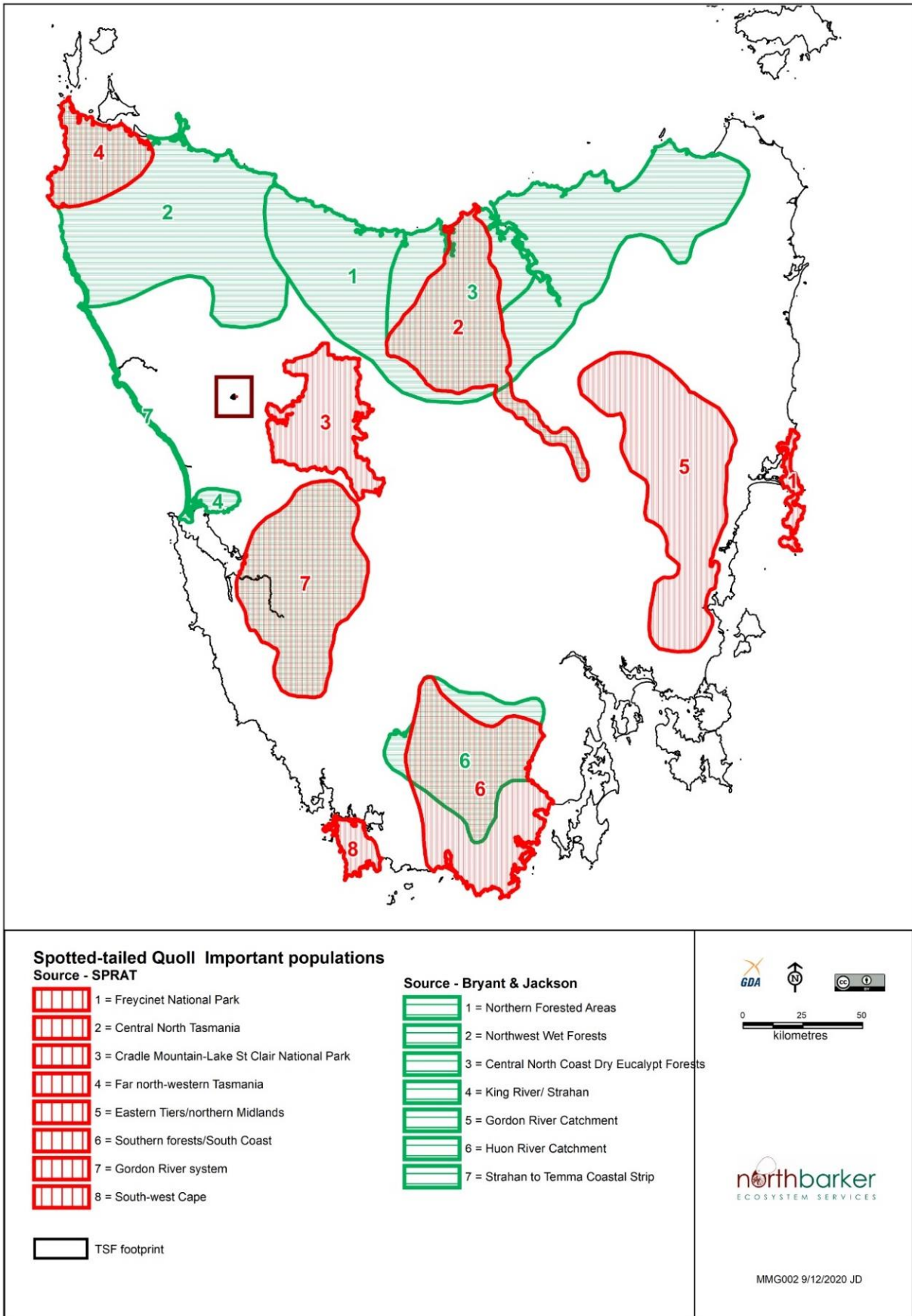


Figure 5: The distribution of important populations and key sites for spotted-tailed quoll

**Australian grayling (*Prototroctes maraena*) vulnerable/Vulnerable**

Habitat values for aquatic fauna are particularly limited in proximity of the study area. No streams or freshwater bodies exist within the immediate disturbance footprint of the quarry areas themselves, however these sites do occur within the catchment of small order streams which flow into Lake Pieman. Desktop searches of the NVR<sup>40</sup> reveal the potential presence of one threatened fish species in Lake Pieman (Australian Grayling *Prototroctes maraena*), however specialist consultation has confirmed that this species is absent from the dam itself including catchment areas upstream of the Lake Pieman dam wall<sup>41</sup>. As such, no impacts to the Australian grayling or any other threatened aquatic fauna are anticipated in relation to this project.

**Grey goshawk (*Accipiter novaehollandiae*) endangered/-**

The grey goshawk is a medium-sized bird of prey. This species nests in mature wet forests, usually near watercourses.<sup>42</sup> Nests are typically located in large blackwood, eucalypt, silver wattle, myrtle, or sassafras trees and tend to be built in a fork beneath the shady crown of the tree. They are large (~50 cm) and made of sticks up to 20 mm thick, with leaves used to line the shallow cup.<sup>43</sup>

The birds hunt from a perch in the canopy and require an open structure to fly beneath the tree canopy to capture animals in the subdominant canopy, often of tea tree, . Grey goshawks will feed on ring-tailed possums as well as small birds, reptiles, and invertebrates.

The project area is within the core range of this species.<sup>44</sup> The grey goshawk has been recorded within 5 km of the project area and has the potential to occur within the project area. This is based on habitat mapping according to the published ranges and the Natural Values Atlas report<sup>45</sup>.

During surveys of the surrounding area a suspected grey goshawk nest was noticed under the canopy of a blackwood tree. The tree was approximately 20 m high with the nest at about 18 m high. No whitewash (faeces) or other signs of goshawk activity were observed, which suggested the nest may currently be inactive. The nest was located approximately 500 m west of the southern quarry at 376587 mE / 5376099 mN, as shown in Plate 5 (below) and Figure 3 (above).

**Wedge-tailed eagle (*Aquila audax fleayi*) endangered/Endangered and white-bellied sea-eagle (*Haliaeetus leucogaster*) vulnerable / -**

One confirmed eagle nest (nest 2734) is known to be south of the existing Bobadil TSF on the western side of Lake Pieman. The nest is situated approximately 1.4 km from the nearest location of proposed embankment works and approximately 1.2 km from the proposed vehicle and machinery parking site. Given the location of this nest in relation to the proposed development, no management constraints are required on account of this nest (Figure 6).

Given the prevalence of mature wet eucalypt forest vegetation throughout much of the surrounding landscape within 1 km of the project area, a targeted aerial search of eagle nests was undertaken on 5 April 2023<sup>46</sup>. No additional nests were identified within 1 km of the proposed footprint. A total of 64.1 ha of suitable eagle nesting habitat (habitat category 3 or higher) is present within 1 km of the study area (Figure 6).

