

**ECOLOGICAL ASSESSMENT OF THE MILLS PROJECT AREA,
NEW NORFOLK, TASMANIA**



**Environmental Consulting Options Tasmania (ECOtas) for
Omega Investment Holdings Pty Ltd
13 April 2020**

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COVER ILLUSTRATIONS

View across modified grassy woodland.

Please note: the blank pages in this document are deliberate to facilitate double-sided printing.

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SUMMARY

General

Omega Investment Holdings Pty Ltd engaged Environmental Consulting Options Tasmania (ECOtas) to undertake an assessment of the ecological values associated with The Mills project area, New Norfolk, Tasmania, primarily to ensure that the requirements of the identified ecological values are appropriately considered during further project planning under local, State and Commonwealth government approval protocols.

Assessment

The main ecological assessment was undertaken on 10 & 11 July 2018 (Brian French). A supplementary ecological assessment was undertaken on 9 April 2020 (Mark Wapstra).

Summary of key findings

Threatened flora

- No plant species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) were detected, or are known from database information, from the study area.
- Two plant species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* (TSPA) are known from database information from the study area, as follows:
 - *Austrostipa bigeniculata* (doublejointed speargrass) [TSPA: rare]: recorded from a single location in the north of the study area (not detected as a consequence of the present assessments and database record of very low precision); and
 - *Velleia paradoxa* (spur velleia) [TSPA: vulnerable]: recorded from a single location in the north of the study area (not detected as a consequence of the present assessments and database record of low precision).
- No plant species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* (TSPA) were detected from the study area.

Threatened fauna

- No fauna species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) and/or the Tasmanian *Threatened Species Protection Act 1995* (TSPA) were detected, or are known from database information, from the study area.
- The study area supports potential habitat of several threatened fauna species, as follows:
 - marsupial carnivores (Tasmanian devil, spotted-tailed quoll, eastern quoll): potential habitat widespread but no specific habitat features (such as dens) or other evidence (e.g. scats) were detected;
 - eastern barred bandicoot: potential habitat widespread;
 - masked owl: no nesting trees (trees with hollows) noted but potential foraging habitat widespread;

- swift parrot: a very small copse of *Eucalyptus ovata* (black gum) trees is present, which is potential foraging habitat, which has marginal potential as opportunistic foraging habitat only; no potential nesting habitat present;
- green and golden frog: very marginal potential habitat is present in the form of small ephemeral farm dams but no vegetation is present in the dams for protection of the species and as such the species should not require further consideration; and
- tussock skink: marginal potential habitat in open grassy areas but habitat considered sub-optimal.

Vegetation types

- The study area supports the following TASVEG mapping units:
 - *Eucalyptus amygdalina* forest on mudstone (DAM);
 - *Eucalyptus viminalis* grassy forest and woodland (DVG);
 - *Allocasuarina verticillata* forest (NAV);
 - lowland grassland complex (GCL);
 - lowland *Themeda triandra* grassland (GTL);
 - agricultural land (FAG);
 - regenerating cleared land (FRG);
 - extra-urban miscellaneous (FUM);
 - permanent easements (FPE);
 - weed infestation (FWU); and
 - water, sea (OAQ).
- Of the vegetation types recorded from the study area, none are listed as threatened vegetation types on Schedule 3A of the Tasmanian *Nature Conservation Act 2002*.
- Lowland *Themeda triandra* grassland (GTL) can equate to a threatened ecological community (Lowland Native Grasslands of Tasmania), listed as Critically Endangered on schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, but in this case the patch does not satisfy the criteria (too small, too weedy).

Weeds

- Four plant species classified as a declared weeds within the meaning of the Tasmanian *Weed Management Act 1999* were detected from the study area, as follows:
 - *Chrysanthemoides monilifera* subsp. *monilifera* (boneseed): several localised patches;
 - *Lycium ferocissimum* (african boxthorn); single shrub in the centre of the study area;
 - *Rubus anglocandicans* (blackberry); extensive patches on the study area; and
 - *Ulex europaeus* (gorse); localised plants in the north of the study area.

Plant disease

- There is no evidence that the study area is infected with *Phytophthora cinnamomi* (rainfall below 600 mm per annum).
- There is no evidence that the study area supports myrtle wilt (absence of *Nothofagus cunninghamii*).
- There is no evidence that the study area supports myrtle rust.

Animal disease (chytrid)

- The study area is not known to support frog chytrid disease and only has marginal habitats conducive to the disease persisting (ephemeral waterbodies and watercourses).

PURPOSE, SCOPE, LIMITATIONS AND QUALIFICATIONS OF THE SURVEY

Purpose

Omega Investment Holdings Pty Ltd engaged Environmental Consulting Options Tasmania (ECOtas) to undertake an assessment of the ecological values associated with The Mills project area, New Norfolk, Tasmania, primarily to ensure that the requirements of the identified ecological values are appropriately considered during further project planning under local, State and Commonwealth government approval protocols.

Scope

This report relates to:

- flora and fauna species of conservation significance, including a discussion of listed threatened species (under the Tasmanian *Threatened Species Protection Act 1995* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*) potentially present, and other species of conservation significance/interest;
- vegetation types (forest and non-forest, native and exotic) present, including a discussion of the distribution, condition, extent, composition and conservation significance of each community;
- plant and animal disease management issues;
- weed management issues; and
- a discussion of some of the policy and legislative implications of the identified ecological values.

This report follows the government-produced *Guidelines for Natural Values Surveys – Terrestrial Development Proposals* (DPIPWE 2015) in anticipation that the report (or extracts of it) may be used as part of various approval processes that could be required for works at the site.

The report format should also be applicable to other assessment protocols as required by the Commonwealth Department of the Environment & Energy (for any referral/approval that may be required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*), and under the local planning scheme (*Derwent Valley Interim Planning Scheme 2015*).

Limitations

The main ecological assessment was undertaken on 10 & 11 July 2018 (Brian French). A supplementary ecological assessment was undertaken on 9 April 2020 (Mark Wapstra). Many plant species have ephemeral or seasonal growth or flowering habits, or patchy distributions (at varying scales), and it is possible that some species were not recorded for this reason. However, every effort was made to sample the range of habitats present in the survey area to maximise the opportunity of recording most species present (particularly those of conservation significance). Late spring and into summer is usually regarded as the most suitable period to undertake most botanical assessments. While some species have more restricted flowering periods, a discussion of the potential for the site to support these is presented.

The survey was also limited to vascular species: species of mosses, lichens and liverworts were not recorded. However, a consideration is made of threatened species (vascular and non-vascular) likely to be present (based on habitat information and database records) and reasons presented for their apparent absence.

Surveys for threatened fauna were practically limited to an examination of “potential habitat” (i.e. comparison of on-site habitat features to habitat descriptions for threatened fauna), and detection of tracks, scats and other signs.

Qualifications

Except where otherwise stated, the opinions and interpretations of legislation and policy expressed in this report are made by the authors and do not necessarily reflect those of the relevant agency. The client should confirm management prescriptions with the relevant agency before acting on the content of this report. This report and associated documents do not constitute legal advice.

Permit

Any plant material was collected under DPIPW permits TFL 17123 & TFL 19120 (in the names of Mark Wapstra and Brian French).

Relevant data (e.g. point locations of weeds) will be entered into DPIPW’s *Natural Values Atlas* database by the author. Some plant material may be lodged at the Tasmanian Herbarium by the authors.

No vertebrate or invertebrate material was collected.

DESCRIPTION OF STUDY AREA

The study area (Figures 1-3) is located to the northwest and southeast of Glebe Road and to the south of the Lyell Highway, New Norfolk, centred on 507015mE 5262661mN (New Norfolk 5026 1:25,000 Tasmap). The study area is within the South East bioregion.

The study area comprises several titles, as follows:

- PID 2304796; C.T. 141514/6 (Poulters Road, New Norfolk);
- PID 2529346; C.T. 142090/5 (Lot 5 Poulters Road, New Norfolk);
- PID 3582966; C.T. 176933/1 (Lot 1 Glebe Road, New Norfolk);
- PID 2726796; C.T. 148315/1 (Lot 1 Ring Road, New Norfolk);
- PID 2726788; C.T. 148140/1 (Lot 1 Ring Road, New Norfolk);
- PID 2213157; C.T. 159779/38 (Ring Road, New Norfolk);
- PID 2213157; C.T. 159779/1 (Ring Road, New Norfolk);
- PID 2186443; C.T. 139136/12 (Glebe Road, New Norfolk);
- PID 2213106; C.T. 139660/7 (Upper Road, New Norfolk); and
- PID 2213114; C.T. 139660/8 (Glebe Road, New Norfolk).

The study area is within the Derwent Valley municipality and includes several zones (Figure 4) pursuant to the *Derwent Valley Interim Planning Scheme 2015*, including Particular Purpose (western part of the study area northwest of Glebe Road); General Residential (approximate northern third of the eastern part of the study area); Low Density Residential (approximate central third of the eastern part of the study area); and Rural Living (approximate southern third of the eastern part of the study area).

The study area is subject to various overlays pursuant to the *Derwent Valley Interim Planning Scheme 2015*, although most have limited direct application to the management of natural values *per se*, the most relevant being the Waterway and Coastal Protection Areas overlay, which covers all of the identified waterways (Figure 5).

The study area is divided into two broad areas: (1) area northwest of Glebe Road incorporating largely cleared titles bounded by Glebe Road and Lower Road and incorporating Upper Road and Ring Road); and (2) area southeast of Glebe Road and the existing residential subdivision adhered to Glebe Road and associated streets and south of the Lyell Highway.

The western part of the study area is essentially disused cleared land in a residential-commercial-industrial setting. The eastern part of the study area is a mosaic of old paddocks used for grazing (or other agriculture such as orchards) in the past, which is evident by the numerous old stock fences and a number of small dams present, and remnant (mainly disturbed) native vegetation. Two high voltage power lines and a major water pipeline easement cross the northern section of the study area in an east-west direction. There are old quarry areas adjacent to the Lyell Highway. Old rubbish dumping sites were noted in the centre of the study area with this recreational pursuit continuing to present with numerous burnt car bodies, garden waste and general waste being discarded virtually across the entire study area. Firewood cutting and recreational vehicle use was noted virtually everywhere with the relatively remote southern section obviously being a favoured 'hooning' location.

LISmap's Fire History later indicates that the southern half of the eastern part of the study area was affected by the February 1967 wildfire event, which accords with field observations of largely regrowth-structured forest/woodland.

The topography of the study area is characterised by a flat alluvial terrace in the northwest with an unnamed ephemeral creek flowing north-south with east and west facing slopes above the creek. There are a number of other small drainage features present.

The elevation of the study area varies from less than 5 m a.s.l. (along the Lyell Highway) to 170 m a.s.l. (steeper slopes on eastern boundary).

Geology of the study area is mapped as (Figure 6):

- Tertiary-age (Cainozoic) "basalt" (geocode: Tb): in the vicinity of the quarries in the north;
- Quaternary-age sediments (predominantly dolerite-derived river terrace) (geocode: Qpad): in the flat area near Glebe road;
- Permian-age (Paleozoic) "mudstone" (geocode: Pum): dominating much of the centre and eastern slopes;
- Permian-age (Paleozoic) "limestone" (geocode: Puc): on the southwestern and southern areas; and
- Jurassic-age (Mesozoic) "dolerite" (geocode: Jd): in the centre-south of the study area.

The geology was confirmed informally by site assessment, with several rock outcrops on the steeper upper slopes, gullies and obvious exposed rock and gravel in the existing quarry areas. The geology is mentioned because it has a strong influence on the classification of vegetation and the potential occurrence of threatened flora (and to a lesser extent, threatened fauna).

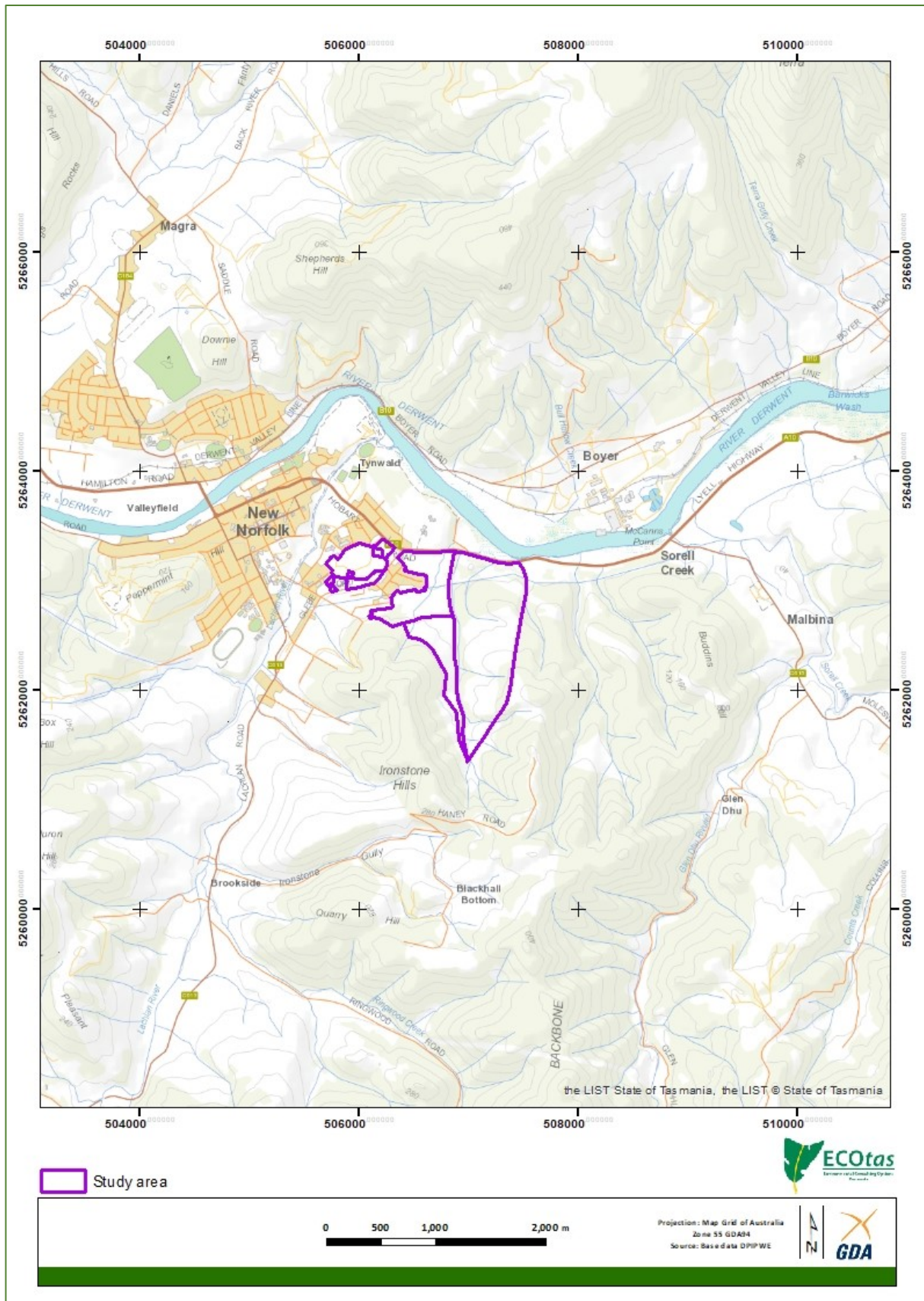


Figure 1. General location of study area

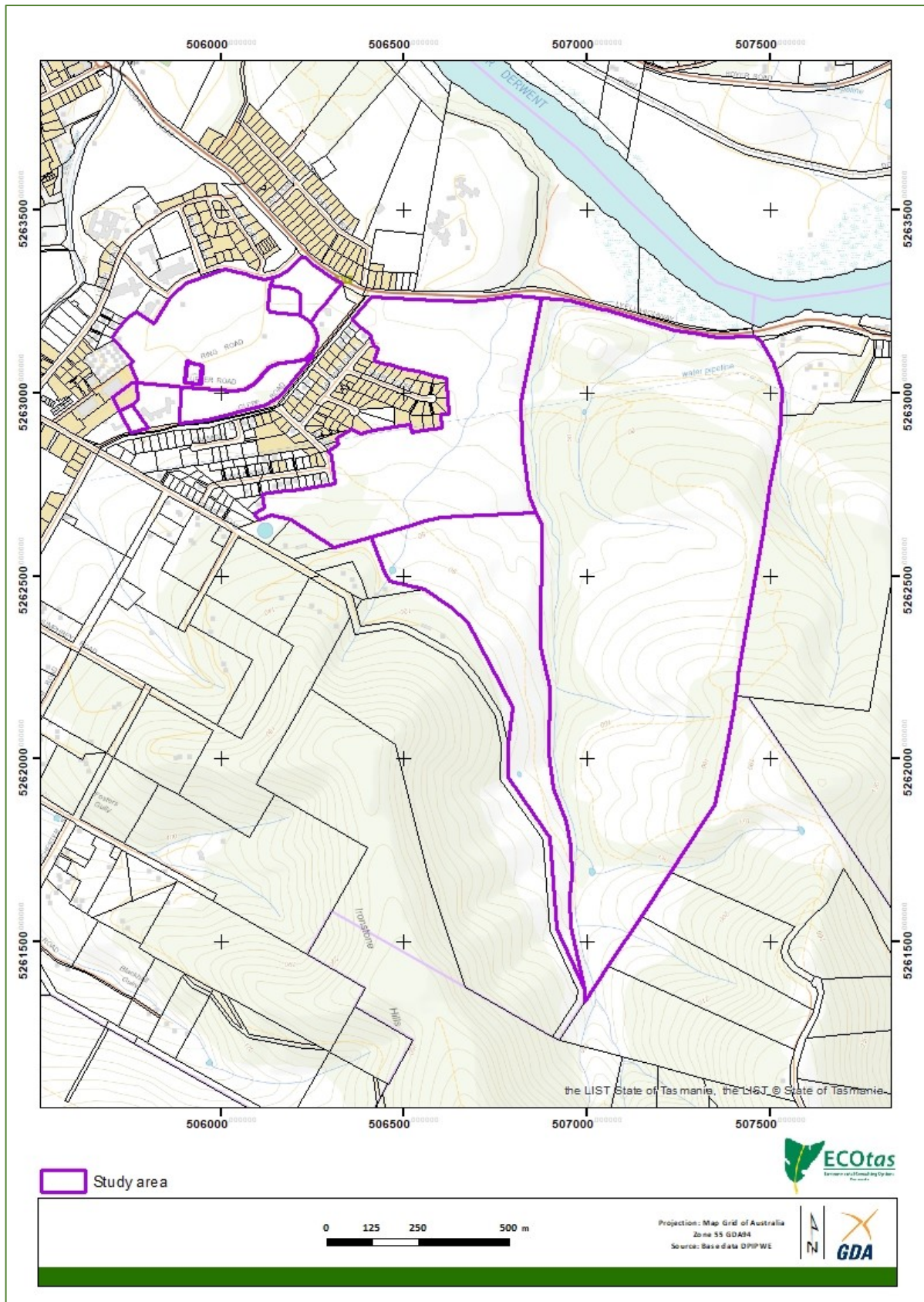


Figure 2. Detailed location of the study area showing topographic features and cadastral boundaries [source: LISTmap]

