

Appendix B

Northbarker Ecosystem Report

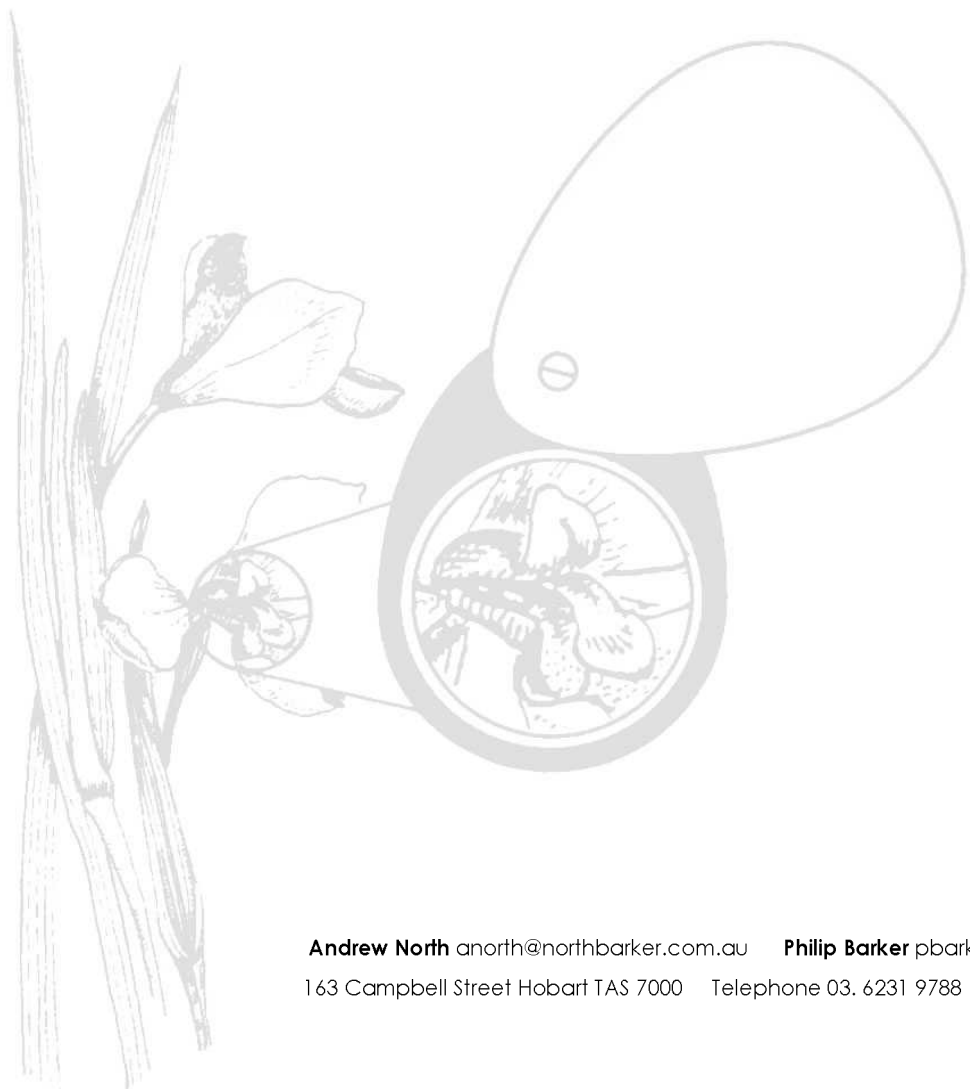
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Tarkine Forest Drive
Arthur River Township to Tayatea Bridge
North West Tasmania

VEGETATION SURVEY AND FAUNA HABITAT ASSESSMENT

For Pitt & Sherry Consulting Engineers

7 October 2011
PAS051



SUMMARY

The Tarkine Forest Drive project includes the sealing of existing rural and forestry roads to create a circular tourist route linking three bridges that cross the Arthur River. This extends for 88.3km from Arthur River township, on the west coast, to Tayatea Bridge via Kanunnah Bridge. Including side roads to tourist features the total length of the road is 99.4 km. Twenty two percent (20 km) of the 88 km of road is already sealed, the remainder utilises existing gravel roads, of which 30% will require widening. The project includes replacement of existing bridges over the Nelson Bay River and Rapid River.

Most of the route passes through native vegetation, which includes rainforest, wet eucalypt forest, dry sclerophyll woodland, buttongrass moorland, coastal heathland and native grassland. Significant sections pass through production forest, which is predominantly native regrowth forest but also includes eucalypt plantation.

The construction of the Tarkine Forest Drive and associated infrastructure is likely to result in an increase in the number of vehicles and people visiting northwest Tasmania. It will also broaden the range of user types in the area.

This assessment specifically considers the impact of the project on the flora and fauna values of the area.

The extent of the existing road infrastructure and the scale of other land use activities throughout much of the corridor are relevant in the context of this assessment. Much of the landscape in which the Tarkine Forest Drive is located is subject to production forestry and mining. The western half of the road is already being used as an alternate transport route linking Smithton with the west coast.

The extent of direct impacts on native vegetation from the construction of the Tarkine Forest Drive is minor relative to the large scale of the current activities in the area, mostly from forestry and mining.

Threatened flora species known to occur along the route include:

- Four threatened rainforest lichens known from the vicinity of the route. These have a moderate chance of occurring on the actual road alignment. Although potential habitat is apparently widespread in the region, many of these species are rarely recorded in spite of extensive targeted survey. Given the scale of works, the chance of impact is considered low.
- The northwest heath (*Epacris curtisiae*) occurs in moorland on each side of the Rebecca Road within the Arthur-Pieman Conservation Area (Segment C-E). Unless works are to occur to the drains then there may be no impacts given the road is already very wide along this section. Other records suggest potential for plants along moorland on Blackwater Road and Dempster Lookout.
- Several State and Nationally listed orchids and annual herbs are located along the west coast section near Temma Road and Couta Rocks Road. Any works affecting vegetation close to the roadside may impact on some of these species. A targeted survey along Segments A, B, and C identified one particular section at Tiger Flats where several threatened species occur very close to the roadside.
- The project is unlikely to have a significant impact upon the conservation status of any flora known from the area, although there may be minor

localised impacts. The quantification of these impacts would require detailed analysis of the road works and possibly further targeted surveys.

Threatened fauna species considered to have moderate or higher potential of being adversely affected include:

- Giant freshwater lobster (*Astacopsis gouldi*) – Several tributaries of the Arthur River that are crossed by the route have high quality habitat supporting good populations of lobster. The main risk is associated with sedimentation and pollution at river crossings. Overall habitat loss will be insignificant for the giant freshwater lobster.
- Tasmanian wedge-tailed eagle (*Aquila audax fleayi*) – No known nests will be impacted.
- Tasmanian grey goshawk (*Accipiter novaehollandiae*) – There are extensive areas of potentially suitable breeding habitat along the road corridor. However, the proposed road is unlikely to have a significant impact on this species because the area of affected habitat is so small.
- Azure kingfisher (*Ceyx azureus*) – There is suitable habitat for this species along the major rivers in the study area. However, the proposed road is unlikely to have a significant impact unless nesting habitat at the riverbanks is affected by bridge works.
- Eastern barred bandicoot (*Perameles gunnii*) – There is potentially suitable habitat along the coastal section in the west, although there is no evidence that they occur there. An increase in traffic volume could elevate the risk of road kill. Habitat loss is minimal.
- Spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus*) – There is suitable habitat for this species throughout the study area. The west coast section is a priority area for the species. An increase in traffic volume could elevate the risk of road kill. Habitat loss is minimal.
- Tasmanian devil (*Sarcophilus harrisi*) – There is suitable habitat throughout the study area and there is evidence of an active population. An increase in traffic volume could elevate the risk of road kill. Habitat loss is minimal. The project is located well outside the range of the Devil Facial Tumour Disease (DFTD) which affects much of the population. The numbers of road kill along the upgraded road are unlikely to have a significant impact on the current healthy devil population, particularly if mitigation measures are implemented. Elevated levels of road kill may have a greater impact if the northwest Tasmanian devil population were ever to become affected by DFTD.

The proposed upgrading of the road system, particularly along the west coast, is likely to result in higher traffic speeds. Based on experience with previous road upgrades in this area, this will consequently result in increases in the rates of road kill.

A road kill monitoring study has been recommended and is being implemented. This study has collected baseline data for the existing road and for reference roads so that the impact of the construction of the Tarkine Forest Drive can be monitored. A road kill mitigation plan is recommended to ensure the road is designed with measures that minimise the risk of road kill.

The impacts of construction works and increased public use within the study area will increase the risk of introducing and spreading weeds, and plant and animal diseases such as *Phytophthora cinnamomi* (Pc) which causes dieback in some plants, *Chalara*

fungus which causes myrtle wilt, and chytrid fungus which causes mortality in frogs and can lead to localised extinctions. A weed and pathogen management plan should be prepared to minimise the risks associated with these hazards. Additional weed and disease assessments will be necessary of any infrastructure and sites that have not been included in this assessment; including gravel quarries.

Recommendations

Further surveys are recommended as part of the road assessment:

- ***Unsurveyed sections and additional infrastructure if works extends outside the existing road formation***
- ***Epacris curtisiae – northwest heath – Vicinity of Blackwater Spur 8a and Dempster lookout.***
- ***PC Survey***

The surveys should be reported as an addendum to this document.

It is recommended that the following plans are prepared prior to construction to minimise impacts on threatened flora and fauna:

- ***Road kill Monitoring Plan and Mitigation Plan***
- ***Flora and Fauna Management Plan***
- ***Weed and Disease Management Plan***

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Menna Jones, UTAS and Save The Tasmanian Devil Program, DPIPW – devil activity and mitigation

David Pemberton, TSS, DPIPW – devil activity and mitigation

Clare Hawkins, TSS, DPIPW - devil activity and mitigation

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Geoff King, Marrawah –road kill, quoll and devil activity Temma Road

Nick Mooney, Wildlife Biologist - devil activity and mitigation, road kill.

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1. INTRODUCTION

1.1 BACKGROUND

The Tarkine Forest Drive project has evolved over several years. The current project incorporates a modified scope confining itself largely to the sealing of existing metalled forest roads. Investigations undertaken in 2009 incorporated a much more ambitious project, which would have created a new 140 km tourist link in the northwest of Tasmania.

The Tarkine Forest Drive now commences from the southern side of the township of Arthur River, at the end of the seal. It follows the Temma Road south to the Rebecca Road, passing the junction with the Heemskirk Road, at the northern end of the Western Explorer Tourist Road. It then continues east and north east following Blackwater Road to Kanunnah Bridge. From there it picks up the previously named Arthur Forest Drive which is a section of road south of the Arthur River linking the Kanunnah and Tayatea Bridges. The Tayatea Bridge, which was washed away in floods in 2007, is being replaced. Those works are not part of this current project and so are not assessed in this report.

There will be two bridge replacements across the Nelson Bay River and Rapid River. In addition, tourism infrastructure facilities are proposed for several sites along the route. This may include the sealing of three side routes to particular features (Lake Chisholm, Dempster Lookout and Milkshake Hills). It also includes the enlarging and sealing of several car parks along with some minor infrastructure works. The total length of road extends for 99.4 km; the main route is 88.3 km of which 19.7 km is already sealed. Of the 79.7 km requiring sealing, 23.6km is likely to require widening of the existing road.

The Tarkine Forest Drive will be shared with the general commercial users (forestry, mining etc).

The context of the project has been summarised as follows:

The Tasmanian Government had previously identified an opportunity to improve tourism access to the Tarkine area through the development of a sealed 131km tourist road connecting Myalla Road with the Arthur River Township. The Project sought to develop the tourist potential of the North West region by creating a self-drive experience for visitors and facilitating the subsequent development of commercial tourist ventures. On this basis, \$2.5M of the then budget was notionally set aside for the construction of tourism infrastructure.

An extensive series of background surveys and monitoring programs had been undertaken commensurate with the environmental and heritage values present. The project was referred to the Commonwealth under the *Environment Protection and Biodiversity Conservation Act* and was deemed a "Controlled Action" requiring full assessment via an Environmental Impact Statement.

When the then Premier, David Bartlett, announced a \$6.7M investment in infrastructure in the North West from the original \$23M allocated for the Tarkine Road Project, it was necessary to re-scope the proposal. In early December 2010, the then Minister for Infrastructure, Hon Lara Giddings MP, announced that Cabinet had approved a revised Project using the balance of the Tarkine Road funding. This decision was based on strong support from key stakeholders, such as the Cradle Coast Authority Tarkine Discussion Group, for a revised Project; now called the Tarkine Forest Drive.

This commitment was consolidated in the 2011/12 State Budget with the Project now identified as a key project and funding allocated for the period 2011/12 to 2013/14.

The proposal is to deliver the Tarkine Forest Drive in two stages, with the first section extending from Tayatea Bridge to Kanunnah Bridge. This stage will include widening and sealing the road to an appropriate standard and cross section, and environmental stewardship measures that will be tested and adapted for the second stage if necessary. It will also include upgrading tourism infrastructure work at Lake Chisholm, Julius River, Sumac Lookout and potentially Kanunnah Bridge.

The State Government has also committed to the second stage, from Kanunnah Bridge to the Arthur River Township. This has been included in the current budget estimates.

There are good reasons for staging the construction of the Tarkine Forest Drive rather than undertaking the two sections simultaneously. Commencing work first on the eastern section of the revised project will build on the significant road and tourism infrastructure already in existence in the area. This will allow the necessary time to plan and implement the required environmental stewardship measures, such as road kill mitigation strategies on the wider route, and in particular the section from Kanunnah Bridge to Arthur River Township, in consultation with key stakeholders.

There is still a substantial planning task ahead and a range of approvals required before construction can commence. Subject to those processes and attainment of approvals in a timely manner, the first stage from Tayatea Bridge to Kanunnah Bridge is planned for construction commencement in 2012.¹

This report updates a previous document that addressed the earlier project and relies entirely on that work with no additional survey. Most of the current project was captured by the original report. Additional sections not previously considered include an alternate route crossing Rapid River using existing roads and two additional access roads to Dempster Lookout and Milkshake Forest Reserve. These additional areas are considered through desktop review.

There has been extensive consultation with individuals and government agencies. See the acknowledgements for a full list of those agencies and individuals that were consulted.

This report documents the results in accordance with the Guidelines for Natural Values Assessment².

1.2 THE STUDY AREA

The Tarkine Forest Drive is located in northwest Tasmania, within the municipality of Circular Head Council. The route follows the boundary of two bioregions³ – ‘King’ to the north and ‘West’ to the south.

The route (refer Figure 1) passes through public land including State Forest, Forest Reserve and Conservation Area. It travels through native forest, moorland, coastal heath, woodland and eucalypt plantation. The proposed road skirts the northern boundary of the wilderness area known as ‘The Tarkine’, which is comprised of a series of formal reserves between the Arthur River and the Pieman River.

¹ Dion Lester, Pitt and Sherry email 3 October 2011

² DPIPWE 2009

³ IBRA 5 Peters & Thackway 1998

The terrain on the western half of the study area is relatively flat with localised incised river valleys. The eastern part of the study area contains more rugged country with steeper hills and deeper, more incised, valleys.

The underlying geologies are dominated by Mesoproterozoic quartzite and mudstone with some Neoproterozoic metamorphosed volcanics and sediments. In addition, there are localised patches of Tertiary basalt throughout and some Quaternary gravels and sands especially on the far western portion.

The route is at a low altitude following a line roughly parallel to the Arthur River with the highest point being at the Dempster Lookout at 250 m above sea level.

Average annual rainfall is generally high and likely to average between 1200mm on the coast increasing inland to more than 1500mm⁴.

The Tarkine Forest Drive is subdivided into thirteen Segments, generally reflecting the nature of the proposed road works. These are reference throughout the report. Figure 2 presents the Tarkine Forest Drive Segments against the existing road system.

⁴ Data from nearby weather stations indicate 1300mm at Temma, 1900mm at Balfour, 1540mm at Tewkesbury, 2180mm at Waratah and 1950mm at Savage River (Australian Bureau of Meteorology Website - www.bom.gov.au)

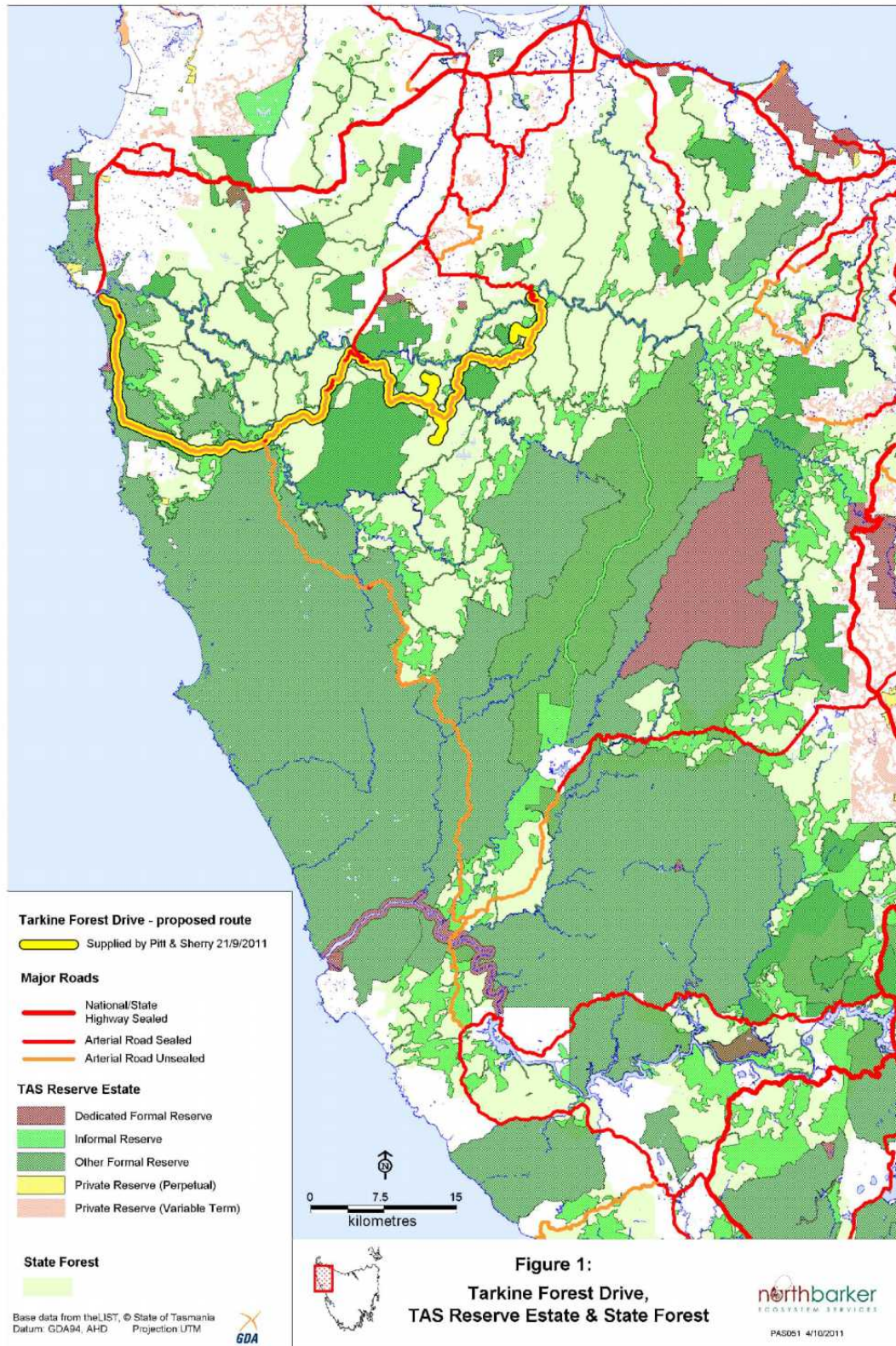


Figure 1: Tarkine Forest Drive and TAS Reserve Estate

2. FLORA AND FAUNA HABITAT ASSESSMENT

This assessment has been undertaken in accordance with the “Guidelines for Natural Values Assessment”⁵.

