Additional information required for preliminary documentation Prosser Plains Raw Water Scheme, Tasmania (EPBC *2017/7927*)

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Issue	Date	Changed By	Description of Change
1.1	15/12/17	P Barker	Issued
1.2	13/04/18	P Barker	Respond to RFI from DOE
1.3	03/05/18	P. Barker	Include minor adjustments David Burt
1.4	21/06/18	P. Barker	Respond to RFI from DOE
1.5	29/06/18	P. Barker	Respond to RFI from DOE
1.6	13/09/18	P. Barker	Respond to Public Comment

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Location of Information responding to the RFI

The document Section and subheading number and page number are indicated below against each of the requirements for information as provided in the letter data August 8 2017 and entitled - Additional information required for preliminary documentation Prosser Plains Raw Water Scheme, Tasmania (EPBC 2017/7927).

1 General Content

Summary **1.1 page 9**

2 Description of Action

a) The location, boundaries and size (in hectares) of the disturbance footprint and of any adjoining areas which may be indirectly impacted by the proposal, including nearby habitat; and areas for stockpiles, vehicle access and associated activities. **2.1 page 10**

b) For pre-construction, construction and operation phases:

i. The proposed activities associated with each phase. **2.2 page 14**

ii. The anticipated timing and duration (including start and completion dates) of each phase. **2.2 page 14**

c) A description of the operational requirements of the action including any anticipated maintenance works. **2.3 page 14**

d) Any feasible alternatives to the action to the extent reasonably practicable, including the alternative of taking no action, a comparative description of the impacts of each alternative on MNES and sufficient detail to make clear why any alternative is preferred to another. Short, medium and long-term advantages and disadvantages of the options should be discussed. **2.4 Page 14; 2.5 page 15**

3 Description of environment and MNES Page 15

Physical Environment 3.1 page 15

a) A description of the swift parrot (Lathamus discolor) that may be affected by this proposal.
This section must provide information detailing known/recorded populations of the species and known or potential habitat, including species habitat both within and surrounding the disturbance footprint. **3.2 page 18**

b) A description of the quality and extent of the lowland native grasslands of Tasmania ecological community both within and surrounding the disturbance footprint. **3.5 page 31**

c) A description of the Tasmanian devil (Sarcophilus harrisii) that may be affected by this proposal. This section must provide information detailing known/recorded populations of the species and known or potential habitat, including species habitat and potential denning opportunities both within and surrounding the disturbance footprint. **3.3 page 25**

d) A description of the Wielangta stag beetle (Lissotes latidens) that may be affected by this proposal. This section must provide information detailing known/recorded populations of the species and known or potential habitat, including species habitat and potential movement connectivity pathways both within and surrounding the disturbance footprint. **3.4 page 28**

e) Details of the resources used to identify and assess the environmental values of the site,

including survey data and historical records. An assessment of the adequacy of any surveys undertaken, in particular the extent to which these surveys were appropriate and undertaken in accordance with the Department's relevant scientific and policy guidance. **3.6 page 36**

f) Whether consultation/advice was sought from local community groups or experts. **3.6 page 36**

4 Relevant impacts

a) An assessment of the direct and indirect loss and/or disturbance of habitat for each species. This must include the quality and type of habitat impacted and a quantification (in hectares) of the total impact area and areas indirectly impacted from the proposed action. **4.1 page 41**

b) Details of the distance of the proposed works to any known or potential Wielangta stag beetle habitat, and analysis of the impacts to species population resulting from the proposed action including impacts to connectivity of habitat. **4.2 page 26.**

c) An assessment of the direct and indirect loss and/or disturbance of the lowland native grasslands of Tasmania ecological community, including quality impacts, as a result of the proposed action. This response must detail the quantum and quality in hectares and the potential area to be impacted through direct removal and disturbance, along with the likely areas to be impacted surrounding the direct impact area.**3.5 page 45**

d) Details on whether any impacts are likely to be unknown, unpredictable or irreversible. **4.4 page 44, 3.5 page 45, 4.2 page 41, 4.3 page 43.**

e) A local, regional and national scale analysis of the likely impacts on the swift parrot, Tasmanian devil, Wielangta stag beetle and the lowland native grasslands of Tasmania ecological community. This should include a discussion of potential cumulative impacts on relevant MNES within the broader region where potential impacts from this proposed action are in addition to existing impacts of other activities (including known potential future expansions or developments by the proponent and other developers in the region and vicinity). **4.4 page 44, 0 page 45, 4.2 page 41, 4.3 page 43.**

f) Any technical data and other information used or needed to make a detailed assessment of the relevant impacts. **4.4 page 44, 3.5 page 45, 4.2 page 41, 4.3 page 43**

5 Proposed avoidance and mitigation measures

a) A detailed description of the measures proposed. This must include relevant protocols, the name of the agency responsible for each measure, locations and the timing for each measure. **5.1 page 46,**

b) Specific measures must be provided for the decommissioning of Tasmanian devil dens or potential dens; and maintaining habitat connectivity for the Wielangta stag beetle such as through the retention or replacement of suitable habitat features such as leaf litter and large logs. **5.2.4 page 50 and 5.2.5 page 50**

c) Avoidance or mitigation measures are also required for the clearing of swift parrot habitat to minimise the risk of harming individuals. This may include limiting clearing to times when the species is not present in the area, and/or conducting pre-clearance surveys to detect adults and nests. **5.2.3 Page 50**

d) A statement addressing the environmental objectives/outcomes the measures are expected to achieve. This must include details of any baseline data, performance criteria, monitoring, reporting and corrective action proposed to demonstrate progress towards

achieving these objectives. **5.3 page 51**

e) A description (including maps) of the location, boundaries and size (in metres) of any buffer areas for proposed exclusion zones or conservation purposes and details on how these areas will be excluded or protected. **5.2 page 47**

f) An assessment of the expected or predicted effectiveness of the measures proposed.

g) Any statutory or policy basis for the measures proposed. **5.1, 5.2 page 46.**

h) Measures for all project phases (construction, operation, decommission) of the proposed action. **5.1, 5.2 page 46.**

i) Details of ongoing management, including research and monitoring programs to support an adaptive management approach and determine the effectiveness of the measures proposed. **5.1, 5.2 page 46.**

j) The achievability of the measures proposed, including affordability. **5.2 page 46**

k) A description of any proposed rehabilitation to disturbed habitat areas, including management, methodology and timing. **5.3 page 51, 6.5.2.1 page 61, 6.5.2.2 page 63, 6.5.2.3 page 63**

6 Residual impacts and proposed offsets

a) The residual impacts on MNES discussed at Section 3 that are likely to occur after proposed avoidance and/or mitigation measures are taken into account. If applicable, include the reasons why avoidance or mitigation of impacts cannot be reasonably achieved. **6.1 page 52**

b) An offset package to compensate for residual impacts on MNES, such as the loss of swift parrot habitat and the lowland native grasslands of Tasmania ecological community. This should consist of an offset proposal (strategy) and key commitments and management actions for delivering and implementing a proposed offset (e.g. an Offset Management Plan). **6.2 page 52, 6.3 page 53-43**

c) The offset package must include, but not be limited to, the following:

i. A description of the offset site(s) including location, size, condition and environmental values present. **6.3 page 53-43**

ii. Justification of how the offset package meets the EPBC Act Environmental Offsets Policy. **6.3 page 53-43**

iii. An assessment (and justification for each input used) of the offset site(s) using the Department's Offset Assessment Guide. **6.3 page 53-43**

iv. Details on how the offset will be secured, managed and monitored, including management actions, responsibility, timing and performance criteria. This should include the specific environmental outcomes to be achieved from management measures. **6.2 page 52, 6.3 page 53.**

7 Other approvals and conditions

a) A description of any approval obtained or required to be obtained from a state or Commonwealth agency or authority (other than an approval under the EPBC Act), including any conditions that apply to the proposed action. **7.1 page 80-7**

b) A statement identifying any additional approval that is required. **7.1 page 80-7**

c) A description of the monitoring, enforcement and review procedures that apply, or are proposed to apply, to the action. **7.4 Page 81**

d) A statement identifying any interaction with other approved projects under the EPBC Act, including compliance with conditions on other approved projects. **7.5 page 81**

8 Social and economic

a) Details of any public consultation activities undertaken, and their outcomes. **8.1 page 81**

b) Projected costs and benefits of the proposed action, including the basis for their estimation through cost/benefit analysis or similar studies, e.g. employment opportunities expected to be generated by the project (including construction and operational phases). **8.2 page 82**

9 Environmental record of person proposing to take the action

a) The person proposing to take the action. **9 page 82**

b) For an action for which a person has applied for a permit, the person making the application. **9 page 82**

10 Conclusion 10 page 82

11 Information sources

a) The source and currency (date) of the information. **11.1 page 85- 45**

b) How the reliability of the information was tested. **11.1 page 85-45**

c) The uncertainties (if any) in the information. **11.1 page 85 -85**

d) The guidelines, plans and/or policies considered. **11.1 page 85-85**

1 General Content

The following document provides detailed information to fulfil the Request for Additional Information (RFAI) required to assist the assessment process for the Prosser Plains Raw Water Scheme (PPRWS) of which a component is the referred Action (EPBC referral 2017/7927). This document is therefore supplementary to the information already provided in the referral.

This document is formatted and numbered to reflect the structure of the RFAI. All primary documents on which this information relies are in Appendices or Attachments to this document.

The primary attachment is the original Referral document (Attachment 1) and its own attendant Attachments (Page 87). Some of the studies provided as Attachments to the referral have since been completed or updated. These are now included as Appendices to this document. Responses to public comments are provided in Appendix 10 and the public comments are in Appendix 10b.

1.1 Summary

The Action is the construction of an in stream dam on the Tea Tree Rivulet (Figure 1) on the Twamley property near Buckland in south east Tasmania. The construction of the dam requires the clearance of about 53 ha of native vegetation.

The Natural Values Assessment and referral documentation submitted in relation to this Action, considered all MNES known or likely to occur in the vicinity. The RFAI focusses on four MNES.

Swift parrot (Lathamus discolor) – critically endangered

Tasmanian devil (Sarcophilus harrisii) – endangered

Wielangta stag beetle (Lissotes latidens) – endangered.

Temperate Lowland Poa grassland – critically endangered

The focus of the information is on the distribution and abundance of MNES in the footprint of the Action, the vicinity and the national context. This information is presented in tables and maps derived from field data and State and Commonwealth databases.

Consideration of the context of the occurrences, the impacts and the implications of the impacts and potential for offsetting residual impacts is presented in the context of the best available scientific literature.

1.1.1 MNES habitat impact and mitigation

The table below indicates the area of vegetation and the MNES habitat that it represents that occurs within the footprint of the Action.

Habitat description	Area (ha)	Poa	Swift parrot	Tasmanian devil	Stag beetle*
(DAD) Eucalyptus amygdalina forest and woodland on dolerite	7.65			7.65	
(DOV) Eucalyptus ovata forest and woodland	21.64		21.64	21.64	5*
(DVG) Eucalyptus viminalis grassy forest and woodland	20.47			20.47	5*
(GPL) Lowland Poa labillardierei grassland	1.25	1.25		1.25	
(NAD) Acacia dealbata forest	0.26			0.26	
(SLL) Leptospermum lanigerum scrub	1.43			1.43	
Grand Total	**52.74**	**1.25**	**21.64**	**52.7**	**10**

Swift parrot

The swift parrot habitat occurs within an important swift parrot breeding area (SPIBA). It is a significant patch of foraging habitat with some nesting trees and adjacent nesting habitat. The loss of the habitat is proposed to be offset by the protection of other areas of high quality foraging and nesting habitat. The current intent is to protect an offset area within the Wielangta SPIBA.

Tasmanian devil

The Tasmanian devil habitat is primarily high quality foraging habitat with potential denning opportunities in existing burrows and in rocky small caverns. The denning habitat is not significant habitat because it is continuous with extensive areas that support denning opportunities. The impact of the Action is not considered to be significant based on EPBC general test for significance and so an offset is not proposed.

Wielangta stag beetle

The area of potential habitat of the Wielangta stag beetle occurs within a narrow riparian strip of suitable forest. No beetles were recorded. The detectability of this species is very low and so the habitat is assumed to be occupied. The impact of the Action is not considered to be significant based on EPBC general test for significance and so an offset is not proposed.

Poa grassland

The poa grassland is a small patch of naturally occurring grassland that requires maintenance by fire to sustain the condition within the characteristic of the threatened ecological community. The area is negligible in the context of the extent of habitat elsewhere in the vicinity.

It is propose the offset the impact of the inundation by either rehabilitating an existing degraded habitat on the same property or by protecting an alternative by Covenant.

Summary of Conclusion

The PPRWS will contribute to economic activity in the region. The development comes at the environmental cost of the inundation of 53 ha of native habitat.

The Action will result in the loss of MNES habitats as described above.

The acceptability of the proposal hinges on the acceptability of the loss of these habitats and the measures proposed to offset the loss. The habitat loss is proposed to be directly offset by protecting similar habitat elsewhere and or by rehabilitating forest and grassland in the immediate vicinity of the Action.

The offset proposal for this Action meets the EPBC Offsets Policy objectives and guidelines. An objective of the EPBC offsets policy is to provide “robust, positive environmental outcomes”. The EPBC offsets policy claims to incorporate current international best practice.

The EPBC offset calculator was used to calculate the worthiness of the offset proposals. The calculation confirmed that the “outcome” of the direct offset proposal can meet 100% of the offset requirement.

The proposal complies with the principals of the National Strategy for Ecologically Sustainable Development (ESD).

2 Description of Action

2.1 The Action – location size and purpose

The Action is the construction of an in stream dam on the Tea Tree Rivulet (Figure 1). The dam storage will be a nominal 3000 ML. The construction of the dam requires the clearance

of about 53 ha of native vegetation (embankment footprint and inundation area to full supply level). The dam would be filled by natural inflows.

Water from the dam will be released via an offtake to flow 17 km down the Tea Tree Rivulet and the Prosser River where it will be held behind an existing TasWater owned weir. This weir (known as the Lower Prosser Dam) storage reservoir supplies the existing TasWater Prosser Water Treatment Plant for local urban centres. The additional water will be extracted from the weir reservoir by a new pump station adjacent to the weir which will pump the raw water through a new pipeline to the Scheme customers (Figure 2).

The route of the pipeline is within a narrow planning corridor. It is currently proposed to be a predominantly terrestrial route but with a sub-marine section laid on the bed of the Prosser River for a portion of the route. The specifications of the pipeline will vary with the locality/terrain from mild steel (MS/MSCL), ductile iron cement lined (DICL), ABS or HDPE. The type of pipe and construction techniques will differ between the various terrestrial locations and the submarine route. The end of the pipeline between Meredith Point and Louisville Point is the end of the PPRWS delivery pipeline.

Four major water users have been identified in the preliminary business case and they would construct their own distribution systems. The users are Taswater, a golf course, a fish farm and other (yet to be identified but are most likely to be agricultural irrigation). The first three uses are for purposes already approved by the State and Council assessment processes.

A 200ML pa allocation from the Scheme as emergency supply for local, urban, treated water delivery in case of drought and/or climate change. The golf course will use the water for irrigation and the salmon farm will use the water to bathe fish to control amoebic gill disease.

The pipeline can be constructed and operated independently of the dam. The pipeline can operate independently during periods when there is sufficient water inflow into or over the two Prosser River weirs to allow the required rate of extraction and/ or if an alternative source of water were available. There are no MNES affected by the proposed regulated flow of the river or the construction of the pump station or the pipeline.

As such the dam has been identified as a discrete Action for the purposes of the EPBC.

The PPRWS has identified four major water users. The users are

1. Taswater – a 200ML contingency allocation for forecast regional treated water consumption to accommodate both climate change or drought condition scenarios and regional growth. No additional infrastructure is required for PPRWS to supply this allocation. Any extraction additional to TasWater's current water licence multiple allocations would require DPIPWE approval;
2. Solis Developments P/L - a 300ML allocation to establish and maintain a golf course (with an associated residential development also driving treated water growth) on the Louisville Peninsula. These infrastructure developments have been approved by the GSBC under their planning scheme,
3. A salmon farm – a 500ML allocation using the water to bathe fish to control amoebic gill disease. The salmon farm is to operate using an expansion within an existing marine lease. Additional sub-marine, floating marine and on-shore infrastructure has achieved or is pending approvals under the GSBC Planning Scheme. An independent EPBC referral (2017/ 7954) has been assessed and approved.
4. Other users are yet to be identified but are most likely to be agricultural irrigation.

Extraction from either the dam outlet or from the run-of-river delivery will require little additional infrastructure for the existing farmers who have expressed interest. The Expressions of Interest for water allocations by farmers to the north of the proposed pipeline termination points have no means of delivery at this time and cannot be supplied under this proposal.

Each user (other than TasWater) will have to construct suitable distribution systems from offtakes provided in the PPRWS.

There are no MNES reported as impacted by the operation of the known water users.

The inundation area will flood a 4WD track on Twamley (private land). Tasmanian Crown Land Services (CLS) and the Parks and Wildlife Service (PWS) believe that the route is a road reserve and that the survey indicating private land is in error. CLS and PWS require an alternative road reserve to be identified, but not developed. The resolution of this is incomplete. The track may be developed into a track in the future to access the land upstream and if so will be done under a Forest Practices Plan which is exempt from the EPBC under the RFA.

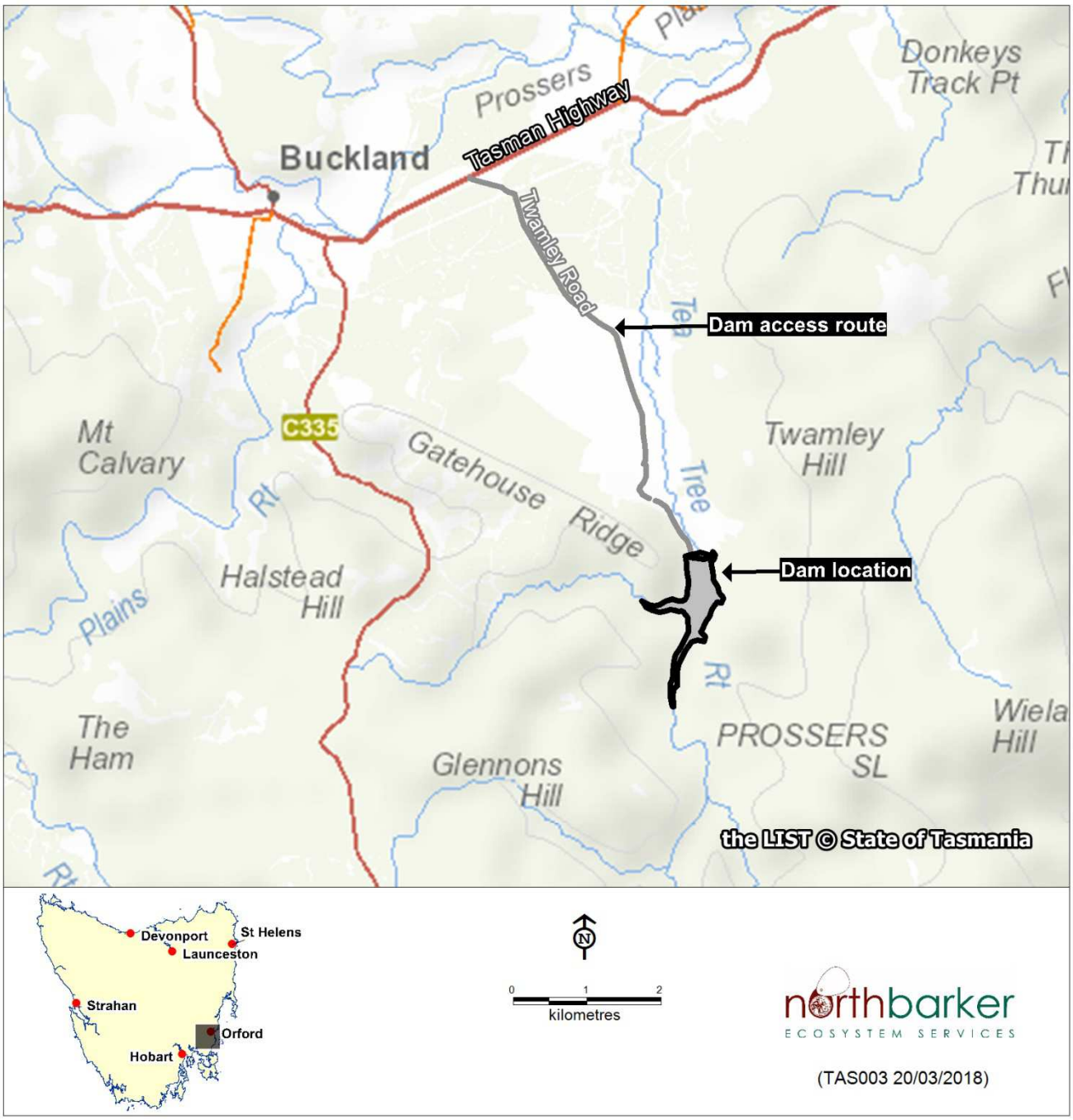

Figure 1. The location and extent of the Action.

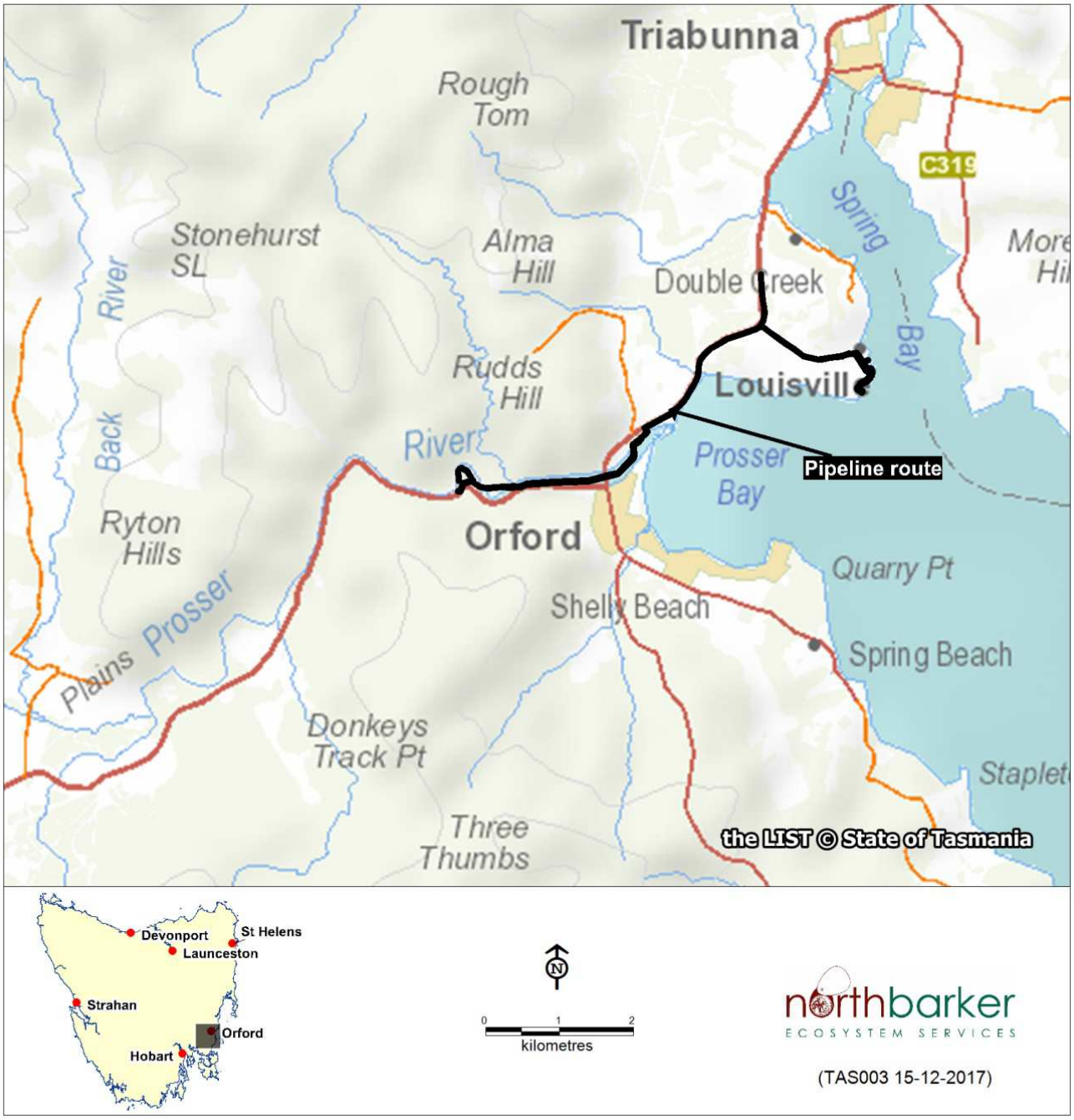

Figure 2. The location of the water pipeline.

2.2 Phases

Phase 1 - Planning & Approvals Municipal, State and Commonwealth approvals processes.

Phase 2 - Pre-construction - this covers detailed design, additional surveys (including baselines) , logging and construction tender and award, establishment of systems, completion of responsibility matrices with contractors & their sub-contractors,

Phase 3 - Construction - covers site preparation, logging, road construction, coffer dams, dam keyway, dam embankment to outlet pipe installation, balance of embankment, spillway, site clean-up and preparation for filling.

Phase 4 - Operation - covers initial filling, dam safety sign-off, controlled water releases for PPRWS customers.

The construction phase activities are described in detail in the Dam Works Practices Plan (DWPP) and the Construction and Environmental Management Plan (CEMP)

Appendix 1 and Appendix 2.

Construction phase start date - Quarter 3 calendar year 2018

Construction phase end date - Dam embankment completion - Quarter 2 calendar year 2019

2.3 Operational requirements and maintenance

The operation of the Twamley Dam is based on winter-take collection of the licence allocated allowance (1795 ML pa under DPIPWE sustainability rules) and the passing of other flows. The inflows and transmission flows are monitored with data sent by telemetry. The outlet pipe valve can be operated remotely or manually to both achieve the progressive filling of the dam and the Scheme releases. Once full, the spillway can pass uncontrolled "overflow" of any excess inputs. The Scheme releases will be automated via the Scheme Manager, based on the actual and predicted customer demand. The inputs, transmission loss and extraction flow measurements will be accounted for to an accuracy of <5% per AS 4747 requirements. A commercial or purpose built PLC or SCADA control system will be used. The Dam and outlet is expected to require minimal maintenance and will operate at >99% availability. The extraction pump station downstream, will have a spare "standby" pump able to be manually switched into use.

2.4 Feasible alternatives

A major issue for the provision of reliable water supply to the coastal region of SE Tasmania is unreliable local rainfall - this results in many creeks being ephemeral. Therefore only those creeks or rivers with large catchment areas can be considered for a new winter-take water licence required for this project's proposed water demand of 1000ML pa. Combine this variable annual rainfall constraint with the requirement for a cost-effective dam site (dam fill to water storage volume ratio) then the number of suitable water collection and storage sites in the greater area is very limited. Suitable dam sites in SE Tasmania had previously been researched by the State (Rivers and Water Commission), Tasmanian Irrigation and various consultants on behalf of water utilities and farmers.

Use of, or incrementing existing water licences by enlarging existing local dams was considered but found to be a costly option. One of the significant cost contributors when modifying older, existing dams was the obligation to then meet fully, the current engineering and compliance standards which are more risk averse than those used for earlier approvals.

The preliminary results from reviewing the Tasmanian Sustainable Yields rainfall data (Water Assessment Tool ex CSIRO/DPIPWE) with a desk-top catchment survey, found the Tea Tree Rivulet to be the most suitable source for a high surety reliability (winter-take Surety 5) 1000ML nominal annual demand.

Hydrology and survey studies confirmed the nominated site's viability.

No other dam site in this catchment area provided both the necessary hydrological reliability and a justifiable capital cost to warrant taking past the concept stage. The state owned Tasmanian Irrigation group passed over this site as being too small to justify an agricultural irrigation scheme of the type and size that they are currently developing.

One existing water storage system able to be diverted into the Prosser catchment, known as Hobbs Lagoons, has been secured as an interim, supplementary water source for this Scheme. However it is not sufficient on its own to sustainably and reliably meet the scheme's annual water demand.

2.5 Supplementary water

TasWater have recently announced a feasibility study for the raising of the crest height their Upper Prosser Dam (weir) to increase their total reservoir storage volume on the Prosser River. This weir is below the confluence of the Tea Tree Rivulet with the Prosser River so has the potential to capture some of the high flow event waters from either catchment. This additional storage is likely to be in the order of several hundred ML (rather than the thousands of ML from the proposed Twamley Dam), so effectively acts as an insurance buffer to drought or climate change scenarios for the customers of TasWaters Prosser Water Treatment plant. This solution has insufficient volumetric capacity to address the needs of the other potential Scheme customers. The feasibility study is yet to make a conclusion about the cost effectiveness of this weir modification against yet to be identified alternatives and other than the proposed Twamley Dam allocation option. This allocation meets the short to medium term TasWater requirements but not their long term objective of a total of 1000ML of raw water storage. This allocation is being offered by GSBC at no or minimal cost for the benefit of the local community.

An interim alternative for the initial commissioning of the Scheme's fish-farm "customer's" needs has been arranged by its owner – a floating barge mounted, reverse osmosis, desalination plant complete with diesel generator set. This technology's high capital and operational costs as well additional it's carbon emissions, make this alternative only a short-term solution for fresh water supply to a limited number and type of customer. It is likely that this barge production unit may be retained by the owner in Tasmania as an emergency water supply for any of its other fish-farms.