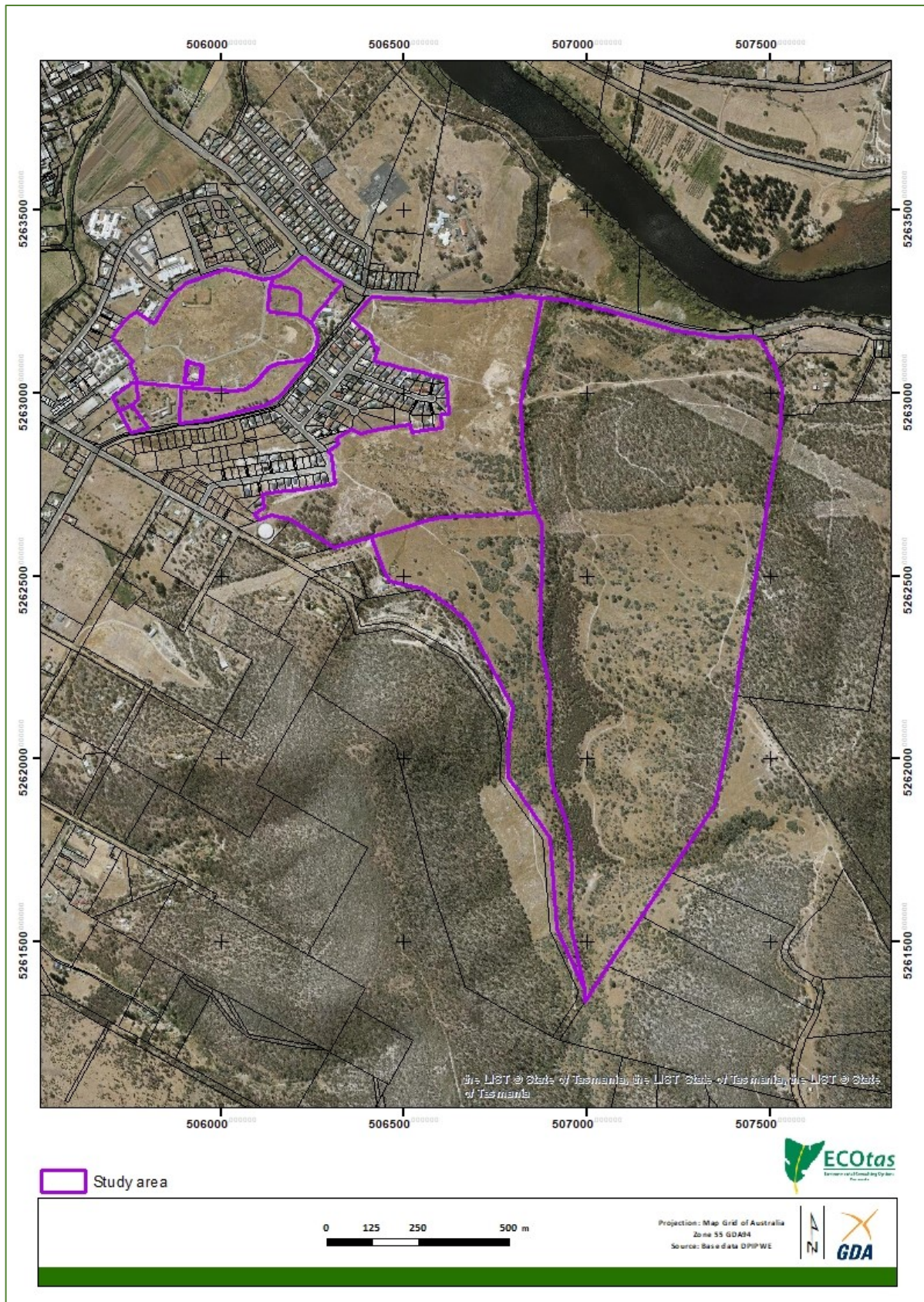


Figure 3. Detailed location of the study area showing recent aerial imagery and cadastral boundaries [source: LISTmap]

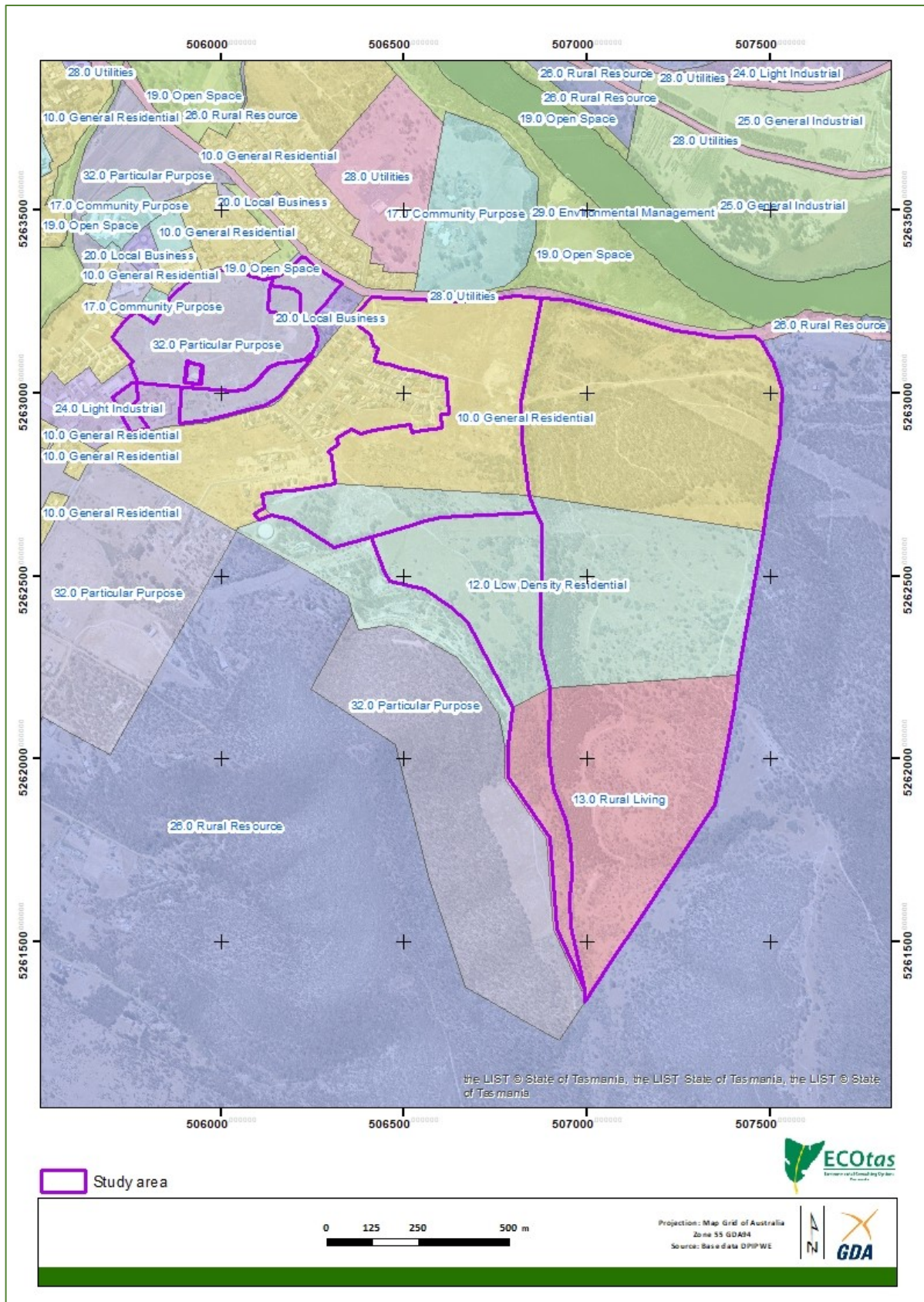


Figure 4. Zoning within the study area and surrounds pursuant to the *Derwent Valley Interim Planning Scheme 2015* [source: LISTmap]

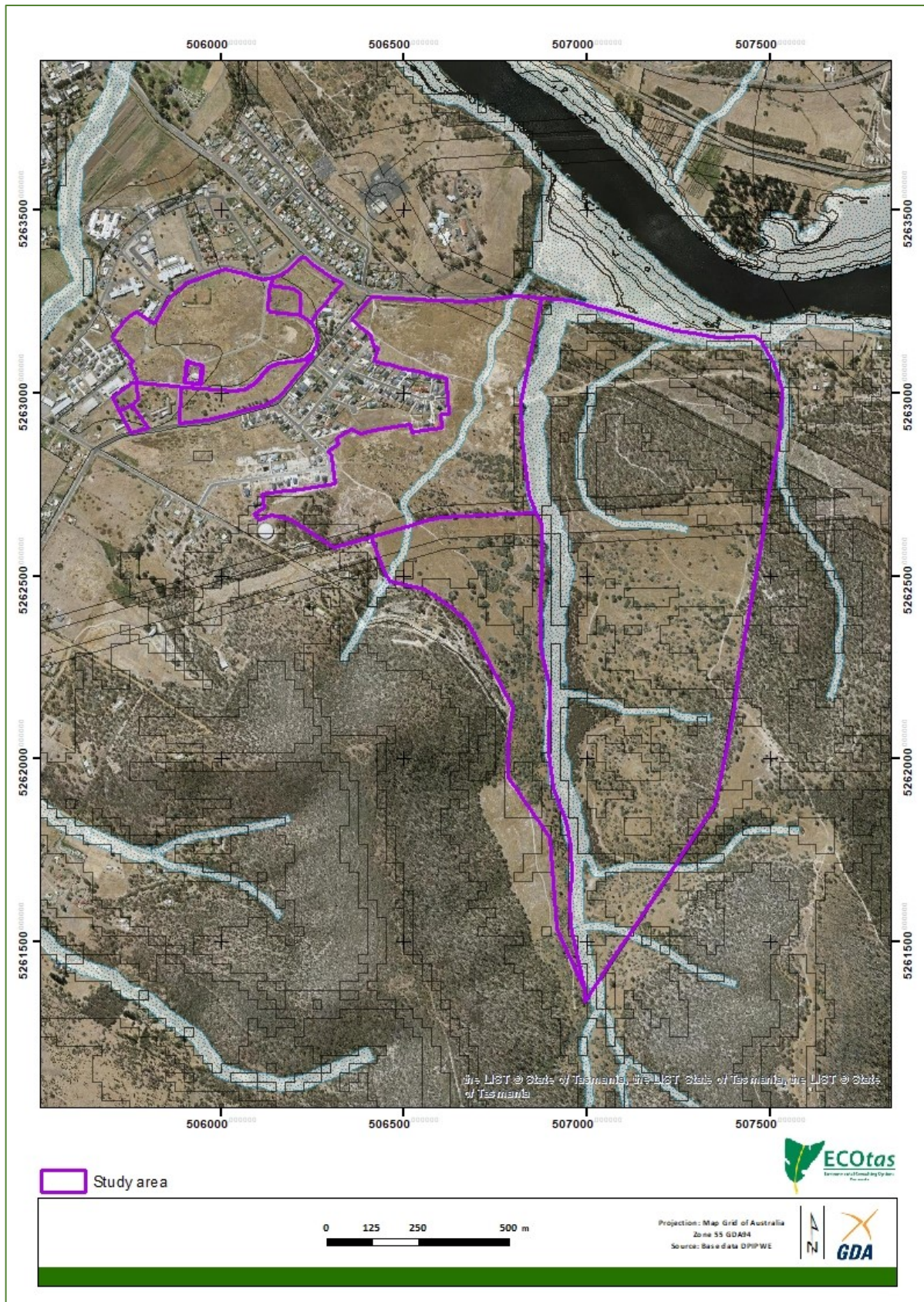


Figure 5. Extent of the Waterway and Coastal Protection Areas overlay within the study area and surrounds pursuant to the *Derwent Valley Interim Planning Scheme 2015* [source: LISTmap]



Figure 6. Geology of the study area and surrounds

METHODS

Nomenclature

All grid references in this report are in GDA94, except where otherwise stated.

Vascular species nomenclature follows de Salas & Baker (2019) for scientific names and Wapstra et al. (2005+) for common names. Fauna species scientific and common names follow the listings in the cited *Natural Values Atlas* report (DPIPWE 2020).

Vegetation classification follows TASVEG 3.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation* (Kitchener & Harris 2013+).

Preliminary investigation

Available sources of threatened flora records, vegetation mapping and other potential environmental values were interrogated. These sources include:

- Tasmanian Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* records for threatened flora and fauna (GIS coverage maintained by the authors current as at date of report);
- Tasmanian Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* report ECOTas_TheMills for a polygon defining the study area, buffered by 5 km, dated 9 April 2020 (DPIPWE 2020) – Appendix E;
- Forest Practices Authority's *Biodiversity Values Database* report, specifically the species' information for grid reference centroid 506853mE 5262617mN (i.e. the centroid of the Natural Values Atlas report), buffered by 2 km and 5km for threatened flora and fauna, respectively, hyperlinked species' profiles and predicted range boundary maps, dated 9 April 2020 (FPA 2020) – Appendix F;
- Commonwealth Department of the Environment & Energy's *Protected Matters Search Tool Report* for a polygon defining the study area, buffered by 5 km, dated 9 April 2020 (CofA 2020) – Appendix G;
- the TASVEG 3.0 vegetation coverage (as available through a GIS coverage) and TASVEG Live vegetation coverage (as available on LISTmap);
- GoogleEarth and LISTmap aerial orthoimagery; and
- other sources listed in tables and text as indicated.

Field assessment

A detailed site assessment was undertaken by Brian French on 10 & 11 July 2018. The survey covered the entire study area with a focus on the areas most likely to contain threatened species and vegetation community habitat.

A supplementary site assessment was undertaken by Mark Wapstra on 9 April 2020. The primary purpose of this assessment was to assess the far western part of the study area (west of Glebe Road, previously unassessed) and review the assessment of the balance of the study area (due to the period of time passed since the last assessment).

While some parts of the study area were well-defined (e.g. by roads, existing fences and residential areas), cadastral information was uploaded to the iPhone application iGIS and used to further guide the assessment.

Vegetation classification

Vegetation was classified by waypointing vegetation transitions for later comparison to aerial imagery. The structure and composition of the vegetation types was described using nominal 30 m radius plots at a representative site within the vegetation types, and compiling “running” species lists between plots and vegetation types.

Threatened flora

With reference to the threatened flora, the survey included consideration of the most likely habitats for such species, and if detected, their location marked using hand-held GPS (none detected so further methods not provided).

Threatened fauna

Surveys for threatened fauna were largely limited to an examination of “potential habitat” (i.e. comparison of on-site habitat features to habitat descriptions for threatened fauna), and detection of tracks, scats and other signs.

Weed and hygiene issues

The site was also assessed with respect to plant species classified as declared weeds under the Tasmanian *Weed Management Act 1999*, Weeds of National Significance (WoNS) or “environmental weeds” (authors’ opinion and as included in *A Guide to Environmental and Agricultural Weeds of Southern Tasmania*, NRM South 2017).

The site was also assessed with respect to potential impacts of plant and animal pathogens, by reference to habitat types and field symptoms.

FINDINGS

Vegetation types

Comments on TASVEG mapping

This section, which comments on the existing TASVEG 3.0 and TASVEG Live mapping for the study area, is included to highlight the differences between existing mapping and the more recent mapping from the present study to ensure that any parties assessing land use proposals (via this report) do not rely on existing mapping. Note that TASVEG mapping, which was mainly a desktop

mapping exercise based on aerial photography, is often substantially different to ground-truthed vegetation mapping, especially at a local scale. An examination of existing vegetation mapping is usually a useful pre-assessment exercise to gain an understanding of the range of habitat types likely to be present and the level of previous botanical surveys.