2.1 BACKGROUND RESEARCH

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

Natural Values Report⁶ - all threatened plant and animal records within 5 km of the study area plus potential suitability for other threatened fauna.

EPBC Protected Matters Report⁷ – all matters of national environmental significance that may occur in the area or relate to the area in some way.

Wapstra (ECOtas, 2009) - for information regarding threatened flora: *Caladenia dienema* and *Prasophyllum favonium* in the Arthur-Pieman Conservation Area; and miscellaneous findings of other threatened species and species of biogeographic interest.

A literature review of research relevant to the Tasmanian devil, the devil facial tumour disease and road kill is referenced throughout the report.

2.2 FLORA ASSESSMENT

Most of the existing road corridors have been inspected from a moving vehicle. Sufficient information has been collected to be able to map the vegetation communities along the route. Periodic sampling has been undertaken of representative examples of each vegetation community to confirm community classification.

Vegetation communities have been extrapolated to a corridor of 50m on either side of the existing road from field data and interpretation of aerial photography. Vegetation communities have been determined according to TASVEG⁸.

Environmental and ‘declared’⁹ weeds were considered wherever seen. Their locations have been mapped.

Plant pathogens including cinnamon root rot fungus (*Phytophthora cinnamomi* – Pc) which causes dieback and *Chalara australis* fungus which causes myrtle wilt have been considered. Symptomatic evidence of either infection has been noted.

Threatened flora assessment is predominantly based on a desktop report utilising data from the Natural Values Atlas and EPBCA Protected Matters Report supplemented with field observations. Those records of threatened species with moderate to high accuracy within 500m of the road corridor have been considered in greater detail in respect to the probability of the species having populations that may be impacted by the proposed development.

Preliminary surveys were undertaken in winter (July) 2009. These surveys and desktop studies identified areas with a high probability of supporting threatened flora warranting targeted survey during appropriate flowering or vegetative periods.

⁵ DPIPWE 2009

⁶ Natural Values Atlas, 5 October 2011 (DPIPWE)

⁷ EPBC Protected Matters Report , 5 October 2011 (Commonwealth of Australia)

⁸ Harris & Kitchener 2005

⁹ Tasmanian *Weed Management Act 1999*

Targeted surveys were undertaken for *Epacris curtisiae* (Sept 2009) and for orchids and other threatened flora on the coastal heaths (Nov 2009).

Botanical nomenclature follows the census of Tasmanian plants¹⁰.

2.2.1 Orchid and spring ephemeral survey

A targeted survey was undertaken between 3-5 November 2009. The survey involved a single pass on foot along each side of the road between Arthur River and the boundary of State Forest at Rebecca Creek. All potential habitats were inspected for several threatened orchid species that have been previously recorded from the vicinity. The timing was chosen to maximise opportunity for identifying the species to coincide with their flowering period. Locations of previous records of threatened orchids were targeted.

2.2.2 Northwest heath survey

A survey¹¹ was undertaken in September 2009 along the Rebecca Road between the Frankland River bridge and Temma Road to map and define the populations of northwest heath (*Epacris curtisiae*). Additional opportunistic observations were also collated during the course of other work in November 2009. The main survey was timed to coincide with peak flowering of *Epacris curtisiae* and to take place before other white flowering shrubs had commenced full flowering.

The survey involved targeted inspection of all records on Natural Values Atlas. A reconnaissance of the road for the remainder of the study area was undertaken by a slow drive past (<50km /hr). Where plants or likely habitat were identified, on ground survey was undertaken to determine the extent and size of the population. Hand held GPS was used to plot locations and site data collected to determine the population scale and to identify evidence of *Phytophthora cinnamomi*.

The report for these investigations is included in Appendix 9.

2.3 FAUNA ASSESSMENT

Fauna habitats were reviewed and assessed for their potential to provide habitats for threatened fauna identified from the desktop study as occurring or potentially occurring within the study area. The mapped vegetation communities were used as a basis for identifying fauna habitats.

Fauna observations were recorded on all road sections, although sections that were walked enabled considerably more observations of scats and footprints of the Tasmanian devil and spotted-tailed quoll to be recorded. Opportunistic observations of mammal fauna throughout the survey were recorded, including road kill.

The potential for the project to introduce or expand the range of feral animals and animal diseases (notably chytrid fungus) is also considered in this report.

2.3.1 Vertebrate carnivores

The northwest of Tasmania is an important area for two threatened species of vertebrate carnivore, the Tasmanian devil and the spotted-tailed quoll¹². Therefore, the fauna assessment has focused on these species. The Tasmanian devil has been subject to intensive study and research in recent years because of the threat posed by devil facial tumour disease to the long-term survival of the largest marsupial carnivore in Australia.

¹⁰ Buchanan, 2009

¹¹ Survey and Photos were undertaken by Anthea Fergusson of Natural Values Consulting as a sub consultancy to NBES

¹² Jones and Rose 1996

The impact of the proposed Tarkine Forest Drive has been the subject of significant media interest, provoked by an open letter sent by a group of concerned scientists to Peter Garrett, the then Minister of DEWHA and to Mr David Llewellyn the former Minister of DPIPW. The concerns that have been expressed are based on the notion that the area provides an important refuge for the Tasmanian devil. The area is understood to support relatively high densities of devils that are not yet infected by the devil facial tumour disease (DFTD)¹³. There is a view that the development of the Tarkine Forest Drive will allow the movement of the disease into an uninfected area as well as resulting in a significant increase in road kill which would provide additional pressure on an already threatened species. The aim of this assessment is to examine and test these assumptions or provide recommendations as to how they could be further tested.

This study seeks to collate the most recent information and knowledge of the species, and the devil facial tumour disease. It considers the dispersal patterns of the Tasmanian devil and the impact roads might have on these. It also considers the current distribution and population density of the Tasmanian devil in the region and the most recent information about the distribution of DFTD.

Previous studies on the relationship between traffic, road type and road kill elsewhere in Tasmania are reviewed. The potential impact of road kill from the Tarkine Forest Drive development is assessed. The road alignment is reviewed to identify likely hotspots for devil and quoll activity.

This study also investigates the possible impacts of the project on the potential spread of DFTD. The assessment considers whether the project is likely to:

- increase the rate and distance of movement of devils;
- facilitate the movement of animals from areas of infection to areas currently free of the disease; and
- significantly change existing (if they exist) natural barriers to devil movement in northwest Tasmania.

A forum was held in late July 2009, attended by scientists with knowledge of the Tasmanian devil and /or spotted-tailed quoll along with staff from State and Federal Government agencies and project engineers and consultants. The Forum provided an opportunity to communicate the details of the project to the scientists and to obtain feedback on what are the key issues associated with the project in relation to impacts on devils and quolls. Discussions were had on the issues relating to road kill and DFTD. The outcomes from the Forum have been used to inform the assessments described in this report. Summary notes from the Forum are included in Appendix 6. At the time of the Forum the original project plan was discussed. This included a new link east of Tayatea Rd through to Myalla Rd. Consequently, much of the discussion revolved around considerations that are no longer relevant.

2.3.2 Road kill and headlight survey

A headlight survey was undertaken for four consecutive evenings in early July, covering sections A-L. The purpose of this study was to provide some indicative information on presence of species and their distribution.

¹³ Hawkins *et. al.* 2006, MacCallum *et. al.* 2007

A 12 month Monitoring Project has been undertaken covering the western half of the route where existing roads are in place (Segments A-E)¹⁴.

The monitoring was linked to the use of traffic counters (for three 3 week periods) which recorded numbers, type (axle set up) and speed of vehicles. Road kill monitoring included daily surveys of 100km of study road made up of 60km of Tarkine Forest Drive, plus two 20km reference roads. Weekly road kill data was be collected for the remaining 43 weeks of the year to detect variations caused by seasonal changes such as weather and post weaning wildlife. The area perceived as highest risk (south of Arthur River township) was monitored daily for road kill. Headlight surveys were also undertaken to attempt to inform hot spots of activity and to check for any correlation between these and road kill hotspots. The purpose of the monitoring was:

- to compare the road kill rate before and after development of the Tarkine Forest Drive
- to identify hotspots of road kill before construction to inform mitigation measures
- to test the effectiveness of headlight surveys for identifying road kill hot spots; and
- to provide ongoing data to inform adaptive management response to pre determined triggers.

2.3.3 Eagle Nest Habitat

Forestry Tasmania has provided map data identifying areas that were aurally searched for eagle nests. Although no metadata was included, the maps indicate areas identified as potential nest habitat and the search route flown by helicopter. The search area appears to cover 500m either side of the road, presumably based on the assumption that limited sighting is likely beyond that distance. Habitat areas appear to follow standard nest site characteristics described in the Forest Practices Authority “Fauna Technical Note No. 1: Eagle Nest Searching, Activity Checking and Nest Management”¹⁵. That is, the habitat areas have been derived from PI types¹⁶ that distinguish mature eucalypts as emergent trees in the canopy that are greater than 27m in height ¹⁷. More recent PI mapping identifies several other areas of potential eagle nesting habitat that were not identified in the Forestry Tasmania mapping. A potential eagle nest habitat map for a 1km corridor has been provided by DPIPWE. This considers PI type and slope and aspect. Information from the ground survey, particularly the height of the eucalypt communities in the vicinity of the proposed route has been included in the development of the eagle nest habitat model.

A prospective eagle nest habitat map was developed which identified those areas requiring further searching.

The additional areas were searched by helicopter using a Ecureuil AS350 B2 which is well suited to this task as it is able to carry three passengers and capable of hovering, thus maximising the searching efficiency.

¹⁴ This was undertaken by Wildspot Consulting (Sept 2009-2010)

¹⁵ <http://www.fpa.tas.gov.au> accessed 5/10/2009

¹⁶ PI – Photographic Interpretation Forest Inventory

¹⁷ Forest Practices Authority, 2009

The aerial survey was undertaken on 23rd February 2010. Surveyors included two staff from NBES and Nick Mooney¹⁸. The flight course was programmed into the helicopter gps to provide the pilot with the proposed road corridor. The survey then ventured into perceivable habitat that was identified as supporting mature eucalypt forest. Other prospective habitat identified during the survey that fell outside the modelled areas was also inspected.

2.3.4 Frog survey

Potential habitat along the coastal sections was the subject of a separate study¹⁹ to assess the presence of the green and gold frog (*Litoria raniformis*). This is reported in Appendix 8.

¹⁸ recently retired from DPIPWE, Nick Mooney is a wildlife biologist with vast experience of research of the wedge-tailed eagle

¹⁹ Wildspot Consulting 2010

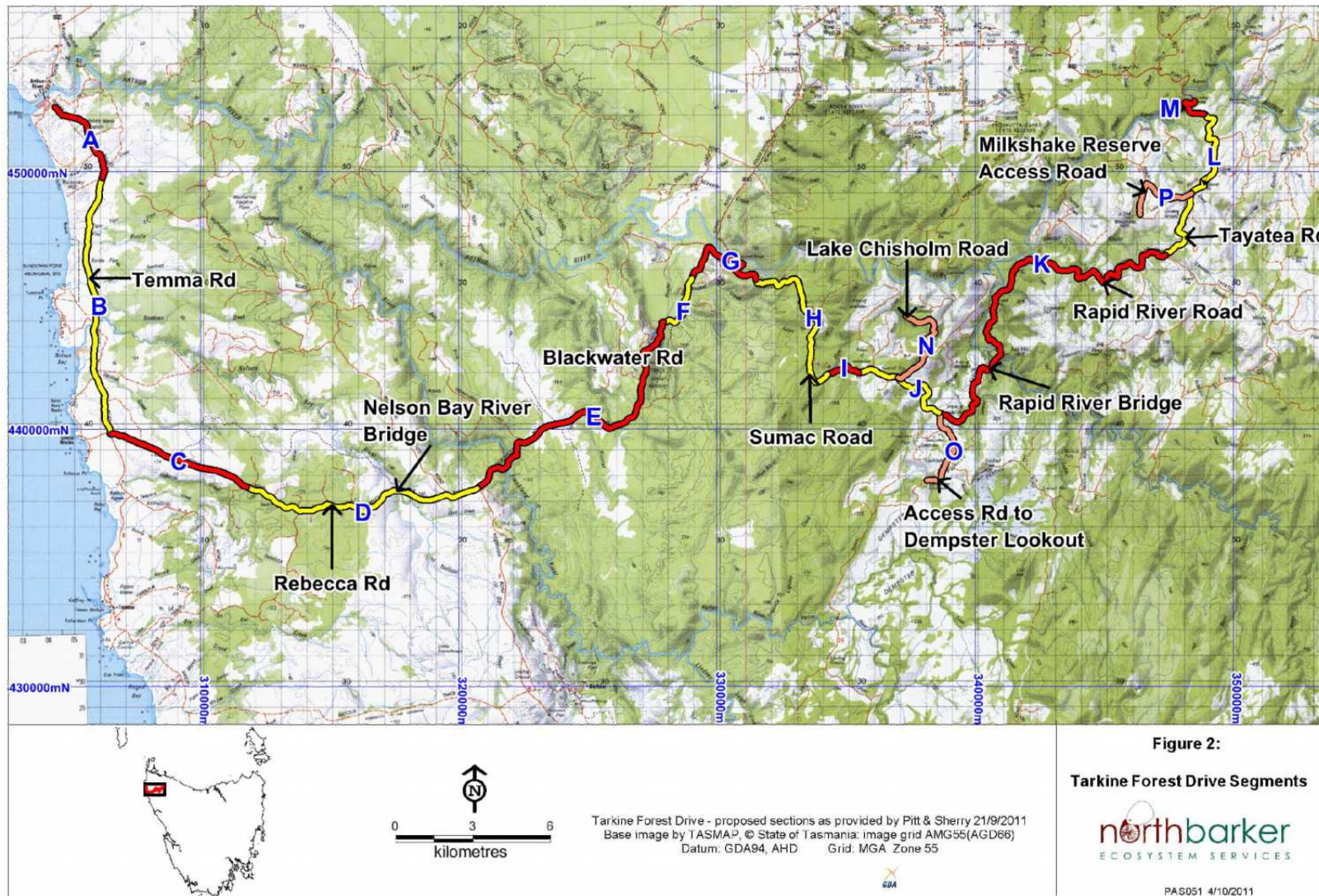


Figure 2: Tarkine Forest Drive Project Segments

Table 1 – Tarkine Forest Drive Project Sections

Section	Road	Description	Distance km	Proposed Works	Survey level
A	Temma Road	South end of seal at Arthur River to Alert Creek	3.7	Widen existing road and seal	Walked
B	Temma Road	Alert Creek to Couta Rocks	10.5	Seal existing road	Walked
C	Rebecca Road	Couta Rocks to Forestry spur Rebecca 1	5.7	Seal the existing road	Walked
D	Rebecca Rd	Forestry spur Rebecca 1 to Western Explorer	10.5	Seal the existing road	Driven slowly
E	Blackwater Road	sealed section east of Western Explorer	12.2	Retain existing sealed road pavement repairs as required	Driven slowly
F	Blackwater Road	Gravel section south west of Kanunnah Bridge	2.4	Seal the existing road	Driven slowly
G	Blackwater and Sumac Roads	Sealed section at Kanunnah Bridge	4.5	Retain existing sealed road pavement repairs as required	Driven slowly
H	Sumac Road	Kanunnah Bridge seal to Julius River seal	7.2	Seal the existing road	Driven slowly
I	Sumac Road	sealed section at Julius River	1.5	Retain existing sealed road Pavement repairs as required	Walked
J	Sumac Road	Julius River seal to Rapid River Road	4.5	Seal the existing road	1.6km driven slowly, 2.9km not inspected
K	Rapid River Road	Sumac Road to Tayatea Road	17.2	Seal the existing road Replace Rapid River bridge	10.2km driven slowly, 7.0km not inspected

Section	Road	Description	Distance km	Proposed Works	Survey level
L	Tayatea Road	Rapid River Road to sealed section at Tayatea Bridge	7.4	Seal the existing road	1.7km at northern end walked. 5.7km driven slowly
M	Tayatea Road	sealed section south of Tayatea Bridge	1.5	Retain existing sealed road pavement repairs as required	Not inspected
Total			88.8		
Tourist facilities in addition to Tarkine Forest Drive					
N	Sumac Spur 4-1 and Lake Chisholm Road	Side road to Lake Chisholm Forest Reserve	4.2	Seal the existing road on Spur 4-1 (1.5 km) Widen the existing road and seal on Lake Chisholm Road (2.7 km)	Driven slowly
P	Milkshake Reserve Access Road	Side road to Milkshake Hills Forest Reserve	3.3	Seal the existing road	Not inspected
O	Sumac Road	Rapid River Road to the Dempster Lookout Track	3.6	Seal the existing road	Not inspected
	Julius River Forest Reserve	Car park, picnic area and footbridge	-	Seal existing car park	Walked
	Sumac Lookout	Car park	-	Seal existing car park	Walked
	Kanunnah Bridge	Car park and viewing platform	-	Construct and seal car park	Walked
	Lake Chisholm	Car park	-	Construct and seal car park	Walked

2.4 ASSESSMENT OF CONSERVATION SIGNIFICANCE

Vegetation types have been classified according to TASVEG²⁰. 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 have suffered considerable loss (approaching 70% or more) are considered to be “threatened”. A 2006 amendment to the *Nature Conservation Act 2002* allows the Minister to list threatened native vegetation communities²¹.

For forests, reservation targets were set using the nationally agreed JANIS criteria as part of the Tasmanian RFA. The reservation targets reflect the extent of loss with “threatened” vegetation types having high targets. The JANIS principles also include the consideration of the bioregional representation of each vegetation type within the CAR reserve system.

