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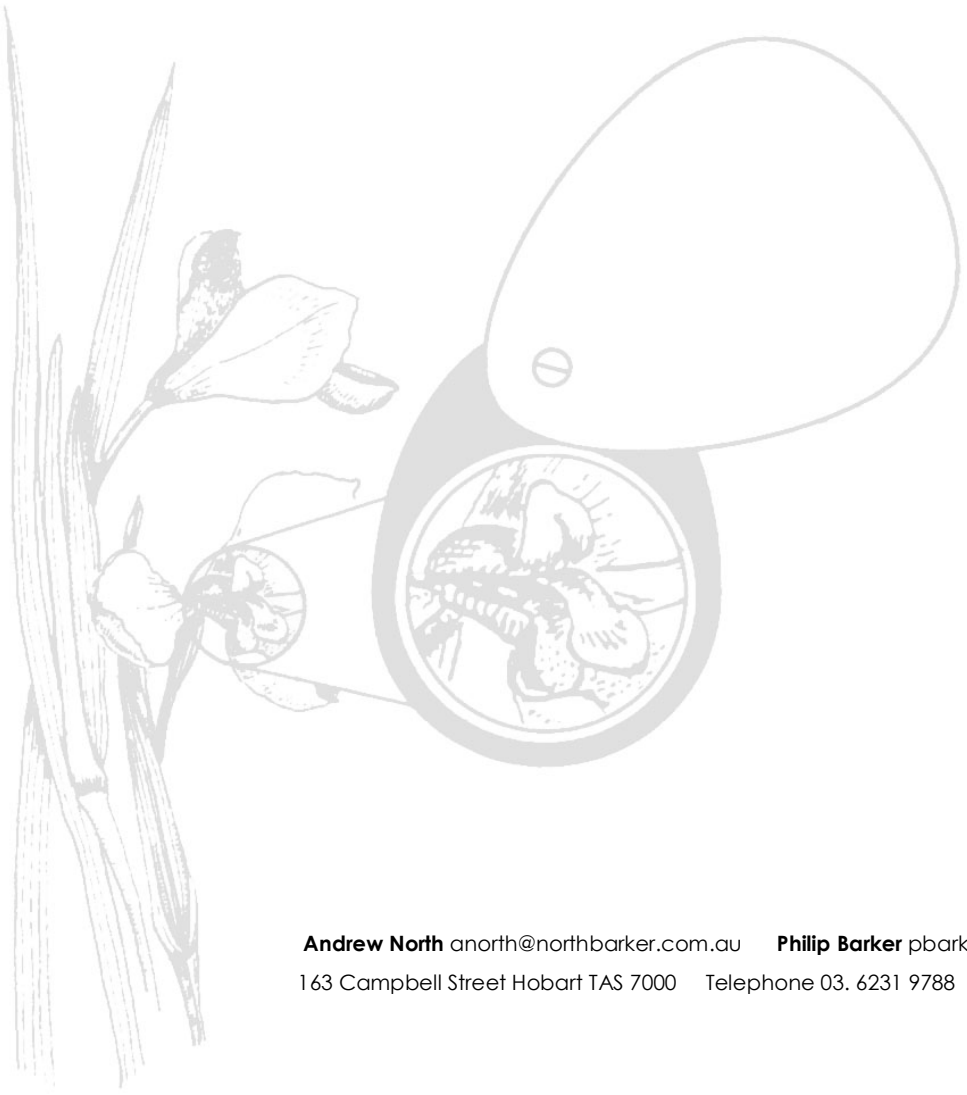
ECOSYSTEM SERVICES

Glamorgan Spring Bay Council
Prosser Plains Raw Water Scheme (PPRWS)
Tea Tree Rivulet Dam

Botanical Survey and Fauna Habitat Assessment

14th March 2017



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Title: Glamorgan Spring Bay Council Prosser Plains Raw Water Scheme (PPRWS) Botanical Survey and Fauna Habitat Assessment

Document Prepared By:	**Dr Philip Barker NBESP Barker**	**1 February 2017**
Document Reviewed by By:	**David Burt P. Barker**	**2 February 2017**

CHANGE RECORD

Issue	Date	Changed By	Description of Change
1.1	7/2/17	P Barker	Minor edits provided by David Burt
1.2	16/2/17	P. Barker	Add results of eagle nest survey
1.3	10/3/17	P. Barker	Redraft for dam site only
1.4	14/3/17	P. Barker	Include results of offset survey and vegetation condition analysis

SUMMARY AND RECOMMENDATIONS

Glamorgan Spring Bay Council is investigating the potential to construct the Prosser Plains Raw Water Scheme (PPRWS). This scheme includes a water storage dam on the Tea Tree Rivulet and a pipeline from below the weir on Prosser River to Louisville Point. Below the dam wall the water will be transferred down the Tea Tree Rivulet and then via the Prosser River to the weir just above Orford.

This assessment considers the proposed 3000 ML water storage on Tea Tree Rivulet.

Investigation of the study areas natural values is required. Toward that end this report documents the vegetation and the flora and fauna values of the footprint of the dam. The report identifies the distribution of threatened vegetation, flora and fauna habits, including communities or populations listed under the TSPA and the EPBC Act.

Findings:

Vegetation

The proposal requires the conversion of native vegetation communities to accommodate the inundation area and the dam wall. The native vegetation types included are:

Eucalyptus amygdalina forest on dolerite (DAD) – 7.65 ha – not threatened

Eucalyptus ovata forest and woodland (DOV) – 21.65 ha –threatened (NCA 2002, Preliminary listing EPBC).

Leptospermum scrub (SLL) – not threatened

Eucalyptus viminalis grassy forest (DVG) – 20.99 ha –not threatened

Poa grassland (GPL) – 1.25 ha –(not threatened NCA 2002, Endangered EPBC)

Threatened vegetation

Poa grassland is listed on the EPBC as endangered. The clearance of this area is likely to cause a significant impact.

The clearance of *Eucalyptus ovata* forest from the dam footprint represents a constraint on the proposal. *E. ovata* has been nominated to be listed as a threatened ecological community on the EPBC Act 1999. The listing is proposed to be critically endangered and the Scientific Committee under the EPBC has recently concluded a public comment period on the proposed listing.

E. ovata is listed on the *Tasmanian Nature Conservation Act 2002* as threatened vegetation. The significance of the impact and consequent requirements for offset will be dictated by the dam assessment process. No areas of *E. ovata* suitable for offset are present on the balance of the property.

Flora:

No threatened flora species were recorded during survey. There remains low to moderate probability that species have been overlooked due to limitations of the survey.

Fauna for which the habitat may be important

The species affected include:

Eastern barred-bandicoot (not listed TSPA / vulnerable EPBC)

About 50 ha of foraging and/or nesting habitat occur in the impact area. There is a moderate - high probability that nests are within the dam footprint. Optimal habitat is present through much of the proposed impact area.

The Tasmanian population is listed on the EPBC and so in the context of vulnerable species it is an important population and should be considered under the EPBC significant impact criteria. Because the animal is highly adaptive and not threatened by foxes in Tasmanian the loss of habitat is not likely to cause a significant decline in this species.

Eastern quoll (not listed TSPA / endangered EPBC)

About 50 ha of foraging and/or nesting habitat occur in the dam footprint. A significant impact is anticipated through the loss of habitat. There is a high probability that dens are within the footprint.

Spotted-tailed quoll (Rare TSPA / Vulnerable EPBC)

About 50 ha of foraging and/or denning habitat) occur in the impact area. The dam footprint is likely to include parts of the home range of 1 or 2 female quolls. The area could be a significant portion of the core range of a female. If so then the female may be displaced and die. There is a moderate probability that an active den is within the footprint.

Tasmanian devil (Endangered TSPA / EPBC)

About 50 ha of foraging and/or denning habitat occur in the dam footprint. A negligible impact is anticipated through the loss of foraging habitat that may result in home range adjustment. There is a moderate probability that utilised dens are within the footprint.

Grey goshawk (Endangered TSPA)

Suitable goshawk habitat nesting habitat is present along the Tea Tree Rivulet.

The larger tract of adjacent vegetation is likely to also be support nesting habitat along the water courses. Although no nests were confirmed within the footprint, a potential nest is present.

No mitigation is proposed for the dam footprint.

Swift parrot (Endangered TSPA / Critically endangered EPBC)

About 21.65 ha of swift parrot foraging habitat is present as *E. ovata* forest in the lower reaches of the dam footprint. Some nesting habitat is present in oldgrowth eucalypts in the dam footprint. The habitat is within a SPIBA (swift parrot important breeding area). The loss of the habitat is likely to cause a significant impact according to the assessment criteria of the EPBC. The project will require referral to the Commonwealth minister for assessment.

Wedge-tailed eagle (Endangered TSPA / EPBC)

Potentially suitable habitat is present for nests of the eagle within 1000 m of the study area. An assessment of this habitat was completed on February 16 2017. No nests were recorded within 1000 m of the footprint.

Two species for which the habitat is potentially suitably but for which no evidence was found during survey are:

Masked owl and Wielangta stag beetle

The habitat is unsuited to other threatened fauna previously recorded in the vicinity. These are:

Green and gold frog

Australian grayling

Chaostola skipper

The proposal requires the conversion or modification of a number of fauna habitats. There is a low risk of animal injury during construction. An injured animal protocol should be developed as part of the Construction and Environmental Management Plan. The mitigation of potential impacts during construction should be managed through the CEMP.

Legislative implications:

Water Management Act 1999

The assessment process for a Dam Permit is required to consider the biodiversity values in relation to the anticipated impacts and the potential for the requirement of to offset and residual impacts. In this case the *Eucalyptus ovata* forest will require an offset that provides formal protection for the offset area.

A Vegetation Condition Assessment was completed to provide a basis for comparison of the area to be inundated with any offset proposal.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Each of the EPBC listed fauna and ecological communities are Matters of National Environmental Significance (MNES) that require assessment under the EPBC.

Threatened species:

The following criterion has been met for two endangered species and an important population of a vulnerable species.

Criterion 2 • reduce the area of occupancy of the species.

For the Tasmanian devil, the eastern quoll the spotted tailed quoll this criterion is met. The area involved may be judged to be negligible in the context of the ecology and range of these species but that would need to be tested through the referral assessment process.

Criteria 5 and 6 • disrupt the breeding cycle of a population and • modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline are judged to be met for the swift parrot.

The black gum habitat is a forage resource that supports breeding success and is within a SPIBA. The loss of breeding habitat is identified as a key threatening process.

No other criteria were met for either endangered or important populations of vulnerable species.

Ecological communities:

Lowland poa grassland is an endangered ecological community and *Eucalyptus ovata* is proposed to be a critically endangered ecological community (draft listing advice has been published).

The following criteria have been met for these communities.

• reduce the extent of an ecological community (due to inundation)

• modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns (due to inundation)

The area involved for the lowland grassland may be judged to be negligible in the context of the range of this community but that would need to be tested through the referral process.

The area of the *E. ovata* forest is substantial in the context of typical patch sizes for this community.

Tasmanian *Threatened Species Protection Act 1995*

The Dam Permit replaces the need for TSPA Permits.

There remains a low probability that dens or nests do occur in the study area. If dens or nests are located during construction of the dam, their removal will be dealt with by the Dam Works Practices Plan approved under the Dam Permit.

Tasmanian *Weed Management Act 2000*

Two Declared weeds are present. One is a zone A which requires management and one is Zone B. A weed control strategy and works plan should be developed.

Summary of recommendations

1. Identify suitable offset for the loss of 20 ha of Eucalyptus ovata forest.
2. An injured animal protocol should be developed and included in the Construction and Environmental Management Plan.
3. A weed and hygiene management plan should be developed and included in the Construction and Environmental Management Plan.
4. Prepare a referral of the project to the Commonwealth Minister for assessment of the impact on each MNES.

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Table of Figures

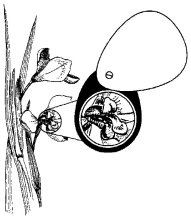
ACKNOWLEDGMENTS

Client: Glamorgan Spring Bay Council

Project Management: Philip Barker

Mapping: Sue Jungalwalla

Survey and report: Philip Barker and Joe Quarmby



1. INTRODUCTION

1.1 BACKGROUND AND AIMS

Glamorgan Spring Bay Council is investigating the potential to construct the Prosser Plains Raw Water Scheme (PPRWS). This scheme includes a dam on the Tea Tree Rivulet and a pipeline from below the weir on Prosser River to Louisville Point. Between the dam wall and the weir the water will be transferred down the Tea Tree Rivulet and then the Prosser River. The scheme consists of a 3000 ML water storage on Tea Tree Rivulet, run of river flow releases and an 8 km long distribution line.

This investigation of natural values is limited to the water storage dam. This report documents the vegetation and the flora and fauna values of the footprint. The report identifies the distribution of threatened vegetation, flora and fauna species habits, including communities or populations listed under the TSPA and the EPBC Act.

1.2 THE STUDY AREA

The study area will be referred to as the dam. The dam study area includes the 52.74 ha including a dam wall on the Tea Tree Rivulet. The dam is on private land.

The dam is within a narrow valley that broadens slightly toward the dam wall. The Tea Tree Rivulet and at least 6 unnamed tributaries contribute directly to the reservoir.

The study area is within the Tasmanian South East bioregion[1] (Figure 1). The South East bioregion covers an area of land upon which the main land uses are conservation reserves, agriculture and forestry; including both native forest silviculture and exotic plantation forestry.

Large tracts of the South East bioregion remain native vegetation.

