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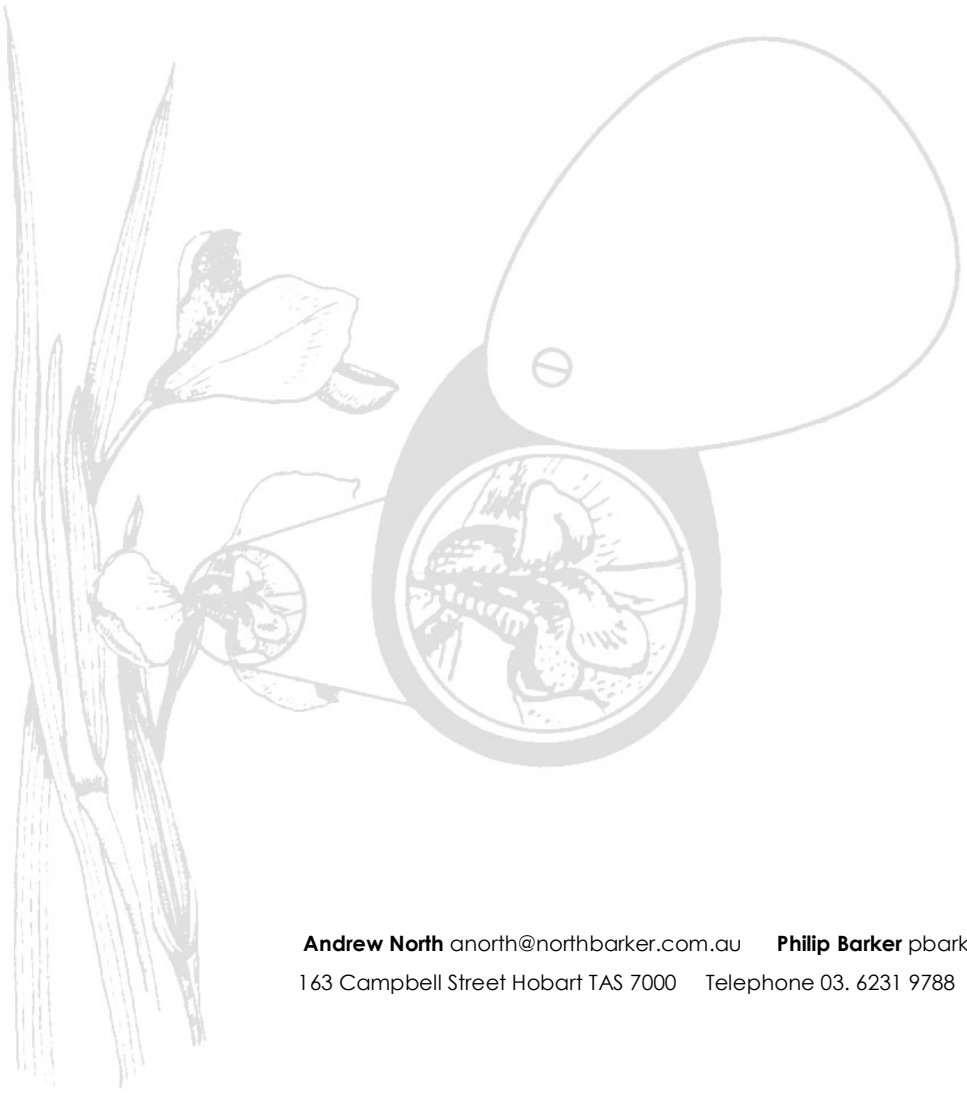
ECOSYSTEM SERVICES

Glamorgan Spring Bay Council
Prosser Plains Raw Water Scheme (PPRWS)

Water Distribution pipeline

Botanical Survey and Fauna Habitat Assessment

15th May 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 NBES**	**1 February 2017**
Document Reviewed by By:	**David Burt**	**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	13/4/17	P. Barker	Take account of route modification
1.3	11/5/17	P. Barker	Adjustments to comply with DoE requests for information.

SUMMARY AND RECOMMENDATIONS

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 via the Prosser River. This report considers the natural values and potential impacts and ,mitigation related to the location and construction of the pipeline.

Toward that end this report documents the vegetation and the flora and fauna values of the footprint of the development. The report identifies the distribution of threatened vegetation, flora and fauna habits, including communities or populations listed under the TSPA and the EPBC Act.

Alterations to the route have been proposed since the field assessment was undertaken and these are indicated on the accompanying maps. These sections have not been assessed.

Findings:

Vegetation

The proposal requires the conversion of native vegetation communities to accommodate the inundation area, dam wall and the pipeline (area of clearance within corridor would be less than full corridor). The native vegetation types included are:

Eucalyptus amygdalina forest on sandstone (DAS) – 0.21 ha –threatened (NCA 2002)

Eucalyptus globulus forest (DGL) – 0.20 ha –threatened (NCA 2002)

Eucalyptus pulchella forest and woodland (DPU) – 0.99 ha – not threatened

Eucalyptus viminalis grassy forest (DVG) – 0.51 ha –not threatened

Saline wetland (ARS) – 0.01 ha –threatened (NCA 2002, vulnerable EPBC)

Themeda grassland (GTL) – 0.39 ha ––(not threatened (due to condition))

Threatened vegetation

Themeda grassland is listed on the EPBC as endangered. The clearance of this area is not likely to cause a significant impact due to its small size and poor condition.

Saline wetland is listed as vulnerable on the EPBC. This does not require mitigation.

The E. globulus and *E. amygdalina* forest on sand stone are each listed on the *Tasmanian Nature Conservation Act 2002* as threatened vegetation. The significance of the impacts is negligible and the ultimate consequences of this will be dictated by the dam assessment process.

Flora:

Two threatened flora species were recorded during survey. These are *Melaleuca pustulata* (warty paperbark) and *Ozothamnus lycopodioides* (club everlasting); both are listed as rare on the Threatened Species Protection Act 1995). There remains low to moderate probability that others have been overlooked due to limitations of the survey.

Fauna for which the habitat may be important

For fauna the impact of the laying of pipeline is likely to be negligible. The pipeline will be laid within a 10 m wide construction corridor within which actual disturb and will be less than 10 m. Re-establishment of the ground layer of vegetation will occur and large trees will be avoided.

The species affected include:

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

Less than 2 ha of foraging and/or nesting habitat occur in the impact area. There is a very low probability that nests are within the footprint.

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)

Less than 4 ha of foraging habitat occur in the footprint. A negligible impact is anticipated through the disturbance of habitat. There is an extremely low probability that dens are within the footprint.

Spotted-tailed quoll (Rare TSPA / Vulnerable EPBC)

Less than 4 ha of foraging habitat) occur in the impact area. The footprint may cross the home range of 1 or 2 female quolls but it is likely that the range adjacent to the Tasman Highway and pasture is empty. There is an extremely low probability that dens are within the footprint.

Tasmanian devil (Endangered TSPA / EPBC)

Less than 4 ha of foraging and/or denning habitat occur in the footprint. A negligible impact is anticipated through the loss of foraging habitat such that home range adjustment would not be necessary. There is an extremely low probability that utilised dens are within the footprint.

Swift parrot (Endangered TSPA / Critically endangered EPBC)

About 0.2 ha of swift parrot foraging habitat is present as *E. globulus* scattered along 200 m of the route. The habitat is within a SPIBA (swift parrot important breeding area). No loss of mature trees is anticipated because all mature trees will be avoided.

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 by desktop and field observation No nests were recorded within 500m of the footprint. And if any are present between 500 and 1000 m they are accustomed to various disturbances along the route.

Australian grayling (Vulnerable EPBC)

This fish could potentially inhabit the Prosser River below the weir. The point at which the pipeline enters the river is below the tidal level and so below any freshwater breeding habitat. The route crosses the river upstream at a boulder riffle and this too is unsuited for breeding (egg laying habitat is gravel bottom).

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

Green and gold frog

Chaostola skipper

Masked owl

Wielangta stag beetle

The proposal requires the conversion or modification of a number of suboptimal fauna habitats. There is a low risk of animal injury during construction. Nevertheless, 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:

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:

No impacts meet criteria for a significant impact.

Ecological communities:

The Themeda grassland does not meet the EPBC condition criteria for the ecological community.

The saline wetland does not require further consideration.

Tasmanian *Threatened Species Protection Act 1995*

A Permit is not required for the pipeline corridor where species disturbance is under a Forest Practices Plan (FPP).

Where pipeline corridor clearance is not under an FPP then a Permit to take flora species along the pipeline corridor is required under this Act. Under these circumstances a Permit to "take" *Melaleuca pustulata and Ozothamnus lycopodioides* (assuming each cannot be avoided) would be required.

There remains a very low probability that dens or nests do occur in the study area. If dens or nests are located during construction of the pipeline, their removal will be dealt with by the requirements within the CEMP.

Tasmanian *Weed Management Act 2000*

Five Declared weeds are present. Four are zone A which require management and one is Zone B. A weed control strategy and works plan should be developed.

Summary of recommendations

1. Mark in the field and avoid threatened flora and blue gums in DGL.
    a. Where necessary, apply for a permit to take threatened plant species that cannot be avoided.
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.

Contents

Table of Figures

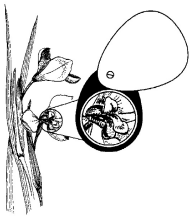
ACKNOWLEDGMENTS

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 pipeline will be submarine along the Prosser River bed below the tidal limit to the Tasman Highway. See Marine Solutions 2017 for a detailed report on natural values, impact and mitigation along this section.

The following assessment considers the natural values and potential impacts and mitigation for the terrestrial portion of the pipeline route. 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 pipeline route. The pipeline route includes 6 terrestrial km and a 10 m wide construction corridor. The submarine route is about 2 km long.

The study area is within the Tasmanian South East bioregion[1] (Figure 1). Large tracts of the South East bioregion and land immediately adjacent to the proposal remain native vegetation.