The most recent bioregional and state analysis of forest communities was completed in 2007 for the Forest Conservation Fund²² which recalculated areas required to achieve a CAR Reserve system based on the RFA modelling. No similar modelling has been undertaken for the current TASVEG non forest communities, although the reservation at state and bioregional level has been calculated for all TASVEG v2 communities²³.

Vegetation matters of national environmental significance (MNES) are listed on the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). *Lowland Native Grassland of Tasmania* includes two such communities for which defining criteria must be met in order for a patch of grassland to qualify as a MNES.

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

2.5 ANALYSIS

All data collected including: remapping of vegetation communities, weeds, plant disease, threatened species locations, evidence of Tasmanian devil or spotted tailed quoll activity have been collated on GIS. This information has been analysed at a mapping scale of 1:17,500. Maps to this scale have been set up on the GIS for printing to inform management decisions, further survey, planning etc. Calculations have been made to determine the extent of vegetation that will be cleared to construct the road. This utilises vegetation mapping based on Tasveg with updates to areas that were covered by surveys.

Concept design has been used where available at the time of reporting²⁴.

²⁰ Harris & Kitchener 2005

²¹ Schedule 3a NCA 2002

²² FCF 2007

²³ DPIPWE 2010

²⁴ Limited to footprints of car parks to be sealed

2.6 LIMITATIONS / DISCLAIMER

The vegetation assessment has not identified all vascular flora due to the limitations of the sampling technique. Sampling has been undertaken to a level that assists with vegetation community identification. Threatened flora habitat has been identified applying current knowledge of the species.

Targeted surveys have been undertaken only at selected sites identified in the earlier assessment²⁵.

All threatened plant species known from the Natural Values Atlas and the EPBCA Protected Matters Report are considered in the light of habitat suitability.

The fauna assessment is predominantly limited to the identification of habitat of significant fauna species known from the area based on the interpretation of database records for threatened fauna. Field surveys for fauna were limited to four nights of headlight survey and the opportunistic recording of fauna that were encountered including tracks and other signs that indicated their presence (e.g. scats and footprints). A separate headlight and road kill study, commissioned on the back of recommendations of earlier investigations, is reviewed.

²⁵ NBES 2009

3. THE BIOLOGICAL VALUES

3.1 THE VEGETATION

The linear study area is depicted by TASVEG v 2.0 as being dominated variously by moorland, scrub, heathland, dry *Eucalyptus nitida* forest, and wet *Eucalyptus nitida* or *Eucalyptus obliqua* forest types or rainforest communities. The change in dominance is largely a function of geology, fire frequency and relative drainage and fertility.

Detailed layout of vegetation has been digitised on GIS. Species lists are not comprehensive but sufficient to determine community classification. A brief floristic inventory of each community is given in Appendix 3.

***Eucalyptus nitida* dry forest and woodland (DNI)**

This is the most widespread vegetation community along the proposed Tarkine Forest Drive and is frequent and extensive in the western section on the low fertility sites derived from quartzite substrates but also widespread in the east along Rapid River Rd and Tayatea Rd. This varies from low open woodland over a predominantly moorland understorey to moderately tall forest with a dense understorey of tea tree and banksia. Amongst the heathlands and moorlands this community is often present in small patches which have slightly improved drainage compared to the surrounding vegetation. *Eucalyptus nitida* dominated vegetation is also an artefact of previous road construction. Within some sections of buttongrass moorland the organic soil horizons have been stockpiled each side of the road, creating a microhabitat that supports a narrow strip of eucalypts.



DNI Segment C



DNI on stockpile soil adjacent to road Segment L

***Eucalyptus obliqua* dry forest and woodland (DOB)**

This community has localised occurrences in the study area. It occurs on the margins of moorland communities on sites of relatively superior drainage.

***Eucalyptus viminalis* coastal forest and woodland (DVC)**

This coastal community occurs along parts of Segment B (Temma Rd) on stabilised sand dunes. *Eucalyptus viminalis* is dominant with *E. nitida* co-dominant in places. Coastal scrub occurs in the understorey with *Acacia sophorae* and *Leptospermum* spp. The ground layer is locally dominated by bracken and sagg.



DVC Segment A

***Eucalyptus brookeriana* wet forest (WBR)**

This wet forest community occurs predominantly as localised patches within sites of relatively poor drainage throughout the study area; often, but not exclusively, associated with drainage lines. The most extensive area occurs adjacent to Segment H (along Sumac Road). Minor occurrences occur along some drainage lines on the coastal section (Segment A) and on the transition zone between wet eucalypt forest and moorland. *Eucalyptus brookeriana* occurs variously as an over storey to *Melaleuca ericifolia*, broad leaf shrubs or mixed forest.



WBR adjacent to Sumac Road, Segment H

***Eucalyptus nitida* forest over *Leptospermum* (WNL)**

There are extensive areas of this community as mature forest and as artificial regeneration following harvest or as a transitional community between mixed forest and scrub or moorland communities. It is common throughout the forested portions of the Tarkine Forest Drive.

***Eucalyptus nitida* forest over rainforest (WNR)**

There are extensive areas of this community as mature forest throughout the forested portions of the Tarkine Forest Drive.

***Eucalyptus nitida* wet forest – undifferentiated (WNU)**

There is a section mapped on TASVEG v2 on the Sumac Rd section heading towards Dempster Lookout. Field assessment is likely to attribute this to one of the above communities.

***Eucalyptus obliqua* wet forest types**

The wet *Eucalyptus obliqua* forest types occupy the more fertile soils. Most of the more extensive areas of stringybark forest have been harvested and regenerated. There are impressive examples of old growth wet *Eucalyptus obliqua* forest just south of the Kanunnah Bridge and near the Sumac lookout.

***Eucalyptus obliqua* forest with broadleaf shrub (WOB)**

There are extensive areas of this community as artificial regeneration following harvest.

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

There are extensive areas of this community as artificial regeneration following harvest.

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

This community is common on the most fertile sites in the Sumac area.



WOR Rapid River Road, Segment K



WOR regrowth



WOB Segment D in Rebecca FR



WOR Segment G

***Eucalyptus obliqua* wet forest – undifferentiated (WOU)**

Significant sections of the new segments incorporated in this project and not assessed are shown to support forest dominated By *E. obliqua*. TASVEG v2 does not differentiate

which of the above mapping units it should be allocated, potentially WOL, WOB and WOR.

***Acacia melanoxylon* swamp forest (NAF)**

Adjacent to the Arthur River on the western approach to the Kanunnah Bridge (Segment G) there is an area of riverine blackwood swamp forest. This is integrated with extensive areas associated with river flats adjacent to the Arthur River.

***Melaleuca ericifolia* swamp forest (NME)**

This occurs predominantly as localised patches on the coastal section of the road (Segment B), generally following watercourses.

***Nothofagus – Phyllocladus* short rainforest (RMS)**

Widespread and extensive in the areas of lower fertility and slower drainage, supporting rainforest; relatively frequent in the middle section.

***Nothofagus – Atherosperma* rainforest (RMT)**

Widespread and extensive in the areas of higher fertility and relative better drainage, supporting rainforest; relatively frequent in the middle section.

Rainforest (undifferentiated) (RMU)

The new alignment utilising Sumac Rd and Rapid River Rd (Segments J&K) are shown to support rainforest. TASVEG v2 does not differentiate which of the above mapping units it should be allocated, though it is likely to be both.

Freshwater aquatic sedgeland and rushland (ASF)

Localised to inundated areas adjacent to Temma Road in road Segment B. The site shown below is immediately adjacent to the existing road.



ASF Segment B



Segment B

Freshwater aquatic herbland (AHF)

Localised to inundated areas adjacent to Temma Road in road Segment B. This is distinguished from ASF by the species composition of native herbs. The photo was taken from a point standing on the road indicating its close proximity.

Coastal grass and herbfield (GHC)

This community occurs as small localised patches in Segment B on the sand plains. Many of these small patches may be disturbance induced by firing and grazing of coastal scrub.

This occurs in leased areas to promote cattle grazing habitat in the autumn and winter of each year.

The grassland is characterised by wallaby grasses (*Austrodanthonia* spp.) with a prominent graminoid layer dominated by knobby clubsedge (*Ficinia nodosa*) and sagg (*Lomandra longifolia*). Kangaroo grass (*Themeda triandra*) although present is not dominant.

This does not conform to the EPBCA listed ecological community “*Lowland native grasslands of Tasmania*’ because it is not dominated by key indicator species *Poa labillardierei* or *Themeda triandra*. If it were then it would be classified as TASVEG units GTL or GPL.



GHC Segment B



MBP Segment L

Undifferentiated buttongrass moorland (MBU)

A general observation of TASVEG buttongrass moorland classification is that they have been described from sampling taken elsewhere in Tasmania, generally within the World Heritage Area. TASVEG v2 does not show much mapping allocated to specific communities, but instead has most mapped as undifferentiated moorland vegetation (MBU). None of the descriptions are a particularly good fit and it may be appropriate at the level of discrimination used for this vegetation type to have a new classification that describes the buttongrass moorland within the region of this study.

Pure buttongrass moorland (MBP)

There is a limited amount of buttongrass moorland on Segment L that fits into the description as pure buttongrass that is dominated by large buttongrass tussocks with almost no other species present.

Buttongrass moorland with emergent scrub (MBS)

This community is characterised by taller and often a greater proportion of emergent myrtaceous scrub species. To a degree the distinction between this community and areas mapped as western lowland sedgeland is purely one of time since last fire - the longer the period the taller the shrub layer. The moorland communities replace the heathland communities away from the coast on quartzite soils as the Tarkine Forest Drive leaves the coast on the Rebecca Road (Segment C). This community is particularly common along the Tayatea Road (Segment L).



MBS Segment L



Low hill of MBS on Tayatea Road, Segment L

Western lowland sedgeland (MSW)

The elements that distinguish this community from buttongrass moorland vegetation in the study area are the relatively low abundance of *Gymnoschoenus* and the predominance of other graminoid species, including *Acion hookeri*, *Eurychorda complanata* and *Empodisma minus*. Where *Leptospermum nitidum* and *Sprengelia incarnata* are present this could be interpreted as western buttongrass moorland but often does not fit well as the abundance of *Gymnoschoenus* is too low. If left unburnt, western lowland sedgeland is likely to evolve into buttongrass moorland with emergent scrub.



MSW Segment C

The moorland communities replace the heathland communities away from the coast on quartzite soils as the Tarkine Forest Drive leaves the coast on the Rebecca Road (Segments D and E).

Coastal heathland (SCH)

This community occurs extensively on the quartzite in the southern part of the coastal area (Segment B) and then the start of Rebecca Road as it climbs up onto the scarp (Segment C)



SCH eastern side of Segment B



SCH burnt in autumn 2009, Segment B between Sarah Ann Rocks and Couta Rocks

Lowland sedgy heathland (SHL)

This heathland occurs in association with the coastal heathland near Sundown Creek (Segment B), occupying the lower lying wetter microhabitats that support a greater proportion of graminoids.

***Leptospermum* scrub (SLW)**

This scrub community occurs at a moderate scale on inland sites on quartzite soils. It can occur as a transitional community between *Eucalyptus nitida* dry forest and moorland communities or where fire has been absent in buttongrass moorland communities and the scrub is becoming dominant and suppressing the buttongrass proportion.



SMR Segment B



SLW *Leptospermum* scrub, Segment L

***Melaleuca squarrosa* scrub (SMR)**

This occurs predominantly in localised poorly drained areas. A dense scrub layer of *Melaleuca squarrosa* and *Leptospermum scoparium* with *Bauera rubioides* overlays a prominent graminoid component characterised by species of Restionaceae family. Herbs are prominent and include some orchids.

Coastal scrub (SSC)

The coastal scrub is limited to the coastal Segment of the road that is on sandy substrates. It occurs as a mosaic amongst the other coastal communities in small to moderate sized patches.

Western wet scrub (SWW)

This scrub community is typified by the presence of *Eucalyptus nitida* and one or all three of the following *Leptospermum* species, *L. nitidum*, *L. scoparium*, and *L. glaucescens* and often *Melaleuca squamea* and/or *M. squarrosa*. This community was recorded from one short section (Segment E).



SSC – Segment A



SWW – Segment E

Riparian scrub (SRI)

This is mapped for a section along the sealed section approaching the Tayatea Bridge. Field assessment is likely to attribute this to another community.

Table 2 - Native Vegetation Communities within the study area:

TASVEG Community ²⁶	State-wide Conservation Priority ²⁷	Regional Conservation Priority ²⁸
FOREST COMMUNITIES		
<i>Eucalyptus nitida</i> dry forest and woodland DNI	Not Threatened. Adequately reserved.	Not Threatened. Adequately reserved Old growth under reserved – King
<i>Eucalyptus obliqua</i> dry forest and woodland DOB	Not threatened. Adequately reserved apart from old growth.	Not Threatened. Adequately reserved - West, Inadequately reserved - King
<i>Eucalyptus viminalis</i> coastal forest and woodland DVC	Rare and Vulnerable. Inadequately reserved.	Rare and Vulnerable. Inadequately reserved
<i>Eucalyptus brookeriana</i> wet forest WBR	Vulnerable and inadequately reserved	Vulnerable Inadequately reserved.
<i>Eucalyptus nitida</i> forest over <i>Leptospermum</i> WNL <i>Eucalyptus nitida</i> forest over rainforest WNR	Not threatened and adequately reserved <i>*FCF data does not differentiate between understorey types (WNU)</i>	Not threatened Adequately reserved apart from old growth. <i>*FCF data does not differentiate between understorey types</i>
<i>Eucalyptus obliqua</i> forest with broadleaf shrub WOB <i>Eucalyptus obliqua</i> forest over <i>Leptospermum</i> WOL <i>Eucalyptus obliqua</i> forest over rainforest WOR	Not threatened and adequately reserved <i>*FCF data does not differentiate between understorey types (WOU)</i>	Not threatened Adequately reserved. <i>*FCF data does not differentiate between understorey types</i>
<i>Acacia melanoxylon</i> swamp forest NAF	Not threatened and adequately reserved	Not threatened Adequately reserved - King Inadequately reserved - West
<i>Melaleuca ericifolia</i> swamp forest NME	Rare and Endangered. Inadequately reserved.	Rare and Endangered. Inadequately reserved
<i>Nothofagus – Phyllocladus</i> short rainforest RMS	Not threatened and adequately reserved.	Not threatened Inadequately reserved - King Adequately reserved - West
<i>Nothofagus – Atherosperma</i> rainforest RMT	Not threatened and adequately reserved.	Not threatened Adequately reserved - West Inadequately reserved – King

²⁶ Harris & Kitchener 2005

²⁷ FCF2007, DPIW 2006

²⁸ The route passes along the boundary of two regions: King (to the north) and West (to the south) FCF2007, DPIW 2006

NON FOREST COMMUNITIES		
No analysis of reservation status has been undertaken or of bioregional conservation status		
Freshwater aquatic sedgeland and rushland ASF	Vulnerable	-
Coastal grass and herbfield GHC	Not Threatened.	-
Pure buttongrass moorland MBP	Not Threatened.	-
Buttongrass moorland with emergent scrub MBS	Not Threatened.	-
Western lowland sedgeland MSW	Not Threatened.	-
Coastal heathland SCH	Not Threatened.	-
Lowland sedgy heathland SHL	Not Threatened.	-
<i>Leptospermum</i> scrub SLW	Not Threatened.	-
<i>Melaleuca squarrosa</i> scrub SMR	Not Threatened.	-
Riparian scrub SRI	Vulnerable	-
Coastal scrub SSC	Not Threatened.	-
Western wet scrub SWW	Not Threatened.	-

3.2 FLORA OF CONSERVATION SIGNIFICANCE

The studies undertaken for this project have not involved extensive or exhaustive species searches but rather broad level survey suitable to allow identification of vegetation types into TASVEG vegetation classifications. This has, however, been supplemented with targeted searches of known threatened flora sites.

The reported distribution of threatened flora comes primarily from the Natural Values Atlas (NVA) and *EPBCA* data sets. There is a significant amount of data derived from extension surveys for orchids in the coastal section of the study area²⁹, which includes 11 nationally listed and 29 state listed threatened flora species.

Six nationally threatened³⁰ plant species fall within the immediate vicinity of the Tarkine Forest Drive (500m). These are all orchids and include *Caladenia dienema*, *Corunastylis brachystachya*, *Diuris lanceolata*, *Prasophyllum favonium*, *Prasophyllum secutum* and *Pterostylis rubenachii*. Two have been highlighted as being of high risk of

²⁹ EcoTas 2009

³⁰ listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

being impacted by the project. Potential habitat for all of these species is confined to the west coast in the vicinity of Segments A, B and C.

Of 14 vascular species listed on the Tasmanian *Threatened Species Protection Act 1995* recorded from the immediate vicinity, six state threatened vascular plant species are considered high risk. All, but one, are confined to Segments A and B along the coastal section. The remaining species is *Epacris curtisiae* which is known from the roadside on Segment D.

Table 3 below lists significant species recorded within the vicinity of the study area. It includes all rare, vulnerable and endangered species within a 5km radius and distinguishes those species recorded from the immediate vicinity (500m radius) and those recorded during the current studies.

Figure 3 presents the location of all threatened flora records from the vicinity. The survey coverage is uneven so that some gaps in distribution may be more a reflection of the absence of surveys. For that reason all location records, including non threatened flora are indicated.

Table 3 - Flora Species of Conservation Significance

Flora species of conservation significance previously recorded in a 5km radius of study area or identified in the EPBC Protected Matters Report.

Species	Status TSPA/ EPBCA (upper case)	Potential to Occur	Observations and Preferred Habitat ³¹
VASCULAR PLANTS			
<i>Barbarea australis</i> native wintercress	Endangered / CRITICALLY ENDANGERED	NONE	A herb of riparian systems that drain to the south and north of the Central Highland. There are no records from north west Tasmania.
<i>Caladenia caudata</i> tailed spider-orchid	Vulnerable / VULNERABLE	VERY LOW (heathland)	Listed on EPBC website but no records from far NW Tasmania, although known from Rocky Cape NP where there is similar habitat.
<i>Caladenia dienema</i> Windswept spider orchid	Endangered/ ENDANGERED	VERY HIGH Arthur River to Rebecca Creek Segments A,B,C	Listed on EPBC website. Known from coastal scrub and wind swept coastal grassland and heaths amongst stunted shrubs and sedges on moist to well-drained sandy and clay loam. Peak flowering is late October to early November. There are several recent records for this species from late 2008 between Tiger Creek and Sundown Creek, and near Couta Rocks.
<i>Caladenia pusilla</i> Tiny fingers	Rare/ -	HIGH Arthur River to Rebecca Creek Segments A, B, C	Known predominantly to occur in heathland and moorland close to the coast on well-drained peaty and sandy soils. Flowering appears to be stimulated by fire with plants more common at sites burnt 3 to 5 years previously. Peak flowering is all of October and early November. Potential flowering is all of October and November.

