

Environmental Living (E4) zone review for
Bywong and Wamboin, NSW
Detailed Biodiversity Values Assessment

FINAL REPORT

Prepared for Queanbeyan-Palerang Regional Council

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Glossary

ACT	Australian Capital Territory
BC Act	<i>Biodiversity Conservation Act 2016</i>
Biosecurity Act	<i>Biosecurity Act 2015</i>
BOS	Biodiversity Offsets Scheme
CEEC	Critically Endangered Ecological Community
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water (formerly the Commonwealth Department of Agriculture, Water and the Environment)
DEE	Department of the Environment and Energy
DPE	NSW Department of Planning and Environment (formerly the NSW Department of Planning, Industry and Environment)
DPIE	NSW Department of Planning, Industry and Environment (now the NSW Department of Planning and Environment)
EEC	Endangered Ecological Community
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	<i>Fisheries Management Act 1994</i>
GIS	Geographic Information System
KTP	Key Threatening Process
LEP	Local Environmental Plan
LGA	Local Government Area
LLS	Local Land Services
Matters of NES	Matters of National Environmental Significance
NSW	New South Wales
OEH	NSW Office of Environment and Heritage (now the NSW Department of Planning and Environment)
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
Study area	Approximately 9,500 hectares comprising the localities of Bywong and Wamboin, NSW within the Queanbeyan-Palerang Regional Council local government area
Subject lots	The 413 Lots mapped as supporting Class 3 Biodiversity Values in Biosis (2019)
TEC	Threatened Ecological Community
WM Act	<i>Water Management Act 2000</i>

1 Introduction

1.1 Project background

Biosis was commissioned by Queanbeyan-Palerang Regional Council (herein referred to as Council) to undertake follow-up detailed field investigations and a review of biodiversity values present on E4 Environmental Living zoned land, mapped as supporting Class 3 biodiversity values (Biosis 2019) (the project) in the localities of Bywong and Wamboin (the study area) (Figure 1). This detailed field investigation has been undertaken to supplement the initial assessment of biodiversity values within the study area undertaken by Biosis in 2019, as part of a Planning Review Planning (AQ Planning 2019) and subsequent Planning Proposal prepared by Council.

The majority of the study area is zoned as E4 Environmental Living zone by the *Palerang Local Environmental Plan 2014* (LEP). The aim of an E4 Environmental Living zone is to protect land with special environmental or scenic values, while accommodating low impact residential development. Council is proposing, based on advice received by Biosis and AQ Planning (AQ Planning 2019), to rezone portions of the study area as R5 Large Lot Residential. Portions to be rezoned being of the lowest biodiversity value within the existing E4 zoning, where higher value biodiversity items were assessed as absent or unlikely to occur.

High value biodiversity items include flora, fauna and ecological communities listed as threatened under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and NSW *Biodiversity Conservation Act 2016* (BC Act), as well as areas of High Environmental Value land (further detailed below).

Relevant conclusions from Biosis' (2019) assessment include:

- The study area supports:
 - Commonwealth and State listed Threatened Ecological Communities (TECs) in varying ecological condition states.
 - Habitat for Commonwealth and State listed threatened species, which ranges from high condition in larger patches of intact vegetation to poor condition in areas surrounded by grazed pasture.
 - Large areas of intact non-threatened native vegetation, some of which provide high value movement corridors for flora and fauna species.
 - Areas where the dominant land use has historically been agricultural and the landscape occurs as mixed native/exotic pasture within scattered trees, providing limited biodiversity value.
- Biodiversity values within the study area were mapped and categorised into three classes, comprising the following:
 - Class 1 – TECs, high condition threatened species habitats, non-threatened native vegetation in high condition and high value biodiversity corridors.
 - Class 2 – Lower condition native vegetation and threatened species habitat, moderate value biodiversity corridors.
 - Class 3 – Non-threatened derived native grasslands, exotic / non-indigenous vegetation and cropped or otherwise disturbed areas, low value biodiversity corridors.
- Due to the scope of the assessment, and the limited amount of detailed field investigation undertaken, it was not possible to fully determine the level of biodiversity values supported by

grassland habitats across the study area. Higher value biodiversity items supported by undetermined grassland habitats could include habitat for threatened species such as Golden Sun Moth *Synemon plana* (Critically Endangered, EPBC Act and Endangered, BC Act) and derived and natural grassland TECs.

- To address this uncertainty Biosis developed and mapped an additional biodiversity class, Class X, to highlight areas of potential higher value biodiversity items.
- It was also recommended that further detailed field investigation be undertaken to determine (as far as practicable) the presence/absence of potential higher value biodiversity items in these areas.
- It was recommended that areas mapped as supporting Class 1 and Class 2 biodiversity values be retained as E4 Environmental Living zoning, and areas supporting Class 3 biodiversity values were suitable for rezoning (later determined by AQ Planning (2019) to be most suited to R5 Large Lot Residential).

The Planning Proposal prepared to support the rezoning of areas of the study area from E4 Environmental Living to R5 Large Lot Residential was submitted by Council, based on the above advice, and reviewed by the NSW Department of Planning and Environment (DPE, formerly NSW Department of Planning, Industry and Environment [DPIE]). A Gateway determination was subsequently issued by DPE advising that the Planning Proposal may proceed subject to conditions including consultation with various state agencies. As part of this consultation period the ACT government and DPIE – Biodiversity and Conservation Division (BCD) both lodged submissions supporting further assessment of environmental values on land proposed to be rezoned to R5 Large Lot Residential. As a result of these submissions, Council re-engaged Biosis to undertake further detailed field investigations to satisfy the requirements of the BCD and the recommendations of the Biosis report (2019). The details of which are included in Section 1.3 and Table 1.

This report details the methods and results of these follow-up detailed field investigations and provides updated recommendations and conclusions relevant to the presence of higher value biodiversity items within the study area.

1.2 Location of the study area

The broader study area covers approximately 9,500 hectares comprising the localities of Bywong and Wamboin, NSW within the Queanbeyan-Palerang Regional Council Local Government Area (LGA). This broader study area excludes any land not zoned E4 Environmental Living. The study area that is the focus of the current assessment comprises the 413 lots (subject lots) proposed to be rezoned to R5 Large Lot Residential (Figure 1).

The study area is located approximately 20 kilometres north-east of Canberra and immediately north of the boundary of NSW and the ACT.

The study area is within the:

- South Eastern Highlands Interim Biogeographic Regionalisation of Australia (IBRA) bioregion.
- Murrumbateman and Monaro IBRA subregions.
- Murrumbidgee River catchment.
- South East Local Land Services (LLS) Management Area.

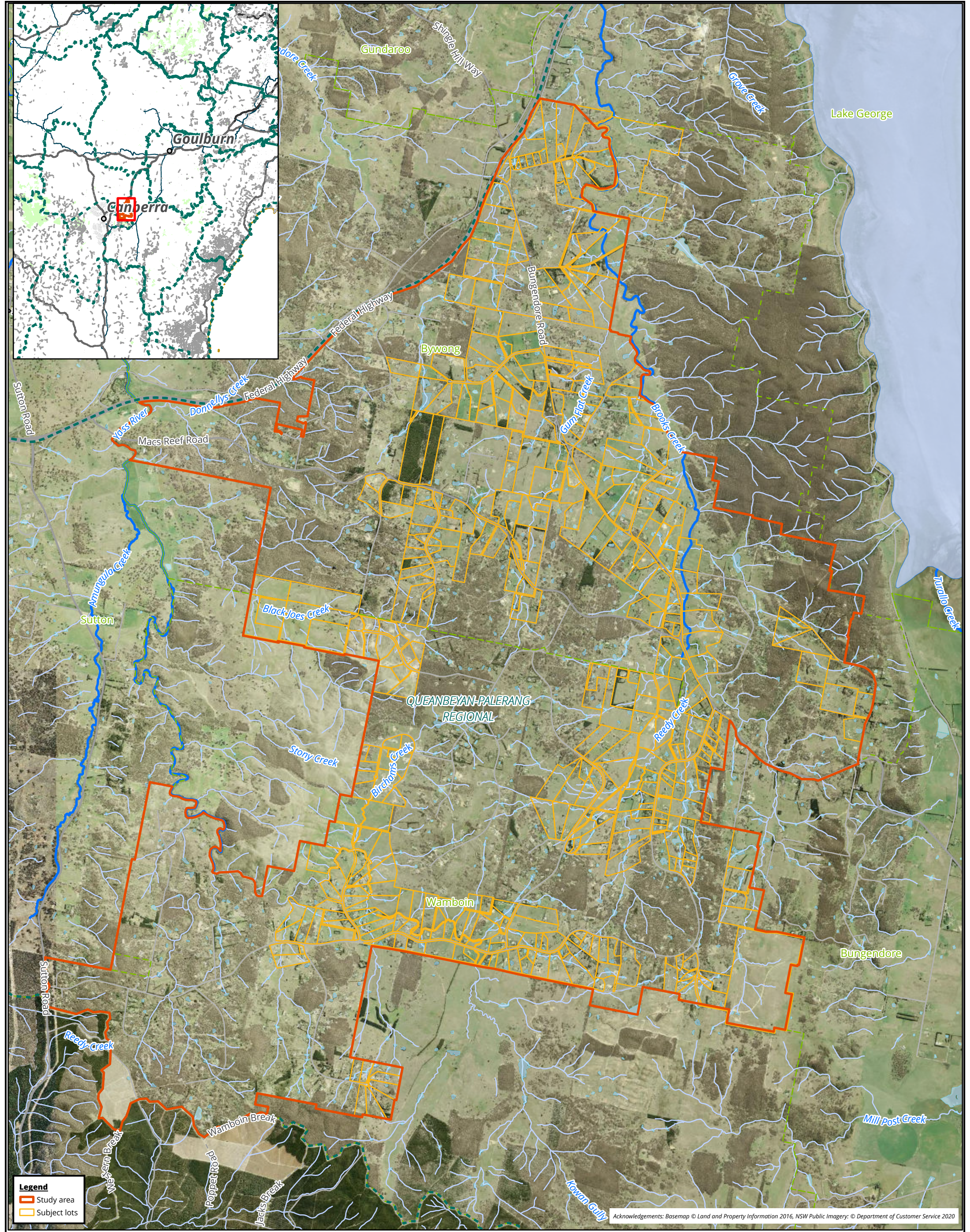
1.3 Consultation

Following review of the submissions received from the ACT government and the BCD, as well as correspondence with Council in May 2021, Biosis undertook further consultation with BCD to gain additional clarification on items raised in their submission. A summary of this consultation, undertaken with BCD in May 2021 (Letter from BCD (DPIE 2021) and meeting correspondence), is provided in Table 1 below.