TASVEG 3.0 maps the study area (Figure 7) as:

- *Eucalyptus tenuiramis* dry forest and woodland on sediments (TASVEG code: DTO): forested slopes in the northeast and east of the study area, extending extensively off-title to the east, south and southwest;
- *Eucalyptus pulchella* forest and woodland (TASVEG code: DPU): mapped as two small polygons adjacent to Glebe Road;
- eastern riparian scrub (TASVEG code: SRE): mapped as a linear strip along the main creek through the study area; and
- agricultural land (TASVEG code: FAG): mapped as large areas of previously cleared land throughout the study area.

TASVEG Live (Figure 8) is somewhat different to TASVEG 3.0, with the following changes noted:

- *Eucalyptus tenuiramis* dry forest and woodland on sediments (TASVEG code: DTO): generally similar to TASVEG 3.0 but minor “corrections” made, including replacing an area in the north near the highway with DVG;
- *Eucalyptus viminalis* grassy forest and woodland (TASVEG code: DVG): small area in the centre-north of the study area previously mapped as DTO;
- *Eucalyptus pulchella* forest and woodland (TASVEG code: DPU): as per TASVEG 3.0;
- eastern riparian scrub (TASVEG code: SRE): as per TASVEG 3.0;
- *Allocasuarina verticillata* forest (TASVEG code: NAV): linear patch to the eastern side of the main creek through the study area, replacing areas previously mapped as FAG;
- extra-urban miscellaneous (TASVEG code: FUM): mapped in the areas of old pasture adjacent to the existing subdivision development in the northwest of the study area previously mapped as FAG;
- regenerating cleared land (TASVEG code: FRG): small areas in the south of the study area where native shrubs have invaded previously cleared land previously mapped as FAG; and
- permanent easements (TASVEG code: FPE): mapped where high-voltage powerlines cross the northern part of the study area previously mapped as DTO and FAG; and
- urban areas (TASVEG code: FUR): cleared areas northwest of Glebe Road.

Vegetation types recorded as part of the present study

Vegetation types have been classified according to TASVEG 3.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation* (Kitchener & Harris 2013+). Table 1 provides information on the vegetation types identified from the study area with notes on condition. Appendix A provides a detailed description of the native vegetation mapping units identified from the study area. Figure 9 shows the revised vegetation mapping.

Note that GoogleEarth aerial imagery was used as the underlay to create the updated vegetation mapping as it shows the nature of land use more accurately than the orthophoto available on LISTmap – specifically, the vegetation transitions are more obvious. However, Figure 8 still uses LISTmap's orthoimage.

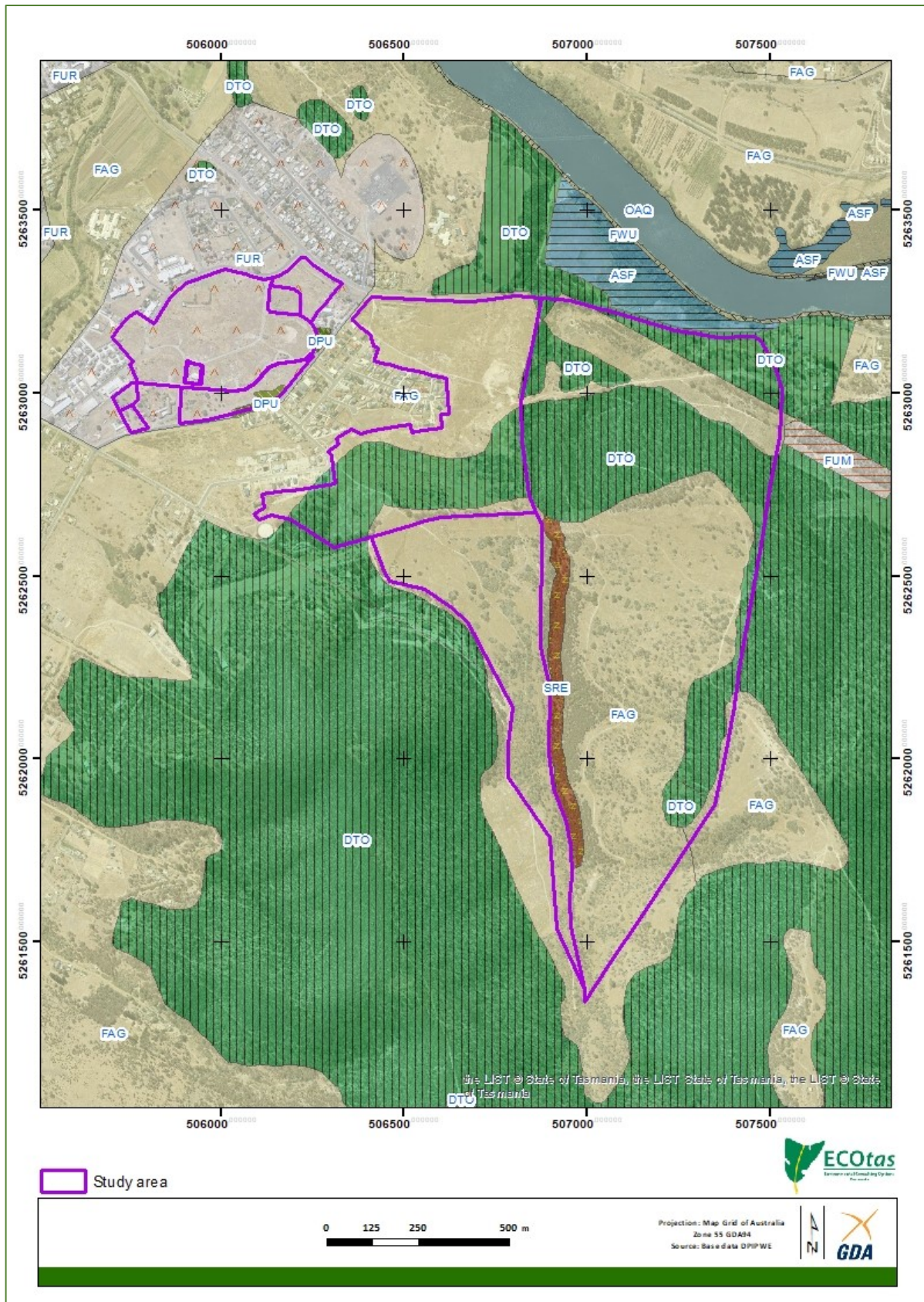


Figure 7. Existing TASVEG 3.0 vegetation mapping for the study area and surrounds (refer to text for codes)



Figure 8. Existing TASVEG Live vegetation mapping for the study area and surrounds (refer to text for codes)

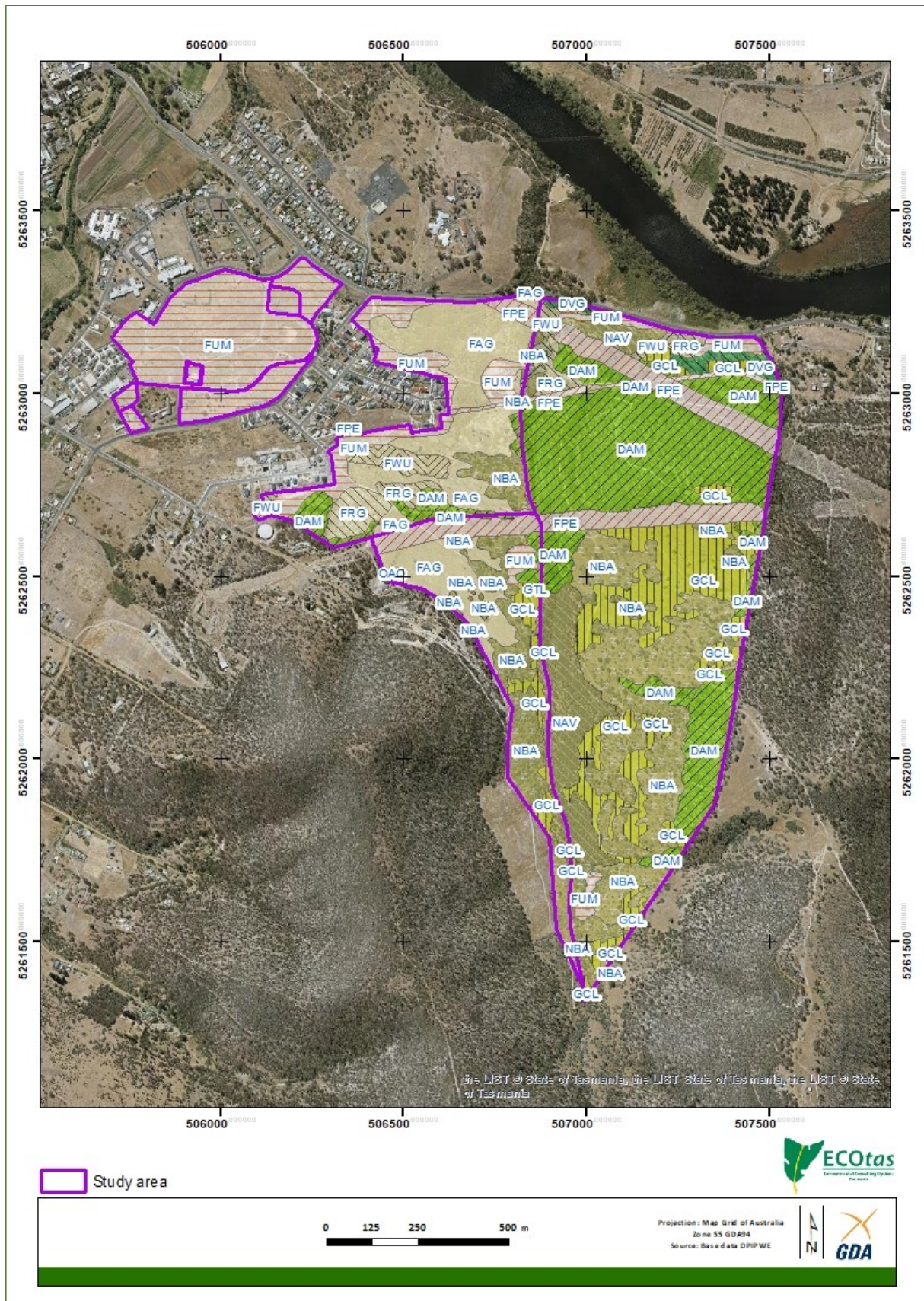


Figure 9. Revised vegetation mapping for the study area (refer to text for codes)

Table 1. Vegetation mapping units present in the study area

[conservation status: NCA – as per Schedule 3A of the Tasmanian *Nature Conservation Act 2002*, using units described by Kitchener & Harris (2013+), relating to TASVEG mapping units only (DPIPWE 2020); table headings are as per modules in Kitchener & Harris (2013+); EPBCA – as per the listing of ecological communities on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, relating to communities as described under that Act, but with equivalencies to TASVEG units]

TASVEG mapping name and code (Kitchener & Harris 2013+)	Conservation status NCA EPBCA	Comments
Dry eucalypt forest and woodland		
<i>Eucalyptus amygdalina</i> forest on mudstone (DAM)	Not threatened <i>Not threatened</i>	The forested slopes are dominated by a forest canopy of <i>Eucalyptus amygdalina</i> (black peppermint) and <i>E. rubida</i> (candlebark) over a largely grassy understorey. In areas where <i>E. rubida</i> dominates, this community is classified under TASVEG as the mapping unit DAM. Despite there clearly being a separate community dominated by <i>E. rubida</i>, the intersectional key in Kitchener & Harris (2013+) clearly indicates that any community dominated by <i>E. rubida</i> is subsumed into other eucalypt communities. The DAM community is in generally good ecological condition, with only minor occurrences of weeds (mainly on the fringes). Due to the close proximity to the New Norfolk township, firewood cutting has been extensive, however, the small stature of the dominant eucalypt species has deterred considerable damage. The understorey is relatively simple floristically, quite typical of this type of forest in this part of the State.
<i>Eucalyptus viminalis</i> grassy forest and woodland (DVG)	Not threatened <i>Not threatened</i>	Small areas of <i>Eucalyptus viminalis</i> (white gum) dominated forest occur on relatively fertile basalt substrate in the north of the study area. DVG is characterised by a grassy understorey with virtually no native shrub species. DVG is in marginal ecological condition due to occurring between the Lyell Highway (and associated quarries) and high voltage powerlines. Weed species, rubbish dumping and firewood cutting were noted in all areas where DVG occurs.
Non-eucalypt forest and woodland		
<i>Allocasuarina verticillata</i> forest (NAV)	Not threatened <i>Not threatened</i>	NAV is associated with the main drainage line through the study area with a small area located in the north between the Lyell Highway and powerline easement. This community is characterised by the dominance of <i>Allocasuarina verticillata</i> (drooping sheoak) with a species-poor understorey containing scattered grasses and shrubs. NAV is in good ecological condition due to species suitable for firewood being absent and generally occurring in areas where refuse dumping has not occurred.
<i>Bursaria-Acacia</i> woodland and scrub (NBA)	Not threatened <i>Not threatened</i>	NBA is widespread across the study area occurring in areas that have been previously cleared for grazing. In the past, NBA would have been either DAM or DVG, which is evident from the numerous eucalypt stumps. The understorey of NBA is characterised by the co-dominance of native and introduced grass species with sparsely scattered native low shrubs and herb species. NBA is in reasonable ecological condition, however, it is essentially a disturbance-induced community following the cessation of grazing. There are numerous old fence lines and vehicle tracks with refuse dumping and recreational vehicle use widespread.

TASVEG mapping name and code (Kitchener & Harris 2013+)	Conservation status NCA EPBCA	Comments
Native grassland		
lowland grassland complex (GCL)	Not threatened <i>Not threatened</i>	GCL is widespread, dominating sites that have been cleared for pasture in the past. GCL is gradational with NBA (see above) where <i>Acacia</i> species are invading the old pasture areas. GCL is characterised by the dominance of native <i>Austrostipa</i> (speargrass) and <i>Rytidosperma</i> (wallabygrass) species. Introduced grass and herb species are persisting from past agricultural practices. GCL is generally in good ecological condition, however, recreational vehicle use, refuse dumping and weed species were noted in some areas.
lowland <i>Themeda triandra</i> grassland (GTL)	Not threatened <i>Potentially threatened</i>	GTL occurs as a small patch on skeletal dolerite soils (0.18 ha) in the west of the study area. GTL has been grazed in the past and vehicle damage was evident. GTL is in poor condition with introduced grasses and herbs dominating approx. 50% of the species composition.
Modified land		
agricultural land (FAG)	Not threatened <i>Not threatened</i>	Areas of old pasture in the west of the study area have been mapped as FAG due to an obviously long history of agricultural use, which is evident due to the dams, fences and dominance of pasture grass and herb species. Despite a long absence of agricultural activity, these areas are still best described as FAG due to the species composition present. On the margins, FAG is gradational with NBA where <i>Acacia dealbata</i> and <i>A. mearnsii</i> are invading and DAM on the forested margins. An area dominated by weed species within FAG is mapped as FWU.
regenerating cleared land (FRG)	Not threatened <i>Not threatened</i>	Some areas of old pasture slowly reverting to a semi-native grassland (i.e. GCL) and eventually shrubland (i.e. NBA) have been mapped as FRG. In practice, the relationship between FAG, FRG, NBA and FWU is complex, the current mapping reflecting a "snapshot" in time as this mosaic is expected to be geographically and temporally transient depending on land use activities.
extra-urban miscellaneous (FUM)	Not threatened <i>Not threatened</i>	FUM is the mapping unit used to describe areas of generally unvegetated areas resulting from human activities. FUM has been used to map the existing subdivision and adjacent areas, gravel quarries, old rubbish (tip) site and a very heavily disturbed area in the south of the study area. The area northwest of Glebe Road has also been mapped as FUM but it is noted this area was previously mapped as FUR. However, at present it is an extensive area of previously cleared land (presumably mainly pasture) that remains largely undeveloped but certainly not used for grazing or cropping (hence not mapped as FAG) or residential occupation (hence not mapped as FUR). Whilst some areas mapped as FUM have vegetation present, any plant species noted were opportunistic introduced weed species. These areas are still being actively used for domestic storage, gravel dumping and miscellaneous works associated with the current subdivision development.
permanent easements (FPE)	Not threatened <i>Not threatened</i>	FPE describes the areas in the north of the study area that are crossed by high-voltage powerlines and a major buried water pipeline. These areas are actively managed for infrastructure protection with numerous tracks, water pipe infrastructure and frequent slashing of the vegetation to minimise fire risk.

TASVEG mapping name and code (Kitchener & Harris 2013+)	Conservation status NCA EPBCA	Comments
weed infestation (FWU)	Not threatened <i>Not threatened</i>	FWU is the mapping unit used to describe areas dominated by declared weed species. In this case, a large area dominated by blackberry (<i>Rubus anglocandicans</i>) and boneseed (<i>Chrysanthemoides monilifera</i>) are the dominant species within this mapping unit. There are numerous other weedy species noted in the study area that are discussed elsewhere.
Other natural environments		
water, sea (OAQ)	Not threatened <i>Not threatened</i>	OAQ is used to describe unvegetated waterbodies, in this case the two small farm dams in the study area. Both the dams do not have vegetation present and are remnant stock watering dams from past agricultural practices.