[1] Peters & Thackway 1998

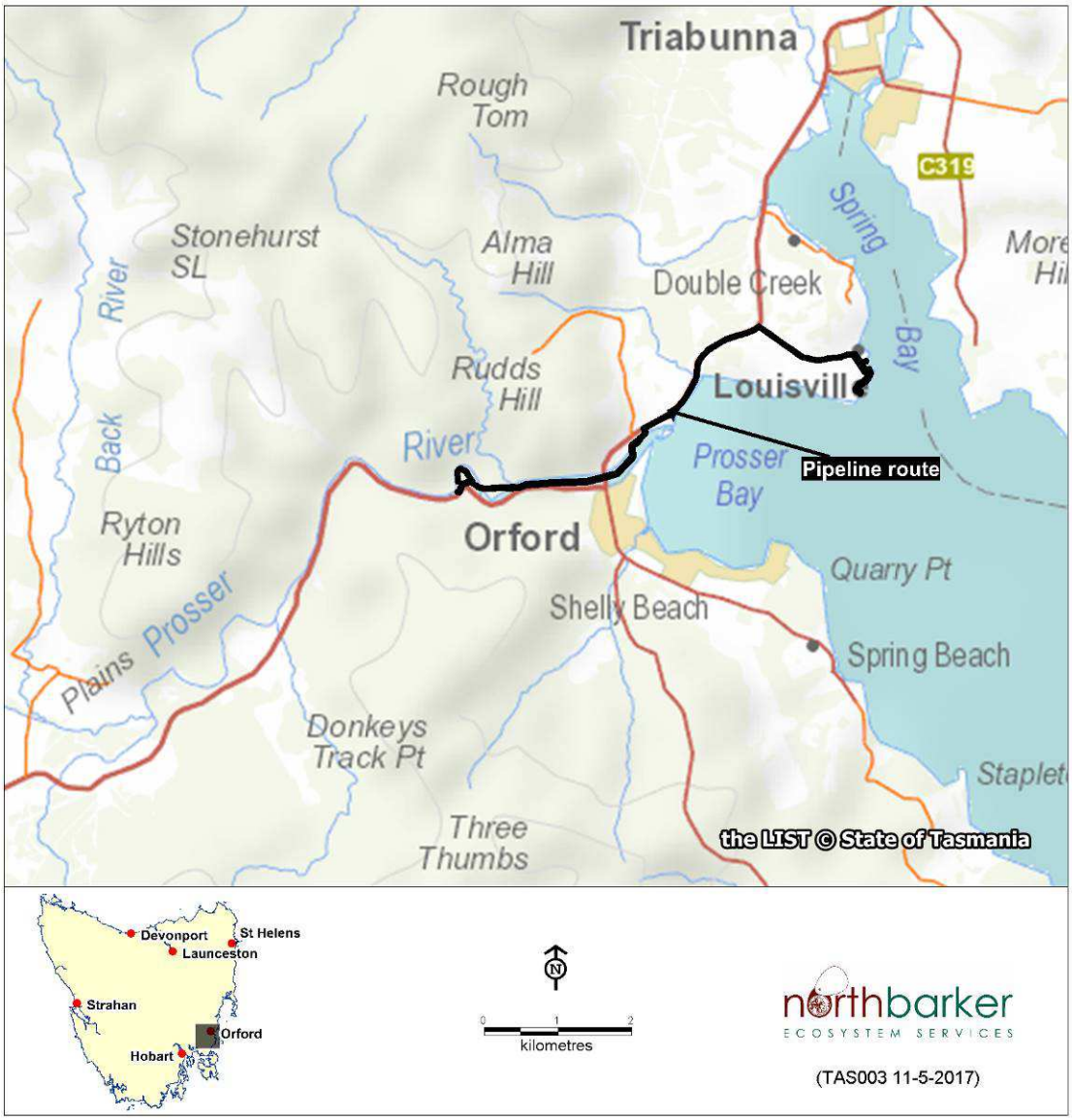


Figure 1. The location of the study area.

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 survey were undertaken on January 11, general habitat observations for fauna were also carried out on this day.

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 20* 20 m plots within forest types. 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 orchids, known from vicinity were targeted in the drier habitats.

Threatened Fauna

Surveys for threatened fauna initially focussed on the identification of suitable habitat for particular species. Suitability was judged against published descriptions 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.

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 considered based on a wedge-tailed eagle nest habitat model produced by the FPA (2013) and modified to take account of known limitations of the model and knowledge of the landscape.

[6] DPIPWE 2010

[7] Knight 2012

Eastern barred bandicoot

Existing records and interpretation of the habitat that is present.

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

No specific survey was undertaken for Wielangta stag beetle (*Lissotes latidens*).

Masked owl

Potential nesting habitat was modelled based on forest maturity. All forest categorised as high or medium maturity was intersected with all eucalypt forest. Trees were observed for large suitable hollows.

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. 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.

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 within 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. 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 pipeline footprint is approximately 8 km long including the submarine section. Most of the vegetation is native with the exception of exotic roadsides and paddocks.

The vegetation in the footprint is dry forest and grassland.

The forests in the study area are dominated by *Eucalyptus amygdalina, E. viminalis, E. pulchella* and *E. globulus*. Forest dominated by *E. amygdalina* on sandstone and *E. globulus* are listed as threatened on the Nature Conservation Act 2002.

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 pipeline corridor of 10 and 20 m width. The works area within this corridor is likely be considerably less than the corridor width.

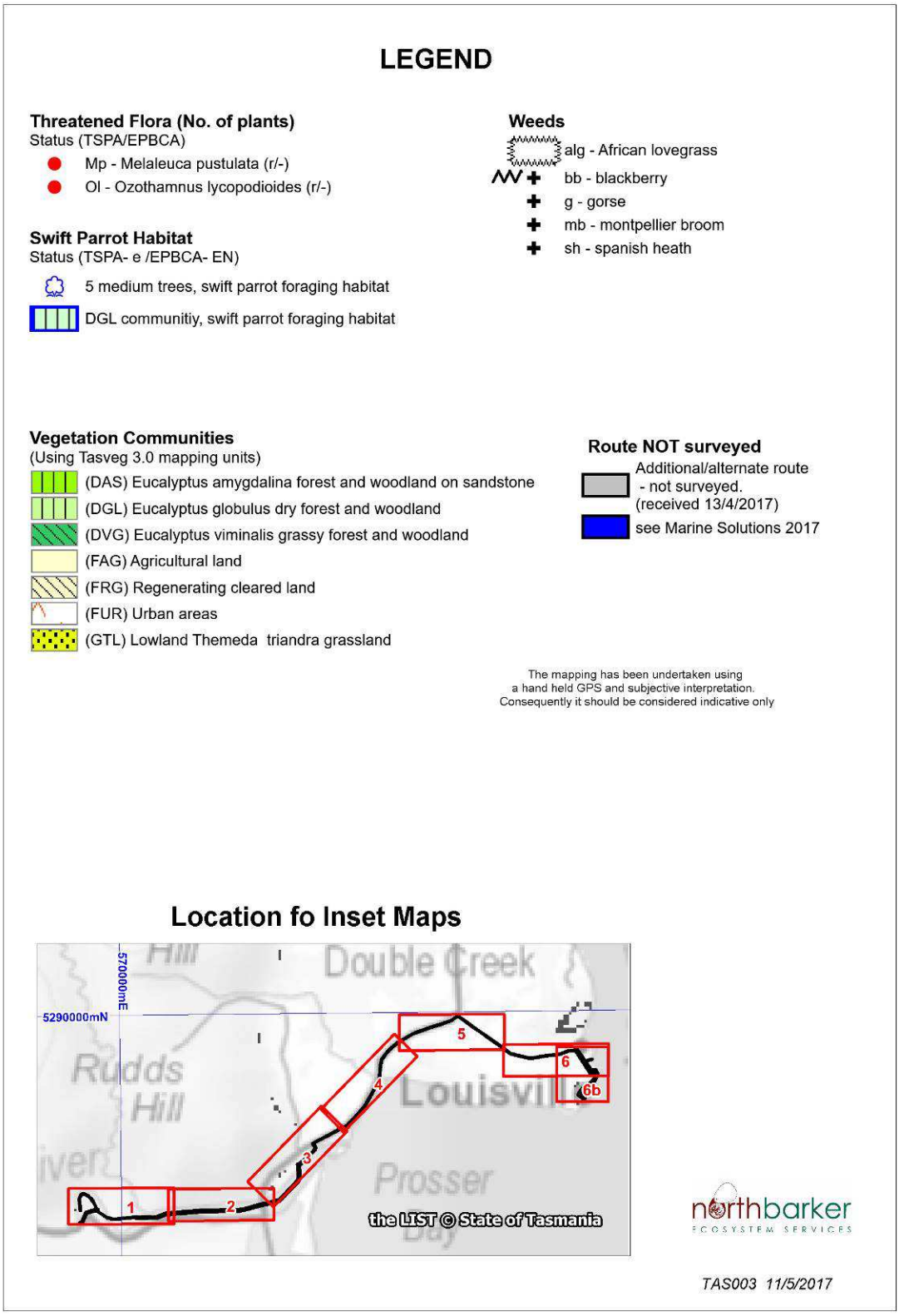
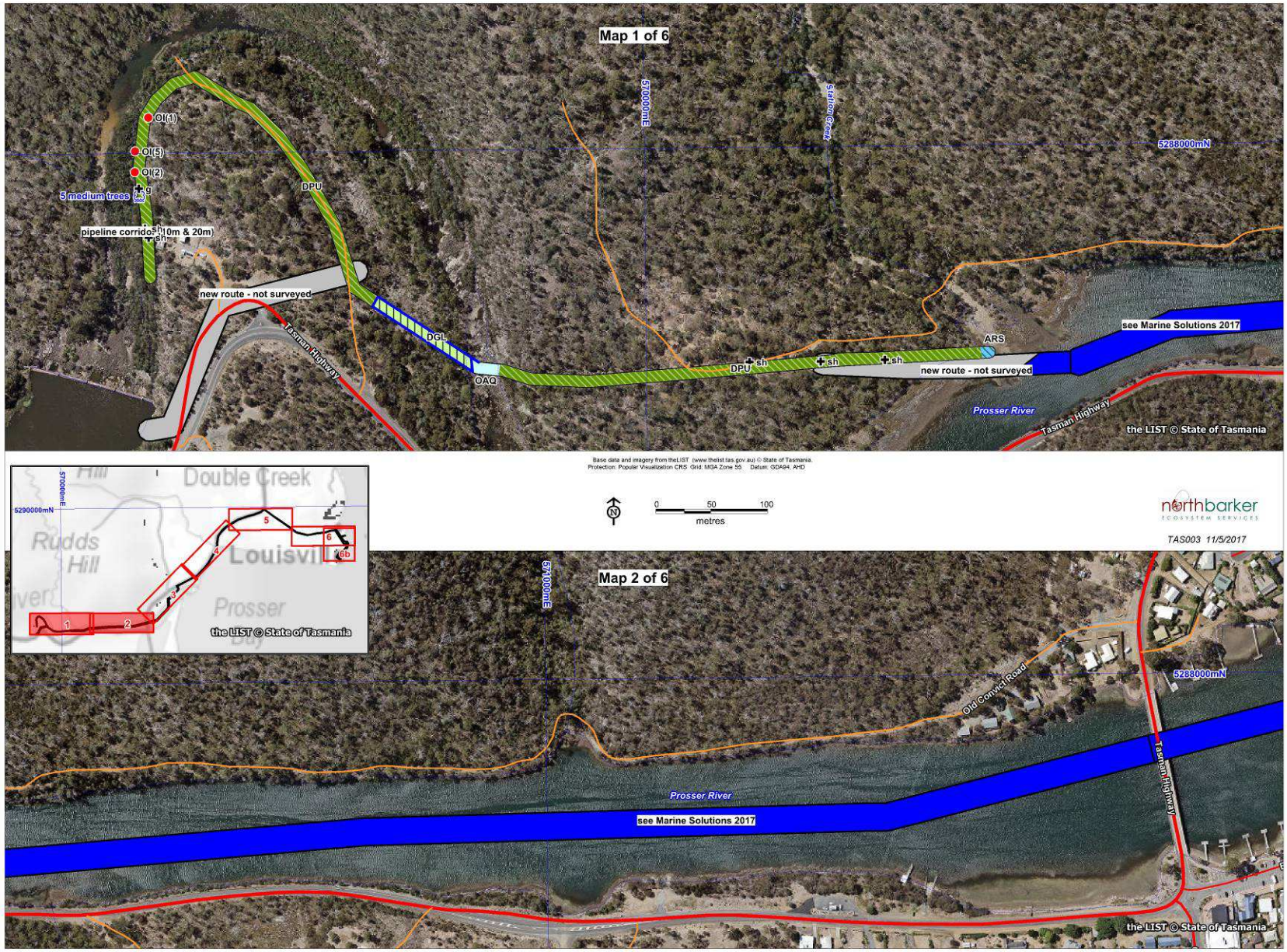


Figure 2. The distribution of vegetation, weeds and threatened flora along the pipeline corridor.