³¹ Lazarus *et. al.*. 2003; Jones *et. al.*. 1999, Wapstra *et. al.* 2008, ECOtas 2009, Curtis & Morris 1975

Species	Status TSPA/ EPBCA (upper case)	Potential to Occur	Observations and Preferred Habitat ³¹
<i>Carex gunniana</i> Mountain sedge	Rare/ -	HIGH Arthur River to Couta Rocks Segments A, B, C	Widespread throughout Tasmania with two records from the vicinity of which one is from the roadside on Temma Road – Segment 36 . Preferred habitat is areas that retain moisture such as drainage lines and other low lying ground.
<i>Corunastylis brachystachya</i> Shortspike midge orchid	Endangered/ ENDANGERED	PRESENT Segment B only	Listed on EPBC website. This species was previously only known presently from Rocky Cape National Park and near Stanley from heathland and heathy eucalypt woodland on well drained rocky sites. The few records of this species suggest a peak flowering period in March, though there is potential throughout February to April.
<i>Cotula vulgaris var. australasica</i> Slender buttons	Rare/ -	LOW	Record from Mark Wapstra (ECOTas, 2009). Known from scrub, herbfield, rocky outcrops and wet or brackish swamps in north and north-east of the State. Recent record extends known range of species.
<i>Cullen microcephalum</i> Dusky scurfspea	Rare/ -	LOW	This species is known from well-drained rocky areas in the salt spray zone. From the study area key locations are Sundown Point, Sarah Ann Rocks and Couta Rocks. This perennial herb is thought to flower from November to April.
<i>Cyrtostylis robusta</i> Large-gnat orchid	Rare/ -	MODERATE Arthur River to Couta Rocks Segments A, B	Known to occur on wooded sand dunes. The peak flowering period is June, July and early August. Potential flowering may extend to late August. Only a single record from the vicinity.
<i>Deyeuxia densa</i> Heath bent grass	Rare/ -	MODERATE	Recorded from three sites in heath and forest, the nearest at Milkshake Hills. Potential impact of road project is very limited
<i>Diuris lanceolata</i> Large golden moths	Endangered/ ENDANGERED	MODERATE Arthur River to Couta Rocks /Rebecca Creek Segments A, B, C	Listed on EPBC website. This species is known in coastal scrub and wind swept coastal grassland and heaths amongst stunted shrubs and sedges on moist to well-drained sandy and clay loam, and occasionally on rock outcrops. Peak flowering is November but potentially may extend through December and January. Targeted surveys by Mark Wapstra in the summer of 2008/2009 located extant populations near Sundown point and near Rebecca Lagoon.
<i>Diuris palustris</i> Swamp doubletail	Endangered/ -	PRESENT Tiger Flats Segment B	Known from open grassy eucalypt forest, sedgy grassland and heathland with tea-tree on poor to moderately drained sandy peat. Peak flowering is September, October and early November but potentially may flower from August through to December.

Species	Status TSPA/ EPBCA (upper case)	Potential to Occur	Observations and Preferred Habitat ³¹
<i>Epacris curtisiae</i> Northwest heath	Rare/ -	PRESENT Segments D, O	Occurs in peaty soils associated with heathlands. The heathlands south of the Nelson Bay River to just east of the Frankland River and Dempster Lookout are key locations for this species within the study area. Peak flowering is August to October.
<i>Euphrasia collina</i> subsp. <i>tetragona</i> northcoast eyebright	Endangered/ -	VERY LOW	Only know from vicinity at Bluff Hill, north of Arthur River township. Population was last assessed in 2008 in project which also investigated the heaths south of Arthur River. No additional population have been recorded near the study area and habitat is generally unsuitable along road;.
<i>Hypolepis distans</i> scrambling ground fern	Endangered/ ENDANGERED	VERY LOW	Only known in the vicinity from a site close to Henry Ryan Creek 7km NW of Tayatea Bridge. This is one of only four known populations on Mainland Tasmania. As two of these were only discovered in 2008 there is potential for more unknown populations to occur in appropriate habitat.
<i>Lotus australis</i> Australian trefoil	Rare/ -	NONE	In Tasmania <i>Lotus australis</i> has been described as being "local on sandy coasts" and has been recorded around the coast north from Macquarie Harbour to Bicheno with few records from offshore islands. Known in vicinity from Sarah Anne Rocks and Gardiner Point on coast. Habitat is described as <i>Poa</i> tussock grassland, low coastal shrubbery and on dunes. Authors have seen species on sandy loams derived from basalt on Trefoil Island. This species has colourful pink flowers and characteristic 'birdsfoot' clusters of seed capsules.
<i>Microtidium atratum</i> yellow onion orchid	Rare/ -	PRESENT	First recorded from study area in 2009 at Tiger Flats at a well known orchid site. Potentially may be more widespread.
<i>Orthoceras strictum</i> Horned orchid	Rare/ -	MODERATE Segment O	New observation record from heathland on Dempster Plains 4km south of Dempster Lookout
<i>Phyllangium divergens</i> Wiry mitrewort	Vulnerable -	MODERATE Arthur River to Rebecca Rd Segments A, B, C	This is a small annual herb which inhabits coastal open periodically inundated areas often on sand or clay overlying rock. It is predominantly known from eastern Tasmania though recent surveys in 2008 & 2009 have identified this plant as widespread and locally abundant in the Arthur-Pieman CA. It flowers in October through to November ³² .
<i>Pneumatopteris pennigera</i> Lime fern	Endangered/ -	LOW	Previously recorded in unnamed creek south of Arthur River less than 1km east of the road. Since considered locally extinct following targeted resurveys undertaken in 2009. It was reconfirmed from two other sites close to Arthur River, but these are more than 1km from the road.

³² ECOtas 2009

Species	Status TSPA/ EPBCA (upper case)	Potential to Occur	Observations and Preferred Habitat ³¹
<i>Prasophyllum favonium</i> Western leek orchid	Endangered/ CRITICALLY ENDANGERED	LOW Arthur River to Rebecca Rd Segments A, B, C	Listed on EPBC website. A species of windswept wet heaths that is promoted by fire. It potentially flowers from the start of October to early December, with a peak in early November. Previously recorded in 1988 and 1998, but not relocated in targeted searches in 2008.
<i>Prasophyllum pulchellum</i> Pretty leek orchid	Endangered/ CRITICALLY ENDANGERED	LOW Segments A, B, C	Listed on EPBC website. Known to occur near Bluff Point Rd turnoff, 4km north of study area and at Rebecca Creek 2km south.
<i>Prasophyllum secutum</i> Northern leek orchid	Endangered/ ENDANGERED	LOW Arthur River to Rebecca Rd Segments A, B, C	Listed on EPBC website. Known to occur in grassy dune swales. Rosette and flower production is dependent on a fire in the preceding season. Single record from location south of Bottle Creek. There is potential for this species to flower between October & December, with a peak in November.
<i>Pterostylis cucullata</i> subsp. <i>Cucullata</i> Leafy greenhood	Endangered/ VULNERABLE	LOW Segment A	In Tasmania this species is known only from the coast. In the vicinity of the study area it is known from a single population near the mouth of the Arthur River. Habitat tea-tree or paperbark scrub on stabilised dunes in well drained locations. The potential flowering period for this species is October to November with a peak in late October to early November.
<i>Pterostylis lustra</i> Sickle greenhood	Rare/ -	MODERATE Segment B	Previous records from Tiger Flats, none close to road. Potential flowering is in November, with peak flowering in early November.
<i>Pterostylis rubenachii</i> Arthur River greenhood	Endangered/ ENDANGERED	PRESENT Tiger Flats Segment B	Listed on EPBC website. This species is only known from the Arthur River and Temma Road area from dry sandy slopes of sparsely vegetated stabilised sand dunes and in the vastly different environment of permanently wet/moist scrubby and sedgy coastal heath converted to semi improved pasture by slashing. Potentially flowers from October to November, with the peak flowering period in early November.
<i>Pterostylis ziegeleri</i> Grassland greenhood	Vulnerable/ VULNERABLE	LOW	Listed on EPBC website. Recorded at Gardiner Point, Arthur River in 2009 in grassland on dune swales. Limited potential habitat in along road.
<i>Scleranthus brockiei</i> mountain knawel	Rare/ -	LOW	Recorded during the investigations of this project near Sundown Point. Not observed in vicinity of road and very limited suitable habitat.
<i>Spyridium vexilliferum</i> var. <i>vexilliferum</i> Helicopter bush	Rare/ -	LOW	Locally frequent in the Couta Rocks area – this population is considered to be one of the key populations in Tasmania. The species is found in sandy heaths and rocky outcrops. A conspicuous shrub not recorded along road.

Species	Status TSPA/ EPBCA (upper case)	Potential to Occur	Observations and Preferred Habitat ³¹
<i>Stylidium beaugleholei</i> Fan triggerplant	Rare/ -	LOW	Recorded from Sarah Ann Rocks area in 2010 in sandy heaths in sites subject to temporary inundation including damp shallow soils amongst rocks. Limited suitable habitat. It is a short lived herb that flowers in October to November.
<i>Stylidium perpusillum</i> Tiny triggerplant	Rare/ -	LOW	Known to occur in sandy heaths in areas which may be temporarily inundated. Recorded at Tiger Flats, 300m east of the road. Limited suitable habitat. It is a short lived herb that flowers in October to November.
<i>Thelymitra mucida</i> Plum sun orchid	Rare/ -	LOW	Habitat is predominantly heathland and eucalypt woodland on poorly drained or peaty loams particularly on margins of swamps. Limited records suggest late November as the peak flowering period. Recently recorded 4km north of Arthur River.
<i>Xerochrysum bicolor</i> Eastcoast everlasting	Rare/ -	LOW	Known from vastly different habitats of heathlands near the coast or in alpine situations. In coastal situations it is known more commonly from the east. There are some west coast records however.
NON VASCULAR PLANTS ³³			
Species	Status TSPA/ EPBCA (upper case)	Potential to Occur	Observations and Preferred Habitat ³⁴
<i>Erioderma sorediatum</i> lichen	Endangered/ -	MODERATE	Grows in scrubby, wet vegetation such as along older road lines, as well as in the canopy where it is hard to pick up. Key sites have been identified as Tayatea Rd south of the Arthur River (Segment L) ³⁵ .
<i>Hypotrachyna laevigata</i> lichen	Vulnerable/ -	MODERATE	A canopy species that is locally very abundant in a few stands of rainforest. Substrate is bark of myrtle beech in the canopy and so is usually picked up in litter fall on the forest floor.
<i>Menegazzia minuta</i> lichen	Endangered/ -	MODERATE	It is a canopy species, especially on leatherwood, and is picked up by examining litter on the forest floor. It is extremely rare and hasn't been picked up for more than 20 years, despite targeted surveys in the area. A key site for this species has been identified as the Sumac Road area particularly in the vicinity of Julius River ³⁶ .
<i>Roccellinastrum neglectum</i> lichen	Endangered/ -	LOW	It is a trunk species that occurs in rainforest and is very rare. Only two records are known, both from the Pipeline Road which is identified as a key site ³⁷ . Of the two sites it was known from, one was logged in 1981 and the species lost. It was very rare at the other and hasn't been relocated.

³³ Notes compiled from advice given by G. Kantvilas *pers. com.*, Kantvilas *et. al.* (2002), Notesheets as indicated

³⁴ Lazarus *et. al.* 2003; Jones *et. al.* 1999, Wapstra *et. al.* 2008, ECOtas 2009, Curtis & Morris 1975

³⁵ *Erioderma sorediatum* Note sheet (Threatened Species Unit 2004) <http://www.dpipwe.tas.gov.au/>

³⁶ *Menegazzia minuta* Note sheet (Threatened Species Unit 2004) <http://www.dpipwe.tas.gov.au/>

³⁷ *Roccellinastrum neglectum* Note sheet (Threatened Species Unit 2004) <http://www.dpipwe.tas.gov.au/>



Threatened Flora by threat status

Colour indicates highest status

- CR Critically Endangered at EPBCA level
- EN Endangered at EPBCA level
- VU Vulnerable at EPBCA level
- e Endangered at TSPA level
- v Vulnerable at TSPA level
- r Rare at TSPA level

Threatened Flora Species - detail

- Caladenia dienema, e/EN
- Caladenia pusilla, r/
- Carex gunniana, r/
- Coronastylis brachystachya, e/EN
- Cullen microcephalum, r/
- Cyrtostylis robusta, r/
- Deyeuxia densa, r/
- Diuris lanceolata, e/EN
- Diuris palustris, e/
- Epacris curtisiae, r/
- Erioderma solediatum, e/
- Euphrasia collina subsp. tetragona, e/
- Hypolepis distans, e/EN
- Hypotrachyna laevigata, v/
- Lotus australis, r/
- Menegazzia minuta, e/
- Microtidium atratum, r/
- Phyllangium divergens, v/
- Pneumatopteris pennigera, e/
- Prasophyllum favonium, e/CR
- Prasophyllum pulchellum, e/CR
- Prasophyllum secutum, e/EN
- Pterostylis cucullata subsp. cucullata, e/VU
- Pterostylis falcata, r/
- Pterostylis lustra, pr/
- Pterostylis rubenachii, e/EN
- Pterostylis ziegeleri, v/VU
- Scleranthus brockiei, r/
- Spyridium vexilliferum var. vexilliferum, r/
- Stylidium beaughleholei, r/
- Stylidium perpusillum, r/
- Thelymitra holmesii, r/
- Xerochrysum bicolor, r/

Tarkine Forest Drive - proposed route

Supplied by Pitt & Sherry 21/9/2011

Vegetation Communities of Conservation Significance

Indicative locations along proposed route (NBES survey 2009)

- AHF Fresh water aquatic herbland
- ASF Fresh water aquatic sedgeland and rushland
- DVC Eucalyptus viminalis coastal forest and woodland
- NME Melaleuca ericifolia swamp forest
- WBR Eucalyptus brookeriana wet forest

Other Flora Observations

Records are from the Natural Values Atlas as at 29/9/2011, observations with an accuracy of 1km or better.



Figure 3:
Threatened
Vegetation Communities
and Flora
- Tarkine Forest Drive -



Threatened Flora Observations are data from the Natural Values Atlas as at 29/9/2011 with an accuracy of 1km or better.

Base image by TASMAR, © State of Tasmania: image grid AMG55(AGD66)

Datum: GDA94, AHD Grid: MGA Zone 55



northbarker
ECOSYSTEM SERVICES

PAS051 4/10/2011

Threatened Species Recorded from within 500 m of the Study Area

This is based on a review of the Natural Values Atlas records of moderate or high accuracy, from targeted surveys undertaken by ECOtas, (2009) on behalf of DPIW as part of extension surveys for threatened orchids, targeted survey of Segments A, B and C undertaken for this project and sampling of Segment E for the northwest heath (*Epacris curtisiae*).



Grassland at Tiger Flats – significant orchid habitat (Segment B).



Grassy swales between Arthur River and Couta Rocks (Segments A & B) provide important habitat for a range of threatened flora.



Swamp doubletail (*Diuris palustris*)



Slaty leek orchid (*Prasophyllum rostratum*)



Arthur River greenhood (*Pterostylis rubenachii*)



Windswept spider orchid (*Caladenia dienema*)

Windswept spider orchid (*Caladenia dienema*)

Endangered (EPBCA) Endangered (TSPA)

This is a small terrestrial orchid that occurs in coastal scrub and wind swept coastal grassland and heaths amongst stunted shrubs and sedges on moist to well-drained sandy and clay loams³⁸. Many occurrences are associated with rock outcrops and rocky open heathy eucalypt heathlands³⁹. Peak flowering is late October to early November. Potential flowering is all of October and November. There are 14 records for this species on NVA although 5 records have low accuracy of between 300 to 3000m.

This species has been the subject of a recent extension survey within the study area ⁴⁰. Recent records infill known distribution of populations of which several from late 2008 occur between Tiger Creek and Sundown Creek, and near Couta Rocks.

Targeted searches undertaken for this project:

- South of Alert Creek. West side, 30 m offset, 6 plants Oct 2008. Not able to be relocated in this survey. Location potentially at risk as it is in clearing in dense scrub where machinery may be parked.
- 3 records from 500m-1km north of Sundown Creek 1988, 2005, 2006. None of these could be relocated. One with gps location is more than 50m from road. Other records have less accurate location data.
- Couta Rocks Rd. 400m west of Tarkine Drive. 10 plants were recorded in this study extending to within the immediate margin of the road in low heath. Any works to Couta Rocks Rd on the south side may impact on this population, although sealing of this road is no longer part of the project.

Tiny fingers (*Caladenia pusilla*)

Rare (TSPA)

This is a diminutive terrestrial species of orchid that is known to occur predominantly in heathland and moorland close to the coast on well-drained peaty and sandy soils. Flowering appears to be stimulated by fire with plants more common at sites burnt 3 to 5 years previously although there are records from within closed heath and shrubby forest and exposed rocky outcrops amongst heathland ⁴¹.

There are twelve records for *Caladenia pusilla* on the NVA between the Arthur River and Couta Rocks. ECOTas (2009) recorded this species from numerous sites in late 2008 with substantial infilling of known distribution and a significant local extension to just south of Temma. At some locations the species was found to be locally abundant. On the strength of these new records ECOTas (2009) consider that reassessment of this species for delisting is warranted.

Targeted searches undertaken for this project:

- No records along the roadside.
- No populations recorded in this study.

³⁸ Jones *et. al.* 1999

³⁹ ECOTas, 2009

⁴⁰ ECOTas, 2009

⁴¹ ECOTas, 2009

Mountain sedge (*Carex gunniana*)

Rare (TSPA)

This small tufted sedge tends to be found in wet forests, sandy heaths and sides of streams, littoral sands and shingle with seepage⁴². It has a wide geographical range, with records throughout the state. One of the key locations for this species is the mouth of the Arthur River. *Carex gunniana* persists after fire, road maintenance, and general disturbance.

Because of the wide range of habitats that this sedge will occupy it has the potential to exist over a large proportion of the study area. However the areas with the greatest potential to support further populations of this species are the northern portion of road Segment B in the sandy heaths, the edges of streams in the coastal section and the verges of the small wetland behind Couta Rocks.

Targeted searches undertaken for this project:

- Single record close to the road approximately 6km south of Arthur River 1999.
- Approximate location searched but plants not relocated.
- Similar habitat also inspected in road length survey.

Shortspike midge-orchid (*Corunastylis brachystachya*)

Endangered (EPBCA) Endangered (TSPA)

This tiny terrestrial orchid is listed on the *EPBC* website. There is one record from NVA in the vicinity of the road on the coastal section although the species is only known with certainty from Rocky Cape National Park and near Stanley from heathland and heathy eucalypt woodland on well drained rocky sites.

The few records of this species suggest a peak flowering period in March, though there is potential throughout February to April. The known habitat is coastal heathland and heathy eucalypt woodland on well-drained rocky sites which is extensively represented in the study area in the vicinity of Segment B, around Couta Rocks and the most westerly section of Segment C on Rebecca Road.