Table 1 Summary of consultation with Biodiversity Conservation Division

Reference	BCD Response	How/where addressed
1	BCD are not generally supportive of the removal of E4 zoning without suitable field investigations to verify the absence of HEV land where sensitive environmental values may be at risk from a change in land use.	Additional field investigation conducted to verify the presence/absence of HEV land – Reported herein.
2	BCD acknowledge however that the proposed zone change will not result in development intensification or altered land use activities under the new Comprehensive Queanbeyan-Palerang Regional Council LEP. Any future development on the subject lots will be subject to BC Act requirements.	Noted.
3	Because of the above, BCD would not object to the proposal, as once the LEP is adopted all 'clearing' would require a permit, and be subject to BC Act and <i>State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017</i> , however BCD have strongly recommended that further investigations are undertaken to verify the absence of HEV land in the subject lots.	The current assessment included additional field investigation conducted to verify the presence/absence of HEV land. Method and results are reported herein.
4	BCD are supportive of an approach that involves a combination of desktop assessments using high definition aerial imagery interpretation, and Council-held weed data, to initially refine uncertainties, followed by ground assessment of presence of HEV areas.	Current assessment undertaken in two stages, including: • Desktop assessment. • Detailed field investigation. Methods reported herein. See Section 3 for further information.
5	Ground assessments would utilise <i>Interim Grasslands and other Groundcover Assessment Method</i> (OEH 2017) or similar, and would not require full NSW <i>Biodiversity Assessment Method</i> (BAM) plots.	Detailed field investigations utilised the <i>Interim Grasslands and other Groundcover Assessment Method</i> (OEH 2017). See Section 3.4 for further information.
6	Ground assessments should target the areas of uncertainty and would also look to confirm areas of low HEV.	Filed investigations targeted areas of uncertainty from prior investigations (Biosis 2019). See Section 3 for further information.
7	Ground assessment would need to occur ideally spring/early-summer due to nature of grassland habitats being targeted. Notwithstanding the above, there may still be a small window of availability to undertake ground assessments in late autumn/early winter (before heavy frosts and drying out of vegetation etc.).	Field investigations were undertaken between November 2021 and February 2022. Ground assessments were undertaken during a wet summer period, and vegetation was lush at the time of

Reference	BCD Response	How/where addressed
		the assessments. As such the timing of field investigations is considered to be optimal.
8	Local data would be captured to ensure suitability and comparability of rapid assessment data and results.	Local data was captured where possible to ensure rapid assessment data and results could be compared to high quality native grasslands in the region. See Section 3 for further information.
9	BCD acknowledge that access constraints may still curtail the field investigation efforts, and not all properties proposed for rezoning will need to (or be able to) be verified/visited on ground.	Noted. A total of 50 properties were accessed for the Stage 2 field investigations and 16 properties accessed for the Stage 3 field investigations. See Section 3.3 and 3.4 for further information.



2 Legislative context

This section provides a brief overview of key biodiversity legislation and government policy considered in this assessment. This section does not describe the legislation and policy in detail and guidance provided here does not constitute legal advice.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act. Under the EPBC Act, activities that have potential to result in significant impacts on MNES must be referred to the Commonwealth Minister for the Environment and Energy for assessment.

A rezoning proposal would be required to consider impacts to MNES in its application. MNES relevant to the current study include nationally threatened species and ecological communities that have been identified within the study area and are further detailed in Section 4.

2.2 State

2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act was enacted to encourage the proper consideration and management of impacts of proposed development or land-use changes on the environment (both natural and built) and the community. The EP&A Act is administered by DPE.

The EP&A Act provides the overarching structure for planning in NSW and is supported by other statutory environmental planning instruments. Sections of the EP&A Act of primary relevance to the natural environment are outlined further below.

The Planning Proposal is assessed under Section 3.4 of the Act with Council as the Planning Proposal authority.

Local Environmental Plans

The study area is currently subject to the *Palerang Local Environmental Plan 2014* (LEP) and is zoned E4 Environmental Living. A comprehensive Queanbeyan Palerang LEP is currently pending enactment that will, once adopted, cover the study area and will bring the vegetation clearing controls for the proposed R5 zoning into alignment with those for E4 in the Palerang LEP. This includes all 'clearing' as requiring a permit, and be subject to requirements of the *Biodiversity Conservation Act 2016* (BC Act) and Chapter 2 Vegetation in non-rural areas of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (formerly the 'Vegetation SEPP').

2.2.2 Biodiversity Conservation Act 2016

The BC Act is the key piece of legislation providing for the protection and conservation of biodiversity in NSW through the listing of threatened species, populations and communities (entities), key threatening processes, and critical habitat for threatened entities.

As part of the rezoning process, impacts to threatened entities are assessed under Section 1.7 of the EP&A Act and Section 7.3 of the BC Act. If assessment under the EP&A Act and BC Act determines a project is likely to result in a significant effect to threatened entities then a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) in accordance the NSW Biodiversity Offsets Scheme (BOS) should be prepared.

As noted in the *BCD response* (DPIE 2021) it is acknowledged that the proposed zoning change will not result in development intensification or altered land use activities under the new Queanbeyan-Palerang LEP. As such it is not expected that further assessment of the proposed rezoning would be required in the form of a SIS or BDAR.

However as any future development within the study area will be subject to requirements of the BC Act, the BOS may be triggered and a BDAR, or in some cases a SIS, could be required for future development proposals that impact upon native vegetation.

Threatened entities listed under the BC Act are discussed in Section 4.

2.2.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through the Assessment of Significance process under Section 1.7 of the EP&A Act (see above). If assessment under Section 1.7 of the EP&A Act determines a project is likely to result in a significant effect to threatened species, populations or communities then a SIS should be prepared.

Threatened entities listed under the FM Act are discussed in Section 4.

2.2.4 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides for the sustainable and integrated management of the state's water for the benefit of both present and future generations based on the concept of ecologically sustainable development. Under the WM Act an approval is required to undertake controlled activities on waterfront land, unless that activity is otherwise exempt under Section 91E. Waterfront land is defined within the Act as the bed of any river, lake or estuary and any land within 40 metres of the river banks, lake shore or estuary mean high water mark. Under section 41 of the *Water Management (General) Regulation 2018*, public authorities are exempt from Section 91E (1) of the Act obtaining a controlled activity approval.

Although Council is exempt from the WM Act, the rezoning process should consider the impacts the objectives of the Act as well as subsequent development applications by the landowners.

3 Methods

3.1 Literature and database review

In order to provide a context for the study area, information about the biodiversity values known or expected to be present was obtained from relevant public databases and other existing studies. Records from the following databases were collated and reviewed:

- Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
- NSW DPE BioNet Atlas of NSW Wildlife for matters protected under the BC Act.

Relevant reports and vegetation mapping, including:

- *Environmental Living (E4) zone review for Bywong and Wamboin, NSW, Biodiversity Values Assessment, Report for Queanbeyan-Palerang Regional Council* (Biosis 2019).
- *Native Vegetation of the Palerang Local Government Area. Palerang Rural Lands Study - BioMetric Vegetation Types and Known Threatened Species* (Umwelt 2015).
- *Native Vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands* (SCIV) (Tozer et al. 2010).

3.2 Desktop assessment

A detailed desktop assessment of the 413 subject lots within the study area was undertaken prior to commencement of the detailed field investigations to refine the areas to be subject to ground validation. This included review of aerial photography from multiple publically available and subscription only sources, such as; the NSW Spatial Information Exchange viewer (SIX Maps), Google imagery, and NearMap.

Imagery interrogated spanned multiple capture dates to allow comparisons of images of the study area both temporally and seasonally. High-definition NearMap imagery from July 2021 was compared to imagery from other capture dates available in NearMap, as well as SIX Maps and Google, as well as historical aerial photography of the study area captured in 1992, 1985 and 1967.

Review and comparison of a range of imagery allowed for the location of areas of ground disturbance such as ripping/tilling, or evidence of cropping, to be highlighted, as well as determination of areas of exotic vegetation that often presents different spectral signatures across image sources, and different seasons compared to native vegetation.

Sites considered as more likely to be substantially disturbed presented visually discernible factors such as:

- Pasture: Grassland may be a brighter green than the surrounding grassland areas, and not located proximal to a waterway, indicating some super-phosphating for pasture.
- Grazing: Grassland is lighter than the surrounding grassland, with at least one dam present for larger blocks, or likely watering infrastructure for smaller yards and distinct colour change at fences, indicating likely use as a grazing paddock.
- Light Grazing: Horse paddocks with minimal grazing.
- Cropping: Grassland has distinct rows in the soil, indicating current or prior use for cropping.

- Cleared: Grassland has a distinct shape that indicates significant historical tree removal or large sections of cleared areas associated with infrastructure.
- Ground: Erosion or other obvious ground disturbance.
- Maintained: Rows of colour change in the grassland that indicate that it may be slashed regularly, or colour difference adjacent to a dwelling that indicates monoculture lawn.

The results of the desktop assessment were used to refine the locations of the detailed field investigation. The initial desktop assessment allowed for the exclusion of clearly disturbed areas, considered highly unlikely to support higher value biodiversity items and HEV lands, and for targeting of areas that either looked highly likely to support those items, or were unable to be categorised and therefore required ground validation data.