[1] Peters & Thackway 1998

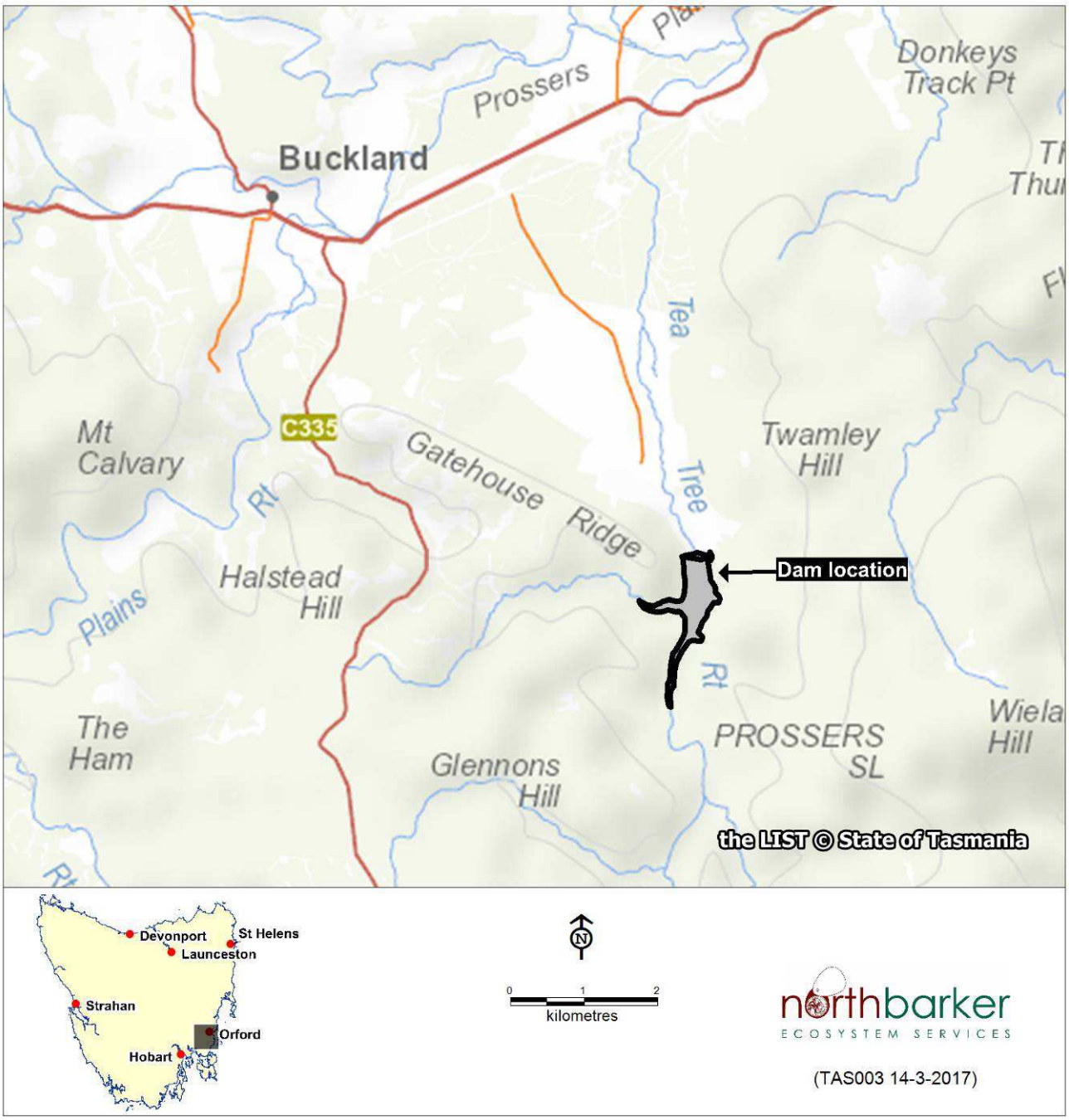


Figure 1. The location of the study area.

2. BOTANICAL SURVEY AND FAUNA HABITAT ASSESSMENT

2.1 Background Research

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

- Natural Values Atlas (NVA)[2] - This DPIPWE database includes biological records.
- Tasveg 3.0 Digital Data.
- The Threatened Fauna Manual[3] - threatened species recorded from the Spring Bay map sheet (Tasmap, Tasmania 1:25 000 series).
- The EPBCA Matters of National Environmental Significance web search tool.

2.2 Limitations

A vegetation and flora and fauna habitat survey of the development area was undertaken during January 2017.

The timing was not suitable for the identification of spring flowering orchids or flora that cannot otherwise be identified without flowers.

There may be some herb, grass or orchid species which flower later in the season or may be present in such low numbers as to have been overlooked. However, all threatened plant species known from the area are considered within this report in the light of habitat suitability noted on site.

The detection of fauna can be affected by the conditions at the time of the survey and or animal behaviour. Survey design conforms to guidelines for such surveys but cannot guarantee that an animal is absent in the case of negative survey results.

This study does not take into account non-vascular plants such as mosses and lichens.

2.3 Assessment of Conservation Significance

Vegetation types are classified according to Tasveg[4]. 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 1,000 ha), or have suffered considerable loss (approaching 70% for vulnerable and 90% for endangered) are listed as "threatened" on the Nature Conservation Act 2002[5].

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 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.

[2] GIS Unit, RMC, DPIPWE, NVA report, 11 January. 2017

[3] Bryant & Jackson, 1999

[4] Kitchener & Harris 2013

[5] Schedule 3a NCA 2002

The reservation at state and bioregional level has been calculated for all Tasveg 3 communities[6]. 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[7]. This analysis calculates areas required to achieve a CAR Reserve system based on the RFA modelling.

The conservation significance of species is determined at a State and Federal level by the Tasmanian *Threatened Species Protection Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (Appendix 1), the implications of which are considered in light of the relevant legislation (Appendix 2).

2.4 METHODS – SURVEY AND ANALYSIS

Survey Timing

The vegetation and flora surveys were undertaken between the 10th and 19th of January 2017, general habitat observations for fauna were also carried out at these times. All surveys were within the recommended survey periods for species with suitable habitat present.

Supplementary surveys were carried out for eagle nests on February 16 and for owls between January 19 and March 9. Additional Stag beetle surveys were carried out on February 20 and March 9.

Vegetation

The Tasveg 3 vegetation mapping was used as a basis for field verification. Each of the vegetation types within the study area were inspected and either verified or changed. Changes are justified based on representative floristic plot data.

Floristic and structural data were collected from one or more locations within each mapped vegetation type.

The vegetation typology is based on Tasveg keys and source documents. The main changes were due to source document interpretations of the forest structure based on dominance and ecotonal influences.

Flora

Representative data were collected from within each forest type. These lists were augmented by searches for additional species throughout the variation in habitat within each forest type.

It is known that the wet forest types provide potential habitat for only a very few threatened flora species. Other threatened species, particularly those listed by the Protected Matters Search Tool and the DPIPWE Natural Values Atlas were targeted during recommended survey periods.

Threatened Fauna

Surveys for threatened fauna initially focussed on the identification of suitable habitat for particular species. Suitability was judged against published descriptions, including those on the EPBC SPRAT database, and previous experience. The observation of any evidence of animals such as sightings, calls, scats, feathers, bones and dens was noted. The survey method for each animal is listed below. The survey methods conform where appropriate to methods required by the Tasmanian Forest Practices Authority, DPIPWE guidelines and or EPBC SPRAT survey guidelines.

[6] DPIPWE 2010

[7] Knight 2012

Eagle nests

Existing locations were considered from data on the NVA. Targeted observations of old growth eucalypts that were encountered were undertaken during vegetation verification within the footprint but not beyond.

Habitat with a moderate to high quality beyond the footprint and within 1000 m line of sight was searched using a helicopter. The extent of the search was based on a wedge-tailed eagle nest habitat model produced by the FPA (2013). This is a qualitative model based on the frequency of nests that occur in habitat with similar, topographic, aspect and forest structural characteristics.

A 1 hour helicopter search for nests, employing two observers and the pilot, was completed February 16 2017. No nests were observed.

Swift Parrot

Foraging habitat was identified and mapped where present. This was defined as blue gum dominated or black gum dominated forest.

5 minute stops listening for calls were completed every 100 m through suitable habitat (5 stops), incidental listening stops were also completed during the flora and fauna habitat assessment.

Mature trees were observed for the presence of potential nesting hollows.

Grey goshawk

The methods described in Technical Note 12 (Forest Practices Authority) were employed throughout the study area. The nesting and foraging habitat classes described in Technical Note 12 were applied to the habitat.

Where potentially suitable nesting trees were observed the trees were visually searched for nests.

Where present the habitat was classified according to a modified interpretation of Technical Note 12. The assessment was modified to accommodate the local habitat conditions (dominant trees suitable for nesting and foraging) which are quite different to those of the NW of Tasmania for which Tech note 12 was developed.

FPA category 1 = priority nesting habitat and foraging habitat

FPA category 2 = primarily foraging habitat but some nesting habitat

FPA category 3 = primarily foraging habitat

FPA category 4 = primarily foraging habitat

Unsuitable habitat was not considered.

Masked owl

Potential nesting habitat has been modelled by the Forest Practices Authority based on forest maturity. All forest categorised as high or medium maturity was intersected with all eucalypt forest. The forest types included were DVG and DOV. These forests were targeted for assessment.

Song Meter call analysis

A Song Meter SM3 was placed in woodland 11/1/2017 to 19/1/2017 and 20/2/2017 to 9/3 2017. The Song Meter was programmed to record calls within the potential frequency range of

the Tasmanian masked owl[8] between half an hour before sunset and up to 2.5 hours after sunset, as well as within the time between half an hour either side of sunrise. The results were then analysed using Song Scope software and a call recogniser compiled from calls collected across Tasmania[9].

Chaostola skipper

Targeted searches for the host plant *Gahnia radula* were proposed for potential habitat patches. As only occasional single plants were observed, no searches for shelters were undertaken.

Wielangta stag beetle

A specific survey was undertaken for Wielangta stag beetle (*Lissotes latidens*). The methods used were those described in Technical note number 4 produced by the Forest Practices Board. The search effort was 4 hours on each of 4 days and included rolling logs, digging in decayed logs and searches amongst other woody debris; particularly flood debris.

Mammals – general

Sign evidence such as diggings, scats and nests/dens were recorded incidentally during the flora and fauna habitat assessment. Motion cameras were established at 5 locations potentially utilised by threatened mammals . The cameras were in place between January 19 and March 9.

Spotted-tailed quoll

The habitat was assessed against published habitat descriptions and the distribution of important habitat and key sites. Incidental records of sign evidence in the form of scats would be recorded. No trapping was undertaken. Motion cameras were established at 5 locations potentially utilised by quolls.

The habitat and its likely productivity were described in the context of published research findings.

Tasmanian devil

A habitat assessment was completed throughout the study area. The habitat was considered as optimal, suboptimal and unsuitable for dens. A survey for suitable structures for dens was undertaken opportunistically in optimal and suboptimal habitat while undertaking the flora survey. Suitable structures include wombat burrows, log hollows, shelter below upturned stumps and caverns. Sign evidence was searched for along roads. Motion cameras were established at 5 locations potentially utilised by devils. An additional camera was placed at a burrow entrance.

Eastern quoll and eastern barred bandicoot

Existing records and interpretation of the habitat that is present. Both of these small mammals are known from the type of habitat that is present. Motion cameras were established at 5 locations potentially utilised by these mammals.

[8] As taken from Todd 2012, *Ecology and habitat of a threatened nocturnal bird, the Tasmanian Masked Owl.* Unpublished Doctor of Philosophy thesis, submitted to the University of Tasmania.

[9] Ibid 8

3. RESULTS, IMPACT AND MITIGATION

3.1 APPROACH TO MITIGATION

In Tasmania, the State Government (DPIPWE 2009) has set guidelines and principals for determining and mitigating impacts. The guidelines employ a hierarchy of mitigation efforts that together form a mitigation strategy. The DPIPWE hierarchy is avoidance, mitigation of impact and potentially offsetting of residual impacts. Guidelines for establishing offsets with in the dam assessment framework have been applied for dam construction in Tasmania for the past decade and these are largely consistent with the DPIPWE guidelines. The dam assessment framework offsets policy is, however, based on a specific hierarchy of values and size of impact. The highest level requiring formal protection of similar habitat. A lower level impact may be offset by works or other efforts contributing to the conservation of the natural values affected.

The EPBCA offsets policy outlines the approach and principles considered under the EPBCA Act. These are consistent with those of DPIPWE policy. However, the EPBCA policy is supported by implementation guidelines which require a residual significant impact to be offset to the satisfaction of a metric that calculates the value of the offset.

The southern Tasmanian combined councils offset strategy provides high level guidance that should be considered in the context of the GSB planning scheme.

In general the mitigation of terrestrial biodiversity impacts due to inundation is based on ensuring ongoing viability of the residual habitat or population in the region and or state-wide.

3.2 THE VEGETATION

General description:

The distribution of vegetation and the impact upon it varies from region to region around Tasmania. The conservation status has been determined and presented at the State level and on a bioregional basis. A bioregion is an area that is similar in biological and physical characteristics throughout and hence the vegetation that occurs in it is generally characteristic of the region. Vegetation that is characteristic of a neighbouring or remote region but also occurs in the bioregion may be considered rare or threatened in one region but not in another. Consequently, the conservation status of any vegetation type may vary from bioregion to bioregion. **Table 1** indicates the state-wide and bioregional status of each vegetation type present.

The dam footprint is approximately 52.65 hectares. All of the vegetation is native dry forest and grassland. The Tea Tree Rivulet has only very occasional aquatic macrophytes.

The predominant vegetation is dominated by *Eucalyptus ovata*. Forest dominated by this species is listed on the Nature Conservation Act 2002 and proposed for listing on the EPBC Act 1999.

Table 1 indicates the Tasmanian and South East bioregional extent of each vegetation type that is found in the study area. The table also indicates how much of each is reserved at each scale. **Table 2** indicates the area of each vegetation type in the dam footprint. .

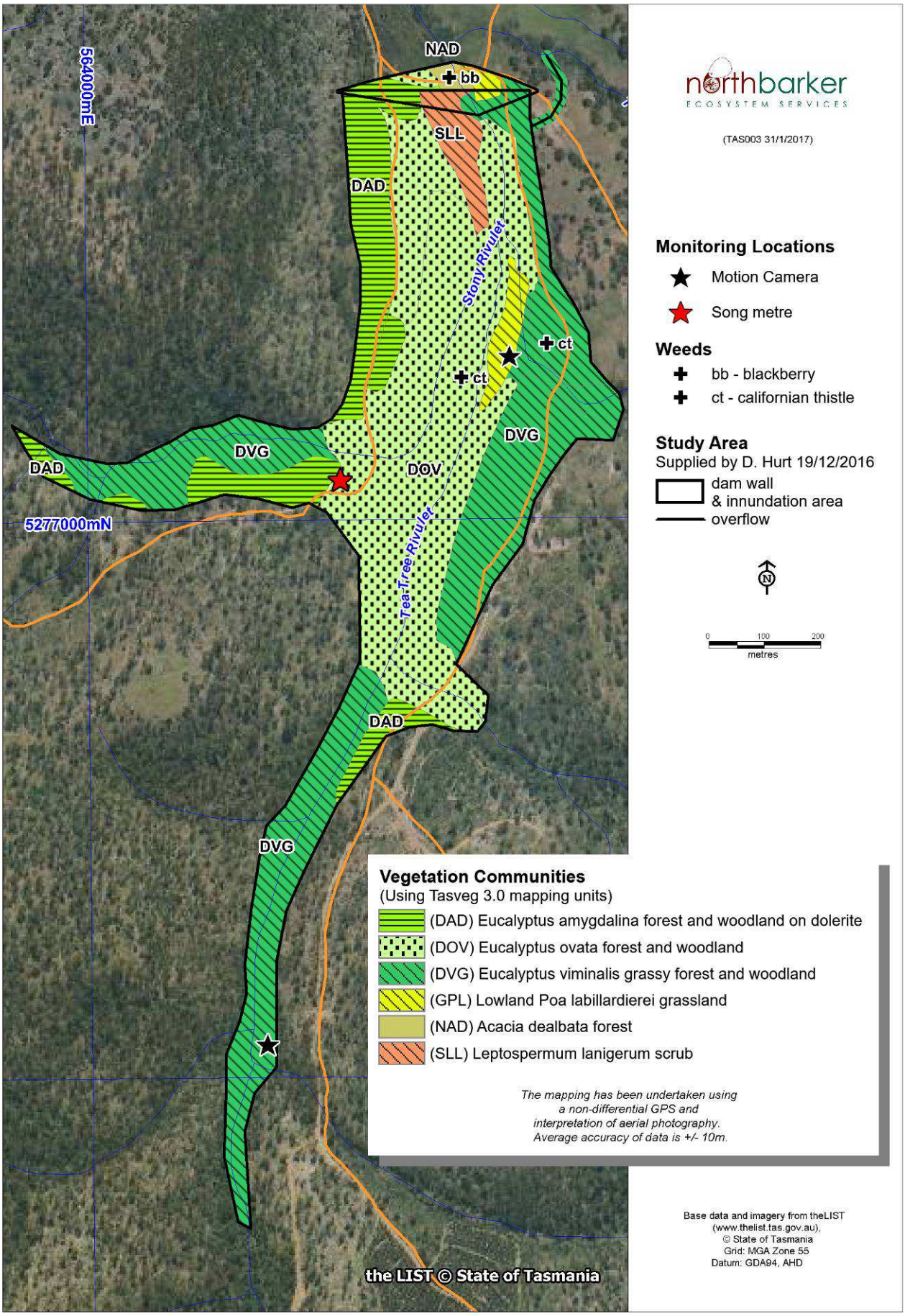


Figure 2. The distribution of vegetation, weeds and fauna monitoring sites in the dam footprint.