- One Natural Values Atlas record from junction of Couta Rocks Rd and Temma Rd 1999.
- Recent record March 2009 is from edge of old track 50m west of Temma Rd 300m north of Couta Rocks Rd. Subsequent resurvey⁴³ in autumn 2010 confirmed it to occur at various locations in heathland between Temma Rd and Couta Rocks including one site 30m off the Temma Rd.
- The use of this area for parking machinery may impact habitat.

Slender buttons (*Cotula vulgaris* var. *australasica*)

Rare (TSPA)

This is a tiny herb with a widely dispersed distribution, only recently recorded in the region at Couta Rocks in 2008. Habitat is rocky environments on shallow soils, wet soaks in heaths and other ephemeral sites suited to short-lived species including annuals.

- No plants recorded in spring survey.
- With deletion of Couta Rocks Rd from project little risk of impact to this species.

⁴² Curtis and Morris 1994

⁴³ J. Cranney TPT

Dusky Scurfpea (*Cullen microcephalum*)

Rare (TSPA)

This species is a small straggling perennial herb with a woody rhizome. There are 2 NVA records from within 500m of the study area. The leaves are trifoliate and have long stalks with small stipules at the base. The small rose coloured pea flowers are clustered in groups of 1-3, each cluster has a hairy, oily, bract at the base. The pod is small, oval, blackish and covered with minute oily, rough outgrowths (Curtis & Morris 1975). Flowering occurs from November to April (Flora of Victoria).

In Tasmania, *Cullen microcephalum* inhabits well-drained rocky areas and the salt spray zone 100 m from the coast around the west and the northwest (Curtis & Morris 1975). Key sites include Conical Harbour, Couta Rocks, Sarah Anne Rocks and Sundown Point on the west coast of Tasmania.

- No plants recorded in spring survey in vicinity of study area.
- With deletion of Couta Rocks Rd from project little risk of impact to this species.

Large gnat orchid (*Cyrtostylis robusta*)

Rare (TSPA)

This diminutive colony forming terrestrial orchid is known to occur in coastal areas on wooded sand dunes and in coastal scrub on well drained loams. It is only recorded once on the NVA within 500m of the study area, approx 1.5km south of Arthur River township. It is only known with certainty from a few coastal locations in northern Tasmania, and on King and Flinders Island.

The peak flowering period is June, July and early August. Potential flowering may extend to late August. There is limited potential that further populations of this species may occur in the coastal sections of the Tarkine Forest Drive in Segments A and B.

- Plants of similar *Cyrtostylis reniformis* were recorded in seed along roadside.

Large golden moths (*Diuris lanceolata*)

Endangered (EPBCA) Endangered (TSPA)

This eye catching terrestrial orchid species is known from coastal scrub and wind swept coastal grassland and heaths amongst stunted shrubs and sedges on moist to well-drained sandy and clay loam, and occasionally on rock outcrops. Peak flowering is November but potentially may extend throughout December and January.

Three of the four NVA records are located between Sundown Creek and Nelson River and out toward Sundown Point. Targeted surveys by Mark Wapstra (ECOtas, 2009) in the summer of 2008/2009 located extant populations near Sundown Point and near Rebecca Lagoon. The records from ECOtas (2009) include numerous individual plants and localised patches that infill the known extent of this species.

There have been no records of this species from the section of road impacted by the Tarkine Forest Drive. Given its conspicuous flower it is unlikely to have been overlooked, given the intensity of surveys in this area.

Swamp doubletail (*Diuris palustris*)
Endangered (TSPA)

There are 12 NVA records for this small spring flowering terrestrial orchid in the vicinity of the coastal section of the Tarkine Road. Known from coastal locations predominantly in the north but also in the southeast, with open grassy eucalypt forest, sedgy grassland and heathland with tea-tree on poor to moderately drained sandy peat. Flowering is strongly promoted by summer fire.

Peak flowering is September, October and early November but potentially may flower from August through to December. There is some likelihood of further surveys locating more populations in the vicinity of the Tarkine Forest Drive along Segments A and B, especially in the heathland area burnt last season near Sarah Anne Rocks and Couta Rocks.

Targeted searches undertaken for this project in November 2009:

- Single population in vicinity of road at Tiger Flats north of Bottle Creek bridge.
- 14 plants recorded on edge of hollow east of road extending from 10-18 m from road shoulder.
- 4 plants have colonised road shoulder extending south of main population. These plants are at risk to any road works including standard grading works.
- Resurvey of this location in 2010⁴⁴ confirmed similar findings extending the distribution of plants slightly.

The distribution of known records at Tiger Flats close to the roadside is presented in Figure 4.

Northwest heath (*Epacris curtisiae*)
Rare (TSPA)

This is a moderate sized upright shrub to 1.5m in height with short prickly leaves and eye catching sprays of white flowers in spring. There are ten records from the NVA close to the road along Segments A, B and C. The majority of these records are of low accuracy although the approximate locations close to the existing road suggest all records are likely to have been recorded from road based surveys. Detailed searching near these records (undertaken as a targeted survey in September 2009 – Appendix 9) demonstrated that there are populations each side of the Rebecca Road. At some locations these extend to the very edge of the road. Figure 5 presents the outcome from this survey.

The sealing of the road to the Dempster Plains lookout was not considered in the 2009 investigations. There are records of this species from the vicinity of the lookout. Without further investigation, it is unclear what impact the sealing of the road and car park may have.

Phytophthora cinnamomi is a threat to this species and symptomatic evidence was observed.

⁴⁴ R.Schahinger and J. Cranney

Australian trefoil (*Lotus australis*)

Rare (TSPA).

This distinctive low scrambling and open tough herb is known from two NVA records in the vicinity of the Tarkine Forest Drive. This clover with grey-green hairy leaves has colourful pink flowers and characteristic ‘birdsfoot’ clusters of seed capsules.

In Tasmania *Lotus australis* has been described as being “local on sandy coasts”⁴⁵ and has been recorded around the coast north from Macquarie Harbour to Bicheno with few records from offshore islands. Habitat is described as *Poa* tussock grassland, low coastal shrubbery and on dunes⁴⁶. In 2008 the authors found a small population of this species on sandy loams derived from basalt on Trefoil Island off the northwest tip of Tasmania. Its location there suggests that it may have survived in that particular locality due to past protection from sheep grazing perhaps in combination with protection from fire.

Marginal habitat for this species occurs in Segment A but more suitable habitat occurs in the more coastal environments. The species may be less evident or reduced in frequency due to grazing by cattle and native marsupials which are abundant in the vicinity of the road. Survey along this section failed to reveal any evidence of plants and it is unlikely that such a conspicuous species would have been overlooked.

Yellow onion-orchid (*Microtidium atratum*)

Rare (TSPA)

A diminutive species, confined to the north in low lying sites, generally near the coast that are subject to periodic inundation. Only discovered in the area in recent years, it was recorded in summer 2009 from Tiger Flats (Segment B) in immediate proximity to other threatened orchid species.

- The NVA record indicates the plants to occur at a site immediately adjoining the road.

Wiry mitrewort (*Phyllangium divergens*)

Vulnerable (TSPA)

The recent records for this small annual herb have extended the distribution of the species considerably. It is predominantly known from eastern Tasmania though recent surveys in 2008 and early 2009 have identified this plant as widespread and locally abundant in the Arthur-Pieman CA⁴⁷.

This herb inhabits open areas in coastal scrub periodically inundated, often on sand or clay overlying rock, or associated with rocky outcrops. It was found to be present from just behind the spray zone and on rocky outcrops jutting out of dense coastal scrub. Total population numbers were thought to be in the vicinity of the high 1000’s separated into sub-populations of tens of individual plants restricted to the crevice of a rock or pan. It flowers in October to November⁴⁸.

Targeted searches undertaken for this project in November 2009:

- No plants recorded in spring survey in vicinity of study area.

⁴⁵ Curtis & Morris 1975

⁴⁶ Lazarus *et. al.* 2003

⁴⁷ ECOtas 2009

⁴⁸ ECOtas 2009

- With deletion of Couta Rocks Rd from project little risk to this species.

Western leek-orchid (*Prasophyllum favonium*)
Critically Endangered (EPBCA) Endangered (TSPA)

NVA has 4 records from the last 20 years for this stout but cryptic terrestrial orchid of windswept wet heaths. Not recorded from 2008 extensions surveys, although the study makes reference separate record for late 2008 from “Heemskirk Road”. Consultation with the recorders⁴⁹ indicates this is incorrect and that their observation was along Bluff Hill Point Track north of Arthur River and outside the study area. They also confirm that none of the NVAtlas records could be relocated in their own 2008 searches.

Fire promotes flowering in this species. It potentially flowers from the start of October to early December, with a peak in early November. The area burnt in autumn 2009 between the access tracks to Sarah Ann Rocks and Couta Rocks has the greatest potential to have flowering plants of this species evident in the spring of 2009. Road Segment B has the greatest potential of revealing new records for this species but the more coastal end of Segment A also supports potential habitat.

Targeted searches undertaken for this project in November 2009:

- Not recorded in this survey.

Leafy greenhood (*Pterostylis cucullata* subsp. *cucullata*)
Vulnerable (EPBCA) Endangered (TSPA)

In Tasmania this robust terrestrial orchid species is known only from the coast from the far north west of Tasmania including offshore islands and from one population on Flinders Island on calcarenite soils. The habitat in northwest Tasmania is tea-tree or paperbark scrub on stabilised dunes in well drained locations. On Flinders Island it is on the edge of a vegetation change between Flinders island scrub and tussock grassland. It often occurs as clumps of plants in which only an individual may be flowering at any time.

On the NVA there are numerous records for this species since 2001. However, the grid references would suggest that at least five records are for the same population and it is possible given the accuracy that all six are the same population on the seaward side of the Arthur River township near the mouth of Arthur River, near Gardiner Point. The other population is south of Temma at Possum Banks

The potential flowering period for this species is October to November with a peak in late October to early November. There is some suitable habitat along Segments A and B.

Targeted searches undertaken for this project in November 2009:

- Not recorded in this survey.

Small sickle greenhood (*Pterostylis lustra*)
Rare (TSPA)

This is a cryptic terrestrial orchid for which there is taxonomic confusion between *Pterostylis falcata* and *P. lustra*. It is unsure whether *Pterostylis falcata* even occurs in Tasmania and whether past records of this species should now be attributed to *P. lustra*. There are only three records on the NVA for both these species. *P. lustra* is a greenhood orchid of moist or swampy conditions in open forest and shrubland, particularly near

⁴⁹ M.Wells and P.Fehre

streams in association with clay and peaty loams. Fires are of a low frequency in habitat of these species.

The NVA has only one record for *P. lustra* near Tiger Creek to the east of the Temma Rd. The accuracy is +/-100m so there is potential that the location could be disturbed by the road development. Assuming the *Pterostylis falcata* records can be attributed to this revised species then there are a further two locations, the records dating back twenty years.

Targeted searches undertaken for this project in November 2009:

- Not recorded in this survey.

**Arthur River greenhood (*Pterostylis rubenachii*)
Endangered (EPBCA) Endangered (TSPA)**

This multi-flowered dwarf terrestrial orchid is only known from the Arthur River and Temma Road areas in coastal lowlands from dry sandy slopes of sparsely vegetated stabilised sand dunes and in the vastly different environment of permanently wet/moist scrubby and sedgy coastal heath converted to semi improved pasture by slashing. There are relatively high numbers of records for this species on the NVA. This species habitat has probably been reduced and fragmented by the clearing and conversion of coastal heaths for grazing. The seasonal grazing of cattle on the native vegetation may favour this species as the area has a concentration of records centring on the Tiger Flats.

Potentially flowers from October to November, with the peak flowering period in early November. There is potential for finding further populations of this orchid species in similar habitat in the northern west coast in Segments A and B of the road and around Couta Rocks.

Targeted searches undertaken for this project in November 2009:

- Known from several populations in vicinity of Tarkine Forest Drive south of Arthur River.
- All known populations have been subject to targeted survey under a specific project targeting this species⁵⁰. A total of 180 plants were recorded from all known populations in 2009, increasing to 250 recorded in 2010 from 3 populations which contrasts with over 800 in 1999.
- One population is located in close vicinity to the Tarkine Forest Drive Project. At sites known as Tiger1 and 2 which are located east of Temma Road in discrete areas north of Bottle Creek and roughly opposite the cattle yards.
- The 1999 surveys indicated 218 plants at these sites. The 2009 surveys recorded 160 plants⁵¹ and 170 were recorded from 3 populations in 2010.
- Supplementary surveys undertaken for this project in 2009 identified additional plants in southern patch (Tiger2) suggesting total may exceed 160.
- Core populations are located in stable grassland habitat over 10m from road and not under direct threat to works.
- Two plants have colonised road shoulder. These plants at risk to any road works including standard grading works.

The distribution of known records at Tiger Flats close to the roadside is presented in Figure 4.

⁵⁰ Arthur River Greenhood *Pterostylis rubenachii* Population Update 30 October 2009.

⁵¹ The TPT investigations identified 145 plants, although supplementary surveys undertaken for this project in 2009 identified additional plants in southern patch (Tiger2) suggesting total may exceed 160.

Helicopter bush (*Spyridium vexilliferum* var. *vexilliferum*)

Rare (TSPA)

This is a scrambling slender, much-branched small shrub less than 1m with eye catching floral bracts which are the inspiration for the common name. Flowering is from September to January⁵². There are records for this shrub on the NVA in the vicinity of Couta Rocks and near Arthur River township.

In Tasmania, *Spyridium vexilliferum* is found in sandy heaths and on rocky outcrops in the east, north and west of Tasmania. Key sites for this species include Couta Rocks and Temma Road near Arthur River⁵³. This shrub is well represented in reserves.

Research suggests that a fire frequency higher than 5-6 years has the potential to eradicate *Spyridium vexilliferum* from a site⁵⁴. This species does not appear to be sensitive to root rot (PC).

While the majority of *Spyridium vexilliferum* in Tasmania can be attributed to *Spyridium vexilliferum* var. *vexilliferum*, further taxonomic work may show that occurrences on the West Coast are a different variety of *Spyridium vexilliferum*, in which case, reassessment of the conservation status of both taxa would be required.

There are no locations in immediate vicinity of existing road. Because of its conspicuous habit it is unlikely that further populations occur.

Targeted searches undertaken for this project in November 2009:

- Not recorded in this survey.

Fan triggerplant (*Stylidium beagleholei*)

Rare (TSPA)

This miniature annual herb has only recently been recorded in northwest Tasmania in 2010 and is the sole NVA record in the Arthur Pieman Conservation Area. It is known to occur in sandy heaths in areas which may be temporarily inundated.

The local records are from vicinity of Sarah Ann Rocks

Targeted searches undertaken for this project in November 2009:

- Not recorded in this survey.

Tiny triggerplant (*Stylidium perpusillum*)

Rare (TSPA)

This miniature annual herb, similar to the previous species, was first recorded in northwest Tasmania in 2008 and is the sole NVA record in the Arthur Pieman Conservation Area. It is known to occur in sandy heaths in areas which may be temporarily inundated. Key sites elsewhere in Tasmania are all coastal.

The record close to the study area is on the eastern side of Temma Road between Tiger and Bottle Creeks (near Segment B) in an area of heathland.

⁵² Walsh & Entwistle 1999

⁵³ *S. vexilliferum* Notesheet <http://www.dpipwe.tas.gov.au/>

⁵⁴ Butterworth 2001 cited in *S. vexilliferum* Notesheet <http://www.dpipwc.tas.gov.au/>

It has the potential to be much more widespread in the coastal section of the Tarkine Forest Drive with suitable habitat but may have simply been overlooked due to its small and ephemeral nature. Flowers in October and November.

Targeted searches undertaken for this project in November 2009:

- Not recorded in this survey.

Threatened Lichen Species Recorded From the Vicinity of Study Area

There are several rainforest lichens known from the region. Although there appears to be extensive habitats for some of these species – such as the trunks of mature myrtle beech (*Nothofagus cunninghamii*) and other rainforest trees, several have only been located on a few occasions in spite of extensive targeted surveys⁵⁵.