<sup>40</sup> NVR report February 2023 (NRE)

<sup>41</sup> Pers comm Inland Fisheries Service (2023)

<sup>42</sup> Bryant & Jackson (1999)

<sup>43</sup> FPA (2010)

<sup>44</sup> Bryant & Jackson (1999)

<sup>45</sup> NVR report February 2023 (NRE)

<sup>46</sup> NBES (2023)



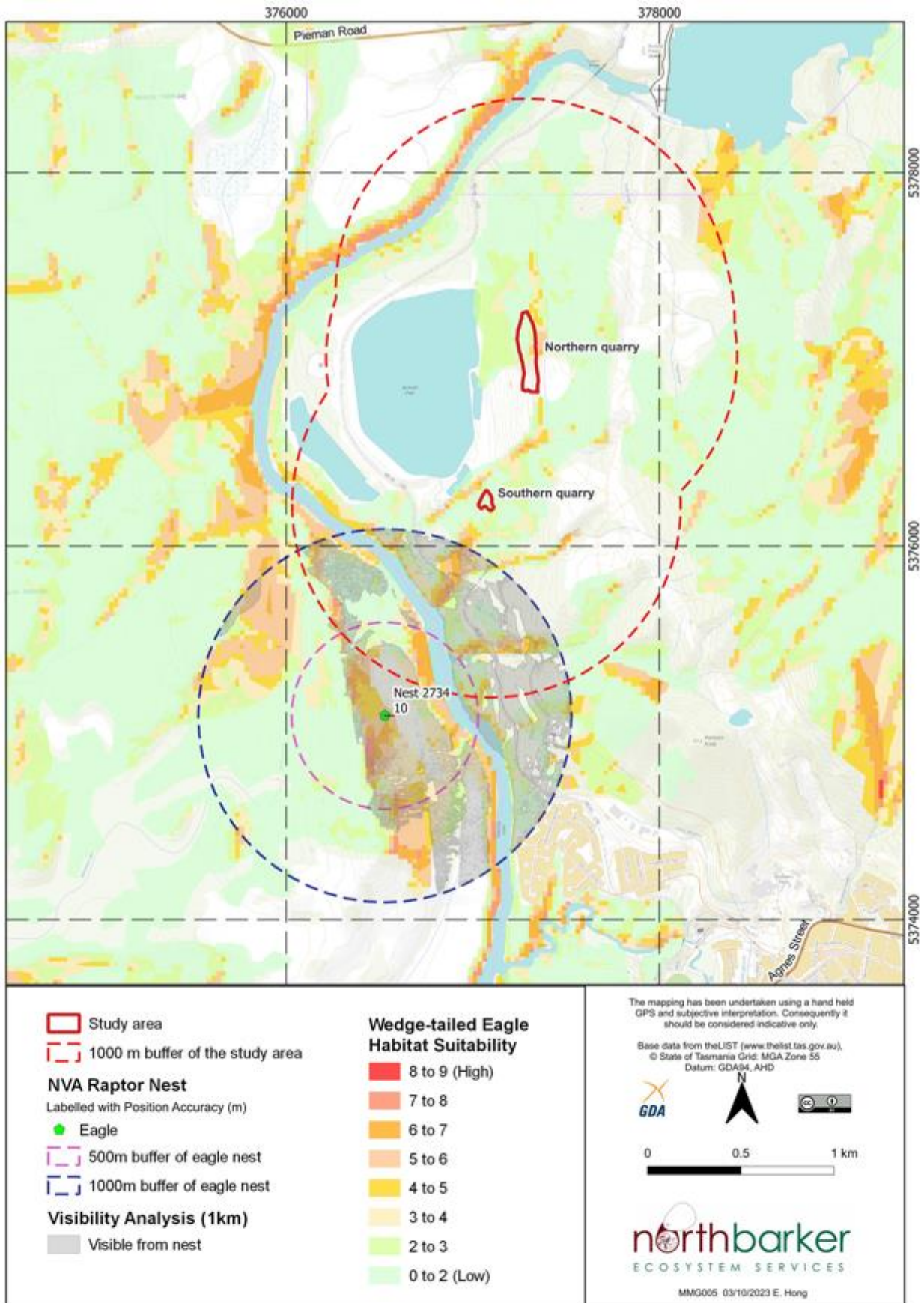


Figure 6: The distribution of modelled eagle nesting habitat and viewshed modelling for the existing nest location





Plate 5. Suspected grey goshawk nest in a blackwood tree

**Tasmanian masked owl (*Tyto novaehollandiae castanops*) e/V**

The Tasmanian subspecies is a nocturnal vertebrate predator that is most active at night and roosts during the day. It feeds predominantly on introduced rodents and rabbits on agricultural land, and on arboreal marsupials, terrestrial mammals and native birds in less disturbed habitats. The subspecies' diet can vary greatly between sites, and individuals can switch between prey items depending on prey availability and size.<sup>47</sup>

The subspecies inhabits a diverse range of forests and woodlands including agricultural and forest mosaics. Forests with relatively open understoreys, particularly when these habitats adjoin areas of open or cleared land, are particularly favoured.<sup>48</sup>

The subspecies is generally found in territorial pairs, or as solitary individuals that are most likely juveniles.<sup>49</sup> Pair bonds are life-long, and pairs appear to occupy a permanent home range or territory.<sup>50</sup> Breeding is reported to be highly seasonal in Tasmania,<sup>51</sup> with most females laying eggs in mid-October to early November,<sup>52</sup> although in May 2006 a nest was found containing a small chick.<sup>53</sup> Nesting occurs in large tree hollows of living or dead trees, but sometimes in vertical spouts or limbs.<sup>54</sup> The birds reach sexual maturity at around 1 year of age, but age of

<sup>47</sup> Green (1982), Green and Rainbird (1985), Mooney (1992), Mooney (1993)

<sup>48</sup> Debus (1993), Bell *et al* (1997), Higgins (1999)

<sup>49</sup> Higgins (1999)

<sup>50</sup> Hill (1955), Kavanagh and Murray (1996)

<sup>51</sup> Mooney (1997)

<sup>52</sup> Green (1982), Mooney (1997)

<sup>53</sup> Bell (pers. comm.)

<sup>54</sup> Bell *et al.* (1997); Higgins (1999)

first breeding has not been reported.<sup>55</sup> The subspecies' generation length is unknown but is estimated to be 5 years.<sup>56</sup>

The site falls within the core range of this species according to the published ranges,<sup>57</sup> the Natural Values Atlas and EPBC protected matters report.<sup>58</sup> Records of the species were confirmed recently from song meter data captured by North Barker at South Marion oak approximately 1 km south of the Bobadil site (NBES, 2021),<sup>59</sup> which also confirmed that the species does occur in the local landscape.

Significant nesting habitat for the subspecies includes large trees with suitably large hollows (>15 cm entrance diameter). Figure 7 depicts areas of wet eucalypt forest within the project area that contain trees of a suitable diameter (> 1 m DBH) that can be considered as having potential to bear hollows and thus support nesting and roosting. Trees in this area were specifically assessed for their current hollow condition and determined to be lacking any hollows suitable to support masked owl nesting (Plates 9 & 10).

Songmeter survey results confirmed the detection of low rates of masked owl calls within the study area. From the 206 survey days captured across three songmeters, there were a total of 2 days where masked owl screech calls were detected. A summary of these results is provided in Table 4.

**Table 4: Masked owl call detection survey results**

Device	Location (GDA 94)	Data capture dates	Results
Songmeter #2	377094 / 5376313	6/9/12 – 12/11/23 (68 days)	No calls detected
Songmeter #7	3773270 / 5377080	6/9/23 – 13/11/23 (69 days)	3 screech calls (dawn 27/9/23)
Songmeter #8	377320 / 5377321	6/9/23 – 13/11/23 (69 days)	1 screech call (dusk 20/10/23)

These results suggest that the Bobadil TSF is likely to fall within an occupied masked owl territory, however the rates of detection from the songmeter surveys are particularly low and effectively amount to a masked owl visiting the study area once a month during September and October of 2023. The large size of masked owl breeding territories<sup>60</sup>, the availability of mature eucalypt forest in the surrounding landscape and the low rates of detected calls suggest that any potential masked owl habitat trees within the study area were not utilised for breeding during the 2023 breeding period.

<sup>55</sup> Higgins (1999)

<sup>56</sup> Garnett and Crowley (2000)

<sup>57</sup> Todd (2012) and FPA (2014)

<sup>58</sup> NVA report February 2023 (NRE); EPBC Protected Matters Report, 29/09/2022

<sup>59</sup> NBES (2021)

<sup>60</sup> Young et al (2020)





Plate 6. Mature eucalypt trees (> 1m DBH) lacking any evidence of large hollows





Plate 7. Mature eucalypt tree (> 1m DBH) surveyed from the ground (left) and from above (right). It contained small hollows, but no hollows large enough for masked owl nesting





Figure 7: Potential masked owl habitat within the project area

### **Swift parrot (*Lathamus discolor*) e/CR**

The swift parrot spends its winter in south-eastern mainland Australia before migrating to Tasmania in late winter and early spring to breed. During the breeding season, nectar from Tasmanian blue gum (*Eucalyptus globulus*) and black gum (*Eucalyptus ovata*) flowers are the primary food resource for the species. These eucalypts are patchily distributed throughout Tasmania, and their flowering patterns are erratic and unpredictable, often leading to only a small proportion of swift parrot habitat being available for breeding in any one year. Swift parrots breed in tree hollows in mature eucalypts within foraging range of a flower source. In most seasons, breeding activity is concentrated within the east and south-eastern parts of the state.