Native vegetation types

In this section vegetation within the study area is described under its Tasveg mapping unit.

Dry Eucalyptus amygdalina forest on dolerite (DAD)

There are relatively small areas of this forest on the upper slopes and dry rocky edges of the rivulet in the dam footprint. A typical species list and structure is set out below.

The likely area and location of conversion is set out in (Table 2).

Trees:	*Eucalyptus amygdalina, Bursaria spinosa subsp. spinosa*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Pomaderris apetala*
Shrubs:	*Coprosma quadrifida, Daviesia ulicifolia, Epacris impressa, Leptecophylla divaricata, Leucopogon collinus, Leucopogon ericoides*
Low Shrubs:	*Acrotriche serrulata, Astroloma humifusum, Hibbertia hirsuta, Hibbertia riparia, Pimelea humilis*
Herbs:	*Acaena novae-zelandiae, Brachyscome sp., Dichondra repens, Drosera peltata, Euchiton sp., Gonocarpus tetragynus, Goodenia lanata, Hydrocotyle sp., Hypericum gramineum, Hypoxis hygrometrica, Lagenophora stipitata, Leptorhynchos squamatus, Microtis sp., Oxalis perennans, Stylidium graminifolium, Wahlenbergia*
Graminoids:	*Lepidosperma curtisiae, Lepidosperma gunnii, Lepidosperma laterale, Lomandra longifolia, Schoenus apogon*
Grasses:	*Austrostipa stuposa, Ehrharta distichophylla, Ehrharta stipoides, Poa labillardierei, Rytidosperma caespitosum, Rytidosperma geniculatum, Themeda triandra*
Weeds:	*Centaurium erythraea*
Climbers:	*Clematis aristata*

Dry Eucalyptus ovata shrubby/grassy forest and woodland (DOV) - Threatened

This is the predominant forest and woodland present in the dam footprint. This vegetation occurs in the downstream half of the footprint. Along the rivulet the riparian forest understorey is predominantly sedges and poa tussock. On the drier slopes beyond the understorey is open dry sclerophyll shrubs and native grasses and herbs.

At the dam wall the vegetation has been regularly burnt in the past and while now appears to be either grassland or shrub land, regenerating *E. ovata* are present throughout. According to the EPBC draft listing advice this would qualify as the community as it meets the key diagnostic criteria[10].

A typical species list and structure is set out below. Lists of other quadrats are in Appendix 3.

The likely area and location of conversion is set out in (Table 2).

Trees:	*Eucalyptus ovata var. ovata, Eucalyptus viminalis subsp. viminalis, Eucalyptus obliqua, Acacia melanoxylon, Bursaria spinosa subsp. spinosa*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Acacia verticillata, Exocarpos cupressiformis, Leptospermum lanigerum, Pomaderris apetala*

[10] Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) DRAFT Conservation Advice (incorporating listing advice) for the Tasmanian Forests and Woodlands dominated by black gum

Shrubs:	*Coprosma quadrifida, Rubus parvifolius*
Herbs:	*Acaena novae-zelandiae, Geranium potentilloides var. potentilloides, Hydrocotyle callicarpa, Mazus pumilio, Myriophyllum sp., Oxalis perennans, Rumex dumosus*
Graminoids:	*Carex gaudichaudiana, Gahnia grandis, Lepidosperma laterale, Lomandra*
Grasses:	*Australopyrum pectinatum, Poa labillardierei*
Ferns:	*Blechnum minus, Dicksonia antarctica, Polystichum proliferum, Pteridium esculentum subsp. esculentum*
Climbers:	*Clematis aristata*
Weeds:	*Cirsium vulgare, Sonchus asper*

Dry Eucalyptus viminalis grassy forest (DVG)

The community is common on the drier slopes of the dam footprint. In some areas *E. amygdalina is also present and can be co dominant*.

The riparian forest type in the upstream section of the dam has been attributed to grassy *E. viminalis* as well. The riparian *E. viminalis* forest has a fern and broadleaf dominated understory which defines it as wet *E. viminalis* forest according to the Tasveg Key. Wet *E. viminalis* forest is a threatened vegetation type. However, this forest occupies a very narrow ecotone and retains scattered dry components such as sagg and poa tussock. The original aim of listing the wet forest type was to capture the wet forests on fertile land that was suitable for agriculture. This forest is not that type but rather simply the riparian margin of dry *E. viminalis* grassy forest. Lists of other quadrats are in Appendix 3.

The likely area and location of conversion is set out in (Table 2).

Riparian facies

Trees:	*Eucalyptus viminalis subsp. Eucalyptus amygdalina, Eucalyptus obliqua, Eucalyptus ovata var. ovata, Acacia melanoxylon, Bursaria spinosa subsp. spinosa,*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Acacia verticillata, Banksia marginata, Beyeria viscosa, Exocarpos cupressiformis, Leptospermum lanigerum, Notelaea ligustrina, Pomaderris apetala, Zieria arborescens*
Shrubs:	*Acacia derwentiana, Coprosma quadrifida, Cyathodes glauca, Epacris impressa, Leptecophylla divaricata, Lomatia tinctoria, Melaleuca pallida, Olearia ramulosa, Pimelea drupacea, Tasmannia lanceolata*
Low Shrubs:	*Hibbertia riparia*
Herbs:	*Acaena novae-zelandiae, Brachyscome sp., Crassula helmsii, Dianella tasmanica, Dichondra repens, Galium sp., Geranium potentilloides var. potentilloides, Gonocarpus tetragynus, Goodenia lanata, Hydrocotyle callicarpa, Lagenophora stipitata, Lythrum hyssopifolia, Mazus pumilio, Oxalis perennans, Pelargonium australe, Poranthera microphylla, Pterostylis decurva, Senecio minimus, Viola hederacea, Wahlenbergia sp.*
Graminoids:	*Carex appressa, Carex iynx, Eleocharis gracilis, Gahnia grandis, Gahnia sieberiana, Juncus sarophorus, Lepidosperma laterale, Lomandra longifolia*
Grasses:	*Australopyrum pectinatum, Deyeuxia quadriseta, Ehrharta stipoides, Poa labillardierei, Poa rodwayi*
Ferns:	*Adiantum aethiopicum, Blechnum minus, Blechnum wattsii, Polystichum proliferum, Pteridium esculentum subsp. esculentum*
Climbers:	*Clematis aristata*
Weeds:	*Centaurium erythraea, Cirsium vulgare, Helminthotheca echioides, Hypochaeris*

	radicata, Lysimachia arvensis, Rubus fruticosus, Sonchus asper
Climbers:	*Clematis aristata*

Lowland *poa labillardierie* grassland (GPL)

This community occurs in the dam footprint and at the dam wall. It is natural occurrence in the river flat. GPL can form part of the EPBC listed threatened ecological community 'Lowland Native Grasslands of Tasmania. In this case the patch at the dam wall does not meet the condition criteria for the listed community. However, the patch within the dam footprint does meet the condition threshold criteria for listing and is >1 ha in size. The likely area and location of conversion is set out in (Table 2).

A typical species list and structure for this community is given below.

Trees:	*Eucalyptus ovata var. ovata*
Tall Shrubs:	*Acacia dealbata subsp. dealbata*
Herbs:	*Acaena novae-zelandiae, Ajuga australis, Geranium potentilloides var. potentilloides, Mazus pumilio, Oxalis perennans, Rubus gunnianus, Senecio sp., Veronica calycina, Wahlenbergia sp.*
Graminoids:	*Carex iynx, Lepidosperma longitudinale, Lomandra longifolia*
Grasses:	*Deyeuxia sp., Poa labillardierei*
Weeds:	*Centaurium erythraea, Cirsium arvense var. arvense, Holcus lanatus, Hypochaeris radicata, Lysimachia arvensis, Rubus fruticosus, Verbena officinalis, Vicia sp.*

Table 1: State-wide and bioregional extent and reservation status of the vegetation types found in the study area.

TasVeg Code[11] Dam	State Wide Extent[12] / NRS Reservation Status [13]	Bioregional Extent / Reservation Status
Black peppermint on dolerite		
DAD	230,439 ha mapped 53,240 ha reserved	100,498 ha mapped 32,865 ha reserved
Shrubby black gum forest		
DOV	186,618 ha mapped 4,467 ha reserved	47,375 ha mapped 967 ha reserved
Grassy white gum forest		
DVG	249,576 ha mapped 15,090 ha reserved	127,281 ha mapped 8,326 ha reserved
Poa grassland		
GPL	13,500 ha mapped 800 ha reserved	7,700 ha mapped 500 ha reserved

[11] Kitchener & Harris 2013

[12] Extent at 1750 for RFA forest types and current extent Tasveg 3 for non forest.

[13] DPIPWE 2014 Tasveg 3 Tas Reserve System (non-forest); Knight 2012 (forest)

TasVeg Code[11] Dam	State Wide Extent[12] / NRS Reservation Status [13]	Bioregional Extent / Reservation Status
Acacia dealbata forest		
NAD	41,415 ha mapped 12,945 ha reserved	1,923 ha mapped 649 ha reserved
Leptospermum lanigerum scrub		
SLL	76,202 ha mapped 51,300 ha reserved	1,600 ha mapped 1000 ha reserved

Table 2. The area (ha) of each Tasveg 3 mapping unit in the dam footprint.

Description	Area (ha)
(DAD) Eucalyptus amygdalina forest and woodland on dolerite	7.65
(DOV) Eucalyptus ovata forest and woodland	21.64
(DVG) Eucalyptus viminalis grassy forest and woodland	20.47
(GPL) Lowland Poa labillardierei grassland	1.25
(NAD) Acacia dealbata forest	0.26
(SLL) Leptospermum lanigerum scrub	1.43
Grand Total	**52.74**

Impact and mitigation:

Figure 2 illustrates the extent of vegetation and Table 2 presents the extent of clearance of each vegetation type in the dam footprint.

The footprint of dam wall and inundation area will be cleared of trees to FSL. The area required to be cleared in the dam footprint is tabulated in Table 2.

Vegetation

Eucalyptus ovata forest

This forest type is listed as threatened on the Nature Conservation Act 2002. The Dam Permit process requires that impacts exceeding 5 ha of this forest type require an offset to be formally protected. No suitable offsets occur on the property.

A Vegetation Condition Assessment was undertaken of the *E. ovata* forest. This will provide the qualitative basis for comparison to any offsets that are proposed.

The results of the VCA from 4 sites is tabulated below. Dov1-Dov3 are of about equal size (7 ha +/-) while Dov 4 is a small degraded remnant of about 1 ha.

	'Site condition score'							*'Landscape context score'*			
	Large trees	Tree canopy cover	Lack of weeds	Understorey summary	Recruitment	Organic litter	Logs	Patch size	Neighbourhood	Distance to core area	***Total VCA score***
Dov 1	6	5	13	15	5	5	4	8	7	4	**72**
Dov 2	6	5	15	15	5	5	4	8	7	4	**74**
Dov 3	6	5	13	15	6	5	2	8	6	4	**70**
Dov 4	0	0	9	10	5	5	0	8	6	4	**47**

EPBCA Significance of Impact Test

There is one EPBC listed ecological community (lowland grassland) within the dam footprint and one that is proposed for listing (*E. ovata* forest).

Significance of impact criteria have been considered in Section 4. In summary the following criteria have been met for lowland grassland and *E. ovata* forest (as proposed for listing).

• reduce the extent of an ecological community (due to inundation).

• modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns (due to inundation).

The practices employed to undertake vegetation clearance will conform to Dam Works Code; to the extent that soils and water will be protected.

The boundaries of the vegetation clearance areas will be marked as per Dam Works Code to ensure the limit of clearance.

3.3 Flora Species

157 species were recorded in the study area. A complete inventory of vascular plant species recorded during field surveys is presented in Appendix 3. These lists include samples from each of the vegetation types in the study area. The lists were compiled from representative plots within each Tasveg mapping unit and augmented by the addition of species observed in the same mapping unit during a timed meander search. The search continued until no additional species were added for 5 minutes. The search targeted all variation within each mapping unit.

Table 3 lists threatened plant species previously recorded within a 5 km radius of the study area. Species previously recorded by the EPBC search tool in this radius but with no conceivable chance of occurring in the study area have been excluded. Those species not previously recorded in the vicinity but present are listed first. Notes on the habitat and the likelihood of the species being in the study area are included.

Table 3. Threatened flora species previously recorded in the vicinity (within 5km)[14].

Species	Status TSPA / EPBCA	Potential to occur	Observations and preferred habitat[15]
Predicted by EPBC habitat mapping and or recorded within 5 km of dam site[16]			
Boronia hippopala *Velvet boronia*	Vulnerable/Vulnerable	Low	Riparian habitat is not similar to that at known habitats being dominated by Pomaderris and or blackwood and ferns.
Corunastylis nuda Tiny midge orchid	Rare /-	Low	No suitable habitat.
Dianella amoena Matted flax lilly	Rare/endangered	Very Low	No suitable habitat
Epacris virgata *Pretty heath Dans Hill*	Vulnerable/ Endangered	Low to moderate	The habitat of this species is variable. Potential habitat is present in the DOV. No plants were observed. May have been overlooked if sparse. Flowering time in this location may be autumn.
Odixia achlaena Golden everlasting	Rare/-	Low	No suitable habitat present on site.
Pterostylis atriola Snug greenhood	Rare/endangered	Moderate	Flowers during February March and so may have been overlooked. Survey at flowering time is required to confirm its absence. Suitable habitat present.
Rhytidosperma indutum Tall wallaby grass	Rare/-	Moderate	Suitable habitat present in dry E. viminalis and *E. amygdalina* grassy forest. May have been overlooked if sparse.
Schenkia australia Spike centaury	Rare/-	Low	Broadly distributed and suspected of being introduced. Suitable habitat present.
Spyridium lawrencei *dustymiller*	Endangered/Endangered	Very low	Very limited suitable rocky habitat present. Unlikely to have been overlooked unless sparse and present in low numbers.
Spyridium parvifolium *Coast dustymiller*	Rare/-	Very low	Suitable rocky habitat present but only confirmed from North east. Unlikely to have been overlooked unless sparse and present in low numbers.