⁵⁵ G. Kantvilas *pers. com.*

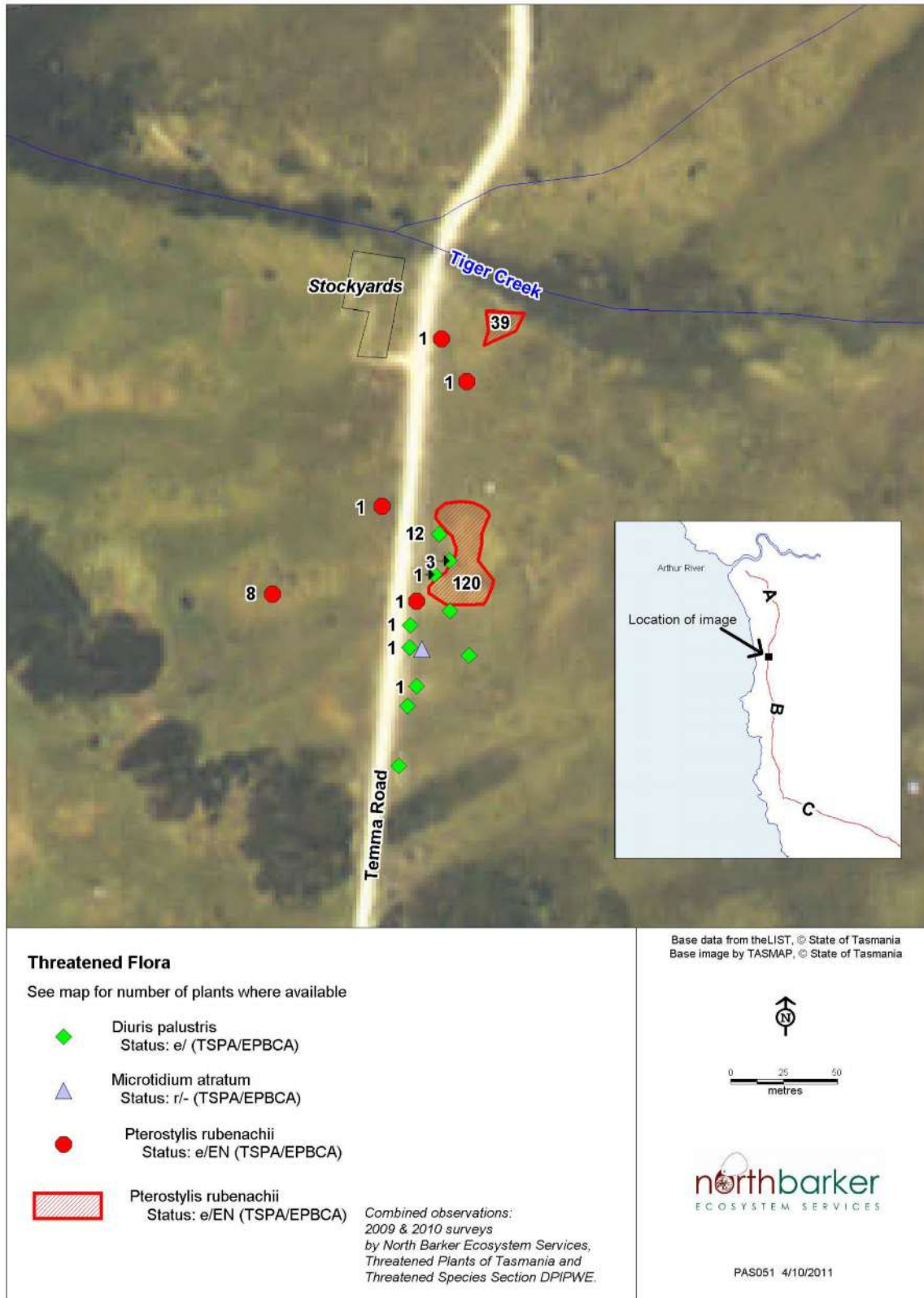


Figure 4: Threatened Flora at Tiger Flats (Segment B)

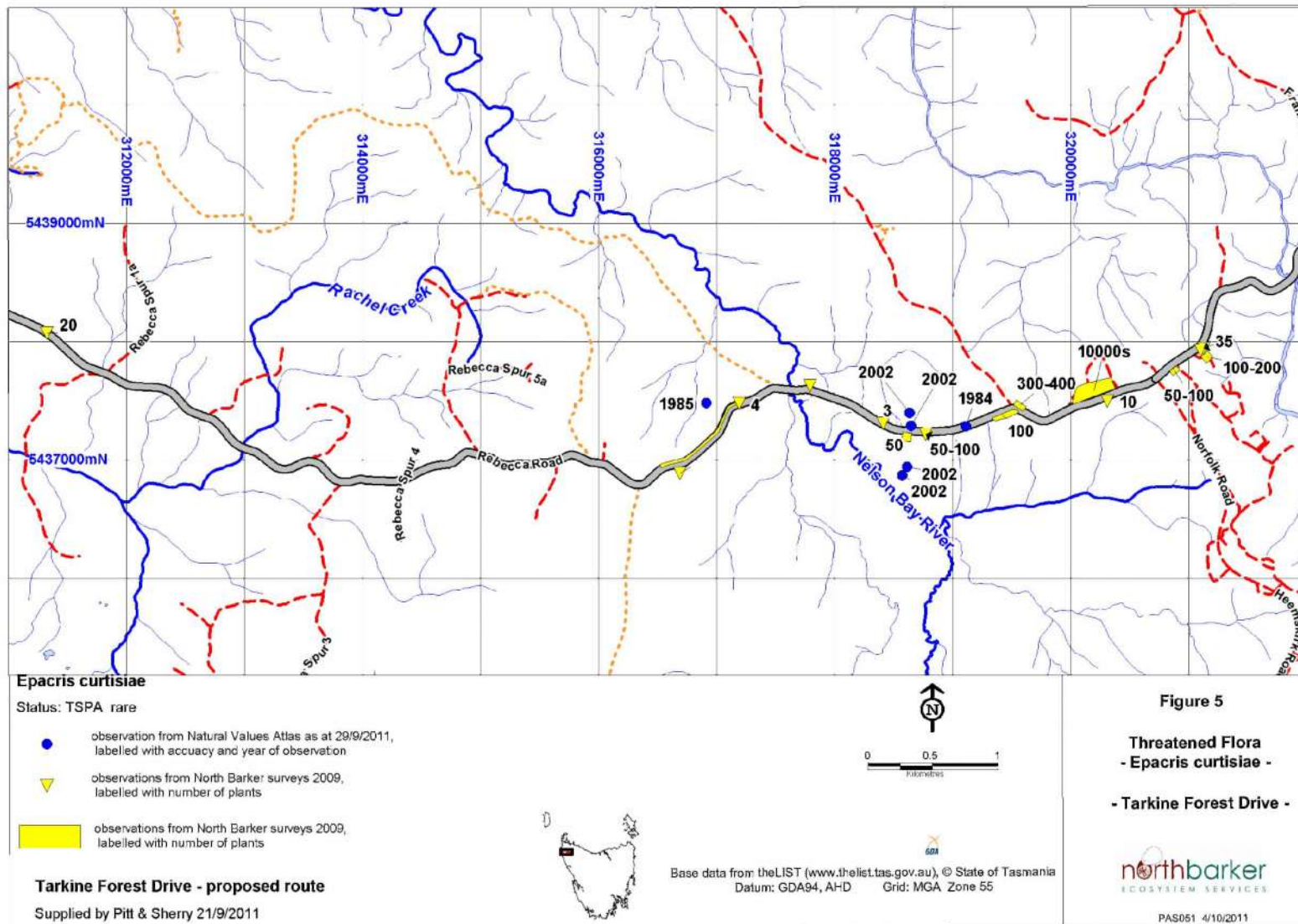


Figure 5: Northwest heath (*Epacris curtisiae*) – Segments C and D

3.3 INTRODUCED PLANTS

Four weed species listed as Declared Weeds on the *Weed Management Act 1999* were recorded from the study area:

- Blackberry (*Rubus fruticosus* agg.) – Isolated patches occur near the Kanunnah Bridge in Segment G.
- Gorse (*Ulex europaeus*) – Isolated plant on the verge of Blackwater Road. Three plants on edge of Temma Road.
- Spanish Heath (*Erica lusitanica* sp.) – Isolated infestations occur along the Rebecca and Sumac Road and near the Kanunnah Bridge.
- Creeping thistle (*Cirsium arvense*) – localised infestation Temma Road.



A blackberry on the banks of the Arthur River near Kanunnah Bridge.



A single spanish heath plant below the turning circle near the Kanunnah Bridge.

The EPBC “Protected Matters Report” identifies the following weeds of national significance (WONS) as occurring or containing suitable habitat to support the species in the vicinity of the study area: bridal creeper (*Asparagus asparagoides*), boneseed (*Chrysanthemoides monilifera*), serrated tussock (*Nassella trichotoma*), Willows (*Salix* spp. – excepting *S. babylonica*, *S.x calodendron* & *S.x reichardtiji*), blackberry (*Rubus fruticosus* agg.) and gorse (*Ulex europaeus*). Only the last two species were recorded during the preliminary survey. It is unlikely that boneseed or serrated tussock occur on the route of the Tarkine Forest Drive as the vegetation is generally of low suitability to invasion by these species and the locations of these species elsewhere in Tasmania is well removed from the far northwest of Tasmania. Willows, although not recorded have some probability of occurring in the study area, particularly in the vicinity of Arthur River, although it is unlikely they were overlooked. Bridal creeper, although not recorded, would have the potential to establish in much of the scrub and forest habitats. There are currently no records from the vicinity.

Other environmental weeds include:

- Foxglove (*Digitalis purpurea*) - Sumac Road verge.
- Cotoneaster (*Cotoneaster* sp.) – one site on Temma Road.

Numerous other herbaceous weed species were present in native vegetation on the coastal section, particularly where cattle graze, but their effect is not thought to be significant. One of particular note is milkwort (*Polygala vulgaris*). Rarely seen in Tasmania this is naturalised amongst the grassy vegetation at Tiger Flat. Its effect is unknown but it may be competitive with native herbs, including orchids.

Outside the coastal section (Segments A, B, C) weeds have been recorded from a windscreen survey. It is likely that a more detailed survey would reveal additional locations.

Figure 6 presents records of significant weed species from the vicinity. These include the species described above which have been accurately mapped for this project.

3.4 PHYTOPHTHORA CINNAMOMI

Commonly known as dieback or root rot fungus, *Phytophthora cinnamomi* (or PC) is a soil borne fungal pathogen that invades the roots of plants and starves them of nutrients and water. Heath communities are the most susceptible to infection with a consequent serious loss of species diversity. It is generally spread by the transportation of soil on vehicles, construction machinery and walking boots. The establishment and spread of *Phytophthora* is favoured in areas that receive above 600 mm of rainfall per annum, are below 800 m altitude and have a predominantly heathy shrub layer.

Symptomatic signs of *Phytophthora* were observed during the survey. Widespread but patchy death was observed in *Sprengelia incarnata*, once in *Banksia marginata* and twice in *Epacris curtisiae* along Rebecca Road. PC symptoms were also observed at an old rehabilitated gravel store and work site on the Blackwater Road just east of the junction with the Western Explorer Tourist Drive and in the same species at a site along Temma Road.

The study area is considered to be of moderate to high susceptibility to *Phytophthora* infection in the heathland and moorland environments and low susceptibility in the eucalypt and rainforest environments.



Symptomatic evidence of PC.



Dead and dying *Sprengelia incarnata*

All records of PC from Natural Values Atlas plus symptomatic evidence opportunistically recorded for this project have been collated and are presented in Figure 6.

3.5 MYRTLE WILT (*CHALARA AUSTRALIS*)

Chalara australis is a naturally occurring fungus that causes a disease in older myrtle beech (*Nothofagus cunninghamii*) regeneration (40-60 years) and mature myrtle, which results in death of the trees. This disease is commonly referred to as 'myrtle wilt'. Symptoms are wilting, followed by leaf death with the dead leaves being retained on the tree for some time. Myrtle wilt is the main cause of disease in undisturbed stands of rainforest and mixed forest. Disturbance within the stand exacerbates the effect of myrtle

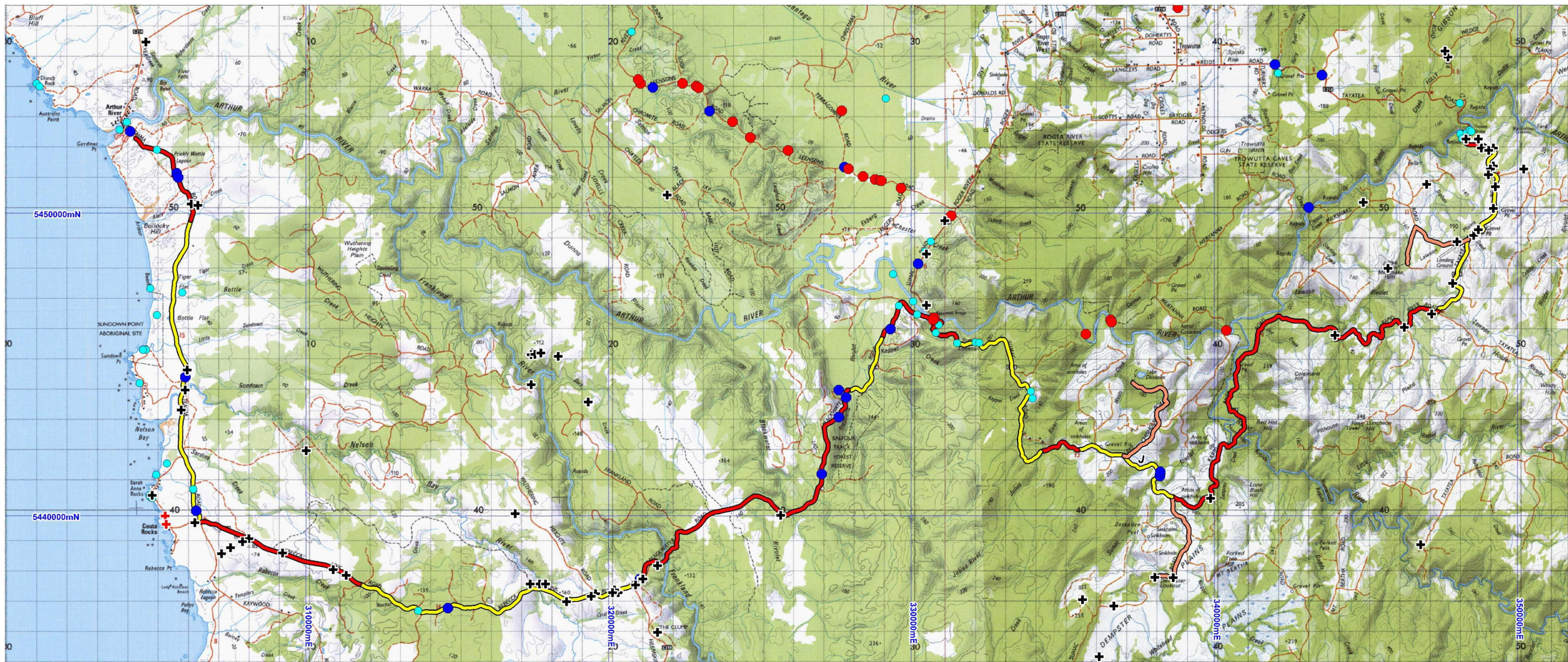
wilt. Disease incidence has been shown to be higher in callidendrous than in thamnic or implicate rainforests; higher in mixed forests the greater the myrtle densities; higher at lower altitudes; higher with increased diameter of tree; and higher where there is stem and crown damage ⁵⁶.

Road construction and any other disturbance which causes damage to older myrtles has the potential to trigger local epidemics of myrtle wilt killing a high proportion of the mature trees and spreading into adjacent undisturbed areas of myrtle forest. Tree damage, producing infection sites typically 50m from the edge of a road, results in rapid initial disease spread with incidences of 150m in three years with later infections occurring much slower to adjacent forest with examples of 20m in five years. There is evidence from research that elevated mortality rate eventually drops to normal levels after an average of nine years ⁵⁷.

The current project is limited to existing roads and infrastructure. It is quite likely that no clearance of myrtle beech will take place limiting any effects on this plant pathogen.

⁵⁶ Parkham, 1991

⁵⁷ Parkham, 1991



Weeds by Status

Weeds of National Significance

- *Rubus fruticosus*, blackberry (declared/WONS)
- *Salix cinerea*, grey willow (declared/WONS)

Declared Weeds

- *Carduus pycnocephalus*, slender thistle
- *Cirsium arvense*, californian thistle
- *Erica lusitanica*, spanish heath
- *Senecio jacobaea*, ragwort
- *Ulex europaeus*, gorse

Environmental Weeds

- *Ammophila arenaria*, marram grass
- *Cirsium* sp.
- *Cirsium vulgare*, spear thistle
- *Comesperma vulgare*
- *Cotoneaster* sp., cotoneaster
- *Digitalis purpurea*, foxglove
- *Euphorbia paralias*, sea spurge
- *Kunzea ambigua*, kunzea
- *Lupinus arboreus*, tree lupin
- *Zantedeschia aethiopica*, arum lily

Plant Pathogens

- ⊕ *Phytophthora cinnamomi*, water mould or root rot

Amphibian Pathogens

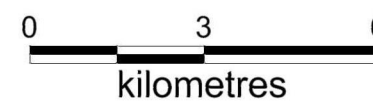
- ⊕ *Batrachochytrium dendrobatidis*, chytrid fungus

Weed and Pathogen Observations include data from:
 - the Natural Values Atlas as at 29/9/2011, observations with an accuracy of 1km or better.
 - North Barker Ecosystem Services survey, July & Nov 2009 & March 2010.

Locations where multiple observation have been recorded display the status of the most significant weed.

Tarkine Forest Drive - proposed route

- Supplied by Pitt & Sherry 21/9/2011



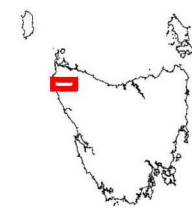
(Scale: 1:130 000 at A3)



Base image by TASMAR, © State of Tasmania: image grid AMG55(AGD66)

Datum: GDA94, AHD Grid: MGA Zone 55

Figure 6:
Weeds,
Plant Pathogens &
Amphibian Pathogens
- Tarkine Forest Drive -



3.6 FAUNA HABITAT

The assessment corridor for the Tarkine Forest Drive crosses a range of fauna habitats including rainforest, eucalypt forest, buttongrass moorland, coastal heathland, grasslands, shrublands and woodland. Aquatic habitats range from major rivers to localised ephemeral wetlands. Some of the forests within the study area support large mature hollow bearing trees.

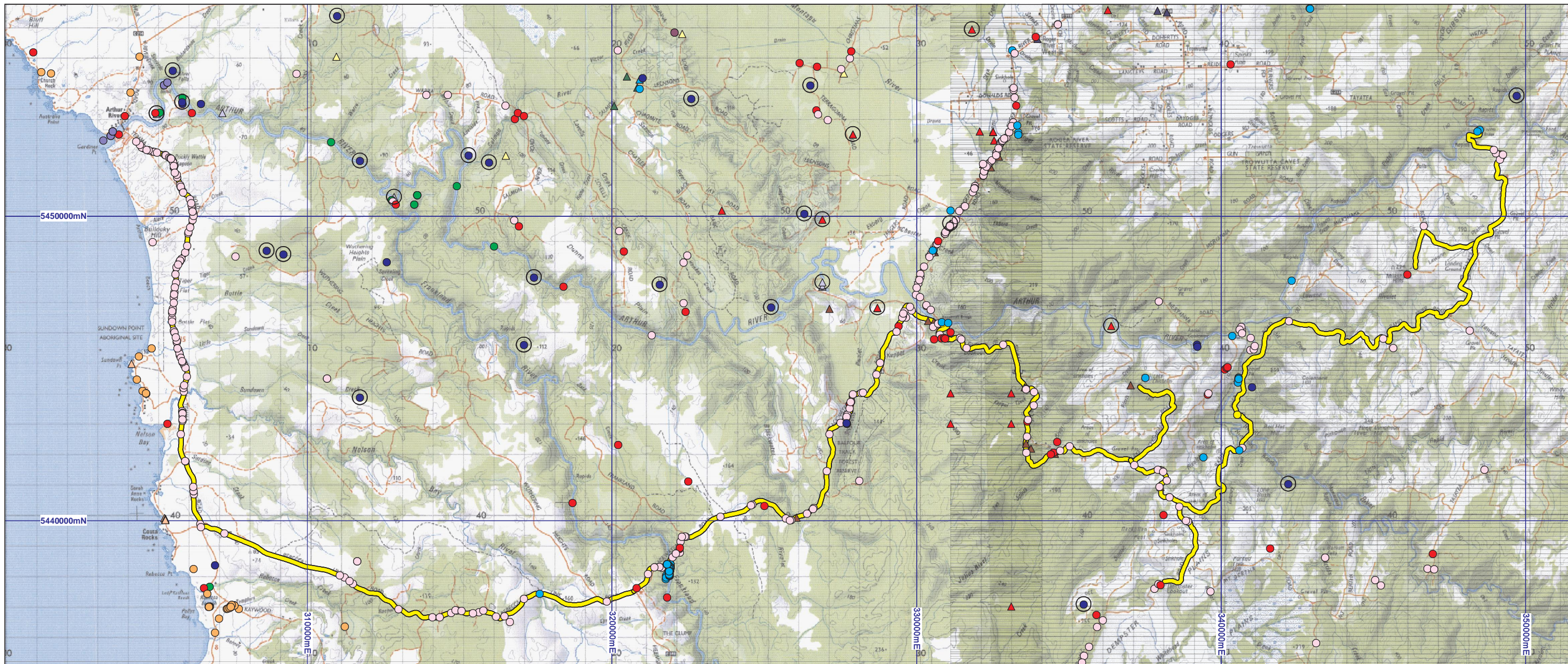
Although the route follows the margins of one of the most extensive natural lowland vegetation systems in Tasmania, much of the fauna habitat along the corridor is in close proximity to managed systems, including rough grazing along the west coast and forestry operations through the forested sections of the proposed Tarkine Forest Drive.