The nearest area to the Bobadil TSF that is recognised as important for swift parrot breeding is what is referred to as the 'North and West Potential Range', which is an area of approximately 400 km<sup>2</sup> situated north of Strahan and west of Zeehan. Bobadil is approximately 22 km east of this area, and as such, is currently recognised as outside the potential breeding range of this species, according to the published ranges.<sup>61</sup>

It should be noted, however, that recent observations of swift parrots now appear on the Natural Values Atlas west of Lake Pieman in the South Marion oak area. These records constitute a total of 8 records within 5 km of Bobadil which report observations of swift parrot breeding (including chick begging calls) between approximately December 2022 and January 2023. Whilst these records could be considered atypical observations of such swift parrot activity, there is no biological limitation within the species that would prevent such an event in this area if a sufficient food resource was present near suitable nesting trees.

In the case of Bobadil, there are numerous large trees in the surrounding landscape with the potential to support nest hollows for this species (assuming foraging habitat is present also); however, few such trees exist within the immediate impact footprint of the proposed works (the same 12 trees as those considered for the masked owl). According to mature forest habitat mapping layers (Figure 8) there are approximately 3,560 ha of medium to high density mature forest and 4,500 ha of low-density mature forest within 10 km of the planned quarry impact areas, indicating abundant potential for mature eucalypt trees with hollows.

However, according to TASVEG 4.0, no swift parrot foraging habitat (*E. globulus* or *E. ovata* forest) has been mapped within 10 km of Bobadil. There are approximately 6,574 ha of eucalypt forest in total within 10 km of the project area, all of which is dominated by either *E. obliqua*, *E. nitida* or *E. delegatensis* (none of which are foraging species for the swift parrot)<sup>62</sup>. Isolated and relatively small (0.5 to 5 ha) occurrences of *E. brookeriana* forest (not mapped in Tasveg) are known to occur within 10 km of the Bobadil TSF<sup>63</sup>, however *E. brookeriana* is recognised as a potential driver of swift parrot breeding activity in the Eastern Tiers region of Tasmania only<sup>64</sup>. Given the overall lack of forest stands supporting foraging habitat within 10 km of Bobadil, there is a low likelihood of any trees near Bobadil being considered for breeding by this species in any given breeding season.

Several other threatened and/or migratory fauna species were identified as having the potential to occur on the site based on broad-scale habitat mapping presented within the EPBC Protected Matters database. Table 3 provides a description of the preferred habitat of these species and an assessment of the likelihood of their occurrence on the site. Despite suitable habitat being predicted by the EPBC database, no other species has been observed within 5 km of the site.

### **Blue-winged Parrot (*Neophema chrysotoma*) -/VU**

The blue-winged parrot is another migratory species which is dependent on hollow-bearing trees for nesting. The species is observed widely throughout Tasmania during its breeding period (September to February), however observations of nesting are limited predominantly to the far

<sup>61</sup> FPA (2014) and NVA report February 2023 (NRE)

<sup>62</sup> Tasveg 4.0 analyses 14/05/2024

<sup>63</sup> NBES unpublished data

<sup>64</sup> FPA (2022)



south-west of the State with isolated occurrences in the southeast, west and north<sup>65</sup>. According to the Natural Values Atlas the nearest records of blue-winged parrot nesting are approximately 80 km south of the project area, to the south of Macquarie Harbour. On this basis, there is a low likelihood of this species utilising the 12 hollow-bearing trees within the project area for nesting.

**Table 5: Fauna species of conservation significance previously recorded within a 5 km radius of the site, or with the potential to occur based on EPBC habitat mapping<sup>66</sup>**

Note: Migratory species are not included because no suitable habitat is present within the project area.

Species	Status <sup>67</sup> TSPA / EPBCA	Potential to breed <sup>68</sup>	Observations and preferred habitat <sup>69</sup>
<b>Known within 5000 m</b>			
<i>Dasyurus maculatus</i> spotted-tailed quoll	Rare / VULNERABLE	Low to moderate	Two records of the species are known from within 5 km, the most recent being made in 1994. Suitable habitat has been mapped within the site. No direct or indirect evidence of the species has been observed on site. However, it is highly likely that the quoll utilises the project area from time to time for hunting. The site is likely to be part of the home range of at least 1 female.  Wet eucalypt forest throughout the site has been mapped as suboptimal. The ground throughout this habitat was wet and generally lacked the structural features such as logs, rock outcrops and dry burrowing sites that the species utilises.
<i>Sarcophilus harrisii</i> Tasmanian devil	Endangered/ ENDANGERED	No optimal denning habitat	The NVA identifies 35 observations of the species within 5 km of the project area. No direct or indirect evidence of the species has been observed on site.  No optimal denning habitat has been recorded within the project area; however, areas of suboptimal denning habitat have been mapped (Figure 4). Further targeted searches for dens may be required if optimal den habitat is discovered. Prey availability throughout the footprint is likely to be low; however, the species is likely to utilise the project area occasionally for foraging.
<b>Potential to occur based on habitat mapping</b>			

<sup>65</sup> Natural Values Atlas data – accessed 14/05/2024

<sup>66</sup> NVA report February 2023 (NRE), EPBC Act Protected Matters report, Commonwealth of Australia)

<sup>67</sup> Tasmanian Threatened Species Protection Act 1995, Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

<sup>68</sup> Potential for to occur based on the presence of suitable breeding habitat.

<sup>69</sup> Lazarus *et al.* 2003; Jones *et al.* 1999



BIRDS			
<i>Accipiter novaehollandiae</i> grey goshawk	Endangered / -	Low nesting potential	<p>The grey goshawk has been recorded from the nearby area with one observation of the species on the NVA within 5 km of the project area. A suspected grey goshawk nest was also found approximately 450 m west of the southern quarry area(GPS location 376587E / 5376099N) located approximately 18 m high in a 20 m tall blackwood. Core habitat for this species is generally described as blackwood dominated forest, but it is not uncommon for the species to nest in tree species other than blackwood, including eucalypt and rainforest trees.</p> <p>Potential nesting and foraging opportunities for this species are relatively abundant within the project area and even more so in the surrounding landscape.</p> <p>No impacts to the suspected grey goshawk nest are anticipated from the proposed works.</p>
<i>Aquila audax fleayi</i> Tasmanian wedge-tailed eagle	Endangered/ ENDANGERED	Nesting: low Foraging: low	<p>Requires large, sheltered trees for nesting and is highly sensitive to disturbance during the breeding season.</p> <p>Forested areas occur through the project; however, most of these areas have a westerly or south-westerly aspect and are thus exposed to prevailing westerly weather. No nests were located during the initial ground survey.</p> <p>Further surveying of nesting habitat within 1 km of the study area was undertaken in April 2023 and no new nests were located.</p>
<i>Ceyx azureus diemenensis</i> Tasmanian azure kingfisher	Endangered/ ENDANGERED	Very low	<p>Not known from within 5 km, but the site occurs within core range, with the species primarily utilising open riverine environments in western Tasmania.</p> <p>The project area does not contain rivers or large waterbodies – except for the tailings dam itself, which is not considered suitable habitat. Small, densely vegetated streams are present but are also mostly unsuitable habitat for this species.</p>
<i>Haliaeetus leucogaster</i>	Vulnerable/ Migratory	Nesting: low Foraging: none	<p>Occurs in coastal habitats and large inland waterways. Terrestrial habitat on the site is suitable for very occasional foraging only. Similar to the WTE, little viable nesting</p>