3.3 Site selection

A total of 413 subject lots were included in the study area, which composed the lots mapped as supporting Class 3 biodiversity values by Biosis (2019). A letter seeking access for field investigations was mailed by Council to the landholders of each of the 413 subject lots on 6 October 2021.

Of the 413 subject lots:

- 167 landholders responded via phone or email, including:
 - 163 landholders provided access for surveys.
 - Four landholders disallowed access for surveys.

The field investigation required sampling of a total of 50 properties which were selected from those where the landholder has provided access for surveys. This meant that the majority of properties where access was provided were not subject to detailed survey, however asking for, and receiving permission for, access prior to detailed planning of field surveys allowed for more targeted selection of sample sites, and prevented duplication of work in locating suitable sites only to be denied access.

A total of 50 sample locations were selected across the subject lots within the study area, which were accessed by foot to undertake the initial field investigation (Stage 2 of the *Interim Grasslands and other Groundcover Assessment Method* (GGAM) (OEH 2017), see Section 3.4 below). These sample sites were selected on the basis that:

- They were broadly disbursed over the extent of the study area and capture a range of landscape positions and topographic locations.
- Were spread over condition types (undisturbed and disturbed), including:
 - A total of 10 lots with disturbance were included in the detailed field investigation to confirm on-ground disturbance.
 - A total of 10 lots were included in the assessment that were intact or had minimal disturbance.
 - A total of 30 lots were included where disturbance was mixed or unknown.
- Had been marked prior as 'Class X' (Biosis 2019), and/or assessed as potentially supporting areas of higher value biodiversity items or HEV lands during the desktop assessment.

A total of 16 subject lots within the study area were then included in the follow-up detailed field data collection stage (Stage 3 of the GGAM) based on the results of the initial assessment (further detail provided below).

3.4 Field investigation

The aim of the detailed field investigation was to confirm desktop results on-ground where possible, and map the presence and condition of biodiversity values through the collection of site-based data on vegetation types and fauna habitats, from a sample of relevant lots, where property access was available.

As the main focus of the investigation was to clarify the biodiversity values associated with grassland vegetation, the detailed site investigations were conducted in accordance with the GGAM (OEH 2017). The GGAM specifies how to determine the conservation value of groundcover vegetation, including grasslands. It has provisions for three categories: Low Conservation Value, Moderate Conservation Value and High Conservation Value (OEH 2017), and is implemented in the following staged manner:

- Stage 1: Assessment of suitability – includes an assessment of whether this method is appropriate to use. This includes if the vegetation meets the definition of ‘groundcover vegetation’:
 - The definition of groundcover within the GGAM is ‘any type of herbaceous vegetation’. It typically comprises herbaceous vegetation (e.g. forbs, grasses, sedges, rushes, and some chenopods) less than 1 m high.
- Stage 2: Exotic assessment – includes an assessment of exotic perennial cover using a transect intercept method to determine whether vegetation is regarded as native vegetation.
- Stage 3: Native species assessment – includes an assessment of vegetation condition relative to the benchmark using the vegetation integrity method (collection of BAM plots (DPIE 2020)).

Stage 1 of the GGAM was undertaken during the desktop assessment stage, where it was ensured that proposed locations for detailed field investigations would occur within areas of grasslands.

All field surveys were led by Paul Price (Technical Lead – Flora, and Accredited BAM Assessor), with assistance from Stephanie Cerato (Consultant Botanist) and Jake Schwebel (Project Botanist). Stage 2 assessments were undertaken over two visits between 22-25 November 2021 and 13-14 December 2021. Stage 3 assessments were undertaken between 7-10 February 2022.

Stage 2 included the capture of 50 ‘Exotic assessment’ plots, in areas pre-planned during the desktop assessment stage. As outlined in the GGAM, this method requires use of a transect-intercept method for estimating percentage cover of exotic perennial and native vegetation, with data is collected on the presence of ‘exotic perennial’ and ‘native’ groundcover plants. Transects must be a minimum of 100 metres in total length, or equivalent. Where the survey area is narrow or small, multiple shorter transects can be used to get a total length of at least 100 metres (e.g. three 35 metre transects) (OEH 2017).

At each metre along a minimum 100 metre transect, the assessor must record the presence (a ‘hit’) of each exotic perennial or native species. A hit is recorded if a vertical pin intercepts the live or dead crown of each plant (i.e. the pin does not need to physically intercept foliage). More than one category of plant (or group) can be recorded at each point (i.e. if the pin intercepts an exotic perennial grass and a native forb), but each group must only be recorded once per point.

Native and exotic species cover was then calculated for each group based on the numbers of hits along each transect, as follows:

1. Sum the number of hits from each group.
2. For each group, divide the number of hits by the total number of points along the transect (typically 100) to obtain the percentage cover.

3. Compare the average percentage cover for 'native' with 'exotic perennial'. If exotic perennial is greater, the groundcover in the vegetation zone is regarded as low conservation value. If the native cover is greater, assessors should proceed to Step 3 to determine the conservation value (OEH 2017).

Stage 3 of the GGAM was then implemented at 16 of the 50 survey locations subject to Stage 2, this included seven of the nine sites assessed as supporting native vegetation, expressed as a higher percentage cover of native species than exotic species,. The remaining nine Stage 3 sample sites were located in areas with a >50 % hit rate for native species, but similarly high exotic cover, to capture additional data on less conclusive areas, as well as areas dominated by exotic vegetation to capture data on the low value areas to aid in follow-up data analysis.

Of the two subject lots assessed as supporting native vegetation during Stage 2 that were not re-visited during Stage 3, one was unable to be accessed due to communication issues with the landowner, and the other was assessed as not supporting grassland vegetation due to the presence of re-growth native vegetation and recent revegetation. Nevertheless both of these sites were assessed as native vegetation during the final data analysis stage.

Stage 3 of the GGAM comprises collection of biometric floristic plot data in accordance with the standard NSW BAM, to ascertain Vegetation Integrity (VI) scores for the sampled vegetation. The BAM (DPIE 2020) provides additional data on how VI scores are calculated, but put simply they equate to a score out of 100, calculated based on floristics attribute data collected from a standardised 50 metre x 20 metre plot. Data collected is then compared to published benchmark attributes and the VI score is calculated by the online BAM Calculator (using formulas published in the BAM (DPIE 2020)).

The GGAM uses the VI scores calculated at each plot, based on the native Plant Community Type (PCT) recorded at each site, to further determine the Conservation Value of the grassland vegetation. Conservation Value based on VI scores is determined by the GGAM, as follows (illustrated in the flow diagram provide below as Figure 2):

- Low Conservation Value grassland:
 - Greater than 50 % of the groundcover vegetation is exotic.
 - Greater than 50 % of the groundcover vegetation is native, VI score is <15.
- Moderate Conservation Value grassland:
 - Greater than 50 % of the groundcover vegetation is native, VI score is <15, known habitat for threatened flora species.
 - Greater than 50 % of the groundcover vegetation is native, VI score is 15-60.
- High Conservation Value grassland:
 - Greater than 50 % of the groundcover vegetation is native, VI score is >60.

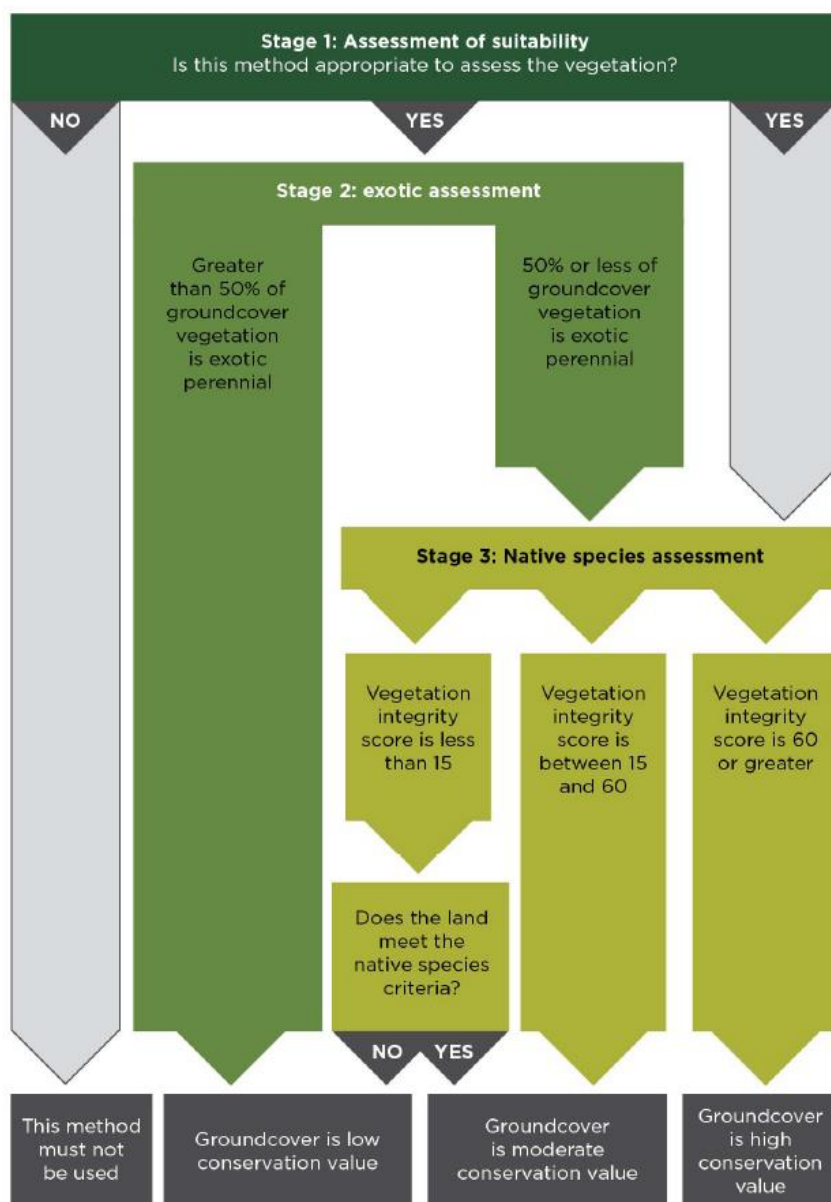


Figure 2 Flow diagram of GGAM Conservation Values (OEH 2017)

3.5 Data analysis

Following completion of Stage 1 and Stage 2, an analysis of rapid assessment data was undertaken to determine and map areas/properties considered to comprise Low Conservation Value grasslands in accordance with OEH (2017). Areas determined to be dominated by native vegetation were prioritised for follow-up assessment and were assigned as properties to be included in the Stage 3 field investigation.