[14] Natural Values Report December 2016, DPIPWE

15 Wapstra et al. 2010, Jones et al. 1999, Threatened Species Link – DPIPWE 2015

[16] EPBC Protected Matters report dated 1 February 2017 – 08M21D

Species	Status TSPA / EPBCA	Potential to occur	Observations and preferred habitat[15]
Thismia rodwayi *Fairy laterns*	Rare/-	Low	Flowers below litter layer most often in pomaderris litter. Marginal suitable habitat is present (sparse litter).
Uncinia elegans Handsome hooksedge	Rare/-	Low - moderate	Predominantly a highland and wet forest species. Marginal habitat present.

3.4 Fauna Habitat

The dam footprint occupies the bottom of the narrow valley of Tea Tree Rivulet. The valley broadens somewhat toward the dam wall. The vegetation is almost entirely forest. Much of the lower area is dominated by black gum which is pre breeding foraging habitat of the swift parrot.

The forest is regrowth but with some old growth elements remaining. The presence of old growth eucalypt trees provides nesting and roosting habitat for hollow using mammals, birds and potentially eagles within 1000 m line of sight.

Logs and hollow bases in mature trees are potential habitat for mammals but large logs are rare in the study area. Deep litter is restricted to patchy accumulations of flood debris, but these do support all stages of decomposition which is favourable for invertebrates.

Grass and herbs are common and so grazing animals are also common. Browsers such as pademelons are also common. Echidna diggings are occasional.

Small birds have good cover, particularly along the riparian area. Larger birds include predominantly currawongs and magpies (in January) and eagles, which were observed foraging above the canopy. The presence of riparian eucalypts in protected riparian situations present some nesting opportunities for goshawks and other canopy nesting birds. Nests were observed but were most likely crow/currawong and magpie nests.

The stream is clear water and trout were obvious. The bed is cobble. There is only very occasional aquatic vegetation present. The riparian vegetation is differentiated from the surrounding vegetation by the presence of ground ferns and broad leaves such as Pomaderris or Beyeria.

Due to the mosaic of native vegetation within a context of more extensive native vegetation there are suitable habitat patches for nesting or denning for a number of threatened fauna species. Others that are reported on the NVA or the Protected Matters Search tool are highly unlikely or do not occur.

Species that **are known or likely to** occur are:

Tasmanian devil – (endangered TSPA / EPBC)

Spotted-tailed quoll (Rare TSPA / Vulnerable EPBC)

Eastern Quoll (endangered EPBC

Swift Parrot (endangered TSPA/ Critically endangered EPBC)

Eastern barred bandicoot (EPBC vulnerable)

Species with a **low to moderate probability** of nesting in suitable habitat in the study area.

Wedge-tailed eagle (TSAP endangered / EPBC)

Grey goshawk (TSPA endangered)

Masked owl (endangered TSPA / EPBC)

Tussock skink (vulnerable TSPA)

Wielangta stag beetle (endangered TSPA / EPBC)

Species with **no to very low probability of occurrence**

Azure kingfisher (TSPA endangered / EPBC endangered)

Australasian bittern (EPBC endangered)

Chaostola skipper (TSPA endangered / EPBC endangered)

Green and gold frog (TSPA vulnerable / EPBC Vulnerable)

Australian grayling (TSPA vulnerable / EPBC vulnerable)

A number of additional species returned in the Protected Matters search tool are marine or migratory and or it is otherwise inconceivable that they would occur. The study area is not in the range of these habitats and so they do not occur. The Protected Matters report is attached in Appendix 4.

3.5 THREATENED FAUNA SPECIES PREVIOUSLY RECORDED

The Natural Values Atlas returned records of threatened species previously recorded from within 5 km of the study area. The table below details these species, followed by a discussion of those species likely to occur and be potentially impacted upon.

Table 4: Fauna species of conservation significance previously recorded, or which may potentially occur, within 5 km of the property[17].

Species	Status TSPA/EPBCA	Likelihood of occurrence[18]	Preferred Habitat[19] and Observations[20]
BIRDS			
Grey goshawk *Accipiter novae-hollandiae*	Endangered/ -	Low - Moderate	This species is likely to be present for hunting at least from time to time. The forest is predominantly unsuitable for nesting except for the riparian strip that supports suitably protected nest trees and a belt of foraging habitat. A potential nest is present but not confirmed for this species.
Swift parrot *Lathamus discolor*	Endangered/ ENDANGERED	High	There are 78 records within 5 km, the most recent being 2010. Requires tree hollows for nesting and feeds on nectar of blue gum (*E. globulus*) and black gum (*E. ovata*) flowers. It is highly likely that the study area is utilised for foraging by swift parrots from time to time. *E. ovata* is an important early or prebreeding season resource. Scattered old growth trees with hollows offer suitable nesting habitat within suitable distance of blue gums.
Masked owl *Tyto novaehollandiae castanops*	Endangered / VULNERABLE	Moderate	This species is dependent upon large tree hollows for nesting. Numerous old growth trees in the dam footprint occur along the riparian area of the upper rivulet. A song metre placed in the lower and then in the upper dam footprint to record Masked owl calls did not record any masked owl calls.
Wedge-tailed eagle *Aquila audax*	Endangered/ ENDANGERED	Low	Five nests are known from within 5 km of the dam footprint. No recent surveys are known of. A number of patches of medium to high quality nesting habitat were searched by observation from a helicopter in mid February 2017. No nests were recorded.
White-bellied sea-eagle *Haliaeetus leucogaster*	Vulnerable/ -	Nil	This species nests and forages primarily near the coast but will also live near large rivers and inland lakes, often moving on a seasonal basis. No suitable marine or aquatic habitat occurs within the vicinity of the study area.

[17] Natural Values Report Dec 2016

[18] For broad ranging species such as eagles and devils this refers to active breeding structures such as nests or dens.

[19] Bryant & Jackson (1999)

[20] Natural Values Report Dec 2016

Species	Status TSPA/EPBCA	Likelihood of occurrence[18]	Preferred Habitat[19] and Observations[20]
MAMMALS			
Eastern quoll *Dasyurus viverrinus*	ENDANGERED	High	Records from the Tasmanian Natural Values Atlas (DPIPWE, 2017) indicate that the eastern quoll occurs in most parts of Tasmania, but is recorded infrequently in the wetter western third of the state. The species' distribution is associated with areas of low rainfall and it is found in a range of vegetation types including open grassland (including farmland), tussock grassland, grassy woodland, dry eucalypt forest, coastal scrub and alpine heathland. Abundance and occurrence within this broader distribution are often patchy over short distances and so hard to predict. There are 11 records within 5 km of the dam site. No recent surveys have been reported. Observations of the habitat present in the study area suggest that it optimal because it provides good cover and a diversity of opportunities for foraging.
Spotted-tailed quoll *Dasyurus maculatus ssp. maculatus*	Rare/ VULNERABLE	Moderate	This naturally rare forest-dweller most commonly inhabits rainforest, wet forest and blackwood swamp forest. It forages and hunts on farmland and pasture and shelters in logs, rocks or thick vegetation. There are two records of this species within 5 km m of the dam. No records of quolls were obtained from 4 motion cameras between Feb 6 – March 9. The study area is within the range of an important population.
Tasmanian devil *Sarcophilus harrisii*	Endangered/ ENDANGERED	Moderate	Inhabits a range of forest types, usually within extensive tracts of remnant native vegetation. There are many records of this species within vicinity. This type of habitat has a high carrying capacity for devils due to the relatively high abundance of prey species. Maternal dens are likely to be clustered in areas of suitable structure for dens. Primarily in drier forest. This tends to be on the higher slopes above the dam footprint. 7 records of 1 or more devils were recorded on 4 motion cameras between Feb 6 – March 9. Two potential dens were noted within the dam footprint but motion cameras did not capture activity other than of wombats. The most likely location of dens is on the rocky slopes above the dam footprint.
Eastern barred bandicoot *Perameles gunnii*	- / VULNERABLE	Moderate - High	Inhabits grassy woodlands, native grasslands, and mosaics of pasture and shrubby ground cover favouring open grassy areas for foraging with thick vegetation cover for shelter and nesting. There are 5 records each from the vicinity of the dam footprint. There is optimal foraging and nesting habitat in DVG and DOV.
FISH			
Australian grayling *Prototroctes maraena*	Vulnerable/ VULNERABLE	Nil	There are no records in the vicinity. A weir on the Prosser River makes upstream migration impossible.
AMPHIBIANS			

Species	Status TSPA/EPBCA	Likelihood of occurrence[18]	Preferred Habitat[19] and Observations[20]
Green and gold frog *Litoria raniformis*	Vulnerable/ VULNERABLE	Nil	No suitable habitat
Reptiles			
Tussock skink *Pseudemoia pagenstecheri*	Vulnerable/ -	Low - moderate	This species is restricted to native tussock grasslands. The dam footprint is within the range of this species and supports suitable habitat in about 1.5 ha of poa tussock grassland. The habitat was searched along transects on two mornings at around 10 am. Both were warm and sunny and so provided ideal conditions for basking. The grassland has numerous open inter tussock spaces that are ideal for basking. No lizards were recorded in the grassland on either day. Numerous other skinks were observed basking and moving around in other sunny habitats, particularly along the riparian area on cobbles and amongst sparse litter. It is possible that the small size and isolated occurrence of the grassland patch is not suitable to sustain a population of tussock skinks. Small islands of habitat isolated in unsuitable habitat are known to contain fewer and fewer species with increasing distance from a large area of suitable habitat. This may explain the possible absence of the tussock skink. There remains a chance that it is present and that limitations of the survey technique (search effort = 2 hrs) explain the negative result.
INVERTEBRATES			
Chaostola skipper *Antipodia chaostola*	Endangered / Endangered	Very low	Host plants are *Gahnia spp*. that is occurring either as an understorey or as the dominant vegetation layer. There are no records in the vicinity but habitat is predicted based on range boundaries (NVA report). Only very occasional single plants of the host were recorded in the study area. It is highly unlikely that this species occurs in the study area.
Wielangta stag beetle *Lissotes latidens*	Endangered / Endangered	Low	This endemic beetle is restricted to the vicinity. There numerous records south of the dam footprint and a few others in the vicinity, including one within the catchment of Tea Tree Rivulet. A narrow riparian strip is the most likely suitable habitat. Large logs are rare and litter was confined to flood deposits. This species is notoriously difficult to locate which is evident in the results of an intensive and extensive search completed by Groves (2006) in which 2 dead specimens were located after searches more than 1000 m of logs and more than 3800 trap days using 162 pitfall traps. 4 * 4 hr litter and log searches did not return a beetle. The ground litter is shallow and dry with little decomposition. Logs are few and small diameter. Searches concentrated in and around flood debris.

3.6 Threatened Fauna For Which Habitat May be Important

Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) - Vulnerable

Context:

The spotted-tailed quoll occurs throughout Tasmania and also in eastern Australia. On the mainland their numbers have declined and Tasmania is now their remaining stronghold. In the south east the spotted-tailed quoll is most abundant in areas containing rainforest and wet forest.

Highest quality habitat is fertile extensive un-fragmented lowland wet forest vegetation, although the species persists in native forest fragmented by agricultural land use. The core range for the spotted-tailed quoll is lowland forested areas of northern Tasmania and the central and north-eastern highlands. Lower densities of animals occur elsewhere in suitable habitat throughout Tasmania and an important population area includes the dam footprint.

The species requires forested areas with suitable shelter sites such as hollow logs, burrowable soil or rocky caverns for denning habitat. This is distinguished from foraging habitat, which can include non-forest and regenerating forest areas adjacent to suitable denning habitat[21]. The best foraging habitat is characterised by an abundance of mammalian prey species, which tends to be on fertile land and is often associated with riparian or alluvial sites such as present in the dam footprint.

There are currently estimated to be 3,000-4,000 animals in Tasmania with a density of about 1 animal per 3 km^2 in core habitat[22]. They are known to have a large home range[23]. Home ranges extend to more than 1,500 ha of continuous suitable habitat for a male and less for a female. Female ranges are often exclusive and male ranges overlap. Continuous habitat patches (denning and hunting) totalling more than 15,000 ha may be required to sustain a minimum viable population of 50 spotted–tailed quoll based on an exclusive home range of 300 ha[24].

Figure 3 illustrates the distribution of important populations and key sites in Tasmania. This is a map derived from descriptions in the Draft Recovery Plan and from the Threatened flora handbook referred to on the map. Without definitive population boundaries habitat suitability and evidence of occupation are important. The dam site is within the intended range of important population 5. The habitat and its characteristics are contiguous and contribute to a patch of > 15000 ha.

A recent study in the north west of Tasmania provided some local insight into the behaviour of female quolls in dry eucalypt forest[25].

In Troy's study, the core ranges of female quolls (50% kernel [time spent]) varied between about 30 and 100 ha while the greater range (95% kernel [time spent]) varied between about 150 and 520 ha. Contrary to the exclusive home ranges described in the Recovery Plan; all of the female ranges had at least some overlap at the 95% kernel (time spent), and most had considerable overlap in the core range, with the others being essentially exclusive in the core range. Such overlap is likely to be facilitated by high productivity in the habitat.

The size of the females range appears to be related to the extent of native forest within the range, the smaller the range the greater the cover of native forest and vice versa.

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[21] Mallick 2003

[22] Meander Dam Mitigation Strategy for spotted-tailed quoll (North Barker 2003).

[23] Tasmania's Threatened fauna handbook, Bryant & Jackson, 1999

[24] PLUC 1996

[25] Troy et al 2011 (poster presentation)

Based on core range sizes measured by Troy, the study area is equivalent to less than 1 female range. However, the actual distribution and partitioning of ranges in the landscape may mean that portions of more female ranges, perhaps 1 or 2, occur in the study area.

Findings:

Spotted-tailed quoll have commonly been recorded from the type of habitat that is found in the study area and from the vicinity. The habitat area is from within the range of an important population.

The entire habitat area in the dam footprint is foraging habitat with suitable burrowing habitat present in sandy soils near the rivulet and tree hollows in old growth trees.

No records of quolls were obtained from the 5 motion cameras set on thoroughfares in the study area.

Impact:

The clearance of the dam footprint will result in the loss of 52 ha of foraging habitat. Denning opportunities are more localised in the study area and generally more abundant outside of the study area. Nevertheless it is possible that small portions of the core range of 1 or 2 female quolls will be converted as a result of the proposal. The response of the animals is not certain but the adult females may adjust their territories or if the loss of core range is too large they may be displaced and die.

Males are likely to be more resilient than females due to their tolerance of others within their home range and lack of philopatric[26] behaviour. In the landscape context of 1000's of hectares of continuous habitat, the conversion of 52 ha is unlikely to result in the loss of a male quoll.

The philopatric sub-adult females on the other hand will either establish themselves in vacant/adjusted territories or are naturally destined to die without breeding (less than 2 years) if they do not.

In the context of the area of habitat loss, and the ecology discussed above, as well as the extent of habitat that is continuous with the study area, no significant impact is anticipated.

Recommendation:

Vegetation clearance is required from the footprint of the dam. The process of vegetation clearance should conform to the Dam Works Code.

An injured animal protocol should be employed should animals be found to be injured during the forest clearance and dam wall construction works.

[26] Philiopatric – behaviour of animals whereby they tend to return to or stay in the maternal home range or other particular area.