Conservation status of identified vegetation mapping units

TASVEG 3.0 (Figure 7) and TASVEG Live vegetation mapping (Figure 8) show a strip of eastern riparian scrub (TASVEG code: SRE) within the study area. SRE is equivalent to riparian scrub, which is listed as threatened on Schedule 3A of the Tasmanian *Nature Conservation Act 2002*. This non-forest mapping unit was not identified from the study area and has been replaced with the non-threatened mapping units of FPE, DAM, NAV and GCL.

TASVEG 3.0 (Figure 7) and TASVEG Live vegetation mapping (Figure 8) show extensive areas of *Eucalyptus tenuiramis* forest and woodland on sediments (TASVEG code: DTO), which is listed as threatened on Schedule 3A of the Tasmanian *Nature Conservation Act 2002*. All areas previously mapped as DTO have been re-mapped as non-threatened units, mainly *Eucalyptus amygdalina* forest on mudstone (TASVEG code: DAM), which is in accordance with the intersectional keys and community descriptions (Kitchener & Harris 2013+). While DTO is certainly present in the wider area, it is definitively absent from the study area. *Eucalyptus tenuiramis* is a minor component of the canopy at limited sites only. Where eucalypt-dominated forest/woodland is present, it is either clearly dominated by *Eucalyptus amygdalina* (usually with some *E. viminalis*, *E. rubida* and even some *E. pulchella*) on sedimentary substrate and hence mapped as DAM, or dominated by *Eucalyptus viminalis* but on basaltic substrate and hence mapped as DVG, or co-dominated by *Eucalyptus amygdalina* and *E. rubida* (the latter sometimes locally dominant) on sedimentary substrate and hence also mapped as DAM. That is, the revised vegetation mapping has removed all occurrences of the threatened DTO from the study area.

Lowland *Themeda triandra* grassland (TASVEG code: GTL) can equate to a listed threatened ecological community on schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, namely Lowland Native Grasslands of Tasmania. However, under the decision flowchart in CofA (2010), the area mapped within the study area does not satisfy the criteria as the site is less than 1 ha in size (patch is 0.18 ha) and perennial non-native species make up 50% or more of the community (the criteria states that weeds need to be less than 20% of the species composition). Furthermore, the high levels of disturbance within and adjacent to GTL and the small size of the patch would be difficult to manage in the long-term. In effect, the area mapped as GTL is part of a complex mosaic of native grassland (mainly GCL), woodland (e.g. NAV and NBA) and low forest (DAM).

None of the vegetation types recorded from the study area are listed as threatened vegetation types on Schedule 3A of the Tasmanian *Nature Conservation Act 2002*.

Plant species

General information

A total of 160 vascular plant species were recorded from the study area (Appendix B), comprising 104 dicotyledons (including 3 endemic and 33 exotic species), 54 monocotyledons (including 1 endemic and 20 exotic species). Note that this list does not include all exotic species associated with road verges and previously heavily disturbed areas (e.g. areas northwest of Glebe Road).

Additional surveys at different times of the year may detect additional short-lived herbs and grasses. For the most part, however, follow-up surveys are not recommended due to the lack of suitable habitat for most species, however, for the three threatened flora species recorded in the study area in the past (see below), additional assessments may be required if any development proposal potentially impacts the recorded location of these species (see also discussion under Threatened flora species potentially present (database information) and Appendix C).

Threatened flora species recorded from the study area

No plant species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* or the Tasmanian *Threatened Species Protection Act 1995* were detected from the study area.

Three plant species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* have been previously recorded in the north of the study area (Figure 10). The potential impact on these species are discussed below.

- *Austrostipa bigeniculata* (doublejointed speargrass)

This grass species is listed as rare (Schedule 5) on the Tasmanian *Threatened Species Protection Act 1995* and largely occurs in the southeast of Tasmania. Within the study area, *Austrostipa bigeniculata* has been recorded in the north of the study area in heavily disturbed areas. The record are from Nov. 1984 (precise only to month and year), attributed to Jamie B. Kirkpatrick and allocated from the "decoda:gland" project. This project is regarded as notoriously inaccurate and the nominal precision of ± 100 m attributed to the database record that allows the record to land in the study area is almost certainly erroneous (at best, records from the "decoda:gland" project can be attributed to a 1 x 1 km grid square).

A thorough search (on two separate occasions) was made for the species in the vicinity of the record. Whilst a number of *Austrostipa* species were noted in the study area, *Austrostipa bigeniculata* has not been detected. As presently understood, the previous report of *Austrostipa bigeniculata* should not present any significant constraints to development in the northern part of the study area because no evidence of the species is present.

- *Velleia paradoxa* (spur velleia)

This perennial herb is listed as vulnerable on the TS Tasmanian *Threatened Species Protection Act 1995* PA and is known from the Hobart and Launceston areas, the Midlands and the Derwent Valley, where it occurs in grassy woodlands or grasslands on dry sites. The record is from 14 Nov. 1985

with a nominal precision of ± 100 m. While the record is from a reliable observer (Rod J. Fensham), the associated information with the vouchered specimen at the Tasmanian Herbarium (HO108492) states it is from "2 km E of New Norfolk". It is most likely that the specimen was collected from the verge of the Lyell Highway rather than from private property to the south of the highway, and the "2 km E of New Norfolk" could effectively place the record along at least a 1-2 km stretch of the highway verge and associated slope.

The nominal location of the record is in remnant eucalypt woodland between a disused quarry, water pipeline and high-voltage powerlines. A thorough search (on two separate occasions) in the vicinity of the known location was made, however, this distinctive herb species was not detected. As presently understood, the previous report of *Austrostipa bigeniculata* should not present any significant constraints to development in the northern part of the study area because no evidence of the species is present.

Threatened flora species potentially present (database analysis)

Table C1 (Appendix C) provides a listing of threatened flora from within 5,000 m of the study area (nominal buffer width usually used to discuss the potential of a particular study area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded (see also Figure 11).

The surveys to date have been conducted in winter (10 & 11 July 2018) and autumn (9 April 2020), both well outside the most suitable period (spring-summer) to detect a wider variety of annually-flowering herbs and grasses. The main concern with this is that some parts of the study area (mainly the less disturbed DAM vegetation on insolated ridges and slopes) supports potential habitat for species such as *Caladenia caudata* (tailed spider-orchid) and possibly other orchid species. Surveys for such species would need to be conducted during the peak flowering period, which is late September through to the end of October (Wapstra 2018). However, such surveys are not recommended until the anticipated extent of clearance and/or disturbance to potential habitat is better understood because the statistical likelihood of detection is low (simply because the target species tend to have highly disjunct and localised occurrences) and surveys can be resource-hungry (and hence need to be targeted carefully).

Fauna species

Threatened fauna species recorded from the study area

No fauna species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were detected from the study area. No such species have been previously reported from the study area.

Threatened fauna species potentially present (database analysis)

Table D1 (Appendix D) provides a listing of threatened fauna from within 5,000 m of the study area (nominal buffer width usually used to discuss the potential of a particular study area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded (see also Figures 12 & 13).

Potential habitat (to some degree) is present for several species, as follows:

- *Sarcophilus harrisii* (Tasmanian devil);
- *Dasyurus maculatus* subsp. *maculatus* (spotted-tailed quoll);
- *Dasyurus viverrinus* (eastern quoll);
- *Perameles gunnii* (eastern barred bandicoot);
- *Pseudemoia pagenstecheri* (tussock skink);
- *Litoria raniformis* (green and gold frog);
- *Lathamus discolor* (swift parrot); and
- *Tyto novaehollandiae* (masked owl).

Further information on these species is provided below.

- marsupial carnivores

Three species (*Sarcophilus harrisii*, Tasmanian devil; *Dasyurus maculatus* subsp. *maculatus*, spotted-tailed quoll; and *Dasyurus viverrinus*, eastern quoll) are considered collectively because they have broadly similar habitat and management requirements.

There are database records within the immediate vicinity of the study area with closest records for the Tasmanian devil and eastern quoll representing roadkill records associated with the Lyell Highway. These species have broad ranges and can occupy a wide variety of habitats. Within (and close to) the study area, it is highly likely that these species use the greater area for opportunistic foraging. The assessment did not locate any potential den sites such as suitable hollow logs, cliffs with small caves or wombat burrows or any evidence of these species such as scats. A targeted survey is not recommended.

- *Perameles gunnii* (eastern barred bandicoot)

There are several records for this species immediately to the north of the study area on the Lyell Highway representing roadkill records associated with the Lyell Highway. The entire study area and the greater region is very good habitat for this species including the old pasture and the recent subdivision area. No evidence of this species was noted (such as distinctive diggings), however, it is likely that the species is present in the greater region. A targeted survey is not recommended.

- *Pseudemoia pagenstecheri* (tussock skink)

Refer to discussion under **FINDINGS Vegetation types** Vegetation types recorded as part of the present study, particularly Table 1 and the discussion of the classification and composition of "grassland" areas, which indicates that the study area area is probably sub-optimal for this species, which tends to utilise well-developed tussock grasslands. That said, the species is also reported from quite degraded grasslands verging on pasture. Unless there is a known site within proximity of a proposed development, undertaking specialist and targeted surveys for the species tend to be not much more than "searching for a needle in a haystack". The species is widespread and probably vastly under-reported (with some specialists questioning its threatened status). In our opinion, any proposal in what is probably sub-optimal habitat presents a very low risk to the species, as it would be encroachment into potential habitat only.

- *Litoria raniformis* (green and golden frog)

Very marginal habitat for the green and golden frog exists in the form of the small farm dams in the study area. However, these waterbodies are unvegetated and ephemeral, which is not optimal habitat for this species. Green and golden frogs have not been recorded within 5,000 m of the study area in the past. A targeted survey is not recommended.

- *Lathamus discolor* (swift parrot)

Marginal potential foraging habitat exists for the swift parrot due to the presence of a *Eucalyptus ovata* (black gum) copse associated with the main drainage feature. However, the copse is very small (a few small trees) and only constitutes highly opportunistic and localised potential foraging habitat. The greater area (outside the study area) has favourable habitat in the form of broad patches of *Eucalyptus ovata* associated with the Derwent River and *Eucalyptus globulus* (blue gum) trees that are locally common. No suitable potential nesting trees were observed within or adjacent to the study area. A targeted survey is not recommended.

- *Tyto novaehollandiae* (masked owl)

While the study area is well within the potential range of the masked owl, the study area itself and immediate surrounds do not support large trees with large hollows. The landscape on and adjacent to the study area is probably ideal for foraging (i.e. mosaic of forest, woodland, farms, barns, rivers, etc.), however, no evidence of the masked owl (e.g. whitewash, pellets, prey remains, feathers, etc.) in suitable roost trees was noted. A targeted survey is not recommended.

Other ecological values

Weed species

Five plant species classified as declared weeds within the meaning of the Tasmanian *Weed Management Act 1999* were detected from the study area (Figure 14).

The study area has had unrestricted public access for a long period with many areas seemingly being used for free and unrestricted refuse dumping. "Green waste" dumping was observed at a number of locations and generally, weed abundance was higher in these areas.

Notes on the declared weeds are provided below.

- *Chrysanthemoides monilifera* subsp. *monilifera* (boneseed)
Boneseed is localised in the northeast of the study area between the Lyell Highway and the water pipeline easement. It is likely that boneseed has spread from garden waste dumping associated with the old quarry sites. Currently, the species is scattered and can easily be controlled by hand-pulling and spot-spraying with herbicide.
- *Lycium ferocissimum* (african boxthorn)

African boxthorn was recorded as a single shrub in the centre of the study area. This single plant can be controlled by herbicide application or physically cutting the shrub down and pasting the stump.

- *Rubus anglocandicans* (blackberry)

Blackberry forms extensive patches in the study area and is mapped as the areas marked as FWU in Figures 9 & 14. Most of the areas of blackberry have invaded old pasture in the vicinity of the recent subdivision development. At the northern end of the main drainage line, an extensive patch of blackberry extends from between the water pipeline easement and the Lyell Highway. Further development will eradicate areas of blackberry infestation.

- *Ulex europaeus* (gorse)

Gorse occurs as localised plants at three locations in the north of the study area. Currently the plants are small and localised and easily controlled by herbicide study area. Due to the highly invasive nature of this species, any future management should consider targeting these sites before any gorse populations become difficult to manage.

Any management actions should aim to minimise the risk of introducing weeds to other areas of the study area, which are largely free of weed species. The key to this will be hygiene protocols for machinery, vehicles and personnel entering work areas from a potentially weed-affected site.

Several planning manuals provide guidance on appropriate management actions, which can be referred to develop site-specific prescriptions for any proposed works. These manuals include:

- Allan, K. & Gartenstein, S. (2010). *Keeping It Clean: A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens*. NRM South, Hobart;
- Rudman T. (2005). *Interim Phytophthora cinnamomi Management Guidelines*. Nature Conservation Report 05/7, Biodiversity Conservation Branch, Department of Primary Industries, Water & Environment, Hobart;
- Rudman, T., Tucker, D. & French, D. (2004). *Washdown Procedures for Weed and Disease Control*. Edition 1. Department of Primary Industries, Water & Environment, Hobart; and
- DPIWE (2015). *Weed and Disease Planning and Hygiene Guidelines - Preventing the Spread of Weeds and Diseases in Tasmania*. Department of Primary Industries, Parks, Water & Environment, Hobart.

Rootrot pathogen, *Phytophthora cinnamomi*

Phytophthora cinnamomi (PC) is widespread in lowland areas of Tasmania, across all land tenures. However, disease will not develop when soils are too cold or too dry. For these reasons, PC is not a threat to susceptible plant species that grow at altitudes higher than about 700 metres or where annual rainfall is less than about 600 mm (e.g. Midlands and Derwent Valley). Furthermore, disease is unlikely to develop beneath a dense canopy of vegetation because shading cools the soils to below the optimum temperature for the pathogen. A continuous canopy of vegetation taller than about 2 metres is sufficient to suppress disease. Hence PC is not considered a threat to susceptible plant species growing in wet sclerophyll forests, rainforests (except disturbed rainforests on infertile soils) and scrub e.g. teatree scrub (Rudman 2005; FPA 2009).

The study area lies in a very dry region of the State with rainfall generally less than 600 mm annually. Furthermore, the vegetation types present are considered low risk with very few species known to be affected by the pathogen present. No evidence of the pathogen was noted. Specific management in relation to PC should not be required.

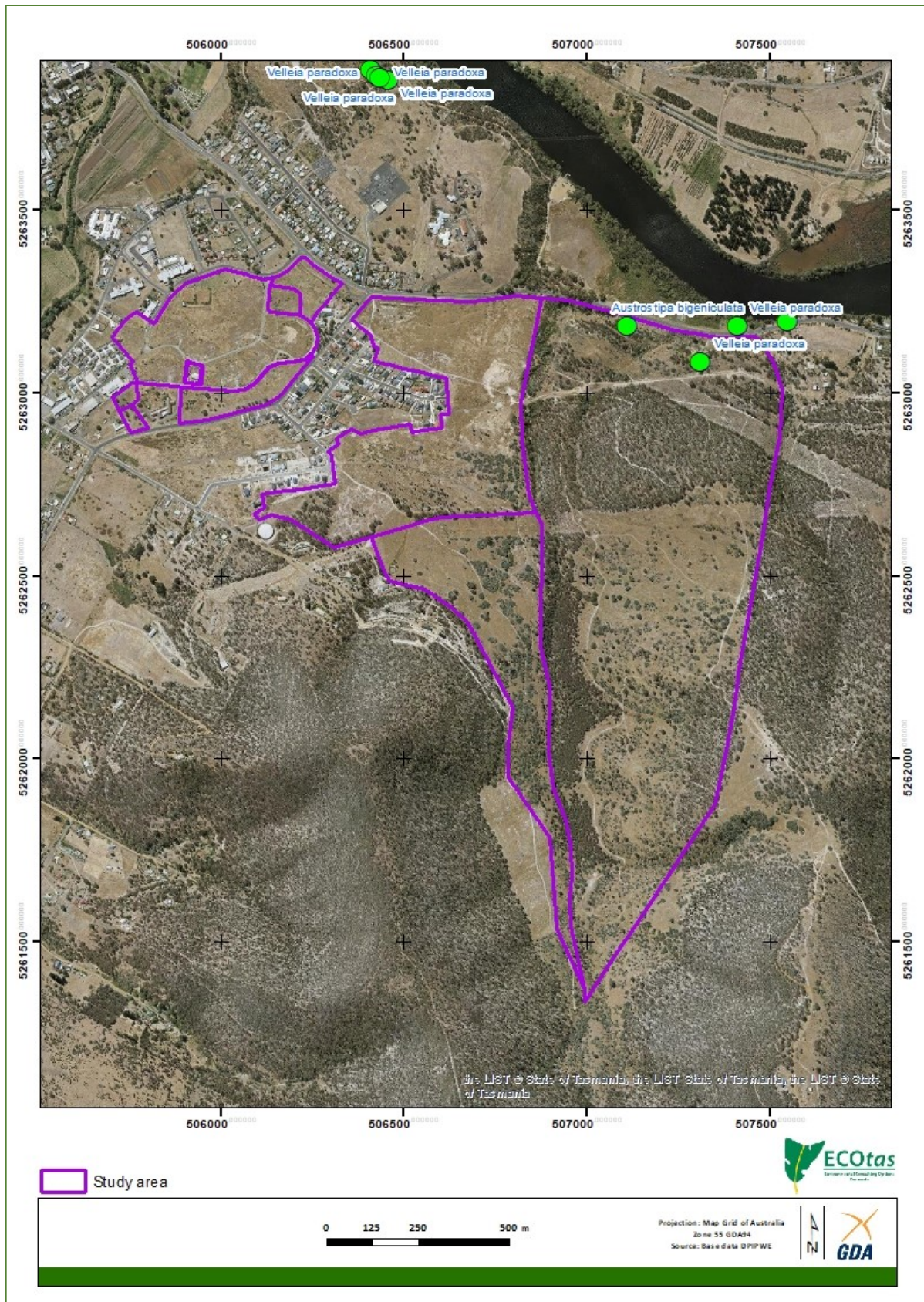


Figure 10. Distribution of previously reported threatened flora within study area and nearby areas
[source: *Natural Values Atlas*, Jan. 2020]