3 Description of environment and MNES

3.1 Physical Environment

The PPRWS is located between Buckland and Orford on the east coast of Tasmania. The landscape features numerous rolling forested hills to about 400 m asl. The two lane Tasman Highway connects Orford to Hobart which is about 80 km west. The region is dominated by forests and to a lesser extent farm enterprises.

Forestry has been a mainstay of the economy but is now much less active. Agriculture cannot develop intensively with existing water infrastructure. The Twamley property is a grazing property supporting sheep and cattle.

The geology is predominantly igneous dolerite and alluvial sediments. The homestead is on a low hill about 1 km downstream of the proposed dam wall. Exotic pasture accounts for about 20% of the property. This area is suitable for irrigated cropping. The property backs onto State forest to the south. The property has a number of tracks traversing it. The main track supports forestry activity to the south where a number of plantations have been established on Twamley. The balance is native forest. Figure 3 provides a satellite image of the footprint and the vicinity.

The predominantly forested environment in the vicinity supports small patches of other structural habitat types including scrubs, grasslands and riverine wetlands. These habitats occur across a range of geologies including predominantly dolerite and sandstone. All occur along a strong rainfall gradient which is characterised by the wet sclerophyll dominated higher ground and the dry sclerophyll forests on the lower land.

Where suitable conditions are present, as either suitable forage species or prey resource, nesting or denning opportunities or coarse woody debris in wet forests or poorly drained flats then the swift parrot, Tasmanian devil, Wielangta stag beetle or poa grasslands may utilise the habitats.

Utilisation of the habitat by these species is patchy across the land scape.

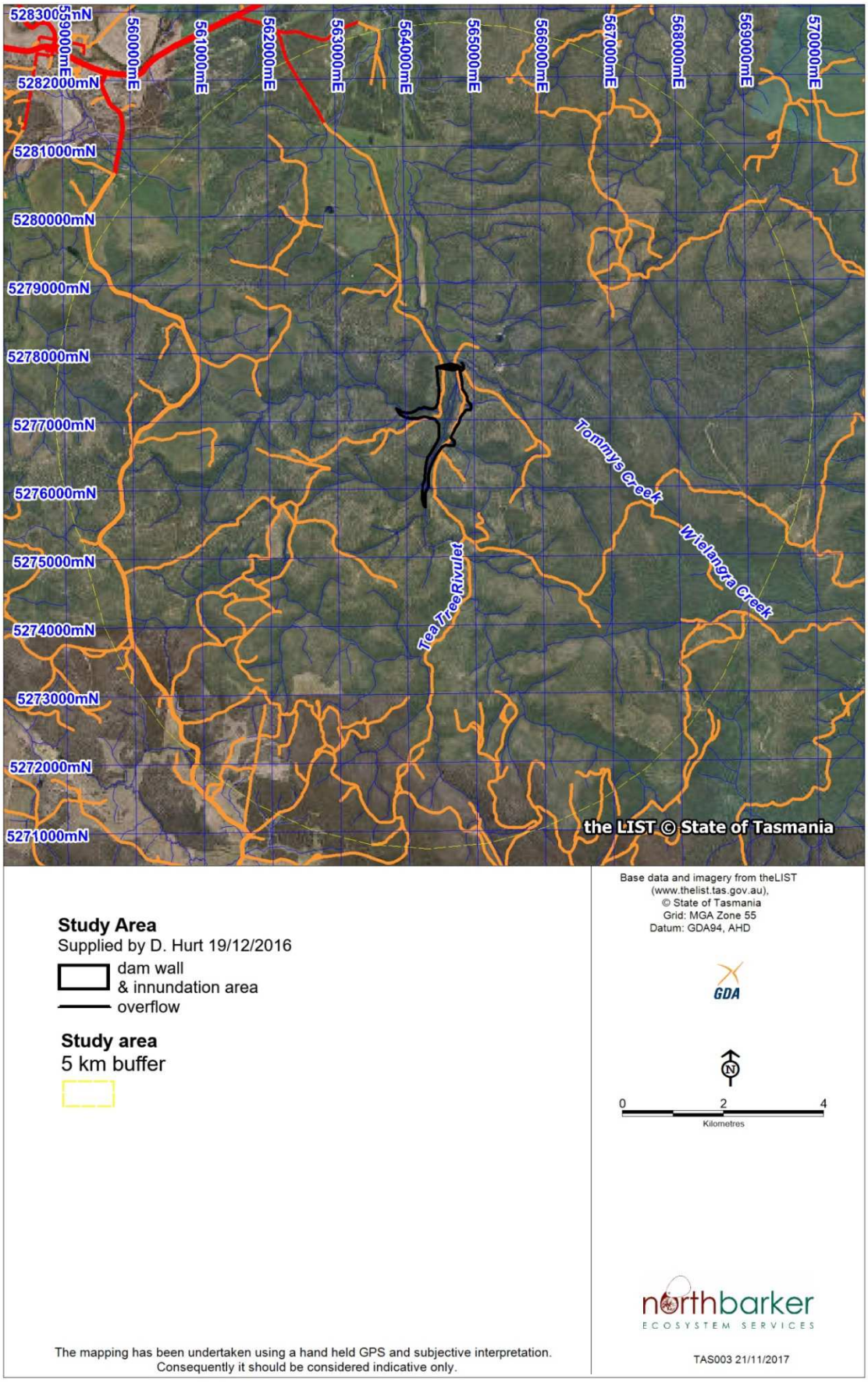

Figure 3. Aerial photo of the environment within 5 km of the Action (centre of photo).

3.2 Swift Parrot (*Lathamus discolor* – critically endangered)

The swift parrot is a Tasmanian breeding endemic. It utilises a range of forage resources but breeding success is strongly associated with the abundance of blue gum flowering and to a lesser extent E. ovata flowering. E. ovata is not the preferred foraging but is used in years when blue gum flowering is poor[1]. The swift parrot is dependent on hollows in eucalypts for nesting opportunities. The close association of foraging and breeding hollows is important[2]. When breeding is completed the birds return to the Australian mainland in the autumn to over winter and return the following August through early spring.

Findings: The dam footprint supports 21.65 ha of black gum forest and woodland and occasional blue gums. This is reported as an important early breeding season forage resource and an alternative to E. globulus foraging habitat in years of poor blue gum flowering (FPA 2010).

There are potential nesting hollows in mature and old growth trees in the dam footprint and in adjacent forest. The presence of potential nesting habitat was assessed using the FPA criteria (Section 3.7). The area identified as potentially supporting nesting hollows covers 19 ha.

Figure 4 illustrates the distribution of the swift parrot foraging and potential nesting habitat in the dam footprint and mature forest within 500 m.

During targeted surveys undertaken in the flowering season of 2016/17 no swift parrots were detected. It was noted that the *E. ovata* was not flowering and the few blue gum on site had scattered light flower at that time. The lack of flower and knowledge that the birds were aggregating elsewhere provided confidence that the birds were, at least, not frequenting the site and were not likely to breed in the habitat in 2016/17 season.

The habitat is characterised by three facies of E. ovata forest and woodland.

1. E. ovata sedgy forest

2. E. ovata grassy woodland

3. E. ovata grassy shrubland. This is regenerating vegetation that has been repeatedly burnt in the agricultural management regime.

A Vegetation Condition Assessment was undertaken of the E. ovata forest habitat. This provides the qualitative basis for the assessment of offsets that are proposed (Section 6.3). The results of the VCA from 3 sites are tabulated below. The forest and woodland are of about equal size (9 ha +/-) while the shrubland is a small degraded remnant of about 2 ha (**Table 1**).

Applying the Tasmanian Forest Practices Authority's criteria[3] for the assessment of swift parrot habitat the stands equate to high, medium and low quality foraging habitat.

Based on these findings it is assumed that swift parrots utilise the forest for foraging from time to time when conditions suit. The likely hood of nesting may be lower simply because the forest is E. ovata which is not the prime breeding season resource. Nevertheless nesting from time to time cannot be excluded as a possibility due to the proximity to stands of blue gum.

[1] Threatened Species Scientific Committee (2016).Conservation Advice Lathamus discolor swift parrot. Canberra: Department of the Environment.

[2] Threatened Species Scientific Committee (2016) Conservation Advice Lathamus discolor *swift parrot*. Canberra DOE

[3] Forest Practices Authority – Technote # 3. Identifying swift parrot breeding habitat.

Table 1. The vegetation condition scores and habitat quality of E. ovata dominated forest.

	'Site condition score'							*'Landscape context score'*						
	Large trees	Tree canopy cover	Lack of weeds	Understorey summary	Recruitment	Organic litter	Logs	Patch size	Neighbourhood	Distance to core area	***Total VCA score***	***Foraging stems relative abundance %***	***FPA quality foraging habitat***	***FPA quality nesting habitat***
Forest	6	5	15	15	5	5	4	8	7	4	**74**	**>50**	**high**	**medium**
Woodland	6	5	13	15	6	5	2	8	6	4	**70**	**30**	**medium**	**medium**
shrubland	0	0	9	10	5	5	0	8	6	4	**47**	**<5**	**low**	**Nil**

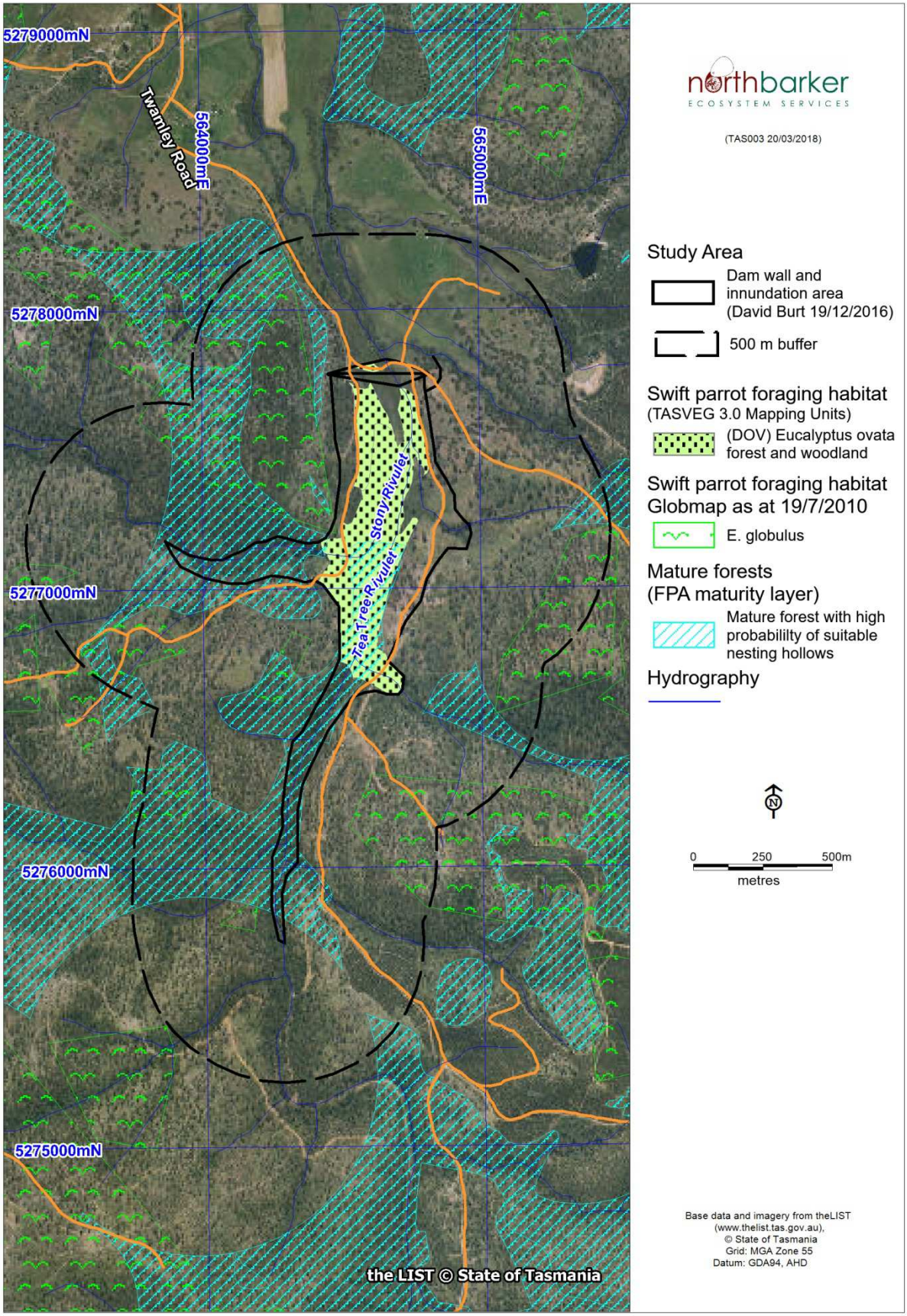

Figure 4. Swift parrot foraging and potential nesting habitat in the footprint of the Action and adjacent.

Context: The Action is within the Wielangta SPIBA (swift parrot important breeding area). Suitable forest in a SPIBA is considered important to the breeding success of swift parrots. SPIBA's are predominantly in the south east of Tasmania from about Triabunna to the southern forests (Figure 5 and Figure 6).

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

Within SPIBA's the blue gum and black gum flowers provide the nectar on which the young birds are reared to fledglings. Forests nearby these forage resources that are dominated by any eucalypt species and supporting nesting hollows are just as important as the forage resource. It is the close spatial relationship between foraging and nesting trees that is important to the energetics of the birds and hence a close association provides an opportunity for efficiency that is likely to promote breeding success.

The intensity of flowering varies from year to year in any one SPIBA; this spatial and temporal variation in flowering intensity means that the location of suitable to support breeding is unpredictable. The SPIBA(s) with the most intense flowering tends to support the breeding in that year. Due to the spatial variation in flowering, the persistence of adequate habitat in all SPIBA's is necessary to provide for swift parrot breeding success in all years.

Breeding success is also affected by other limitations. In particular, recent research has shown that predation of birds and eggs by the introduced sugar glider has resulted in severe losses (Stojanovic et al. 2014). These losses are the primary driver in population viability analyses which predict > 90% decline in the species over the next 15 years. Other threats including habitat loss, mortality due to collisions with infrastructure and disease contribute additional downward pressure on the population.

Habitat in the vicinity: Tasveg 3.0 mapping indicates the forest type in the vicinity to be virtually entirely *E. puchella* complex. This mapping unit can include dominant or co dominant blue gum and stands of blue gum.

DPU supports a mosaic of dry forest types with stands that were too small to discriminate in the original Tasveg mapping project (CRA 1996). Consequently, the DPU complex supports many small stands of DOV and DGL that are not discriminated in the mapping. Recognising this issue, specifically in relation to swift parrot habitat, further discrimination has been completed. A separate mapping layer known as "glob map" was produced by DPIPWE in 2010[4]. Glob map includes the Tasveg DGL layer and the additionally discriminated stands.

Figure 6 illustrates the extent of E. ovata and E. globulus dominated forest within 10 km of the Action mapped by Tasveg 3 (DOV, DGL and WGL) and "glob map". The total area of mapped foraging habitat within 10 km is 2296 ha. The component areas are:

DOV	27 ha.
DGL	214 ha.
WGL	79 ha.
Globmap	1973 ha.

Figure 6 also illustrates the location of known nesting sites and the extent of mature forest . It is highly likely that more nesting sites and many potential nesting hollows are present in the mature forest. Note that only 1 of 70 known nest sites within 10 km is not located in the mature forest.

Table 2 indicates the area of E. ovata and E. globulus forest in the south east bioregion and State wide and the area of each reserved. E. globulus wet forest, which is also an important

[4] DPIPWE, 2010, GlobMap, The swift parrot foraging habitat map. Biodiversity Conservation Branch, Department of Primary Industries Parks, Water and Environment. Tasmanian Government. Hobart

swift parrot habitat is not entirely discriminated in Tasveg. Until recently it was mapped as E. regnans forest and no abundance data are available.

Table 2: State-wide and bioregional extent and reservation status of the E. ovata and E. globulus forest (swift parrot foraging habitat).

TasVeg Code	State Wide Extent/ NRS Reservation Status	Bioregional Extent / Reservation Status
Shrubby black gum forest		
DOV	186,618 ha original 17,733 ha now 4,467 ha reserved	47,373 ha original 4,285 ha now 967 ha reserve
Grassy blue gum forest		
DGL	47,062 ha original 26,552 ha now 6560 ha reserved	47,062 ha original 26,552 ha now 6560 ha reserved

Expert opinion: Expert opinion was sought from Dr Phil Bell from the FPA and Eric Woehler from Birds Tasmania. Each provided written opinions (Appendix 3). In summary both conclude that the methods used to assess the habitat were appropriate and that the findings are a true reflection of the context and significance of the habitat.

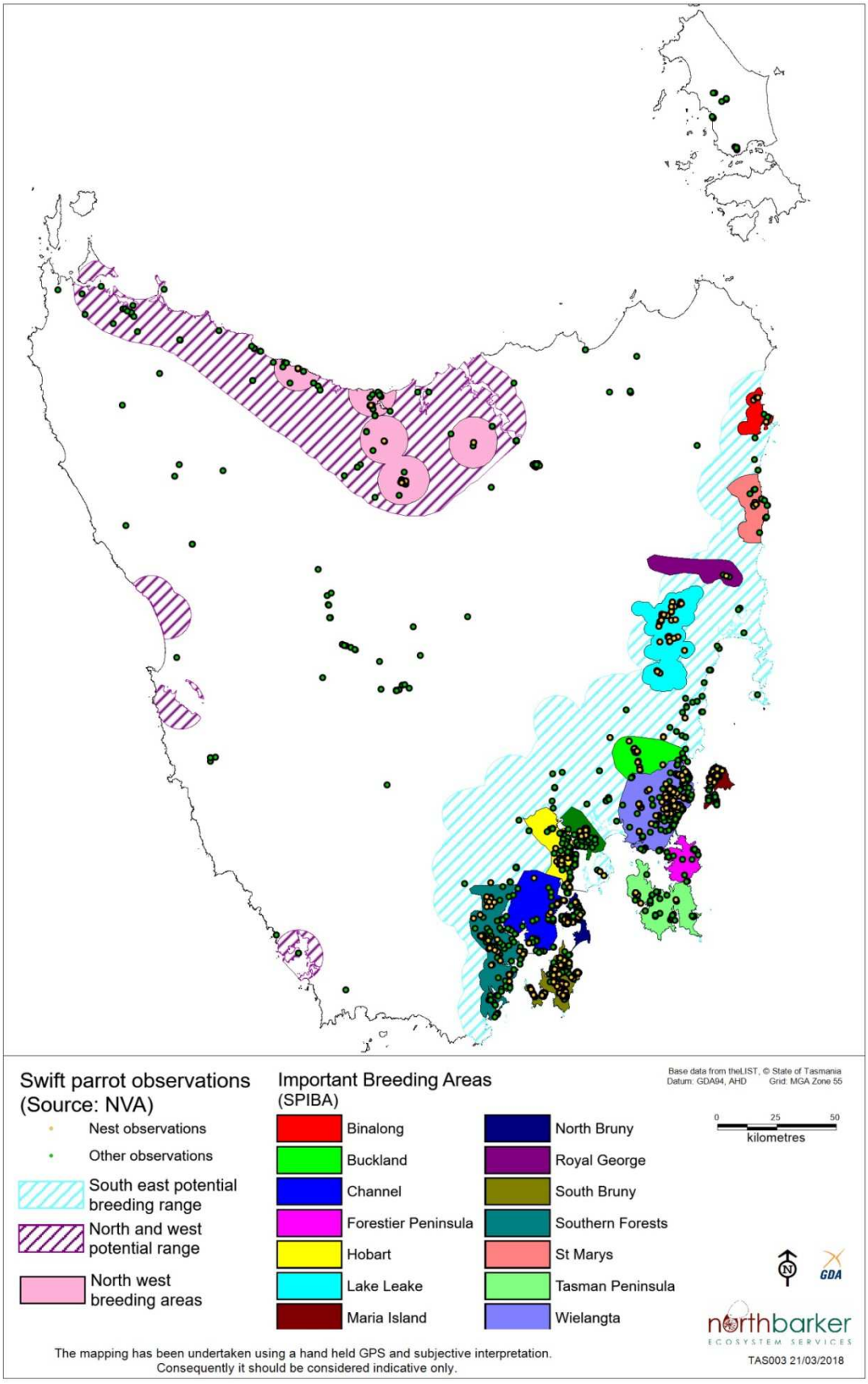

Figure 5. Swift Parrot Important Breeding Areas in Tasmania.

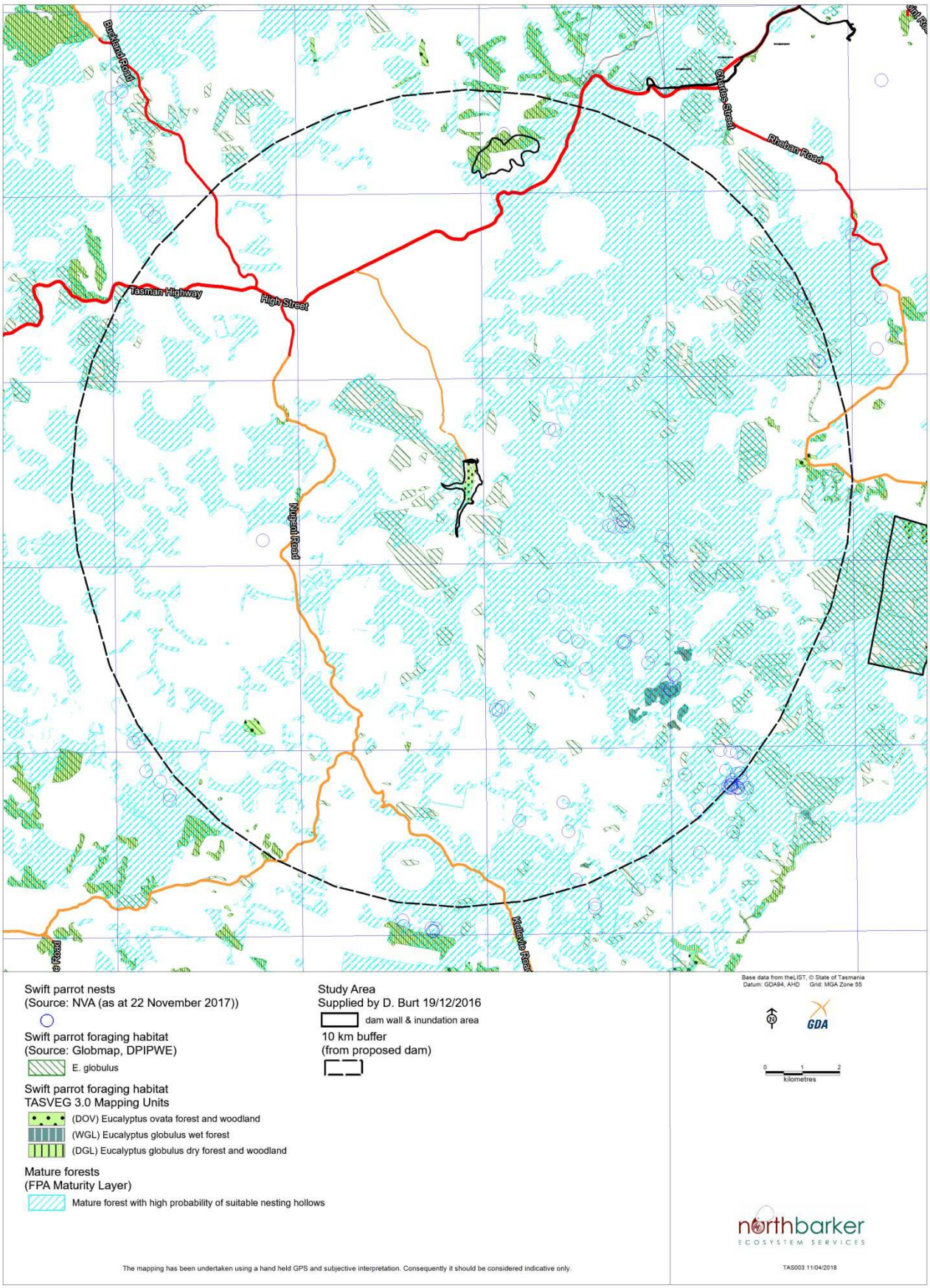

Figure 6. Swift parrot foraging habitat from Tasveg 3 and "globmap", known nests and mature forest within 10 km of the Action.

3.3 Tasmanian devil (*Sarcophilus harrisii* - endangered)

Context:

This species was listed on the *EPBCA* following the significant impact of Tasmanian devil Facial Tumour Disease (DFTD) on the population[5].

Persecuted along with the Tasmanian tiger, the species was in threat of extinction by the early 20th century. However changes in policy allowed the species to recover so that it reached historically high levels by the 1990's. Some estimates suggest the population may have exceeded 150, 000 individuals at that time[6].

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

Tasmanian devils are usually solitary animals but they share continuously overlapping home ranges and come into contact with other Tasmanian devils around prey carcasses and during the mating season[7]. They mate once a year giving birth in April through to July, and can produce up to four young which develop for up to 20 weeks in the pouch. The young are fully weaned at 10 months of age.

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

Animals typically travel around 8 km a night, although individuals have been recorded covering more than 50km in a single night[8]. They have home ranges of 8 to 20 km² (800 to 2,000 ha), although more recent studies suggest smaller ranges[9] probably reflecting higher carrying capacity. The home ranges overlap to a very large extent with other individuals but they forage separately and are antagonistic toward each other on meeting. The density of Tasmanian devils ranges between 0.3 and 0.7 per km².

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

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

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

Studies of devil Facial Tumour Disease (DFTD) have shown that it has spread across more than 60% of Tasmania with population declines averaging 84%, although the population in the northeast has declined by up to 96%[10]. The last remaining stronghold for the Tasmanian devil is in the northwest, with the west and southwest areas supporting much lower densities of disease free Tasmanian devils.

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[5] Threatened Species Scientific Committee (TSSC) (2009). Commonwealth Listing Advice on Sarcophilus harrisii. Department of the Environment, Water, Heritage and the Arts.

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

[7] Hamede *et. al.* 2009

[8] Tarkine Tasmanian devil Forum (2009)

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

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

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

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

The DFTD has passed through the area of the Action.

Potential habitat: Potential habitat for the Tasmanian devil is all terrestrial native habitats, forestry plantations and pasture. Tasmanian devils require shelter (e.g. dense vegetation, hollow logs, burrows or caves) and hunting habitat (open understorey mixed with patches of dense vegetation) within their home range.[11]

Significant habitat: Significant habitat for the Tasmanian devil is a patch of potential denning habitat where three or more entrances (large enough for a Tasmanian devil to pass through) may be found within 100 m of one another, and where no other potential denning habitat with three or more entrances may be found within a 1 km radius, being the approximate area of the smallest recorded Tasmanian devil home range (FPA Tech Note 10 2013). This is significant because (a) there is the potential for multiple individuals to be breeding there, so disturbance could have a particularly high local impact and (b) these features would imply that denning habitat is limited in the area, and its loss would be most likely to exert a higher long term impact. This definition of significance is relied upon because it supersedes EPBC conservation and listing advice and has been developed through collaboration between Tasmanian experts.

Within the disturbance footprint

The entire dam footprint is suitable habitat for foraging (52 ha). It is likely to be productive habitat due to the diversity of structure which will support a range of prey species, its optimal landscape position and proximity to agricultural land. No trapping survey nor electronic tracking was undertaken in the study area. Given the relatively small area of impact compared to range size the effort required to estimate the number of Tasmanian devils that utilise the site could not be justified on the basis that it would offer little additional relevant information to that described above for general ecology.

In the absence of disease the carrying capacity of the footprint is likely to be at the higher range of density estimates for the species (0.3-0.7 per km^2).

Seven observations recorded by motion cameras[12] confirm that the site is utilised by Tasmanian devils. The existing habitat in the study area and adjacent habitat provides continuous home ranges.

The location of natal dens is most likely to be in habitats that have suitable dry habitat above the water table; these include wombat burrows and may include other structures.

A habitat survey in January 2017 found wombat burrows were present in burrowable soils near the rivulet. Motion cameras did not record Tasmanian devils utilising either of two wombat burrows that were assessed. Other burrows and other potential denning structures are likely to be present. Dens are very difficult to locate without radio tracking animals.

Perhaps counter intuitively, the frequency of denning opportunities within the disturbance footprint and surrounding landscape, i.e. burrowable soils and rocky outcrops, earth banks etc. suggests that the footprint is not significant habitat. This is because 3 or more entrances are likely to be present repeatedly within at least 1 km radii of each other.[13] By this definition, significance relies on remoteness from other dens.

[11] DPIPWE – Threatened fauna range and habitat descriptions 2016.

[12] Survey guidelines for Australia's threatened mammals. APBC Act Survey Guidelines 6.5.

[13] FPA – Fauna Tech Note 10. Identifying Tasmanian devil and spotted-tailed quoll habitat.

Surrounding the disturbance footprint (5 km radius)

The Natural Values Report indicates that the surrounding area is potential range of the Tasmanian devil. The entire landscape surrounding the Action is potential Tasmanian devil habitat. However, just 8 sightings have previously been reported from within 5 km of the Action[14]. This low number is unreliable as a measure of relative abundance compared to other areas and more likely due to the remoteness from major roads.

Prey is also abundant in the vicinity and denning areas are likely to occur on the surrounding upper slopes high above the dam footprint. These areas offer dry denning opportunities in rocks caverns and potentially in logs. Banks and margins along creeks are also likely to support many denning structures.

The land to the north and west provides an optimum landscape mosaic of native/agricultural habitats for den opportunities and hunting. The carrying capacity of this habitat is likely to also be high.

The land to the east and south is predominantly a forest mosaic of dry and wet and plantation forests. These are also suited to denning and hunting but are likely to be lower productivity for the Tasmanian devil.