Following Stage 3 field investigations, analysis of all field data was undertaken in conjunction with ongoing aerial imagery assessment to update the Biodiversity Class mapping prepared by Biosis (2019).

3.5.1 High Environmental Value (HEV) lands

HEV lands (referred specifically in feedback received from DPE on Council's Planning Proposal (Table 1), comprise lands that meet at least one of a set of criteria presented in *Developing maps of High Environmental Value for strategic planning - mapping and governance guide* (OEH – Environmental Programs Branch) (OEH 2015). These criteria being:

- Areas protected for conservation.
- Native vegetation of high conservation value.
- Key habitat for threatened species and, populations.
- Wetlands, Rivers, Estuaries and Coastal features of high value.
- Areas of geological significance.

These areas of HEV contain values of particular significance where development proposals generally receive a higher level of assessment and are given some form of protection under existing legislation, regulation, policy or inter-governmental agreement. As such, the proposed criteria do not increase the reach of legislation, but rather achieve a consolidation of current protections into one set of criteria (OEH 2015).

OEH (2015) provides detailed definitions of each criteria in the 'Mapping Guide' presented in that document, with criteria of particular relevance to the study area listed below.

- Native vegetation of high conservation value, including:
 - Over-cleared vegetation types (that are in moderate-good condition), which are >70 % cleared from their pre-European extent.
 - This includes five of the eight PCTs recorded within the study area (see Section 4.3).
 - Vegetation (that is in moderate-good condition) in over-cleared landscapes, which are >70 % cleared.
 - This includes vegetation present of the Dalton Hills, Lake George Complex and Upper Murrumbidgee Channels and Floodplains NSW (Mitchell) landscapes (Mitchell 2002) which cover approximately 80-90 % of the study area.
 - TECs listed under the EPBC Act and/or EPBC Act.
 - This includes three TECs recorded within the study area (see Section 4.3).
- Wetlands, Rivers, Estuaries and Coastal features of high value:
 - Riparian vegetation of rivers, comprising third Strahler order (Strahler 1964) watercourses (and above), plus the riparian buffers consistent with those prescribed by the Framework for Biodiversity Assessment (FBA) (OEH 2014):
 - For the purposes of this assessment the mapping of HEV based on this criteria has been restricted to areas of riparian vegetation in moderate-good condition, as per the other relevant criteria.

Above references to vegetation in 'moderate-good condition' relate to the definitions provided in the FBA (OEH 2014). Vegetation not in moderate-good condition is considered to be in 'Low condition' and is defined as:

- Woody native vegetation with native over-storey percent foliage cover less than 25 % of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either:

- Less than 50 % of ground cover vegetation is indigenous species, or
- Greater than 90 % of ground cover vegetation is cleared.

OR

- Native grassland, wetland or herbfield where either:
 - Less than 50 % of ground cover vegetation is indigenous species, or
 - More than 90 % of ground cover vegetation is cleared.

HEV mapping already exists for the study area, developed by DPE Regional Operations teams, however OEH (2015) notes the following limitations with the existing mapping.

HEV maps are intended for use at a regional planning level and give an indication of relative biodiversity value at this scale. The maps have been compiled from numerous datasets representing the best available information. Reliability of the underlying data is variable.

While these data may provide an indication of relative biodiversity significance at the local level, users should be aware that these data have limitations including those of scale and positional accuracy. Property level users should make use of finer resolution local data where available. More detailed vegetation mapping and ground-truthing is needed in priority areas to ensure that threatened entities and their habitat are appropriately represented at the local scale.

As such the guidance and criteria for HEV mapping (as outlined in OEH (2015)) have been applied during the current assessment during mapping of Biodiversity Classes, rather than the existing mapping being relied upon to determine areas of HEV lands.

3.5.2 Updated Biodiversity Class categories

As part of the detailed assessment of the biodiversity values of the subject lots within the study area, the Biodiversity Class assigned in Biosis (2019) have been revised slightly to account for application of the GGAM and further detailed assessment of HEV lands. Biodiversity Classes and relevant criteria assigned in the current assessment are as follows.

- Class 1 – High biodiversity values:
 - TECs listed under BC Act or EPBC Act.
 - High condition threatened species habitat listed under BC Act or EPBC Act.
 - Native vegetation in high condition.
 - High value biodiversity connectivity corridors.
- Class 2 – Moderate biodiversity values:
 - Moderate to low condition habitat for threatened species under BC Act or EPBC Act.
 - Non-threatened native vegetation (including derived native grasslands/shrublands) in moderate or poor condition.
 - HEV comprising over-cleared vegetation types and on over-cleared landscapes.
 - High condition derived native grassland, and/or buffer areas.
 - Representing GGAM Moderate or High Conservation Value grasslands.

- Native riparian vegetation not in Low condition, 3rd order streams and above, within FBA (OEH 2014) riparian buffer.
- Moderate value biodiversity connectivity corridors.
- Class 3 – Low biodiversity values:
 - Low Conservation Value grassland vegetation.
 - Disturbed/agricultural land, exotic/non-indigenous vegetation, or native vegetation in Low condition.
 - Low value biodiversity connectivity corridors.

Refer to Biosis (2019) for additional detailed descriptions and justifications of Biodiversity Classes mapped across the study area.

3.6 Limitations

Biodiversity surveys provide a sampling of flora and fauna at a given time and season. There are a number of reasons why not all species will be detected during survey, such as species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. In many cases these factors do not present a significant limitation to assessing the overall biodiversity values of a study area.

The current assessment was conducted between November 2021 and February 2022 after recent rain, where vegetation was generally in higher condition, and as such is considered an optimal time for survey.

Whilst this study was designed as a detailed assessment to resolve areas of residual uncertainty following Biosis' (2019) assessment, it should be acknowledged that a limited number of locations, across a very large study area, were able to be subject to detailed data collection. As such data extrapolation was required based on aerial mapping interpretation and landscape/topographical assessment, and comparison to known biodiversity values at sample locations. The accuracy of the mapping of Biodiversity Classes (and related biodiversity values) in areas subject to a range of ground-confirmation assessments, from detailed biometric plot data, rapid point transect data collection, site-based and 'over-the-fence' vegetation mapping, to drive-by assessments, is considered of lower confidence level based on the level of detailed data that was able to be collected for each location.

Confidence levels assigned to the mapping of Biodiversity Classes (included in the GIS data) are as follows:

- Confirmed – Detailed field assessment data collected.
- High – Rapid field assessment data collected and or site mapping undertaken.
- Moderate – Drive-by or 'over-the-fence' mapping, or desktop only with indicative data available.
- Low – Desktop only with limited definitive data available, or non-ground validated native vegetation (i.e. derived/natural native grassland) observed from long-distance visual assessment.

Conservative assessments of biodiversity values potentially present on the subject lots have been made to attempt not to under-value areas lacking detailed site-based data, and a confidence level in the Biodiversity Class has been assigned in the associated GIS data.

The data output from this assessment should not be relied upon in place of detailed biodiversity field investigation for the purposes of development applications, or other proposed land-use changes. However data collected and assessment undertaken is considered of sufficient accuracy to meet the aims of this project.

It should also be noted that a current limitation of online BAM Calculator prevented a number of the PCTs recorded within the study area being selected, despite meeting all the required location criteria for selection. In order to calculate VI scores for some Stage 3 plots the closest associated PCTs were selected for those that were not available, ensuring vegetation classes were matched and biometric benchmark data was identical for the actual and proxy PCTs. This is not considered a significant limitation to the results of the study, and the VI scores calculated are considered accurate.