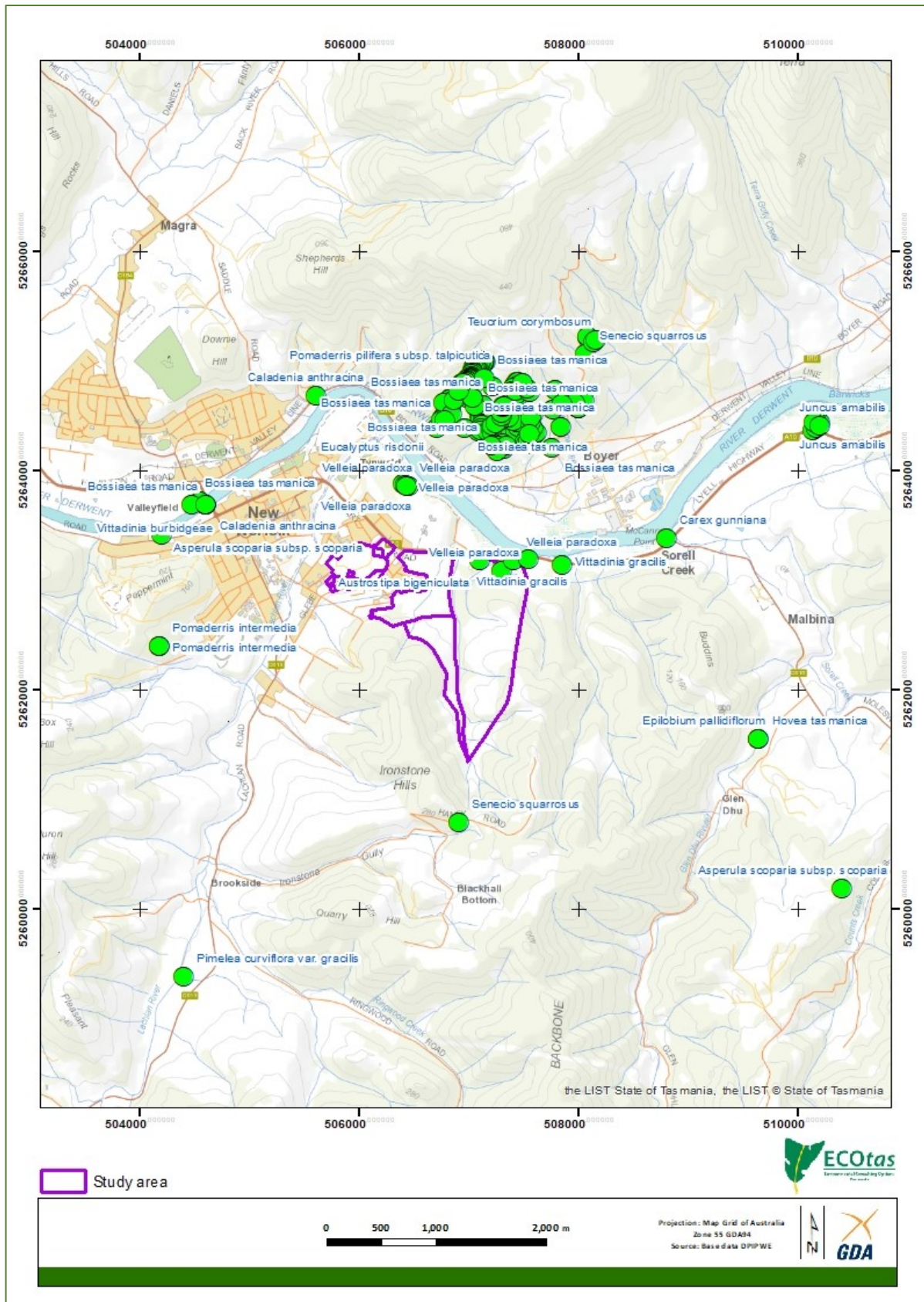


Figure 11. Distribution of previously reported threatened flora within wider area
[source: *Natural Values Atlas*, Jan. 2020]

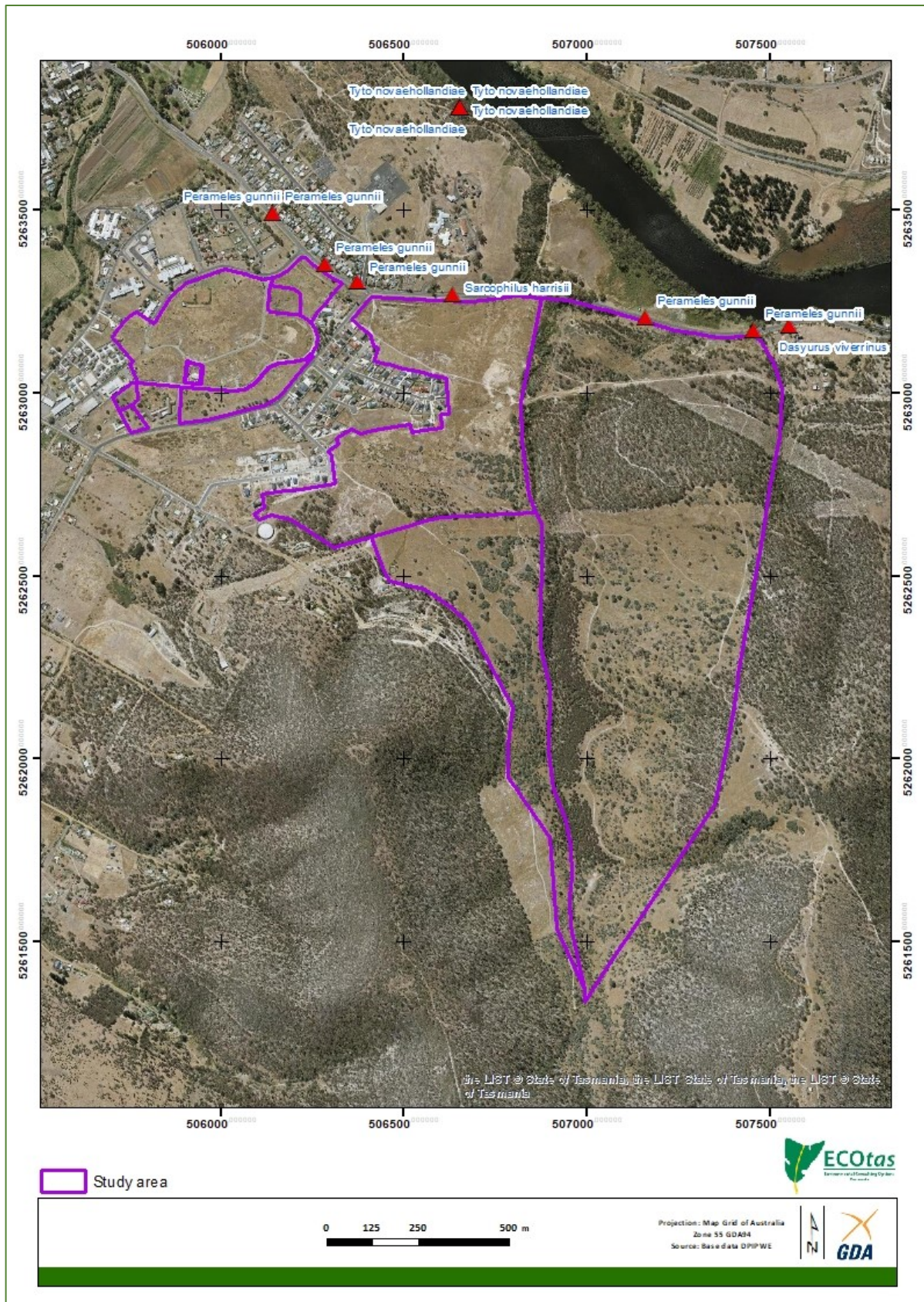


Figure 12. Distribution of previously reported threatened fauna within study area and nearby areas
[source: *Natural Values Atlas*, Jan. 2020]

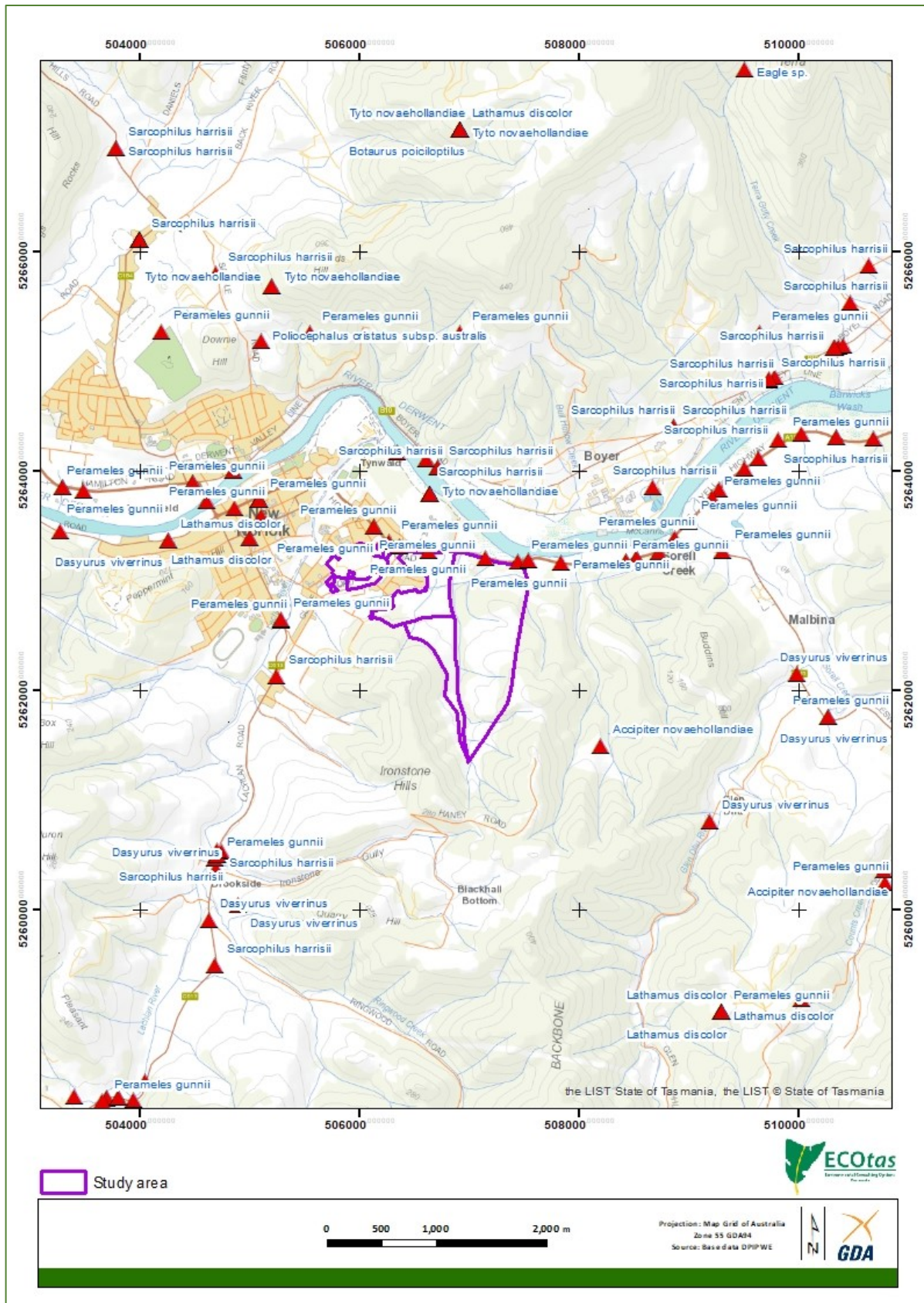


Figure 13. Distribution of previously reported threatened fauna within wider area
[source: *Natural Values Atlas*, Jan. 2020]

Myrtle wilt

Myrtle wilt, caused by a wind-borne fungus (*Chalara australis*), occurs naturally in rainforest where myrtle beech (*Nothofagus cunninghamii*) is present. The fungus enters wounds in the tree, usually caused by damage from wood-boring insects, wind damage and forest clearing. The incidence of myrtle wilt often increases forest clearing events such as windthrow and wildfire.

Nothofagus cunninghamii is absent from the study area. No special management is required.

Myrtle rust

Myrtle rust is a disease limited to plants in the Myrtaceae family. This plant disease is a member of the guava rust complex caused by *Austropuccinia psidii*, a known significant pathogen of Myrtaceae plants outside Australia. Infestations are currently limited to NSW, Victoria, Queensland and Tasmania (DPIPWE 2015).

No evidence of myrtle rust was noted. It is recommended that any plantings of Myrtaceae species use plants sourced from nurseries certified as free of myrtle rust (routine trade biosecurity protocols should ensure this condition is met).

Chytrid fungus and other freshwater pathogens

Native freshwater species and habitat are under threat from freshwater pests and pathogens including *Batrachochytrium dendrobatidis* (chytrid frog disease), *Mucor amphibiorum* (platypus mucor disease) and the freshwater algal pest *Didymosphenia geminata* (didymo) (Allan & Gartenstein 2010). Freshwater pests and pathogens are spread to new areas when contaminated water, mud, gravel, soil and plant material or infected animals are moved between sites. Contaminated materials and animals are commonly transported on boots, equipment, vehicles tyres and during road construction and maintenance activities. Once a pest pathogen is present in a water system it is usually impossible to eradicate. The manual *Keeping it Clean - A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens* (Allan & Gartenstein 2010) provides information on how to prevent the spread of freshwater pests and pathogens in Tasmanian waterways wetlands, swamps and boggy areas.

The study area has ephemeral waterbodies, creeks and drainage lines such that the management prescriptions recommended in *Keeping it Clean - A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens* (Allan & Gartenstein 2010) should be considered relation to chytrid.

Matters of National Environmental Significance – Threatened Ecological Communities

CofA (2020) indicates that the threatened ecological community Tasmanian Forests and Woodlands dominated by Black Gum or Brookers Gum (*Eucalyptus ovata*/*Eucalyptus brookeriana*), listed as Critically Endangered on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, is likely to occur within the area. This vegetation community is not present within or close to the study area.

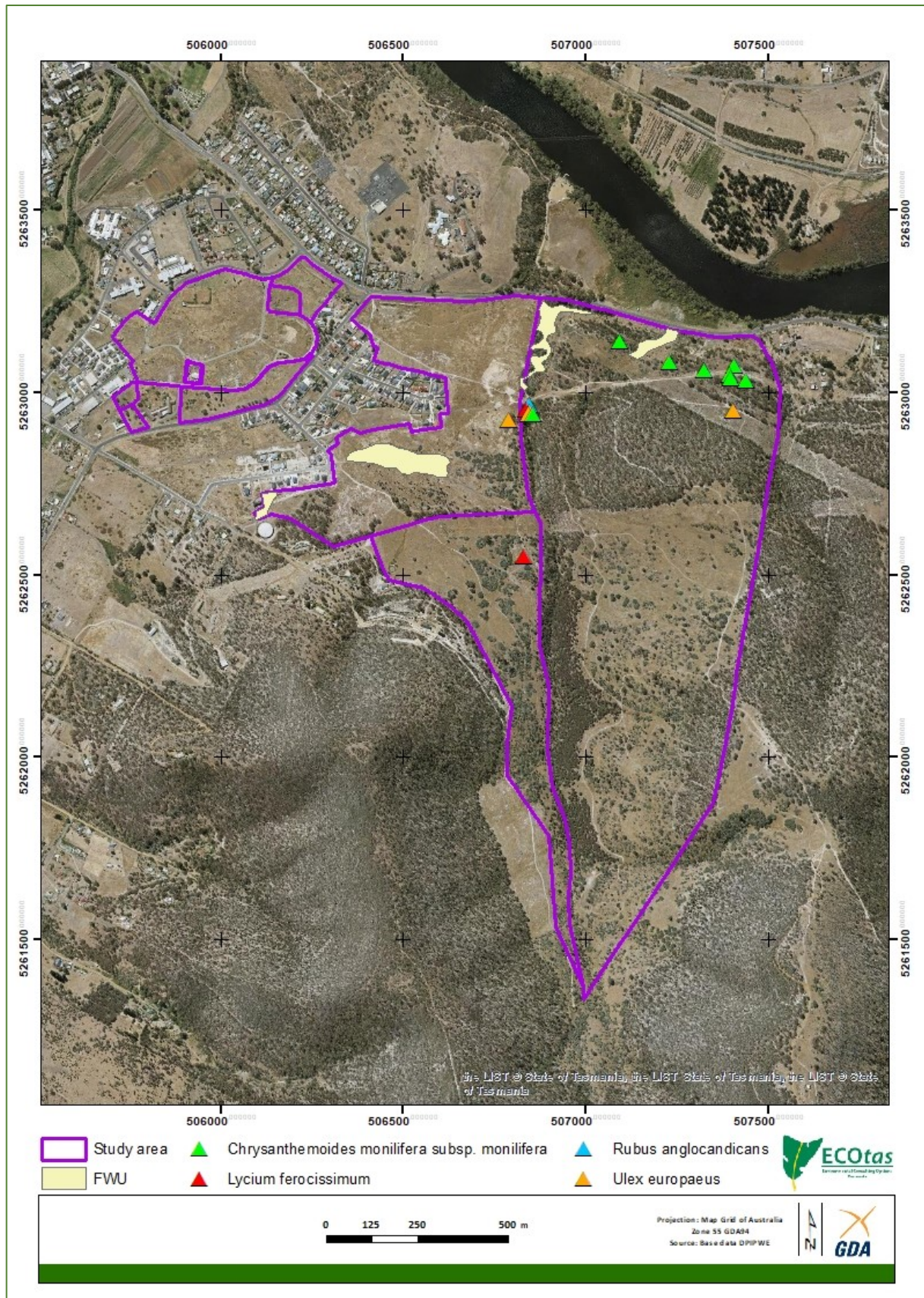


Figure 14. Distribution of weed species in the study area

DISCUSSION

Summary of key findings

Threatened flora

- No plant species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) were detected, or are known from database information, from the study area.
- Two plant species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* (TSPA) are known from database information from the study area, as follows:
 - *Austrostipa bigeniculata* (doublejointed speargrass) [TSPA: rare]: recorded from a single location in the north of the study area (not detected as a consequence of the present assessments and database record of very low precision); and
 - *Velleia paradoxa* (spur velleia) [TSPA: vulnerable]: recorded from a single location in the north of the study area (not detected as a consequence of the present assessments and database record of low precision).
- No plant species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* (TSPA) were detected from the study area.