white-bellied sea-eagle			<p>habitat exists within the project area, but considerable areas of potential nesting habitat occur within 1 km.</p> <p>Further surveying of nesting habitat within 1 km of the study area was undertaken in April 2023 and no new nests were located.</p>
<i>Lathamus discolor</i> swift parrot	Endangered/ CRITICALLY ENDANGERED	None	<p>For nesting, this species requires tree hollows adjacent to food plants, which are blue gums (<i>E. globulus</i>) and black gums (<i>E. ovata</i>), and in some parts of the state, Brooker's gum (<i>E. brookeriana</i>). Eight confirmed records and 5 unverified records of this species exist within 5 km of the project. The unverified records include observations of potential swift parrot nesting behaviour.</p> <p>Much of the project area falls outside any areas currently recognised as important for swift parrot breeding; it sits approximately 22 km west of the 'North and West Potential Range' located north of Strahan and west of Zeehan. Limited foraging habitat is available in the local area.</p>
<i>Tyto novaehollandiae castanops</i> Tasmanian masked owl	Endangered/ VULNERABLE	Moderate	Requires a mosaic of forest and open areas for foraging, and large old-growth, hollow-bearing trees for nesting. Potential nesting habitat exists on site in mature wet eucalypt forest in areas adjacent to the proposed works (outside the proposed impact footprint).
<b>FISH</b>			
<i>Prototroctes maraena</i> Australian grayling	Vulnerable/ VULNERABLE	None	<p>A diadromous species (one that has both marine and freshwater stages of its lifecycle) that occurs in major rivers and unpolluted streams with large pools, particularly in the middle and lower parts of the catchment where there are no barriers to the sea. Adults spawn in streams over gravel beds and the young migrate to sea for a period before moving back into rivers. No suitable habitat occurs within the project area or immediate surrounding area.</p>

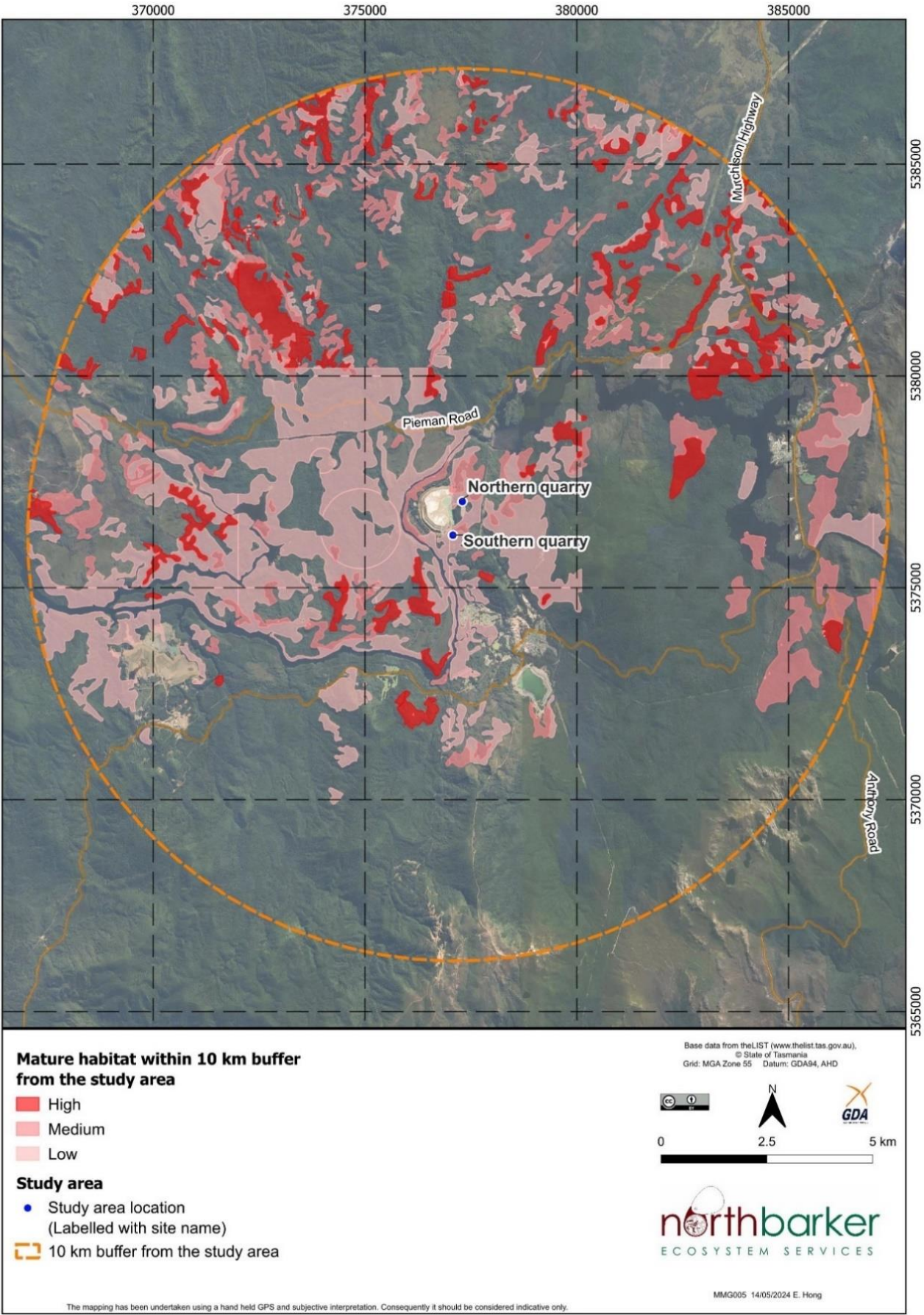


Figure 8: Context of mature forest habitat within 10 km of the project area

## 2.5 Introduced Plants and Plant Pathogens

### Weeds

Records on the Tasmanian Natural Values Atlas document the occurrence of approximately 19 species within 5 km of the project area which are listed as declared weeds. During our field investigations, one declared weed was identified as blackberry (*Rubus fruticosus*). This record was from one location beneath the dam wall.

### Cinnamon root-rot fungus (*Phytophthora cinnamomi*)

*Phytophthora cinnamomi* (PC) surveys confirmed the presence of this pathogen from numerous sites within and surrounding the Bobadil TSF, including from 6 positive soils samples and field-based assessments of symptomatic flora species<sup>70</sup>. Specific sites where PC has been detected include the peat source quarry east of Bobadil, the intermediate peat storage area and numerous locations within the revegetation cover trials on the TSF itself. The pathogen may be distributed more widely around the facility but for the purpose of management the entire TSF including access roads and borrow areas should be considered PC-positive site.

## 3 ASSESSMENT OF IMPACT AND MITIGATION

The following assessment of impacts and mitigation considerations relate to the areas covering the two new quarry sites for the Stage 11 and 12 developments of the Bobadil site.

### 3.1 Native Vegetation Communities

The site supports a typical west coast mosaic of rainforest, wet eucalypt forest and scrub communities. All TASVEG units are well reserved at the state and bioregional level and therefore not considered to be threatened.

Table 4 below lists the extent of each TASVEG unit that occurs within each area.

**Table 4. The extent (ha) of vegetation types in each area**

TASVEG Unit	Southern Quarry	Northern Quarry	Total
(FUM) Extra-urban miscellaneous	0.52	1.83	2.33
(WOL) <i>Eucalyptus obliqua</i> forest over <i>Leptospermum</i>	-	0.02	0.02
(WOR) <i>Eucalyptus obliqua</i> forest over rainforest	-	0.94	0.94
(WOB) <i>Eucalyptus obliqua</i> forest with broad-leaf shrubs		0.52	0.52
<b>Grand Total</b>	<b>0.52</b>	<b>3.29</b>	<b>3.80</b>

### 3.2 Threatened Flora

The site has not been found to support any species of threatened flora and is not thought to have a high likelihood of doing so. Consequently, no mitigation regarding threatened flora species is required, based on current knowledge.