3.7 FAUNA OF CONSERVATION SIGNIFICANCE

Table 4 lists species that have been recorded within the vicinity of the study area or that are considered to have the potential to occur because of the presence of suitable habitat⁵⁸. A brief discussion is provided in the table to indicate if there is suitable habitat present. The EPBC Act “Protected Matters Report” identified 19 species of bird potentially occurring within the study area, however, all but three are pelagic birds and these are not considered further. Marine species such as whales (3 species) and sharks (2 species) are also excluded.

Figure 7 presents all records of threatened fauna collated from the Natural Values Atlas and observations from this study. The nature of these records varies from site specific habitats such as known nest sites to evidence of the species including scats and prints. The NVA is a repository of data from incidental observations and surveys. There are significant gaps in the coverage of the state depending on the level of visitation and whether there have been any studies in the area. For contextual reference all records of fauna are also indicated.

⁵⁸ Natural Values Report , NVA, DPIPWE, 19/8/09



Threatened Fauna Observations

EPBCA listed species

- *Alcedo azurea* subsp. *diemenensis*, azure kingfisher or azure kingfisher (tasmanian) (e/EN)
- *Aquila audax* subsp. *fleayi*, wedge-tailed eagle (e/EN)
- *Astacopsis gouldi*, giant freshwater lobster (v/VU)
- *Dasyurus maculatus* subsp. *maculatus*, spotted-tailed quoll (r/VU)
- *Oreiplanus munionga* subsp. *larana*, marawah skipper (e/VU)
- *Prototroctes maraena*, australian grayling (v/VU)
- *Sarcophilus harrisii*, tasmanian devil (e/EN)
- *Tyto novaehollandiae*, masked owl (pe/PVU)

Threatened Fauna Observations

TSPA listed species

- ▲ *Accipiter novaehollandiae*, grey goshawk (e/-)
- ▲ *Beddomeia gibba*, hydrobiid snail (salmon river road) (r/-)
- ▲ *Beddomeia mesibovi*, hydrobiid snail (arthur river) (r/-)
- ▲ *Beddomeia salmonis*, hydrobiid snail (salmon river) (r/-)
- ▲ *Beddomeia topsiae*, hydrobiid snail (williamson creek) (r/-)
- ▲ *Haliaeetus leucogaster*, white-bellied sea-eagle (v/-)
- ▲ *Limnodynastes peroni*, striped marsh frog (e/-)
- ▲ *Tasmaphena lamproides*, keeled snail (r/-)

Nests



Threatened Fauna Observations include evidence such as sightings, nests, tracks, scats and latrines. Data is from the Natural Values Atlas as at 29/9/2011, observations with an accuracy of 1km or better.

Conservation Status is indicated in brackets (TSPA/EPBCA).

Note:- 3 nests close to the road, recorded in 1985 on NVA, have been confirmed to be no longer present (B.Brown TSPS and / or A. North, Helicopter search March 2011). These observations are displayed as sightings not nests.

- where observations for EPBCA and TSPA listed species are coincident the EPBCA listed species are displayed.

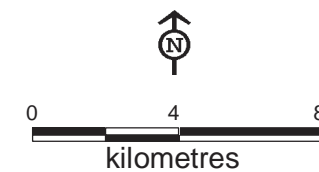
Tarkine Forest Drive - proposed route

Supplied by Pitt & Sherry 21/9/2011



Figure 7:

**Threatened Fauna
- Tarkine Forest Drive -**



(Scale: 1:130 000 at A3)



Base image by TASMAR, © State of Tasmania; image grid AMG55(AGD66)

Datum: GDA94, AHD Grid: MGA Zone 55

Table 4 - Threatened Fauna Species of Conservation Significance

Species previously recorded within a 5km radius or considered to potentially occur based on habitat mapping⁵⁹ or identified in the EPBC Protected Matters Report (Appendix 5), excluding pelagic species which will not occur in the terrestrial environments of this study.

Species	Status TSPA/EPBCA	Potential to be impacted by project	Observations and Preferred Habitat ⁶⁰
MAMMALS			
Tasmanian devil <i>Sarcophilus harrisii</i>	Endangered / ENDANGERED	HIGH	Occurs widely throughout the study area with greatest concentrations likely to be along the western seaboard from Couta Rocks to Arthur River because the habitat in this area is considered to be more suitable. Facial tumour disease is the major threat to the species although road kill could be a significant factor if the disease becomes established in the region. Increased road kill of prey species may lead to increased interactions between animals which may facilitate the spread of the DFTD.
Spotted-tail quoll <i>Dasyurus maculatus</i> subsp. <i>maculatus</i>	Rare / VULNERABLE	HIGH	Widespread across the study area. This species is likely to occur throughout all habitats although it is thought to occur in highest concentrations along the coastal section. Spotted tailed quolls are susceptible to road kill particularly where scavenging from carcasses on the road.
Eastern-barred bandicoot <i>Perameles gunnii</i>	- / VULNERABLE	LOW	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. Although no records from vicinity of Tarkine Forest Drive suitable habitat occurs south of Arthur River township.
BIRDS			
Wedge-tailed eagle <i>Aquila audax</i> subsp. <i>fleayi</i>	Endangered / ENDANGERED	LOW	Requires large old growth eucalypt trees generally located in large tracts (more than 10 ha) of old-growth eucalypt or mixed forest for nesting. There are several known breeding territories bisected by the route. Several nests occur within 5km, none within 1km; and two previously known nests close to the existing road are no longer present ⁶¹ .
Australasian bittern <i>Botaurus poiciloptilus</i>	- / ENDANGERED	VERY LOW	A resident of densely vegetated freshwater wetland habitats. In Tasmania confined to the northeast, There are no observation records from the vicinity.
White-bellied sea-eagle <i>Haliaeetus leucogaster</i>	Vulnerable / -	LOW	A species which occurs along coasts and large inland lakes and waterways. Nesting habitat is forest with large old-growth eucalypt trees within 5km of the coast (nearest coast including shores, bays, inlets and peninsulas), rivers, lakes or large farm dams. There is potential nesting habitat along the coast within the study area and there are known nests along the Arthur

⁵⁹ Natural Values Report, NVA, DPIPWE, 6/10/11

⁶⁰ Bryant & Jackson 1999, Notesheets and Listing Statements DPIPWE Threatened Species website <http://www.dpipwe.tas.gov.au/>

⁶¹ B. Brown pers. com.

Species	Status TSPA/EPBCA	Potential to be impacted by project	Observations and Preferred Habitat ⁶⁰
			River. However, there are no known nests within 1km of road and no potential nesting habitat
Grey goshawk <i>Accipiter novaehollandiae</i>	Endangered / -	LOW	Inhabits wet eucalypt forest with a blackwood and/or myrtle understorey, blackwood swamp forest, rainforest and tea-tree swamp forest. There is extensive nesting habitat within the study area. Given the project is limited to existing roads and infrastructure, there is limited potential for impact.
Tasmanian masked owl <i>Tyto novaehollandiae</i> subsp. <i>castanops</i>	Endangered / VULNERABLE	VERY LOW	Preferred habitat is lowland dry forest and woodlands. Nests in large hollow bearing trees. The wet vegetation types through which the new sections traverse are sub optimal habitat although there are large trees with hollows occurring across much of the study area. There are no records for the study area on NVA
Tasmanian azure kingfisher <i>Ceyx azureus</i> subsp. <i>diemensis</i>	Endangered / ENDANGERED	LOCALLY MODERATE in riparian areas	Inhabits riparian areas and is known to nest along the lower reaches of the Arthur River. Some potential habitat in the vicinity of Rapid River Bridge.
Swift parrot <i>Lathamus discolor</i>	Endangered / ENDANGERED	NONE	This migratory species is occasionally recorded on the west coast and is regularly recorded in the north west (e.g. Smithton) during the breeding season and post breeding foraging on flowers of planted <i>Eucalyptus globulus</i> (Tasmanian blue gum) and <i>Eucalyptus nitida</i> (Smithton peppermint).
Orange-bellied parrot <i>Neophema chrysogaster</i>	Endangered / CRITICALLY ENDANGERED	VERY LOW	This species migrates along the west coast of Tasmania to its breeding areas in south western Tasmania. Buttongrass moorland habitat may be occasionally used for foraging by migrating birds.
AMPHIBIANS			
Striped marsh frog <i>Limnodynastes peroni</i>	Endangered / -	LOW	Occurs in north west and north east Tasmania and on King Island. There are records north of Arthur River. It is likely that this species could occur in suitable wetland habitat in the western parts of the route, although not identified in targeted survey in 2010.
Green and gold frog <i>Litoria raniformis</i>	Endangered / VULNERABLE	LOW	Historically widespread in lowland areas in the Midlands, eastern and northern Tasmania and King and Flinders Island. There are a small number of records from the north west. The species has declined in recent years thought to be due to prolonged dry periods and chytrid fungus. There are historic records south of study area near the coast and more recent observations from Woolnorth. Some wetlands close to the road edge may provide potential habitat, particularly in the west of the study area, although not identified in targeted survey in 2010.
FISH			
Australian grayling <i>Prototroctes marina</i>	Vulnerable / VULNERABLE	LOW	Occurs in un-polluted streams with large pools and major rivers particularly in low and mid catchment where there are no barriers to the sea. The species spawns in streams over gravel beds and the young migrate to sea for a period before moving back into

Species	Status TSPA/EPBCA	Potential to be impacted by project	Observations and Preferred Habitat ⁶⁰
			rivers. Previously recorded in the Arthur River.
INVERTEBRATES			
Giant freshwater lobster <i>Astacopsis gouldi</i>	Vulnerable / VULNERABLE	MODERATE in riparian areas	Occurs in north flowing rivers and the Arthur River catchment. There are confirmed records from within the study area at Frankland River, Kanunnah Bridge and Rapid River. All watercourses flowing into the Arthur River are suitable habitat.
Keeled snail <i>Tasmaphena lamproides</i>	Rare / -	LOW	Endemic snail confined to north west Tasmania and Wilsons Promontory in Victoria. Most records are from the Woolnorth area but there is a record from the confluence of Arthur and Frankland Rivers. It potentially may be more widespread in suitable habitat in the region. Habitat includes damp litter in wet forests.
Beddomid snails <i>Beddomeia</i> spp.	Rare / -	MODERATE in riparian areas	There are several species of freshwater Beddomid snails which utilise their aquatic habitats in separate creek and river sub catchments of the Arthur River. These are mostly threatened by activities which impact on stream side vegetation and create water pollution. Habitats may occur in direct alignment with some of the proposed bridgeworks although such impacts are localised.
Marawah skipper <i>Oreisplanus munionga</i> subsp. <i>larana</i>	Endangered / VULNERABLE	LOW	This is confined to the north west of Tasmania where it is associated with sedgeland and swamp forest where there is the larval food plant – cutty sedge (<i>Carex appressa</i>) present. Recent extension surveys have located populations close to the coast south of Arthur River. Potential habitat occurs along drainage lines on the Temma Road section.

Threatened Fauna Species that may be affected by the project

Tasmanian devil (*Sarcophilus harrisi*)⁶² Endangered (EPBCA) Endangered (TSPA)

The Tasmanian devil (*Sarcophilus harrisi*) is Australia's largest surviving marsupial carnivore and only specialist scavenger. Although variable in size, adult males can weigh up to 12kg and be 30cm high at the shoulder. They are covered in coarse thick black fur with variable white markings. They have a proportionately stronger upper body and large jaws strong enough to crush the bones of carrion which includes dead animals of any type and some live food also. Previously occurring on the Australian mainland, the species is now confined to Tasmania where it is widely distributed across all environments throughout the State although at low densities in the southwest⁶³.

⁶² Information largely taken from Save The Tasmanian Devil website (www.tassiedevil.com.au), DPIWE threatened species website (24 Aug 2009 and 24 Oct 2011)

⁶³ Jones and Rose, 1996, MacCallum *et. al.* 2007

Devils are usually solitary animals but they are known to come into contact with other devils around prey carcasses and during the mating season⁶⁴. 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.

Devils roam familiar routes using their sense of smell to locate food. Animals typically travel with a characteristic loping gait around 8km a night, although individuals have been recorded covering more than 50km in a single night⁶⁵. They have home ranges of 8 to 20 square kilometres, although more recent studies suggest smaller ranges⁶⁶. These overlap with other individuals as they are not wholly territorial.

The devil is largely nocturnal and is well known for its screaming calls and growls. In daytime animals hole up in shelter, including underground dens, wombat burrows, hollows and caves.

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 1990s. Some estimates suggest the population may have exceeded 150,000 individuals at this time⁶⁷.

In 1996 debilitating facial lesions were observed on animals in the north east of Tasmania. This was the first signs of what is now described as Devil Facial Tumour Disease (DFTD), a rare contagious cancer which is 100% fatal to animals that contract it, usually killing within 8 months of the initial signs. This has led to significant declines in population (up to 97%⁶⁸), resulting in the complete loss of mature individuals with no animals over 2 years of age⁶⁹.

Information on population densities gleaned from a mark and recapture study⁷⁰ indicates 0.8 to 2.9 individuals per km² in disease-free areas (three sites), and 0.3 to 1.4 [REDACTED]² in the confirmed diseased region (four sites).

It is the impacts of DFTD which have resulted in the listing of the Tasmanian devil as 'endangered' under both state and commonwealth legislation. It is estimated that the species may be extinct in the wild within 25 to 30 years⁷¹.

In 2003 the Tasmanian Government with Australian Government support established the "Save the Tasmanian Devil Program" which was given the following objectives: ⁷²

1. Maintain the genetic diversity of the Tasmanian devil population.
2. Maintain the Tasmanian devil population in the wild.
3. Manage the ecological impacts of a reduced Tasmanian devil population over its natural range.

⁶⁴ Hamede *et. al.* 2009

⁶⁵ Tarkine Devil Forum (2009)

⁶⁶ 2.5 km² for females and 10km² for males (S. Troy *pers. com.* – "Landscape ecology of the Tasmanian devil and spotted-tailed quoll"

⁶⁷ N. Mooney cited in McGlashan *et. al.* 2006

⁶⁸ Hawkins *et. al.*, 2006

⁶⁹ MacCallum *et. al.* 2007

⁷⁰ MacCallum *et. al.* 2007

⁷¹ CBSG 2008

⁷² Save The Tasmanian Devil Program Strategic Plan www.dpipwe.tas.gov.au/inter.nsf/WebPages/EKOE-75M7UZ?open

Studies of DFTD have shown that it has spread across more than 60% of Tasmania (Figure 8) with population declines averaging 84% although the population in the north east has declined by up to 96%⁷³. The last remaining stronghold for the Tasmanian devil is in the north west with the west and southwest areas supporting much lower densities. A reduced population such as that affected by DFTD is considered highly vulnerable to other causes of mortality such as road kill.

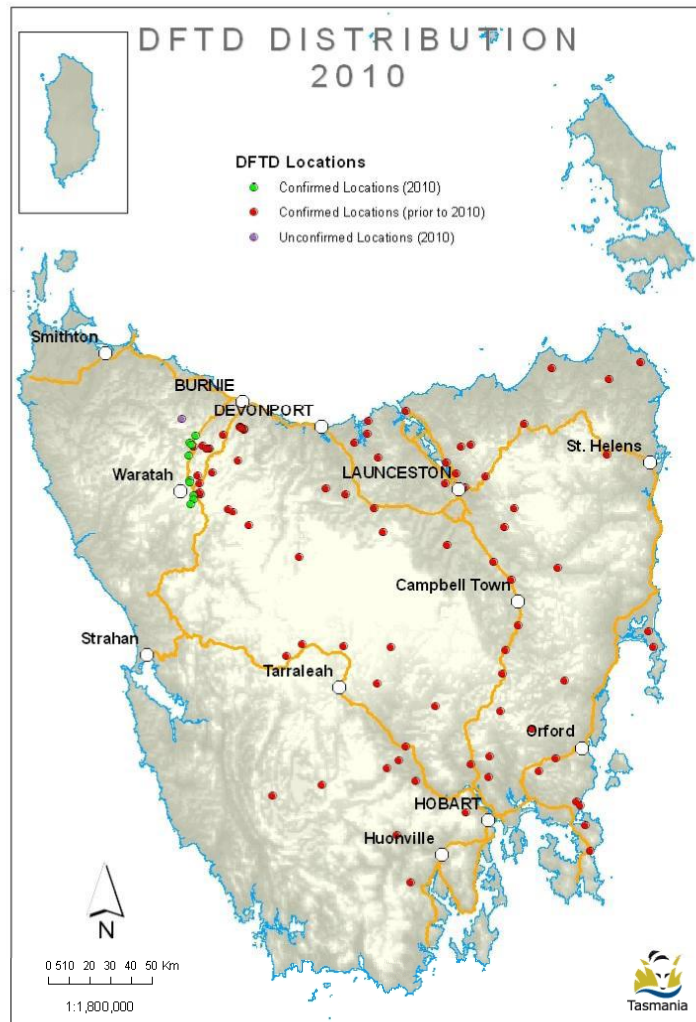


Figure 8: The distribution of DFTD ⁷⁴

Particular interest has been taken in the western front of the disease in northwest Tasmania, which approximates to the Murchison Highway. Intensive sampling undertaken in 2009 and repeated in 2010⁷⁵ indicates it continued to progress westwards at about 7 km year. This is markedly slower than the rate of spread elsewhere in Tasmania.

Figure 9 presents all observation records including live sightings and road kill.

⁷³ Based on sightings - Save The Tasmanian Devil website (www.tassiedevil.com.au), DPIWE threatened species website (4 Oct 2011)

⁷⁴ Save The Tasmanian Devil website (www.tassiedevil.com.au) (4 October 2011)

⁷⁵ Reported in Save The Tasmanian Devil website (www.tassiedevil.com.au) (4 October 2011)



Devil Footprints – Rebecca Rd-Heemskirk Rd junction – Segment E

The devil facial tumour disease (DFTD) is the single most significant cause of mortality and therefore threat to the conservation of the Tasmanian devil. The retention of naturally occurring disease free populations is a key factor in ensuring the long term survival of the species in the wild. Any activity that may increase the risk of accelerating the spread of DFTD into areas currently disease free may be considered as having a significant impact to the species.

There have been no local extinctions as a result of the disease, although in the northeast of Tasmania the devil population is at a very low level. It has declined by 97% and the age structure of the population has changed with no animals over two years old persisting in the region⁷⁶. It is when populations are at such low levels that they become sensitive to other causes of mortality such as road kill.