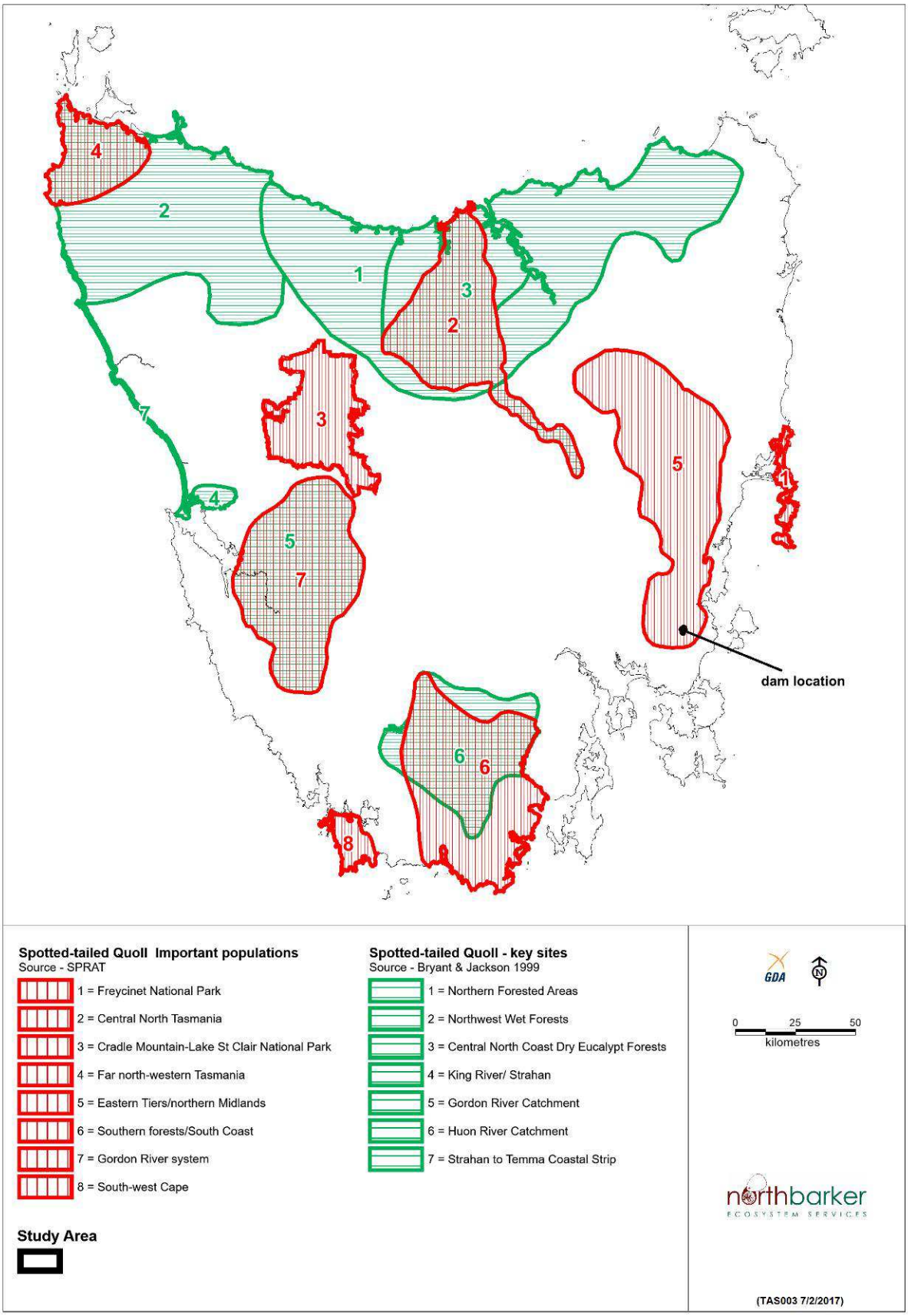

Figure 3. The distribution of important populations and key sites of the spotted-tailed quoll.

Tasmanian devil (*Sarcophilus harrisii*)

Context:

This species was listed on the *TSPA* and *EPBCA* following the significant impact of Devil Facial Tumour Disease (DFTD) on the population.

Persecuted along with the Tasmanian tiger, the species was in threat of extinction by the early 20th century. However changes in policy allowed the species to recover so that it reached historically high levels by the 1990's. Some estimates suggest the population may have exceeded 150, 000 individuals at that time[27].

The Tasmanian devil (*Sarcophilus harrisii*) is Australia's largest surviving marsupial carnivore and only specialist scavenger. Although variable in size, adult males can weigh up to 12 kg and be 30 cm high at the shoulder. The species is now confined to Tasmania where it is widely distributed across all environments throughout the State.

Devils are usually solitary animals but they share continuously overlapping home ranges and come into contact with other devils around prey carcasses and during the mating season[28]. They mate once a year giving birth in April through to July, and can produce up to four young which develop for up to 20 weeks in the pouch. The young are fully weaned at 10 months of age.

The animals can be active during the day where there is no human disturbance but otherwise hunt during the night (Pemberton pers. comm.). In daytime animals hole up in shelter, including underground dens, wombat burrows, hollows and caves. Communal denning, particularly natal dens, occurs in clusters associated with suitable geomorphology in secure sites above the water table. Females are careful to select dens that are difficult to find without the use of electronic tracking devices. Mating occurs in copulation dens which are male dominated and distinct from the natal dens.

Animals typically travel around 8 km a night, although individuals have been recorded covering more than 50km in a single night[29]. They have home ranges of 8 to 20 km² (800 to 2,000 ha), although more recent studies suggest smaller ranges[30] probably reflecting higher carrying capacity. The home ranges overlap to a very large extent with other individuals but they forage separately and are antagonistic toward each other on meeting. The density of devils ranges between 0.3 and 0.7 per km².

The overlapping ranges and high density of animals results in a population of devils that utilises the whole of the landscape as a single entity.

Devils thrive in a landscape mosaic of native habitat and agricultural land.

Fragmentation of the landscape by forest clearance disrupts home ranges. Devils displaced by habitat loss will move to other home ranges but ultimately the population may decrease due to the limits of carrying capacity. This is likely to be over a period of the lifespan of the displaced animals.

Studies of Devil Facial Tumour Disease (DFTD) have shown that it has spread across more than 60% of Tasmania (Figure 4) with population declines averaging 84%, although the population in the northeast has declined by up to 96%[31]. The last remaining stronghold for the Tasmanian devil is in the northwest, with the west and southwest areas supporting much lower densities of disease free devils.

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[27] N. Mooney cited in McGlashan *et. al.* 2006

[28] Hamede *et. al.* 2009

[29] Tarkine Devil Forum (2009)

[30] S. Troy *pers. comm.* –" Landscape ecology of the Tasmanian devil and spotted-tailed quoll"

[31] Based on sightings - Save The Tasmanian Devil website (**www.tassiedevil.com.au**), DPIWE threatened species website (4 Oct 2011)

The devil facial tumour disease (DFTD) is the single most significant cause of mortality and therefore threat to the conservation of the Tasmanian devil.

A reduced population due to DFTD is considered highly vulnerable to other causes of mortality such as road kill or loss of denning habitat.

Findings:

No trapping survey was undertaken in the study area. Given the relatively small area of impact compared to range size the effort required to estimate the number of devils that utilise the site could not be justified on the basis that it would offer little additional relevant information to that described above for general ecology.

Seven observations recorded by motion cameras confirm that the site is utilised by devils. The existing habitat in the study area and adjacent habitat provides continuous home ranges.

The location of natal dens is most likely to be in habitats that have suitable dry habitat above the water table.

A habitat survey in January 2017 found that the most likely denning opportunities were wombat burrows that were present in burrowable soils near the rivulet. Motion cameras did not record devils utilising either of two wombat burrows. Others are likely to be present.

Other denning areas are likely to occur on the upper slopes high above the dam footprint. These areas offer dry denning opportunities in rocks caverns and logs.

Impact:

Habitat loss:

In the landscape context the loss of 52 ha is unlikely to result in the loss of any animals; they are more likely to adjust their home ranges.

The clearance of the study area (0.52 km^2) is far less than one home range (8 - 20 km^2) and this compares to the likely density of between 0.3 and 0.7 devils per km2 for a productive area. The productivity in this case being moderate and driven by the creek lines which attract prey. However, as a result of a high degree of overlapping ranges among devils, the impact is likely to affect more than one devil. Considering the reported range and density figures for unproductive and productive areas, then, a few devils may utilise the foraging habitat if pre disease densities were present. However, the density is likely to be lower because the study area is well within the infected area of habitat and has been for some years.

Prey:

The conversion of the study area is unlikely to affect the abundance of larger mobile prey species (wallabies and small mammals and birds) that preferentially utilise the fertile valley bottom, However, the peri agricultural location provides abundant grazing land for prey species. In the context of the scale of the landscape versus the impact area the loss of prey species across the seasons is likely to be negligible.

Road kill:

The intensification of road traffic over the construction period will be relatively low level. The traffic involved in the clearance of vegetation from the dam site will be infrequent and slow moving. Significant increases in traffic levels are not anticipated and so an increase in the frequency of road kills is not anticipated. The vast majority of traffic associated with the proposal will be day time traffic. A small portion may traverse the area in the high risk dusk and pre-dawn periods if works are undertaken when days are short.

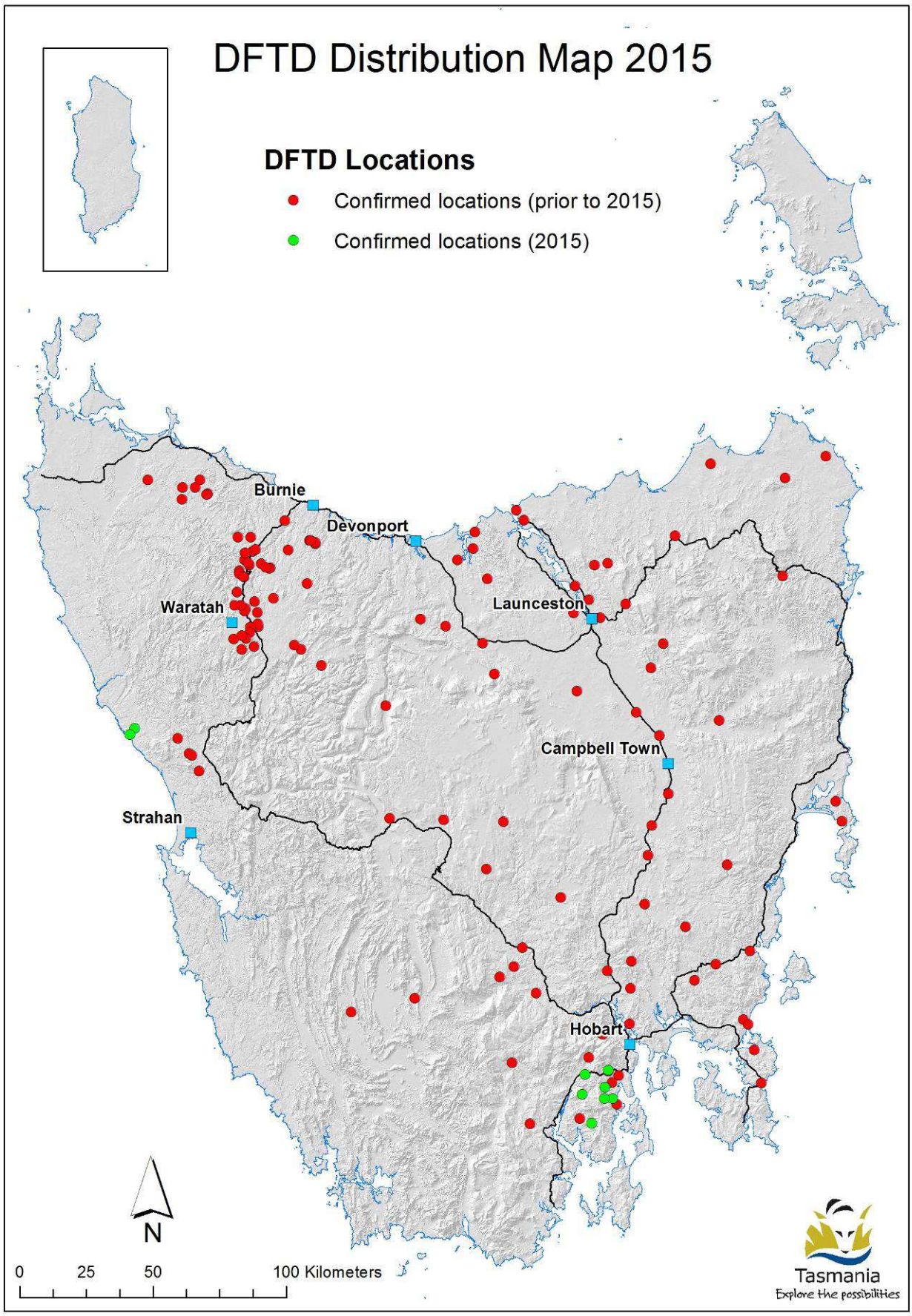

Figure 4. The distribution of Tasmanian devil facial tumour disease in 2015.

Eastern barred bandicoot (*Perameles gunnii*)

Context:

The eastern barred bandicoot was previously widespread across Tasmania, but is now most abundant in the south-east of the state and less abundant throughout the rest of the state. During the day it rests in a grass nest, sometimes in Poa tussocks. This small mammal also requires could cover of low vegetation in which to take refuge and safety from predators.

It feeds throughout the night on earthworms, insects, bulbs, tubers and fungi. It is sensitive to disturbance and is known to eject young from its pouch if scared.

The species is not considered to be threatened in Tasmania due to its relative abundance, absence of a key exotic predator (the fox), and its adaptability to the woodland and pasture interface. Nevertheless, it has declined severely in the midlands of Tasmania and this may reflect the scale of land clearance compared to woodland interfaces.

Findings:

The grassy habitat that is prevalent in the white gum and the black gum forest and woodland in the dam footprint is ideal native habitat for this species. Although the animal was not recorded by motion cameras set in this habitat it is highly likely to be present.

Impact:

Conversion of approximately 25 ha of foraging and potential nesting habitat. Because home ranges are potentially considerably smaller than the area of inundation; perhaps as small as 2-4 ha for females and males respectively but may be as large as 20 ha, the likely outcome is displacement of individuals from home ranges. The probability of survival of displaced animals is not known. Overlap in home ranges does occur; particularly for females but less for males. Due to the short longevity of the species the readjustment to carrying capacity is likely to be rapid.

Eastern quoll (*Dasyurus viverrinus*)

Context:

It is extinct on mainland Australia. The reason for its listing relates to inferred decline of the surviving Tasmanian population, over a 10 year period to 2009, exceeding 50%. The cause for the decline is not fully understood but The EPBC Scientific Advisory Committee has based great credence on a correlation of the decline with successive mild wet winters between 2001 and 2003, followed by very limited recovery in the population since[1]. Although subject to predation from domestic pets and feral cats it has persisted with these pressures for over a century.

A notable distinction between Tasmania and mainland Australia is the absence of the European fox, although another major factor in the mainland decline is thought to be from disease. Changes in predator population biology, resulting from decline in Tasmanian devil populations, and subsequent behavioural change in feral cat behaviour, (increased nocturnal activity plus likely increase in population size) has been proposed as being a likely factor. Currently the eastern quoll is not listed on the Tasmanian TSPA and continues to be widespread and not uncommon throughout much of eastern Tasmania.

