Melbourne Airport's Third Runway Project
Ecology Technical Report

Final report – Version 3

Prepared for Australia Pacific Airports (Melbourne)

31 March 2023

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Glossary

Airports Act	Commonwealth *Airports Act 1996*
airside	The area of Melbourne Airport occupied by the active operational airfield, including runways, taxiways and other infrastructure associated with the operation of the airfield
APAM	Australia Pacific Airports (Melbourne) Pty Ltd, the Melbourne Airport lessee
CaLP Act	Victorian *Catchment and Land Protection Act 1994*.
Commonwealth land	Commonwealth land, under the jurisdiction of the Commonwealth of Australia
CMA	Catchment Management Authority
DAWE	Australian Government Department of Agriculture, Water and the Environment, now DAWE
DBH	Diameter at Breast Height, in reference to the trunk of a tree
DELWP	Victorian Government Department of Environment, Land, Water and Planning
Ecology chapter	Chapter to be included within the project's MDP outlining the ecological values
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	Victorian *Flora and Fauna Guarantee Act 1988*
Freehold land	Freehold land, under the jurisdiction of the State of Victoria
GBW	Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, a TEC listed under the EPBC Act
impact area	The project area, excluding areas of pre-existing approvals (Taxiway Zulu and Northern Access)
landside	The area of Melbourne Airport outside of the active airfield. Includes various land uses, such as roads, carparks, buildings, a quarry, a concrete recycling plant, a golf course, stockpile sites, agricultural land, dams, waterways, drainage lines and undeveloped land supporting remnant native vegetation.
local area	The area within a 10 km radius of the project area
MDP	Major Development Plan is required for each major development on Commonwealth land at Melbourne Airport under the Airports Act
Melbourne Airport	The area of land leased by APAM from the Australian Government or otherwise in APAM's exclusive possession for the operation of the airport at Tullamarine, Victoria. Includes both airside and landside areas. Most is Commonwealth land but, at any given time, may also include freehold land purchased for addition to the Commonwealth leasehold area.
MNES	Matters of National Environmental Significance, listed under the EPBC Act
NTGVVP	Natural Temperate Grassland of the Victorian Volcanic Plain, a TEC listed under the EPBC Act

project	The Melbourne Airport Third Runway Project or M3R.
project area	The 925.324-hectare footprint required to construct and operate the Melbourne Airport Third Runway Project, most of which would be subject to direct or indirect disturbances during construction.
PMST	Australian Government Protected Matters Search Tool
Self-assessment	An assessment against the relevant EPBC Act Significant Impact criteria for relevant threatened species and ecological communities, listed migratory species and the environment on Commonwealth land
significant impact	A significant impact on the environment or on an MNES is an impact that is "important, notable, or of consequence, having regard to its context or intensity" (DoE 2013; DSEWPaC 2013). The significance of an impact is determined according to criteria outlined in the EPBC Act Significant Impact Guidelines (DoE 2013; DSEWPaC 2013).
TEC	Threatened Ecological Community, listed under the EPBC Act or FFG Act
VBA	Victorian Biodiversity Atlas
VPP	Victoria Planning Provisions
VQA	Vegetation quality assessment (i.e. habitat hectares method)
woodland	The large area of treed vegetation, most of which constitutes the GBW threatened ecological community, on Radar Hill near the northern boundary of Melbourne Airport

Executive summary

Context

This document has been updated to include native vegetation mapping collected in 2021. This version closes out the inaccessible areas denoted as 'assumed' or 'estimated' native vegetation in previous versions. All areas of land within the impact area have now been subject to site assessment. The previous version of the report was updated to address the regulator review of the exposure draft MDP Ecology Chapter and addresses comments received on the document from the regulator. Results within this report reflect the reduced impact area for the project (received on 2 June 2021).

Development of Melbourne Airport's Third Runway (the project) will result in a new 3 kilometre north-south runway along with additional taxiways and other associated infrastructure. This document reports on the ecological values present within the project area and the project's likely significant impacts to Matters of National Environmental Significance (MNES), including threatened species and ecological communities, listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). For the purpose of assessing impacts, the impact area does not include those parts of the project area subject to existing approvals.

Approach

Desktop assessments were initially undertaken to inform the level of field investigation required. The table below outlines the MNES that were identified as having a medium to high likelihood of occurring within or immediately adjacent to the project area, or those that had previously been recorded. The table also identifies the MNES for which targeted surveys were conducted or for which existing data (from previous assessments or database searches) were available for the purposes of significant impact self-assessments.

MNES	Targeted survey?	Existing data?
Australian Grayling *Prototroctes maraena*		Yes
Fork-tailed Swift *Apus pacificus*		Yes
Golden Sun Moth *Synemon plana*	Yes	
Grey-headed Flying-fox *Pteropus poliocephalus*		Yes
Growling Grass Frog *Litoria raniformis*	Yes	
Latham's Snipe *Gallinago hardwickii*		Yes
Rufous Fantail *Rhipidura rufifrons*		Yes
Satin Flycatcher *Myiagra cyanoleuca*		Yes
Striped Legless Lizard *Delma impar*	Yes	
Swift Parrot *Lathamus discolor*		Yes
White-throated Needletail *Hirundapus caudacutus*		Yes
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia (Grey Box Woodland), treed and derived native grassland condition states	Yes	
Natural Temperate Grassland of the Victorian Volcanic Plain (Natural Temperate Grassland)	Yes	
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (Seasonal Herbaceous Wetlands)	Yes	

Striped Legless Lizard and Seasonal Herbaceous Wetlands were not recorded during targeted surveys and are unlikely to be directly impacted by the project. Therefore, a significant impact assessment was not deemed necessary for Striped Legless Lizard or Seasonal Herbaceous Wetlands.