The opportunities for dens are likely to occur across the native forest landscape at a frequency of more than 3 per 1 km^2. This density of opportunities indicates that the habitat is high quality but is of not of high significance.

Other than DFTD the road kill on the Tasman Highway is probably the greatest threat to the Tasmanian devil in this area.

Expert opinion: The author has had numerous discussions over years with the widely recognised experts regarding the identification and quality of Tasmanian devil habitat. Two of the experts (Nick Mooney and David Pemberton) are the authors and major contributors to the literature and to the EPBC conservation Advice, Policy Statements and methods guidelines. As a result of this engagement and field experience the author has sufficient knowledge to identify the presence of Tasmanian devil habitat and interpret its likely productivity and significance in the context of the literature and experience in identifying and reporting such habitat for EPBC assessment through referrals and EIS.

[14] DPIPWE NVR December 2016

3.4 Wielangta stag beetle (*Lissotes latidens* - endangered)

Context:
The Wielangta stag beetle occurs in wet forests at more than 106 sites in south-eastern Tasmania in the area between Orford and Copping, and on Maria Island (Figure 7). Its distribution is centred on the Wielangta State Forest (Bryant & Jackson 1999b; TSSC 2002p) and covers an area of about 280 km² and it has been reported that the range holds about 43 km² of suitable habitat[15].

Within this area, Meggs (1999) found the beetle in a range of wet forest types including damp eucalypt forest, wet eucalypt forest, rainforest and riparian areas amongst drier forest types. Relative to other Tasmanian stag beetles, the Wielangta stag beetle was found to occur at quite low population densities. Michaels and Bornemissza, 1999 were also able to capture the beetle in relatively modest pitfall trapping efforts.

Meggs reported that the species had a preference for forest with a well-developed overstorey and greater than 10% ground cover of coarse woody debris (CWD). Although the Wielangta stag beetle is soil-dwelling throughout its life-cycle, it has a close association with CWD, occurring under logs at the interface of soil and CWD.

Since Meggs (1999) reported 20% of the habitat had been cleared, further areas of forest have been converted to plantation within the range of the beetle and the current extent of loss has not been calculated. Much of the range has been harvested and regenerated and a significant portion has been converted to plantation.

In 1999 Meggs reported that around 15% of the species' area of occurrence consists of potentially suitable habitat. This has possible serious consequences for the species as small isolated populations are at risk from localised extinction (Meggs 1999; TSSC 2002p). This was interpreted by Clarke & Spier-Ashcroft 2003 as being severely fragmented and is one of the criteria considered by the Scientific Advisory Committed for its listing as endangered.

Despite the 1999 efforts and the number of records, this species has proven notoriously difficult to locate. This is evident in the results of an intensive and extensive search in the Wielangta State forest completed by Groves (2006). Groves found 2 dead specimens after searches of more than 1000 m of logs and more than 3800 trap days using 162 pitfall traps. Groves also had the assistance of an excavator to move logs.

Two aspects of the ecology of the species that may contribute to low detectability are:

1. the species is reported to be nocturnal (Karen Richards Pers. Comm.[16]) and buries its self in the ground during the day;
2. that the animals remain in larvae form for years and may only be present in that form. The larvae cannot yet be identified to species level. Consequently, the lack of detection does not confirm absence or that the habitat is not suitable.

The patchiness in the distribution that has been described as severe fragmentation is not due to habitat fragmentation but rather patchiness in presence absence records and the increasing patchiness toward the north of the distribution (such as where the Action is located) (Pers. comm. Karen Richards).

[15] Threatened Species Scientific Committee (2002). Commonwealth Listing Advice on Lissotes latidens (Broad-toothed Stag Beetle).

[16] Karen Richards – Threatened Species Ecologist DPIPWE Nov 28 2017

Findings:
The majority of the dam footprint is dry forest which is not considered suitable habitat[17], there is no extensive wet forest. A very narrow riparian strip (2-5 m each side) dominated by E. viminalis is the only habitat that may be potentially suitable for the beetle. In this habitat large logs are rare and litter and debris are thin on the ground or else confined to piles of flood debris (CWD) that dries out in summer drought and may move with successive flood events. The beetle may or may not occur in such habitat. The riparian area discussed here extends over about 10 ha.

No Wielangta stag beetles were found and no larvae were found at the CWD ground interface.

Although it remains possible that the beetle is present and could have been missed during sampling.

Surrounding the disturbance footprint (10 km radius)

There is no suitable habitat continuous with and north of the Action due to historic conversion to pasture. Further north, north east and north west the landscape and its forests are drier and so in general do not conform to the suitable habitat descriptions. The landscape to the north, particularly along the Prosser River, supports riparian forests which could conceivably support the beetle, in fact the northern most outlying record is from such forest (Figure 7).

The vast majority of the known habitat is south of the Action in native wet forest. Consequently there are a number of records within 10 km south of the dam footprint. Native wet forests cover extensive areas on the higher ground and suitable aspects associated with Wielangta Hill and associated peaks (Figure 7). There are 3300 ha of wet forest within 10 km of the Action. It should be noted that the wet forest in Figure 7 is based on Tasveg 3 and the scale of mapping does not indicate the narrow strips of riparian wet forest along most creeks including where some of the records of WSB occur.

The dam footprint is north of the continuous habitat range but within the extent of occurrence. The SPRAT database reports this area as “species habitat is likely to occur”.

One record occurs 6 km upstream in the catchment of Tea Tree Rivulet in wet forest. At one site on the edge of Stoney Creek very near the dam footprint, Meggs (1999) was unable to find a stag beetle. At nearly half of the sites sampled in similar habitat Meggs did not find Wielangta stag beetles.

The most likely extension of range is in the wet forests east of the known range toward the coast.

In forestry areas in the vicinity the habitat of the beetle is protected in stream side reserves, typically of 30 m width.

Expert opinion: The recognised expert in this field and employed by the Tasmanian government is Dr Karen Richards. In discussion regarding the findings reported above, she has indicated that in her recent experience, when considering density and frequency of animals, the beetle is extremely rare in occupied habitat and that occupation is patchy. Richards has indicated that the beetle is increasingly patchy in the northern half of its range and she was not surprised that survey did not reveal it. Dr Richards supported the methods used but reiterated the low detectability due to the rareness and patchiness of occurrence.

[17] Threatened Species Scientific Committee (2002). Commonwealth Listing Advice on Lissotes latidens (Broad-toothed Stag Beetle).

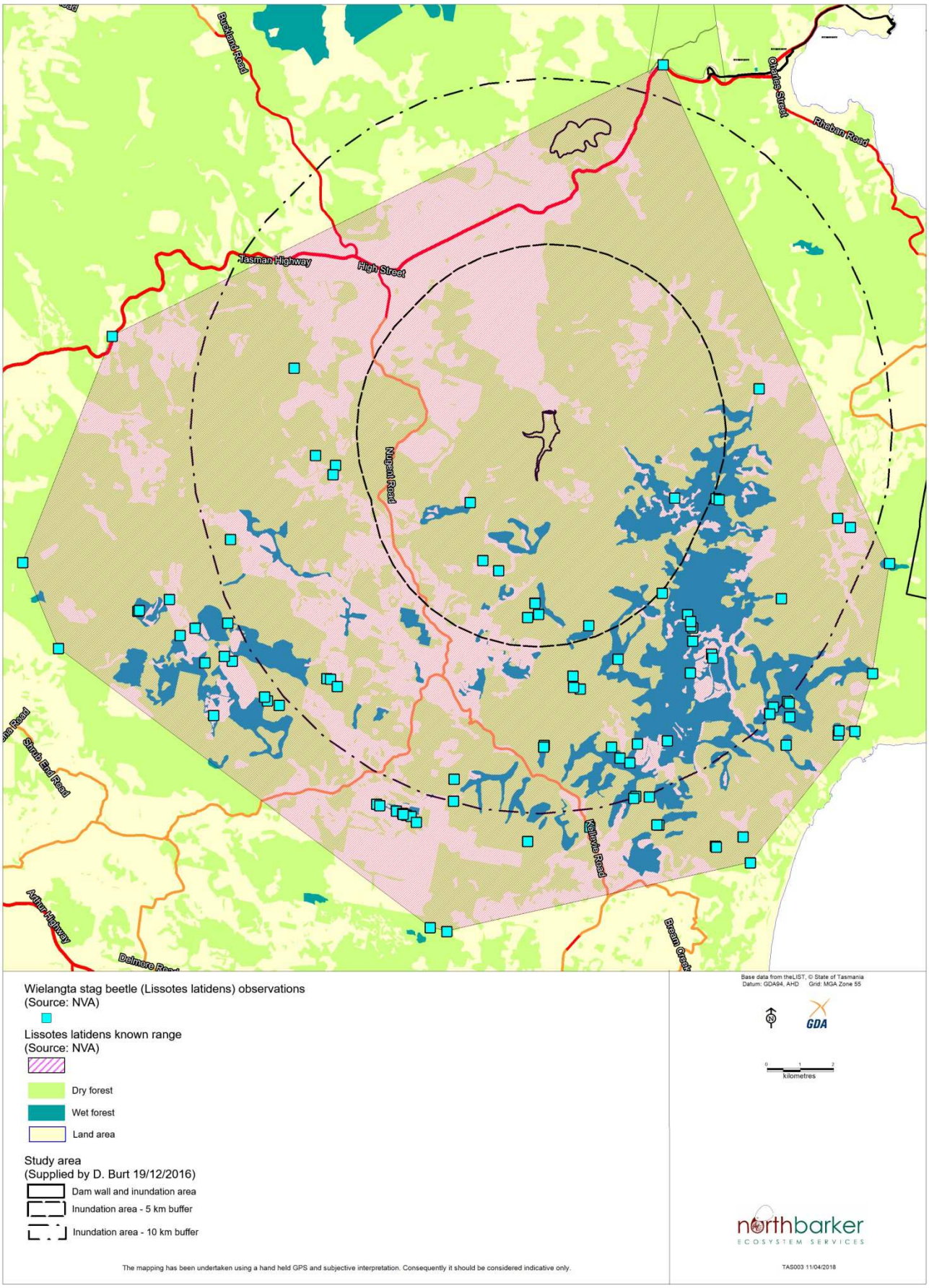

Figure 7. The distribution of records and the range of the Wielangta stag beetle.

3.5 Temperate Lowland Poa grassland (endangered ecological community) - (subset of Tasveg GPL)

GPL within the disturbance footprint: This grassland community occurs in the dam footprint and at the dam wall. 1.25 ha of poa is a natural occurrence in the dam footprint but is maintained by fire. This is evident from stems of burnt tea tree and invasion by Acacia dealbata.

GPL can form part of the EPBC listed threatened ecological community 'Lowland Native Grasslands of Tasmania. In this case the patch at the dam wall does not meet the condition criteria for the listed community because the cover of perennial weeds is too high and the diversity of native herbs is too low. However, the patch within the dam footprint does meet the EPBC[18] condition criteria and is >1 ha in size. The area occupied is 1.25 ha (Figure 8).

A Vegetation Condition Assessment (VCA) (Michaels 2006) was calculated based on field observations. VCA score is derived by comparison of scores for structural and floristic components to a notional "benchmark" patch of habitat. The notional benchmark score is 100. The result of the assessment are listed in Table 3 below.

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

Trees: Eucalyptus ovata var. ovata

Tall Shrubs: Acacia dealbata subsp. dealbata

Herbs: Acaena novae-zelandiae, Ajuga australis, Geranium potentilloides var.

potentilloides, Mazus pumilio, Oxalis perennans, Rubus gunnianus, Senecio sp.,

Veronica calycina, Wahlenbergia sp.

Graminoids: Carex iynx, Lepidosperma longitudinale, Lomandra longifolia

Grasses: Deyeuxia sp., Poa labillardierei

Weeds: Centaurium erythraea, Cirsium arvense var. arvense, Holcus lanatus,

Hypochaeris radicata, Lysimachia arvensis, Rubus fruticosus, Verbena officinalis, Vicia sp.

GPL in the vicinity: The Lowland Native Grasslands of Tasmania ecological community equates with the GPL Tasveg floristic community in full where the condition thresholds presented in the listing advice have been met. However, field assessment is required to confirm the presence of the EPBC ecological community.

In Tasmanian there are 13 500 ha of lowland grasslands (GPL) mapped by Tasveg 3. Of these 1900 ha are reserved. In the south east bioregion there are 7 700 ha mapped and 500 ha reserved.

Adjacent to the Action, Poa labillardierei lowland grassland is present in a broad marsh and in narrow strips along the Tea Tree Rivulet riparian area downstream from the Action. This grassland has been assessed against EPBC criteria and does not meet the condition criteria for the endangered ecological community (P. Barker March 23 2017).

Additional small and another substantial (> 20 ha) area occur within 10 km of the Action (Figure 9). However, these are derived from clearance of woodland and scrub and have been utilised for grazing for many years. Consequently, they are degraded to the extent that they do not or are unlikely to meet the condition criteria that define the EPBC ecological community.

[18] Department of the Environment, Water, Heritage and the Arts, 2009 Nationally threatened species and ecological communities guidelines EPBC Act Policy Statement 3.18

There are 16 patches of GPL covering an area of 129 ha within 10 km of the Action that are not mapped in the policy statement. There are 70 patches of GCL covering an area of 460 ha within 10 km of the Action also not mapped in the policy statement. All of the GCL and most of the GPL are derived and intensively grazed. Those patches that are natural have long been exposed to grazing and have been degraded. It is possible that a small portion meets the EPBC condition criteria. Field assessment of each patch would be required to determine if and where the EPBC ecological community is present.

Sites on the Brushy Plains (PID 3175797), The Thumbs Creek (PID 2812272) and Runnymead (PID 2805187) that are mapped in the Policy Statement do not meet EPBC condition criteria. The grasslands are mapped as GPL or GCL by Tasveg. Inspection of satellite imagery (2017) indicates that the Tasveg mapping over estimates the extent at The Thumbs and Runnymead, and almost all of the grassland present is derived.
The table below indicates the extent of GPL an unknown amount of which would meet the criteria for the endangered ecological community.

TasVeg Code[19]	**State Wide Extent**[20] **/ NRS Reservation Status** [21]	**Bioregional Extent / Reservation Status**
GPL	13,500 ha mapped 800 ha reserve	7,700 ha mapped 500 ha reserved

Expert opinion: R. Brereton (Entura) and Stephen Casey (Consultant) advised that in their opinion the grasslands in the vicinity of the Action were in poor condition and do not meet the EPBC criteria for the listed ecological community. Each completed surveys of the grasslands downstream of the Action to consider whether there could be any impact of the Action on MNES. The condition of the poa grassland in the footprint of the Action was discussed with them and it was agreed that if the weed cover and diversity of native herbs complied with the EPBC criteria then it would conform to the listed ecological community. It was further discussed and agreed that appeared to be burnt regularly and was likely to be dependent on fire for its maintenance. The author is also expert in the identification of lowland poa grassland being the author of the original Tasmanian grasslands recovery plan in 1999.

[19] Kitchener & Harris 2013

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

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

Table 3. The VCA and EPBC vegetation condition score/criteria for lowland poa grassland.

	'VCA Site condition score'							*'VCA Landscape context score'*			
	Dominant life form	Life form summary	Lack of weeds	Persistence potential	Organic litter	**Subtotal**	**Multiply by 1.07 (Forest equivalence)**	Patch size	Neighbourhood	Distance to core area	***Total VCA score***
Poa grassland	15	10	11	4	3	**43/70**	**46/75**	1	9	4	**60**

✓/X	**EPBC Threatened Ecological Community Criteria**	**Enter estimate here**
✓	Patch size ≥ 1ha, AND	1.25
✓	≥ 50% of perennial native tussock cover is Poa *and/or* Themeda OR Herbs + Poa/Themeda ≥ 50 % total ground cover, AND	100
✓	If **P. lab dom,** ≥ 5 native herb species in 0.5 ha, Sept – March, AND	>8
✓	≤ 5 mature Euc trees/ ha, AND	< 5
✓	≤ 30% solid crown cover of trees and shrubs > 2m, AND	<10
✓	≤ 10 % solid crown cover regenerating woody natives, AND	<10
✓	≤ 20 % of ground cover is perennial weeds	<10

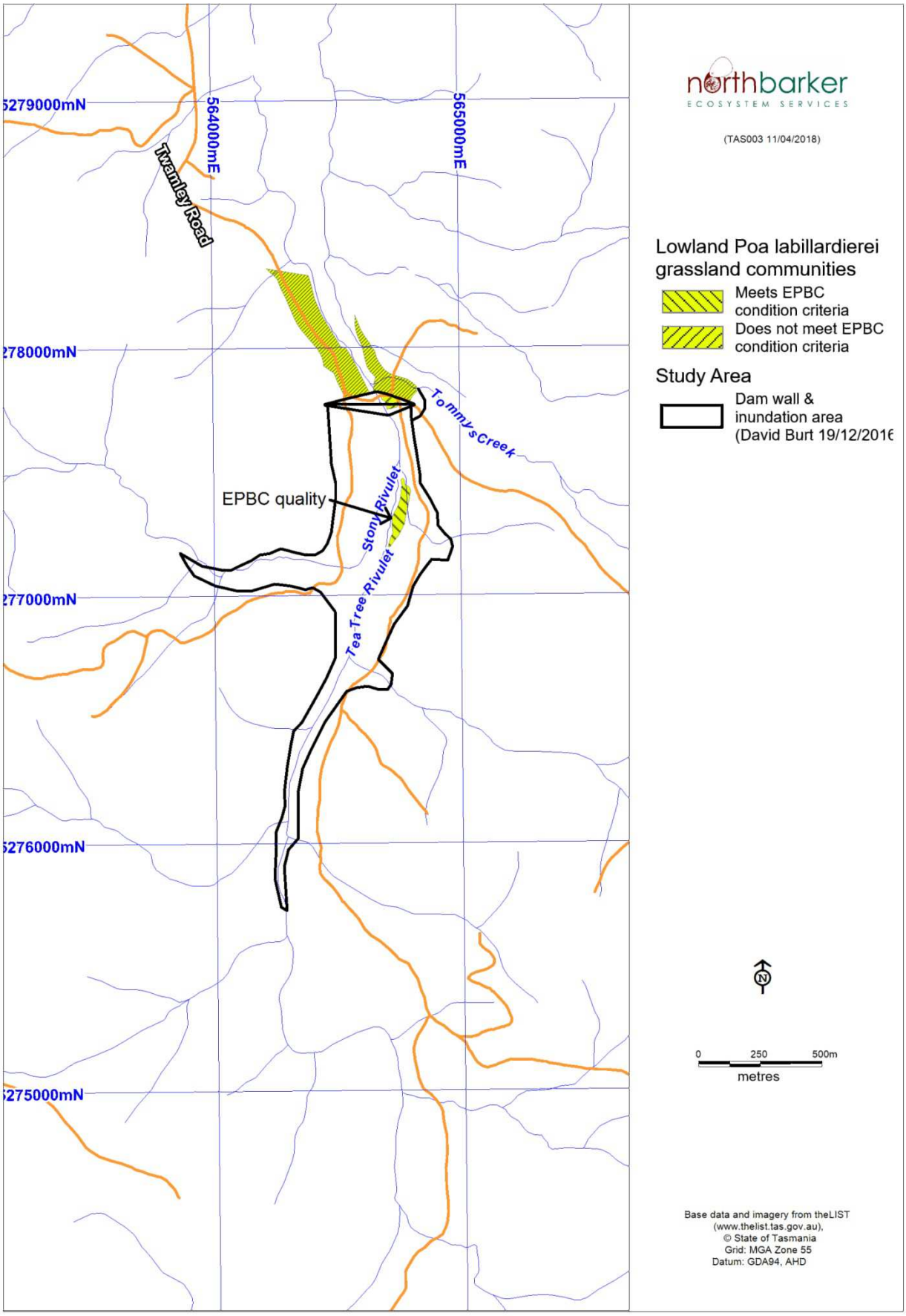

Figure 8. The distribution of the ecological community – temperate lowland grassland.

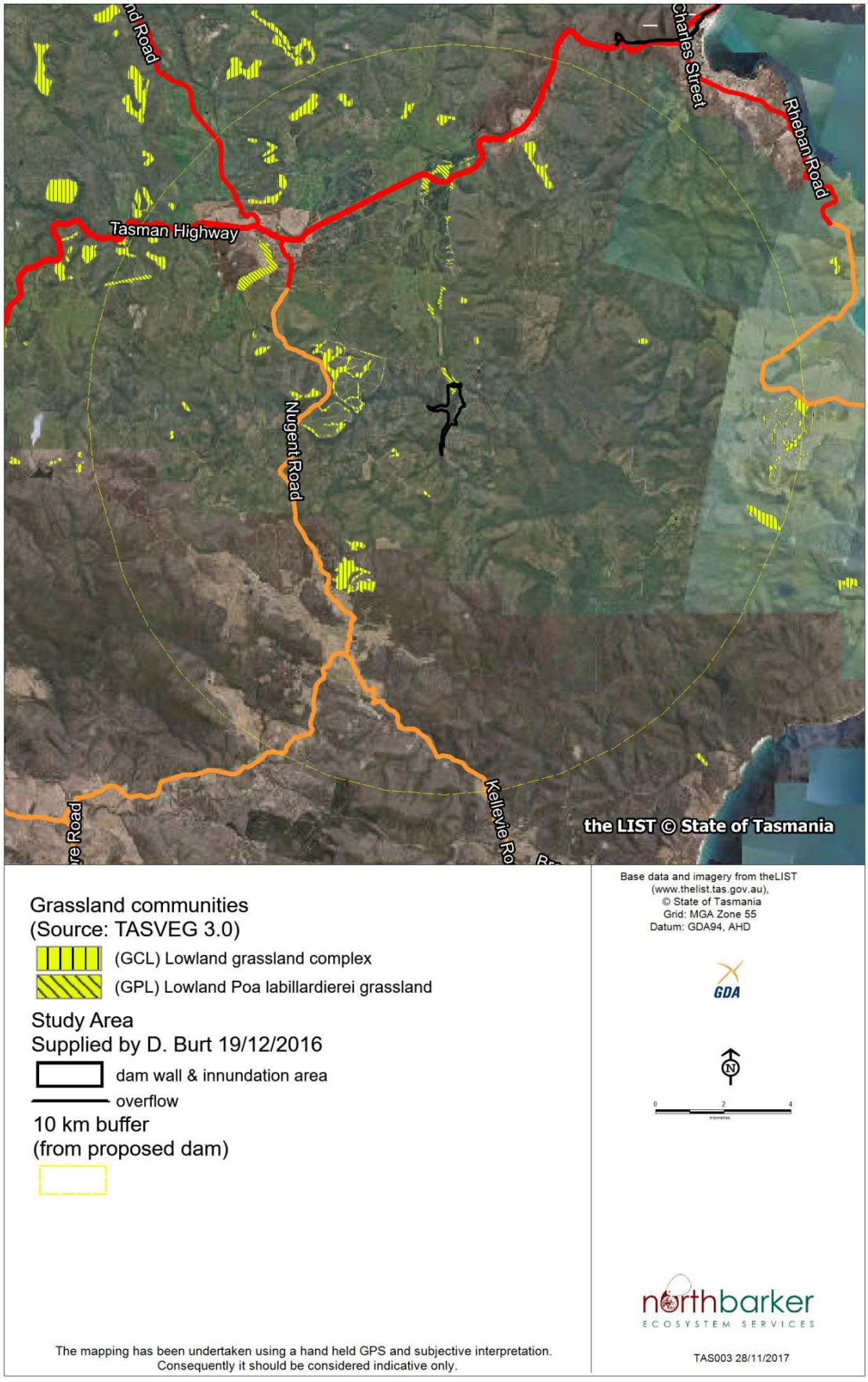

Figure 9. The distribution of Poa lowland grassland and lowland complex in the vicinity (from Tasveg 3).

3.6 Contribution of findings to overall understanding of MNES

The findings for each of the MNES discussed above are consistent with expectations of the location, landscape and range of habitats present. The findings reinforce the current knowledge of the distribution, habitat prevalence and likelihood of occupation of the habitat in the footprint and the habitat in the vicinity of the Action.

The occurrence of 1.25 ha of lowland poa grassland along a low lying drainage line (Tea Tree Rivulet also reinforces current understanding. The prime habitat for this community is along broad riverine flats where ever it occurs in Tasmania. It is however, less common in the south east where forest tends to dominate these flats. Hence, the area of the MNES being restricted in size.

It is known that the Action is proposed to be undertaken in a swift parrot SPIBA and so the discovery of a large stand of swift parrot foraging habitat was likely because it is common in the area and that is why it is a SPIBA. The apparent absence of the swift parrot in 2017 is consistent with the knowledge of the spatial correlation of bird activity with the flowering of blue gum. The birds aggregated for breeding in the south Bruny Island SPIBA in that season while habitat in the Wielangta SPIBA did not produce abundant flower. While the Wielangta SPIBA was active in the 2018 season the absence of birds from the habitat in the Action simply reflects that the particular forage resource (E. ovata) was not flowering. These finding are entirely consistent with the understanding of the ecology of the swift parrot described in the literature and including the EPBC Act Advice, guidelines and policy statements.

The Tasmanian devil is known to occupy the vast majority of Tasmania. It is understood that in the absence of DFTD the variation in density across Tasmania is driven by the productivity of the habitat and at a larger scale the availability of denning habitat. The habitat can be naturally productive, supporting abundance prey in all seasons, or its productivity can be enhanced by the proximity of the habitat to improved pastures that support large populations of prey species. In the case, the habitat characteristics are of a naturally moderately productive landscape that is enhanced by its proximity to the exotic pastures adjacent to it. These finding are entirely consistent with the understanding of the ecology of the Tasmanian devil described in the literature and including the EPBC Act Advice, guidelines and policy statements.

The Wielangta stag beetle is a micro endemic species restricted to a small area of Tasmania. It is known to be rare in occupied habitat and that occupation is patchy. Notwithstanding the limitations of searching a large area for a rare beetle, the failure of the survey to discover a beetle is entirely consistent with the literature and particularly unsurprising because the habitat is not as described as core habitat in the literature.

3.7 Survey methods, resources and effort

Survey Timing

All original and subsequent surveys were within the recommended survey periods for species with suitable habitat present. The MNES vegetation and fauna habitat surveys were undertaken between the 10th and 19th of January 2017. Habitat assessment for MNES and observations for sign evidence including calls (swift parrot) was completed at this time.

Additional Stag beetle surveys were carried out on February 20 and March 9.Tasmanian devil motion camera establishment was undertaken between 20th February and the 9th of March 2017.

Swift parrot habitat condition assessment was completed on the 8th and 20th of March 2017.

An additional swift parrot presence absence survey was undertaken on the 10th of November 2017.

Method, resources and effort

The identification of species (and their habitat) and ecological communities have been undertaken in accordance relevant EPBC guidelines. Where no guidance is provided by EPBC guidelines, surveys of animals and or habitats were completed using methods described and approved for use in Tasmanian State scientific and policy guidelines.

All surveys have inherent limitations. The observation of sign evidence is directly related to the abundance of evidence and the intensity of sampling and therefore sign evidence can be missed. This extends to the observation of hollows in trees, dens in thick vegetation and skeletal remains of animals including beetles. This risk was minimised by observing recommended survey intensity.

All surveys were undertaken on the ground, walking through habitat with the assistance of maps and GPS. Two ecologists were present for all surveys except swift parrot habitat condition assessments and motion camera set up and collection, which were completed by one ecologist.

Total survey effort is in the order of 64 hrs over 52 ha of land, 48 hrs of which was within the foraging period of the swift parrot.

Temperate Lowland Poa grassland

This community was mapped using Tasveg mapping protocols[22]. The condition criteria attached to the EPBC policy statement 3.1[23] were applied to floristic and structural data to determine that the ecological community was present.

Opinion regarding the condition and origin of the Poa grasslands included below was discussed with expert colleagues and associates (Ray Brereton Entura, Stephen Casey Consultant)

Swift Parrot

Foraging habitat was identified and mapped where present. This was defined as blue gum dominated or black gum dominated forest. Foraging habitat was assessed using the criteria described by the Forest Practices Authority in Technical Note # 3 (Table 4).

Utilisation of the habitat is assumed to occur from time to time based on location and forage trees present; the EPBC survey guidelines for detecting threatened birds do not provide any methods for determining quality or quantification of habitat[24].

Glob Map was used as an indication of foraging habitat present within the vicinity[25]. Glob map includes the Tasveg E. globulus grassy forest (DGL) layer and the stands of DGL that have been discriminated from within other forest.

Mature trees in the disturbance footprint were observed from ground level for the presence of potential nesting hollows.

Nesting habitat was also assessed using the methods described in Technical Note 3. The Forest Practices Authorities Mature Forest layer was used to identify forest with at least a medium potential to support nesting hollows. This layer is based on the cover of mature trees and the level of senescent trees in the canopy. All forest categorised as high or medium maturity was adopted as potentially supporting nesting hollows.

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[22] Department of Primary Industries, Parks, Water and Environment. TASVEG 3.0, Released November 2013. Tasmanian Vegetation Monitoring and Mapping Program, Resource Management and Conservation Division.

23 Department of the Environment, Water, Heritage and the Arts (2010). Lowland Native Grasslands of Tasmania — a nationally threatened ecological community. Environment Protection and Biodiversity Conservation Act 1999 Policy Statement 3.18. Australian Government, Canberra.

[24] Department of the Environment, Water, Heritage and the Arts (2010) Survey guidelines for Australia's threatened birds.

25 DPIPWE, 2010, GlobMap, The swift parrot foraging habitat map. Biodiversity Conservation Branch, Department of Primary Industries Parks, Water and Environment. Tasmanian Government. Hobart

The methods detailed in Technical Note 3 are consistent with and extend the EPBC survey guidelines for threatened birds[26].