### 3.3 Threatened Fauna

#### Devils and quolls

Although no scats were recorded during the survey, foraging presence of the Tasmanian devil and spotted-tailed quoll is highly likely. Wet eucalypt forest within the project area has been mapped as containing suboptimal habitat for these species.

<sup>70</sup> Quarry Clean (2024)

Further pre-clearance surveys are recommended in accordance with the Department of NRE Survey and Advice Guidelines<sup>71</sup> to ensure that no active den sites are disturbed within 50 m of works areas. Such surveys should be done progressively ahead of the clearing works. For any potential den discovered at that time, a den activity assessment will be required to demonstrate the feature is vacant before it is decommissioned.

It is unlikely that any impact within the areas mapped as unsuitable habitat would conflict with breeding individuals of these species.

### **Grey goshawk**

A grey goshawk nest has been identified within 500 m of the project area as well as areas of potential goshawk nesting habitat within and surrounding the proposed development area. This includes gullies and creek lines supporting blackwood and rainforest trees that are large enough for nesting.

Avoidance of this known nest with a minimum 100 m buffer should be readily achievable as part of the proposed works and as such, no direct or indirect impacts to this nest site are anticipated.

If, for whatever reason, disturbance to a grey goshawk nest cannot be avoided due to physical constraints during works, it may be necessary to apply for a permit to take the nest under the *Threatened Species Protection Act 1995*.

No further targeted surveying for grey goshawk nests is warranted regarding the specific areas proposed for development.

### **Wedge-tailed eagle**

Tasmanian wedge-tailed eagles are sensitive to disturbance around their nests, particularly during their breeding season. The eagle breeding season is accepted to be 1 July to 31 January inclusive, although it may be extended to the end of February in late years (which is determined annually by the FPA around November).

The known eagle nest south-west of the project area is beyond a 1 km line of sight from any of the proposed development areas and therefore no operational constraints are required during the eagle breeding period on account of this nest.

Given the aerial eagle nest search undertaken in April 2023, no additional searches for nests are required in this case.

### **Masked owl**

A total of 12 potential masked owl (TMO) nesting trees are present within the footprint of the northern quarry area (as per Figure 7). The trees are large diameter eucalypts (>1 m DBH), however the ground-based and aerial assessments of these trees do not support evidence of suitable masked owl nesting hollows. As such, these trees are unlikely to support masked owl breeding habitat. Furthermore, songmeter surveys within the study area and within 150 m of the proposed impact footprint have established that it is unlikely that masked owls utilised this area for breeding in the 2023 breeding period.

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<sup>71</sup> Natural and Cultural Heritage Division (2015)



Potential impacts of works to the masked owl within the study area are therefore considered in two broad categories:

1. Direct impact to the 12 habitat trees identified within the immediate works disturbance footprint (and within 15 m of the cut quarry edge) &
2. Potential for disturbance to masked owls breeding within 150 m of the works disturbance footprint.

Given that the ground-based and aerial assessments of the habitat trees and the songmeter surveys all suggest a particularly low likelihood of occurrence of masked owl within the study area, there are grounds to suggest that habitat trees within the impact footprint, as they currently exist, could be removed outside of the core masked owl breeding period (ie during 1 February to 31 August) without causing any significant negative impact to the species.

Despite this, further impact mitigation for this species is warranted and consideration should be given to the implementation of pre-clearance procedures for masked owl habitat trees in accordance with the following:

- The clearance of vegetation containing potentially suitable nesting habitat for TMO should be undertaken outside of the TMO breeding season (ie outside of the period 01 September to 31 January inclusive).
- To account for variations in the TMO breeding season, a suitably trained, dedicated bird observer should be onsite during tree clearing works to undertake assessments and observe bird behaviour. Should a TMO be observed exiting a tree hollow, work within 150 m of that tree should immediately cease and NRE Tasmania should be contacted for advice.
- It is recommended that during clearing operations, smaller nearby trees are cleared first to allow noise disturbance to flush out any birds from potential nest trees. If a bird is flushed, the tree is considered a nest site. If at any point a tree is thought to contain a nest (through flushing birds or physical evidence), works should cease, and advice be sought from CAS.

If vegetation clearing cannot be undertaken outside the TMO breeding season (01 September to 31 January), a combination of techniques should be utilised to minimise the risk of a nest being overlooked, in addition to the above dot-points:

1. Trees should be checked for any signs of nesting or roosting (regurgitated pellets, whitewash, feathers at the base of the tree within the tree's dripline). Lack of these signs does not indicate an absence of nest but the presence of any of these signs can strongly indicate a nest hollow.
2. Immediately prior to clearing potential TMO habitat, should be tapped firmly (hammer, heavy stick etc) while the dedicated bird observer visually inspects the hollow opening to see if a bird is flushed from the hollow or is visible from the hollow opening – the purpose of this is to generate inquisitive behaviour so a bird will emerge from the hollow, not to get the bird to abandon the tree.
3. Finally, as a last resort and only if safe and practicable to do so (as it is dangerous for the assessor and highly disturbing to TMOs), consider physical inspection of hollows.
4. If any TMOs are observed during clearance works, CAS should be contacted for further advice.

#### **Swift parrot & Blue-winged Parrot**

The likelihood of swift parrots or blue-winged parrots breeding at Bobadil is very low, however a sufficient potential for risks to these species has been identified in relation to the removal of hollow-bearing habitat trees (the same 12 habitat trees as identified for the masked owl). As such, it is recommended that potential presence of these species is assessed as part of the same pre-clearance protocol as described above for the masked owl (noting that the Blue-winged parrot breeding period extends until end of February).

Prior to the commencement of pre-clearance tree surveys, advice should be sought from the EPA/CAS regarding any available data for the distribution of swift parrots or blue-winged parrots in that breeding season, and specifically whether any recent observations of these species in proximity of the Bobadil TSF have been documented.

### 3.4 Weeds and Pathogens

One declared weed (blackberry) has been identified on the existing Bobadil TSF site and numerous declared weed species have been recorded from the local area historically. Potential for further spread of these species exists through dispersal of vegetative material and seed during construction and earthworks.

#### ***Phytophthora cinnamomi (PC)***

The presence of PC at the Bobadil TSF has been confirmed. Based on currently available data, the pathogen is considered to be relatively extensive throughout and adjacent to the site. As such, it is appropriate to treat the whole of the Bobadil site including access roads, borrow areas, the TSF itself and the associated ponds as a PC-positive site.

As it is not possible to eliminate the pathogen from the site, management actions must focus on limiting further spread of the pathogen at the local scale as much as possible, but more importantly preventing spread of the pathogen from Bobadil to new areas beyond the TSF which are currently free of the pathogen.

A weed and hygiene management plan meeting the NRE guidelines for such plans should be developed. In particular, the plan should identify how these issues will be managed during and after works and include long-term monitoring and control.

## 4 LEGISLATIVE IMPLICATIONS

### **Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBCA)**

The EPBCA is structured for self-assessment; the proponent must determine whether or not the project is considered a 'controlled action' which, if confirmed, would require approval from the Commonwealth Minister.

Referral under the EPBCA will be necessary if an action has, will have, or is likely to have a significant impact on any matter of national environmental significance (MNES), (amongst other things):

*... modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species or ecological community is likely to decline.*

Where a project is referred for a significant impact on one MNES, it is necessary to address all MNES that are present to demonstrate the likelihood of a significant impact on each. Targeted surveys are required on the natural values that are known or likely to occur within the project area before an assessment can be made on the likelihood of the project's potential to cause significant impacts to MNES.

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Wedge-tailed eagle – e/EN

No known eagle nests will be impacted by the proposal, as confirmed by recent aerial surveys undertaken on 5 April 2023.