It is mostly solitary and is active at night: hunting for prey such as insects, small mammals, birds and reptiles. Eastern quolls can be either fawn or black, with white spots; but no spots on the tail. The home range is reported to be about 35 -45 ha for females and males respectively. The longevity of animals is between 2-4 years (SAC 2015 Conservation Advice). The animals tend to be solitary.

It feeds throughout the night on earthworms, insects, bulbs, tubers and fungi. It is sensitive to disturbance and is known to eject young from its pouch if scared.

Findings:

The habitat is suitable for the eastern quoll but the presence has not been confirmed. It is likely to be present. The probability of occurrence is enhanced by the mosaic of vegetation types with good cover and a relatively productive landscape.

Impact:

Conversion of 52 ha of foraging and potential burrow/nesting habitat. The impact is likely to be the displacement of 1 to a few animals from all or a part of their territory. The probability of survival of displaced animals is not known but competitive behaviour that may exclude intruders from territories has been reported (Jones and Rose 2001). If competitive exclusion is effective, displaced animals may die of starvation/exposure or predation relatively quickly, otherwise carrying capacity may be re established over a couple of years.

The grassy habitat that is prevalent in the white gum and the black gum forest and woodland in the dam footprint is ideal native habitat for this species. Although the animal was not recorded by motion cameras set in this habitat it is highly likely to be present.

Wedge-tailed eagle (*Aquila audax* subsp. *fleayi*)

Context:

The Tasmanian subspecies of the wedge-tailed eagle (*Aquila audax* ssp. *fleayi*) is regarded as being larger than the mainland birds with a wingspan of 2 m and a body weight up to 5.5 kg[32].

Adults are resident, highly territorial and have very large home ranges. Although considered to be widespread but uncommon at the time of European settlement, the breeding success has decreased to a point where it is now considered that fewer than 100 pairs are successful at breeding each year[33].

Wedge-tailed eagles nest in a range of old growth native forests and the species is dependent on forest for nesting. It nests almost exclusively in mature eucalypts capable of supporting their nests. Nests can be developed over many years of use and grow to over 2m in diameter. The eagles choose old growth trees in relatively sheltered sites for locating their nests. Territories can contain multiple nests and up to five alternative nests have been located in a single territory. Nests within a territory are usually close to each other but may be up to 1 km apart where habitat is locally restricted. Wedge-tailed eagles prey and scavenge on a wide variety of fauna including fish, reptiles, birds and mammals.

Depending on the productivity of the landscape the territories will vary in size and so too the distance between nests of different breeding pairs.

The main threat to the species is the continuing decline in productivity as a result of disturbance of breeding birds and loss of nesting habitat[34]. High levels of unnatural mortality because of persecution (illegal shooting, trapping and poisoning); electrocution and collision (with powerlines, vehicles, fences and wind turbines) have led to a reduction in the mean age

[32] Bryant and Jackson 1999

[33] B. Brown *pers. com.*

[34] Threatened Species Section 2006

of the population, resulting in a reduction in breeding success[35]. They are sensitive to disturbance during the breeding season, which occurs between August and January.

Findings: There are five records of eagle's nests within +/-5 km of the dam footprint.

Figure 5 illustrates a habitat quality model produced by the Forest Practices Authority 2013. This figure illustrates the extent and location of moderate to high quality habitat within 1 km line of sight of the dam footprint. Contours lines assist in determining line of sight.

Helicopter based verification and a search of moderate to high quality nest habitat was undertaken at the end of the breeding season on February 16 2017). No nests were observed.

Impact: No impact anticipated.

Recommendation: Repeat the survey if construction is not begun within 3 years.

[35] Threatened Species Section 2006

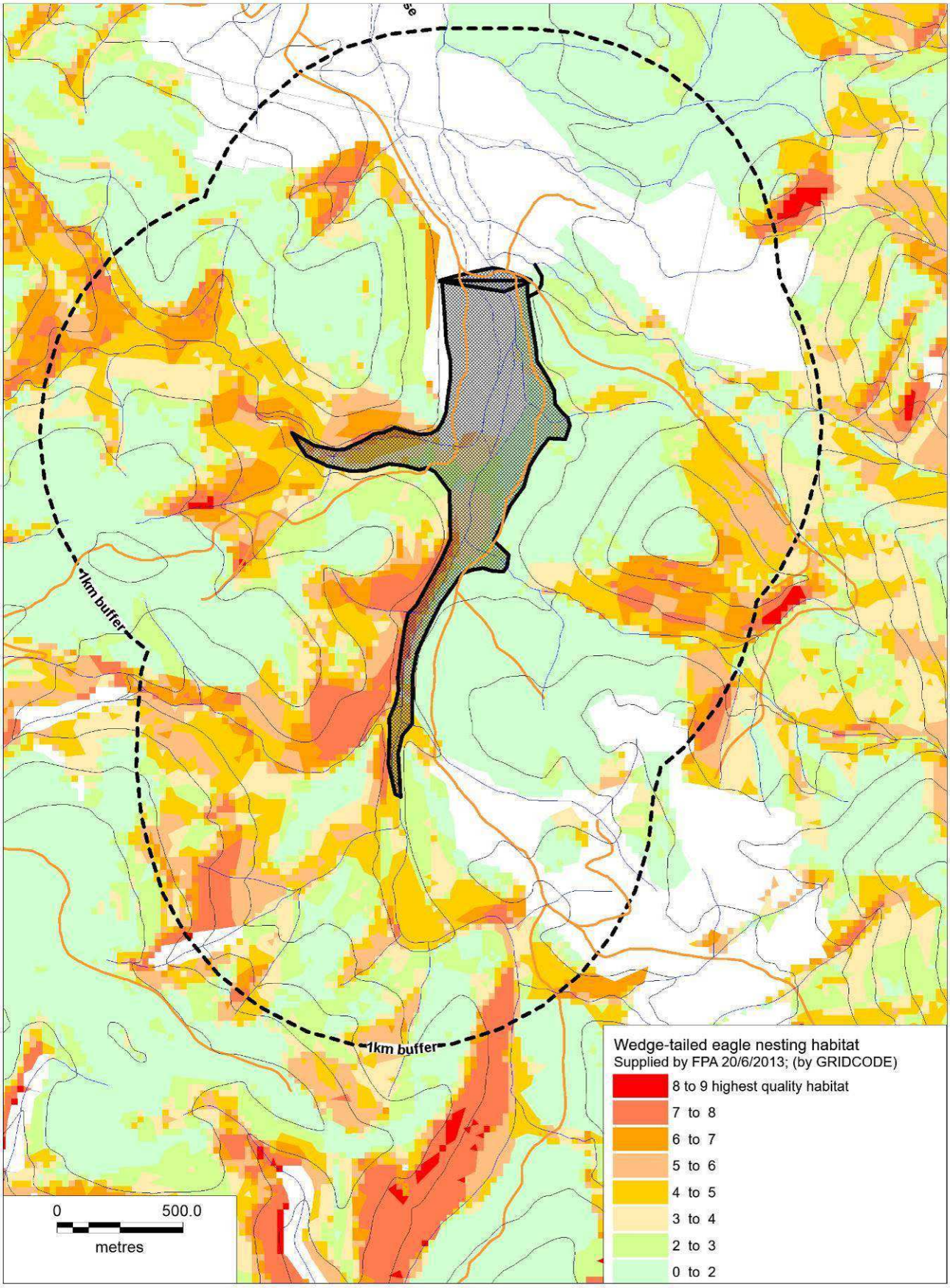

Figure 5. The distribution of wedge-tailed eagle nest habitat quality.

Masked owl (*Tyto novaehollandiae castanops*)

Context: There are estimated to be between about 500 and 1,300 breeding birds in

Tasmania. The highest densities are below 600 m elevation in the east and the north of Tasmania. Breeding pairs occupy home ranges of between 1800 and 2500 ha.[36]

The endemic race of this Australia wide species is widely distributed in Tasmania particularly in lowland dry forests and woodlands. It has extensive foraging territories; however, the bird is threatened by the loss of breeding habitat which is old growth eucalypts with nesting hollows.

Significant habitat for this species is currently defined as all nesting habitat within the core range; which is eucalypt forests and woodlands containing old growth trees or isolated old growth trees containing large hollows.

Findings:

A masked owl habitat model indicates that the habitat in the centre of core habitat range and the habitat along the rivulet are mapped as high maturity (potentially suitable for nesting) reflecting our observation of old growth trees (Figure 6).

The study area is within a larger area of forest much of which retains old growth elements but extensive areas of forestry activity have reduced the nesting opportunities in the vicinity, particularly to the south east. In the context of the range of this bird this clearance could displace birds and increasing the probability of nesting in the footprint.

The songmeter did not record a masked owl call in the vicinity of its placement (Figure 2) in the week of January 11-19 in the lower footprint and February 20 – March 9 higher in the footprint.

Regardless of whether nests are present in the footprint the habitat is likely to be part of the range of a pair of masked owls.

Impact: No significant impact is anticipated.

[36] Young, D. (2006).

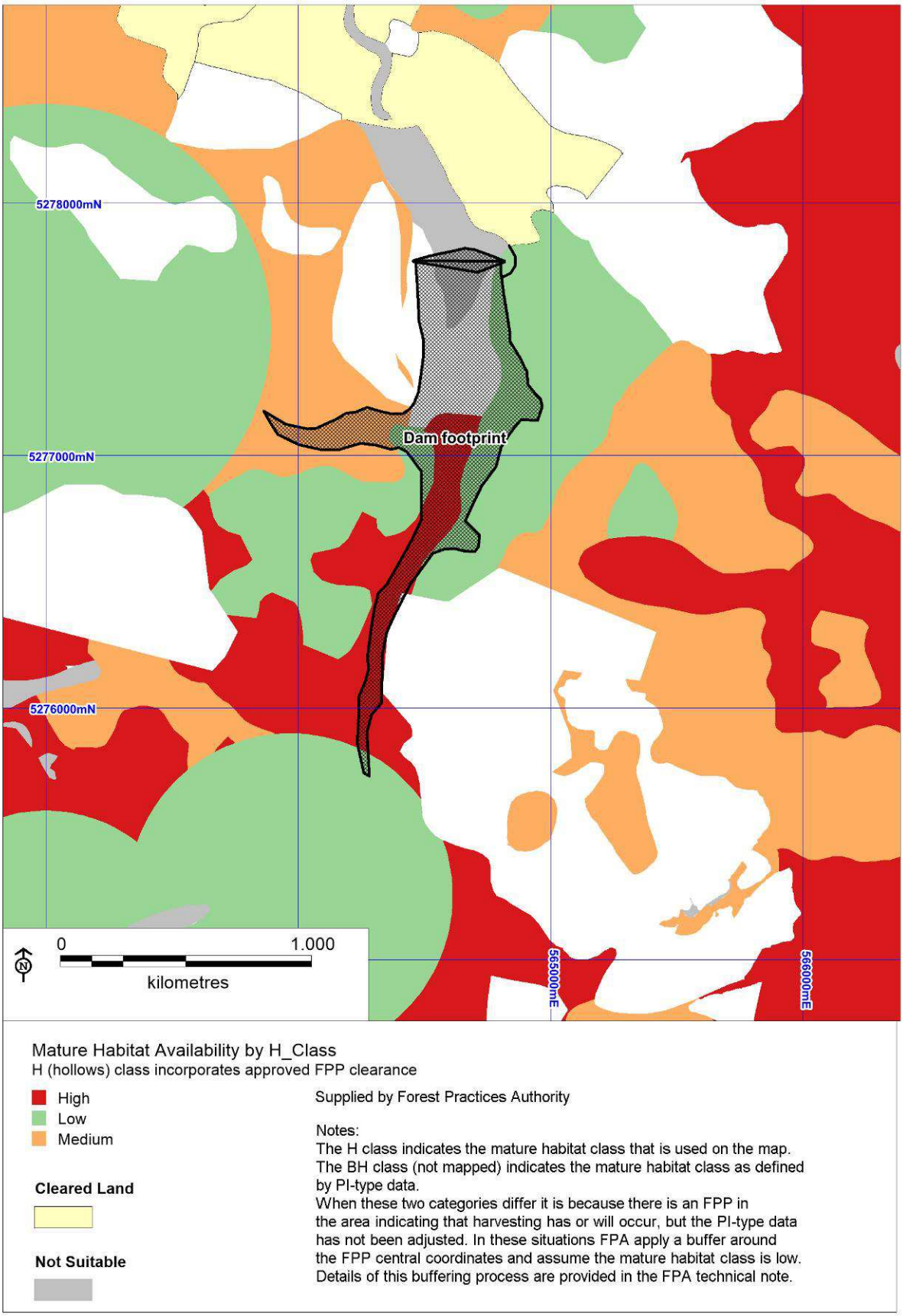

Figure 6. The quality of mature forest habitat in the vicinity.

Swift Parrot (*Lathamus discolor*)

Context: The entire proposal is within the Wielangta SPIBA (swift parrot important breeding area). Suitable forest in a SPIBA is considered important to the breeding success of swift parrots. SPIBA's are predominantly in the south east of Tasmania from about Triabunna to the southern forests (Figure 7).

SPIBA's support regional scale blue gum flowering events in association with suitable nesting habitat. These events are supported early in the breeding season by black gum flowering.

Within SPIBA's the blue gum and black gum flowers provide the nectar on which the young birds are reared to fledglings. Forests nearby these forage resources that are dominated by other tree species and supporting nesting hollows are just as important as the forage resource.

The intensity of flowering varies from year to year in any one SPIBA; this spatial and temporal variation in flowering intensity is reflected in the utilisation of SPIBA's. The SPIBA(s) with the most intense flowering tends to support the breeding in that year. However, it is the persistence of all SPIBA's that is necessary to provide for swift parrot breeding success in all years.

Findings:

The dam footprint supports black gum forest and occasional blue gums.

The dam footprint supports 21.65 ha of black gum forest and woodland. This is an important pre breeding and early season forage resource.

There are potential nesting hollows in mature and old growth trees. However, detailed evaluation was not undertaken.

Stands of blue gum exist in the vicinity but the extent of these stands has not been mapped. Tasveg 3.0 mapping indicates the forest type in the vicinity to be virtually entirely *E. puchella* complex. This mapping unit can include dominant or co dominant blue gum and stands of blue gum.

Impact: Clearance of 21.65 ha of black gum and potential nest hollows. The EPBC significant impact criteria indicate that this impact is likely to be significant. See Section 4.

In this case the loss of forest to conversion is not possible to avoid or directly mitigate. Mitigation through offsetting may be acceptable to regulators. The potential offset policies that apply are discussed in section 3.1 Approach to mitigation.

Recommendations:

Prepare an offset strategy for the impact.

Prepare a referral to under the EPBC Act 1999.