Map 1 of 6
570000mE
Station Creek
5288000mN
OI(1)
OI(5)
OI(2)
5 medium trees
DPU
pipeline corridor (10m & 20m)
sh
new route - not surveyed
Tasman Highway
DGL
OAQ
ARS
see Marine Solutions 2017
Prosser River
the LIST © State of Tasmania
Base data and imagery from theLIST (www.thelist.tas.gov.au) © State of Tasmania.
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Double Creek
Rudds Hill
Louisville
Prosser Bay
5290000mN
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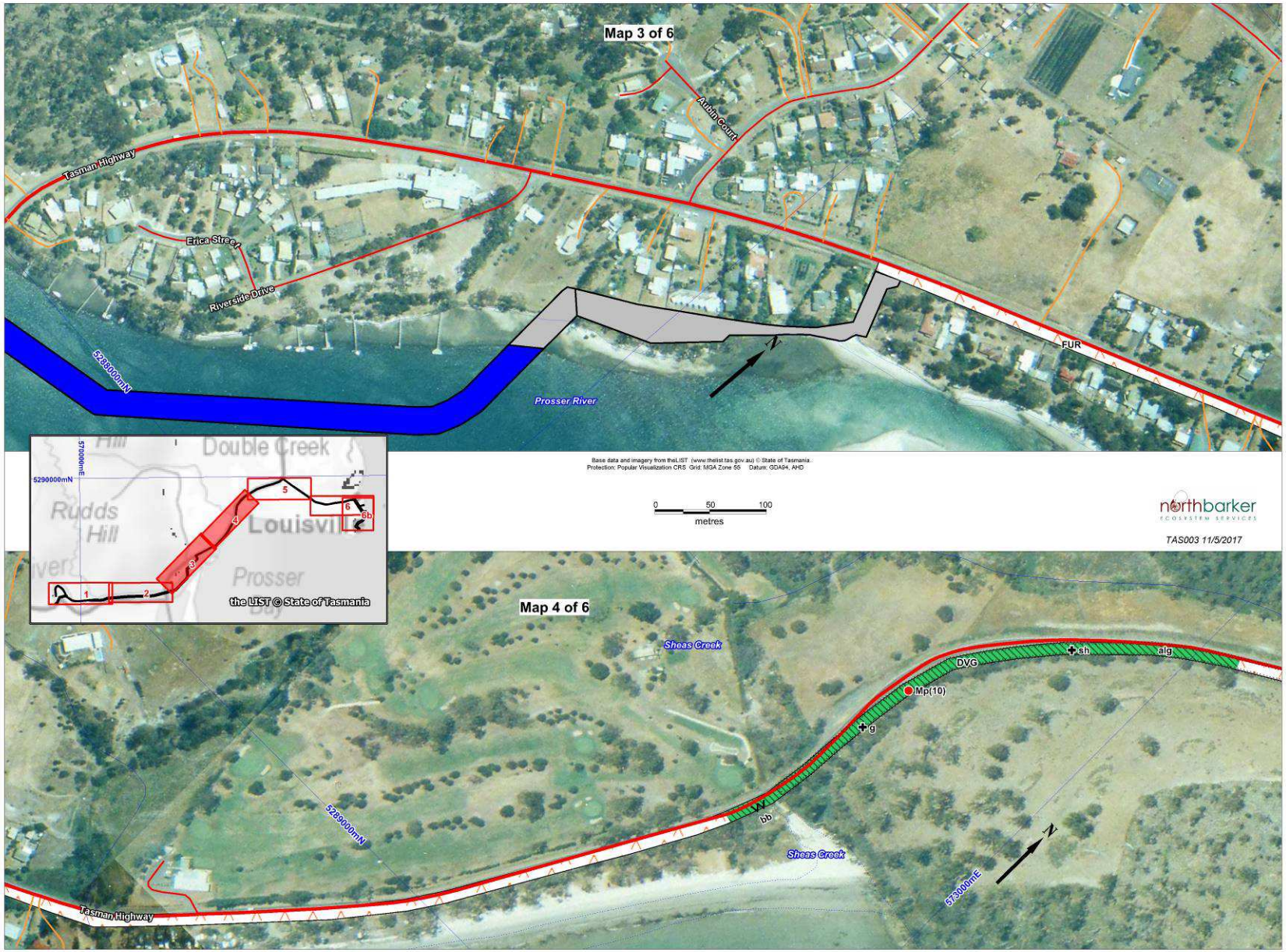
Map 2 of 6
Old Convict Road
Tasman Highway


Map 3 of 6
Tasman Highway
Erica Street
Riverside Drive
Aubin Court
FUR
5293000mN
Prosser River
Base data and imagery from theLIST (www.thelist.tas.gov.au) © State of Tasmania.
Projection: Popular Visualization CRS Grid: MGA Zone 55 Datum: GDA94, AHD
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TAS003 11/5/2017
5700000mE
5290000mN
Rudds Hill
Double Creek
Louisville
Prosser
the LIST © State of Tasmania
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2
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6
6b
Map 4 of 6
Sheas Creek
DVG
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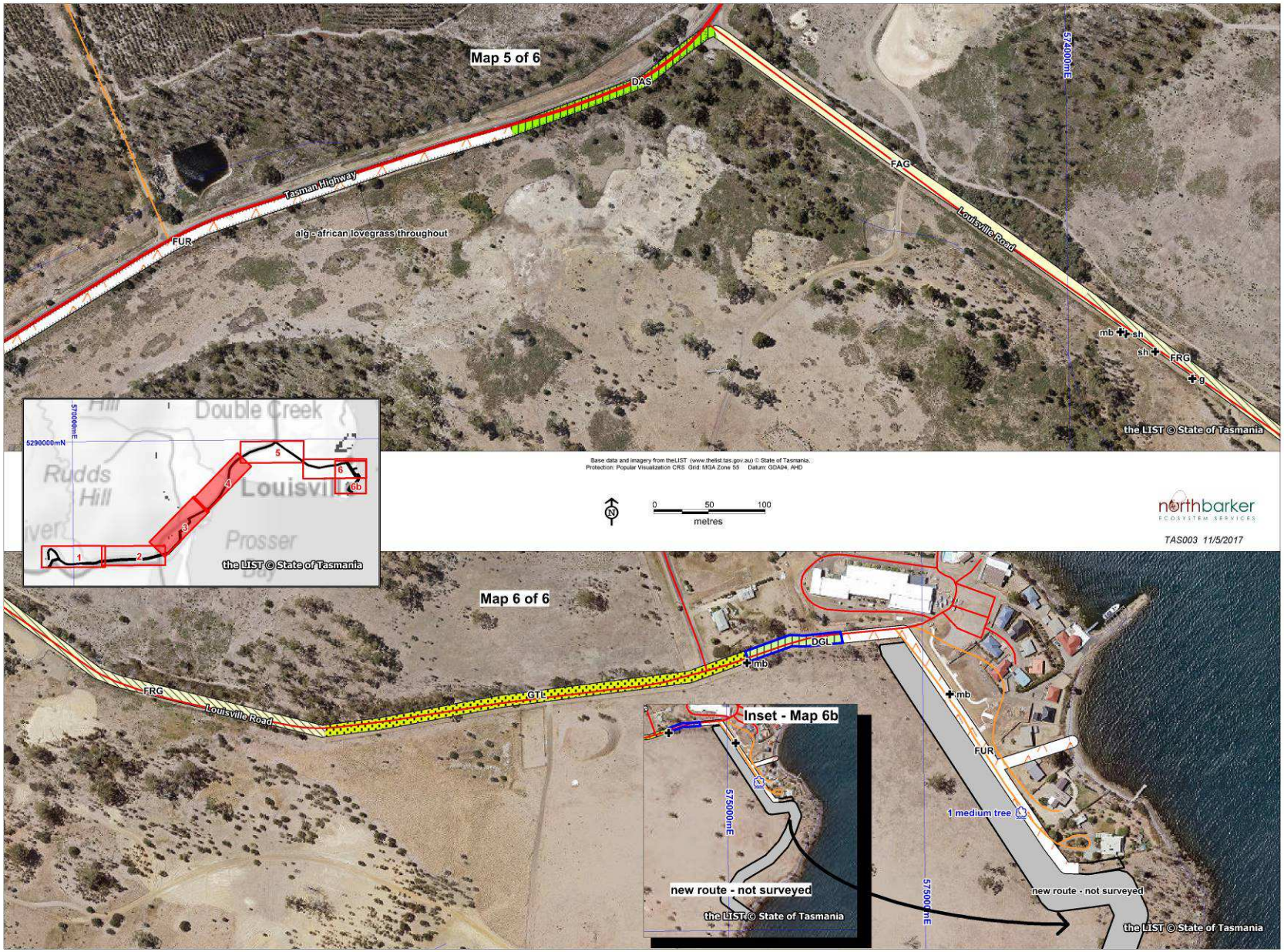
alg
Mp(10)
g
bb
5290000mN
Sheas Creek
Tasman Highway
573000mE


Map 5 of 6
DAS
Tasman Highway
FUR
alg - african lovegrass throughout
FAG
Louisville Road
574000mE
mb
sh
sh
FRG
g
the LIST © State of Tasmania
Double Creek
Rudds Hill
Louisville
Prosser
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Base data and imagery from theLIST (www.thelist.tas.gov.au) © State of Tasmania.
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ECOSYSTEM SERVICES
TAS003 11/5/2017
Map 6 of 6
DGL
mb
FRG
Louisville Road
GTL
mb
Inset - Map 6b
FUR
575000mE
1 medium tree
new route - not surveyed
the LIST © State of Tasmania
575000mE
new route - not surveyed
the LIST © State of Tasmania

Native vegetation types

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

Eucalyptus amygdalina forest and woodland on sandstone (DAS) - Threatened

This community occurs along the Tasman Highway near the intersection with Louisville Rd. It is a small roadside remnant which has been substantially modified and disturbed. There are several medium sized *E. amygdalina* trees within the road reserve. A typical species list and structure for this community is given below.