The location of the habitat was compared to the extent of Swift Parrot Important Breeding Areas provided on Figure 5 (above).

Other organisations were approached for comment on the significance of the habitat present in the disturbance foot print. Representatives from the Forest Practices Authority and Birds Tasmania were asked if the methods employed to qualify and quantify the habitat were appropriate and if so is are the findings "significant" or "otherwise" and for what reasons.

Expert opinion was sought from Dr Phil Bell from the FPA and Eric Woehler from Birds Tasmania. Each provided written opinions (Appendix 3).

Presence absence surveys:

The Natural Values Atlas (DPIPWE) was interrogated for records of occurrence from within 5 km radius.

Presence absence surveys were completed using the methods applied by DPIPWE for annual breeding season surveys (Webb 2008)[27] and compliant with the EPBC survey guidelines. Five minute stops listening for calls were completed every 100 m through suitable habitat (5 stops along each of 10 transects), incidental listening stops were also completed during the flora and fauna habitat assessment in January 2016. This assessment was repeated in November 2017 at which time a drive through survey of the full length of the footprint and 2 km south was also completed. It was noted that the *E. ovata* was not flowering and the blue gum on site had scattered light flower at that time. The lack of flower and knowledge that the birds were aggregating elsewhere provided confidence that the birds were not frequenting the site and were not likely to breed in the habitat in 2016/17 season.

Table 4. Potential foraging habitat tree density.

Potential foraging-habitat density class	Description[b]
High	≥ 50% of the stems over 40cm dbh in any one hectare patch are foraging-trees[c]
Medium	20-49% of the stems over 40cm dbh in any one hectare patch are foraging-trees[c]
Low (dry forest)	1-19% of the stems over 40cm dbh in any one hectare patch are foraging-trees[c]
Low (wet forest)	10-19% of the stems over 40cm dbh in any one hectare patch are foraging trees[c], except for the southern forest and south Bruny SPIBAs where the threshold is 1-19%
Negligible	All areas that do not meet the above definitions

[a] *Potential foraging habitat does not include* E. globulus *plantations. Plantation forest may have a very large percentage cover of* E. globulus, *but due to age, tree density and genetic strain plantations are generally unlikely to provide a substantial foraging resource for the swift parrot.*

[b] *Forest type, i.e. wet or dry, is to be determined in accordance with the FPA Forest Botany Manual. In circumstances where the definitions provided do not meet the intent of Swift Parrot management prescriptions, documentation and explanation can be provided to the FPA for consideration.*

[c] *Potential foraging-trees are* E. globulus *and/or* E. ovata *≥40 cm dbh.*

[26] DEWHA 2010. Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2.

[27] Webb, M. 2008. *Swift parrot Breeding Season Survey Report – 2007/2008*. Threatened Species Section, Biodiversity Branch, Tasmanian Department of Primary Industries and Water. Viewed 10 Feb 2009 at http://www.dpiw.tas.gov.au/inter.nsf/Attachments/LJEM-7GKVQQ?open

Table 5. Potential nesting habitat tree size and density.

Potential nesting-habitat density class	Mapping layer categories for desktop assessment [a]		Field-based assessment criteria [c]	
	PI-type 'E' class (mature eucalypt crown cover)	SenCode mapping layer[b]	Dry forest	Wet forest
High	a and b (>40%)	All except nil	At least 8 trees/ha are over 100 cm dbh.	At least 15 trees/ha are over 100 cm dbh or 8 trees /ha over 150 cm dbh
Medium	c (20-40%)	All except nil	At least 8 trees/ha are greater than 70 cm dbh.	At least 8 trees/ha are greater than 100 cm dbh.
Low	d and f (1-20%) OR a, b and c (>20%)	All categories Nil	Trees over 70 cm dbh are present, but comprise less than 8 trees/ha.	Trees over 100 cm dbh are present, but comprise less than 8 trees/ha.
Negligible	PI-types with no E class density	All categories	There are no eucalypt trees over 70cm dbh	There are no eucalypt trees over 100 cm dbh

[a] *These are the mapping categories used to construct the Mature Habitat Availability Map (www.fpa.tas.gov.au). Both crown cover and senescence assessments are based on aerial photo interpretation of the forest canopy and are depicted in the PI-type and SenCode mapping layers respectively.*

[b] *Senescence categories are the proportion of mature crowns that show visible signs of senescence.*

[c] *A size limit is used to facilitate rapid assessments of mature trees. However, it is acknowledged that in some areas regrowth trees can be ≥100 cm in diameter and some areas smaller trees can provide mature forest features such as hollows. In circumstances where the definitions provided do not meet the intent of swift parrot management prescriptions, documentation and explanation can be provided to the FPA for consideration.*

Tasmanian devil

Tasmanian devil habitat was identified by comparison to the habitat characteristics described in the Commonwealth listing advice[28]and the FPA 2012[29].

Motion camera surveys complied with methods described in EPBC survey guidelines[30].

All survey efforts and den activity assessments complied with methods described by DPIPWE 2015[31]. Habitat survey was undertaken over 3 separate days concurrently with general habitat assessments and vegetation mapping. The method included a meandering transect which included inspection of all habitat types and variation within them. The identification of potential den structures during this survey was based on inspecting

[28] Threatened Species Scientific Committee (TSSC) (2009). Commonwealth Listing Advice on Sarcophilus harrisii. Department of the Environment, Water, Heritage and the Arts.

[29] FPA – 2012 Threatened Species Range Boundaries and Habitat Descriptions.

30 Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act

[31] Natural and Cultural Heritage Division (2015) Survey Guidelines and Management Advice for Development Proposals that may impact on the Tasmanian devil (Sarcophilus harrisii). Department of Primary Industries, Parks, Water and Environment.

potentially suitable structures such as log hollows, rocky outcrops, burrowable banks existing animal burrows.

The Natural Values Atlas was interrogated for records of occurrence from within 5 km radius.

No methodological advice is provided in the EPBC Policy Statement.[32]

Wielangta stag beetle

Literature relevant to species description, habitat, distribution and survey methods was reviewed and included Meggs (1999) and Groves (2006), FPA 2011 and Commonwealth listing advice[33].

The Natural Values Atlas was interrogated for records of occurrence from within 10 km radius.

The survey methods complied with those described by the FPA 2011[34].

The methods used were those described in Technical note number 4 produced by the Forest Practices Board.

The presence or absence of adult beetles was determined by employing a single search method involving the systematic rolling of logs and smaller woody debris to enable close scrutiny of the exposed ground for the presence of live adults and exoskeletal remains

The survey included 6 sites. The survey areas were stratified across the inundation area, with a minimum of one survey point per 10 hectare area in each suitable forest type. . The search effort was 4 hours on each of 4 days and included rolling logs, digging in and below decayed logs and searches under woody debris; particularly flood debris.

Expert opinion was gained verbally from Dr Simon Groves (Tasmanian museum) and Dr Karen Richards (Threatened species zoologist DPIPWE). These discussions included habitat descriptions, range, fragmentation of habitat, connectivity of habitat, frequency of occurrence, detectability, life stage detectability, abundance at known sites.

No methodical advice is provided on the SPRAT database and neither Conservation Advice nor a Recovery Plan exists.

[32] EPBC Policy Statement 3.6 Tasmanian devil (Sarcophilus harrisii)

[33] Threatened Species Scientific Committee (2002). *Commonwealth Listing Advice on* Lissotes latidens *(Broad-toothed Stag Beetle)*.

[34] FPA – 2011 Fauna Tech Note No. 4. Protocol for conducting broad-toothed stage beetle *Lissotes latidens* surveys.

4 Relevant impacts

4.1 Summary of impacts on habitats

Table 6 below indicates the extent of direct loss of habitat due to the Action, for each MNES described in Section 3 above. Habitat clearance and inundation converts the habitat to unsuitable and practically irreversible in all cases.

No indirect losses of habitat are anticipated for any MNES including downstream.

The quality of the habitats are described in Section 3 in detail and summarised here.

Table 6. The extent of habitat directly lost to the Action.

Habitat description	Area (ha)	Poa	Swift parrot	Tasmanian devil	Wielangta Stag beetle*
(DAD) Eucalyptus amygdalina forest and woodland on dolerite	7.65			7.65	
(DOV) Eucalyptus ovata forest and woodland	21.64		21.64	21.64	5*
(DVG) Eucalyptus viminalis grassy forest and woodland	20.47			20.47	5*
(GPL) Lowland Poa labillardierei grassland	1.25	1.25		1.25	
(NAD) Acacia dealbata forest	0.26			0.26	
(SLL) Leptospermum lanigerum scrub	1.43			1.43	
Grand Total	**52.74**	**1.25**	**21.64**	**52.7**	**10***

* potential habitat.

4.2 Swift Parrot

The data below are based on field measures, Tasveg 3 mapping and analysis (DPIPWE 2014) and records kept by the FPA.

Direct impact: The impact of the construction of the dam and inundation of the land is the loss of all of the habitat in the dam footprint. The direct impact of the Action is the loss of foraging and some potential nesting habitat which is practically irreversible.

The DOV habitat within the footprint of the Action occurs in three condition states:

1. 15 ha high quality foraging / medium nesting
2. 5.65 ha medium quality foraging / low nesting
3. 2 ha low quality foraging / nil nesting

In the south east Bioregion there are 4300 ha of DOV mapped by Tasveg including 1000 ha reserved.

In the south east Bioregion there are 18 100 ha of DGL mapped by Tasveg including 5 500 ha reserved.

Locally there are 2296 ha of foraging habitat (DOV, DGL, WGL) mapped within 10 km.

The direct impact on foraging equates to the loss of 1% of the habitat within 10 km and 0.1% of the habitat within the south east bioregion.

Locally there are 14 150 ha of mature forest, likely to support hollows, within 10 km and closely associated with the foraging habitat.

The direct impact on potential nesting habitat equates to the loss of 0.1 % of the habitat within 10 km. This is unlikely to affect breeding success.

The south east bioregion contains 10 of the 12 SPIBA's.

The impact of the loss of the habitat on the conservation status and viability of the swift parrot is not known. It is not know to what extent the habitat lost to the Action contributes to population viability. Existing population viability focusses on the impact of predation[35] .

Indirect Impact: No indirect impacts are anticipated. However, the swift parrot only breeds in Tasmania and so the regional impact on breeding is equivalent to the National impact. The impact of a reduced breeding success may playout in winter survival rates on the mainland of Australia. However, E. ovata is not the preferred foraging species supporting breeding success and is used in years when blue gum flowering is poor[36].

The potential for indirect impacts as a result of competition from large honey eaters is unpredictable. The birds are already present in the open woodland, which is expected. An increase in their number would require an increase in carrying capacity and such an increase is unlikely to be related to the Action. It is not anticipated to exacerbate predation by sugar gliders. This predator is almost certainly already present in the landscape which conforms to the criteria that are associated with high levels of predation i.e. broad scale forestry activity including selective logging within the footprint, It is not anticipated that the Action would exacerbate other threats including collision with structures, wildfires or disease.

Cumulative impact: Other historic and cumulative impacts are predominantly related to land clearing. The Conservation Advice identifies habitat loss as severe on the mainland of Australia but quantitative impact on the species is unknown. The Conservation Advice identifies blue gum clearance and clearance of breeding habitat as a threat. However, the protection of the conversion of DOV and DGL to plantation as a result of the Tasmanian RFA has limited the loss of habitat. Notwithstanding this limitation, patches of DOV and DGL may have been selectively or entirely logged with the intention to regenerate. This treatment, however, effectively removes the foraging and nesting habitat from these stands for decades, while they regenerate. The area logged under Forest Practices Plans to be regenerated is recorded by the Forest Practices Authority. Additional small areas have also been lost to conversion to pasture and other developments, some with and some without Forest Practices Plans.

The area of DOV and DGL that has been logged and regenerated since 1998 is 1196 ha of DOV and 5342 ha of DGL. These areas are 6.7 % and 20% of the current area respectively. The Action proposes to clear 0.1% and 0% of each.

The contribution of the Action to the cumulative impact is unknown and effectively unpredictable. The potential of a cumulative impact of foraging and nesting habitat loss is to decrease breeding success by limiting the forage resource that supports the breeding effort in adjacent nesting habitat.

[35] Threatened Species Scientific Committee (2016). *Conservation Advice* Lathamus discolor *swift parrot*. Canberra: Department of the Environment.

[36] Threatened Species Scientific Committee (2016). *Conservation Advice* Lathamus discolor *swift parrot*. Canberra: Department of the Environment.

There is no likelihood of future expansion of the Action by the proponent. There are other water developments planned for the region but they are insufficiently advanced to be considered here.

Conclusion: The impact of the Action is considered to be significant based on EPBC significant impact criteria.

4.3 Tasmanian Devil

The Tasmanian devil ranges widely across the local, regional and Tasmanian landscape as described in Section 3.

Direct impact: The inundation of about 53 ha of foraging and some potential denning opportunities will cause the loss of this habitat. The direct impact of the loss of the habitat are is practically irreversible. The response to the direct impact of habitat loss at this scale is reasonably predictable.

All vegetation habitats present in the inundation area are optimal foraging habitat. The den habitat in the inundation area is not significant den habitat because it is continuous with other extensive habitat (outside the footprint) that is highly likely to support dens that will not be impacted. The loss of dens from this habitat is therefore not likely to cause a significant impact on breeding success.

Significant denning habitat is by definition, relatively rare, because it is defined by remoteness or isolation from other denning habitat.

There is a low probability that devils could be killed in the process of land clearance and the construction phase. If occupied dens are not detected in pre clearance surveys then the loss of an individual is possible but unlikely. Devils are unlikely to remain in dens as inundation approaches the den.

There is a low probability that devils could be killed by collisions with vehicles either used on the construction site or travelling to and from the construction site. The probability is low because the number of vehicles involved is small, the speed of the vehicles on the construction site is low and the daylight operating hours are outside of the main danger period of dusk to dawn. Despite the low probability of collision a mitigation strategy is included below in Appendix 2c.

Indirect Impact: The loss of the habitat may result in the displacement of a few individuals whose home ranges overlap each other and the inundation area. This displacement may result in a small amount of increased competition locally. However, if the population is below carrying capacity, due to disease pressure, the displaced individuals are unlikely to cause a density dependant loss of animals and will fit within carrying capacity.

Cumulative impact: Historic and cumulative impacts on the size of the population across Tasmania are predominantly related to persecution and most recently disease. The loss of native habitat to land clearance has not been reported as contributing to pressure on the natural population but could impede recovery if disease pressure is high. In this region there is anecdotal evidence that the Tasmanian devil population is recovering from the initial impact of disease.

It is not known what the cumulative impacts of small losses of habitat are on the conservation status of the Tasmanian devil because it has not been considered in a population viability analysis. Listing Advice does however indicate that the Tasmanian devil is less susceptible to habitat modification than many other mammals. The existing population viability analysis focusses on the impact of DFTD[37].

[37] Threatened Species Scientific Committee (TSSC) (2009). *Commonwealth Listing Advice on* Sarcophilus harrisii. Department of the Environment, Water, Heritage and the Arts.

Under historically high, and now a recovering local population, the cumulative impact of habitat loss on the population size is difficult to identify because it is confounded by changes in carrying capacity, and population recovery and decline elsewhere. Certainly, the rates of forest conversion described in section 3 do not have the same impact on the Tasmanian devil as they do on the swift parrot. This is because the loss of mature flowering trees equals the loss of significant habitat for the swift parrot but the same conversion does not destroy foraging habitat for Tasmanian devil's prey species and can provide or retain denning opportunities for the Tasmanian devils. Forest conversion to pasture is likely to have driven the population growth of the Tasmanian devil in the past, due to the population growth of prey species grazing on the pasture. Consequently, current rates of conversion of forest in the area and beyond are unlikely to be having a cumulative negative impact on the population. There is no likelihood of future expansion of the Action by the proponent. There are other water developments proposed for the region but they are insufficiently advanced to be considered here because they may not eventuate.

Conclusion: The impact of the Action is not considered to be significant based on EPBC general test for significance.

4.4 Wielangta stag beetle (WSB)

The entire known distribution of the Wielangta stag beetle is illustrated in Figure 7. The species is endemic to Tasmania and regionally is restricted to the Wielangta area.

Direct impact: The inundation of about 53 ha of habitat includes about 10 ha that has the potential to support the WSB. The impact of the loss of the habitat on the conservation status and viability of the WSB is not known. It is not known because it is not known if the habitat is occupied or indeed ultimately actually viable and it is not know to what extent single patches of occupied habitat contribute to population viability.

The WSB has not been located at most of the sites searched by ecologists over the years. Meggs reported not finding the beetle at nearly 50% of sites and Groves was far less successful than that. No one knows if that means that they are undetectable in some circumstances or have a very patchy distribution in which they are absent from much of the forest area.

Regardless of whether the beetle is there or not the direct impact on the habitat is practically irreversible.

There are no abundance estimates for the stag beetle. However, Bryant and Jackson[38] reported an extent of occurrence of 280 km^2 and Clarke[39] suggested that 43 km^2 of that is potential habitat. The area of "potential habitat" within the footprint is 10 ha which represents 0.035% of the extent of occurrence and 0.235 % of potential habitat. No additional habitat is proposed to be cleared in the future in relation to this Action.

Indirect Impact: The habitat to be inundated is on the northern edge of continuous native habitat. The riparian and adjacent vegetation downstream has been cleared and converted to pasture, other than a very narrow strip of scrub and grassland along the rivulet. This strip is not potential habitat. There will be no downstream impacts. Because the habitat is at the northern edge of the native habitat its loss does not fragment the habitat and so connectivity is not diminished.

[38] Bryant, S. & J. Jackson (1999b). *Tasmania's Threatened Fauna Handbook: What, Where and How to Protect Tasmania's Threatened Animals*. Hobart, Tasmania: Threatened Species Unit, Parks and Wildlife Service.

[39] Clarke, G. & F. Spier-Ashcroft (2003). *A Review of the Conservation Status of Selected Australian Non-Marine Invertebrates*. Environment Australia, Canberra.

Cumulative impact:

Other historic and cumulative impacts are predominantly related to land clearing. In particular, the establishment of extensive areas of plantation forest since 1996 has resulted in fragmentation of habitat. Informal reserves established along stream sides have been established to protect elements of the habitat in the plantation landscape. Land clearance for other purposes is relatively minor. The proposed Action contributes to the cumulative impacts of the past in a small but unquantifiable way because the scale of past impacts has not been recorded.

Conclusion: The impact of the Action is not considered to be significant based on EPBC general test for significance.

4.5 Temperate lowland native grasslands

Direct impact: 1.25 ha of lowland native grassland will be lost to inundation. In Tasmanian there are 13 500 ha of lowland grasslands (GPL) mapped by Tasveg 3. Of these 1900 ha are reserved. In the south east bioregion there are 7 700 ha mapped and 500 ha reserved. The Lowland Native Grasslands of Tasmania ecological community equates with this Tasveg floristic community in full where the condition thresholds presented in the listing advice have been met.

Indirect Impact: No indirect impacts of the Action to other patches of grassland in the vicinity, including downstream impacts, are anticipated given the absence of the ecological community downstream.

Cumulative impact: As implied above, not all Tasveg GPL mapping units meet the condition criteria that define the Temperate Lowland Grasslands ecological community listed on the EPBC. As a result the extent of the listed community in Tasmania is not known. The EPBC policy statement includes a map which illustrates patches of grassland that are likely to be the listed ecological community. This map depicts grasslands in the immediate vicinity of the Action.

These patches are either naturally occurring on seasonally inundated or low lying margins of the Brushy Plains Rivulet, Tea Tree Rivulet or derived from clearance of grassy forest such as at The Thumbs Creek and Runnymead. All of these occurrences have been long exposed to grazing by sheep and cattle. All patches on the Tea Tree Rivulet have been inspected and do not meet the EPBC condition criteria.

Perversely, because lowland poa derived from the clearance of grassy forests and woodlands can meet the EPBC criteria, the continued clearance of trees from grassy forest could result in an increase in the area of the EPBC ecological community.

Because the extent of the listed community in Tasmania is not known the cumulative impact cannot be measured.

The Significant Impact Guidelines 1.1 remind us the general test for significance is whether an impact is 'important, notable or of consequence, having regard to its context or intensity'. Given the data above, and dependence on recurrent fire to prevent succession to scrub, the loss of 1.25 ha is not significant.

Conclusion: The impact of the Action is considered to be significant based on EPBC significant impact criteria.

4.6 Other Impacts

- disturbance from increased dust, noise, vibration;
    - These will be present during the land clearance and construction phase only. Tasmanian devils and swift parrots may move away from the site if they are present or nearby during the land clearance and construction phase due to intolerance of dust, noise and or vibration. The dust noise and vibration are unlikely to cause any significant impact of these animals.
    - The Wielangta stag beetle and poa grassland have no means of avoiding the

dust noise or vibration but no impacts to adjacent habitats are anticipated because each does not occur there.

- sedimentation issues
  - Sedimentation will not impact on the poa grassland, swift parrot, Tasmanian devil of the Wielangta stag beetle.
  - There are no MNES downstream that could be affected by sedimentation.
  - Should excessive suspended sediment enter the stream due to unpredicted circumstances it may deposit in low energy areas downstream. NO MNES were located downstream between the dam and the Prosser River weir; the weir would capture suspended sediment.
- hydrology changes and additional run-off from construction/operational activities –
  - The hydrological changes to be induced through the capture and release of water for the PPRWS will not have any impacts of the MNES discussed above or any other MNES known from the vicinity. Details of the impacts of the hydrological changes on aquatic values are presented in Appendix 6. Appendix 7 includes an assessment of the ecological community (poa grasslands) and concludes that none exists where hydrological change is proposed.
- alienation/barrier effect
  - The Action does not present a barrier to the movement of any MNES. No Wielangta stag beetle habitat occurs downstream and there is no barrier to upstream migration, although the beetle is a very poor disperser. The surrounding habitat is suitable for the movement of all other MNES known from the vicinity and so the dam will not represent a barrier to their movement.

5 Proposed avoidance and mitigation measures

5.1 Construction and Environmental Management Plan

This plan has been developed to specifically identify risks to the MNES and the environment during all phases of the Action. The phases include;

1. Planning and approvals
2. Pre- construction
3. Construction and rehabilitation
4. Operations and maintenance
5. Decommissioning.

The CEMP is in Appendix 2. This is a draft document which include sections that will be completed once the Action gains approval because these sections require contractor input. The CEMP includes the mitigation of potential impacts during construction that will be managed through Environmental Protection Requirements (EPR) and Environmental Protection Guidelines (EPG) Appendix 2c. The guidelines are each specific to the, the Tasmanian devil and Swift parrot. The EPG's will be implemented during the construction phase.

Once construction is complete no further mitigation or monitoring is required or proposed other than for weed management which will continue throughout the operational phase.

The Environmental Protection Guidelines are each based on protocols and management prescriptions developed through the Agreed Procedures between DPIPWE and the FPA. This process is the basis on which forest harvesting is undertaken in a manner agreed to by the Threatened Species Section (DPIPWE) and the FPA biodiversity specialists and is a process

approved through the Tasmanian regional Forests Agreement 1997.. All measures are consistent with the relevant Conservation advice, EPBC policy Statements and Recovery Plans listed for each MNES in the references (section 14).

http://dpipwe.tas.gov.au/Documents/Final%20signed%20Procedures%20for%20the%20management%20of%20threatened%20species.pdf

5.2 Summary of EPG's -Environmental outcomes

The EPG's objectives are delivered through prescriptions designed to ensure that no Swift parrot or Tasmanian devil is injured during the construction phase of the Action. Management of the Wielangta stag beetle is not included in an EPG because it is impractical for the reasons outlined in 5.2.5. Lowland poa grassland is not included because there are no mitigation actions proposed.

The success of the measures will be measured by compliance with the EPG's through the DWPP and other CEMP requirements relevant to habitat protection.

Specific details for monitoring the objectives of the EPG's are set out within the EPG's.

Each EPG includes the requirements for monitoring and reporting both of which feed into the assessment of compliance in the DWPP. Monitoring requirements are consistent with the application of Agreed Procedures.

The objectives and attendant surveys and mitigation actions proposed in the EPG's are practical, achievable and highly likely to be effective. Published[40] understanding of habitat utilisation and identification, agreed survey methods and management prescriptions provides for a very high degree of confidence of success.

All mitigation in the CEMP is affordable as it does not require any construction or rehabilitation of habitat.

Location of exclusion zones

There are no areas within the footprint of the Action that are to be excluded from conversion. However, the mitigation measures included in the EPG's describe temporary exclusion zones within the footprint and a 50 m buffer around it. They also include an area of 500 m radius around the footprint that will be assessed to inform the mitigation strategy of the presence of Swift Parrot (Figure 10). The 50 m exclusion zones will protect nesting and den habitat for the duration of the breeding season to ensure breeding is not interrupted and no animals are injured during preparation of the site for construction.

All mitigation measures described below will commence during the site preparation stage and remain in force until the project is certified as complete.

During construction, storage sheds, site office, toilets, materials, works equipment and vehicles will be located within the inundation area and or on adjacent pastoral land.

The outcomes are consistent with the EPBC outcomes based conditions policy.

5.2.1 EPG – 1 Disturbance to Terrestrial and Aquatic Flora and Fauna

Objective: To minimise the effects of construction activities on vegetation, flora and fauna, particularly any endangered or protected species or ecological communities.

Aim: No negative impacts on flora, fauna or ecological communities in the vicinity of the project beyond those outlined within planning approvals.

Requirement: Identification of exclusion zones and the location of significant values and notification to responsible persons for all MNES.

[40] EPBC Listing Advise, Conservation Advice, Recovery Plans and Policy statements and FPA and DPIPWE survey guidelines

5.2.2 EPG – 2 Weed and Hygiene Control

Objective: To minimise the transfer of weeds, infectious plant diseases and fungal infestation within and between sites.

Aim: No spread of weeds, infectious plant disease and fungal infestation within the site or from one site to another or to adjoining land.

No importation of infectious plant diseases from another geographic region.

Requirement: identification of Declared weeds and Weeds of National Significance.

The Contractor must submit a Weed Management Plan (WMP) to PPRWS management for approval prior to commencing works within the construction corridor. The plan must be consistent with APIA Code guideline 9.3, DPIPWE Wash down Guidelines for Weed and Disease Control – Machinery, Vehicles and Equipment – Edition 1, April 2004 and Keeping it clean: A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens, March 2010.

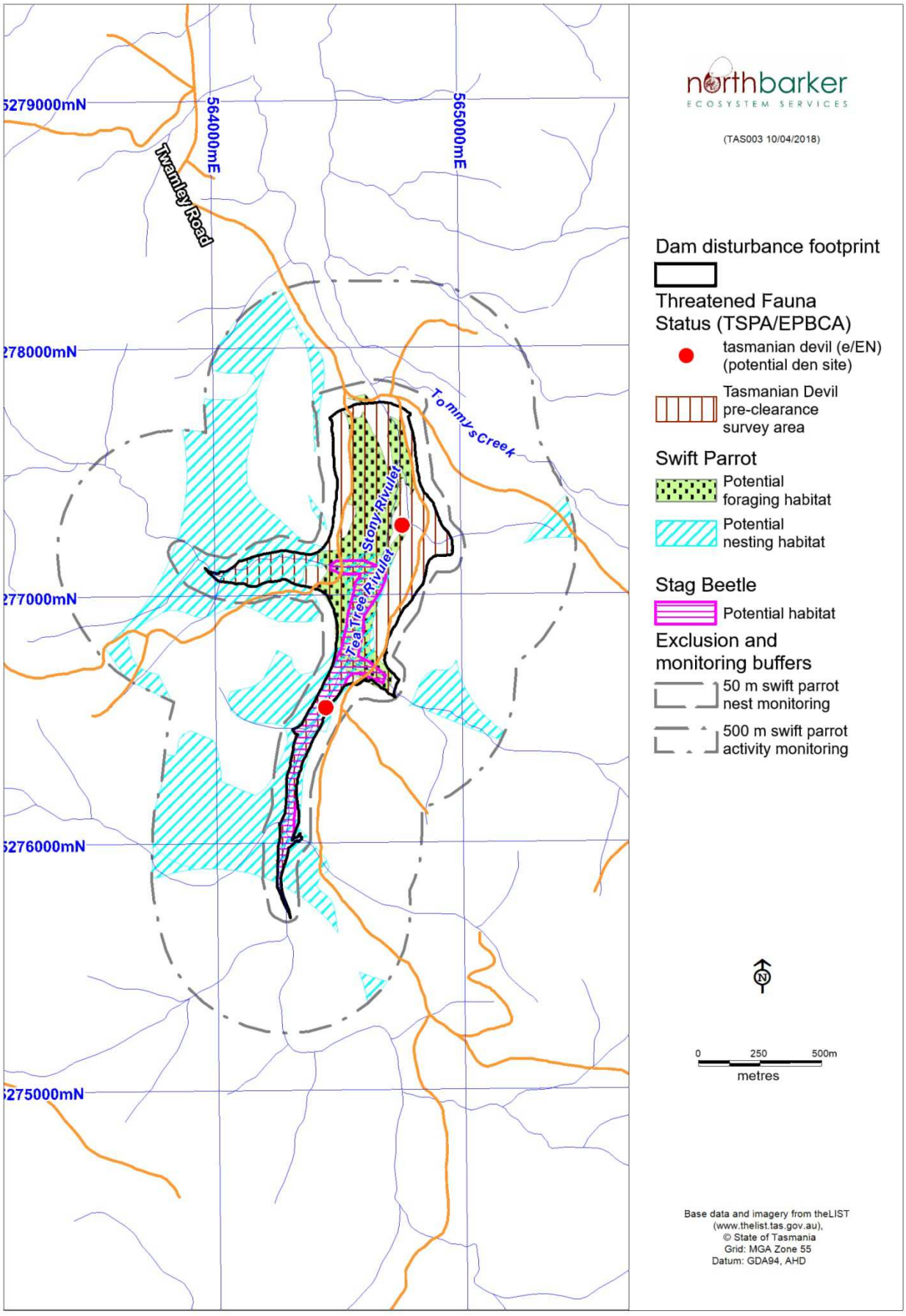

Figure 10. The extent of buffers zones excluded from disturbance and areas subject to the EPG's.