Threatened fauna

- No fauna species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) and/or the Tasmanian *Threatened Species Protection Act 1995* (TSPA) were detected, or are known from database information, from the study area.
- The study area supports potential habitat of several threatened fauna species, as follows:
 - marsupial carnivores (Tasmanian devil, spotted-tailed quoll, eastern quoll): potential habitat widespread but no specific habitat features (such as dens) or other evidence (e.g. scats) were detected;
 - eastern barred bandicoot: potential habitat widespread;
 - masked owl: no nesting trees (trees with hollows) noted but potential foraging habitat widespread;
 - swift parrot: a very small copse of *Eucalyptus ovata* (black gum) trees is present, which is potential foraging habitat, which has marginal potential as opportunistic foraging habitat only; no potential nesting habitat present;
 - green and golden frog: very marginal potential habitat is present in the form of small ephemeral farm dams but no vegetation is present in the dams for protection of the species and as such the species should not require further consideration; and
 - tussock skink: marginal potential habitat in open grassy areas but habitat considered sub-optimal.

Vegetation types

- The study area supports the following TASVEG mapping units:
 - *Eucalyptus amygdalina* forest on mudstone (DAM);
 - *Eucalyptus viminalis* grassy forest and woodland (DVG);
 - *Allocasuarina verticillata* forest (NAV);

- lowland grassland complex (GCL);
- lowland *Themeda triandra* grassland (GTL);
- agricultural land (FAG);
- regenerating cleared land (FRG);
- extra-urban miscellaneous (FUM);
- permanent easements (FPE);
- weed infestation (FWU); and
- water, sea (OAQ).
- Of the vegetation types recorded from the study area, none are listed as threatened vegetation types on Schedule 3A of the Tasmanian *Nature Conservation Act 2002*.
- Lowland *Themeda triandra* grassland (GTL) can equate to a threatened ecological community (Lowland Native Grasslands of Tasmania), listed as Critically Endangered on schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, but in this case the patch does not satisfy the criteria (too small, too weedy).

Weeds

- Four plant species classified as a declared weeds within the meaning of the Tasmanian *Weed Management Act 1999* were detected from the study area, as follows:
 - *Chrysanthemoides monilifera* subsp. *monilifera* (boneseed): several localised patches;
 - *Lycium ferocissimum* (african boxthorn); single shrub in the centre of the study area;
 - *Rubus anglocandicans* (blackberry); extensive patches on the study area; and
 - *Ulex europaeus* (gorse); localised plants in the north of the study area.

Plant disease

- There is no evidence that the study area is infected with *Phytophthora cinnamomi* (rainfall below 600 mm per annum).
- There is no evidence that the study area supports myrtle wilt (absence of *Nothofagus cunninghamii*).
- There is no evidence that the study area supports myrtle rust.

Animal disease (chytrid)

- The study area is not known to support frog chytrid disease and only has marginal habitats conducive to the disease persisting (ephemeral waterbodies and watercourses).

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APPENDIX A. Vegetation community structure and composition

The tables below provide basic information on the structure and composition of the native vegetation mapping units identified from the study area.

Eucalyptus amygdalina forest on mudstone (TASVEG code: DAM)

The forested slopes are dominated by a forest canopy of *Eucalyptus amygdalina* (black peppermint) and *E. rubida* (candlebark) over a largely grassy understorey. In areas where *E. rubida* dominates, this community is classified under TASVEG as the mapping unit DAM. Despite there clearly being a separate community dominated by *E. rubida*, the intersectional key in Kitchener & Harris (2013+) clearly indicates that any community dominated by *E. rubida* is subsumed into other eucalypt communities.

The DAM community is in generally good ecological condition, with only minor occurrences of weeds (mainly on the fringes). Due to the close proximity to the New Norfolk township, firewood cutting has been extensive, however, the small stature of the dominant eucalypt species has deterred considerable damage. The understorey is relatively simple floristically, quite typical of this type of forest in this part of the State.



DAM on the slopes in the south of the study area

Stratum	Height (m) Cover (%)	Species (<u>underline</u> = dominant, parentheses = sparse or occasional)
Trees	6-8 m 10-15%	<i>Eucalyptus amygdalina</i> , <i>E. rubida</i> , (<i>E. viminalis</i>)
Tall shrubs	2-4 m <10%	<i>Exocarpos cupressiformis</i> , <i>Allocasuarina littoralis</i> , <i>Dodonaea viscosa</i> , <i>Acacia dealbata</i> , (<i>A. mearnsii</i>)
Low shrubs	<0.5 m 20%	<i>Acacia gunnii</i> , <i>Acacia genistifolia</i> , <i>Pultenaea gunnii</i> , <i>Pomaderris pilifera</i> , <i>Astroloma humifusum</i> , <i>Epacris impressa</i> , <i>Pultenaea pedunculata</i> , <i>Tetradlea labillardierei</i>
Grasses	30-60%	<i>Poa</i> spp., <i>Austrostipa</i> spp., <i>Rytidosperma</i> spp., <i>Briza maxima</i> , <i>Anthoxanthum odoratum</i>
Graminoids	+	<i>Lomandra longifolia</i> , <i>Dianella revoluta</i>
Herbs	5%	<i>Acaena echinata</i> , <i>Gonocarpus tetragynus</i> , <i>Oxalis perennans</i>

***Eucalyptus viminalis* grassy forest and woodland (TASVEG code: DVG)**

Small areas of *Eucalyptus viminalis* (white gum) dominated forest occur on relatively fertile basalt substrate in the north of the study area. DVG is characterised by a grassy understorey with virtually no native shrub species.

DVG is in marginal ecological condition due to occurring between the Lyell Highway (and associated quarries) and high voltage powerlines. Weed species, rubbish dumping and firewood cutting were noted in all areas where DVG occurs.



DVG in the north of the study area

Stratum	Height (m) Cover (%)	Species (<u>underline</u> = dominant, parentheses = sparse or occasional)
Trees	6-8 m 10-15%	<i>E. viminalis</i> , (<i>Eucalyptus amygdalina</i>)
Tall shrubs	2-4 m 15%	<i>Dodonaea viscosa</i> , <i>Acacia dealbata</i>
Shrubs	1-2 m 10%	<i>Chrysanthemoides monilifera</i>
Low shrubs	<0.5 m 20%	<i>Lissanthe strigosa</i> , <i>Pultenaea pedunculata</i> , <i>Tetratheca labillardierei</i> , <i>Astroloma humifusum</i>
Grasses	60%	<i>Themeda triandra</i> , <i>Austrostipa</i> spp., <i>Rytidosperma</i> spp., <i>Anthoxanthum odoratum</i>
Graminoids	+	<i>Lomandra longifolia</i> , <i>Dianella revoluta</i>
Herbs	10%	<i>Senecio biserratus</i> , <i>Acaena echinata</i> , <i>Gonocarpus tetragynus</i> , <i>Oxalis perennans</i> , <i>Acetosella vulgaris</i> , <i>Hypochaeris radicata</i>

***Allocasuarina verticillata* forest (TASVEG code: NAV)**

NAV is associated with the main drainage line through the study area with a small area located in the north between the Lyell Highway and powerline easement. This community is characterised by the dominance of *Allocasuarina verticillata* (drooping sheoak) with a species-poor understorey containing scattered grasses and shrubs.

NAV is in good ecological condition due to species suitable for firewood being absent and generally occurring in areas where refuse dumping has not occurred.



NAV (middle ground) in the main creekline through the centre of the study area

Stratum	Height (m) Cover (%)	Species (<u>underline</u> = dominant, parentheses = sparse or occasional)
Tall shrubs	4-6 m 40-60%	<i>Allocasuarina verticillata</i>
Shrubs	<3 m 10%	<i>Acacia dealbata</i> , <i>A. mearnsii</i>
Low shrubs	<0.5 m 10%	<i>Lissanthe strigosa</i> , <i>Astroloma humifusum</i>
Grasses	20-60%	<i>Austrostipa</i> spp., <i>Rytidosperma</i> spp.
Graminoids	+	<i>Dianella revoluta</i>
Herbs	10%	<i>Acaena echinata</i> , <i>Gonocarpus tetragynus</i> , <i>Oxalis perennans</i>

Bursaria-Acacia woodland and scrub (TASVEG code: NBA)

NBA is widespread across the study area occurring in areas that have been previously cleared for grazing. In the past, NBA would have been either DAM or DVG, which is evident from the numerous eucalypt stumps. The understorey of NBA is characterised by the co-dominance of native and introduced grass species with sparsely scattered native low shrubs and herb species.

NBA is in reasonable ecological condition, however, it is essentially a disturbance-induced community following the cessation of grazing. There are numerous old fence lines and vehicle tracks with refuse dumping and recreational vehicle use widespread.



NBA in the south of the study area

Stratum	Height (m) Cover (%)	Species (<u>underline</u> = dominant, parentheses = sparse or occasional)
Tall shrubs	3-6 m 5-15%	<u>Acacia mearnsii</u> , <u>Acacia dealbata</u> , <i>Dodonaea viscosa</i> , (<i>Allocasuarina verticillata</i>)
Shrubs	<2 m <10%	<i>Acacia dealbata</i> , <i>A. mearnsii</i>
Low shrubs	<0.5 m 10%	<i>Lissanthe strigosa</i> , <i>Astroloma humifusum</i>
Grasses	60-70%	<i>Austrostipa</i> spp., <i>Rytidosperma</i> spp., <i>Anthoxanthum odoratum</i> , <i>Dactylis glomerata</i> , <i>Bromus diandrus</i> , <i>Holcus lanatus</i>
Graminoids	<10%	<i>Lomandra longifolia</i> , <i>Dianella revoluta</i>
Herbs	20%	<i>Hypochaeris radicata</i> , <i>Acetosella vulgaris</i> , <i>Trifolium repens</i> , <i>Acaena echinata</i> , <i>Gonocarpus tetragynus</i> , <i>Oxalis perennans</i>

lowland grassland complex (TASVEG code: GCL)

GCL is widespread, dominating sites that have been cleared for pasture in the past. GCL is gradational with NBA (see above) where *Acacia* species are invading the old pasture areas. GCL is characterised by the dominance of native *Austrostipa* (speargrass) and *Rytidosperma* (wallabygrass) species. Introduced grass and herb species are persisting from past agricultural practices.

GCL is generally in good ecological condition, however, recreational vehicle use, refuse dumping and weed species were noted in some areas.



GCL in the centre of the study area

Stratum	Height (m) Cover (%)	Species (<u>underline</u> = dominant, parentheses = sparse or occasional)
Tall shrubs	3-6 m <5%	<i>Acacia mearnsii</i> , <i>Acacia dealbata</i>
Low shrubs	<0.5 m 10%	<i>Lissanthe strigosa</i> , <i>Astroloma humifusum</i>
Grasses	80-90%	<i>Austrostipa</i> spp., <i>Rytidosperma</i> spp., <i>Anthoxanthum odoratum</i> , <i>Dactylis glomerata</i> , <i>Bromus diandrus</i> , <i>Holcus lanatus</i>
Graminoids	<10%	<i>Lomandra longifolia</i> , <i>Dianella revoluta</i>
Herbs	20%	<i>Arctotheca calendula</i> , <i>Hypochaeris radicata</i> , <i>Acetosella vulgaris</i> , <i>Trifolium repens</i> , <i>Acaena echinata</i> , <i>Gonocarpus tetragynus</i> , <i>Oxalis perennans</i>

lowland *Themeda triandra* grassland (TASVEG code: GTL)

GTL occurs as a small patch on skeletal dolerite soils (0.18 ha) in the west of the study area. GTL has been grazed in the past and vehicle damage was evident.

GTL is in poor condition with introduced grasses and herbs dominating approx. 50% of the species.



GTL in the centre of the study area

Stratum	Height (m) Cover (%)	Species (<u>underline</u> = dominant, parentheses = sparse or occasional)
Grasses	60-90%	<u>Themeda triandra</u> , <i>Austrostipa</i> spp., <i>Rytidosperma</i> spp, <i>Anthoxanthum odoratum</i> , <i>Dactylis glomerata</i> , <i>Bromus diandrus</i> , <i>Holcus lanatus</i>
Graminoids	<10%	<i>Lepidosperma laterale</i> , <i>Schoenus apogon</i>
Herbs	20-30%	<i>Cirsium vulgare</i> , <i>Geranium molle</i> , <i>Arctotheca calendula</i> , <i>Hypochaeris radicata</i> , <i>Acetosella vulgaris</i> , <i>Trifolium repens</i> , <i>Acaena echinata</i> , <i>Gonocarpus tetragynus</i> , <i>Oxalis perennans</i>

APPENDIX B. Vascular plant species recorded from the study area

Botanical nomenclature follows *A Census of the Vascular Plants of Tasmania* (de Salas & Baker 2019), with family placement updated to reflect the nomenclatural changes recognised in the *Flora of Tasmania Online* (Duretto 2009+) and APG (2016); common nomenclature follows *The Little Book of Common Names of Tasmanian Plants* (Wapstra et al. 2005+, updated online at www.dpipwe.tas.gov.au).

i = introduced/naturalised; e = endemic to Tasmania

DW = declared weed within meaning of *Tasmanian Weed Management Act 1999*

Table B1. Summary of vascular species recorded from the study area

STATUS	ORDER			
	DICOTYLEDONAE	MONOCOTYLEDONAE	GYMNOSPERMAE	PTERIDOPHYTA
	68	33	-	2
e	3	1	-	-
i	33	20	-	-
Sum	104	54	0	2
TOTAL	160			