The DFTD is an extremely unusual but lethal disease, being a contagious cancer which forms grotesque lesions around the face. It is able to be transferred from animal to animal by a process known as allograft where infectious cells are passed through biting⁷⁷. Therefore the management of disease transfer requires management of animal movements and their social behaviours.

The northwest population of Tasmanian devils is disease free (refer figure 8). The western most occurrence of DFTD is at Takone and the Murchison Highway, however this data is 12 months old⁷⁸. Modelling suggests that the current rate of disease spread is between 10 and 20km per year⁷⁹ although it has moved 50km per year on at least one occasion. This has led to a consensus view amongst scientist that the DFTD may have spread throughout mainland Tasmania in as little as 5 to 6 years and that the species may become extinct in the wild within 15 years⁸⁰. Other estimates suggest 25 to 30 years⁸¹. Elsewhere the disease ‘front’ has been estimated to be spreading at an average rate of 7km per year⁸².

⁷⁶ MacCallum *et. al.* 2007, Hawkins *et. al.* 2006

⁷⁷ Pearse *et. al.*, Fox, Bender *et. al.* (Save The Tasmanian Devil 2007)

⁷⁸ Save the Tasmanian Devil Program unpublished data

⁷⁹ Marvoneck (Save The Tasmanian Devil 2007)

⁸⁰ McCallum – Overview (Save The Tasmanian Devil 2007)

⁸¹ CBSG 2008

⁸² McCallum *et. al.* 2007

The Save the Tasmanian Devil Program scheduled targeted investigation of the western front of DFTD in the spring of 2009, which was repeated in 2010. These suggest a slow but continuous spread of approximately 7km per year.

Trapping studies indicate devils are regularly trapped at distances of 5 to 7 kilometres apart on consecutive nights⁸³. An adult male has been radio-tracked covering a distance of 50km in a single night, albeit within its home range⁸⁴. Young adults are known to disperse from their home territory and may potentially travel significant distances. Studies into dispersal rates are currently underway and will further inform this issue⁸⁵. However, the current knowledge indicates that it is possible that a diseased animal could spread the DFTD a significant distance. Most dispersal is undertaken by young animals post weaning (at 9-18 months of age) which are less likely to be carriers of the DFTD than mature individuals. However, DFTD has been found in animals as young as 13 months of age, although this is rare⁸⁶. DFTD in sub adults is reportedly low⁸⁷, although this relies on the assumption that the incubation period is brief.

The identification of DFTD relies on gross pathology and disease front monitoring is based on clinical testing. There is no pre-clinical test available yet. A pre-clinical test is currently under trial⁸⁸ but it is not certain whether this will prove to be viable.

The disease 'front' is not a solid line, with the typical pattern being localised outbreaks ahead of a more generalised infected population. A recently published study on Tasmanian devil social networks⁸⁹ has found that despite being solitary animals devils are highly connected socially, which has implications for the spread of DFTD. Certain individuals have a large number of social connections and present a heightened risk of translocating the disease through a population⁸⁹.

There is evidence that the northwest devil population is of a distinct genetic provenance showing greater allelic variation than the eastern population⁹⁰. This has been further corroborated by research of major histocompatibility complex (MHC) genes which demonstrated greater variability in western populations than eastern devils which may result in improved levels of disease resistance⁹¹. This may result in the possibility that DFTD will have a different impact to northwest populations. Early evidence suggests mortality rates may be lower. The pinch point for the genetic separation is thought to be at Mawbanna. The devil genetic provenance starts to change at about Devonport. There is a grey zone in the genetic provenance from Devonport to Stanley⁹². Wet forest and higher altitude are thought to be the partial barrier to devil movements in this area.

Preliminary results from observations of disease spread within an infected population west of Cradle Mountain⁹³ supports the hypothesis that some level of disease resistance occurs in the western population. Similarly, a 12 month monitoring study of Tasmanian devils in the Cradle Mountain area using remote cameras⁹⁴ in 2006/07 recorded 77

⁸³ Hamede *pers. com.*

⁸⁴ Jones *pers. com.*

⁸⁵ R. Hamede *pers. com.*

⁸⁶ M. Jones *pers. com.*

⁸⁷ Hawkins *et. al.* 2006

⁸⁸ STDP newsletter

⁸⁹ Hamede *et. al.* 2009

⁹⁰ Jones and Barmuta 2000

⁹¹ Siddle *et. al.* (2010)

⁹² M. Jones *pers. com.*

⁹³ Hamede in DFTD (Save The Tasmanian Devil 2007)

⁹⁴ Coupland & Anthony 2007

individuals of which the presence of DFTD was observed in a small proportion. There was no evidence of an increase in the prevalence of the disease in the population during the period of monitoring. This differs from observations of the rates of spread of DFTD in eastern Tasmania. Given the disease was first observed in the area in 2004; these results indicate DTFD incidence is around 10% and suggests that the local population may have a level of resistance to the disease.

The slowed rate of transmission may be due to a higher degree of resistance as a result of the greater genetic diversity in the northwest Tasmanian devil population. Alternatively there may be other explanations, such as a reduced basal population having lower transmission due to reduced contact between individuals in a population with a naturally low density⁹⁵ or slower rates of transmission through dense forests than across agricultural land⁹⁶.

Healthy populations of Tasmanian devils are able to withstand what may appear to be devastating mortality rates. Road kill rates peak in summer, impacting on young animals just out of the den and migrating males which may have been driven out by dominant adults. Road kill however has been shown to have a significant impact on small isolated populations (e.g. Cradle Valley) and on depleted populations such as those affected by DFTD⁹⁷.

While the northwest of Tasmania continues to have a healthy population of Tasmanian devils, road kill is not likely to have a significant impact on the population.

The Save the Tasmanian Devil Programme is planning for the expected spread of the DFTD into northwest of Tasmania⁹⁸. Road kill could have a significant impact in the area if the disease arrives.

The rate of the spread of DFTD will affect the nature of the response from the Devil Task Force. If there is an opportunity for DFTD to penetrate into new areas this would have a major impact on the Save the Tasmanian Devil Programme. The Devil Task Force is planning to set up disease free populations in the North West which will be fenced to prevent access by diseased individuals⁹⁹. If the disease arrives in the North West before these refuge populations are established this will have major implications for this program.

There are no obvious barriers to devil movements along the North West coast from Devonport through to Woolnorth. Indeed the mosaic of agricultural land and bushland represents favourable habitat and so the population density would be anticipated to be concentrated along the northern seaboard thus providing the most likely route for the spread of DFTD into the far North West

⁹⁵ Obendorf and McGlashan 2008

⁹⁶ Marvonek in DFTD (Save The Tasmanian Devil 2007)

⁹⁷ Jones 2000

⁹⁸ A. Sharman *pers. com.*

⁹⁹ CBSG 2008

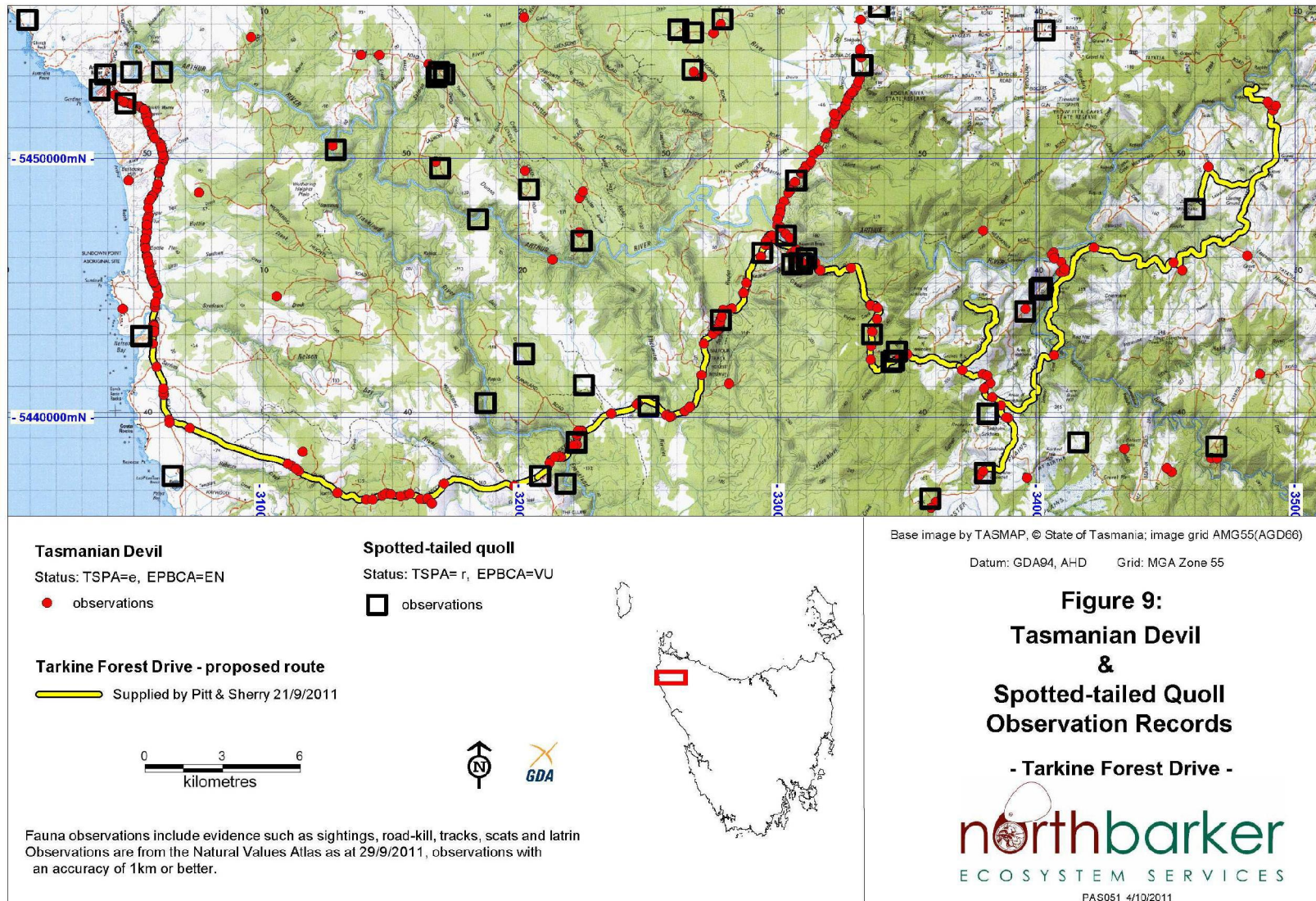


Figure 9: Tasmanian Devil and Spotted-tailed Quoll Records

Spotted-tailed quoll (*Dasyurus maculatus*)
Vulnerable (EPBCA) Rare (TSPA)

The Spotted-tailed Quoll (*Dasyurus maculatus*) is a medium-sized carnivorous marsupial found in forest habitats in south-eastern mainland Australia and in Tasmania. There are currently estimated to be 3000 to 4000 Spotted-tailed Quoll remaining in Tasmania based on a density of about 1 per 300 ha¹⁰⁰. The density can be higher in the core habitat area in northern Tasmania and in other limited 'hot spots'; in the incised river valleys of the Gordon and Huon River catchments in southern Tasmania, and along a narrow strip of the west coast. The species appears to be declining in abundance, and may be vulnerable to further declines through continued habitat removal and fragmentation¹⁰¹.

Home ranges extend to more than 1,500 ha of continuous suitable habitat for a male and a little less for a female spotted-tailed quoll. Population densities are likely to be in the order of one individual per 4 km², with female ranges largely exclusive and male ranges overlapping. 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 ha¹⁰².

Priority habitat for the species is generally described as lowland, high-rainfall forest across the north of Tasmania. The species requires forested areas with suitable shelter sites such as hollow logs or rocky caverns as denning habitat. This is distinguished from foraging habitat which can include non forest and regenerating forest areas adjacent to suitable denning habitat¹⁰³. 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 as well as lower slopes in wet gullies.

Figure 9 presents all observation records including live sightings and road kill.

Eastern-barred bandicoot (*Perameles gunnii*)
Vulnerable (EPBCA)

The eastern-barred bandicoot (*Perameles gunnii*) is a small nocturnal dasyurid which is widespread across Tasmania and abundant in some areas including parts of the southeast and northwest. Preferred habitat includes open grassy areas for foraging in close association with dense ground cover for nesting and shelter. The eastern-barred bandicoot feeds on invertebrates including earthworms and fungi which it excavates forming distinctive conical holes. Natural habitat includes grasslands and grassy woodland with abundant tussocks, rushes and other forms of cover. However they also frequently use garden lawns, pasture and sports fields where there is an adjacent cover of dense shrubs including weedy species such as gorse.

This species is not currently listed in Tasmania as threatened under state legislation although the Tasmanian subspecies *Perameles gunnii gunnii* is nationally listed as Vulnerable. The mainland subspecies *Perameles gunnii* unnamed *subspecies* is listed as endangered because it now only persists as a few small captive colonies in south eastern Victoria. Its decline on the mainland is thought to be linked to the predatory impacts of the European fox. Establishment of the fox in Tasmania probably presents the greatest potential threat to the species.

¹⁰⁰ Jones and Rose 1996

¹⁰¹ Bryant & Jackson 1999

¹⁰² PLUC 1996

¹⁰³ Mallick 2003

Prior to European settlement the range of the eastern barred bandicoot in Tasmania has been suggested to have been mostly within the Midlands region¹⁰⁴. The Midlands region falls within the Northern Midlands and South East bioregions. A recent assessment of the distribution of the eastern barred bandicoot has found that the species has declined in the Northern Midlands, is present in the South East, Central Highlands and Northern Slopes bioregions and has naturally expanded into the Ben Lomond, King and Tasmanian Southern Ranges bioregions¹⁰⁵. This range expansion is believed to have occurred because the clearing of forested land for agriculture has opened up areas within the northern and southern bioregions that were previously unsuitable because they were heavily forested¹⁰⁶. The preferred habitat of the eastern barred bandicoot is highly productive agricultural land with deep soils and high rainfall where there are open pasture areas for foraging and ground cover for nesting and shelter¹⁰⁷.

Although there are records for the eastern barred bandicoot from north west Tasmania, there are none from the study area (see Figure 10). There is little suitable habitat for the species within the study area other than the coastal section (Segments A & B).

Generally the Tarkine Forest Drive project passes through vegetation characterised by a mosaic of moorland, scrub, heathland, dry *Eucalyptus nitida* forest, wet *Eucalyptus nitida* / *obliqua* forest types, or rainforest communities; none of which are suitable habitat for eastern barred bandicoots.

There are small localised patches of coastal grasslands on the sand plains between sand dune systems along Temma Road (Segments A and B) which may be suitable habitat. However, it is considered that these grasslands have a low potential to support eastern barred bandicoots because they are on sandy soils with low fertility which is not the preferred habitat of this species.

¹⁰⁴ Mallick et al. 1997

¹⁰⁵ Sattler and Creighton 2002

¹⁰⁶ Driessen et al. 1996

¹⁰⁷ Driessen et al. 1996

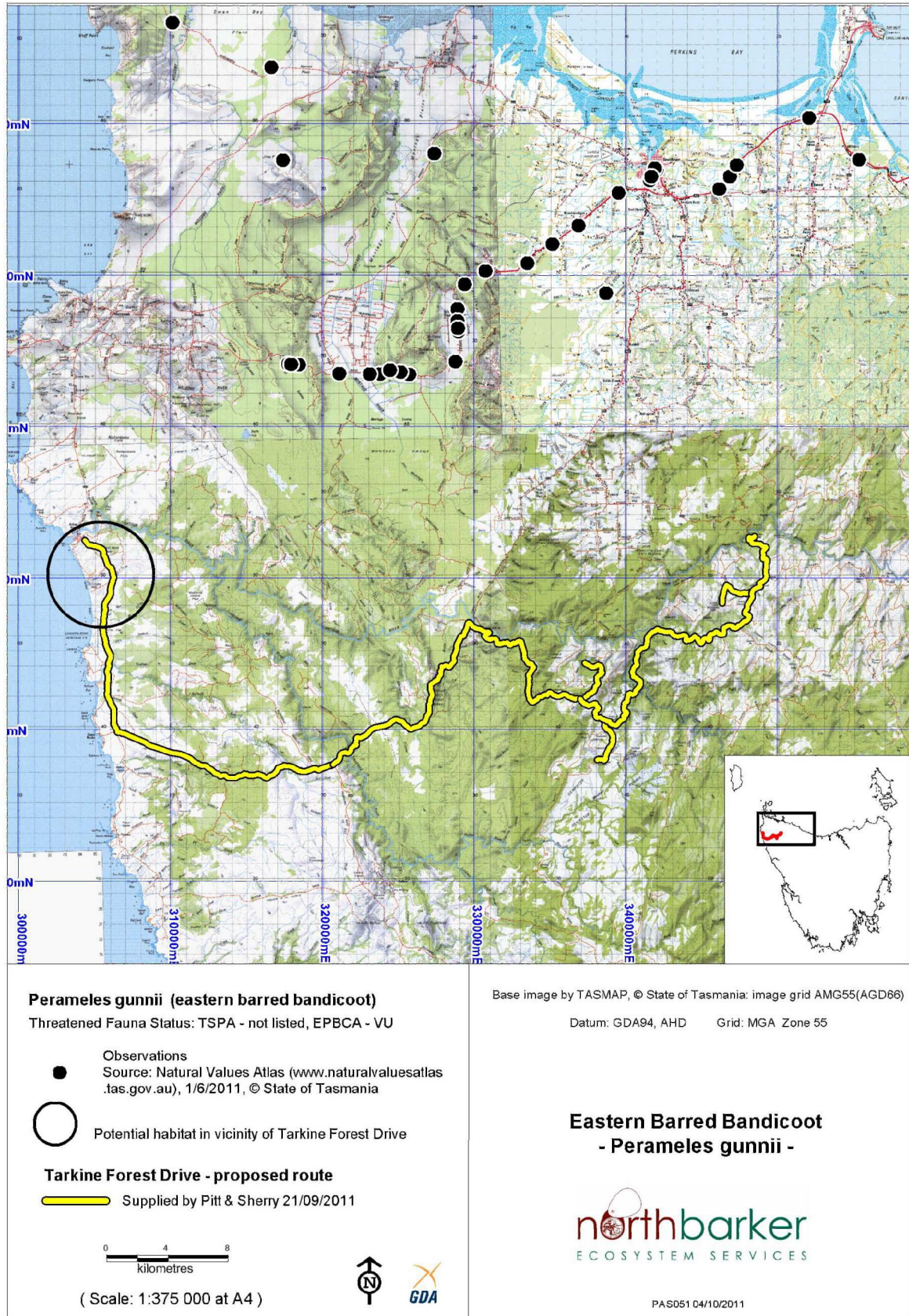


Figure 10 – Eastern barred bandicoot records in NW Tasmania