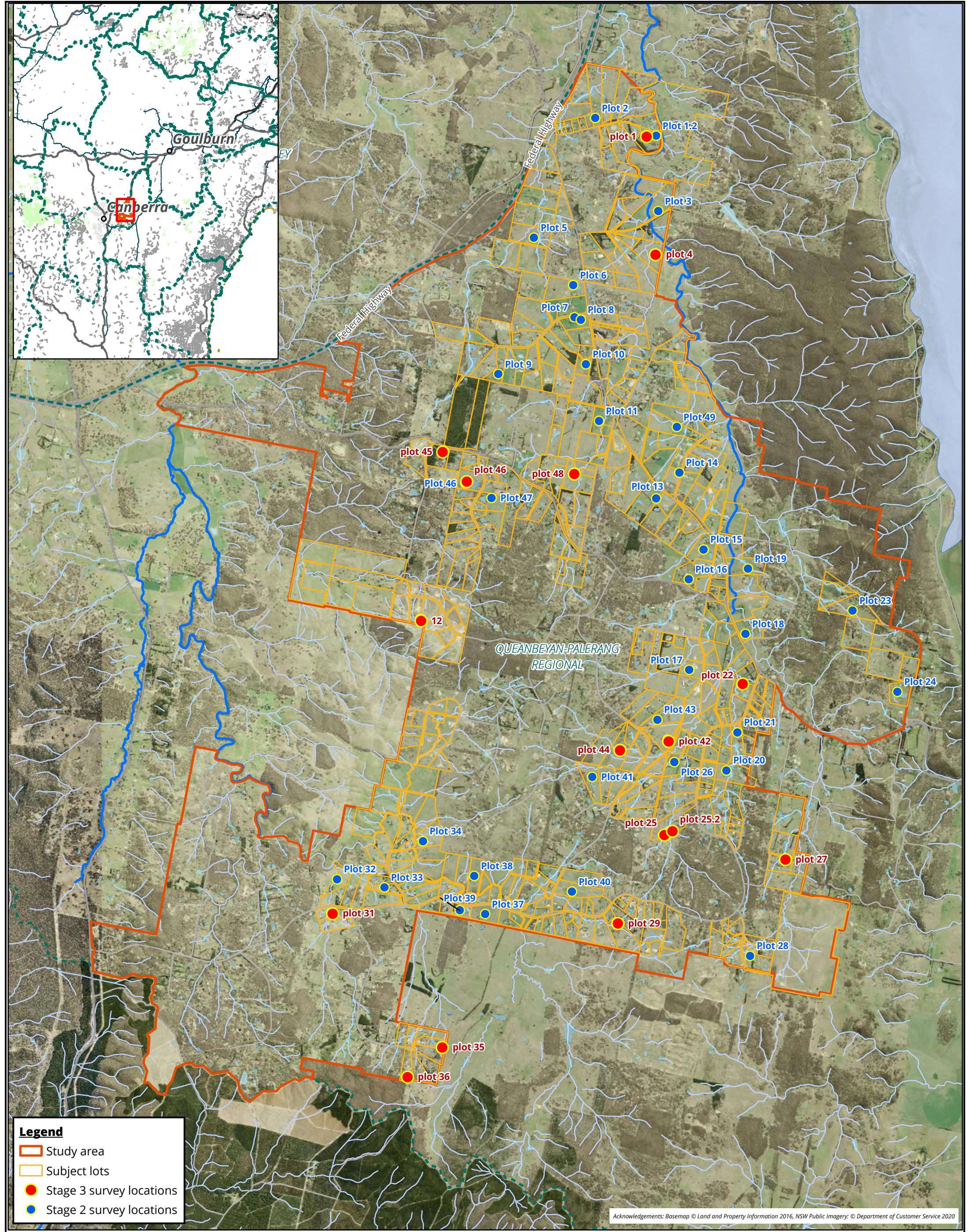


Figure 3 GGAM Stage 2 and Stage 3 survey locations



4 Results

4.1 GGAM Stage 2

As outlined above, GGAM Stage 2 involved the collection of native versus exotic species data at 1 metre intervals along a 100 metre (or equivalent) step point transect. Where percentage cover of natives was found to be greater than 50 % of the total species hits recorded, the vegetation was considered 'native vegetation' and more likely to represent Moderate or High Conservation Value grassland.

Table 2 provides a summary of the data collected at the 11 of the 50 GGAM Stage 2 plots (collected across nine subject lots) which were found to support native vegetation. Table 4 in Appendix 1 provides data from the full list of 50 'Exotic assessment' plots.

Table 2 GGAM Stage 2 assessment site found to support native vegetation

Plot ID	Native hits	Exotic hits	Total hits	Native % cvr.	Exotic % cvr.	Native veg.
Plot 01	85	41	126	67	33	Yes
Plot 01.2	99	32	131	76	24	Yes
Plot 09	38	22	60	63	37	Yes
Plot 12	88	63	151	58	42	Yes
Plot 25.2	99	16	115	86	14	Yes
Plot 27	93	24	117	79	21	Yes
Plot 34	86	54	140	61	39	Yes
Plot 35	100	5	105	95	5	Yes
Plot 36	96	52	148	65	35	Yes
Plot 42	85	74	159	53	47	Yes
Plot 48	90	57	147	61	39	Yes

4.2 GGAM Stage 3

Stage 3 detailed biometric data plots were completed at 16 locations subject to data collection during the Stage 2 field investigation. This included eight of the sites listed as supporting native vegetation in Table 2 above, and a further eight locations deemed as exotic vegetation during Stage 2 to collect additional comparison data, and to look to clarify areas of uncertainty. A summary of the results are provided in Table 3 below, with additional detail on PCT selection provided in Table 5, along with floristic plot data in Appendix 1. VI scores derived from Stage 3 plots are presented in Appendix 2.

Table 3 GGAM Stage 3 assessment of sites found to support native vegetation

Plot no.	PCT	Associated TEC present	Stage 2 - Native veg	VI score	GGAM Cons. Value
Plot 01	PCT 1202: <i>Speargrass grassland of the South Eastern Highlands Bioregion</i>	Natural Temperate Grassland of the South Eastern Highlands' (EPBC Act)	Yes	82.1	High
Plot 04	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	N/A	No	2.8	Low
Plot 12	PCT 1093: <i>Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion</i>	N/A	Yes	39.5	Moderate
Plot 22	PCT 1229: <i>Swamp Gum - Ribbon Gum woodland on poorly-drained flats, South Eastern Highlands Bioregion</i>	No	No	28.6	Moderate
Plot 25	PCT 896: <i>Kangaroo Grass - Wallaby Grass - Snow Grass moist tussock grassland in the Monaro and the Southern Tablelands regions of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion</i>	Natural Temperate Grassland of the South Eastern Highlands' (EPBC Act)	No	77.2	High
Plot 25.2	PCT 896: <i>Kangaroo Grass - Wallaby Grass - Snow Grass moist tussock grassland in the Monaro and the Southern Tablelands regions of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion</i>	Natural Temperate Grassland of the South Eastern Highlands' (EPBC Act)	Yes	94.9	High
Plot 27	PCT 1330: <i>Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion</i>	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (BC Act & EPBC Act)	Yes	24.3	Moderate
Plot 29	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	N/A	No	14.4	Low
Plot 31	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	N/A	No	2.8	Low
Plot 35	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	N/A	Yes	48.9	Moderate

Plot no.	PCT	Associated TEC present	Stage 2 - Native veg	VI score	GGAM Cons. Value
Plot 36	PCT 1093: <i>Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion</i>	N/A	Yes	41.8	Moderate
Plot 42	PCT 896: <i>Kangaroo Grass - Wallaby Grass - Snow Grass moist tussock grassland in the Monaro and the Southern Tablelands regions of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion</i>	Natural Temperate Grassland of the South Eastern Highlands' (EPBC Act)	Yes	92.6	High
Plot 44	PCT 1110: <i>River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion</i>	No	No	96.0	High
Plot 45	PCT 1093: <i>Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion</i>	N/A	No	21.1	Moderate
Plot 46	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	N/A	No	13.3	Low
Plot 48	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	N/A	Yes	6.8	Low

4.3 Plant community types and threatened entities

A total of seven PCTs were found to be present within the study area during the current study and Biosis (2019). These PCTs include:

- PCT 731 *Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion.*
- PCT 896 *Kangaroo Grass - Wallaby Grass - Snow Grass moist tussock grassland in the Monaro and the Southern Tablelands regions of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion.*
- PCT 1093 *Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion.*
- PCT 1110 *River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion.*
- PCT 1202 *Speargrass grassland of the South Eastern Highlands Bioregion.*
- PCT 1229 *Swamp Gum - Ribbon Gum woodland on poorly-drained flats, South Eastern Highlands Bioregion.*
- PCT 1330 *Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion.*

Justifications and the rationale for PCT selection at the 16 GGAM Stage 3 plot locations is provided in Table 5, along with floristic plot data in Appendix 1. Additional descriptive information on a number of the above PCTs is also included in Biosis (2019).

Three TECs listed under the BC Act and/or EPBC Act were found to be present within the study area during the current assessment. These included:

- *White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions* (Critically Endangered, BC Act).
- *White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Critically Endangered, EPBC Act).
- *Natural Temperate Grassland of the South Eastern Highlands* (Critically Endangered, EPBC Act).

As detailed in Biosis (2019) the study area is considered to support habitat for a number of threatened species, including (and of most relevance to the assessment of grassland habitats):

- Aromatic Peppergrass *Lepidium hyssopifolium* (Endangered, BC Act and EPBC Act).
- Hoary Sunray *Leucochrysum albicans* var. *tricolor* (Endangered, EPBC Act).
- Small Purple Pea *Swainsona recta* (Endangered, BC Act and EPBC Act).
- Silky Swainson-pea *Swainsona sericea* (Vulnerable, BC Act).
- Golden Sun Moth *Synemon plana* (Endangered, BC Act and Critically Endangered, EPBC Act).
- Pink-tailed Worm Lizard *Aprasia parapulchella* (Vulnerable, BC Act and EPBC Act).

- Little Whip Snake *Suta flagellum* (Vulnerable, BC Act).
- Rosenberg's Goanna *Varanus rosenbergi* (Vulnerable, BC Act).

Areas found to support high condition natural and derived grasslands within the study area during the current assessment are considered to support higher quality potential habitat for the above listed species. No areas of notable potential habitat for Golden Sun Moth, supported by exotic species such as Serrated Tussock *Nassella trichotoma* were recorded during the field investigations.

4.4 Riparian and aquatic habitats

Aquatic habitats within the study area are considered to be in very poor condition (DPI 2018), however they do present habitat for aquatic species. Watercourses throughout the study area flow through agricultural landscapes, with most waterways having multiple inline water storages resulting in numerous barriers to fish movement. This is considered to be the greatest contributing factor to the poor condition of aquatic habitats, in addition to higher nutrient inputs associated with agricultural uses. No threatened species or ecological communities listed under the FM Act are considered likely to occur within the study area.