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

Trees:	*Eucalyptus amygdalina, Eucalyptus viminalis subsp. viminalis*
Tall Shrubs:	*Allocasuarina littoralis, Leptospermum scoparium*
Shrubs:	*Acacia genistifolia, Bossiaea cinerea*
Low Shrubs:	*Pimelea humilis*
Herbs:	*Euchiton sp., Kennedia prostrata, Thelymitra sp.*
Graminoids:	*Gahnia radula, Lomandra longifolia*
Grasses:	*Austrostipa mollis, Austrostipa pubinodis, Austrostipa rudis subsp. australis, Austrostipa stuposa, Rytidosperma caespitosum, Themeda triandra*
Ferns:	*Pteridium esculentum subsp. esculentum*
Weeds:	*Agrostis capillaris, Alopecurus pratensis, Briza minor, Conyza sp., Dactylis glomerata, Eragrostis curvula, Erica lusitanica, Holcus lanatus, Hypochaeris radicata*

Eucalyptus globulus dry forest and woodland (DGL) - Threatened

This community occurs near the Prosser River above the crossing and along a short section along Louisville Rd. In both instances the canopy is dominated by *E. globulus*, including medium-sized trees within the proposed alignment. The understorey along Louisville Rd has a dry grassy understorey and is in poor condition due to disturbance and weed invasion. Each section is about 100 m long.

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

Separate species lists and structure for each form are given below.

Trees:	*Eucalyptus globulus subsp. globulus, Eucalyptus pulchella, Eucalyptus amygdalina, Acacia melanoxylon, Bursaria spinosa subsp. spinosa, Callitris rhomboidea*
Tall Shrubs:	*Acacia mearnsii, Acacia mucronata subsp. longifolia, Acacia verticillata, Allocasuarina littoralis, Allocasuarina verticillata, Banksia marginata, Bedfordia salicina, Beyeria viscosa, Dodonaea viscosa subsp. spatulata, Leptospermum lanigerum, Leptospermum scoparium, Notelaea ligustrina, Pomaderris apetala, Prostanthera lasianthos var. lasianthos, Zieria arborescens*
Shrubs:	*Epacris impressa, Epacris tasmanica, Hakea microcarpa, Leptecophylla divaricata, Leucopogon collinus, Lomatia tinctoria, Melaleuca pallida,, Pimelea nivea, Pomaderris pilifera, Rubus parvifolius, Veronica formosa*
Low Shrubs:	*Astroloma humifusum, Hibbertia riparia*
Herbs:	*Acaena novae-zelandiae, Bulbine glauca, Coronidium scorpioides, Correa reflexa, Dianella brevicaulis, Dianella tasmanica, Euchiton sp., Gratiola peruviana, Hydrocotyle sp., Hypoxis hygrometrica, Isolepis sp., Leptorhynchos squamatus subsp. squamatus, Linum marginale, Lobelia anceps, Microtis sp., Oxalis*

	perennans, Pelargonium australe, Plantago varia, Rumex sp., Veronica calycina, Wahlenbergia sp.
Graminoids:	*Baumea juncea, Carex appressa, Diplarrena moraea, Ficinia nodosa, Gahnia grandis, Juncus kraussii subsp. australiensis, Lepidosperma laterale, Lomandra longifolia*
Grasses:	*Austrostipa stipoides, Austrostipa stuposa, Ehrharta stipoides, Poa labillardierei, Rytidosperma sp.*
Ferns:	*Adiantum aethiopicum, Asplenium flabellifolium, Cheilanthes austrotenuifolia, Microsorum pustulatum subsp. pustulatum, Polystichum proliferum*
Climbers:	*Clematis aristata*
Weeds:	*Erica lusitanica, Lysimachia arvensis, Ulex europaeus*

DGL along Louisville Rd

Trees:	*Eucalyptus globulus subsp. globulus, Bursaria spinosa subsp. spinosa*
Tall Shrubs:	*Acacia mearnsii, Dodonaea viscosa subsp. spatulata, Exocarpos cupressiformis*
Low Shrubs:	*Astroloma humifusum, Hibbertia hirsuta*
Herbs:	*Acaena echinata, Acaena novae-zelandiae, Senecio quadridentatus, Wahlenbergia gracilis*
Graminoids:	*Carex iynx, Lepidosperma gunnii, Lepidosperma laterale, Lomandra longifolia*
Grasses:	*Austrostipa mollis, Austrostipa stuposa, Dichelachne crinita, Poa labillardierei, Poa rodwayi, Rytidosperma caespitosum, Rytidosperma geniculatum, Rytidosperma pilosum, Themeda triandra*
Weeds:	*Briza maxima, Cirsium vulgare, Cotyledon orbiculata, Dactylis glomerata, Ehrharta erecta, Genista monspessulana, Paspalum dilatatum, Phalaris aquatica, Plantago lanceolata, Rosa rubiginosa, Sedum album, Verbascum thapsus, Vulpia bromoides*

Eucalyptus pulchella forest and woodland (DPU)

This community occurs along the edges of the Prosser River near the proposed pump station and along the proposed pipeline. The vegetation is floristically diverse and is generally in good condition. A typical species list and structure for this community is given below. The likely area and location of conversion is set out in (Table 2).

Trees:	*Eucalyptus pulchella, Eucalyptus globulus subsp. globulus, Eucalyptus amygdalina, Acacia melanoxylon, Bursaria spinosa subsp. spinosa, Callitris rhomboidea,*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Acacia mearnsii, Acacia mucronata subsp. longifolia, Allocasuarina littoralis, Allocasuarina verticillata, Banksia marginata, Beyeria viscosa, Dodonaea viscosa subsp. spatulata, Exocarpos cupressiformis, Leptospermum lanigerum, Leptospermum scoparium, Melaleuca squarrosa, Notelaea ligustrina, Pomaderris apetala*
Shrubs:	*Bossiaea prostrata, Epacris impressa, Epacris tasmanica, Euryomyrtus ramosissima, Leptecophylla divaricata, Melaleuca pallida, Micrantheum hexandrum, Olearia ramulosa, Ozothamnus lycopodioides, Pultenaea juniperina,*
Low Shrubs:	*Acacia myrtifolia, Acrotriche serrulata, Astroloma humifusum, Hibbertia hirsuta, Hibbertia riparia, Pimelea humilis*
Herbs:	*Acaena echinata, Argentipallium dealbatum, Brachyscome sp., Coronidium*

	scorpioides, Correa reflexa, Dianella tasmanica, Dichondra repens, Drosera peltata, Geranium sp., Gonocarpus teucrioides, Goodenia lanata, Hydrocotyle sp., Hypericum gramineum, Hypoxis hygrometrica, Leptorhynchos squamatus, Linum sp., Oxalis perennans, Pelargonium australe, Stylidium graminifolium, Viola hederacea, Wahlenbergia sp.
Graminoids:	*Carex appressa, Carex iynx, Eleocharis gracilis, Lepidosperma curtisiae, Lepidosperma laterale, Lomandra longifolia, Schoenus apogon*
Grasses:	*Australopyrum pectinatum, Austrostipa mollis, Austrostipa rudis subsp. australis, Austrostipa sp., Austrostipa stuposa, Deyeuxia quadriseta, Ehrharta stipoides, Poa labillardierei, Poa rodwayi, Rytidosperma setaceum, Themeda triandra*
Ferns:	*Blechnum minus, Cheilanthes austrotenuifolia, Gleichenia microphylla, Pteridium esculentum subsp. esculentum*
Weeds:	*Centaurium erythraea, Erica lusitanica, Lysimachia arvensis, Ulex europaeus*

Dry Eucalyptus viminalis grassy forest (DVG)

The community occurs along the Tasman Highway roadside. *E. globulus* is also present. The community has a number of grassy and woody weeds.

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

Trees:	*Bursaria spinosa subsp. spinosa, Eucalyptus globulus subsp. globulus, Eucalyptus viminalis subsp. viminalis*
Tall Shrubs:	*Acacia dealbata subsp. dealbata, Acacia mearnsii, Allocasuarina littoralis, Exocarpos cupressiformis*
Shrubs:	*Cassinia aculeata subsp. aculeata, Melaleuca pustulata*
Low Shrubs:	*Astroloma humifusum*
Herbs:	*Carpobrotus rossii, Dianella revoluta, Dichondra repens, Linum sp., Senecio hispidulus, Senecio quadridentatus, Wahlenbergia gracilis*
Graminoids:	*Gahnia radula, Juncus kraussii subsp. australiensis, Lomandra longifolia*
Grasses:	*Austrostipa mollis, Austrostipa stuposa, Rytidosperma caespitosum, Rytidosperma setaceum, Themeda triandra*
Weeds:	*Briza maxima, Dactylis glomerata, Eragrostis curvula, Erica lusitanica, Paspalum dilatatum, Rubus fruticosus*

Non forest Vegetation

Saline sedgeland/rushland (ARS)

This community occupies a small strip on the edge of the Prosser River where it is proposed to divert the pipeline under the river. This community is included in the Vulnerable EPBCA listed threatened ecological community 'Subtropical and Temperate Coastal Saltmarsh'. A typical species list and structure for this community is given below.

Tall Shrubs:	*Acacia mucronata subsp. longifolia, Dodonaea viscosa subsp. spatulata*
Herbs:	*Apium prostratum, Samolus repens var. repens*
Graminoids:	*Gahnia filum, Juncus kraussii subsp. australiensis*
Grasses:	*Austrostipa stipoides, Poa labillardierei*
Weeds:	*Plantago coronopus, Spergularia tasmanica*

Lowland *Themeda triandra* grassland (GTL)

This community occurs along Louisville Rd and is derived from previous clearance and roadside mowing. GTL can form part of the EPBC listed community 'Lowland Native Grasslands of Tasmania' however this patch does not meet the condition threshold criteria for

listing and is <1 ha in size. Similarly a small area of grassland may occur in the unsurveyed area at the eastern end of the route. This area is too small to meet the significant impact criteria regardless of its condition.