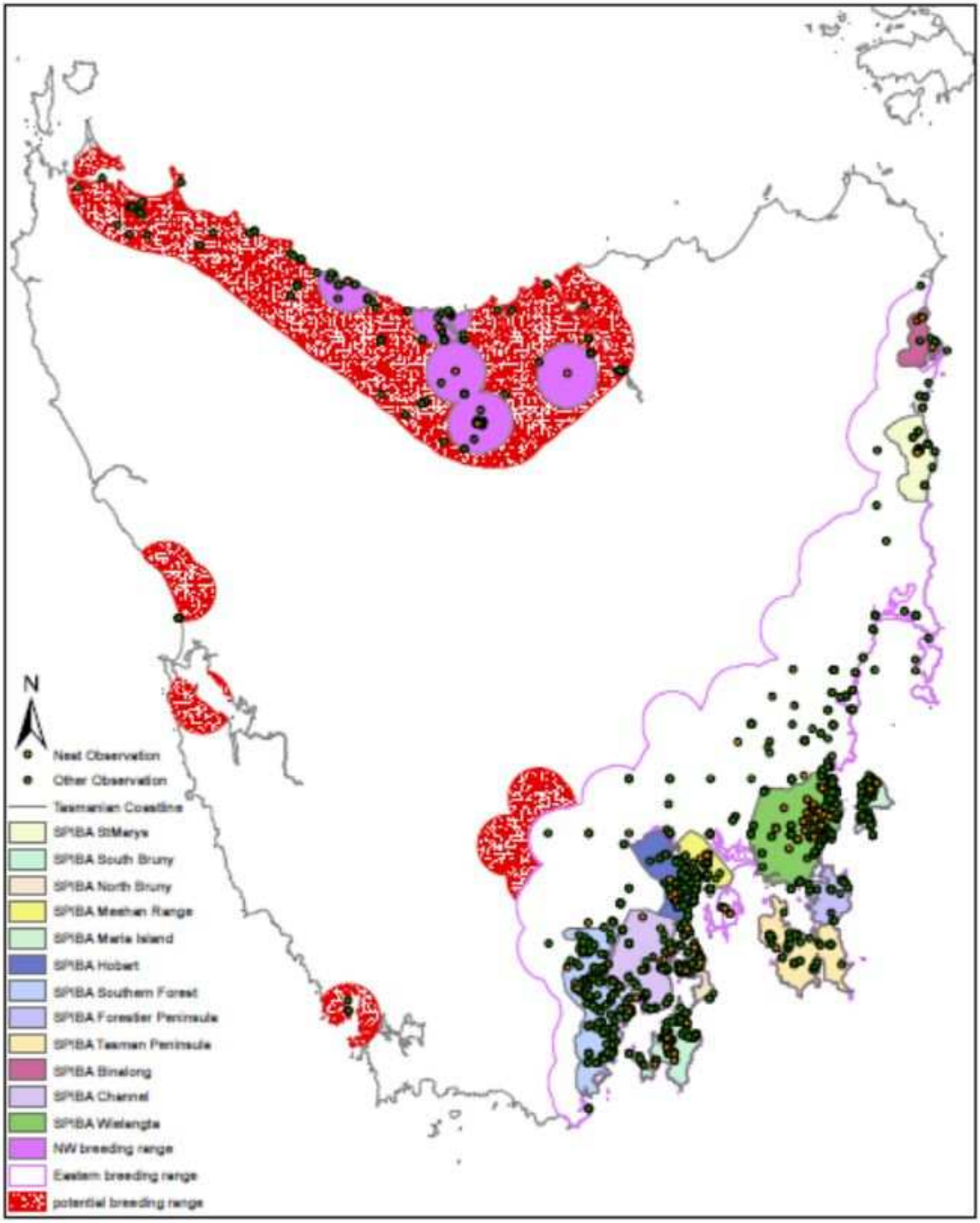

Figure 7: The location of swift parrot important breeding areas (SPIBA's).

Wielangta stag beetle (*Lissotes latidens*)

Context:

The Wielangta Stag Beetle occurs at more than 106 sites in south-eastern Tasmania in the area between Orford and Copping, and on Maria Island. Its distribution is centred on the Wielangta State Forest (Bryant & Jackson 1999b; TSSC 2002p) and covers an area of about 280 km² and it has been reported that the range holds about 43 km² of suitable habitat. The habitat occurs in the wetter forest types and most records are not along riparian forests.

Approximately 20% of forest cover within the species' area of occurrence has been cleared since European settlement, primarily for grazing (Meggs 1999). Since Meggs report further areas of forest have been converted to plantation within the range of the beetle and so the precise extent of loss is not known;

Current populations of the Broad-toothed Stag Beetle are severely fragmented, especially in the western part of its range where it is largely restricted to patches of wet forest along watercourses (Clarke & Spier-Ashcroft 2003). Only around 15% of the species' current area of occurrence consists of potentially suitable habitat. This has possible serious consequences for the species as small isolated populations are at risk from localised extinction (Meggs 1999; TSSC 2002p).

Findings:

The dam footprint is within the range of the beetle and consequently there are a number of records within 5 km of the dam footprint, including one within the catchment of Tea Tree Rivulet, albeit upstream.

Despite the number of records this species is notoriously difficult to locate. This is evident in the results of an intensive and extensive search in the Wielangta State forest completed by Groves (2006). Groves found 2 dead specimens after searches of more than 1000 m of logs and more than 3800 trap days using 162 pitfall traps. Groves also had the assistance of an excavator to move logs.

In the dam footprint a very narrow riparian strip (2-5 m each side) is the most likely habitat for the beetle. In this habitat large logs are rare and litter is thin on the ground or else confined to piles of flood debris.

Small, logs and litter in flood debris were searched during 4 * 4 hr surveys. No Wielangta stag beetles were found. It remains possible that the beetle is present and could have been missed during sampling if it is sparse and or in very low numbers.

Impact: Not impact is anticipated based on survey results. If the beetle is present then the area of suitable habitat (assuming the riparian forest) that would be lost to inundation is about 2 ha. This equates to less than 0.05 % of the habitat in its range. While negligible, it is the accumulation of such impacts that can result in significant impacts.

3.7 Pathogens and Weeds

Weeds

Dam footprint: Blackberry and Californian thistle are present at the dam wall, in the Poa grasslands and scattered elsewhere.

Table 5. Declared weeds present, TWM Act zones and management action.

Species	Zone	Distribution	Action
Rubus fruitcosis (blackberry)	B	Widespread infestations	Containment within municipal boundaries, protection of specified areas within municipal boundaries, prevention of spread to Zone A municipalities. This applies to all Zone B municipalities.
Cirsium arvense (Californian thistle)	A	Isolated infestations	Implement integrated control program for eradication and prevent

			future occurrences. This applies to all Zone A municipalities

Some agricultural weeds were also recorded (Appendix 3).

Recommendations:

The introduction of machinery and vehicles in general presents an increased risk of introducing new and spreading existing weeds. Direct removal (or herbicide spraying) of mature environmental and/or agricultural weeds within development area will need to be carried out. Follow up weed control is recommended 12 and 24 months after the works to eradicate new infestations in the study area. Continued monitoring of weed establishment and regrowth is also recommended for the first four years.

Mitigation measures of washing machinery and equipment before entering the site will also reduce the risk of introduction of weeds and root pathogens to unaffected places.

The following points in regard to the development of a weed management plan have been recommended by DPIPWE:

(1) A Weed Management Plan should cover all relevant aspects of the control and management of declared weeds and weeds that are considered to have significant impacts on agriculture and natural values. A Weed Management Plan should cover, but not be limited to:

- Overarching set of objectives and the context in which they are to be achieved.
- An accurate assessment of the distribution of Declared Weeds and significant environmental weeds.
- Declared weeds and significant weed distributions should be clearly and accurately mapped.
- Priorities developed for management and control of weeds, both in the short term as well as long term.
- An assessment of the potential impact of those weeds, including immediate and adjacent areas which are free of particular declared weeds.
- Strategies for *managing* weeds within the area disturbed, including their eradication.
- Strategies for ongoing monitoring and control of weeds in disturbed areas.
- Identification of appropriate herbicides for control and how they are to be used.

(2) A hygiene plan that is consistent with best practice should adequately provide for the management of weeds and pathogens.

Phytophthora cinnamomi

No symptomatic evidence of PC was recorded.

Soil and climate conditions are conducive to disease. However, the vegetation proposed for clearing is generally low in terms susceptibility. No symptomatic evidence of *Phytophthora* was observed.

Mitigation: All earth moving equipment should be cleaned before working on the site and these measures should be contained in the hygiene plan applied to weeds.

4. LEGISLATIVE IMPLICATIONS

Water Management Act 1999

A Dam Permit is an instrument under this Act allowing the construction of dam. The impact on natural values is assessed through application for a Dam Permit. The impact of dam construction on *Eucalyptus ovata* forest (and swift parrot habitat) exceeds acceptable limits

and will therefore require an offset of an area of at least equal size. This must take account of environmental value (vegetation condition). No suitable areas exist on the property and offset areas should be sought elsewhere; the offset should be in the order 20 ha +/- condition multiplier.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

The significant impact guidelines have been applied to all EPBC listed matters of national environmental significance (MNES) that are or for which habitat is present. The following criteria apply to the dam footprint.

Species:

The following criterion has been met for critically endangered and an important population of a vulnerable species.

Criterion 2 • reduce the area of occupancy of the species.

For the Tasmanian devil, the eastern quoll the spotted tailed quoll this criterion is met. It is inevitable that the area of occupancy criterion is met when terrestrial habitat is inundated. The area involved may be judged to be negligible in the context of the ecology and range of these species but that would need to be tested through the referral assessment process.

Criterion 5 and 6 • disrupt the breeding cycle of a population and • modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline are judged to be met for the swift parrot. The habitat is an important forage resource that supports breeding success and is within a SPIBA. The loss of this type of habitat is identified as a key threatening process.

No other criteria were met for either critically endangered or important populations of vulnerable species.

Based on the area of *Eucalyptus ovata* as habitat and a subjective measure of its quality as swift parrot habitat (6 out of 10) then the EPBC offset metric indicates that 70 ha will be required to be protected elsewhere. This calculation considered area and condition only and did not take account of any nesting hollows in the impact area nor the offset area.

Ecological communities:

Lowland poa grassland is an endangered ecological community and *Eucalyptus ovata* is proposed to be a critically endangered ecological community (draft listing advice has been published).

The following criteria have been met for these communities.

• reduce the extent of an ecological community (due to inundation)

• modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns (due to inundation)

The area involved for the lowland grassland may be judged to be negligible in the context of the ecology and range of this community but that would need to be tested through the referral assessment process.

The area of the black gum forest is substantial in the context of typical patch sizes for this community.

Recommendation:

Under the EPBC Act an action will require approval from the minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.

The proposal should be referred to the Commonwealth Minister for assessment with a view to determine if the Action would be a controlled Action. The Action is likely to be a controlled Action due to the significant impact through loss of habitat requiring an offset. This precludes the Action not requiring assessment and approval if undertaken in a "particular manner".

No suitable offset areas are present on the property. An offsite offset should be sought elsewhere. The offset should be in the order of 70 ha.

Tasmanian *Threatened Species Protection Act 1995*

No permits are required under this Act.

Tasmanian *Weed Management Act 2000*

A weed control strategy and works plan should be developed and implemented.

5. RECOMMENDATIONS

1. Identify suitable offset for the loss of approx. 20 ha of Eucalyptus ovata forest.
2. An injured animal protocol should be developed and included in the Construction and Environmental Management Plan.
3. A weed and hygiene management plan should be developed and included in the Construction and Environmental Management Plan.
4. Prepare a referral of the project to the Commonwealth Minister for assessment of the impact on each MNES.

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APPENDIX 1. DEFINITIONS OF CONSERVATION VALUES OF PLANT AND ANIMAL SPECIES

SPECIES OF NATIONAL SIGNIFICANCE

Listed in Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The *EPBCA* Act has six categories of threat status for species:

1. **Extinct -** If at a particular there is no reasonable doubt that the last member of the species has died
2. **Extinct in the wild -** If it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or If it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form
3. **Critically endangered** - If at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria
4. **Endangered** - If it is not critically endangered; and it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria
5. **Vulnerable** - If at a particular time it is not critically endangered or endangered; and it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
6. **Conservation dependent -** If, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years

SPECIES OF STATE SIGNIFICANCE

Listed in Tasmanian *Threatened Species Protection Act 1995* (TSP Act)

Threatened flora and fauna species in Tasmania are listed in Schedules 3 (extinct or endangered), 4 (vulnerable) or 5 (rare). These three categories are defined in Section 15 of the Act.

1. **Extinct** - If no occurrence of the taxon in the wild can be confirmed during the past 50 years
2. **Endangered -** If it is in danger of extinction because long-term survival is unlikely while the factors causing it to be endangered continue operating.
3. **Vulnerable** - If it is likely to become an endangered taxon while the factors causing it to be vulnerable continue operating.
4. **Rare** - If it has a small population in Tasmania that is not endangered or vulnerable but is at risk."

Species that have been nominated and approved by the Scientific Advisory Committee for listing in the Act

SPECIES OF REGIONAL OR GENERAL SIGNIFICANCE

The following definitions are from three publications: Flora Advisory Committee 1994, Vertebrate Advisory Committee 1994, Invertebrate Advisory Committee 1994

Flora only - Species listed as rare but not necessarily 'at risk' (**r3**)

Fauna only – Species requiring monitoring (**m**)

Both – Species of unknown risk status (**k**) in Tasmania, or thought to be uncommon within region, or a species having a declining range or populations within the area.

Species considered to be outside its normal range or of an unusual form as determined and justified in the body of the report.

Species identified in regional studies as being of conservation significance that are not listed in current legislation

Species that have been recognised but have not been described in a published journal that are thought to significant as determined and justified in the body of the report.

Plant species that are not known to be reserved. To be so it must be known to exist in at least one secure Reserve. Secure reserves include reserves and parks requiring the approval of both Houses of Parliament for their revocation. They include: National Parks, Aboriginal Sites, Historic Sites, Nature Reserves, State Reserves, Game Reserves, Forest Reserves, Wellington Park, and insecure reserves in the World Heritage Area which is protected by international agreement under the World Heritage Convention.

APPENDIX 2. LEGISLATIVE IMPLICATIONS OF THREATENED SPECIES.

Tasmanian State Legislation Affecting Threatened Species

Threatened Species Protection Act 1995

Threatened flora and fauna species in Tasmania are listed in Schedules 3 (endangered) and 4 (vulnerable) of the Threatened Species Protection Act, 1995. Rare species that are considered to be 'at risk' are listed in Schedule 5 of the Act. These three categories are defined in Section 15 of the Act.

1. "An extant taxon of native flora or fauna may be listed as **endangered** if it is in danger of extinction because long-term survival is unlikely while the factors causing it to be endangered continue operating.
2. A taxon of native flora or fauna may be listed as **vulnerable** if it is likely to become an endangered taxon while the factors causing it to be vulnerable continue operating.
3. A taxon of native flora or fauna may be listed as **rare** if it has a small population in Tasmania that is not endangered or vulnerable but is at risk."

The Act provides mechanisms for protecting these species from threatening processes the implementation of 'recovery plans', 'threat abatement plans', 'land management plans', public authority agreements', and 'interim protection orders'.