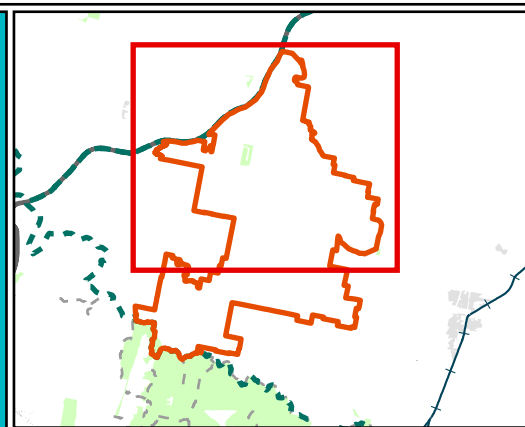
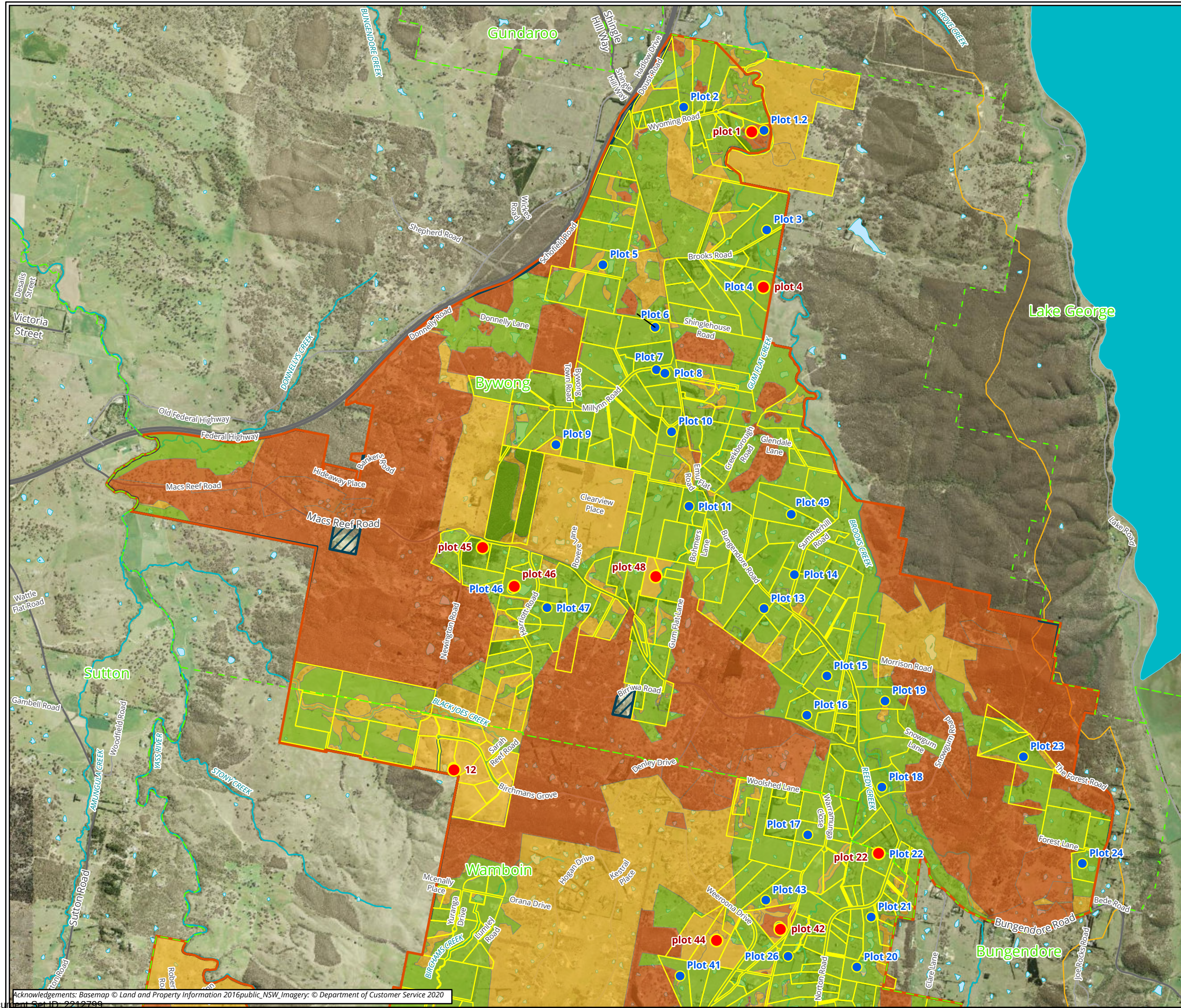
Riparian habitats within the study area are generally degraded and lacking natural structure. Areas mapped as HEV as part of the current assessment based on the presence of native riparian vegetation are generally associated with areas of native grasslands/wetlands dominated by native graminoids along drainage depressions of higher order watercourses, or those areas supporting some native tree/shrub vegetation within riparian buffers.

4.5 Biodiversity values update

The results of the initial desktop assessment, GGAM Stage 2 and Stage 3 field investigations, and follow-up detailed desktop data analysis were combined to methodically update the Biodiversity Class mapping of the study area developed during Biosis' previous 2019 assessment (Biosis 2019).

The detailed and staged process allowed for better resolution around areas of uncertainty, and has allowed for a generally higher level of confidence in the updated mapping. As outlined in Section 3.6, areas of uncertainty remain, in locations subject to a lower level of on ground-validation, however the volume and spatial extent of the data collected has allowed these areas of lower confidence to be minimised as far as is practicable.

Updated Biodiversity Class mapping is presented in Figure 4 below, and should be viewed in more detail through interrogation of the associated GIS dataset (Biosis 2022).



- Legend**
- Study area
 - Subject lots
 - Stage 3 survey locations
 - Stage 2 survey locations
 - Suburb
 - Land excluded from assessment (not E4 zoning)
- Biodiversity class**
- Class 1
 - Class 2
 - Class 3

Figure 4 Biodiversity classes of the study area

0 330 660 990 1,320 1,650
Metres
Scale: 1:40,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55



Matter: 35294, Date: 08 April 2022,
Drawn by: JMS, Checked by: CW, Last edited by: jshepherd
Layout: 35294_F4_Biodiversity classes
Project: P:\35200s\35294\Mapping\35294_Bywong Wamboin Rezoning Surveys.aprx

5 Discussion and recommendations

The purpose of the current study was to undertake detailed site investigations to confirm the presence/absence of high value biodiversity items and HEV lands proposed to be rezoned to R5 Large Lot Residential in accordance with the recommendations of the Biosis (2019) report and the submission to the Planning Proposal by the BCD.

Detailed surveys were undertaken over late-spring 2021 to summer 2022 and involved site based investigation of 50 subject properties applying the GGAM (OEH 2017) with the primary aim of resolving uncertainties around the biodiversity values supported by grassland vegetation. Site based survey were augmented pre and post field investigation by desktop data analysis and mapping, and by additional drive-by and other visual surveys to collect additional data on the biodiversity values potentially present on the subject lots, and broader study area.

The results of desktop and field-based assessments were used to refine the Biodiversity Class mapping developed by Biosis during the initial biodiversity investigations of the study area, undertaken to support the zoning review prepared by AQ Planning (AQ Planning 2019) and the subsequent Planning Proposal prepared by Council. Areas of uncertainty in the Biosis (2019) Biodiversity Class mapping, mainly represented by the 'Class X' status applied to areas of grassland unable to be suitably confirmed as not supporting higher value biodiversity items, were resolved in the current investigation as far as was practicable.

Areas of uncertainty however do remain due to the nature (sampling approach) and spatial extent of the current assessment, particularly in areas that were not visited on-ground. As well as where limited data was available from desktop sources, including from the range of recent and historical aerial imagery investigated. However, the detailed and staged approach of this additional assessment has allowed for better resolution around these areas of uncertainty, and has allowed for a generally higher level of confidence in the updated mapping. However it should be noted that even detailed site based investigations have resulted in some unexpected and somewhat inconsistent findings.

Grasslands are a dynamic ecosystem and results of field-based investigations can be expected to differ over temporal and seasonal timeframes. The timing of the current survey is considered close to optimal, being undertaken over late-spring/summer, during warm and wet prevailing weather, having resulted in ideal growing conditions for grassland (and other) vegetation types. These conditions maximise the chances of detection of species present during both site-based plots surveys (maximising germination of soil stored seed) and longer-range visual assessment (stronger flowering of plants being more visible from a distance i.e. patches of Kangaroo Grass *Themeda triandra* in paddocks).

The updated Biodiversity Class mapping has determined Class 3 biodiversity values as present over the majority of the study area, with relatively few areas being revised to higher Biodiversity Classes (i.e. Class 1 or Class 2). This is supported by the recording of exotic grassland vegetation at 39 of the 50 (78 %) GGAM Stage 2 plots, with Low Conservation Values confirmed at five of the 16 (31 %) GGAM Stage 3 sites, one of which was mapped as native vegetation during Stage 2 assessment. This shows the majority of the sites visited, which were originally selected to sample areas of uncertainty, were found to support exotic dominated vegetation, be of Low Conservation Value, and at low risk to impacts to high values biodiversity items if future development, or land-use change was to occur.

However, a number of areas found to support exotic vegetation during GGAM Stage 2 were found to represent Moderate and even High Conservation Value grasslands during subsequent Stage 3 assessment, with one site assessed as EPBC Act listed Natural Temperate Grassland CEEC (refer Table 3).

A total of eight GGAM Stage 3 survey locations were assessed as supporting exotic vegetation during Stage 2 investigations, four of which subsequently resulted in a VI score of <15, confirming the presence of Low Conservation Value grasslands. Two locations resulted in VI scores of <30, which equate to Moderate Conservation Value under the GGAM, but are still considered a low VI score, meaning the vegetation is in low ecological condition. The final two survey locations (assessed as exotic during Stage 2) were found to result in VI scores of 77.2 and 96 (of out a possible 100) and therefore represent High Conservation Value grassland, in high ecological condition.

These high scores illustrate that even grassland comprised of >50 % cover of exotic species can be of high biodiversity value and that detailed site based assessments may be required to provide ultimate clarity on the presence and value of biodiversity items in grassland ecosystems. This apparent inconsistency between the results of GGAM Stage 2 and Stage 3 is likely to be the result of the strong growing season leading into the current surveys whereby all species (native and exotic) have been able to undergo a strong period of growth resulting in high levels of cover and abundance. Furthermore, the presence and total cover and abundance of exotic species is not explicitly considered in the calculation of VI scores under the BAM (and GGAM Stage 3), which are based solely on the native floristic makeup of the vegetation being sampled. The presence of exotic species is considered in an indirect manner, whereby it would generally be expected that when exotic cover and abundance is higher, native cover and abundance is lower due to competition for space and other resources. However in a better growing season, where resources are less limited, both native and exotic species can grow together and flourish concurrently. This again illustrates the potential for areas assessed as exotic during the study, be that via application of GGAM Stage 2 or via aerial mapping, could in fact support high value biodiversity items, and detailed biodiversity assessments are required to accurately assess potential impacts of any future land use changes.