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

Trees:	*Bursaria spinosa subsp. spinosa*
Low Shrubs:	*Hibbertia hirsuta*
Graminoids:	*Lomandra longifolia*
Grasses:	*Themeda triandra Austrostipa stuposa, Poa labillardierei, Poa rodwayi, Rytidosperma caespitosum*
Weeds:	*Centaurium erythraea, Leontodon saxatilis, Paspalum dilatatum, Plantago lanceolata*

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

TasVeg Code[8]	State Wide Extent[9] / NRS Reservation Status [10]	Bioregional Extent / Reservation Status
Black peppermint on sandstone		
DAS	117,767 ha mapped 14,221 ha reserved	95,351 ha mapped 7,762 ha reserved
Grassy blue gum forest		
DGL	47,062 ha mapped 6,783 ha reserved	44,231 ha mapped 6,142 ha reserved
Grassy white gum forest		
DVG	249,576 ha mapped 15,090 ha reserved	127,281 ha mapped 8,326 ha reserved
Saline wetland		
ARS	2,500 ha mapped 1,000 ha reserved	600 ha mapped 200 ha reserved
Themeda grassland		
GTL	7,400 ha mapped 1,100 ha reserved	1,800 ha mapped 100 ha reserved

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

Description	Area (ha)
(ARS) Saline sedgeland/rushland	0.01
(DAS) Eucalyptus amygdalina forest and woodland on sandstone	0.21
(DGL) Eucalyptus globulus dry forest and woodland	0.20
(DPU) Eucalyptus pulchella forest and woodland	0.99
(DVG) Eucalyptus viminalis grassy forest and woodland	0.51
(FAG) Agricultural land	0.41
(FRG) Regenerating cleared land	0.51
(FUR) Urban areas	2.80
(GTL) Lowland Themeda triandra grassland	0.39
Grand Total	**6.02***

*the clearance required within the corridor to allow for access and construction will be less than the assessed area**.**

[8] Kitchener & Harris 2013

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

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

Impact:

Figure 2 illustrates the extent of vegetation and Table 2 presents the extent of clearance of each vegetation type in the pipeline corridor.

Vegetation will also be cleared from an area within a corridor for construction along the pipeline route; the clearance required within the corridor to allow for access and construction will be less than the 10 m assessed and reported in Table 2. The land will be rehabilitated.

Vegetation - EPBCA Significance of Impact Test

There is one EPBC listed ecological community (saline wetland) within the pipeline corridor. There is no regulatory requirement associated with this listing.

The practices employed to undertake vegetation clearance will conform to Dam Works Code; and be documented in a Dam Works Practices Plan 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

190 species were recorded in the study area. An 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 lists 2 species (*Melaleuca pustulata* and *Ozothamnus lycopodioides*) as present in the pipeline corridor.

Context:

***Melaleuca pustulata*: Rare TSPA**

This species is restricted to the central east coast of Tasmania and is endemic to Tasmania. Within this restricted range it can be abundant and prolific. It is a very hardy species that regenerates strongly following disturbance and can do so through vegetative resprouting as well as seed germination. The species is abundant in the vicinity and there are hundreds of records on the NVA.

Where present within the pipeline corridor it is likely to persist following the proposed works. Nevertheless every attempt should be made to avoid it or minimise disturbance to it.

***Ozothamnus lycopodioides:* Rare TSPA**

This species is also restricted to the central east coast of Tasmania and is endemic to Tasmania. Within this restricted range it can also be abundant and prolific. This plant responds strongly from seed following ground disturbance. There are more than 50 records on the NVA and it is generally understood to be relatively common within its restricted range.

Where there is the potential to avoid this species it should be protected during the works.

Flora Impact:

The two threatened flora species listed on the TSPA can potentially be avoided and this should be the objective of trench location and during works in the corridor.

Table 3. Threatened flora species previously recorded in the vicinity (within 5km)[11].

Species	Status TSPA / EPBCA	Potential to occur	Observations and preferred habitat[12]
Present pipeline corridor			
Melaleuca pustulata Warty paperbark	Rare/-	Present	Warty paperbark is a compact shrub to 2 m tall. It has narrow leaves with prominent pustulate glands on the underside, and has stalkless yellow flowers at the end of the branches. This species was found along the Tasman Highway north of Sheas Creek on the side of the eastern road embankment. Approximately 10 plants observed which were mostly <1 m in height and were probably regenerating following disturbance.
Ozothamnus lycopodioides Clubmoss everlasting	Rare/-	Present	Clubmoss everlasting is a low spreading shrub up to 1 m in height. It has small overlapping leaves and clusters of tiny daisy flowers at the end of the branches. It is endemic to Tasmania where it is restricted to several sites on the east coast, and is known to be locally common at several locations (including along the Prosser River). It is generally found in dry sclerophyll forest on rocky slopes with a dolerite substrate. This species was observed at one location along the proposed pipeline route. The occurrence (c.10 plants) was observed immediately east of the TasWater pump station near the location of the proposed new pump station. There are also a number of previous records in NVA from this general vicinity including near the point where the pipeline crosses the Prosser River, however a targeted search did not detect any plants in this location. However it is likely that additional plants are scattered throughout this general area, but survey effort was limited to a 10-20 m strip.
Predicted by EPBC habitat mapping and or recorded within 500 m of pipeline corridor[13]			

[11] Natural Values Report 64460 31st Aug 2015, DPIPWE

[12] Wapstra *et al.* 2010, Jones *et al.* 1999, Threatened Species Link – DPIPWE 2015

[13] EPBC Protected Matters report dated 16 July 2017.

Species	Status TSPA / EPBCA	Potential to occur	Observations and preferred habitat[12]
Eucalyptus barberi Barbers gum	Rare/-	Very low	Marginal potential habitat. Unlikely to be overlooked.
Glossostigma elatinoides Small mudmat	Rare/-	Nil	No Suitable habitat.
Gyrostemion thesioides Broom wheelfruit	Rare/-	Moderate	Marginal potential habitat. Unlikely to be overlooked.
Pimelia flava Yellow rice flower	Rare/-	Moderate	Marginal potential habitat. Unlikely to be overlooked.
Pterostylis squamata Ruddy greenhood	Rare/-	Moderate	Marginal potential habitat. Only observable during flowering time. Potential to be overlooked.
Stenanthemum pimelioides Propeller plant	Rare/-	Very low	Very limited suitable habitat. Unlikely to be overlooked.
Teucrium corymbosum Forest germander	Rare/-	Moderate to high	Potential habitat. Unlikely to be overlooked.
Caladenia filamentosa Daddy longlegs	Rare/-		No suitable habitat.
Carex longebrachiata Drooping sedge	Rare/-	Very low	Marginal potential habitat. Unlikely to be overlooked.
Diuris palustris Swamp doubletail	Endangered/-	Very low	No Suitable habitat.
Isoetes elatior Tall quillwort	Rare/-	Very low	Marginal habitat present at edge of Prosser weir and crossing. Not observed.
Junus amabilis Gentle rush	Rare/-	Low	Most often recorded in pasture in damp sites. Limited habitat present. Unlikely to be overlooked.
Pomaderris intermedia Lemon dogwood	Rare/-	Very low	No suitable forest habitat.

Species	Status TSPA / EPBCA	Potential to occur	Observations and preferred habitat[12]
Scaevola aemula Fairy fanflower	Rare/-	Low - Moderate	Marginal habitat present. Sampling limitations, may have been overlooked if sparse.
Scleranthus fasicularis Spreading knawel	Vulnerable /-	Moderate	Suitable habitat present. Sampling limitations, may have been overlooked if sparse.
Vittadinia gracilis Woolly new holland daisy	Rare/-	Low - Moderate	Suitable habitat present. Sampling limitations, may have been overlooked if sparse.

3.4 Fauna Habitat

The pipeline corridor is predominantly dry forest and modified grassy vegetation. Sections are dominated by blue gum which is also foraging habitat of the swift parrot. Much of the route follows previously disturbed habitats including a power easement. The alignment along the road sides is highly modified and unsuited as habitat for mammals due to the danger posed by vehicles. The understorey is modified to the extent that cover for small animals and birds is suboptimal.

Due to the extensive native habitat in the vicinity there are many records of threatened animals reported on the NVA and on the Protected Matters Search tool.

These are highly unlikely to occur in the pipeline corridor other than when occasional traversing the land. Breeding opportunities are essentially absent.

Species that **are known or likely to** occur from time to time but unlikely to nest or breed:

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)
Wedge-tailed eagle (TSAP endangered / EPBC)

Species with a **low to moderate probability** of nesting or breeding in the corridor.

Tussock skink (vulnerable TSPA)

Species with **no to very low probability of occurrence** of nesting or breeding in the corridor.

Masked owl (endangered TSPA / EPBC)

Grey goshawk (TSPA endangered)

Wielangta stag beetle (endangered TSPA / EPBC)

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)

Fairy tern (EPBC marine)

Hooded plover (EPBC vulnerable)

A number of additional species retuned 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[14].

Species	Status TSPA/EPBCA	Likelihood of occurrence[15]	Preferred Habitat[16] and Observations[17]
BIRDS			
Grey goshawk *Accipiter novae-hollandiae*	Endangered/ -	Very low	This species is likely to be present for hunting at least from time to time. The forest is unsuitable for nesting.
Swift parrot *Lathamus discolor*	Endangered/ ENDANGERED	Very High	There are numerous records within 5 km. Requires tree hollows for nesting and feeds on nectar of blue gum (*E. globulus*) and black gum (*E. ovata*) flowers. It is likely that the study area is utilised for foraging by swift parrots from time to time. *E. globulus* is an important breeding season resource. E. globulus are scattered along the route but all trees along the pipeline route can be avoided.
Masked owl *Tyto novaehollandiae castanops*	Endangered / VULNERABLE	Very low	No suitable nest trees were observed.
Wedge-tailed eagle *Aquila audax*	Endangered/ ENDANGERED	Foraging / no nests recorded	No nests are known within 1000 m line of sight nor within 500 m. No suitable nest trees are present in the pipeline corridor.
White-bellied sea-eagle *Haliaeetus leucogaster*	Vulnerable/ -	Very low	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 nests are known within 1000 m line of sight nor within 500 m. No suitable nest trees are present in the pipeline corridor.
Shore birds Hooded plover and Fairy tern	-	Vulnerable / marine	Both of these species have been recorded nesting on a sand spit near the mouth of the Prosser River. The sand spit is not within the pipeline corridor. The pipeline route is more than 200 m away from the main nesting area at its closest point and across the river channel. Given the existing activity in this area the construction is unlikely to cause significance disturbance.
MAMMALS			

[14] Natural Values Report January 2017

[15] For broad ranging species this refers to breeding structures such as nests or dens.

[16] Bryant & Jackson (1999)

[17] Natural Values Report January 2017

Species	Status TSPA/EPBCA	Likelihood of occurrence[15]	Preferred Habitat[16] and Observations[17]
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 is 1 record with 500 m of the pipeline corridor. No recent surveys have been reported. Observations of the habitat present in the study area suggest that it is predominantly unsuited to dens and provides insufficient cover for protection and shelter.
Spotted-tailed quoll *Dasyurus maculatus ssp. maculatus*	Rare/ VULNERABLE	Moderate	This naturally rare forest-dweller most commonly inhabits forests but other vegetation types may occur within its home range. It forages and hunts on farmland and pasture and shelters in logs, rocks or thick vegetation. There are two records within 5 km of the pipeline corridor. The study area is within the range of an important population but the habitat does not provide for denning opportunities or shelter and cover for the vast majority of the route.
Tasmanian devil *Sarcophilus harrisii*	Endangered/ ENDANGERED	Moderate - High	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 low carrying capacity for devils due to the presence of a highway and other roads along much of the route. The habitat is highly unlikely to support dens.
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 pipeline corridor. There is suboptimal foraging and nesting habitat within the pipeline corridor.
FISH			
Australian grayling *Prototroctes maraena*	Vulnerable/ VULNERABLE	Nil	The are no records in the vicinity. A weir on the Prosser River makes upstream migration impossible. The underwater route of the pipeline was not required to be assessed but laying a pipe on the bed is unlikely to disturb the behaviour of this species if present.
AMPHIBIANS			
Green and gold frog *Litoria raniformis*	Vulnerable/ VULNERABLE	Nil	No suitable habitat
Reptiles			

Species	Status TSPA/EPBCA	Likelihood of occurrence[15]	Preferred Habitat[16] and Observations[17]
Tussock skink *Pseudemoia pagenstecheri*	Vulnerable/ -	Low - moderate	This species is restricted to native tussock grasslands. The only habitat in which it could potentially occur is within the unsurveyed grassland at the eastern end of the route. The potential to occur is judged to be low simply because the area of potential habitat is very limited.
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	Very low	This endemic beetle is restricted to the vicinity. There is a record within 5 km of the pipeline corridor. Large logs are rare to absent and litter is dry sclerophyllous. This species is highly unlikely to occur on the route.