Vegetation clearance from the proposed works will result in the minor loss of foraging habitat for this species by way of loss of approximately 1.48 ha of intact native forest. However, the clearance may also result in some level of habitat fragmentation, which benefits the eagles' ability to perch and hunt within the proposed impact footprint.

Overall, no deleterious impacts to this species or its habitat are anticipated as a result of the proposed works. More specifically, no significant impact is anticipated in the context of the EPBCA impact assessment criteria.

Spotted-tailed quoll – r/VU

The project will not have a significant impact on the 'Vulnerable' spotted-tailed quoll under the significant impact criteria as the area does not support an 'important population' as defined under this legislation.

Tasmanian devil – e/EN

A targeted pre-clearance survey of all suboptimal habitat within the site is recommended to mitigate the potential for impacts to dens and animals. If dens or burrows are found, a permit to take will be required under the *Nature Conservation Act 2002*.

Provided potential breeding sites for this species are identified and managed through a pre-clearance survey, then no meaningful impacts to this species are anticipated. The removal of relatively small areas of suboptimal and unsuitable denning habitat (non-critical habitat) for this species will in no way affect populations of the species or result in any other deleterious impact that may cause the species to decline. Such habitat is common in the Bobadil area and more widely throughout western Tasmania. In the context of the MNES impact assessment criteria, these impacts are not considered to be significant and a referral under this Act on the basis of the Tasmanian devil is unlikely to be warranted in this case.

Masked owl – e/VU

Habitat avoidance measures and pre-clearance assessments of potential nesting trees have been undertaken as the primary means of mitigating impacts to this species. As a 'Vulnerable' listed species, assessment considerations under the EPBCA centre around whether an action will have a deleterious effect on an 'important population', which includes populations defined as follows:

- *key source populations either for breeding or dispersal,*
- *populations that are necessary for maintaining genetic diversity, and/or*
- *populations that are near the limit of the species range.*

Although masked owls occur at varying densities throughout the state, the whole of Tasmania is effectively treated as one continuous population of the species, and to that end is considered to constitute one 'important population' of the species in the context of the EPBCA.

With the mitigation and pre-clearance protocols for this species described above (Section 4.3) the likelihood of any direct or indirect affects to masked owl breeding sites is very low. No significant impacts to this species are therefore anticipated as a result of the proposed works in relation to the EPBCA assessment criteria.

Swift parrot – e/CR

Forested habitat within the proposal's impact footprint falls approximately 22 km outside the published breeding ranges of this species. Large trees within the impact footprint are also unlikely to be utilised for breeding because of the long distance to any substantial foraging resource (*E. globulus* and *E. ovata* trees and forest). As such, the forested areas proposed for clearance in this case are unlikely to constitute important habitat to this species, and the proposed developments are therefore unlikely to constitute a significant impact to the species



in the context of the MNES Impact Assessment Guidelines. Therefore, a referral under this Act is not likely to be required on account of the swift parrot.

### **Threatened Species Protection Act 1995 (TSPA)**

Under the TSPA, a person cannot knowingly without a permit 'take' a listed species, Where the definition of 'take' encompasses actions that kill, injure, catch, damage, destroy and/or collect threatened species or vegetation elements that support threatened species, such as nests and dens. Surveys to date have also confirmed the presence of a suspected grey goshawk nest near the project area and pre-clearance surveys for devil dens may reveal the presence of a den within the footprint. Disturbance to either threatened flora or fauna species within the meaning of the word 'take' under the Act will trigger the requirement for a permit under this Act.

### **Biosecurity Act 2019 (BA)**

The site contains one species of declared weed and as such, there are obligations under the *Biosecurity Act* to prevent further spread of this species.

### **Forest Practices Act 1985 (FPA)**

Under the *Forest Practices Act 1995*, a Forest Practices Plan is required for clearing of land. However, Section 6 states that this does not apply in prescribed circumstances. The prescribed circumstances are defined in the *Forest Practices Regulations 2017*.

Section 4 of the Regulations states under what circumstances a Forest Practices Plan is not required. These circumstances include mineral exploration activities or mining activities that are authorised under:

- (i) a permit granted under the Land Use Planning and Approvals Act 1993; or
- (ii) an exploration licence within the meaning of the Mineral Resources Development Act 1995; or
- (iii) a retention licence within the meaning of the Mineral Resources Development Act 1995; or
- (iv) a mining lease within the meaning of the Mineral Resources Development Act 1995.

If the activity fits within one of the above points, a Forest Practices Plan is not required.

### **Land Use Planning and Approvals Act 1993 (LUPAA)**

LUPAA states that 'in determining an application for a permit, a planning authority must (amongst other things) seek out the objectives set out in Schedule 1.<sup>72</sup>

Schedule 1 includes 'The objectives of the Resource Management and Planning System of Tasmania', which are (amongst other things):

'To promote sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity'.

Sustainable development includes 'avoiding, remedying or mitigating any adverse effects of activities on the environment'.<sup>73</sup>

<sup>72</sup> Section 51(2)(b) – Part 4 Enforcement of Planning Control – Division 2 Development Control (LUPAA 1993)

<sup>73</sup> page 56 – LUPAA 1993

## 5 SUMMARY AND RECOMMENDATIONS

### Vegetation Communities

The site is typical of western Tasmanian lowland vegetation and habitats on similar underlying geologies. It includes three distinct vegetation communities or mapping units (TASVEG 4.0) all of which are common communities that are well represented in reserves.

### Threatened Flora

No evidence of threatened flora has been found within the development footprint to date. A targeted survey for the horned orchid (*Orthoceras strictum*) was undertaken in January 2023 but no evidence of the species was found. The likelihood of additional threatened flora species being present within the proposed development areas is very low and as such, no further surveys or specific permits for threatened flora are required in this case.

### Threatened Fauna

Fauna habitats within the project area are also typical of west coast wet forests and scrubs. The landscape is not very productive in terms of nutrients and prey, and the abundance of animals, particularly large predators, reflects this. The following specific recommendations are provided for mitigation of potential impacts to threatened fauna species:

#### Grey goshawk

A suspected grey goshawk nest was noted approximately 450 m west of the southern quarry area. This nest should remain unaffected by the proposed works and does not require any specific additional management considerations or permits.

In the unlikely event that disturbance to this nest and the immediate surrounds (within 100 m) cannot be avoided, then a permit from the Department of NRE may be required prior to commencement of vegetation clearing works in this area.

#### Hollow Nesting Birds (Masked owl, Swift parrot and Blue-winged parrot)

Avoidance of direct impacts to large-diameter trees (>1 m DBH) should be considered wherever possible as part of the future design and location of construction works, particularly avoidance of large trees in the northern end of the northern quarry area.

The 12 large trees in this area that were assessed for their hollow nesting potential have a low likelihood of supporting nesting for the masked owl, swift parrot and blue-winged parrot. Given that large tracts of better-quality mature forest surround the Bobadil area, the loss of these trees would not significantly impact these species.

A precautionary pre-clearance protocol has been recommended for hollow-bearing habitat trees (see Section 4.3).

#### Mammals (Tasmanian devil & spotted-tailed quoll)

- A pre-clearance survey for dens will be required prior to the commencement of any vegetation clearance and should be undertaken ahead of any forest clearance plan.
- If a suspected den is found, then decommissioning of the den will be required in accordance with the Department of NRE Guidelines.<sup>74</sup>

#### Wedge-tailed eagle

No additional mitigation or management recommendations for this species are warranted in this case.

#### Weeds and Hygiene

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<sup>74</sup> Natural & Cultural Heritage Division (2015)

- A weed and hygiene management plan meeting the NRE guidelines for such plans should be developed. In particular, the plan should identify how these issues will be managed during and after construction, and including long-term monitoring and control.
- Before entering the site, all machinery and all tools used to move earth, including hand tools, should be cleaned so as to be free of dirt. The cleaning process should comply with the Weed Management and Hygiene Guidelines set out in:
  - <https://nre.tas.gov.au/invasive-species/weeds/weed-hygiene/weed-and-disease-planning-and-hygiene-guidelines>
- The Bobadil TSF is now confirmed as a *Phytophthora cinnamomi* (PC)-positive site as such a series of mitigation measures for this pathogen should be implemented as per the management plan.