5.2.3 EPG – 3 Swift parrot habitat clearance

Objective: To minimise disturbance of swift parrots.

Aim: To ensure that no known nest trees are felled during the breeding season and to minimise disturbance of foraging birds.

Avoidance: An acceptable solution to avoid swift parrots and ensure no impact during forest clearance is to clear habitat between March and August inclusive. At other times risk minimisation is required.

Risk minimisation: Preclearance nest surveys may be completed following a strategy to identify risks according to time of year and flowering abundance in the impact are, vicinity and SPIBA.

Response to risks: A mitigation hierarchy includes no mitigation for low risk, bird surveys at moderate risk (light flowering present) and if birds present then nest surveys; at high risk (moderate to heavy flowering) then nest surveys are to be undertaken.

The presence of nests requires clearance activity to cease until young are fledged.

5.2.4 Monitoring and compliance measures are included and will be undertaken as part of the DWPP. EPG – 4 Tasmanian devil

Objective: To minimise disturbance of Tasmanian devils

Aim: To ensure that no active Tasmanian devil den is disturbed during construction.

To minimise the risk of injury to Tasmanian devils during site preparation and construction.

To minimise the potential for collision with vehicles

Risk minimisation:

Pre clearance dens surveys, activity assessments for potential dens and decommissioning protocols in line with EPBC approved guidelines.

Preclearance surveys have not been completed at this stage because dens may or may not be active at the time of survey and inactive dens may be reused at a later date and so it is important to undertake the surveys closer to the time of habitat clearance.

Traffic management: All traffic associated with the construction of the Action will move no faster than 60 km per hr and will not be active at the site between dusk and dawn.

Monitoring and compliance measures are included and will be undertaken as part of the DWPP.

5.2.5 Wielangta stag beetle

Based on advice from the DPIPWE specialist (Karen Richards) no direct mitigation action is proposed. No connectivity measures are considered necessary or practical.

This advice simply reflects that:

Translocation of beetles (that have not been recorded) is impractical.

Connectivity cannot be maintained or provided to habitat north of the site because no habitat exists for more than 7.5 km downstream and connectivity upstream (south) is not diminished.

Translocation of logs and other course woody debris to remote suitable habitat is not useful because the beetles live in the ground beneath logs. Translocation to the margins of the inundation area is similarly not likely to be useful because the habitat is too dry.

Due to these limitations no further survey is proposed because surveys to date meet the survey guidelines and no practical response exists.

5.3 Offsets as outcome based condition:

The proposed outcome is to offset the loss of habitat by protecting other habitat to the level required by the Offset Calculator. This outcome is consistent with the EPBC Offsets Policy. It is consistent with the Tasmanian Dam Assessment Guidelines Offset Policy.

Offsets see Section 6 below for strategy.

In this case the impacts on the swift parrot, Tasmanian devil and poa grassland are well understood to be the loss habitat. For the Wielangta stag beetle it isn't known if the habitat is utilised. Nevertheless, because these losses are not proposed to be avoided, and cannot be minimised on the site, suitable offsets are an appropriate outcome.

The offset strategy detailed below indicates that offsets will be delivered through the protection of alternative habitat. The amount of habitat protected will reflect the condition and level of threat that characterises the offset habitat.

The area and condition of the habitats protected as offsets can be objectively measured. The continuing existence and condition can be objectively measured. The quality of each habitat is determined by criteria published by the Commonwealth and State agencies. The quality criteria can be independently repeated for verification.

The DPIPWE process of protecting offset areas by covenant has a well-established management system and governance including legislative protection of the habitat under the Tasmanian Nature Conservation Act 2002.

The offsets strategy proposed in Section 6 demonstrates progress toward achieving the outcome by way of a score board based on the output of the Biodiversity Offset calculator.

The level of confidence in the proposed outcome is very high due to the rigour in the process of identifying appropriate sites and the security of the protection.

The proposed outcome covers residual impacts of construction and operation.

The Offset strategy includes criteria to measure success and details of measuring the criteria.

There will be no disturbed habitat areas outside of the footprint and so no rehabilitation to disturbed habitat is required. However, the rehabilitation of disturbed land outside of the inundation area is included in the CEMP and DWPP.

6 Residual impacts and proposed offsets

6.1 Residual impacts

The DOEE EPBC Act Environmental Offsets Policy (2012) details the process for determining when offsets are required. That policy notes that "offsets are not required for all approvals under the EPBC Act. Offsets are not required where the impacts of a proposed action are not thought to be significant or could reasonably be avoided or mitigated".

The Offsets implementation guide that is used to support application of the policy only applies where the proposed action is likely to have a residual significant impact on a threatened species or ecological community.

A residual impact is the impact that remains after all efforts at minimisation and avoidance have been implemented.

This action involves the construction of a dam and the inundation of 53 ha of land. The inundation area will not be reduced to minimise impacts and the impact of cannot be mitigated for the relevant MNES. Therefore the residual impact is the loss of the 53 ha's of habitat described above (Section 4).

Within this area there are 21.65 ha of swift parrot habitat and 1.25 ha of Lowland poa grassland. The whole area is foraging habitat for the Tasmanian devil and about 10 ha is potential stag beetle habitat.

However, only the impact of the loss of 21.65 ha of swift parrot habitat and 1.25 ha of poa grassland is deemed to be a significant residual impact.

As such and offset must cater for this area of habitat and must be designed and implemented to meet the requirements of the DOEE EPBC Act Environmental Offsets Policy (2012).

6.2 Offset package

The significant residual impacts of the Action are required to be offset. An offset package to compensate for the significant residual impacts on the swift parrot and the lowland poa grassland is required to be presented as a strategy with an attendant Offset Management Plan.

The following offset package meets the DOEE EPBC Act Environmental Offsets Policy (2012). The proposed offset is a direct offset to be delivered by protecting the requisite area of habitat by conservation covenant under the Tasmanian Nature Conservation Act 2002. The covenant will be in perpetuity.

An offset management plan has also been developed to provide for the key commitments and management actions required to deliver the proposal. The offset management plan includes a template for the management of the covenanted habitat. Details are included to accommodate specific site requirements including vulnerabilities and site resilience. See Appendix 5 for an example. This example is a template in which the relevant data are entered for each candidate property.

The process for selecting and judging the worthiness of habitats for inclusion in the offset proposal are detailed below.

The quantum required to be protected is based on calculations using an "offset calculator" which is described in the EPBC "offsets assessment guide".

http://www.environment.gov.au/system/files/resources/12630bb4-2c10-4c8e-815f-2d7862bf87e7/files/offsets-how-use.pdf

The offset calculator requires a range of inputs including habitat area and quality of the area impacted and the habitat area and quality of the area(s) to be protected as offsets. The other inputs include, the risk of loss of values at the site, with or without protection as an offset and the future condition of the site with or without offset.

These values of the inputs for the offset sites are justified below.

The output of the calculation is the % of the impact that is offset by the protection of the candidate area. The direct offset proposal must provide at least 90% of the offset requirement. The balance can be met using indirect offset efforts.

The land will be secured by a Conservation Covenant under the Tasmanian Nature Conservation Act 2002. Conservation covenants are relatively secure instruments that require at least the authorisation of the State Minister to change, and where there is an interest, the authorisation of the Commonwealth Minister may also be required.

Management of the each parcel of land will be directed by a dedicated management plan to ensure the persistence and appropriate management of the habitat values.

The protection by Conservation Covenant under the Tasmanian Nature Conservation Act 2002 improves the protection of habitats to a level much higher than current regulations require under any other legislation. For example, the Forest Practices Act 1986 and attendant Forest Practices System does NOT preclude the logging (and regeneration) of forests supporting each of the relevant habitats; except where they occur in situations that are protected during all forestry operations, such as stream side reserves. The forest Practices System can require up to 5% of the FPP area to be protected under duty of care provisions. These provisions cover soil, water and threatened species and communities. Protection of larger areas can require compensation payments to the affected landowner.

Where forest practices plans are not required, Conservation Covenants protect land that otherwise could be developed under local government planning schemes or the Tasmanian Water Management Act which may otherwise allow inundation.

Each of the offset candidates described below has or is being considered for development. Ringrove has had a Forest Practices Plan developed and refused and now has tourism development proposals.

6.3 Offset Strategy

The following offset strategy provides for offsets for the loss of swift parrot and lowland poa grassland. The proposal is for direct offsets to provide for 100% of the offset requirement.

For swift parrot, the offset will result in the protection of foraging habitat in the vicinity of nesting habitat to reflect the juxta position of the two habitats in the impact area and the importance of the association.

For the lowland poa grassland the offset will provide for by the enhancement of existing but degraded poa grassland.

The following proposal is also consistent with the Swift parrot Recovery Plan and relevant EPBC Act Conservation Advice and the Environmental Offsets Policy (2012).

6.3.1 Offset calculation

6.3.1.1 Habitat quality:

To allow simple comparison of offset candidates the quality of habitat in the impact area has been scored as 9 for high quality, 6 for medium and 3 for low quality habitat. The same classification has been applied to offset candidates. Intermediate scores have been assigned to offset candidates to allow for improvement or degradation with and without offset. This notional assignment is based on, for example, a site that is not protected by covenant nor managed to protect swift parrot habitat is less likely to improve in value as much as one that is managed to protect it As such a protected site may be expected to improve from say 6-8 over time while an unprotected site may only improve from 6-7 over time due to degradation in some form or not improve at all.

For the impact area the condition scores have been multiplied by the area (ha) in each and divided by the total area to give an average condition. The average condition in the impact area is 8 for forage and 6 for nesting habitat. The same procedure has been applied to candidate areas. At candidate areas the size and density of trees was estimated at representative locations and extrapolated aided by aerial photo interpretation and the forest maturity layer.

The size of trees is a critical factor for swift parrot habitat. To reflect this, the time to ecological benefit (for stands of trees not yet suitable for foraging) has been judged based on a maximum growth rate of 1 cm diameter at breast height (dbh). So a tree of 20 cm dbh today may grow to 40 cm dbh in 20 years. The maximum time to ecological benefit was set at 20 years to reflect the maximum time over which loss can be averted in the offset calculator and in the net present value calculation in the offset calculator.

6.3.1.2 Risk of Loss:

The risk of loss that a habitat patch is at is an imprecise calculation. The elements considered here are consistent with the assessment guide. Confidence in the levels of risk of loss without and with offset is affected by:

1. formal protection mechanism and legal constraints
2. other activities that indicate intent
3. average risk of loss for similar site

Swift Parrot habitat

The Forest Practices Act 1986 and attendant regulations do no prevent the logging and regeneration of threatened vegetation types; including DGL and DOV. Nor does the Water Management Act 1999 under which this Action is proposed.

While E. ovata and E. globulus forests are potentially protected from conversion by forest practices regulations, they are not necessarily protected from logging and regeneration or clearance for other developments (such as this Action). See the link below for evidence of loss of nesting habitat despite legal constraints[41].

Data provided above (Section 4) indicate the rate of logging and conversion of E. globulus and E. ovata forest despite being "protected". The habitat of "kicking the can down the road" with regard to the Tasmanian Permanent Forest Estate Policy also illustrates an appetite for extending the period over which broad scale land clearance can be undertaken.

The average risk of loss of similar sites is reflected in the fact that E. ovata has less than 10% of its original extent remaining and E. globulus forest has about 30% remaining. Data reported in Section 4.1 indicate that since 1998, a further 6.7 % and 20% of the current area respectively has been logged. There are no collated data available on how much has been lost to dams, subdivision or other development.

The PPRWS is not easily able to collate data on pending development application, mining leases or other development proposals to illustrate other risks to the habitats in the vicinity. However, it is known that residential development, water development and the Tasmanian government's policy of growing the forestry industry will put areas of unprotected habitat at various levels of risk. The Tasmanian Government's forest policy identifies areas of future potential wood production forest in these habitats that would otherwise remain reserved (Figure 11). In this figure the approx. area of the Action is located in the top left corner and the "Ringrove" offset site (discussed below) is on the right hand side, the cross hatched area is future potential production forest.

[41] https://www.news.com.au/national/tasmania/logging-of-habitat-a-disaster-for-critically-endangered-bird-says-anu-researcher-dr-dejan-stojanovic/news-story/77ac66d3c92d7edaab3b588b60986668

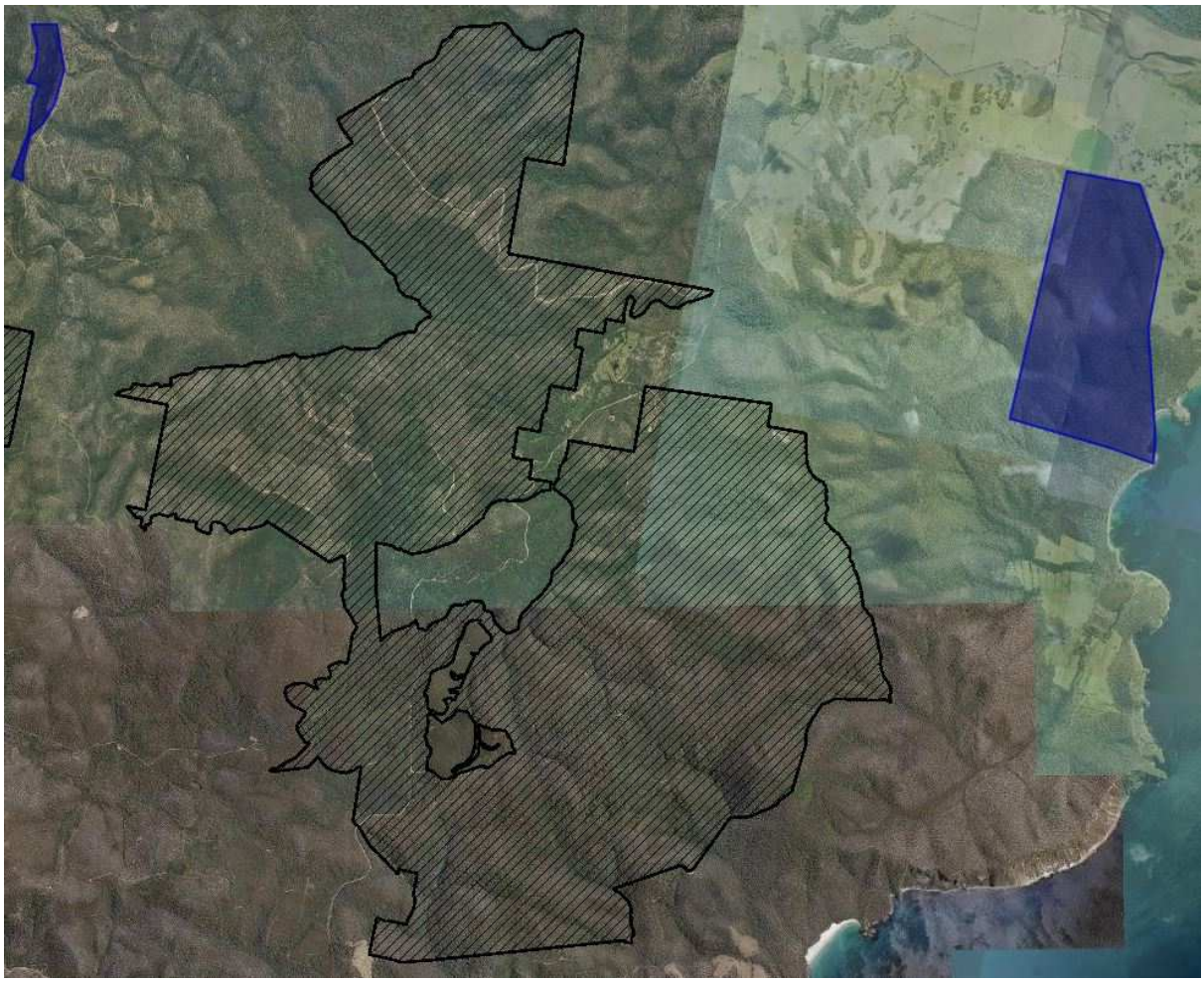

Figure 11. Future potential production forest (cross hatch).

These data and lack of data suggest that the risk of loss remains quite high but is not known with certainty.

The risk of loss of the candidate habitats without offsets has been set to reflect the risks in different circumstances. The risks are 10% for foraging and 20% for nesting at Ringrove and 30% and 50% at Brockley over the next 20 years. The difference between foraging and nesting risk is for three reasons:

1. nesting may occur in any forest type for which legal constraints are lower i.e non threatened forest types.

2. in circumstances where no legal constraint exists, for example small forestry operations (< 1ha) or more extensive fire wood cutting in non threatened vegetation, the hollow bearing trees may be targeted. Recent evidence of precisely this received media attention in Tasmanian in 2016[42].

3. Once felled nesting habitat is effectively "completely lost" because its recovery is well outside the time frame of risk assessment i.e. 20 years.

Foraging habitat

The 10% risk is for Ringrove foraging habitat, a candidate site for which logging and conversion of the forest has already been refused under the Tasmanian forest practices system and as such the risk of loss to forestry is low.

[42] https://www.news.com.au/national/tasmania/swift-parrot-nesting-trees-cut-down/news-story/8fc7376cea633c8d5a1f02d384c8db34

The 30% risk is applied to candidate sites that could potentially still be logged and regenerated subject to a Forest Practices Plan being certified and accepted. The 30% risk is also applied to foraging and nesting habitat at Lewis Hill. A site that occupies a potential dam inundation area.

Nesting habitat

The nesting habitat has been treated as a habitat area rather than the number of hollows. This is justified because the number of hollows is difficult to objectively measure over large areas. Hence the surrogate measure of mature forest, which includes trees of > 70 dbh, adopted in the recovery plan and the FPA, has been adopted.

The risk of loss of nesting habitat that is not E. ovata or E. globulus is higher than the risk of loss of the foraging habitat because many other forest types that support hollows are not protected from conversion by forest practices regulations. The risk of loss of these stands without offset has been set at 50% at Brockley and 20% at Ringrove due to the refusal of an FPP. Lewis Hill is at 30% due to the potential for a dam.

The risk of loss with offset has been set at 10% reflecting faith that protection by restrictive covenant and a management plan will prevent logging and conversion/inundation and hence remove by far the largest threats to these habitats. Due to the refusal of an FPP at Ringrove the risk is reduced to 5%. But nothing is certain.

Poa grassland

The risk of loss of the offset site without offset is judged to be high at 80%. This is due to the likelihood of conversion to irrigated pasture or crop or continuing degradation through stock grazing.

The confidence in the risk of loss with protection as an offset is only 50% because there is substantial political pressure to allow these sites to be developed. In Tasmania areas continue to be removed from areas protected by Covenants to allow development and the relevant Commonwealth Minister has recently refused to list other Tasmanian communities due to such pressure.

The high risk is supported by evidence of decline and causes of decline provided to the Threatened Species Scientific Community. This evidence resulted in Approved Conservation Advice that indicates; “the ecological community met criteria 1, 2, 4 and 5 of their eligibility criteria because it has undergone a severe decline in extent and has a very restricted geographic distribution (as indicated by very small patch sizes) coupled with demonstrable threat.” Furthermore, Tasmanian is undergoing extensive irrigation development which potentially may result in poa grasslands been converted to cropping. It is well known among farmers that the condition of the grassland is critical to a determination as to whether a particular patch can be converted. Consequently there is no incentive to reduce the impact of grazing to preserve the quality of existing patches that may meet the criteria for listing.

Poa grassland has no State protection from conversion and stocking rates. The EPBC has offers no protection from continuing use (e.g. grazing) and there is no way of knowing if the intensity is raised.

The photographs below demonstrate the risk of conversion by illustrating the potential intensity of irrigated development of previous Poa habitat. Note that the area above the crop circle along the river is also cropped. Similar habitat adjacent to the Twamley offset proposal is illustrated in the second photograph (below). Note that the Twamley site is immediately adjacent to the irrigation dam proposal (this Action) and so costs of development would be low, making it an ideal site. While there is no current proposal to convert (in the context of no irrigation dam), the average risk of loss of similar site is very high and hence the listing as critically endangered.

The risk of loss with offset is 10% due to protection of the site by a covenant under the Tasmanian Nature Conservation Act 2002.

6.3.1.3 Confidence in result:

Swift Parrot

Confidence in the result that a conservation covenant will avert loss of the habitat is 80%. This simply allows for the risk of legislative change.

Confidence in the result that the quality of the habitat will improve over time is 90%. This is based on the principal that as trees grow larger and older the forage resource increases with canopy size and nest hollow development progresses (Brereton 1997).

A combination of offset sites of different size, risk and condition could make up the offset requirement. Different combinations of candidates will be compared to assess the relative area (ha) and cost efficiency of the different combinations.

Poa grassland

Confidence in the result that a conservation covenant will avert loss of the habitat is 80%. This simply allows for the risk of legislative change.

Confidence in the result that the quality of the habitat will improve over time is 80%. This reflects condition of the grassland which is not severely degraded. Grasslands that are not severely degraded have a higher chance of successful restoration (Prober and Theil 2005). In this case the Poa grassland only requires minimal enhancement of the diversity to meet the condition criteria of an EPBC grassland. This may be able to be achieved by simply burning it or by enhancement planting.

6.4 Swift parrot offset strategy

6.4.1 Offset calculation – Area and Quality

It is proposed to protect an area of forest and woodland that meets the area and condition requirements necessary to offset the loss of 21.65 ha of swift parrot foraging habitat and 19 ha of medium quality mature forest supporting tree hollows

The offset proposal includes forest and or woodland dominated primarily by Eucalyptus ovata and or E. globulus. Both forest types are foraging habitat for the swift parrot and are important for breeding. Both are assumed to be of equal value for the purposes of quantification.

It is also proposed to include mature examples of forests to capture suitable nesting habitat within or adjacent to the same patches. In general, the prevalence of hollows in eucalypt forests and woodlands and their proximity to a foraging resource is considered more important than forest type and/or tree species[43]. Therefore, mature forests dominated by other eucalypt species may also be included when in close association with the foraging habitat.

The swift parrot recovery plan (2011) reports that nesting hollows used by Swift Parrots are found predominantly in older growth trees located in forest patches of greater than 100 hectares. Nest trees are typically characterised by having a diameter at breast height greater than 0.7 m, several visible hollows and showing signs of senescence. The FPA criteria for assessing the quality of swift parrot nesting habitat remotely captures these criteria using the mature forest mapping layer that has been utilised in Section 3 to identified potential nesting habitat.

Stands within the area impacted were categorised as high, medium and low quality swift parrot foraging habitat (**Table 1** in section 3.2) as per the methods described in section 3.6. These qualities are based on condition assessments consistent with the Forest Practices Authority Tech Note # 3 which classifies the assessment of swift parrot habitat quality

[43] Swift Parrot Recovery Plan 2011

according to forage tree frequency and nest tree size and density. The field assessment confirmed the forest maturity layer as indicating the presence of nesting habitat.

The consideration of site condition, context and stocking rate have each been considered so as to align the quality assessment with the EPBC guidelines on "how to use the offsets assessment guide".

The metric is relied upon to identify the area required to offset the residual impact given the input values described above (Section 6.3.1).

6.4.2 Selection of candidate areas

Tasveg 3 mapping and satellite imagery were compared and satellite images were searched for the *E. ovata* and *E. globulus* signatures. Areas generally greater than 10 ha, of forest that is likely to be E. ovata forest in association with E. globulus forest are selected. These are candidate areas.

Prioritisation was given to areas close to the impact area. Additional areas were also prioritised for verification. The property identification numbers were recorded and owners determined by Council from the rates database.

The candidates were contacted to determine if they were potentially interested in participating by allowing suitable forest on their land to be protected under a conservation covenant.

If there was interest a letter with further explanation was sent. This letter described the project and the constraints and management requirements of a covenant. A follow up call was made a week later.

The candidate areas were then inspected verified, mapped and the condition determined.

The data were input to the offset calculator and if the results in terms of whether or not the site could make a worthwhile contribution to the offset requirement were reported to the candidate. The candidate was advised that once the Action was approved a negotiation may begin.

There is no guarantee that a land owner who participated to this stage will make an acceptable offer. To manage this risk Council has assessed sufficient sites to over subscribe the offset requirement so that they can select sites to meet or exceed the 90% requirement at an acceptable cost.

Before a candidate area can be formally endorsed, following agreement on a financial consideration, the proposal must pass through a DPIPWE Property Assessment Group (PAG). PAG will provide technical review of all covenant proposals relevant to the DPIPWE covenant policy. For suitable proposals PAG will recommend them for inclusion in the private reserve system via covenanting under the NCA.

All offset proposals will be develop in the context of the DPIPWE covenanting policy (Appendix 4).

6.4.3 Swift parrot offset Management Plan

The management of all offset areas will be subject to the standard limitations and requirements of the Department of Primary Industries, Water and Environment (DPIPWE). The limitations of use and treatment of the reserve are set out in the attendant management agreement (Terms of Covenant). The management objectives and management prescriptions are set out in a management plan called an Operations Plan (OP) (Appendix 5).

The OP may allow for limited firewood removal and grazing. Each is limited according to the forest type and pre determined limits are applied. For example, in grassy forest sustainable grazing of 0.5 dse (dry sheep equivalent) may be allowed and in dry forest a sustainable low tonnage of fire wood may be removed.

6.4.3.1 Responsibility and Monitoring

The GSBC has the expertise to monitor the offset sites. Monitoring would include:

- assessment of compliance with the terms of the covenant
- assessment of compliance with the management prescriptions in the Operations plan
- assessment of the maintenance of the habitat quality in the context of swift parrot habitat
    - assessment of flowering productivity in mature stands
    - assessment of stem growth rates in immature stands

6.4.3.2 Performance criteria (PI)

Successful offsetting will be reliant on sustainable and potentially adaptive management of offset sites.

For high and medium quality sites, sustainability requires maintenance of the recruitment potential of sites to ensure that new habitat trees can be naturally recruited when conditions allow or demand. Recruitment stimuli may include fire or canopy disturbance due to tree fall.

The key indicator for sustainable recruitment potential is seed production of mature habitat trees. The PI for these sites is the presence of capsules in the litter or on the trees and the presence of flowers in years where the species is flowering in the vicinity.

For lower quality sites, on which growth of the habitat trees is required to provide higher quality habitat in the future, an adequate rate of growth is required. The PI is growth rate in the diameter at breast height that will result in the stand reaching high quality over time. The largest trees in the stand are most likely to be the trees that dominate the site. A measure of dbh of 10 of the largest size class of trees less than 40 cm dbh. The measure will be repeated after 2 and 5 years. The PI is met where the annual increment of the DBH exceeds 6.5 mm.

6.5 Poa grassland offset strategy

The following proposal is consistent the DOEE EPBC Act Environmental Offsets Policy (2012).

It is proposed to enhance 6.2 ha of natural lowland poa grassland to meet the condition criteria necessary to offset the loss of 1.25 ha of lowland poa grassland.

The offset proposal includes an existing area of poa grassland immediately downstream of the proposed dam wall. On Figure 12, the area between the two creek lines is lowland poa grassland that currently does meet the EPBC condition criteria for the ecological community. The candidate area is on the same land title as the Action. The grassland has been exposed to grazing for more than 100 years. The site retains the structure of native grassland but is too species poor to meet the EPBC condition criteria of the threatened ecological community.

The proposal meets the policy requirement of being able to rehabilitate the site over a defined period of time with the input of identified resources.

Figure 12. Lowland poa enhancement proposal (dam wall bottom RHS).

6.5.1 Offset calculation - Area and quality

For poa grassland the inputs to the offset calculator aim to achieve a 100% direct offset.

The impact area is 1.25 ha and the quality of the habitat is judged to be 6. This score is a conversion of the Vegetation Condition Assessment score (VCA) (Michaels 2006). The score has been divided by 10 to conform to the offset calculator requirement and reflects low diversity, weed cover, small size and percentage of the neighbourhood that is disturbed.

The component scores of the VCA are listed in Table 3 (page 33).

The future quality of the grassland without and with offset is likely to rise from 4 now to 6 once the grassland is enhanced. The confidence in this result is 80%.

The offset calculator indicates that the enhancement of 6.2 ha of grassland will return 100% of the offset requirement allowing for 3 years until the ecological benefit is gained through enhancement.

6.5.2 Poa grassland offset management plan

6.5.2.1 Enhancement process

To meet the criteria for the nationally threatened Lowland Native Grasslands of Tasmania ecological community, the existing lowland Poa labillardierei grassland will be enhanced to a VCA condition of 6 and will have:

- perennial native grasses present and be greater than one hectare in size
- less than 20% cover of non-native plant species (weeds)
- greater than 50% cover of Poa labillardierei

- at least five native wildflower species will be established in each 0.5 hectare area of the grassland patch
- less than 30% cover of native trees and shrubs greater than 2 metres high
- less than 10% cover of regenerating Eucalyptus trees or other native woody species.

There is a very high degree of confidence of successful rehabilitation because:

- the site is a natural poa grassland site
- the floristic composition of poa grassland is simple
- the propagation of the native wild flowers is understood
- the establishment techniques are well known
- the protection of the site is feasible
- the maintenance of the site is feasible

The risks to successful enhancement are:

Low quality planting and seed stock

Inadequate preparation

Poor planting technique

Poor weed control

Inadequate protection from native and domestic grazing during establishment

Site preparation

Rehabilitation of grasslands is an ecological endeavour that has proven successful in many parts of the world. Numerous research papers demonstrate successful methods and highlight risks to successful enhancement of degraded grasslands.