3.6 THREATENED FAUNA FOR WHICH HABITAT MAY BE IMPORTANT

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

Spotted-tailed quoll have been recorded from the type of habitat that is found in the study area. However, this habitat is suboptimal and unlikely to support dens.

The pipeline corridor is more likely to be occasionally traversed by a quoll.

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 pipeline route.

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[18]. 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. This is rare along the route.

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[19]. They are known to have a large home range[20]. Home

[18] Mallick 2003

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

ranges extend to more than 1,500 ha of continuous suitable habitat for a male and as little as 200 ha 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[21].

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 pipeline route is within the range of important population 5. The habitat and its characteristics are suboptimal.

Impact:

No detectable impact is anticipated because the pipeline corridor is suboptimal habitat which is unlikely to support denning or significant hunting opportunities.

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:

An injured animal protocol should be employed should animals be found to be injured during the forest clearance and pipeline trenching works.

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

[21] PLUC 1996

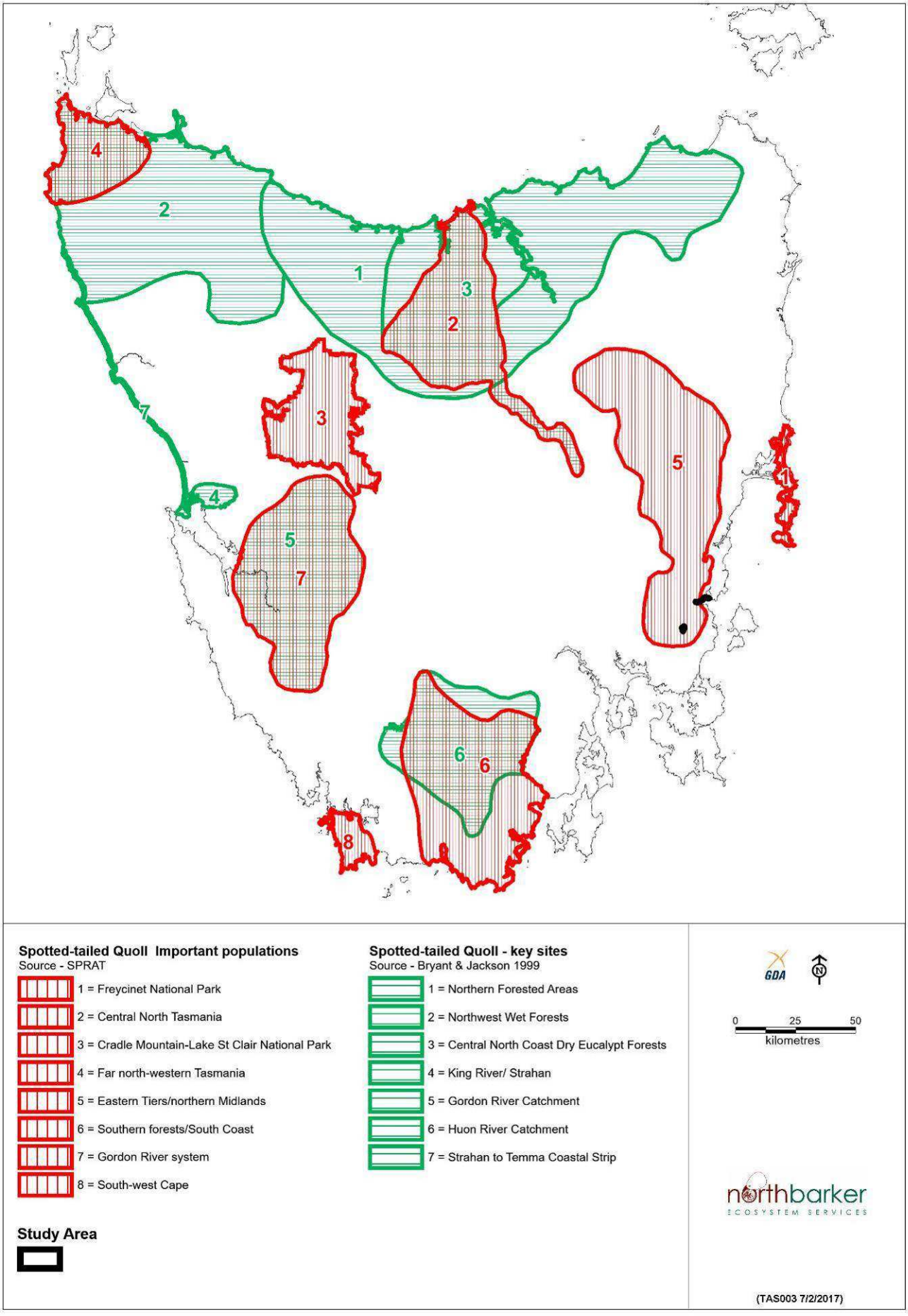

Figure 3. The distribution of important populations and key sites of the spotted-tailed quoll.

Tasmanian devil (*Sarcophilus harrisii*)

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[22].

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[23]. 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[24]. They have home ranges of 8 to 20 km^2 (800 to 2,000 ha), although more recent studies suggest smaller ranges[25] 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 km^2.

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.

Findings:

No trapping survey was undertaken in the study area. No sign evidence of devils was found. The habitat is predominantly too open for denning and the presence of the roads makes it a high risk environment for devils to survive in. It is likely that devils would cross the route from time to time. The frequency of these occurrences would be particularly low where the route is

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

[23] Hamede *et. al.* 2009

[24] Tarkine Devil Forum (2009)

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

open to cleared paddocks. Cleared paddocks offer few opportunities for prey at the same time as offering little cover and protection from which to hunt.

Context:

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%[26]. 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.

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.

Impact:

Habitat loss:

The total area of impact is negligible and would make little difference to the current behaviour of the devil.

Prey:

The conversion of the study area is unlikely to affect the abundance of prey species; wallabies and small mammals and birds, vertebrates and other essentially sedentary species.

Road kill:

The intensification of road traffic over the construction period will very low. The traffic involved in the pipeline construction will be limited in time 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.

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

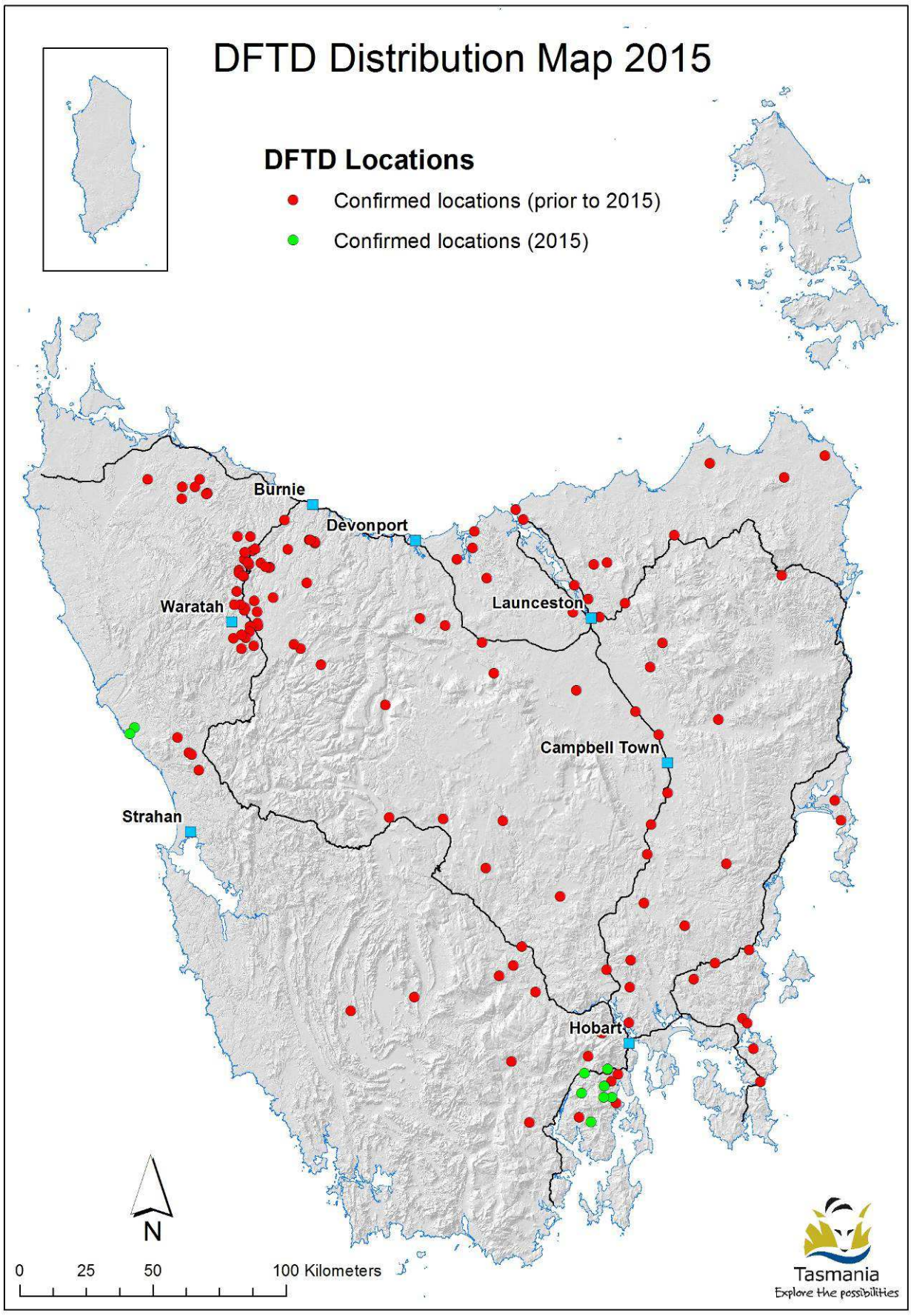

Figure 4. The distribution of Tasmanian devil facial tumour disease in 2015.

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 5).

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 pipeline corridor supports two remnant stands of blue gum. The toatal area in the corridor is 0.2 ha. There is unlikely to be any loss of trees along the pipeline corridor.