Section 51 (a) of the TSPA states that: "A person must not knowingly, without a permit - take, trade in, keep or process any listed flora or fauna". The Act defines 'take' as including: "kill, injure, catch, damage, destroy and collect. A land manager is therefore required to obtain a permit from the Tasmanian Department of Primary Industries, Water and Environment (DPIPWE) to carry out management that may adversely affect any of the species listed in the Act

Commonwealth of Australia Legislation Affecting Threatened Species

Environment Protection and Biodiversity Conservation Act 1999

The EPBCA Act establishes a process for assessing actions that are likely to have impacts of *national environmental significance*. Such impacts include World Heritage Areas, RAMSAR Wetland sites of international importance, migratory species protected under international agreements, nuclear actions, the Commonwealth marine environment and **nationally threatened species and communities.**

Threatened species are defined in several categories:

1. Extinct

- If at a particular there is no reasonable doubt that the last member of the species has died

2. Extinct in the wild

- If it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
- If it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form

3. Critically endangered

- If at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria

4. Endangered

- If it is not critically endangered; and it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria

5. Vulnerable

- If at a particular time it is not critically endangered or endangered; and it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

6. Conservation dependent

- If, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years

An action that is likely to affect species that are listed in any of the above categories may require ministerial approval unless the Commonwealth Environment Minister has granted an exemption. The Act establishes a **referral process** to Environment Australia to determine whether an action requires a formal **approval** and thus would be required to proceed through the **assessment and approval process**.

A referral must provide sufficient information to allow the Minister to make a decision. The Minister is then required to make a decision within 20 business days of the referral. The Minister may decide an approval is not necessary if the action is taken in a specified manner. The action may not require approval but may require a **permit** if undertaken on Commonwealth land. If an approval is required then an **environmental assessment** must be carried out. In such instances the environmental assessment approach will be determined by the Minister and may vary from preliminary documentation to a full public inquiry depending on the scale and complexity of the impact.

APPENDIX 3. FLORA SPECIES LIST.

Number of Species:	157	96	DICOTYLEDONAE
		7	PTERIDOPHYTA
		53	MONOCOTYLEDONAE

Site: 14 Dam site, southern creekline - DVG

Grid Reference:	564324E, 5276339N
Accuracy:	GPS (within 10 metres)
Date of Survey:	10 Jan 2017
Trees:	*Bursaria spinosa subsp. spinosa, Eucalyptus amygdalina, Eucalyptus obliqua, Eucalyptus viminalis subsp. viminalis*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Acacia verticillata, Banksia marginata, Leptospermum lanigerum, Notelaea ligustrina, Pomaderris apetala, Zieria*
Shrubs:	*Acacia derwentiana, Coprosma quadrifida, Cyathodes glauca, Epacris impressa, Leptecophylla divaricata, Lomatia tinctoria, Melaleuca pallida, Tasmannia lanceolata*
Low Shrubs:	*Hibbertia riparia*
Herbs:	*Brachyscome sp., Crassula helmsii, Dianella tasmanica, Dichondra repens, Galium sp., Geranium potentilloides var. potentilloides, Goodenia lanata, Hydrocotyle callicarpa, Oxalis perennans, Pelargonium australe, Senecio minimus, Viola hederacea, Wahlenbergia sp.*
Graminoids:	*Carex appressa, Eleocharis gracilis, Gahnia grandis, Gahnia sieberiana, Juncus sarophorus, Lepidosperma laterale, Lomandra longifolia*
Grasses:	*Australopyrum pectinatum, Deyeuxia quadriseta, Ehrharta stipoides, Poa labillardierei, Poa rodwayi*
Ferns:	*Blechnum minus, Blechnum wattsii, Polystichum proliferum, Pteridium esculentum subsp. esculentum*
Climbers:	*Clematis aristata*
Weeds:	*Centaurium erythraea, Helminthotheca echioides, Hypochaeris radicata, Sonchus asper*

Site: 15 Dam site - eastern edge DAD

Grid Reference:	564523E, 5276603N
Accuracy:	GPS (within 10 metres)
Date of Survey:	10 Jan 2017
Trees:	*Bursaria spinosa subsp. spinosa, Eucalyptus amygdalina*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Pomaderris apetala*
Shrubs:	*Coprosma quadrifida, Daviesia ulicifolia, Epacris impressa, Leptecophylla divaricata, Leucopogon collinus, Leucopogon ericoides*
Low Shrubs:	*Acrotriche serrulata, Astroloma humifusum, Hibbertia hirsuta, Hibbertia riparia, Pimelea humilis*
Herbs:	*Acaena novae-zelandiae, Brachyscome sp., Dichondra repens, Drosera peltata, Euchiton sp., Gonocarpus tetragynus, Goodenia lanata, Hydrocotyle sp., Hypericum gramineum, Hypoxis hygrometrica, Lagenophora stipitata, Leptorhynchos squamatus, Microtis sp., Oxalis perennans, Stylidium graminifolium, Wahlenbergia*
Graminoids:	*Lepidosperma curtisiae, Lepidosperma gunnii, Lepidosperma laterale, Lomandra longifolia, Schoenus apogon*
Grasses:	*Austrostipa stuposa, Ehrharta distichophylla, Ehrharta stipoides, Poa labillardierei, Rytidosperma caespitosum, Rytidosperma geniculatum, Themeda triandra*
Weeds:	*Centaurium erythraea*

Site: 16 Dam site, central - DOV

Grid Reference:	564584E, 5276936N
Accuracy:	GPS (within 10 metres)
Date of Survey:	10 Jan 2017
Trees:	*Acacia melanoxylon, Bursaria spinosa subsp. spinosa, Eucalyptus obliqua, Eucalyptus ovata var. ovata, Eucalyptus viminalis subsp. viminalis*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Acacia verticillata, Exocarpos cupressiformis, Leptospermum lanigerum, Pomaderris apetala*
Shrubs:	*Coprosma quadrifida, Rubus parvifolius*
Herbs:	*Acaena novae-zelandiae, Geranium potentilloides var. potentilloides, Hydrocotyle callicarpa, Mazus pumilio, Myriophyllum sp., Oxalis perennans, Rumex dumosus*
Graminoids:	*Carex gaudichaudiana, Gahnia grandis, Lepidosperma laterale, Lomandra*
Grasses:	*Australopyrum pectinatum, Poa labillardierei*
Ferns:	*Blechnum minus, Dicksonia antarctica, Polystichum proliferum, Pteridium esculentum subsp. esculentum*
Climbers:	*Clematis aristata*
Weeds:	*Sonchus asper*

Site: 17 Dam site, dry eastern edge - DVG

Grid Reference:	564740E, 5277028N
Accuracy:	GPS (within 10 metres)
Date of Survey:	10 Jan 2017
Trees:	*Bursaria spinosa subsp. spinosa, Eucalyptus amygdalina, Eucalyptus viminalis subsp. viminalis*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Pomaderris apetala*
Shrubs:	*Coprosma quadrifida, Daviesia ulicifolia, Epacris impressa, Melicytus dentatus*
Low Shrubs:	*Astroloma humifusum, Hibbertia hirsuta*
Herbs:	*Acaena novae-zelandiae, Dichondra repens, Euchiton sp., Gonocarpus tetragynus, Goodenia lanata, Hypericum gramineum, Hypoxis hygrometrica, Leptorhynchos squamatus, Lobelia pedunculata, Mazus pumilio, Wahlenbergia sp.*
Graminoids:	*Carex iynx, Gahnia grandis, Juncus sarophorus, Lepidosperma curtisiae, Lepidosperma gunnii, Lepidosperma laterale, Lomandra longifolia, Schoenus*
Grasses:	*Anthosachne scabra, Austrostipa rudis subsp. australis, Ehrharta distichophylla, Poa labillardierei, Rytidosperma caespitosum, Rytidosperma setaceum, Themeda*
Weeds:	*Centaurium erythraea, Cirsium vulgare, Leontodon saxatilis*

Site: 18 Dam site west tributory - DVG

Grid Reference:	564181E, 5277140N
Accuracy:	GPS (within 10 metres)
Date of Survey:	12 Jan 2017
Trees:	*Acacia melanoxylon, Bursaria spinosa subsp. spinosa, Eucalyptus amygdalina, Eucalyptus obliqua, Eucalyptus ovata var. ovata, Eucalyptus viminalis subsp.*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Acacia verticillata, Beyeria viscosa, Exocarpos cupressiformis, Leptospermum lanigerum, Pomaderris apetala, Zieria arborescens*
Shrubs:	*Coprosma quadrifida, Cyathodes glauca, Leptecophylla divaricata, Lomatia tinctoria, Olearia ramulosa, Pimelea drupacea, Tasmannia lanceolata*
Herbs:	*Acaena novae-zelandiae, Dianella tasmanica, Dichondra repens, Galium sp., Gonocarpus tetragynus, Hydrocotyle callicarpa, Lagenophora stipitata, Lythrum hyssopifolia, Mazus pumilio, Oxalis perennans, Poranthera microphylla, Pterostylis decurva, Wahlenbergia sp.*
Graminoids:	*Carex appressa, Carex iynx, Gahnia sieberiana, Juncus sarophorus, Lepidosperma laterale, Lomandra longifolia*
Grasses:	*Australopyrum pectinatum, Ehrharta stipoides, Poa labillardierei*
Ferns:	*Adiantum aethiopicum, Blechnum minus, Polystichum proliferum, Pteridium esculentum subsp. esculentum*

Climbers:	*Clematis aristata*
Weeds:	*Cirsium vulgare, Lysimachia arvensis, Rubus fruticosus, Sonchus asper*

Site: 19 GPL

Grid Reference:	E, N
Accuracy:	within 50 metres
Recorder:	Philip Barker
Date of Survey:	10 Jan 2017
Trees:	*Eucalyptus ovata var. ovata*
Tall Shrubs:	*Acacia dealbata subsp. dealbata*
Birds:	*Aquila audax fleayi*

Site: 23 DAD

Grid Reference:	564531E, 5277779N
Accuracy:	within 100 metres
Recorder:	Philip Barker
Date of Survey:	11 Jan 2017
Trees:	*Eucalyptus amygdalina, Eucalyptus ovata var. ovata*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Leptospermum lanigerum, Leptospermum scoparium*
Shrubs:	*Epacris impressa, Pultenaea juniperina*
Low Shrubs:	*Lissanthe strigosa subsp. subulata*
Herbs:	*Hypoxis hygrometrica, Opercularia varia, Oxalis perennans, Wahlenbergia sp.*
Graminoids:	*Lepidosperma laterale, Lomandra longifolia, Schoenus apogon, Schoenus sp.*
Grasses:	*Austrostipa aphylla, Austrostipa stuposa, Deyeuxia sp., Ehrharta distichophylla, Ehrharta stipoides, Rytidosperma caespitosum, Themeda triandra*

Site: 24 GPL

Grid Reference:	564733E, 5277817N
Accuracy:	within 100 metres
Date of Survey:	11 Jan 2017
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Leptospermum lanigerum*
Herbs:	*Acaena novae-zelandiae, Ajuga australis, Geranium potentilloides var. potentilloides, Leptorhynchos squamatus, Oxalis perennans, Rubus gunnianus,*
Graminoids:	*Juncus planifolius, Juncus sp.*
Grasses:	*Poa labillardierei, Rytidosperma caespitosum, Rytidosperma penicillatum, Rytidosperma semiannulare, Themeda triandra*
Weeds:	*Anthoxanthum odoratum, Centaurium erythraea, Cirsium arvense var. arvense, Geranium dissectum, Holcus lanatus, Hypochaeris radicata, Plantago lanceolata, Rubus fruticosus*

Site: 25 DOV

Grid Reference:	564550E, 5277372N
Accuracy:	within 100 metres
Date of Survey:	11 Jan 2017
Trees:	*Bursaria spinosa subsp. spinosa, Eucalyptus amygdalina, Eucalyptus ovata var.*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Acacia verticillata, Leptospermum scoparium*
Shrubs:	*Bossiaea prostrata, Daviesia ulicifolia, Epacris impressa, Leptecophylla divaricata, Pultenaea juniperina*
Low Shrubs:	*Astroloma humifusum, Hibbertia prostrata, Leucopogon virgatus, Lissanthe strigosa subsp. subulata, Pimelea glauca*
Herbs:	*Acaena novae-zelandiae, Acaena ovina, Dianella revoluta, Euchiton japonicus, Gonocarpus tetragynus, Hypericum gramineum, Leptorhynchos nitidulus, Oxalis perennans, Pauridia glabella var. glabella, Poranthera microphylla, Stylidium graminifolium, Viola hederacea, Wahlenbergia sp.*
Graminoids:	*Carex gaudichaudiana, Lepidosperma filiforme, Lepidosperma inops,*

	Lepidosperma laterale, Lomandra longifolia
Grasses:	*Austrostipa aphylla, Austrostipa sp., Ehrharta distichophylla, Ehrharta stipoides, Poa gunnii, Poa sieberiana, Themeda triandra*
Weeds:	*Centaurium erythraea*

Site: 26 DOV

Grid Reference:	564749E, 5277515N
Accuracy:	within 100 metres
Recorder:	Philip Barker
Date of Survey:	11 Jan 2017
Trees:	*Acacia melanoxylon, Eucalyptus ovata var. ovata, Eucalyptus viminalis subsp. viminalis*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Leptospermum lanigerum, Pomaderris apetala*
Shrubs:	*Bossiaea prostrata, Bossiaea riparia, Coprosma quadrifida, Epacris impressa, Tasmannia lanceolata*
Low Shrubs:	*Lissanthe strigosa subsp. subulata*
Herbs:	*Acaena novae-zelandiae, Gonocarpus tetragynus, Hypoxis hygrometrica, Oxalis perennans, Stylidium graminifolium, Viola hederacea, Wahlenbergia sp.*
Graminoids:	*Carex iynx, Lepidosperma ensiforme, Lepidosperma longitudinale, Lomandra longifolia, Uncinia sp.*
Grasses:	*Ehrharta distichophylla, Ehrharta stipoides, Poa labillardierei, Rytidosperma sp.*
Ferns:	*Blechnum nudum, Pteridium esculentum subsp. esculentum*

Site: 27 GPL

Grid Reference:	564764E, 5277293N
Accuracy:	GPS (within 10 metres)
Date of Survey:	11 Jan 2017
Trees:	*Eucalyptus ovata var. ovata*
Tall Shrubs:	*Acacia dealbata subsp. dealbata*
Herbs:	*Acaena novae-zelandiae, Ajuga australis, Geranium potentilloides var. potentilloides, Mazus pumilio, Oxalis perennans, Rubus gunnianus, Senecio sp., Veronica calycina, Wahlenbergia sp.*
Graminoids:	*Carex iynx, Lepidosperma longitudinale, Lomandra longifolia*
Grasses:	*Deyeuxia sp., Poa labillardierei*
Weeds:	*Centaurium erythraea, Cirsium arvense var. arvense, Holcus lanatus, Hypochaeris radicata, Lysimachia arvensis, Rubus fruticosus, Verbena officinalis, Vicia sp.*

Site: 28 SLL

Grid Reference:	564648E, 5277695N
Accuracy:	GPS (within 10 metres)
Date of Survey:	19 Jan 2017
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Leptospermum lanigerum*
Herbs:	*Acaena novae-zelandiae, Ajuga australis, Gonocarpus tetragynus, Mazus pumilio*
Graminoids:	*Carex gaudichaudiana, Carex iynx, Juncus astreptus, Juncus sp., Lomandra*
Grasses:	*Deyeuxia sp., Poa labillardierei*
Weeds:	*Geranium dissectum*

APPENDIX 4. PROTECTED MATTERS SEARCH TOOL REPORT (ATTACHED).