DICOTYLEDONAE

AIZOACEAE

Carpobrotus rossii

native pigface

AMARANTHACEAE

Einadia nutans subsp. *nutans*

climbing saltbush

ASTERACEAE

i *Arctotheca calendula*

capeweed

i *Bellis perennis*

english daisy

Brachyscome aculeata

hill daisy

Cassinia aculeata subsp. *aculeata*

common dollybush

i *Chrysanthemoides monilifera* subsp. *monilifera*

boneseed

DW

Chrysocephalum apiculatum subsp. *apiculatum*

common everlasting

i *Cirsium vulgare*

spear thistle

i *Conyza bonariensis*

flaxleaf fleabane

Coronidium scorpioides

curling everlasting

Euchiton japonicus

common cottonleaf

i *Hypochaeris glabra*

smooth catsear

i *Hypochaeris radicata*

rough catsear

Lagenophora stipitata

blue bottledaisy

Leptorhynchus squamatus subsp. *squamatus*

scaly buttons

Ozothamnus obcordatus

yellow everlastingbush

e *Ozothamnus scutellifolius*

buttonleaf everlastingbush

Senecio biserratus

jagged fireweed

Senecio minimus

shrubby fireweed

Senecio quadridentatus

cotton fireweed

i *Sonchus asper*

prickly sowthistle

BORAGINACEAE

Cynoglossum suaveolens

sweet houndstongue

BRASSICACEAE

i *Brassica rapa*

turnip

i *Cardamine hirsuta*

hairy bittercress

CAMPANULACEAE

Wahlenbergia stricta subsp. *stricta*

tall bluebell

CARYOPHYLLACEAE

i *Cerastium vulgare*

common mouse-ear

CASUARINACEAE

Allocasuarina littoralis

black sheoak

Allocasuarina verticillata

drooping sheoak

CONVOLVULACEAE	
<i>Dichondra repens</i>	kidneyweed
CRASSULACEAE	
<i>Crassula sieberiana</i>	rock stonecrop
DILLENIACEAE	
<i>Hibbertia hirsuta</i>	hairy guineaflower
<i>Hibbertia riparia</i>	erect guineaflower
ELAEOCARPACEAE	
<i>Tetratheca labillardierei</i>	glandular pinkbells
ERICACEAE	
<i>Acrotriche serrulata</i>	ants delight
<i>Astroloma humifusum</i>	native cranberry
<i>Epacris impressa</i>	common heath
<i>Lissanthe strigosa</i> subsp. <i>subulata</i>	peachberry heath
EUPHORBIACEAE	
i <i>Euphorbia peplus</i>	petty spurge
FABACEAE	
i <i>Acacia baileyana</i>	cootamundra wattle
<i>Acacia dealbata</i> subsp. <i>dealbata</i>	silver wattle
<i>Acacia genistifolia</i>	spreading wattle
<i>Acacia gunnii</i>	ploughshare wattle
<i>Acacia mearnsii</i>	black wattle
<i>Acacia myrtifolia</i>	redstem wattle
<i>Acacia stricta</i>	hop wattle
<i>Acacia verticillata</i> subsp. <i>verticillata</i>	prickly moses
<i>Bossiaea prostrata</i>	creeping bossia
<i>Daviesia latifolia</i>	hop bitterpea
<i>Daviesia ulicifolia</i> subsp. <i>ulicifolia</i>	yellow spiky bitterpea
<i>Pultenaea daphnoides</i>	heartleaf bushpea
<i>Pultenaea gunnii</i> subsp. <i>gunnii</i>	golden bushpea
<i>Pultenaea juniperina</i>	prickly beauty
<i>Pultenaea pedunculata</i>	matted bushpea
i <i>Trifolium repens</i>	white clover
i <i>Trifolium subterraneum</i>	subterranean clover
i <i>Ulex europaeus</i>	gorse
GENTIANACEAE	
i <i>Centaurium erythraea</i>	common centaury
<i>Sebaea ovata</i>	yellow sebaea
GERANIACEAE	
i <i>Erodium botrys</i>	long heronsbill
i <i>Erodium cicutarium</i>	common heronsbill
i <i>Geranium dissectum</i>	cutleaf cranesbill
i <i>Geranium molle</i>	soft cranesbill
<i>Geranium solanderi</i>	southern cranesbill
GOODENIACEAE	
<i>Goodenia lanata</i>	trailing native-primrose
HALORAGACEAE	
<i>Gonocarpus tetragynus</i>	common raspwort
HYPERICACEAE	
<i>Hypericum gramineum</i>	small st johns-wort
LAMIACEAE	
<i>Ajuga australis</i>	australian bugle
LAURACEAE	
<i>Cassytha melantha</i>	large dodderlaurel
<i>Cassytha pubescens</i>	downy dodderlaurel
LINACEAE	
<i>Linum marginale</i>	native flax
MYRTACEAE	
e <i>Eucalyptus amygdalina</i>	black peppermint
<i>Eucalyptus ovata</i> var. <i>ovata</i>	black gum
e <i>Eucalyptus pulchella</i>	white peppermint
<i>Eucalyptus rubida</i>	candlebark
<i>Eucalyptus viminalis</i> subsp. <i>viminalis</i>	white gum
<i>Euryomyrtus ramosissima</i>	rosy heathmyrtle
OXALIDACEAE	
i <i>Oxalis corniculata</i> subsp. <i>corniculata</i>	yellow woodsorrel
<i>Oxalis perennans</i>	grassland woodsorrel
i <i>Oxalis pes-caprae</i>	soursob

DW

	PAPAVERACEAE		
i	<i>Fumaria muralis</i> subsp. <i>muralis</i>	wall fumitory	
	PITTOSPORACEAE		
	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	prickly box	
	PLANTAGINACEAE		
i	<i>Callitriche stagnalis</i>	mud waterstarwort	
i	<i>Plantago coronopus</i> subsp. <i>coronopus</i>	slender buckshorn plantain	
i	<i>Plantago lanceolata</i>	ribwort plantain	
i	<i>Plantago major</i>	great plantain	
	POLYGALACEAE		
	<i>Comesperma volubile</i>	blue lovecreeper	
	POLYGONACEAE		
i	<i>Acetosella vulgaris</i>	sheep sorrel	
	RHAMNACEAE		
	<i>Pomaderris elliptica</i> var. <i>elliptica</i>	yellow dogwood	
	<i>Pomaderris pilifera</i> subsp. <i>pilifera</i>	hairy dogwood	
	ROSACEAE		
	<i>Acaena echinata</i>	spiny sheepsburr	
	<i>Acaena novae-zelandiae</i>	common buzzy	
	<i>Acaena x anserovina</i>	hybrid sheepsburr	
i	<i>Rosa rubiginosa</i>	sweet briar	
	<i>Rubus anglocandicans</i>	blackberry	DW
	RUTACEAE		
	<i>Philotheca verrucosa</i>	fairy waxflower	
	SANTALACEAE		
	<i>Exocarpos cupressiformis</i>	common native-cherry	
	<i>Exocarpos strictus</i>	pearly native-cherry	
	SAPINDACEAE		
	<i>Dodonaea viscosa</i> subsp. <i>spatulata</i>	broadleaf hopbush	
	SCROPHULARIACEAE		
i	<i>Verbascum thapsus</i>	great mullein	
	SOLANACEAE		
i	<i>Lycium ferocissimum</i>	african boxthorn	DW
	STYLIDIACEAE		
	<i>Stylidium graminifolium</i>	narrowleaf triggerplant	
	THYMELAEACEAE		
	<i>Pimelea humilis</i>	dwarf riceflower	
	MONOCOTYLEDONAE		
	AMARYLLIDACEAE		
i	<i>Agapanthus praecox</i> subsp. <i>orientalis</i>	agapanthus	
i	<i>Allium triquetrum</i>	triangular garlic	
	<i>Dianella revoluta</i> var. <i>revoluta</i>	spreading flaxlily	
	ASPARAGACEAE		
	<i>Lomandra longifolia</i>	sagg	
	CYPERACEAE		
	<i>Carex appressa</i>	tall sedge	
	<i>Carex iynx</i>	tussock sedge	
	<i>Isolepis inundata</i>	swamp clubsedge	
	<i>Lepidosperma gunnii</i>	narrow swordedge	
e	<i>Lepidosperma inops</i>	fan sedge	
	<i>Lepidosperma laterale</i>	variable swordedge	
	<i>Schoenus apogon</i>	common bogsedge	
	<i>Tetraria capillaris</i>	hair sedge	
	IRIDACEAE		
i	<i>Romulea rosea</i> var. <i>australis</i>	lilac oniongrass	
	JUNCACEAE		
	<i>Juncus filicaulis</i>	thread rush	
	<i>Juncus pallidus</i>	pale rush	
	<i>Juncus procerus</i>	tall rush	
	<i>Juncus sarophorus</i>	broom rush	
	ORCHIDACEAE		
	<i>Acianthus pusillus</i>	small mosquito-orchid	
	POACEAE		
i	<i>Agrostis capillaris</i> var. <i>capillaris</i>	browntop bent	
i	<i>Agrostis stolonifera</i>	creeping bent	
i	<i>Aira caryophyllea</i> subsp. <i>caryophyllea</i>	silvery hairgrass	
i	<i>Aira elegantissima</i>	delicate hairgrass	
i	<i>Aira praecox</i>	early hairgrass	
	<i>Anthosachne scabra</i>	rough wheatarass	

i	<i>Anthoxanthum odoratum</i>	sweet vernalgrass
i	<i>Arrhenatherum elatius</i> var. <i>bulbosum</i>	bulbous oatgrass
	<i>Austrostipa mollis</i>	soft speargrass
	<i>Austrostipa nodosa</i>	knotty speargrass
	<i>Austrostipa pubinodis</i>	tall speargrass
	<i>Austrostipa rudis</i> subsp. <i>australis</i>	southern speargrass
	<i>Austrostipa semibarbata</i>	fibrous speargrass
	<i>Austrostipa stiposa</i>	corkscrew speargrass
i	<i>Avena sativa</i>	cereal oat
i	<i>Briza maxima</i>	greater quaking-grass
i	<i>Briza minor</i>	lesser quaking-grass
i	<i>Bromus catharticus</i>	prairie grass
i	<i>Bromus diandrus</i>	great brome
i	<i>Dactylis glomerata</i>	cocksfoot
	<i>Deyeuxia quadriseta</i>	reed bentgrass
	<i>Dichelachne rara</i>	common plumegrass
i	<i>Ehrharta erecta</i> var. <i>erecta</i>	panic veldtgrass
i	<i>Holcus lanatus</i>	yorkshire fog
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	weeping grass
i	<i>Phalaris aquatica</i>	toowoomba canarygrass
i	<i>Poa annua</i>	winter grass
	<i>Poa hookeri</i>	hookers tussockgrass
	<i>Poa rodwayi</i>	velvet tussockgrass
	<i>Poa tenera</i>	scrambling tussockgrass
	<i>Rytidosperma caespitosum</i>	common wallabygrass
	<i>Rytidosperma pilosum</i>	velvet wallabygrass
	<i>Rytidosperma setaceum</i>	bristly wallabygrass
	<i>Tetrarrhena distichophylla</i>	hairy ricegrass
	<i>Themeda triandra</i>	kangaroo grass
	RESTIONACEAE	
	<i>Centrolepis strigosa</i> subsp. <i>strigosa</i>	hairy bristlewort
	PTERIDOPHYTA	
	ASPLENIACEAE	
	<i>Asplenium flabellifolium</i>	necklace fern
	PTERIDACEAE	
	<i>Cheilanthes austrotenuifolia</i>	green rockfern

APPENDIX C. Analysis of database records of threatened flora

Table C1 provides a listing of threatened flora from within 5,000 m of the study area (nominal buffer width usually used to discuss the potential of a particular study area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded.

Table C1. Threatened flora records from within 5,000 m of boundary of the study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from DPIPWE's *Natural Values Atlas* (DPIPWE 2020) and other sources where indicated. Habitat descriptions are taken from FPA (2016), FPA (2017) and TSS (2003+), except where otherwise indicated. Species marked with # are listed in CofA (2020).

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
<i>Anogramma leptophylla</i> Annual fern	v -	<i>Anogramma leptophylla</i> grows in shallow soil layers over rock, on exposed or semi-exposed outcrops in dry or damp sclerophyll forest. Plants are mostly found on rock ledges, often on, or just inside, the drip line of the overhead rock-face. The substrate is variable, including dolerite, basalt and sandstone.	Historical record with low precision only. Potential habitat (highly atypical of all known sites) marginally present in the form of the small mudstone cliff-line parallel with the main creek line. This species was not detected.
<i>Asperula scoparia</i> subsp. <i>scoparia</i> prickly woodruff	r -	<i>Asperula scoparia</i> subsp. <i>scoparia</i> is widespread in Tasmania, and is mainly found in native grasslands and grassy forests, often on fertile substrates such as dolerite-derived soils. Forested sites are usually dominated by <i>Eucalyptus globulus</i> and <i>E. viminalis</i> (lower elevations) and <i>E. delegatensis</i> (higher elevations).	Historical record with low precision only. Potential habitat marginally present in the <i>Eucalyptus viminalis</i> woodland in the north of the study area. This species was not detected (detectable and identifiable at any time of the year).
<i>Austrostipa bigeniculata</i> doublejointed speargrass	r -	<i>Austrostipa bigeniculata</i> is found mainly in the southeast and Midlands in open woodlands and grasslands, where it is often associated with <i>Austrostipa nodosa</i> .	Species has been previously recorded in the study area in the past. Refer to FINDINGS Plant species <u>Threatened flora species recorded from the study area</u> for more details.
<i>Barbarea australis</i> riverbed wintercress	e EN # only	<i>Barbarea australis</i> is a riparian species found near river margins, creek beds and along flood channels adjacent to the river. It tends to favour the slower reaches, and has not been found on steeper sections of rivers. It predominantly occurs in flood deposits of silt and gravel deposited as point bars and at the margins of base flows, or more occasionally or between large cobbles on sites frequently disturbed by fluvial processes. Some of the sites are a considerable distance from the river, in flood channels scoured by previous flood action, exposing river pebbles. Most populations are in the Central Highlands, but other populations occur in the northeast and upland areas in the central north.	Potential habitat absent.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
<i>Bossiaea tasmanica</i> spiny bossia	r -	<i>Bossiaea tasmanica</i> is found in dry sites within dry sclerophyll forest. Most sites are on Mathinna shales in open sites in <i>Eucalyptus sieberi</i> forest in the northeast but there is an anomalous site on dolerite in open <i>E. delegatensis</i> forest at Mt Foster. There is another localised site on Triassic sediments near Tunnack, and more recently from the New Norfolk area.	Potential habitat present. This shrub (detectable and identifiable at any time of the year) was not detected.
<i>Caladenia anthracina</i> blacktip spider-orchid	e CR #	<i>Caladenia anthracina</i> has a restricted distribution in the midlands area, occurring in grassy woodland with <i>Acacia dealbata</i> (silver wattle) and bracken on well-drained sandy soil. Two historical sites from the Derwent Valley are presumed extinct.	Historical records with low precision only. The surveys occurred in winter and autumn outside of the known flowering period (Wapstra 2018) and in that regard, no evidence of <i>Caladenia</i> species were recorded (such as distinctive leaves). However, this part of the range of the species (i.e. outside the core Midlands area) is considered to no longer support the species so follow-up targeted surveys are not considered warranted.
<i>Caladenia caudata</i> tailed spider-orchid	v VU # only	<i>Caladenia caudata</i> has highly variable habitat, which includes the central north: <i>Eucalyptus obliqua</i> heathy forest on low undulating hills; the northeast: <i>E. globulus</i> grassy/heathy coastal forest, <i>E. amygdalina</i> heathy woodland and forest, <i>Allocasuarina</i> woodland; and the southeast: <i>E. amygdalina</i> forest and woodland on sandstone, coastal <i>E. viminalis</i> forest on deep sands. Substrates vary from dolerite to sandstone to granite, with soils ranging from deep windblown sands, sands derived from sandstone and well-developed clay loams developed from dolerite. A high degree of insolation is typical of many sites.	Potential habitat present and difficult to discount the possible presence of the species, mainly from areas mapped as DAM. However, the surveys were well outside the peak flowering period (Wapstra 2018), such that if the areas mapped as DAM were to be developed, a follow-up timed-targeted survey in spring (late August to late September) is recommended. Refer also to FINDINGS Plant species <u>Threatened flora species potentially present (database analysis)</u> for more information.
<i>Carex gunniana</i> mountain sedge	r -	The habitat of <i>Carex gunniana</i> is poorly understood and highly variable. It includes wet eucalypt forest, sandy heathlands, margins of streams, littoral sands, shingle with seepage, damp grasslands within dry forest and rough pasture.	Historical records with low precision only. Potential habitat present. This perennial sedge (detectable and identifiable at any time of the year) was not detected.
<i>Colobanthus curtisiae</i> grassland cupflower	r VU # only	<i>Colobanthus curtisiae</i> occurs in lowland grasslands and grassy woodlands but is also prevalent on rocky outcrops and margins of forest on dolerite on the Central Highlands (including disturbed sites such as log landings and snig tracks).	Potential habitat marginally present but the species is not known from southeast Tasmania.
<i>Dianella amoena</i> grassland flaxlily	r EN # only	<i>Dianella amoena</i> occurs mainly in the northern and southern Midlands, where it grows in native grasslands and grassy woodlands.	Potential habitat present. This perennial graminoid (detectable and identifiable at any time of the year) was not detected.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
<i>Epacris exserta</i> south esk heath	e EN # only	<i>Epacris exserta</i> occurs along the lower reaches of the South Esk, North Esk and Supply rivers. It is a strictly riparian species that grows in areas subject to periodic inundation, mainly on alluvium amongst dolerite boulders within dense riparian scrub, and occasionally in open rocky sites. It has been recorded from 10-310 m a.s.l.	The inclusion of this species in CofA (2020) is difficult to reconcile with the available distributional and habitat information on the species. Potential habitat absent.
<i>Epacris virgata</i> Kettering pretty heath	v EN	<i>Epacris virgata</i> (Kettering) occurs among foothills in southeastern Tasmania in dry sclerophyll forest on hilly terrain at elevations of 10-300 m a.s.l., mainly on dolerite, though sometimes close to the geological boundary of dolerite and Permian mudstone. It is generally associated with grassy/heathy <i>Eucalyptus ovata</i> woodland/forest, but is also occasionally found in grassy/heathy <i>E. pulchella</i> woodland/forest.	Potential habitat absent (the small area of dolerite supports atypical habitat). This shrub (detectable and identifiable at any time of the year) was not detected.
<i>Epilobium pallidiflorum</i> showy willowherb	r -	<i>Epilobium pallidiflorum</i> occurs in wet places (e.g. natural wetlands amongst forest, margins of <i>Melaleuca ericifolia</i> swamp forest, scrubby-sedgy <i>E. ovata</i> woodland on heavy soils, etc.) mostly in the north and northwest of the State.	Potential habitat absent.
<i>Eucalyptus risdonii</i> risdon peppermint	r -	<i>Eucalyptus risdonii</i> is restricted to the greater Hobart area (particularly the Meehan Range), with an outlying population at Mangalore and on South Arm. It occurs on mudstone, with an altitudinal range from near sea level to 150 m a.s.l. It can occur as a dominant in low open forest with a sparse understorey on dry, isolated ridgelines and slopes (e.g. with a northwest aspect), and individuals can extend into other forest types typically dominated by <i>E. tenuiramis</i> or <i>E. amygdalina</i> (but occasionally by other species) on less exposed sites.	Potential habitat present. This distinctive small tree species was not detected (detectable and identifiable at any time of the year).
<i>Glycine latrobeana</i> clover glycine	v VU # only	<i>Glycine latrobeana</i> occurs in a range of habitats, geologies and vegetation types. Soils are usually fertile but can be sandy when adjacent to or overlaying fertile soils. The species mainly occurs on flats and undulating terrain over a wide geographical range, including near-coastal environments, the Midlands, and the Central Plateau. It mainly occurs in grassy/heathy forests and woodlands and native grasslands.	Potential habitat marginally present but the species is not known from southeast Tasmania.
<i>Hovea tasmanica</i> rockfield purplepea	r -	<i>Hovea tasmanica</i> occurs in central and northeastern regions. It is usually found on dry, rocky ridges or slopes (mostly dolerite) in forest and riverine scrub.	Historical record with low precision only. Potential habitat absent.
<i>Juncus amabilis</i> gentle rush	r -	<i>Juncus amabilis</i> occurs in a variety of habitats, usually poorly-drained sites such as damp grasslands and grassy	Potential habitat superficially present in the form of poorly-