Impact: It is proposed to avoid the clearance of blue gums along the pipeline route.

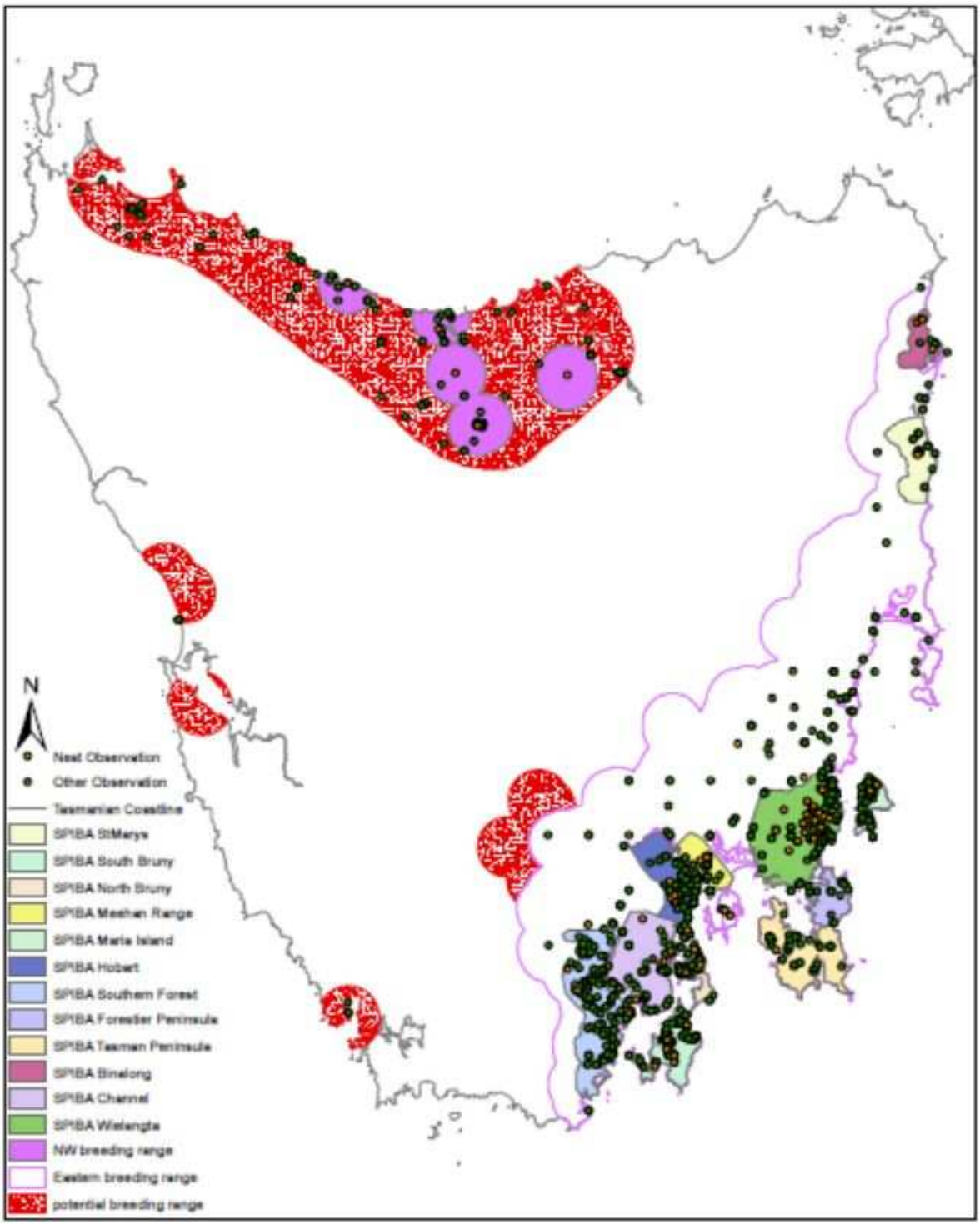

Figure 5: The location of swift parrot important breeding areas (SPIBA's).

3.7 Pathogens and Weeds

Weeds

Five Declared weeds were present along the pipeline corridor (Table 5 and.

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

Species	Zone	Distribution	Action
Eragrostis curvula (African love grass)	A	None recorded	Prevention and early detection
Genista monspessulana (Montpellier broom)	A	Localised infestations	Implement integrated control program for eradication and prevent future occurrences
Erica luscitanica (Spanish heath),	A	Localised infestations	Implement integrated control program for eradication and prevent future occurrences
Echium plantagineum (patersons curse)	A	Localised infestations	Implement integrated control program for eradication and prevent future occurrences
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.

Other agricultural and garden 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

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.

Species:

The pipeline works are likely to cause a negligible impact on habitats of MNES species. This impact could not reasonably be deemed as "likely" to be significant.

Ecological communities:

The Themeda grassland recorded along the route does not meet the EPBC condition criteria for the ecological community.

The vulnerable saline wetland does not require further consideration.

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.

Tasmanian *Threatened Species Protection Act 1995*

A Permit is not required for the pipeline corridor, where habitat clearance is under a Forest Practices Plan (FPP). Where disturbance is outside of an FPP operational area a Permit is required to disturb *Melaleuca pustulata and or Ozothamnus lycopodioides*.

No products of wildlife protected by this Act, such as dens or nests, were located.

Tasmanian *Weed Management Act 2000*

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

5. RECOMMENDATIONS

1. Mark in the field and avoid threatened flora and blue gums to the extent possible.
2. Where necessary, apply for a permit to take threatened plant species that cannot be avoided.
3. An injured animal protocol should be developed and included in the Construction and Environmental Management Plan.
4. A weed and hygiene management plan should be developed and included in the Construction and Environmental Management Plan.

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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: 190

117	DICOTYLEDONAE
2	GYMNOSPERMAE
63	MONOCOTYLEDONAE
8	PTERIDOPHYTA

Species list - project: TAS003

Status codes:

ORIGIN	NATIONAL SCHEDULE	STATE SCHEDULE
i - introduced	EPBC Act 1999	TSP Act 1995
d - declared weed WM Act	CR - critically endangered	e - endangered
en - endemic to Tasmania	EN - endangered	v - vulnerable
t - within Australia, occurs only in Tas.	VU - vulnerable	r - rare

Sites:

1	Proposed pump station - DPU - E569568, N5288049	12-01-2017 Joe Quarmby
2	TasWater plant to pump - DPU - E569543, N5287962	12-01-2017 Joe Quarmby
3	Along track from Pump station - DPU - E569699, N5287967	12-01-2017 Joe Quarmby
4	Prosser River crossing - DGL - E569777, N5287862	12-01-2017 Joe Quarmby
5	Powerline easement - DPU - E570089, N5287809	12-01-2017 Joe Quarmby
6	Powerline to river option - ARS - E570301, N5287814	12-01-2017 Joe Quarmby
7	Old convict track - DGL - E570831, N5287935	12-01-2017 Joe Quarmby
8	Tasman Highway to Raspins Beach - FUR - E572191, N5288641	12-01-2017 Joe Quarmby
9	Tasman Highway north of Sheas Creek - DVG, FRG - E, N	12-01-2016 Joe Quarmby
10	Tasman Highway - Lousville Rd intersection - DAS - E573577, N5289893	12-01-2017 Joe Quarmby
11	Lousville Rd - FAG, FRG - E574291, N5289517	12-01-2017 Joe Quarmby
12	Solis property to twin gums - DGL - E575204, N5289365	12-01-2017 Joe Quarmby
13	Alternative entry through Lot 9 - FUR - E575100, N5289462	12-01-2017 Joe Quarmby
20	Lousville Rd - GTL - E574724, N5289518	12-01-2017 Joe Quarmby
21	Lousville Rd - DGL - E574864, N5289550	12-01-2017 Joe Quarmby
22	Solis property - FUR along driveway - E575063, N5289452	12-01-2017 Joe Quarmby

Site	Name	Common name	Status
	DICOTYLEDONAE		
	AIZOACEAE		
9	*Carpobrotus rossii*	native pigface	
	APIACEAE		
6	*Apium prostratum*	sea celery	
2 7	*Hydrocotyle sp.*	pennywort	
	ASTERACEAE		
5	*Argentipallium dealbatum*	white everlasting	
7	*Bedfordia salicina*	tasmanian blanketleaf	en
5	*Brachyscome sp.*	daisy	
9	*Cassinia aculeata subsp. aculeata*	dollybush	
11 21	*Cirsium vulgare*	spear thistle	i
10	*Conyza sp.*	fleabane	i
3 4	*Coronidium scorpioides*	curling everlasting	

22	*Dimorphotheca fruticosa*	trailing daisy	i
4 10	*Euchiton sp.*	cudweed	
22	*Gazania linearis*	tufted gazania	i
8 10 11	*Hypochaeris radicata*	rough catsear	i
8 11 13 20 22	*Leontodon saxatilis*	hairy hawkbit	i
1 5	*Leptorhynchos squamatus*	scaly buttons	
7	*Leptorhynchos squamatus subsp. squamatus*	scaly buttons	
2	*Olearia ramulosa*	twiggy daisybush	
2 7	*Ozothamnus lycopodioides*	clubmoss everlastingbush	en r
9	*Senecio hispidulus*	rough fireweed	
9 12 21	*Senecio quadridentatus*	cotton fireweed	
22	*Sonchus asper*	prickly sowthistle	i
11	*Taraxacum officinale*	common dandelion	i
	BORAGINACEAE		
22	*Echium plantagineum*	patersons curse	d
	CAMPANULACEAE		
4	*Lobelia anceps*	angled lobelia	
9 21	*Wahlenbergia gracilis*	sprawling bluebell	
2 4 5 11	*Wahlenbergia sp.*	bluebell	
	CARYOPHYLLACEAE		
6	*Spergularia tasmanica*	coastal seaspurrey	i
	CASUARINACEAE		
1 5 7 9 10 11	*Allocasuarina littoralis*	black sheoak	
1 3 5 7	*Allocasuarina verticillata*	drooping sheoak	
	CLUSIACEAE		
3 5	*Hypericum gramineum*	small st johns-wort	
	CONVOLVULACEAE		
5 9	*Dichondra repens*	kidneyweed	
	CRASSULACEAE		
12 22	*Cotyledon orbiculata*	pig's ear	i
12	*Sedum album*	white stonecrop	i
	DILLENIACEAE		
1 3 20 21	*Hibbertia hirsuta*	hairy guineaflower	
1 3 4	*Hibbertia riparia*	erect guineaflower	
12	*Hibbertia sp.*	guinea-flower	
	DROSERACEAE		
1	*Drosera peltata*	pale sundew	
	EPACRIDACEAE		
1 5	*Acrotriche serrulata*	ants delight	
1 3 4 5 9 11 12 21	*Astroloma humifusum*	native cranberry	
3 4 5	*Epacris impressa*	common heath	
5 7	*Epacris tasmanica*	eastern heath	en
1 2 3 4 5	*Leptecophylla divaricata*	spreading pinkberry	en
7	*Leucopogon collinus*	white beardheath	
	ERICACEAE		
2 5 7 9 10 11	*Erica lusitanica*	spanish heath	d