OEH (2015) recommends that areas of HEV be given consideration in all strategic land use planning processes including growth strategies and regional and local plans, and that appropriate recommendations within such strategies and plans would include:

- That planning authorities strive to avoid and minimise impacts from zoning intensification and development on areas of HEV, and consider appropriate offset or other mitigation mechanisms for unavoidable impacts.
- That existing protections for environmental values in areas of HEV be at least maintained, and where possible, enhanced.

In their response to Council's Planning Proposal BCD (formerly OEH) acknowledge that the proposed zone change will not result in development intensification or altered land use activities under the new comprehensive LEP, and that any future development on the subject lots will be subject to BC Act requirements. Because of this, BCD would not object to the proposal, as once the LEP is adopted all 'clearing' would require a permit, and be subject to BC Act and the State Environmental Planning Policy (SEPP) (Vegetation in Non-Rural Areas) 2017 (now Chapter 2 of SEPP (Biodiversity and Conservation) 2021), however BCD strongly recommended that further investigations are undertaken to verify the absence of HEV land in the subject lots.

In light of the results of the current study, and the advice received from BCD, the rezoning of land to R5 mapped as supporting Class 3 Biodiversity Values within the study area is not considered to be adverse to the recommendations provided in OEH (2015), or the advice provided in AQ Planning report where the R5 zone was determined as the most appropriate alternative zoning for the study area (AQ Planning 2019).

It is a recommendation of this report that the presence of higher value biodiversity items and HEV be assessed via detailed site-based investigations during any proposed land-use changes within the study area, both within land to be rezoned to R5, and that retained as E4. It is also recommended that to align with the OEH (2015) recommendations relating to consideration appropriate offset or other mitigation mechanisms for

unavoidable impacts, that Council develop a system whereby if verified HEV land is impacted then offsets are secured. These offsets could be secured through mechanisms such as the retiring credits under the BOS or less formal site based restoration activities, implemented through Vegetation Management Plans that focus on existing areas of HEV, or areas that could be restored to become HEV, such as degraded riparian areas.

As outlined in Section 3.6 the data output from this assessment should not be relied upon in place of detailed biodiversity field investigation for the purposes of development applications, or other proposed land-use changes. However data collected and assessment undertaken is considered of sufficient accuracy to meet the aims of this project.

6 References

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Appendix 1 – Floristic data

Table 4 GGAM Stage 2 assessment data

Plot ID	Native hits	Exotic hits	Total hits	Native % cvr.	Exotic % cvr.	Native veg.
Plot 01	85	41	126	67	33	Yes
Plot 01.2	99	32	131	76	24	Yes
Plot 02	2	100	102	2	98	No
Plot 03	8	100	108	7	93	No
Plot 04	74	85	159	47	53	No
Plot 05	36	89	125	29	71	No
Plot 06	0	100	100	0	100	No
Plot 07	1	100	101	1	99	No
Plot 08	54	94	148	36	64	No
Plot 09	38	22	60	63	37	Yes
Plot 10	1	100	101	1	99	No
Plot 11	20	100	120	17	83	No
Plot 12	88	63	151	58	42	Yes
Plot 13	1	100	101	1	99	No
Plot 14	25	100	125	20	80	No
Plot 15	24	99	123	20	80	No
Plot 16	21	97	118	18	82	No
Plot 17	31	95	126	25	75	No
Plot 18	47	96	143	33	67	No
Plot 19	3	100	103	3	97	No
Plot 20	23	100	123	19	81	No
Plot 21	21	100	121	17	83	No
Plot 22	54	96	150	36	64	No
Plot 23	27	100	127	21	79	No
Plot 24	41	100	141	29	71	No
Plot 25	57	98	155	37	63	No
Plot 25.2	99	16	115	86	14	Yes
Plot 26	1	100	101	1	99	No
Plot 27	93	24	117	79	21	Yes
Plot 28	49	89	138	36	64	No
Plot 29	52	87	139	37	63	No
Plot 31	61	92	153	40	60	No

Plot ID	Native hits	Exotic hits	Total hits	Native % cvr.	Exotic % cvr.	Native veg.
Plot 32	40	84	124	32	68	No
Plot 33	15	100	115	13	87	No
Plot 34	86	54	140	61	39	Yes
Plot 35	100	5	105	95	5	Yes
Plot 36	96	52	148	65	35	Yes
Plot 37	12	100	112	11	89	No
Plot 38	32	86	118	27	73	No
Plot 39	54	78	132	41	59	No
Plot 40	7	100	107	7	93	No
Plot 41	26	92	118	22	78	No
Plot 42	85	74	159	53	47	Yes
Plot 43	18	96	114	16	84	No
Plot 44	60	90	150	40	60	No
Plot 45	70	75	145	48	52	No
Plot 46	54	99	153	35	65	No
Plot 47	22	100	122	18	82	No
Plot 48	90	57	147	61	39	Yes
Plot 49	2	100	102	2	98	No

Table 5 GGAM Stage 3 data summary

Plot no.	PCT	Justification / rationale	PCT / TEC associations	TEC present	Stage 2 - Native veg	VI score	GGAM Cons. Value
Plot 01	PCT 1202: <i>Speargrass grassland of the South Eastern Highlands Bioregion</i>	Diagnostic species and landscape position meets that of the PCT description. Data also meets that of corresponding vegetation type: r6: Dry tussock grassland of the Monaro in the South Eastern Highlands bioregion (Armstrong et al. 2012).	PCT 1202 is partly associated with the CE EPBC Act listed TEC 'Natural Temperate Grassland of the South Eastern Highlands'.	Yes	Yes	82.1	High
Plot 04	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	A derived community from PCT 731. Relatively disturbed remnant grassland community. Diagnostic species and landscape position meets that of PCT description and Tozer et al (2010) GW p23: Tableland Hills Grassy Woodland.	There are currently no TECs associated with this PCT.	N/A	No	2.8	Low
Plot 12	PCT 1093: <i>Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion</i>	A derived community from PCT 1093. Relatively disturbed remnant grassland community. Evidence of landowner ripping substratum to promote disturbance/regeneration. Diagnostic species and landscape position meets that of PCT description and Tozer et al (2010) DSF p14: Western Tablelands Dry Forest.	There are currently no TECs associated with this PCT.	N/A	Yes	39.5	Moderate
Plot 22	PCT 1229: <i>Swamp Gum - Ribbon Gum woodland on poorly-drained flats, South Eastern Highlands Bioregion</i>	Heavily disturbed community, slashed prior to survey. Low lying/near creekline. Swamp Gums identified on creekline next to plot. Diagnostic species and landscape position partially meets that of the PCT descriptions.	PCT 1229 is partly associated with BC Act CE Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion.	No	No	28.6	Moderate
Plot 25	PCT 896: <i>Kangaroo Grass - Wallaby Grass - Snow Grass moist tussock grassland in the Monaro and the Southern Tablelands regions of the</i>	Associated with PCT 896. Partially disturbed community, Diagnostic species and landscape position meets that of the PCT description. The data also meets that of corresponding vegetation type: r3: <i>Rytidosperma</i> sp. – <i>Themeda australis</i> –	PCT 896 is partly associated with the CE EPBC TEC 'Natural Temperate Grassland of the South Eastern Highlands'.	Yes	No	77.2	High

Plot no.	PCT	Justification / rationale	PCT / TEC associations	TEC present	Stage 2 - Native veg	VI score	GGAM Cons. Value
	<i>South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion</i>	<i>Juncus</i> sp. tussock grassland of occasionally wet sites of the South Eastern Highlands bioregion (Armstrong et al. 2012).					
Plot 25.2	PCT 896: <i>Kangaroo Grass - Wallaby Grass - Snow Grass moist tussock grassland in the Monaro and the Southern Tablelands regions of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion</i>	Associated with PCT 896. Diagnostic species and landscape position meets that of the PCT description. The data also meets that of corresponding vegetation type: r3: <i>Rytidosperma</i> sp. – <i>Themeda australis</i> – <i>Juncus</i> sp. tussock grassland of occasionally wet sites of the South Eastern Highlands bioregion (Armstrong et al. 2012).	PCT 896 is partly associated with the CE EPBC Act listed TEC 'Natural Temperate Grassland of the South Eastern Highlands'.	Yes	Yes	94.9	High
Plot 27	PCT 1330: <i>Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion</i>	Associated with PCT 1330. Whilst not indicative with plot data, many Yellow Box <i>Eucalyptus melliodora</i> and Blakely's red gum <i>Eucalyptus blakelyi</i> located within site. Diagnostic species and landscape position meets that of PCT description and Tozer et al (2010) GW p24: Tableland Grassy Box-Gum Woodland.	PCT 1330 is equivalent to the CE BC Act and EPBC Act listed White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions.	Yes	Yes	24.3	Moderate
Plot 29	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	Very broadly associated with PCT 731. Heavily disturbed community, regular slashing and grazing evident. Low lying (in sections) and part of natural ephemeral drainage line. PCT difficult to determine.	There are currently no TECs associated with this PCT.	N/A	No	14.4	Low