A detailed review of the abundant literature on grassland restoration will be completed. The most appropriate methods with the highest probability of success in the shortest time will be determined from the literature. These methods will be applied on the site at Twamley Farm.

The main subjects that are researched in the literature deal with seed and planting material preparation, control of perennial weeds and exotic grasses, preparatory treatments of the site (including burning, scarification and mulching) to create a receptive seed bed and suitable conditions for root development.

Preparation of stock and planting

The project will engage a botanist to collect seed and wild stock of grassland “wild flowers” and other grassland species. The seeds and stock will be collected from the impact site on Twamley farm in the first instance and from other sites of local provenance as necessary.

The species may include any of those listed in Poa grassland benchmark or present at the grassland site in the dam footprint.

At least 8 wildflower species and 4 grasses or graminoids in addition to poa will be collected. Planting eight wildflowers will allow for specific site conditions that may favour one over another and ultimately sustain at least 5 per 0.5 ha.

The enhancement may include species that are best established on the site using seed or by planting seedlings or divided root stock.

A nursery will be engaged to germinate and grow species from seed and to divide and establish root stock.

The seed of species suitable for direct sowing will be prepared for sowing by mixing with a bulking and spreading medium and fertiliser.

Planting density will be determined once the site has been assessed for existing frequency and density.

6.5.2.2 Management:

The site will be protected by a wallaby proof fence. The fence will be checked for breaches four times a year.

Once plants have established and weeds have been controlled native grazing will be introduced.

Sheep may be introduced to control weeds on a seasonal basis.

Burning may be introduced to control weeds.

6.5.2.3 Responsibility and Monitoring

The land is owned by the Turvey family. The family has had possession of the property since 1842. The family is committed to continuing ownership and specifically to the protection of the site. As such the site is at low risk of inadvertent or deliberate illegal conversion.

The responsible manager will be the GSBC. The GSBC have the expertise to manage and monitor the grassland once it has been enhanced.

A plotless sampling strategy will be employed whereby a systematic arrangement of 1*1 m plots will be photographically monitored. The number of sites will be sufficient to ensure that the plotless technique returns a representative sample of the grassland from each measurement event. The number of plots required will be calculated based on the frequency of species planted such that the sampling will provide 95% confidence in the measurement result.

The data recorded from the plots will be those required to inform the EPBC condition criteria to judge the success of the enhancement works.

The monitoring strategy will include an adaptive management response to control threats and thus maximise the sites potential quality.

6.5.2.4 Performance criteria

The success of the enhancement will be measured. Success will be defined as the return of plotless sampling data that confirms the presence of a grassland that meets the EPBC condition criteria 3 years after enhancement. The data will confirm the EPBC quality grassland covers an area of 6 ha.

Further enhancement or management intervention will continue until success is achieved. Alternative management techniques will be employed where and when threats persist.]

6.6 The offset candidate sites:

To date 12 candidates have been assessed either by desktop, interview or field assessment. Four candidates have been advised that their forest is suitable and under consideration. The five sites that have been identified as able to make a worthwhile contribution to the offset requirement are illustrated in Figure 13. All sites are within core breeding range of the swift parrot.

Table 7 lists the scores for the attributes required by the offset calculator.

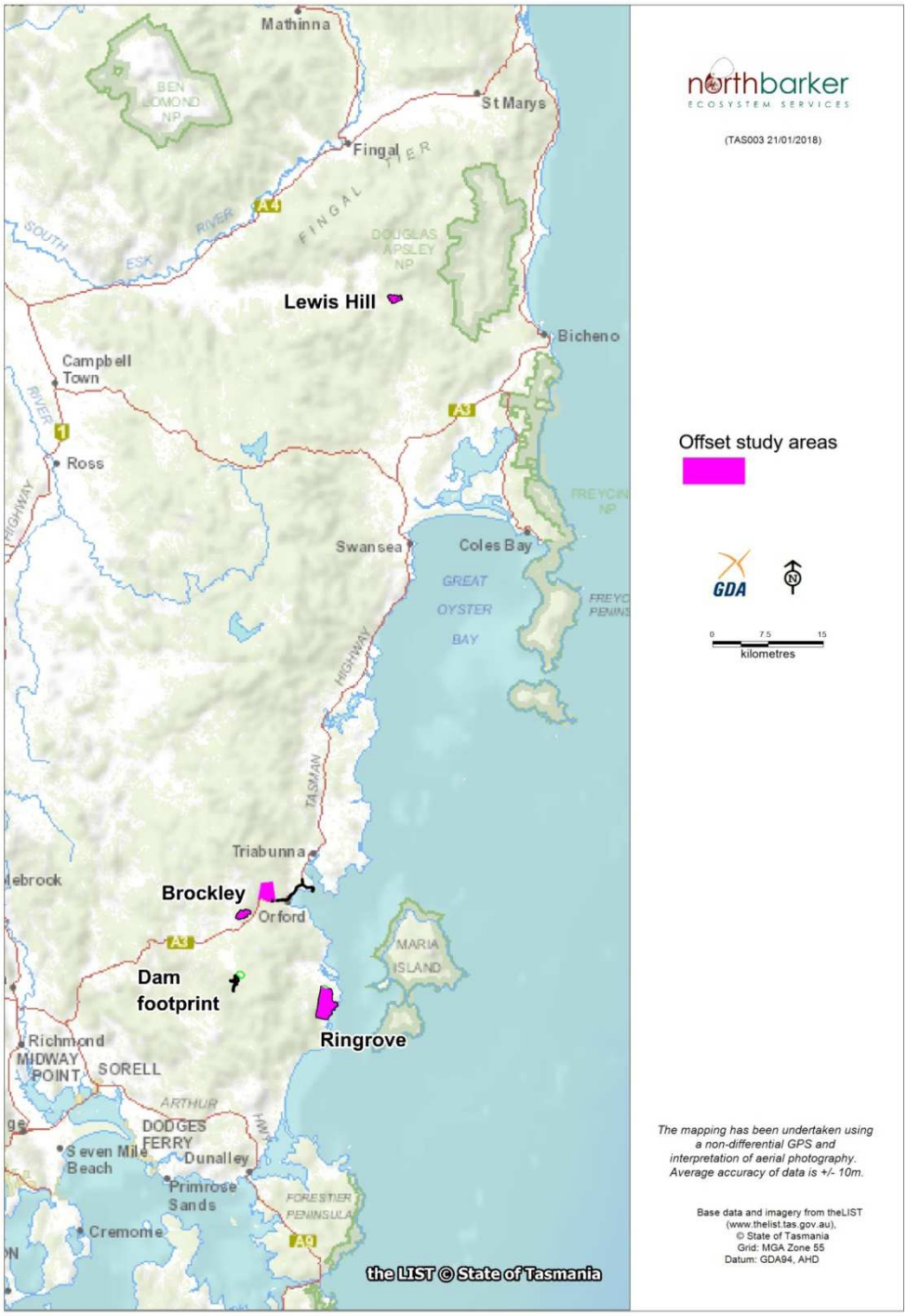

Figure 13. The location of four offset sites.

Brockley

This property is on the Prosser River a few km north of the Action. It is within the Wielangta SPIBA. Two sites have been identified as Brockley North and Brockley South. The vegetation on those sites is illustrated on Figure 14 and Figure 17.

Brockley North: The extent and quality of swift parrot habitat is illustrated on the Figure 15.

Brockley South: The extent and quality of swift parrot habitat is illustrated on the Figure 18. It is within the Wielangta SPIBA.

Ringrove

The extent of vegetation and quality of swift parrot habitat is illustrated on Figure 20, Figure 21 and Figure 22. It is within the Wielangta SPIBA. The vegetation is illustrated on Figure 20.

Lewis Hill

The extent of vegetation and quality of swift parrot habitat is illustrated on Figure 23, Figure 24 and Figure 25. It is within the St Pauls SPIBA.

Twamley

Figure 26 illustrates the combined extent of currently low quality swift parrot foraging habitat and the area of poa grassland proposed to be enhanced. This area is immediately downstream of the Action.

Cost:

While the cost per hectare is a very important consideration the likely cost of the offset requirement is unknown. Recent costs for covenanting land range considerably from near $0 to more than $2000 per ha. Assuming a value somewhat below the upper end of the range ($1000 per ha) the cost could be in the range of $150 000 – $400 000. One candidate has agreed to consider accepting water from the PPRWS as some or all of the consideration.

The cost of enhancement of 6 ha of habitat at Twamley is estimated to be $20 000 - $30000.

Table 7. ..The input data applied through the offset calculator and the contribution that each of the sites can make to the requirement.

Candidate	MNES	Habitat	Area	Quality	Impact	TOWLA	TEB	SA	SQ	RWO	FAWO	FQWO	RW	FAW	FQW	CL	CQ	NPV	%offset	Target
Ringrove	Swift parrot	foraging	21.7	8	17.32	20	20	490	7	10%	383.2	8	5%	441	9	80%	90%	15	90%	yes
Ringrove	Swift parrot	nesting	19	6	11.40	20	10	660	7	20%	528	8	10%	594	9	80%	90%	37	327%	yes
Brockley N	Swift parrot	foraging	21.7	8	17.32	20	10	387	5	30%	270.9	7	10%	348.3	8	80%	90%	21	121%	yes
Brockley N	Swift parrot	nesting	19	6	11.40	20	10	399	6	50%	199.5	7	10%	359.1	8	80%	90%	36	282%	yes
Brockley South	Swift parrot	foraging	21.7	8	17.32	20	10	290	7	30%	203	8	10%	261	9	80%	90%	21	119%	yes
Brockley South	Swift parrot	nesting	19	6	11.40	20	10	240	5	50%	120	4	10%	216	6	80%	90%	23	206%	yes
Lewis Hill	Swift parrot	foraging	21.7	8	17.32	20	10	12.4	8	30%	8.68	7	10%	11.16	9	80%	90%	1.3	7.5%	no
Lewis Hill	Swift parrot	nesting	19	6	11.40	20	10	61	6	30%	42.7	7	10%	54.9	8	80%	90%	4	24%	no
Twamley	Poa	community	1.25	6	0.75	20	3	6.2	4	80%	1.2	1	10%	5.6	6	80%	80%	0.97	128%	yes
Twamley	Swift parrot	foraging	21.7	8	15.2	20	10	20	3	80%	4	3	10%	18	8	80%	90%	3	19%	no

Column abbreviations: TOWLA –time over which loss is averted , TEB – time to ecological benefit, SA – start area, SQ – start quality, RWO – risk of loss without offset, FAWO, future area without offset, FQWO – future quality without offset, RW – risk of loss with offset, FAW – future area with offset, FQW – future quality with offset, CL – confidence in risk of loss, CQ – confidence in change in quality, NPV – net present value, %offset - % or requirement, Target - > 100%.

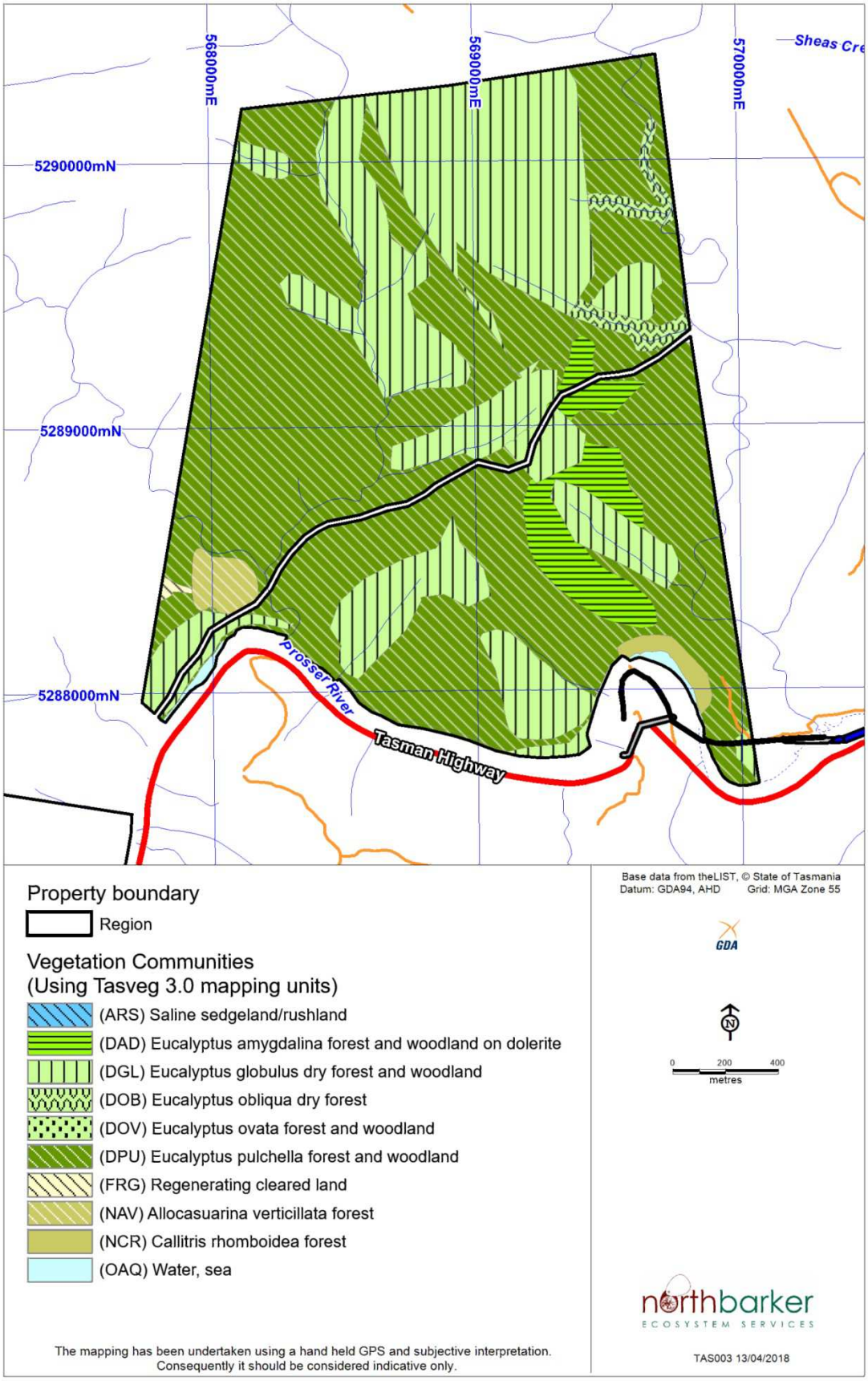

Figure 14. Brockley North: The distribution of Tasveg 3 vegetation mapping units.

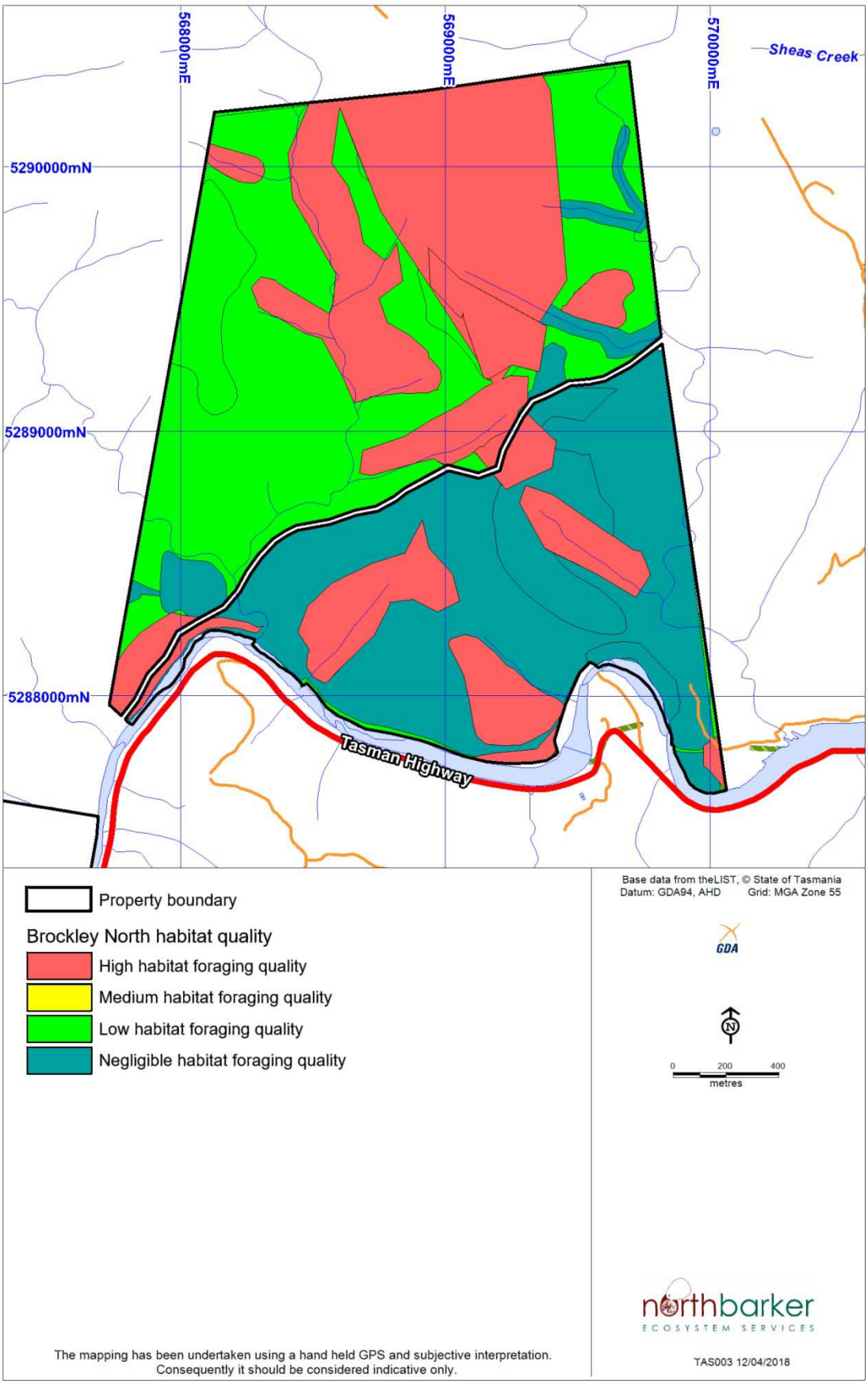

Figure 15. Brockley north: Distribution of swift parrot foraging habitat quality.

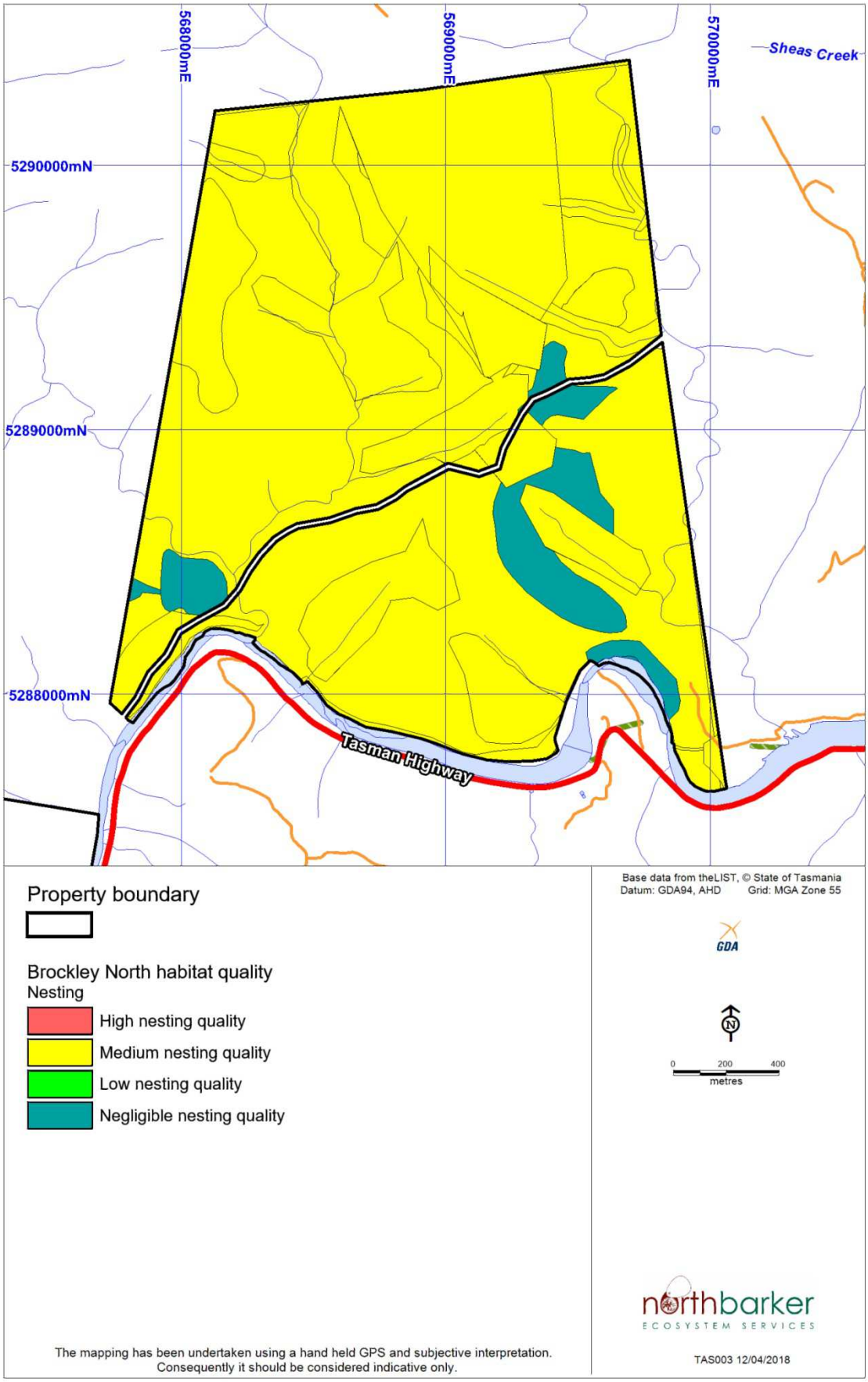

Figure 16. Brockley north: Distribution of swift parrot nesting habitat quality.

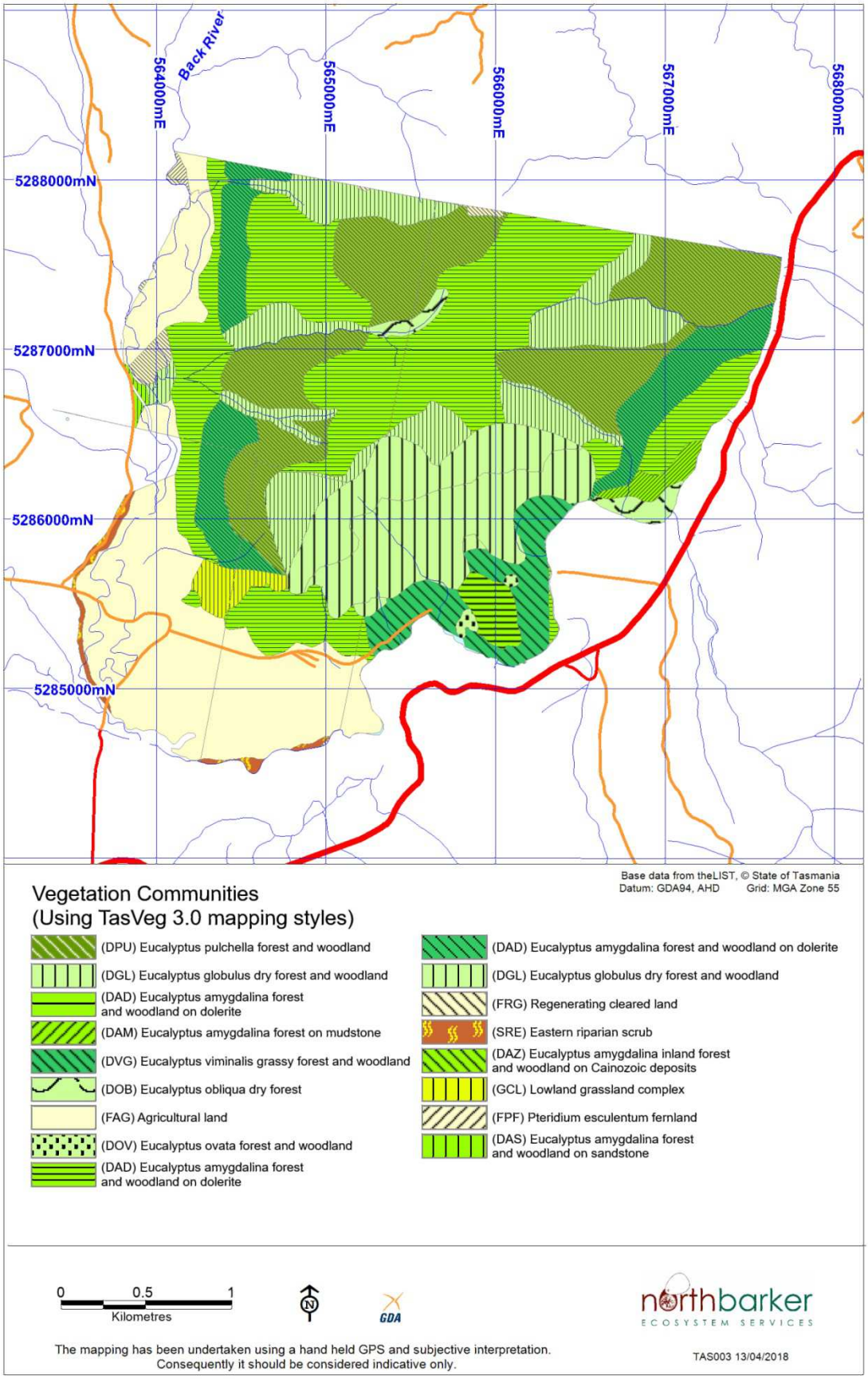

Figure 17. Brockley south: The distribution of Tasveg 3 vegetation mapping units.

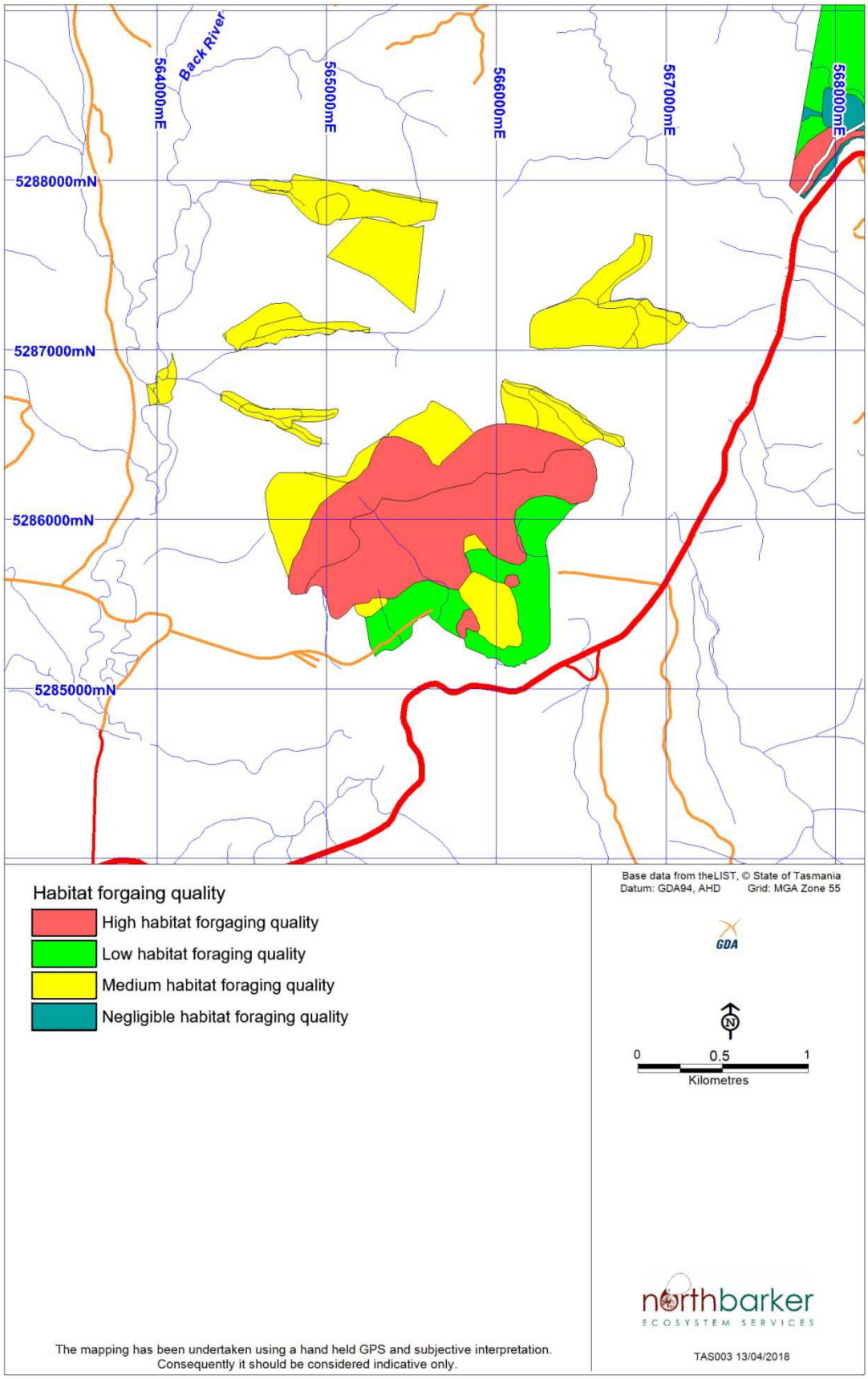

Figure 18. Brockley south: Distribution of swift parrot foraging habitat quality.