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## APPENDIX 1 – VEGETATION PLOT SAMPLE LOCATIONS

TASVEG Community	GPS	Easting	Northing
WOL	123	376087	5376969
	240	377350	5376451
	186	377250	5377074
WOR	142	376792	5376146
	202	377321	5377567
	128	376067	5377052
	210	377205	5377716
WOB	154	377069	5375996
	199	377264	5377393
	203	377255	5377658
	212	377218	5377548
WNL	214	377739	5375921
	227	377716	5376253
	1030	377584	5377818
	1051	377481	5376804
	233	377528	5376083
RMT	1038	377429	5377293
	1097	376583	5376079
NLM	1052	377368	5376902

## APPENDIX 2 – FLORA SPECIES LIST

### Species list - project: MMG005

**Status codes:**

ORIGIN

i - introduced

d - declared weed WM Act

en - endemic to Tasmania

t - within Australia, occurs only in Tas.

NATIONAL SCHEDULE

EPBC Act 1999

CR - critically endangered

EN - endangered

VU - vulnerable

STATE SCHEDULE

TSP Act 1995

e - endangered

v - vulnerable

r - rare

**Sites:**

1 WOL - E414457, N1453033

2 WOR - E414455, N1453032

5 WOB - E414523, N1453111

13/09/2022 Hayley Kingsley

13/09/2022 Hayley Kingsley

15/09/2022 Hayley Kingsley

Site	Name	Common name	Status
	<b>DICOTYLEDONAE</b>		
	<b>ASTERACEAE</b>		
1 2	<i>Olearia argophylla</i>	musk daisybush	
	<b>ATHEROSPERMATACEAE</b>		
1 2 5	<i>Atherosperma moschatum</i> subsp. <i>moschatum</i>	sassafras	
	<b>CONVOLVULACEAE</b>		
5	<i>Dichondra repens</i>	kidneyweed	
	<b>CUNONIACEAE</b>		
2 5	<i>Anodopetalum biglandulosum</i>	horizontal	en
1 2 5	<i>Bauera rubioides</i>	wiry bauera	
	<b>ELAEOCARPACEAE</b>		
5	<i>Aristotelia peduncularis</i>	heartberry	en
	<b>ERICACEAE</b>		
1 5	<i>Epacris impressa</i>	common heath	
5	<i>Leptecophylla juniperina</i>	pink or crimson berry	
1	<i>Leptecophylla juniperina</i> subsp. <i>juniperina</i>	common pinkberry	t
1 2 5	<i>Monotoca glauca</i>	goldey wood	
1 2	<i>Trochocarpa cunninghamii</i>	straggling purpleberry	en
	<b>ESCALLONIACEAE</b>		
1 2 5	<i>Anopterus glandulosus</i>	Tasmanian laurel	en
	<b>EUCRYPHIACEAE</b>		
1 5	<i>Eucryphia lucida</i>	leatherwood	en
	<b>FABACEAE</b>		
1 2	<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle	
1 2 5	<i>Acacia melanoxylon</i>	blackwood	
1 2	<i>Acacia mucronata</i>	variable sallow wattle	
1 2 5	<i>Acacia verticillata</i>	prickly moses	
1	<i>Bossiaea cinerea</i>	showy bossiaea	
	<b>FAGACEAE</b>		
1 2 5	<i>Nothofagus cunninghamii</i>	myrtle beech	
	<b>HALORAGACEAE</b>		
5	<i>Gonocarpus micranthus</i> subsp.	creeping raspwort	
1 2 5	<i>Gonocarpus teucroides</i>	forest raspwort	
	<b>MYRTACEAE</b>		
5	<i>Eucalyptus delegatensis</i> subsp.	gumtopped stringybark	en



	<i>tasmaniensis</i>		
1 2	<i>Eucalyptus nitida</i>	western peppermint	en
1 2 5	<i>Eucalyptus obliqua</i>	stringybark	
1 2	<i>Leptospermum scoparium</i>	common tea-tree	
1 5	<i>Melaleuca squarrosa</i>	scented paperbark	
	<b>PITTOSPORACEAE</b>		
2 5	<i>Pittosporum bicolor</i>	cheesewood	
	<b>PROTEACEAE</b>		
1 5	<i>Cenarrhenes nitida</i>	native plum	en
	<b>RHAMNACEAE</b>		
2 5	<i>Pomaderris apetala</i>	common dogwood	
	<b>ROSACEAE</b>		
5	<i>Rubus fruticosus</i>	blackberry	d
	<b>RUBIACEAE</b>		
1 2 5	<i>Coprosma quadrifida</i>	native currant	
	<b>RUTACEAE</b>		
1 2 5	<i>Nematolepis squamea</i>	satinwood	
1	<i>Philotheca verrucosa</i>	fairy waxflower	
1	<i>Philotheca virgata</i>	twiggy waxflower	
2 5	<i>Zieria arborescens</i>	stinkwood	
	<b>THYMELAEACEAE</b>		
1 2 5	<i>Pimelea drupacea</i>	cherry riceflower	
	<b>WINTERACEAE</b>		
1	<i>Tasmania lanceolata</i>	mountain pepper	
	<b>GYMNOSPERMAE</b>		
	<b>PHYLLOCLADACEAE</b>		
1 2 5	<i>Phyllocladus aspleniifolius</i>	celerytop pine	en
	<b>MONOCOTYLEDONAE</b>		
	<b>CYPERACEAE</b>		
1	<i>Baumea tetragona</i>	square twigsedge	
1 2 5	<i>Gahnia grandis</i>	cutting grass	
1	<i>Gymnoschoenus sphaerocephalus</i>	buttongrass	
5	<i>Lepidosperma laterale</i>	variable swordsedge	
	<b>HEMEROCALLIDACEAE</b>		
1 2 5	<i>Dianella tasmanica</i>	forest flaxlily	
	<b>LUZURIAGACEAE</b>		
1 2 5	<i>Drymophila cyanocarpa</i>	turquoise berry	
	<b>ORCHIDACEAE</b>		
1 5	<i>Chiloglottis</i> sp.	bird orchid	
1 2	<i>Pterostylis melagramma</i>	blackstripe greenhood	
1 5	<i>Pterostylis nutans</i>	nodding greenhood	
1	<i>Pterostylis</i> sp.	greenhood	
	<b>RESTIONACEAE</b>		
1 2	<i>Baloskion tetraphyllum</i> subsp. <i>tetraphyllum</i>	tassel cordrush	
5	<i>Calorophus elongatus</i>	long roperush	
	<b>PTERIDOPHYTA</b>		
	<b>ASPIDIACEAE</b>		
1 2 5	<i>Polystichum proliferum</i>	mother shieldfern	
1 2 5	<i>Rumohra adiantiformis</i>	leathery shieldfern	
	<b>BLECHNACEAE</b>		
1 2 5	<i>Blechnum nudum</i>	fishbone waterfern	
1 2 5	<i>Blechnum wattsii</i>	hard waterfern	

<b>DENNSTAEDTIACEAE</b>		
1 2 5	<i>Histiopteris incisa</i>	batswing fern
5	<i>Hypolepis rugosula</i>	ruddy groundfern
1 2 5	<i>Pteridium esculentum</i> subsp. <i>esculentum</i>	bracken
<b>DICKSONIACEAE</b>		
1 2 5	<i>Dicksonia antarctica</i>	soft treefern
<b>GLEICHENIACEAE</b>		
1	<i>Gleichenia dicarpa</i>	pouched coralfern
1 2	<i>Gleichenia microphylla</i>	scrambling coralfern
<b>GRAMMITIDACEAE</b>		
1 2 5	<i>Notogrammitis billardierei</i>	common fingerfern
5	<i>Notogrammitis heterophylla</i>	gypsy fern
<b>HYMENOPHYLLACEAE</b>		
2 5	<i>Hymenophyllum cupressiforme</i>	common filmyfern
2	<i>Hymenophyllum flabellatum</i>	shiny filmyfern
1 2 5	<i>Hymenophyllum rarum</i>	narrow filmyfern
<b>POLYPODIACEAE</b>		
1 2 5	<i>Microsorium pustulatum</i> subsp.	kangaroo fern
<b>TMESIPTERIDACEAE</b>		
2	<i>Tmesipteris elongata</i>	narrow forkfern
5	<i>Tmesipteris obliqua</i>	common forkfern