	EUPHORBIACEAE		
2 4 7	*Beyeria viscosa*	pinkwood	
1 2 3 5	*Micrantheum hexandrum*	river tridentbush	
	FABACEAE		
10 11	*Bossiaea cinerea*	showy bossiaea	
3 5	*Bossiaea prostrata*	creeping bossiaea	
11 21 22	*Genista monspessulana*	canary broom	d
10	*Kennedia prostrata*	running postman	
3 11	*Pultenaea juniperina*	prickly beauty	
2 7 11	*Ulex europaeus*	gorse	d
	GENTIANACEAE		
1 3 5 11 20	*Centaurium erythraea*	common centaury	i
	GERANIACEAE		
13	*Geranium molle*	soft cranesbill	i
5	*Geranium sp.*	native geranium	
1 2 4	*Pelargonium australe*	southern storksbill	
22	*Pelargonium Xdomesticum*	garden geranium	i
	GOODENIACEAE		
5	*Goodenia lanata*	trailing native-primrose	
	HALORAGACEAE		
5	*Gonocarpus teucrioides*	forest raspwort	
	LAMIACEAE		
7	*Prostanthera lasianthos var. lasianthos*	christmas mintbush	
	LINACEAE		
7	*Linum marginale*	native flax	
1 9	*Linum sp.*	native flax	
	MALVACEAE		
13	*Malva sp.*	mallow	i
	MIMOSACEAE		
2 3 5 9 11	*Acacia dealbata subsp. dealbata*	silver wattle	
10	*Acacia genistifolia*	spreading wattle	
5 7 9 12 21 22	*Acacia mearnsii*	black wattle	
5 7 22	*Acacia melanoxylon*	blackwood	
1 2 3 4 5 6 7	*Acacia mucronata subsp. longifolia*	longleaf caterpillar wattle	
1	*Acacia myrtifolia*	redstem wattle	
7	*Acacia verticillata*	prickly moses	
	MYRTACEAE		
3 5 7 10 11	*Eucalyptus amygdalina*	black peppermint	en
2 3 4 5 7 9 11 12 21 22	*Eucalyptus globulus subsp. globulus*	tasmanian blue gum	
1 2 3 5 7	*Eucalyptus pulchella*	white peppermint	en
22	*Eucalyptus sp.*	gum	
9 10	*Eucalyptus viminalis subsp. viminalis*	white gum	
1	*Euryomyrtus ramosissima*	heath-myrtle	
3 4	*Leptospermum lanigerum*	woolly teatree	
3 5 7 10 11	*Leptospermum scoparium*	common tea-tree	

1 2 3 4 7	*Melaleuca pallida*	yellow bottlebrush	
9	*Melaleuca pustulata*	warty paperbark	en r
5	*Melaleuca squarrosa*	scented paperbark	
	OLEACEAE		
1 7	*Notelaea ligustrina*	native olive	
	OXALIDACEAE		
1 3 7	*Oxalis perennans*	grassland woodsorrel	
	PITTOSPORACEAE		
1 2 4 5 7 9 11 12 20 21	*Bursaria spinosa subsp. spinosa*	prickly box	
	PLANTAGINACEAE		
6 8 11 22	*Plantago coronopus*	buckshorn plantain	i
8 11 12 20 22	*Plantago lanceolata*	ribwort plantain	i
7	*Plantago varia*	variable plantain	
	POLYGONACEAE		
11	*Acetosella vulgaris*	sheep sorrel	i
4	*Rumex sp.*	dock	
	PRIMULACEAE		
2 4 7 11 13	*Lysimachia arvensis*	scarlet pimpernel	i
6	*Samolus repens var. repens*	creeping brookweed	
	PROTEACEAE		
3 7 8 11	*Banksia marginata*	silver banksia	
4	*Hakea microcarpa*	smallfruit needlebush	
7 11	*Lomatia tinctoria*	guitarplant	en
	RANUNCULACEAE		
7	*Clematis aristata*	mountain clematis	
	RHAMNACEAE		
1 2 3 4 5 7	*Pomaderris apetala*	common dogwood	
7	*Pomaderris pilifera*	hairy dogwood	
1 3 5	*Spyridium obovatum*	smooth dustymiller	en
	ROSACEAE		
5 11 21	*Acaena echinata*	spiny sheeps burr	
7 12	*Acaena novae-zelandiae*	common buzzy	
22	*Cotoneaster sp.*	cotoneaster	i
12 22	*Rosa rubiginosa*	sweet briar	i
9	*Rubus fruticosus*	blackberry	d
7	*Rubus parvifolius*	native raspberry	
	RUTACEAE		
1 7	*Correa reflexa*	correa	
4	*Zieria arborescens*	stinkwood	
	SANTALACEAE		
3 5 9 12 22	*Exocarpos cupressiformis*	common native-cherry	
	SAPINDACEAE		
3 4 6 7 12	*Dodonaea viscosa subsp. spatulata*	broadleaf hopbush	
	SCROPHULARIACEAE		
4	*Gratiola peruviana*	southern brooklime	

12	*Verbascum thapsus*	great mullein	i
4	*Veronica calycina*	hairy speedwell	
4 7	*Veronica formosa*	common speedwellbush	en
	STYLIDIACEAE		
5	*Stylidium graminifolium*	narrowleaf triggerplant	
	THYMELAEACEAE		
3 10	*Pimelea humilis*	dwarf riceflower	
7	*Pimelea nivea*	bushmans bootlace	en
	VIOLACEAE		
5	*Viola hederacea*	ivyleaf violet	
	GYMNOSPERMAE		
	CUPRESSACEAE		
1 2 3 4 7	*Callitris rhomboidea*	oyster bay pine	
	PINACEAE		
22	*Pinus sp.*	pine	i
	MONOCOTYLEDONAE		
	CYPERACEAE		
4	*Baumea juncea*	bare twigsedge	
2 4	*Carex appressa*	tall sedge	
11	*Carex inversa*	knob sedge	
3 11 21	*Carex iynx*	tussock sedge	
2	*Eleocharis gracilis*	slender spikesedge	
7	*Ficinia nodosa*	knobby clubsedge	
6	*Gahnia filum*	chaffy sawsedge	
7	*Gahnia grandis*	cutting grass	
9 10 11	*Gahnia radula*	thatch sawsedge	
11	*Isolepis levynsiana*	fan clubsedge	?i
4	*Isolepis sp.*	club rush	
5	*Lepidosperma curtisiae*	little swordsedge	
12	*Lepidosperma gunnii*	narrow swordsedge	
1 3 4 5 7 21	*Lepidosperma laterale*	variable swordsedge	
3	*Schoenus apogon*	common bogsedge	
	IRIDACEAE		
7	*Diplarrena moraea*	white flag-iris	
	JUNCACEAE		
11	*Juncus articulatus*	jointed rush	i
11	*Juncus bufonius*	toad rush	
4 6 9	*Juncus kraussii subsp. australiensis*	sea rush	
11	*Juncus planifolius*	broadleaf rush	
11	*Juncus sarophorus*	broom rush	
	LILIACEAE		
22	*Agapanthus praecox subsp. orientalis*	agapanthus	i
7	*Bulbine glauca*	bluish bulbine-lily	
7	*Dianella brevicaulis*	shortstem flaxlily	
9	*Dianella revoluta*	spreading flaxlily	
5 7	*Dianella tasmanica*	forest flaxlily	
2 3 4 5	*Hypoxis hygrometrica*	golden weatherglass, golden star	
	ORCHIDACEAE		
7	*Microtis sp.*	onion orchid	
10	*Thelymitra sp.*	sun-orchid	

	POACEAE		
10 11	*Agrostis capillaris*	brown top bent grass	i
10	*Alopecurus pratensis*	meadow foxtail	i
11	*Anthoxanthum odoratum*	sweet vernalgrass	i
1	*Australopyrum pectinatum*	prickly wheatgrass	
5 9 10 21	*Austrostipa mollis*	soft speargrass	
10	*Austrostipa pubinodis*	tall speargrass	
1 5 10	*Austrostipa rudis subsp. australis*	southern speargrass	
1 8	*Austrostipa sp.*	speargrass	
6 7	*Austrostipa stipoides*	coast speargrass	
1 7 9 10 12 20 21	*Austrostipa stuposa*	corkscrew speargrass	
9 12 21	*Briza maxima*	greater quaking-grass	i
10 11	*Briza minor*	lesser quaking-grass	i
8 13	*Bromus catharticus*	prairie grass	i
8	*Bromus diandrus*	great brome	i
9 10 11 12 21 22	*Dactylis glomerata*	cocksfoot	i
3	*Deyeuxia quadriseta*	reed bentgrass	
21	*Dichelachne crinita*	longhair plumegrass	
12 22	*Ehrharta erecta*	panic veldtgrass	i
4 5 7 11	*Ehrharta stipoides*	weeping grass	
9 10	*Eragrostis curvula*	african lovegrass	i
8 10 11	*Holcus lanatus*	yorkshire fog	i
8 9 11 13 20 21	*Paspalum dilatatum*	paspalum	i
11 12 21 22	*Phalaris aquatica*	toowoomba canarygrass	i
1 3 4 5 6 7 20 21	*Poa labillardierei*	silver tussockgrass	
5 12 20 21	*Poa rodwayi*	velvet tussockgrass	
8 9 10 11 12 20 21	*Rytidosperma caespitosum*	common wallabygrass	
21	*Rytidosperma geniculatum*	kneed wallabygrass	
21	*Rytidosperma pilosum*	velvet wallabygrass	
1 9	*Rytidosperma setaceum*	bristly wallabygrass	
4	*Rytidosperma sp.*	wallabygrass	
1 3 5 9 10 11 12 20	*Themeda triandra*	kangaroo grass	
12	*Vulpia bromoides*	squirreltail fescue	i
	TYPHACEAE		
8	*Typha domingensis*	slender cumbungi	
	XANTHORRHOEACEAE		
1 2 3 4 5 8 9 10 11 20 21	*Lomandra longifolia*	sagg	

PTERIDOPHYTA

	ADIANTACEAE		
7	*Adiantum aethiopicum*	common maidenhair	
1 2 5 7	*Cheilanthes austrotenuifolia*	green rockfern	
	ASPIDIACEAE		
7	*Polystichum proliferum*	mother shieldfern	

	ASPLENIACEAE	
7	*Asplenium flabellifolium*	necklace fern
	BLECHNACEAE	
2	*Blechnum minus*	soft waterfern
	DENNSTAEDTIACEAE	
5 10 11	*Pteridium esculentum subsp. esculentum*	bracken
	GLEICHENIACEAE	
2	*Gleichenia microphylla*	scrambling coralfern
	POLYPODIACEAE	
7	*Microsorum pustulatum subsp.*	kangaroo fern

Appendix 4. Protected Matters Search Tool Report (attached).