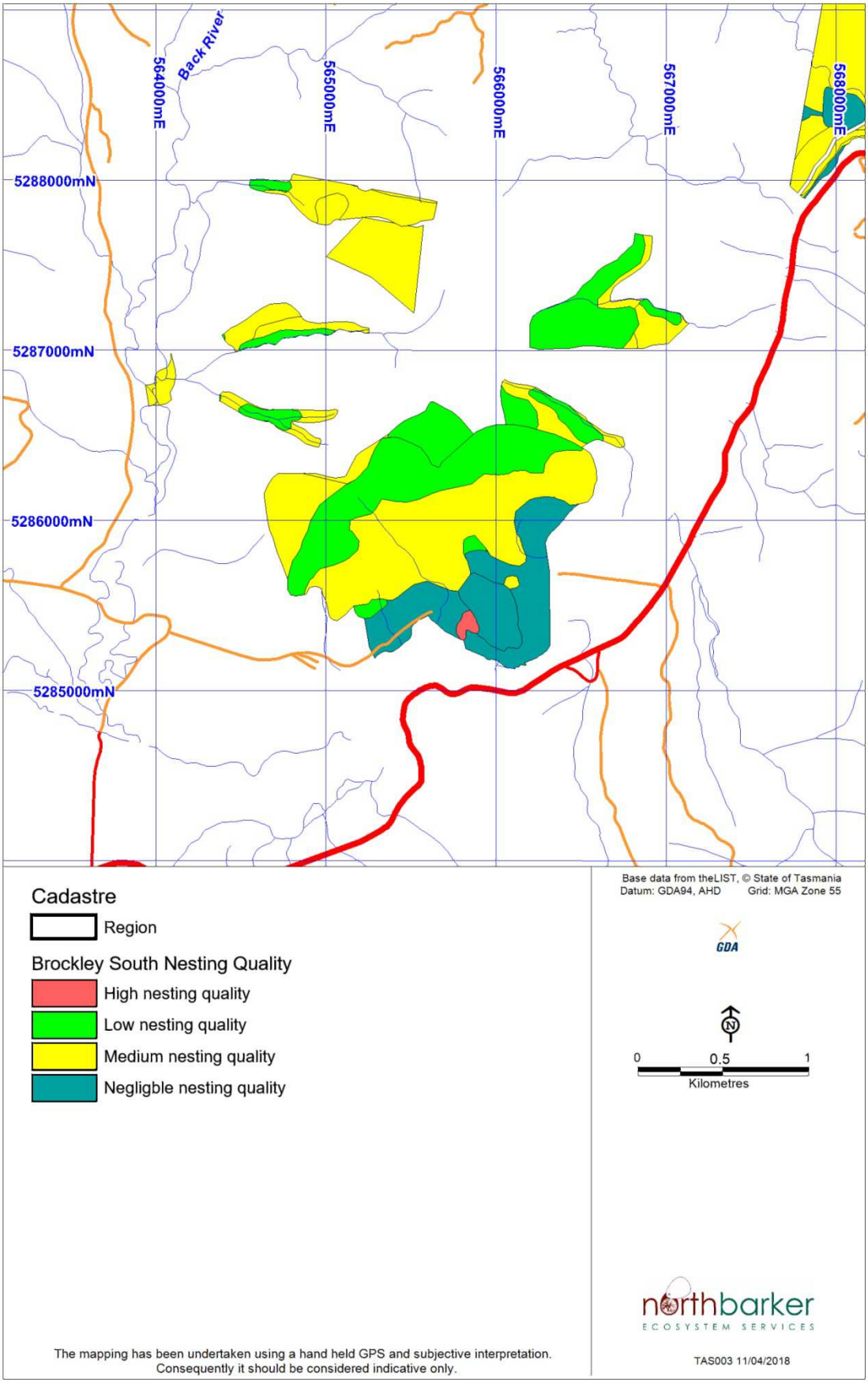

Figure 19. Brockley south: Distribution of swift parrot nesting habitat quality.

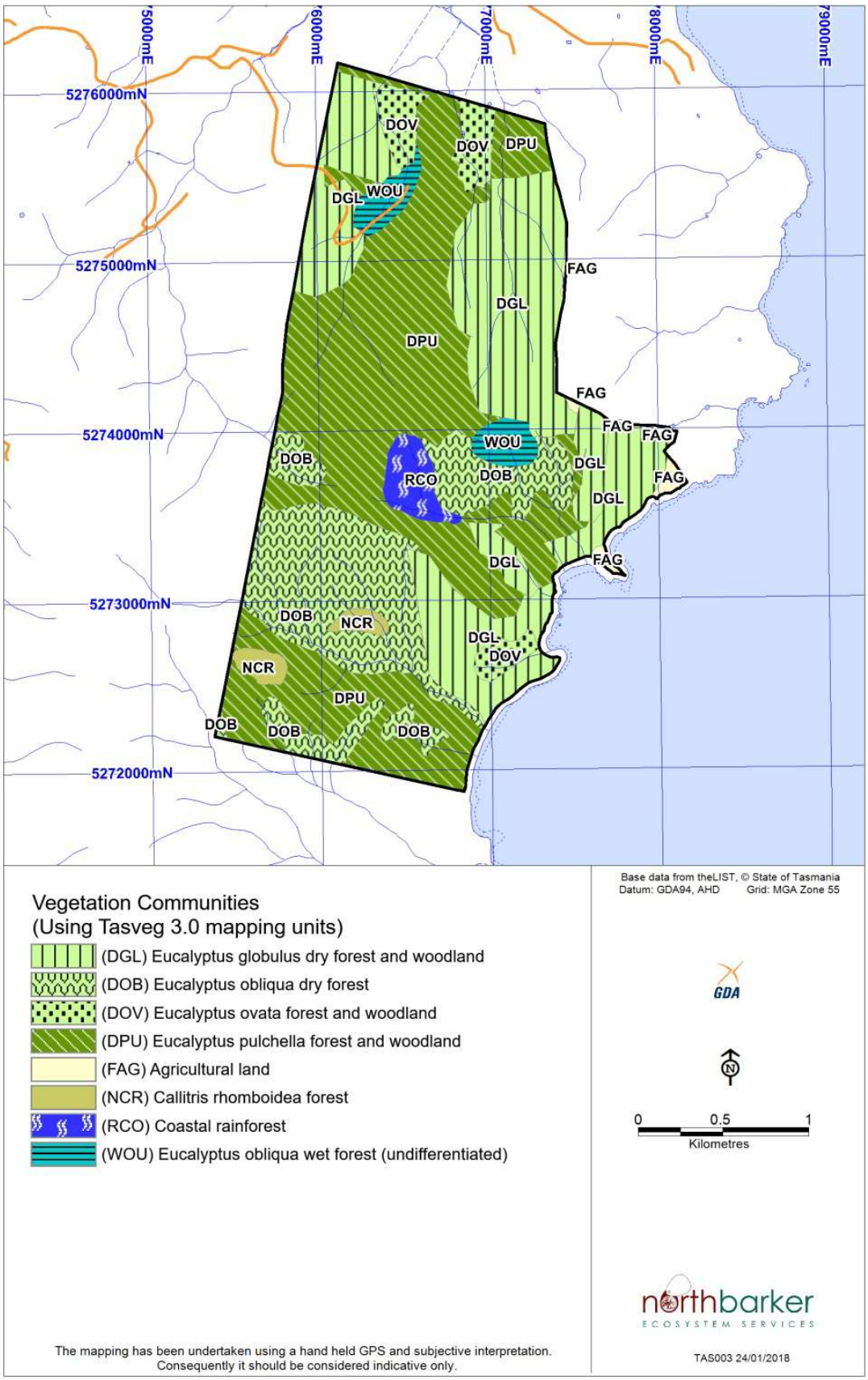

Figure 20. Ringrove: The distribution of Tasveg 3 vegetation mapping units.

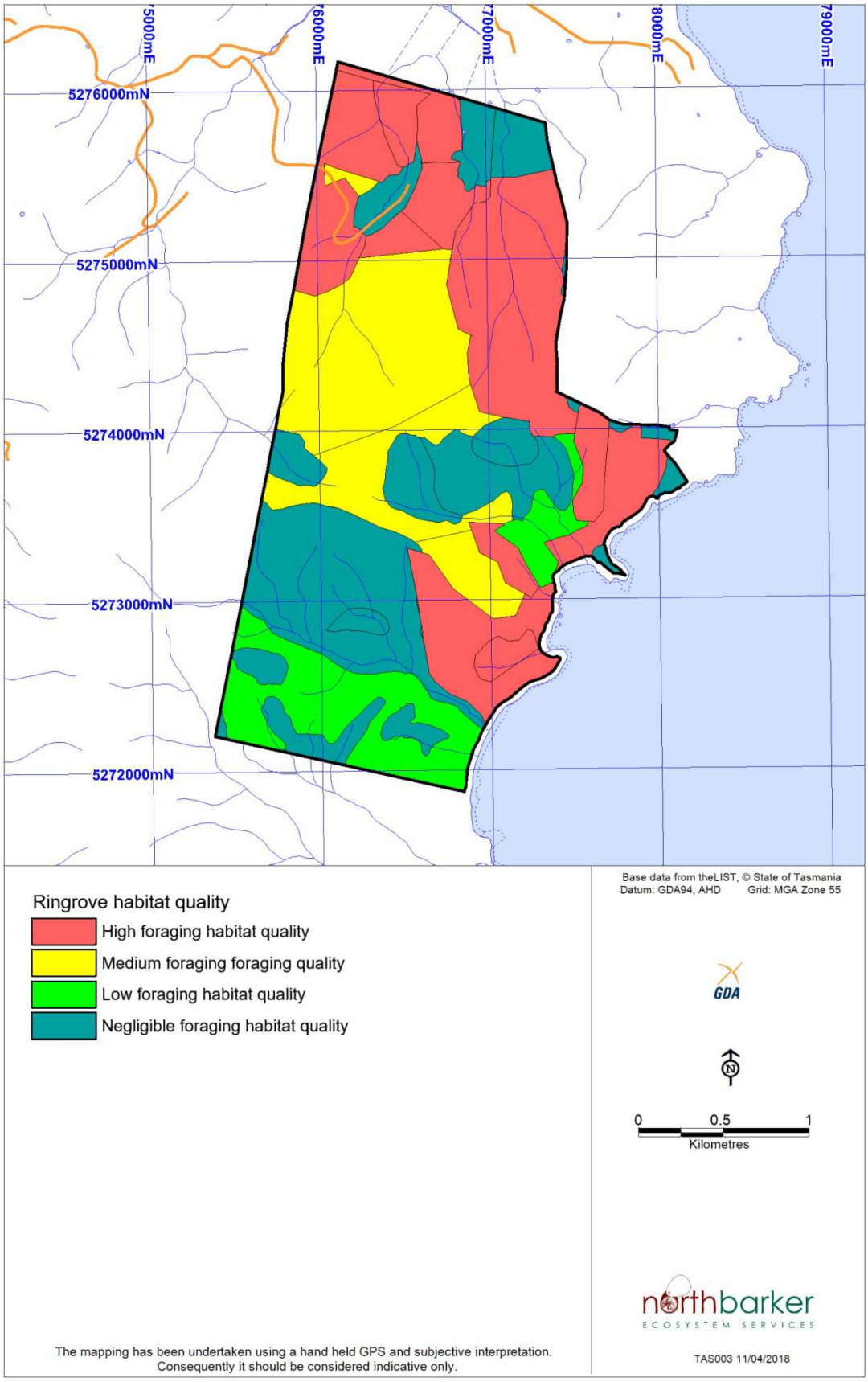

Figure 21. Ringrove: Distribution of swift parrot foraging habitat quality.

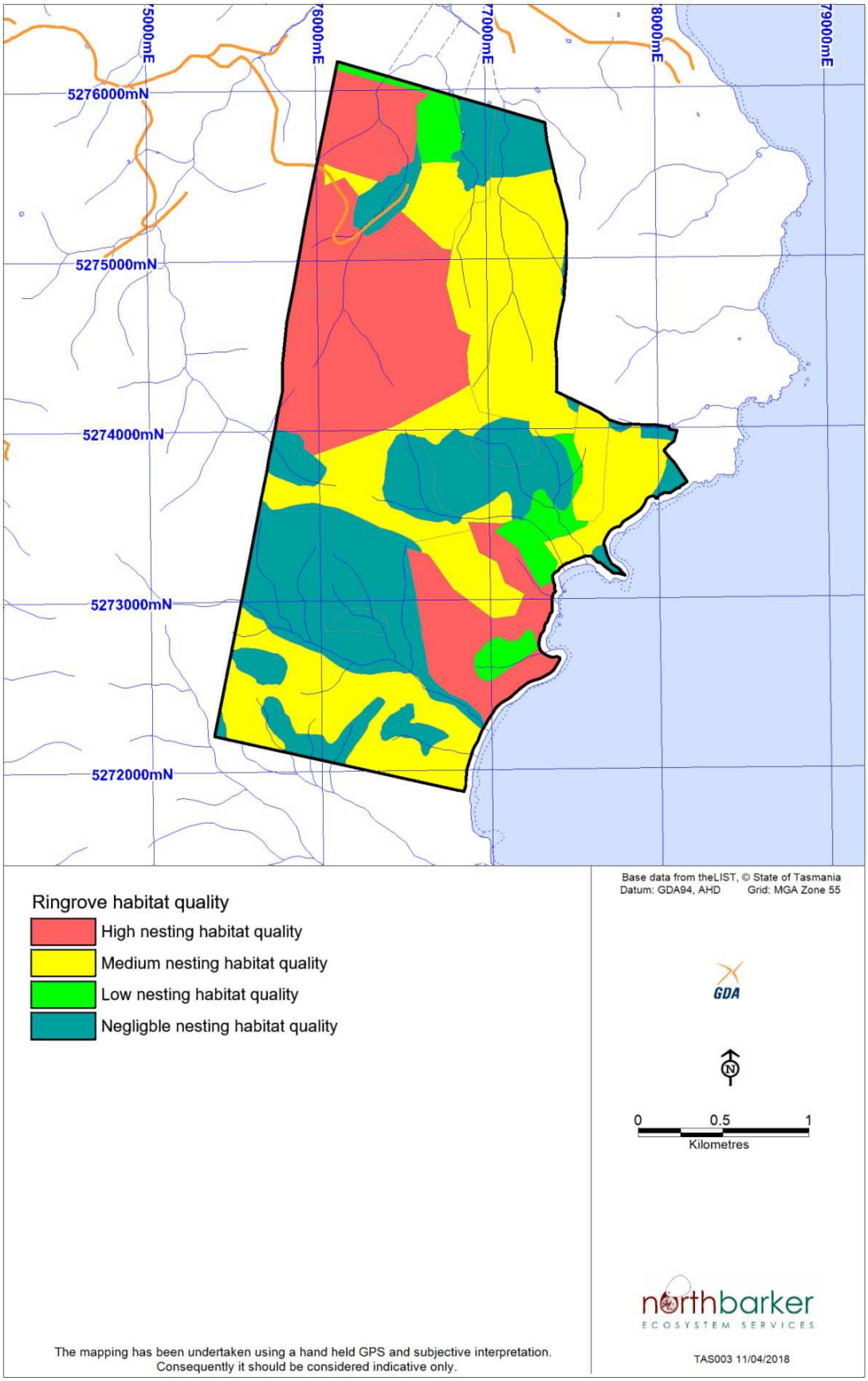

Figure 22. Ringrove: Distribution of swift parrot nesting habitat quality.

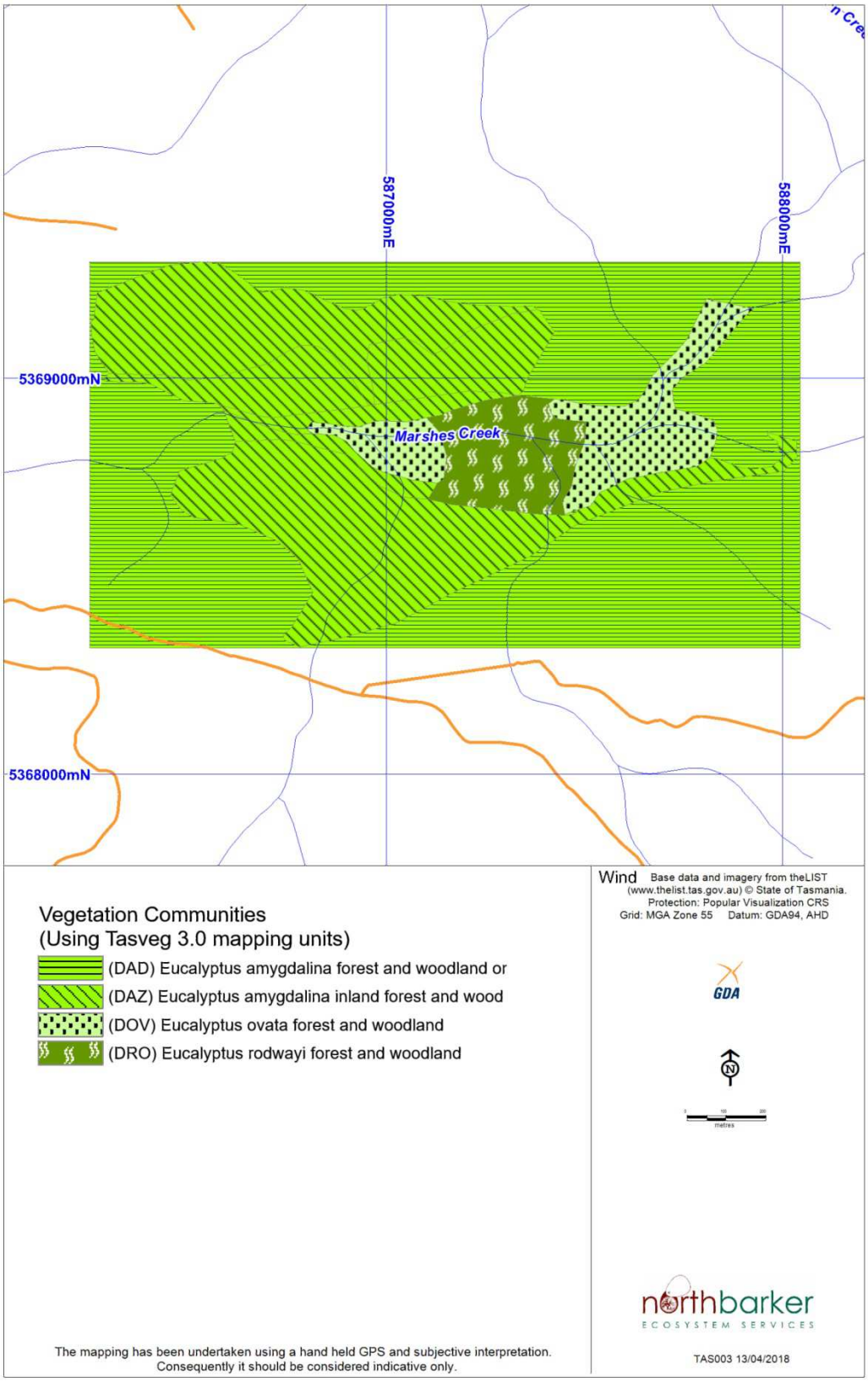

Figure 23. Lewis Hill: The distribution of Tasveg 3 mapping units.

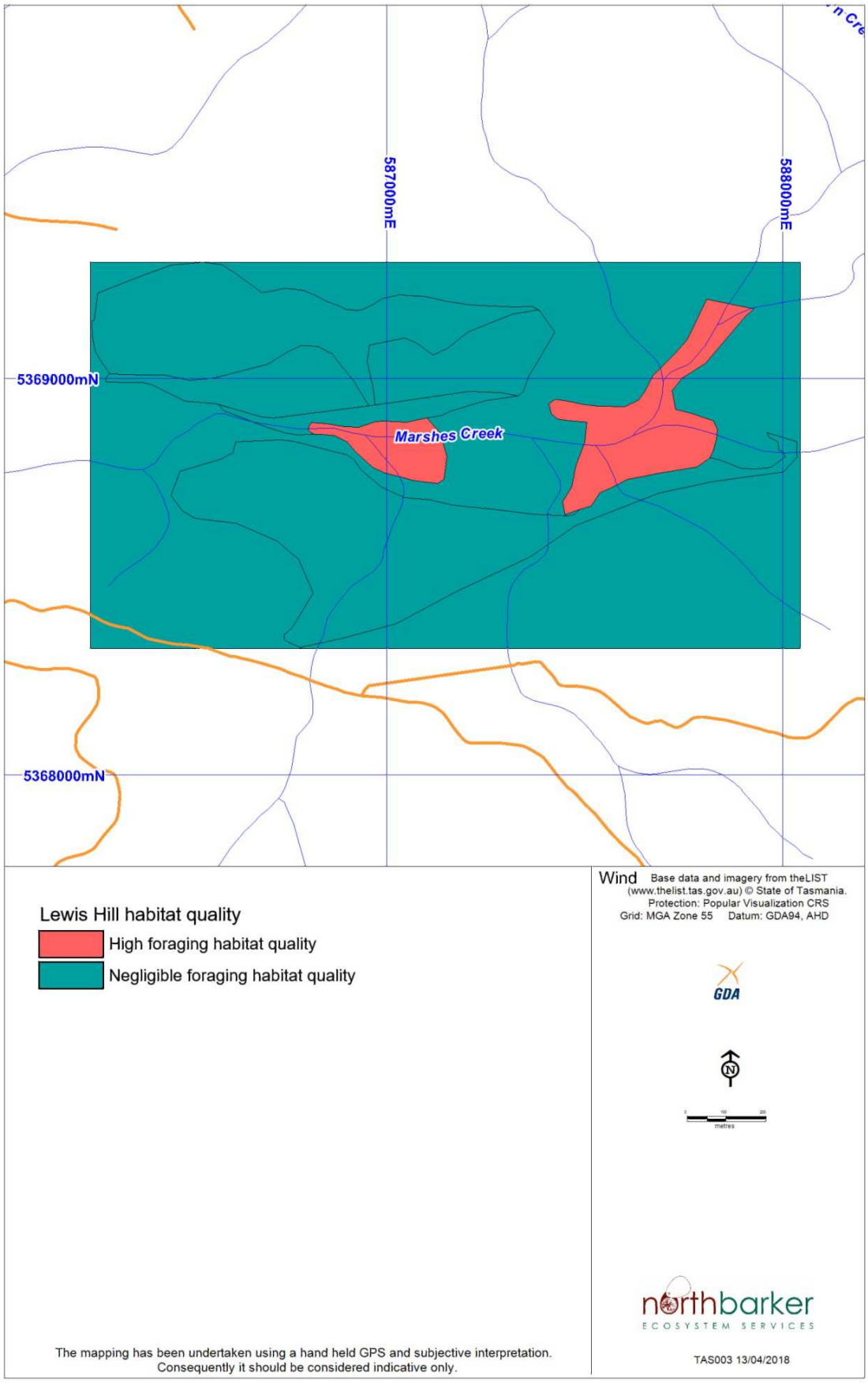

Figure 24. Lewis Hill: The distribution of swift parrot foraging habitat quality.

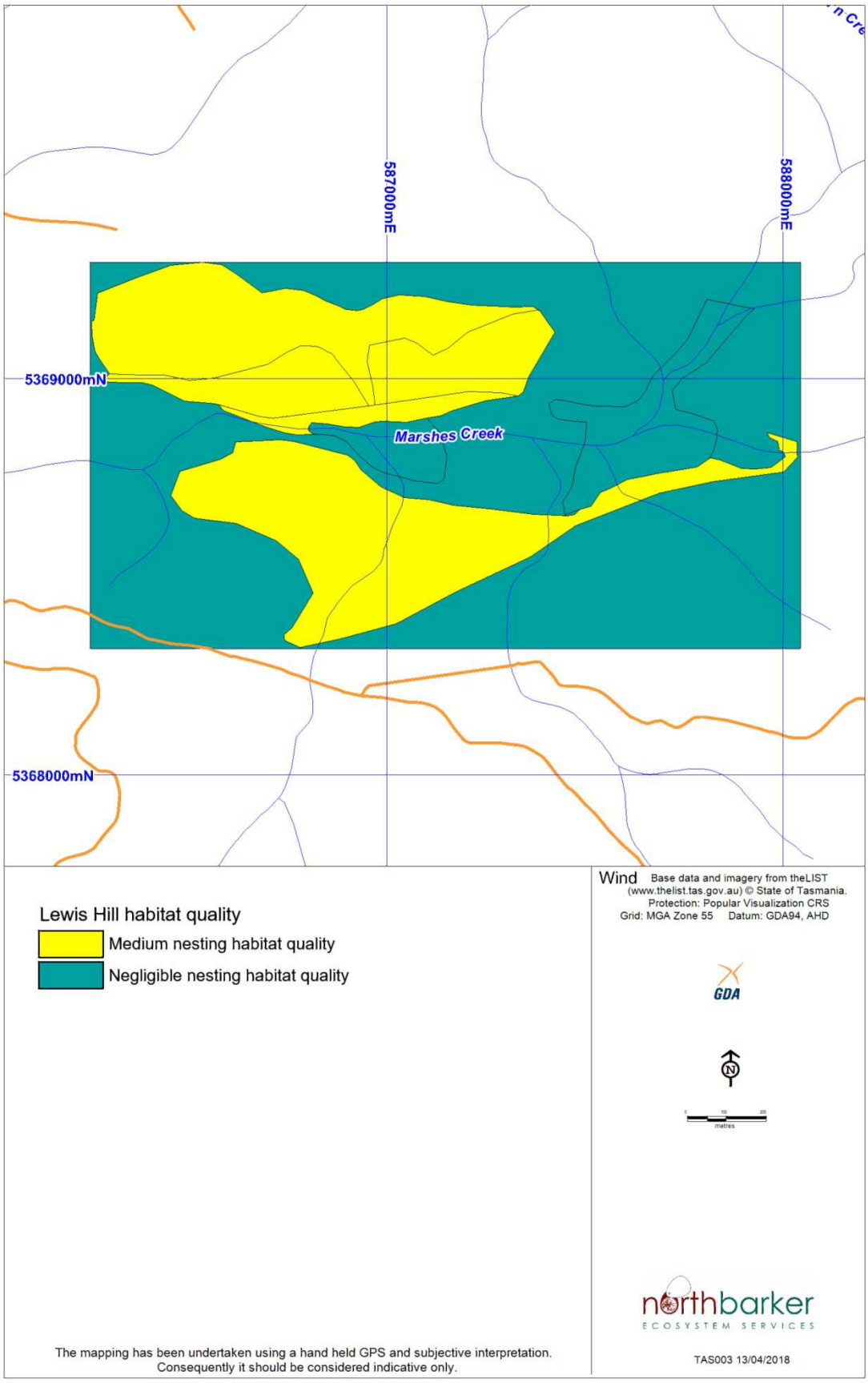

Figure 25. Lewis Hill: The distribution of swift parrot nesting habitat quality.

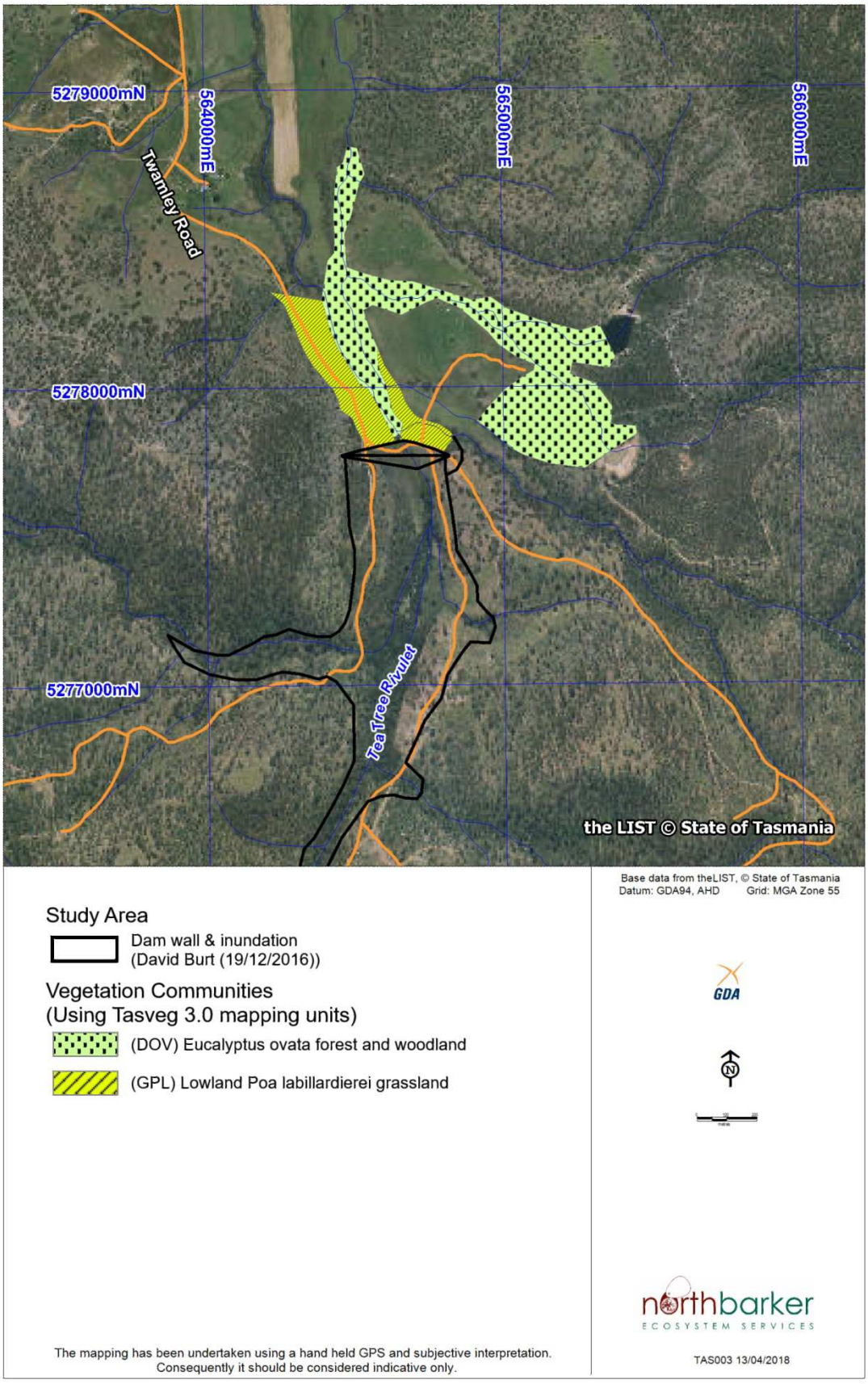

Figure 26. Twamley: The extent of swift parrot foraging habitat (low quality) and poa lowland grassland enhancement.