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
		woodlands, wet pastures, roadside ditches and edges of still and slow-flowing waterbodies. As presently understood, the species is mainly confined to lowland areas in the eastern half of the State but there are potential higher elevation and more western records that require confirmation.	drained ditches mainly in the northwest of the study area. This distinctive perennial graminoid species was not detected (detectable and identifiable at any time of the year). This species is in the process of being removed from schedules of the Tasmanian <i>Threatened Species Protection Act 1995</i> .
<i>Lachnagrostis punicea</i> subsp. <i>punicea</i> bristle blowgrass	r -	<i>Lachnagrostis punicea</i> subsp. <i>punicea</i> occurs in moist depressions in grassy woodlands/forests and grasslands, and on the edges of swamps and saline flats.	Historical record with low precision. Potential habitat marginally present. No <i>Lachnagrostis</i> species were recorded.
<i>Lepidium hyssopifolium</i> soft peppergrass	e EN # only	The native habitat of <i>Lepidium hyssopifolium</i> is the growth suppression zone beneath large trees in grassy woodlands and grasslands (e.g. over-mature black wattles and isolated eucalypts in rough pasture). <i>Lepidium hyssopifolium</i> is now found primarily under large exotic trees on roadsides and home yards on farms. It occurs in the eastern part of Tasmania between sea-level to 500 metres a.s.l. in dry, warm and fertile areas on flat ground on weakly acid to alkaline soils derived from a range of rock types. It can also occur on frequently slashed grassy/weedy roadside verges where shade trees are absent.	Potential habitat marginally present. This perennial shrub-like herb (detectable and identifiable at any time of the year) was not detected.
<i>Leucochrysum albicans</i> subsp. <i>tricolor</i> grassland paperdaisy	e EN # only	<i>Leucochrysum albicans</i> var. <i>tricolor</i> occurs in the west and on the Central Plateau and the Midlands, mostly on basalt soils in open grassland. This species would have originally occupied <i>Eucalyptus pauciflora</i> woodland and tussock grassland, though most of this habitat is now converted to improved pasture or cropland.	Potential habitat effectively absent (too heavily disturbed). Initial survey conducted at beginning of rosette-forming stage of growth so would have been detectable if present. Records from this part of the State are historical only and the species is now considered absent from the southeast of the State.
<i>Pimelea curviflora</i> var. <i>gracilis</i> slender curved riceflower	r -	<i>Pimelea curviflora</i> var. <i>gracilis</i> occurs in a range of vegetation types from wet and dry sclerophyll forest to hardwood plantations. Understories vary from open and grassy to densely shrubby. It can densely colonise disturbed sites such as firebreaks, log landings and tracks.	Historical record with low precision. Potential habitat marginally present. This shrub (detectable and identifiable at any time of the year) was not detected.
<i>Pomaderris intermedia</i> lemon dogwood	r -	<i>Pomaderris intermedia</i> occurs in heathland and heathy woodland on eastern Bass Strait islands but extends to mainly dry sclerophyll forest on mainland Tasmania, most often associated with rock outcrops (dolerite), riparian areas and open forest.	Potential habitat present This shrub (detectable and identifiable at any time of the year) was not detected.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on study area and database records
<i>Pomaderris pilifera</i> subsp. <i>talpicutica</i> moleskin dogwood	e VU	<i>Pomaderris pilifera</i> subsp. <i>talpicutica</i> is known with certainty from a few small subpopulations. Generally, the species occurs on western and northwestern slopes between 10-125 m a.s.l. It occurs on mudstone on very well drained skeletal soils, in either <i>Eucalyptus amygdalina</i> or <i>Eucalyptus risdonii</i> low woodlands. Elsewhere, the taxon occurs in open shrubby woodland dominated by <i>Eucalyptus amygdalina</i> , usually on dolerite.	Potential habitat present. This shrub (detectable and identifiable at any time of the year) was not detected.
<i>Prasophyllum apoxychilum</i> tapered leek-orchid	v EN #	<i>Prasophyllum apoxychilum</i> is restricted to eastern and northeastern Tasmania where it occurs in coastal heathland or grassy and scrubby open eucalypt forest on sandy and clay loams, often among rocks. It occurs at a range of elevations and seems to be strongly associated with dolerite in the east and southeast of its range.	Potential habitat absent.
<i>Senecio squarrosus</i> leafy fireweed	r -	<i>Senecio squarrosus</i> occurs in a wide variety of habitats. One form occurs predominantly in lowland damp tussock grasslands. The more widespread and common form occurs mainly in dry forests (often grassy) but extends to wet forests and other vegetation types.	Potential habitat present. This perennial herb (detectable and identifiable at most times of the year) was not detected.
<i>Teucrium corymbosum</i> forest germander	r -	<i>Teucrium corymbosum</i> occurs in a wide range of habitats from rocky steep slopes in dry sclerophyll forest and <i>Allocasuarina</i> (sheoak) woodland, riparian flats and forest.	Potential habitat present. This small shrub (detectable and identifiable at any time of the year) was not detected.
<i>Velleia paradoxa</i> spur velleia	v -	<i>Velleia paradoxa</i> is known from the Hobart and Launceston areas, the Midlands and the Derwent Valley, where it occurs in grassy woodlands or grasslands on dry sites. It has been recorded up to 550 m a.s.l. at sites with an annual rainfall range of 450-750 mm.	Species has been previously recorded in the study area in the past. Refer to FINDINGS Plant species <u>Threatened flora species recorded from the study area</u> for more details.
<i>Vittadinia burbridgeae</i> smooth new-holland-daisy	r -	<i>Vittadinia burbridgeae</i> occurs in native grassland and grassy woodland.	Potential habitat present. This perennial herb (detectable and identifiable at most times of the year) was not detected.
<i>Vittadinia gracilis</i> woolly new-holland-daisy	r -	<i>Vittadinia gracilis</i> occurs in native grassland and grassy woodland.	As above
<i>Xerochrysum palustre</i> swamp everlasting	v VU # only	<i>Xerochrysum palustre</i> has a scattered distribution with populations in the northeast, east coast, Central Highlands and Midlands, all below about 700 m elevation. It occurs in wetlands, grassy to sedgy wet heathlands and extends to associated heathy <i>Eucalyptus ovata</i> woodlands. Sites are usually inundated for part of the year.	Potential habitat absent.

APPENDIX D. Analysis of database records of threatened fauna

Table D1 provides a listing of threatened fauna from within 5,000 m of the study area (nominal buffer width usually used to discuss the potential of a particular study area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded.

Table D1. Threatened fauna records from 5,000 m of boundary of the study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the DPIPWE's *Natural Values Atlas* (DPIPWE 2020), Bryant & Jackson (1999) and FPA (2020); marine, wholly pelagic and littoral species such as marine mammals, fish and offshore seabirds are excluded. Species marked with # are listed in CofA (2020).

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on mining lease area and database records
<i>Accipiter novaehollandiae</i> grey goshawk	e -	Potential habitat is native forest with mature elements below 600 m altitude, particularly along watercourses. Significant habitat may be summarised as areas of wet forest, rainforest and damp forest patches in dry forest, with a relatively closed mature canopy, low stem density, and open understorey in close proximity to foraging habitat and a freshwater body (i.e. stream, river, lake, swamp, etc.).	Potential habitat absent (as described). The species probably utilises the greater title area as part of a home range and for foraging but small-scale development should not have a significant impact on this aspect of the life history of the species.
<i>Antipodia chaostola</i> tax <i>leucophaea</i> chaostola skipper	e EN #	Potential habitat is dry forest and woodland supporting <i>Gahnia radula</i> (usually on sandstone and other sedimentary rock types) or <i>Gahnia microstachya</i> (usually on granite-based substrates).	Potential habitat absent (both <i>Gahnia</i> species are absent).
<i>Alcedo azurea</i> subsp. <i>diemenensis</i> Tasmanian azure kingfisher	e EN #	Potential foraging habitat is primarily freshwater (occasionally estuarine) waterbodies such as large rivers and streams with well-developed overhanging vegetation suitable for perching and water deep enough for dive-feeding. Potential breeding habitat is usually steep banks of large rivers (a breeding site is a hole (burrow) drilled in the bank).	Potential habitat absent (ephemeral creekline does not provide potential foraging or breeding habitat). Listed as <i>Ceyx azurea</i> subsp. <i>diemenensis</i>
<i>Aquila audax</i> subsp. <i>fleayi</i> tasmanian wedge-tailed eagle	e EN #	Potential habitat comprises potential nesting habitat and potential foraging habitat. Potential foraging habitat is a wide variety of forest (including areas subject to native forest silviculture) and non-forest habitats. Potential nesting habitat is tall eucalypt trees in large tracts (usually more than 10 ha) of eucalypt or mixed forest. Nest trees are usually amongst the largest in a locality. They are generally in sheltered positions on leeward slopes, between the lower and mid sections of a slope and with the top of	No known nests within 1,000 m of boundary of study area. No novel nests were detected as a consequence of the surveys. The species probably utilises the greater title area as part of a home range and for foraging but small-scale development should not have a significant impact on this aspect of the life history of the species.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on mining lease area and database records
		the tree usually lower than the ground level of the top of the ridge, although in some parts of the State topographic shelter is not always a significant factor (e.g. parts of the northwest and Central Highlands). Nests are usually not constructed close to sources of disturbance and nests close to disturbance are less productive. More than one nest may occur within a territory but only one is used for breeding in any one year. Breeding failure often promotes a change of nest in the next year.	
<i>Botaurus poiciloptilus</i> Australasian bittern	- EN #	Potential habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. <i>Phragmites</i> , <i>Cyperus</i> , <i>Eleocharis</i> , <i>Juncus</i> , <i>Typha</i> , <i>Baumea</i> , <i>Bolboschoenus</i>) or cutting grass (<i>Gahnia</i>) growing over a muddy or peaty substrate (TSSC 2011).	Potential habitat absent.
<i>Dasyurus maculatus</i> subsp. <i>maculatus</i> spotted-tailed quoll	r VU #	Potential habitat is coastal scrub, riparian areas, rainforest, wet forest, damp forest, dry forest and blackwood swamp forest (mature and regrowth), particularly where structurally complex and steep rocky areas are present, and includes remnant patches in cleared agricultural land.	Refer to FINDINGS Fauna species Threatened fauna species recorded from the study area for more details.
<i>Dasyurus viverrinus</i> eastern quoll	- EN #	Potential habitat is a variety of habitats including rainforest, heathland, alpine areas and scrub. However, it seems to prefer dry forest and native grassland mosaics which are bounded by agricultural land.	Refer to FINDINGS Fauna species Threatened fauna species recorded from the study area for more details.
<i>Haliaeetus leucogaster</i> white-bellied sea-eagle	v -	Potential habitat comprises potential nesting habitat and potential foraging habitat. Potential foraging habitat is any large waterbody (including sea coasts, estuaries, wide rivers, lakes, impoundments and even large farm dams) supporting prey items (fish). Potential nesting habitat is tall eucalypt trees in large tracts (usually more than 10 ha) of eucalypt or mixed forest within 5 km of the coast (nearest coast including shores, bays, inlets and peninsulas), large rivers (Class 1), lakes or complexes of large farm dams. Scattered trees along river banks or pasture land may also be used.	Potential habitat is present with the Derwent River occurring immediately to the north of the study area. However, the study area does not support good habitat as the dams are small and creeklines are ephemeral. There is no nesting habitat present.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on mining lease area and database records
<i>Hirundapus caudacutus</i> white-throated needletail	- VU # only #	This species is mostly aerial, from heights of less than 1 m up to more than 1,000 m above the ground. Although they occur over most types of habitat, they are recorded most often above wooded areas, including open forest and rainforest.	Potential habitat present. However, as this species rarely lands or roosts (and does not breed) on the Australian migration, any proposal should not have a deleterious impact on the species.
<i>Lathamus discolor</i> swift parrot	e CR #	Potential habitat comprises potential foraging habitat and potential nesting habitat. Potential foraging habitat comprises <i>Eucalyptus globulus</i> (blue gum) or <i>Eucalyptus ovata</i> (black gum) trees that are old enough to flower. For management purposes, potential nesting habitat is considered to comprise eucalypt forests that contain hollow-bearing trees.	Refer to FINDINGS Fauna species Threatened fauna species recorded from the study area for more details.
<i>Litoria raniformis</i> green and gold frog	v VU #	Potential habitat is permanent and temporary waterbodies, usually with vegetation in or around them. Potential habitat includes features such as natural lagoons, permanently or seasonally inundated swamps and wetlands, farm dams, irrigation channels, artificial water-holding sites such as old quarries, slow-flowing stretches of streams and rivers and drainage features. Significant habitat is high quality potential habitat.	Refer to FINDINGS Fauna species Threatened fauna species recorded from the study area for more details.
<i>Pardalotus quadragintus</i> forty-spotted pardalote	e EN	Potential habitat is any forest and woodland supporting <i>Eucalyptus viminalis</i> (white gum) where the canopy cover of <i>E. viminalis</i> is greater than or equal to 10% or where <i>E. viminalis</i> occurs as a localised canopy dominant or codominant in patches exceeding 0.25 ha.	While <i>Eucalyptus viminalis</i> is present in the study area, the greater area is not known habitat for this species.
<i>Perameles gunnii</i> subsp. <i>gunnii</i> eastern barred bandicoot	- VU #	Potential habitat is open vegetation types including woodlands and open forests with a grassy understorey, native and exotic grasslands, particularly in landscapes with a mosaic of agricultural land and remnant bushland.	Refer to FINDINGS Fauna species Threatened fauna species recorded from the study area for more details.
<i>Poliiocephalus cristatus</i> subsp. <i>cristatus</i> great crested grebe	- v	Potential habitat is wetlands and open water bodies.	Potential habitat absent.
<i>Prototroctes maraena</i> Australian grayling	v VU #	Potential habitat is all streams and rivers in their lower to middle reaches. Areas above permanent barriers (e.g. Prosser River dam, weirs) that prevent fish migration, are not potential habitat.	Potential habitat absent (minor drainage lines do not provide potential habitat as they are ephemeral and disconnected from the Derwent River).
<i>Pseudemoia pagenstecheri</i> tussock skink	v -	Potential habitat is grassland and grassy woodland (including rough pasture with paddock trees), generally with a greater than 20% cover of native grass species, especially where medium to tall tussocks are present.	Refer to FINDINGS Fauna species Threatened fauna species recorded from the study area for more details.

Scientific name Common name	Status TSPA EPBCA	Tasmanian habitat description (and distribution)	Comments on mining lease area and database records
<i>Sarcophilus harrisii</i> tasmanian devil	e EN #	Potential habitat is all terrestrial native habitats, forestry plantations and pasture. 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 (427 km ²). Significant habitat is a patch of potential denning habitat where three or more entrances (large enough for a 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 devil home range. Potential denning habitat is areas of burrowable, well-drained soil, log piles or sheltered overhangs such as cliffs, rocky outcrops, knolls, caves and earth banks, free from risk of inundation and with at least one entrance through which a devil could pass.	Refer to FINDINGS Fauna species <u>Threatened fauna species recorded from the study area</u> for more details.
<i>Tyto novaehollandiae</i> subsp. <i>castanops</i> tasmanian masked owl	e VU #	Potential habitat is all areas with trees with large hollows (≥15 cm entrance diameter). In terms of using mapping layers, potential habitat is considered to be all areas with at least 20% mature eucalypt crown cover (PI type mature density class 'a', 'b', or 'c'). Remnants and paddock trees (in any dry or wet forest type) in agricultural areas may constitute potential habitat. Significant habitat is any areas within the core range of native dry forest with trees over 100 cm dbh with large hollows (≥15 cm entrance diameter).	Refer to FINDINGS Fauna species <u>Threatened fauna species recorded from the study area</u> for more details.

APPENDIX E. DPIPWE's *Natural Values Atlas* report for the study area

Appended as pdf file.

APPENDIX F. Forest Practices Authority's *Biodiversity Values Atlas* report for the study area

Appended as pdf file.

APPENDIX G. CofA's *Protected Matters* report for the study area

Appended as pdf file.

ATTACHMENTS

- .shp and .dwg files of revised vegetation mapping;
- .shp and .dwg files of point locations for: (1) known threatened plants; (2) weeds.