## APPENDIX 3 – VEGETATION COMMUNITY COMPOSITION

### WOL

Trees:	<i>Acacia melanoxylon</i> , <i>Atherosperma moschatum</i> subsp. <i>moschatum</i> , <i>Eucalyptus nitida</i> , <i>Eucalyptus obliqua</i> , <i>Eucryphia lucida</i> , <i>Nothofagus cunninghamii</i> , <i>Phyllocladus aspleniifolius</i>
Tall Shrubs:	<i>Acacia dealbata</i> subsp. <i>dealbata</i> , <i>Acacia mucronata</i> , <i>Acacia verticillata</i> , <i>Anopterus glandulosus</i> , <i>Leptospermum scoparium</i> , <i>Melaleuca squarrosa</i> , <i>Monotoca glauca</i> , <i>Nematolepis squamea</i> , <i>Olearia argophylla</i>
Shrubs:	<i>Bauera rubioides</i> , <i>Bossiaea cinerea</i> , <i>Cenarrhenes nitida</i> , <i>Coprosma quadrifida</i> , <i>Epacris impressa</i> , <i>Philotheca verrucosa</i> , <i>Philotheca virgata</i> , <i>Pimelea drupacea</i> , <i>Tasmannia lanceolata</i> , <i>Trochocarpa cunninghamii</i>
Herbs:	<i>Chiloglottis</i> sp., <i>Dianella tasmanica</i> , <i>Drymophila cyanocarpa</i> , <i>Gonocarpus teucrioides</i> , <i>Leptecophylla juniperina</i> subsp. <i>juniperina</i> , <i>Pterostylis melagramma</i> , <i>Pterostylis nutans</i> , <i>Pterostylis</i> sp.
Graminoids:	<i>Baloskion tetraphyllum</i> subsp. <i>tetraphyllum</i> , <i>Baumea tetragona</i> , <i>Gahnia grandis</i> , <i>Gymnoschoenus sphaerocephalus</i>
Ferns:	<i>Blechnum nudum</i> , <i>Blechnum watsii</i> , <i>Dicksonia antarctica</i> , <i>Gleichenia dicarpa</i> , <i>Gleichenia microphylla</i> , <i>Histiopteris incisa</i> , <i>Hymenophyllum rarum</i> , <i>Microsorium pustulatum</i> subsp. <i>pustulatum</i> , <i>Notogrammitis billardiarei</i> , <i>Polystichum proliferum</i> , <i>Pteridium esculentum</i> subsp. <i>esculentum</i> , <i>Rumohra adiantiformis</i>

### WOR

Trees:	<i>Acacia melanoxylon</i> , <i>Atherosperma moschatum</i> subsp. <i>moschatum</i> , <i>Eucalyptus nitida</i> , <i>Eucalyptus obliqua</i> , <i>Nothofagus cunninghamii</i> , <i>Phyllocladus aspleniifolius</i>
Tall Shrubs:	<i>Acacia dealbata</i> subsp. <i>dealbata</i> , <i>Acacia mucronata</i> , <i>Acacia verticillata</i> , <i>Anodopetalum biglandulosum</i> , <i>Anopterus glandulosus</i> , <i>Leptospermum scoparium</i> , <i>Monotoca glauca</i> , <i>Nematolepis squamea</i> , <i>Olearia argophylla</i> , <i>Pittosporum bicolor</i> , <i>Pomaderris apetala</i> , <i>Zieria arborescens</i>
Shrubs:	<i>Bauera rubioides</i> , <i>Coprosma quadrifida</i> , <i>Pimelea drupacea</i> , <i>Trochocarpa cunninghamii</i>
Herbs:	<i>Dianella tasmanica</i> , <i>Drymophila cyanocarpa</i> , <i>Gonocarpus teucrioides</i> , <i>Pterostylis melagramma</i>
Graminoids:	<i>Baloskion tetraphyllum</i> subsp. <i>tetraphyllum</i> , <i>Gahnia grandis</i>
Ferns:	<i>Blechnum nudum</i> , <i>Blechnum watsii</i> , <i>Dicksonia antarctica</i> , <i>Gleichenia microphylla</i> , <i>Histiopteris incisa</i> , <i>Hymenophyllum cupressiforme</i> , <i>Hymenophyllum flabellatum</i> , <i>Hymenophyllum rarum</i> , <i>Microsorium pustulatum</i> subsp. <i>pustulatum</i> , <i>Notogrammitis billardiarei</i> , <i>Polystichum proliferum</i> , <i>Pteridium esculentum</i> subsp. <i>esculentum</i> , <i>Rumohra adiantiformis</i> , <i>Tmesipteris elongata</i>

### WOB

Trees:	<i>Acacia melanoxylon</i> , <i>Atherosperma moschatum</i> subsp. <i>moschatum</i> , <i>Eucalyptus delegatensis</i> subsp. <i>tasmaniensis</i> , <i>Eucalyptus obliqua</i> , <i>Eucryphia lucida</i> , <i>Nothofagus cunninghamii</i> , <i>Phyllocladus aspleniifolius</i>
Tall Shrubs:	<i>Acacia verticillata</i> , <i>Anodopetalum biglandulosum</i> , <i>Anopterus glandulosus</i> , <i>Melaleuca squarrosa</i> , <i>Monotoca glauca</i> , <i>Nematolepis squamea</i> , <i>Pittosporum bicolor</i> , <i>Pomaderris apetala</i> , <i>Zieria arborescens</i>
Shrubs:	<i>Aristotelia peduncularis</i> , <i>Bauera rubioides</i> , <i>Cenarrhenes nitida</i> , <i>Coprosma quadrifida</i> , <i>Epacris impressa</i> , <i>Leptecophylla juniperina</i> , <i>Pimelea drupacea</i>
Herbs:	<i>Chiloglottis</i> sp., <i>Dianella tasmanica</i> , <i>Dichondra repens</i> , <i>Drymophila cyanocarpa</i> , <i>Gonocarpus micranthus</i> subsp. <i>micranthus</i> , <i>Gonocarpus teucrioides</i> , <i>Pterostylis nutans</i>
Graminoids:	<i>Calorophus elongatus</i> , <i>Gahnia grandis</i> , <i>Lepidosperma laterale</i>
Ferns:	<i>Blechnum nudum</i> , <i>Blechnum watsii</i> , <i>Dicksonia antarctica</i> , <i>Histiopteris incisa</i> , <i>Hymenophyllum cupressiforme</i> , <i>Hymenophyllum rarum</i> , <i>Hypolepis rugosula</i> , <i>Microsorium pustulatum</i> subsp. <i>pustulatum</i> , <i>Notogrammitis billardiarei</i> , <i>Notogrammitis heterophylla</i> , <i>Polystichum proliferum</i> , <i>Pteridium esculentum</i> subsp. <i>esculentum</i> , <i>Rumohra adiantiformis</i> , <i>Tmesipteris obliqua</i>
Weeds:	<i>Rubus fruticosus</i>

## APPENDIX 4 – DEVELOPMENTAL STAGES OF THE HORNED ORCHID (*ORTHO CERAS STRICTUM*) IN WESTERN TASMANIA



*Orthoceras strictum*: above, left – immature flower (13/12/2022); above, right – peak flower,(30/01/2023) from the Murchison Highway near Melba Flats; right – old flower, from Trial Harbour Road, (20/2/2023)