7 Other approvals and conditions

7.1 Planning framework

A number of Tasmanian Acts regulate activities that are relevant to the Action. In complying with the Acts some require specific approvals for the activity to be permitted.

The legislative and planning framework that governs the protection and management of Tasmania's environment includes the following relevant regulatory requirements and instruments.

7.2 Water Management Act 1999

7.2.1 Dam Permit

A permit may be issued by DPIPWE where it is demonstrated that a dam can be constructed with adherence to national dam building standards. The process requires the assessment of biodiversity values where present. Where impacts are not acceptable the process requires offset for residual impacts on threatened species and vegetation communities and ensures clearing and sediment and erosion controls and weed and pathogen management during construction. These elements must be managed according to prescriptions contained in a Construction and Environmental Management Plan (CEMP).

The supporting documentation for the application to construct the dam has been reviewed by DPIPWE. The formal application will not be made available until approval is gained through the EPBC Act assessment process.

7.2.2 Water licence

The purpose is to ensure that water is sustainably allocated in accordance with National Water Initiative (NWI) principles. The licence is provided by DPIPWE and sets environmental flows to protect aquatic values, daily take limits and cease to take limits for watercourses.

The Stage 2B environmental flow and updated reliability report were issued to DPIPWE in early October 2018 (Appendix 6 and Appendix 7). The DPIPWE water licence has subsequently been approved and authority has been provided to pass water via the Tea Tree Rivulet to the Prosser River (Appendix 8 and Appendix 9).

7.2.3 Forest Practices Act 1985

A forest practices plan is normally required under this Act to clear native forest. A Dam Works Practices Plan (DWPP) under the WMA replaces the FPP for works approved under the Dam Permit.

A DWPP has been drafted and will be certified by a Forest Practices Officer once final permit conditions are resolved.

7.2.4 Threatened Species Protection Act 1995

A Permit is normally required under this Act to "take" threatened species. However, the requirement for Permits under this Act is transferred to the Water Management Act where the "take" is related to a Dam Permit and so dam construction is exempt from the TSPA. Any works that occur outside of the dam permit process must comply with this Act.

7.2.5 Nature Conservation Act 2002

This Act contains the schedule of Threatened Vegetation in Tasmania. The requirement for Permits under this Act is transferred to the Water Management Act. The Dam Permit process replaces the requirement for a Permit to take products of wildlife allows for the decommissioning of dens and burrows and destruction of unused nests or the translocation of species.

7.3 Additional Approvals

7.3.1 Land Use Planning and Approvals Act 1994

A permit under this Act ensures that all activities are consistent with the relevant local government planning schemes. In this case the Glamorgan Spring Bay Interim Planning Scheme 2013.

The Development Application for the PPRWS pipeline and pump station was approved by Glamorgan Spring Bay Council on 22 August via issue of Planning Permit DA 2017 / 00132 but this is currently subject to appeal by Marine Protection Tasmania.

b) A statement identifying any additional approval that is required.

The status and relative timing of approvals is as described above for each of the relevant regulations.

7.4 Monitoring, enforcement and procedural review

The proponent GSBC has limited current, internal water system operational experience since the state wide takeover of the previous Council-owned water systems (including the Prosser Water Treatment Plant). The GSBC will partner with other more experienced parties or contract their expertise to develop suitable policy and procedure documentation to operate and maintain the PPRWS. The State legislation and DPIPWE licencing requirements will be the primary drivers for these documents.

A Scheme Operator/Manager will be appointed by the GSBC to ensure that these P & P requirements are met and regularly reported to the various stakeholders. DPIPWE are likely to require 24/7 read-only access to the Scheme control system to review its performance against the licence conditions. External expertise will be used to review and audit the Scheme activities and performance.

7.5 Interaction with other approved projects

One of the major customers of the PPRWS is the Tassal owned and operated salmon farm within the Okehampton Bay marine lease. This activity was approved under the EPBC Act in 2016. There are no other EPBC approved projects linked to the PPRWS.

8 Social and economic

8.1 Public consultation

The development of the concept of the Scheme was prompted by the local water restrictions during the drought of 2008/9. The drought also contributed to one of the proposed water users (the then recently GSBC approved Solis golf course and residential development) being put on hold.

The resurrection of the golf course and residential development, in combination with the expansion of a fish farm inside an existing marine lease, has received unprecedented media coverage. The additional raw water delivery options were part of this publicity. At least one public meeting was called by the opponents of these developments.

The Water Licence application was advertised in early 2016 by DPIPWE and consultations are on-going between GSBC and TasWater, the only formal respondent.

The GSBC passed the preliminary Business Case for the Scheme in January 2017 as part of its regular meeting schedule. This routine Council meeting was open to the public.

On 25 May 2017, the GSBC Natural Resource Management group ran their second workshop entitled “Review of the Prosser Catchment Plan 2002” with multiple community, business and government representatives. The PPRWS Project Manager presented the planning

details for the Scheme and was involved during the day and subsequently with private and group stakeholder discussions about the Scheme.

During the development of the documentation for the project's Approvals Phase from January to present (October 2017), many landowners and other stakeholders have been consulted. Unsolicited expressions of interest for an allocation from this proposed raw water supply have been received by the GSBC during this planning phase of the project. The majority of the requestors have had discussions with either Council officers or the PPRWS Project Manager about the proposed Scheme and its potential for future expansion of coverage.

A qualified Tasmanian Aboriginal Heritage Officer was part of the cultural survey team for the assessment of the Scheme's footprint in January 2017. The impact report was reviewed by representatives of the southern indigenous communities and their permission to proceed was provided in mid-2017.

The Development Application for the scheme pump station and pipeline proposal was advertised twice in mid-2017. The approval process included assessing issues raised by the respondents with several being contacted personally for clarifications.

The regular GSBC Council meeting held to consider this and other DA's was advertised. The agenda was advertised on Friday 18 August for the regular monthly Council meeting scheduled for 22 August. The meeting was open to the public.

When the dam construction application is made it will be advertised by DPIPWE for public comment. Meetings have been held with and/or correspondence has been entered into with adjacent landowners.

8.2 Social and economic analysis

Quoted from Oct 2017 Funding Application by GSBC "Capturing and distributing this region's heavy yet irregular rainfalls will deliver water surety to unlock $97 million of capital investment, includes over $80 million of private investment, plus create between 85 to 100 direct jobs when completed across the three key sectors of tourism, aquaculture and agri-business. The PPRWS will also provide additional water capacity and contingency for the region's strategic potable water needs to service now increased growth expected in residential and commercial development in response to PPRWS coming online."

9 Environmental record of person proposing to take the action

The Action is being undertaken by the Glamorgan Spring Bay Council. This organisation is a local planning authority that oversees the planning and development process and imposes and audits conditions of development related to environmental management. The planning process is set out in the Land Use Planning and Approvals Act 1993. The Environmental Protection and Pollution Control Act 1993 also dictates through regulation how the council operates developments. The council has a long history of compliance in this regard.

Mr David Metcalf is General Manager of the GSBC and the person applying for a Permit on behalf of the GSBC.

10 Conclusion

The PPRWS is a water supply development that will contribute to economic activity in the region. The development will result in the inundation of 53 ha of native vegetation. In sum, the entire area variously represents habitat of four MNES that are listed below.

This documentation demonstrates the context of habitat for each MNES with regard to area impacted, area of habitat remaining in the vicinity (10 km radius) and area remaining in Tasmania.

Impact: The development comes at the environmental cost of the inundation of 53 ha of native vegetation. The vegetation represents the habitat of four MNES considered here.

Swift parrot: There are 21.64 ha of swift parrot foraging habitat and potential nest trees and the habitat is within a SPIBA. In some years the foraging habitat could be important early season foraging habitat. The loss of the habitat is a significant impact. This is largely because the foraging habitat is in close associated with potential nesting habitat and is within a matrix of swift parrot habitat within a SPIBA. Based on location, size and quality of the habitat the impact of the Action is deemed to be significant based on EPBC significant impact criteria.

Tasmanian devil: The 53 ha footprint of the Action represents Tasmanian devil habitat that is suitable for hunting and denning. It is not significant denning habitat because there are structures with openings suitable for a devil to pass through dens (potential dens) scattered across the footprint and adjacent landscape. The loss of the habitat may result in the displacement of a few individuals whose home ranges overlap each other and the inundation area. This displacement may result in a small amount of increased competition locally. However, if the population is below carrying capacity, due to disease pressure, the displaced individuals are unlikely to cause a density dependant loss of animals and will fit within carrying capacity.

Rigorous measures are proposed to ensure that no active den is disturbed.

The impact of the Action is not considered to be significant based on EPBC general test for significance.

Wielangta stag beetle: Previous research has demonstrated that the WSB is extremely difficult to locate WSB and has very patchy distribution. The Action includes 10 ha of potential Wielangta stag beetle habitat. This habitat has not been proven to be occupied and does not provide connectivity to any other potential habitat. The area of "potential habitat" within the footprint is 10 ha which represents 0.035% of the extent of occurrence and 0.235 % of potential habitat.

The impact of the Action is not considered to be significant based on EPBC general test for significance.

Poa grassland: A small area of lowland temperate grassland occurs within the footprint and would be inundated. Although the grassland is natural it appears to require fire to be sustained. The area of 1.25 ha is very small in the landscape context, however it does meet the size criteria of the ecological community (> 1 ha). In Tasmanian there are 13 500 ha of lowland grasslands (GPL) mapped by Tasveg 3. Of these 1900 ha are reserved. In the south east bioregion there are 7 700 ha mapped and 500 ha reserved. It is not known how much of this area meets the EPBC condition criteria of the listed ecological community. Based on size and condition of the grassland patch the impact of the Action is deemed to be significant based on EPBC significant impact criteria.

Mitigation: The acceptability of the proposal hinges on the acceptability of the loss of these habitats and the measures proposed to compensate or offset the loss. The irreversible impact of the inundation of habitat, or residual impact, is proposed to be directly offset by protecting similar habitat elsewhere and by rehabilitating forest and grassland in the immediate vicinity of the Action. The protection instrument will be a Covenant under the Tasmanian Nature Conservation Act 2002. This measure and the attendant management plan will ensure that those habitats cannot be degraded in the future.

The MNES impacted by this Action are endemic (or breeding endemics) to Tasmania. Their threat status is therefore a national and global status and the pursuit of measures to offset the impacts recognises and reflects this status.

The offset proposal for this Action meets the EPBC Offsets Policy objectives and guidelines. An objective of the EPBC offsets policy is to provide "robust, positive environmental outcomes". The EPBC offsets policy claims to incorporate current international best practice.

The EPBC offset calculator was used to calculate the worthiness of the offset proposals. The input data have been justified as reasonable estimates of area, quality and the associated risks of loss, with and without protection, and changes in quality with and without protection. The calculation confirmed that the "outcome" of the direct offset proposal can meet 100% of the offset requirement.

Environmental management: A Construction and Environmental Management Plan contains management prescriptions that met all of the regulatory requirements and standards of pre construction, construction and post construction environmental management. The CEMP includes general elements such as erosion, noise, dust and water quality. The plan includes specific environmental protection guidelines (EPG's) for each of the MNES. These prescribed guidelines detail preconstruction and construction requirements to detect and protect MNES. The guidelines include risk management, monitoring and performance criteria.

A Dam Works Practices Plan has also been developed for utilisation during the land clearance phase. The EPG's are attendant to the DWPP and compliance will be audited through this plan.

Ecologically Sustainable Development: The proposal complies with the principals of the National Strategy for Ecologically Sustainable Development (ESD).

The competing requirements of growing a diverse economy and environmental protection are recognised. The capacity of a strong economy to enhance environmental outcomes is demonstrated through the ability of the proponents to comply with the EPBC offsets policy. Only an economically viable proposal can meet the requirements of the multiplier applied to the area required to be protected to offset the residual impacts of the Action.

The EPBC offset policy was developed in the context of the principals of ESD. The whole notion of offsetting impacts acknowledges that there may be acceptable residuals impacts caused by desirable development. The multiplier applied here ultimately limits the total area of habitat that can be converted by ultimately extinguishing the possibility of direct offsets once the balance of habitat is protected.

There are no other dam sites in the Prosser River catchment which can achieve this project's and the broader community interest objectives. All other potential sites involve greater areas of inundation, lower reliability and/or less cost effective capture and storage ratios. The majority proportion of this harvested water will facilitate food production and support the projected local area domestic use. The lack of sufficient storage within the Prosser River catchment means that many times the volume of this Scheme's capture is lost to the sea each year. The PPRWS costs and outputs compare favourably with similar schemes in Tasmania which have won praise for efficient productivity in the agriculture and horticulture sectors. The Scheme although small, remains favourable when assessed against the eastern states major rural water systems impacts and competitiveness.

The potential for enhancing the Scheme capture volume via additional temporary flood harvest water licencing has already been raised. This is of particular interest to farmers north of the current water distribution area who have submitted pro-active expressions of interest thus exampling the broader community involvement.

As a component of the PPRWS, this Action should be approved to be undertaken in the manner specified above for:

- construction as per DWPP and CEMP,
- operation as per the Water Licence and
- compensation for residual impacts as per the Offsets Strategy and Management Plan(s).

11 Information sources

11.1 Field and desktop data biodiversity

a) The source and currency (date) of the information.

The field data used to quantify and describe the MNES and analyse the quality of habitats has all been collective since December 2016.

Distributional data is derived from the DPIPWE Natural Values Atlas. These data include most known records. Range boundaries were sourced from the NVA data. The currency is recent.

b) How the reliability of the information was tested.

The NVA only records data that have been deemed to be reliable. The reliability of NVA data is tested in a variety of ways including but not limited to expert review and field verification. In this study only those distributional data with a precision estimate of < 100 m have been used for illustrative and analytical purposes.

c) The uncertainties (if any) in the information.

Tasveg 3 and glob map were used to indicate the extent of habitats where relevant. Tasveg undergoes updates from time to time. Tasveg 3 is variable in quality. Globmap is also variable in quality. Both can be imprecise and inaccurate in a significant proportion of polygons[44]. However, Tasveg 3 was corrected before application to the footprint of the Action. Tasveg was accepted in remote areas but was verified in places considered as candidates for offsets.

d) The guidelines, plans and/or policies considered.

The collection and interpretation of the data, the assessment of likely impacts and the development of mitigation and offsets was undertaken in compliance with:

- DPIPWE guidelines for natural values surveys (2015)– terrestrial development proposals (2015).
- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act
- Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the EPBC Act
- Additional survey guidelines produced as a series of Technical Notes by the Forest Practices Authority.
- EPBC Significant impact guidelines.
- EPBC, Tasmanian Dam Assessment Framework and DPIPWE offset policies.
- EPBC guidelines for developing offsets
- EPBC Recovery plans

11.2 Field and desktop data water resource

a) The source and currency (date) of the information.

All surveys and reports for this project have been produced from January 2016 to present with the latest being the Stage 2 Hydrology by Entura. This was updated to meet additional information requests from DPIPWE for water licence and environmental flow assessments.

b) How the reliability of the information was tested.

All reports have used industry-recognised professionals with company selection based on references and experience. The inclusion of local expertise in the team was given higher weighting in the evaluation of these offers of professional services. Local stakeholders and

[44] North Barker 2016

impacted landowners have been kept informed and/or interviewed to cross-check much of the study material and conclusions.

For the hydrology studies, full modelling with field validation of flows at different seasons were used. In this work, stream flow cross-sections were derived from recent LiDAR and other sources checked with field surveyor transects at critical locations.

For many of the reports field data was supported by the presence of the Project Manager and sometimes other local expertise engaged by the proponent (GSBC) or the major Scheme customers. Any discrepancies were resolved via broader consultations.

c) The uncertainties (if any) in the information.

The run-of-river water transmission loss assessments were unable to be modelled but additional measurements and on-going management conditions have been proposed and are to be included in the water course authority licence to ensure a progressive increase in accuracy for routine flows in each season and any significant flood events.

d) The guidelines, plans and/or policies considered.

Relevant reference material published by government, commercial, educational and private companies/individuals was researched by the study team members.

In particular, DPIPWE, Forest Practices, DIER/DSG, Crown land Services and Parks and Wildlife guidelines, policies and procedures were used as resources to develop the Scheme as proposed. For many issues over the last 11 months of planning, one or more meetings were sought and held with multiple staff from these organisations to ensure compliance with their requirements.

The Tasmanian Irrigation staff and website were particularly helpful as TI has successfully developed many sustainable winter harvest/storage and summer supply rural water systems.

In some cases even those who were known to be opposed to the project or aspects of the project, were consulted. Any representations and/or objections to the Development Application for the PPRWS Pump Station and Pipeline were thoroughly researched so that responses were factual and any design/planning adjustments or mitigations were effective. This open approach is also to continue for this later planning phase of the Action.

12 Appendix

Appendix 1. Dam Works Practices Plan (DWPP)

Appendix 2. Construction and Environmental Management Plan (CEMP)

Appendix 2b. Sediment and erosion Control Plan

Appendix 2c. Environmental Protection Guidelines.

Appendix 3. Expert opinion – swift parrot

Appendix 4. DPIPWE Covenant Policy Statement

Appendix 5. Terms of Covenant and Offset Management Plan

Appendix 6. Aquatic baseline and environmental flow requirements

Appendix 7. Hydrological reliability modelling

Appendix 8. Water licence

Appendix 9. Water course authority

13 Attachments

Attachment 1. Referral

Attachment 3.1_flora_and_fauna_habitat_assessment_-dam_site.pdf

Attachment 3.1b_assessment_of_likelihood_of_occurrence_of_mnes.pdf

Attachment 3.1c_epbc_pmst.pdf

Attachment 3.1d_flora_and_fauna_habitat_assessment_-_pipeline.pdf

Attachment 3.1d_flora_and_fauna_habitat_assessment_pprws_pipeline.pdf

Attachment 3.1e_marine_values_pipeline.pdf

Attachment 3.1f_prosser_river_shore_bird_habitat_mast.pdf

Attachment 3.2a Redundant see Appendix 8

Attachment 3.2b Redundant see Appendix 7

Attachment 3.2c_transmission_loss_report_.pdf

Attachment 3.9_aboriginal_heritage_assessment.pdf

Attachment 4.1_cemp_injured_animal_protocol.pdf

14 References

Bell, P. J. & Mooney, N. J. (1998). *Wedge-tailed Eagle Recovery Plan 1998-2003*. Department of Primary Industries, Water and Environment.

Bryant, S. & Jackson, J. (1999). *Tasmania's Threatened Fauna Handbook: what, where and how to protect*. Threatened Species Unit, Parks & Wildlife Service, Hobart.

Cole. I, and Lunt, I. D. 2005 Restoring Kangaroo Grass (Themeda triandra) to grassland and woodland understoreys: a review of establishment requirements and restoration exercises in south-east Australia. Ecological Management and Restoration 6 (1) 28-33.

Commonwealth of Australia & State of Tasmania (1997). *Tasmanian Regional Forest Agreement*.

Commonwealth of Australia (1999). *Environment Protection and Biodiversity Conservation Act 1999. No. 91, 1999*.

Curtis, W.M. and Morris, D.I. (1994). *The Students Flora of Tasmania, part 4B. Angiospermae: Alismataceae to Burmanniaceae*. Government Printer, Hobart.

Department of Environmental and Heritage (2006) Tasmanian Devil (Sarcophilus harrisii) - EPBC Policy Statement 3.6

Department of the Environment, Water, Heritage and the Arts (2009). Approved Conservation Advice for Sarcophilus harrisii (Tasmanian Devil).

Department of the Environment, Water, Heritage and the Arts, 2009 Nationally threatened species and ecological communities guidelines EPBC Act Policy Statement 3.18

DEWHA (2010) Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2.

Department of Primary Industries, Parks, Water and Environment (2010) Recovery Plan for the Tasmanian devil (Sarcophilus harrisii). Department of Primary Industries, Parks, Water and Environment, Hobart.

DPIPWE January 2017 *Natural Values Atlas* Tasmania.

DPIPWE (2015) Survey Guidelines and Management Advice for Development Proposals that may impact on the Tasmanian devil (Sarcophilus harrisii). Natural and Cultural Heritage Division.

DPIPWE (2015) Guidelines for natural values surveys terrestrial development proposals.

Flora Advisory Committee (1994) *Native Higher Plant Taxa Which Are Rare Or Threatened In Tasmania*. Parks & Wildlife Service, Hobart.

Forest Practices Authority 2008. FPA planning guideline 2008/1.

Forest Practices Authority (2011). Fauna Technical Note 12: Goshawk habitat categories. Version 2.1.

Forest Practices Authority (2011). Fauna Technical Note No. 4: Protocol for conducting broad-toothed stag beetle Lissotes latidens surveys.

Forest Practices Authority (2013). Fauna Tech Note 10. Identifying Tasmanian devil and spotted-tailed quoll habitat. Version 1.3.

Forest Practices Authority (2014). Fauna Technical Note No. 3: Identifying swift parrot breeding habitat. Version 1.3.

Grove, S. (2006) Forestry Tasmanian surveys for broad-toothed stag beetle *Lissotes latidens* Wielangta State Forest. Tech Report 02/2006.

Hamede R.K., J. Bashford, H. McCallum, M. Jones (2009). Contact networks in a wild Tasmanian devil (*Sarcophilus harrisii*) population: using social network analysis to

reveal seasonal variability in social behaviour and its implications for transmission of Tasmanian devil facial tumour disease. *Ecology Letters* 12:1147-1157.

Harris, S and Kitchener, A. (2005). *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*, DPIW, Hobart

Higgins, P.J. & S.J.J.F. Davies, eds. (1996). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Melbourne, Victoria: Oxford University Press.

Jones, M.E. & Rose, R.K. (1996). *Preliminary assessment of distribution and habitat associations of the spotted-tailed quoll* (Dasyurus maculatus maculatus) *and eastern quoll* (D. viverrinus) *in Tasmania to determine conservation and reservation status*. Report to the Tasmanian RFA Environment and Heritage Technical Committee.

Kirkpatrick, J.B., Barker, P., Brown, M.J., Harris, S., and Mackie, R. (1995). *The Reservation Status of Tasmanian Vascular Plant Communities*. Wildlife Scientific Report 95/4. Parks and Wildlife Service, Hobart.

Kirkpatrick, J.B., Peacock, R.J., Cullen, P.J. and Neyland, M.G. (1988) *The Wet Eucalypt Forests of Tasmania*. Tasmanian Conservation Trust, Hobart.

Knight, R.I. (2012). Analysis of comprehensiveness of existing conservation reserves and proposed additions to the Tasmanian forest reserves system. Report to the Independent Verification Group for the Tasmanian Forests Intergovernmental Agreement, February 2012. Natural Resource Planning, Hobart.

McGlashan, N., Obendorf, D., Harington, S. (2006) Aspects of the fatal malignant disease among the Tasmanian devil population (*Sarcophilus laniarius*). European Journal of Oncology, Vol. 11, n. 2, pp. 95 - 102.

Meggs, J.M. (2003) Summary of strategic analysis of Grey Goshawk habitat in Togari forest block. Forestry Tasmania.

Muller. S, Dutoit, T, Alard. D and Grévilliot. F (1998) Restoration and Rehabilitation of Species-Rich Grassland Ecosystems in France: Restoration Ecology 6 (1) 94-101.

Natural and Cultural Heritage Division (2015) Survey Guidelines and Management Advice for Development Proposals that may impact on the Tasmanian Devil (Sarcophilus harrisii). Department of Primary Industries, Parks, Water and Environment.

North, A.J., Johnson, K., Ziegler, K., Duncan, F.,K Hopkins, D, Ziegeler, D., Watts, S. (1998). *Flora of Recommended Areas for Protection and Forest Reserves in Tasmania*. Forestry Tasmania / Forest Practices Board / Parks & Wildlife Service, Hobart.

North Barker (2016) Tasmania Defence Sites. Terrestrial Biodiversity Monitoring. Australian Government Department of Defence.

Peters, D. & Thackway, R. (1998) *A New Biogeographic Regionalisation for Tasmania*.

Tasmanian Parks and Wildlife Service, Hobart.

Pemberton, D. (1990) Social organisation and behaviour of the Tasmanian devil, *Sarcophilus harrisii*. PhD thesis, University of Tasmania.

Prober, S. M. and Thiele, K. R. (2005) Restoring Australia's temperate grasslands and grassy woodlands: integrating function and diversity

PLUC (1996). *Environment and Heritage Report. Background Report Part C Vol I-V*. For Tasmanian -Commonwealth Regional Forest Agreement. Tasmanian Public Land Use Commission, Hobart.

PLUC (1996a). *Supplement to Environment and Heritage Report. Background Report Part C Vol V*. For Tasmanian -Commonwealth Regional Forest Agreement. Tasmanian Public Land Use Commission, Hobart.

Saunders, D.L. and Tzaros, C.L. 2011. National Recovery Plan for the swift parrot Lathamus discolor, Birds Australia, Melbourne.

Save the Tasmanian devil website (2012). http://www.tassieTasmanian devil.com.au/tasTasmanian devil.nsf

Tasmanian State Government (2002). *Nature Conservation Act 2002*. No.63 of 2002. Government Printer, Hobart, Tasmania.

Tasmanian State Government (1995). *Threatened Species Protection Act 1995*. No.83 of 1995. Government Printer, Hobart, Tasmania.

Tasmanian State Government (1999). *Tasmanian Weed Management Act 1999*. No. of 1999. Government Printer, Hobart, Tasmania

Tasmanian Vascular Plant Census 2017. 2. A Census of the Vascular Plants of Tasmania, including Macquarie Island. 2017 edition. MF de Salas and ML Baker.

Threatened Species Scientific Committee (2002). Commonwealth Listing Advice on Lissotes latidens (Broad-toothed Stag Beetle).

Threatened Species Scientific Committee (TSSC) (2009). Commonwealth Listing Advice on Sarcophilus harrisii. Department of the Environment, Water, Heritage and the Arts.

Threatened Species Scientific Committee (2016) Conservation Advice Lathamus discolor *swift parrot*. Canberra DOE.

Tierney, E. (2011) Species distribution modelling for the grey goshawk, *Accipiter novaehollandiae*, in north-western Tasmania. PhD, UTas.

Troy, S., Johnson, C., Hawkins, C., Munks, S. and Jones, M. (2011) Habitat use by the Tasmanian spotted-tailed quoll in an agricultural landscape. Poster presentation.

Young, D. (2006). Home range size, habitat use and diet of the endangered Tasmanian masked owl. *Forest Practices News*. 7(4).

PPRWS Supporting documentation running list (ex Shane Wells GSBC)

As at October 2017, the following supporting documentation is available.

GSBC has committed to select Tasmanian consultancy firms subject to assessment of expertise and price competitiveness.

Report	Author	Version	Final
Dam, Water Licence & Watercourse Authority			
Aquatic Environment and Environmental Flow Assessment	Entura Consulting	29 September 2017	Yes
Hydrological Reliability Modelling	Entura Consulting	29 September 2017	Yes
Twamley Dam Transmission Loss Assessment V2	WMA Water Pty Ltd	March 2017	Yes
Twamley Dam Design Flood Study	WMA Water Pty Ltd	April 2017	Yes
Dam Safety Emergency Management Plan	JMG Engineers & Planners Pty Ltd	July 2017	Yes
Geotechnical investigation – Twamley Dame	GeoTon Pty Ltd	19 April 2017	Yes
Dam Pre-Construction Report	JMG Engineers & Planners Pty Ltd	June 2017	Yes
Sediment & Erosion Control Plan	JMG Engineers & Planners Pty Ltd	July 2017	Yes
Dam plan & survey	Walter Surveys & Site Positioning Management	4 March 2017	Yes
Proposed Twamley Dam Metering & Monitoring	Macquarie Franklin	16 October 2017	Yes
Dam Works Practices Plan	SFMES Pty Ltd	24 May 2017	Yes
Pipeline			
Pipeline Corridor Design	JMG Engineers & Planners Pty Ltd	4 May 2017	Yes

Pipeline Functional Description	JMG Engineers & Planners Pty Ltd	April 2017	Yes
Aboriginal Heritage Assessment	Cultural Heritage Management Australia	30 January 2017	Yes
Historic Heritage Assessment	Cultural Heritage Management Australia	21 February 2017	Yes
Bathymetery Survey	Marine Solutions Tasmania Pty Ltd	May 2017	Yes
Desktop and Field Assessment of the Natural Values at the Proposed Site of a Pipeline in the Prosser River, Orford, Tasmania	Marine Solutions Tasmania Pty Ltd	May 2017	Yes
Botanical Survey and Fauna Habitat Assessment	North Barker Ecosystem Services Pty Ltd	18 April 2017	Yes
Foreshore Contamination Management Plan	GES Geo-Environmental Solutions Pty Ltd	July 2017	Yes