Plot no.	PCT	Justification / rationale	PCT / TEC associations	TEC present	Stage 2 - Native veg	VI score	GGAM Cons. Value
Plot 31	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	A derived community from PCT 731. Relatively disturbed remnant grassland community. Diagnostic species and landscape position meets that of PCT description and Tozer et al (2010) GW p23: Tableland Hills Grassy Woodland.	There are currently no TECs associated with this PCT.	N/A	No	2.8	Low
Plot 35	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	A derived community from PCT 731. Relatively disturbed remnant grassland community. Diagnostic species and landscape position meets that of PCT description and Tozer et al (2010) GW p23: Tableland Hills Grassy Woodland.	There are currently no TECs associated with this PCT.	N/A	Yes	48.9	Moderate
Plot 36	PCT 1093: <i>Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion</i>	A derived community from PCT 1093. Disturbed and cleared. Diagnostic species and landscape position meets that of PCT description and Tozer et al (2010) DSF p14: Western Tablelands Dry Forest.	There are currently no TECs associated with this PCT.	N/A	Yes	41.8	Moderate
Plot 42	PCT 896: <i>Kangaroo Grass - Wallaby Grass - Snow Grass moist tussock grassland in the Monaro and the Southern Tablelands regions of the South Eastern Highlands Bioregion and NSW South Western Slopes Bioregion</i>	Associated with PCT 896. Diagnostic species and landscape position meets that of the PCT description. The data also meets that of corresponding vegetation type: r3: <i>Rytidosperma</i> sp. – <i>Themeda australis</i> – <i>Juncus</i> sp. tussock grassland of occasionally wet sites of the South Eastern Highlands bioregion (Armstrong et al. 2012).	PCT 896 is partly associated with the CE EPBC Act listed TEC 'Natural Temperate Grassland of the South Eastern Highlands'.	Yes	Yes	92.6	High

Plot no.	PCT	Justification / rationale	PCT / TEC associations	TEC present	Stage 2 - Native veg	VI score	GGAM Cons. Value
Plot 44	PCT 1110: <i>River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion</i>	A derived community from PCT 1110. Historically cleared, partially revegetated around the edges of property. Diagnostic species and landscape position meets that of PCT description and Community vegetation r3: <i>Rytidosperma</i> sp. – <i>Themeda australis</i> – <i>Juncus</i> sp. tussock grassland of occasionally wet sites of the South Eastern Highlands bioregion (Armstrong et al. 2012).	PCT 1110 is partly associated with the CE EPBC Act listed TEC 'Natural Temperate Grassland of the South Eastern Highlands'.	No	No	96	High
Plot 45	PCT 1093: <i>Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion</i>	A derived community from PCT 1093. Historically cleared and planted with <i>Pinus radiata</i> . Plot location regular slashed for powerline easement. Diagnostic species and landscape position meets that of PCT description.	There are currently no TECs associated with this PCT.	N/A	No	21.1	Moderate
Plot 46	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	A derived community from PCT 731. Historically cleared. Broadly linked to the PCT. Very disturbed, slashed, and grazed.	There are currently no TECs associated with this PCT.	N/A	No	13.3	Low
Plot 48	PCT 731: <i>Broad-leaved Peppermint - Red Stringybark grassy open forest on undulating hills, South Eastern Highlands Bioregion</i>	A derived community from PCT 731. Historically cleared. Diagnostic species and landscape position meets that of PCT description.	There are currently no TECs associated with this PCT.	N/A	Yes	6.8	Low

Table 6 GGAM Stage 3 BAM plot data summary

Plot ID	PCT	Easting	Northing	Clearing	Comp. Tree	Comp. Shrub	Comp. Grass	Comp. Forbs	Comp. Ferns	Comp. Other	Struc. Tree	Struc. Shrub	Struc. Grass	Struc. Forbs
Plot_01	1202	167526	6104888	102	0	1	12	6	0	0	0.0	0.1	90.2	0.6
Plot_04	731	167768	6103129	125	0	0	11	17	0	0	0.0	0.0	53.3	9.6
Plot_12	1093	164582	6097429	242	1	10	20	12	0	0	0.3	2.0	87.6	2.1
Plot_22	1229	169463	6096771	266	0	0	11	5	0	3	0.0	0.0	29.1	0.6
Plot_25	896	168426	6094440	239	0	2	13	15	0	1	0.0	0.2	43.8	22.4
Plot_25.2	896	168540	6094504	46	1	1	9	9	0	0	0.3	0.3	105.8	30.9
Plot_27	1330	170258	6094180	122	1	6	13	20	0	0	0.1	0.7	11.0	2.4
Plot_29	731	167809	6093070	106	0	1	10	8	0	0	0.0	0.1	45.1	20.9
Plot_31	731	163521	6092957	118	0	2	13	16	1	0	0.0	0.2	48.0	3.7
Plot_35	731	165290	6091054	239	1	7	19	11	1	0	2.0	1.8	100.6	1.4
Plot_36	1093	164796	6090579	254	2	10	14	14	1	1	1.5	1.2	54.5	2.4
Plot_42	896	168401	6095842	42	0	1	15	9	0	0	0.0	0.1	113.1	41.7
Plot_44	1110	167681	6095669	157	0	1	9	11	0	1	0.0	0.1	110.5	16.0
Plot_45	1093	164753	6099978	168	1	6	15	8	1	0	0.3	20.8	20.9	0.9
Plot_46	731	165140	6099556	107	0	1	8	8	0	0	0.0	0.1	86.2	0.8
Plot_48	731	166744	6099766	196	0	2	12	10	0	0	0.0	0.2	42.3	27.7

Table 5 Cont'd GGAM Stage 3 BAM plot data summary

Plot ID	PCT	Struc. Ferns	Struc. Other	Fun. Large Trees	Fun. Hollow Trees	Fun. Litter Cover	Fun. Lgth Fallen Logs	Fun. Tree Stem 5to9	Fun. Tree Stem 10to19	Fun. Tree Stem 20to29	Fun. Tree Stem 30to49	Fun. Tree Stem 50to79	Fun. Tree Regen	Fun. High Threat Exotic
Plot_01	1202	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0.2
Plot_04	731	0.0	0.0	0	0	1	0	0	0	0	0	0	0	0.3
Plot_12	1093	0.0	0.0	0	0	1	0	1	1	0	0	0	1	0.2
Plot_22	1229	0.0	0.3	0	0	2	0	0	0	0	0	0	0	0.0
Plot_25	896	0.0	0.1	0	0	1	0	1	0	0	0	0	0	0.4
Plot_25.2	896	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Plot_27	1330	0.0	0.0	0	0	9	2	1	1	1	1	1	0	0.3
Plot_29	731	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0.1
Plot_31	731	0.1	0.0	0	0	1	0	0	0	0	0	0	0	0.2
Plot_35	731	0.1	0.0	0	0	8	22	1	0	0	0	0	1	0.0
Plot_36	1093	0.1	0.1	0	0	1	16	1	0	1	0	0	1	0.0
Plot_42	896	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Plot_44	1110	0.0	0.1	0	0	1	0	0	0	0	0	0	0	0.2
Plot_45	1093	0.1	0.0	0	0	0	14	0	1	0	0	0	0	0.2
Plot_46	731	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0.2
Plot_48	731	0.0	0.0	0	0	3	0	0	0	0	0	0	0	0.2

Appendix 2 – BAM-C Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00031917/BAAS18138/22/00031919	Wamboin Bywong Rezoning Assessment - for Report	16/06/2022
Assessor Name	Report Created	BAM Data version *
Callan Wharfe	24/08/2022	54
Assessor Number	BAM Case Status	Date Finalised
BAAS18138	Open	To be finalised
Assessment Revision	Assessment Type	BOS entry trigger
1	Part 4 Developments (General)	BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion												
1	732_731_G rassland_P29	Not a TEC	14.4	14.4	1	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0

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2	732_731_G rassland_P 04	Not a TEC	2.8	2.8	1	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
3	732_731_G rassland_P 31	Not a TEC	2.8	2.8	1	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
4	732_731_G rassland_P 35	Not a TEC	48.9	48.9	1	PCT Cleared - 65%	High Sensitivity to Gain			1.75		21
5	732_731_G rassland_P 46	Not a TEC	13.3	13.3	1	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
6	732_731_G rassland_P 48	Not a TEC	6.8	6.8	1	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
										Subtotal		21
Kangaroo Grass - Purple Wire-grass - Mat-rush - Wallaby Grass - Common Buttons dry tussock grassland on steep sites in the north-western and Eastern parts of the Southern Tablelands of the South Eastern Highlands Bioregion												
7	895_896_G rassland_P 25	Not a TEC	77.2	77.2	1	PCT Cleared - 90%	High Sensitivity to Gain			2.50		48
8	895_896_G rassland_P 25-2	Not a TEC	94.9	94.9	1	PCT Cleared - 90%	High Sensitivity to Gain			2.50		59
9	895_896_G rassland_P 42	Not a TEC	92.6	92.6	1	PCT Cleared - 90%	High Sensitivity to Gain			2.50		58

										Subtotal	165
Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion											
10	1093_Grassland_P12	Not a TEC	39.5	39.5	1	PCT Cleared - 61%	High Sensitivity to Gain			1.75	17
11	1093_Grassland_P36	Not a TEC	41.8	41.8	1	PCT Cleared - 61%	High Sensitivity to Gain			1.75	18
12	1093_Grassland_P45	Not a TEC	21.1	21.1	1	PCT Cleared - 61%	High Sensitivity to Gain			1.75	9
										Subtotal	44
River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion											
13	1110_Grassland_P44	Not a TEC	96	96.0	1	PCT Cleared - 90%	High Sensitivity to Gain			2.50	60
										Subtotal	60
Speargrass grassland of the South Eastern Highlands Bioregion											
14	1202_Grassland_P01	Not a TEC	82.1	82.1	1	PCT Cleared - 68%	High Sensitivity to Gain			1.75	36
										Subtotal	36

Swamp Gum - Ribbon Gum woodland on poorly-drained flats, South Eastern Highlands Bioregion												
15	1229_Grassland_P22	Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion	28.6	28.6	1	PCT Cleared - 80%	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	18
											Subtotal	18

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Yellow Box - Blakely's Red Gum grassy woodland on the tablelands, South Eastern Highlands Bioregion												
16	1330_Grassland_P27	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	24.3	24.3	1	PCT Cleared - 94%	High Sensitivity to Gain	Critically Endangered Ecological Community	Critically Endangered	2.50	True	15
											Subtotal	15
											Total	359

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAI	Species credits
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