All vegetation was mapped within the project area to determine the type and extent of native vegetation on Commonwealth land, and to identify and assess the presence and quality of threatened ecological communities.

Results

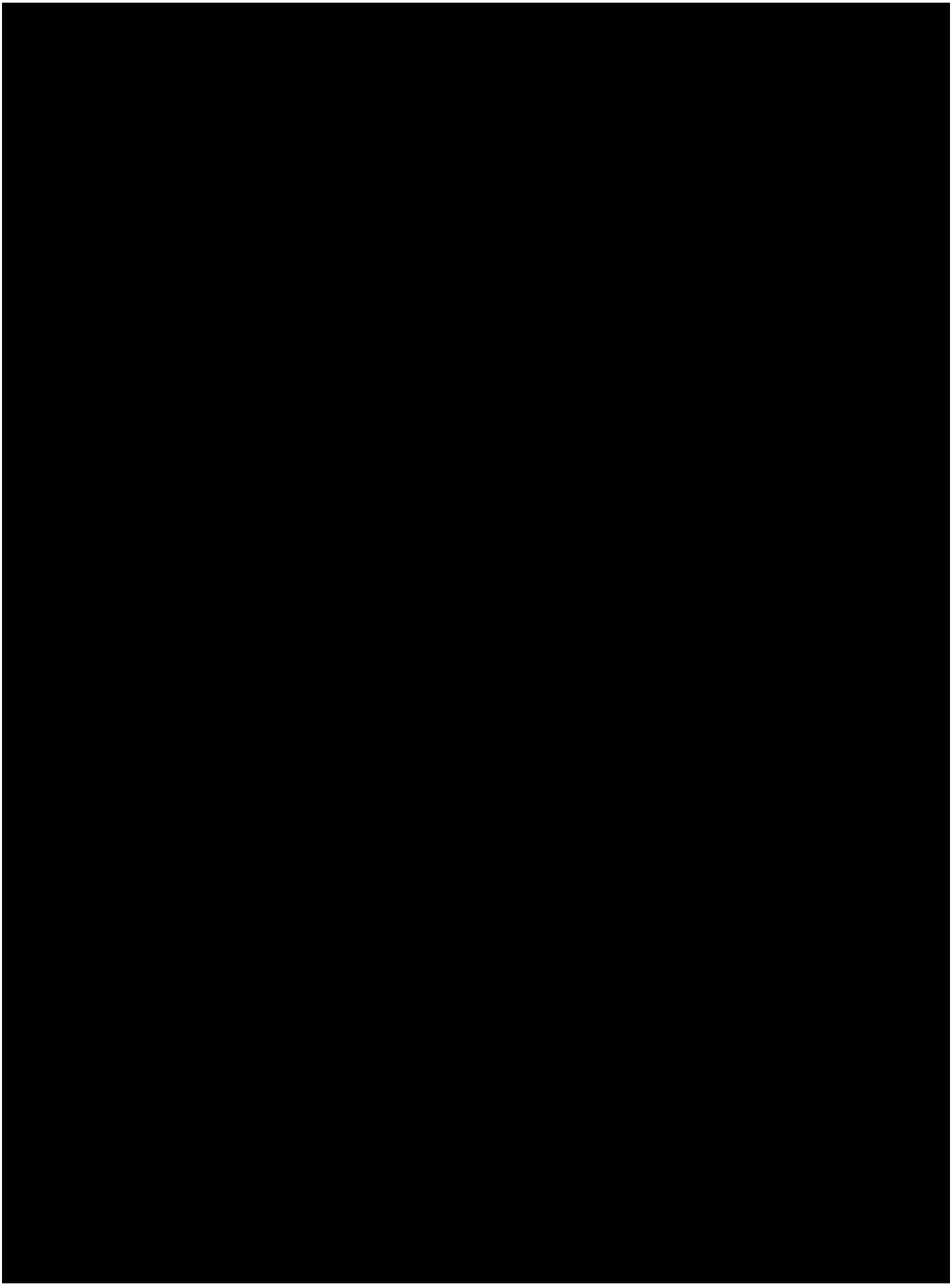
The project area supports 268.47 hectares of native vegetation, which includes:

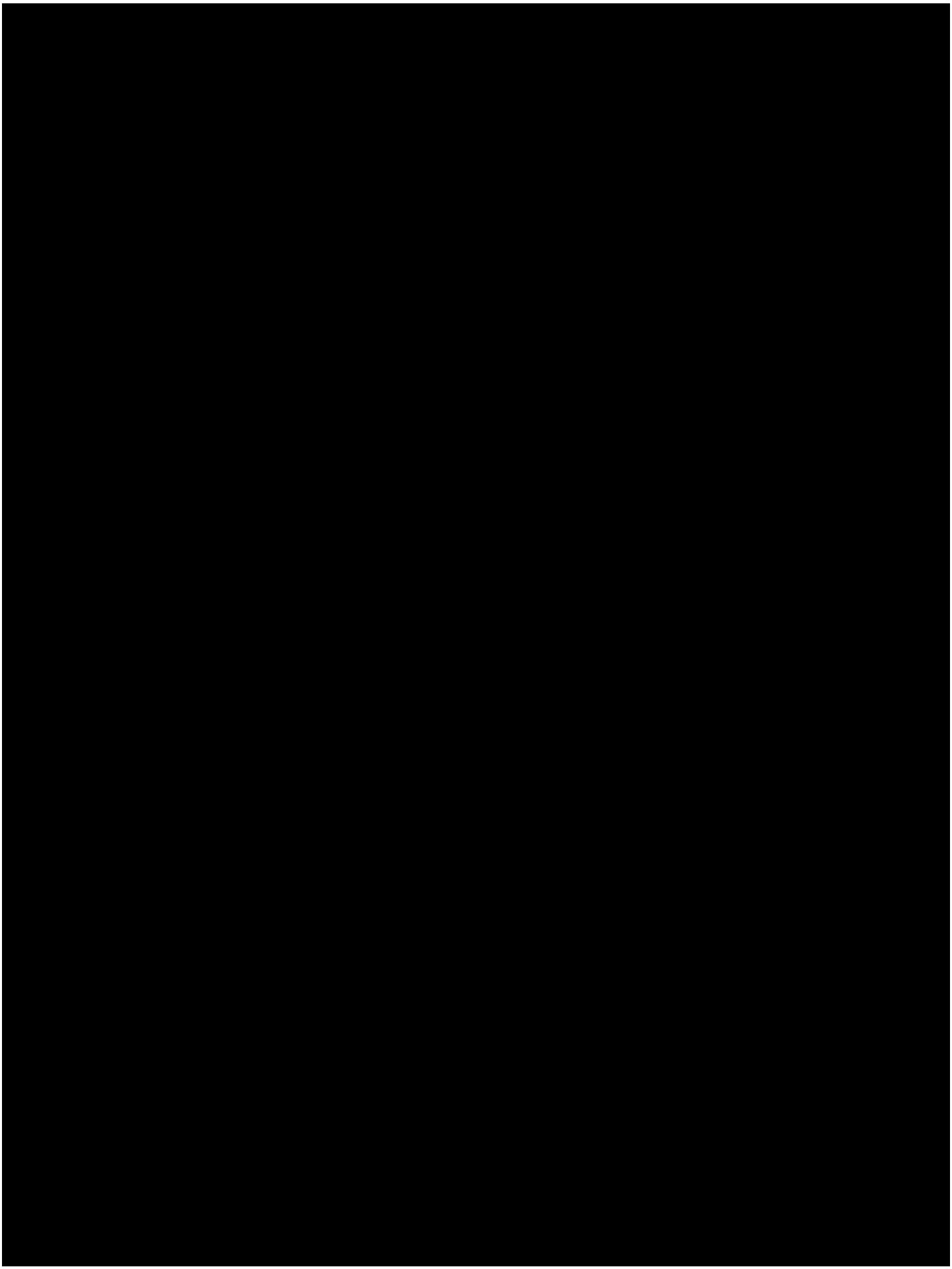
- A total of 247.96 hectares of native vegetation within the impact area.
- Nine Ecological Vegetation Classes (EVCs), some of which represent EPBC listed threatened ecological communities (TECs):
  - 68.02 hectares of Grey Box Woodland (treed condition state)
  - 10.69 hectares of Grey Box Woodland (derived native grassland condition state)
  - 97.90 hectares of Natural Temperate Grassland

The following EPBC listed threatened species utilise habitat within or adjacent to the project area:

- Growling Grass Frog
- Golden Sun Moth
- Swift Parrot
- Grey-headed Flying-Fox
- Australian Grayling (aquatic habitats adjacent to the project area).

Project impacts





Recommendations

1. Introduction

1.1 Project background

Australia Pacific Airports (Melbourne) Pty Ltd (APAM) is planning the development of a third runway, known as Melbourne Airport's Third Runway Project (M3R) (the project). Melbourne Airport is close to capacity (pre-Covid-19) and, with the forecast for domestic and international travel demand to continue growing, a third runway is needed to avoid delays and disruptions across the aviation network.

Biosis Pty Ltd is working with APAM to undertake updated ecological assessments across the project area to inform the approval documentation for the project.

The ecological values of Melbourne Airport are well understood and have been documented in previous studies. However, these values require re-assessment every three to five years to ensure the information remains current.

1.2 Context

1.3 Document scope

This document has been updated to include native vegetation mapping collected in 2021. This version closes out the areas denoted as 'assumed' or 'estimated' native vegetation in previous versions. All areas of land

within the impact area have now been subject to site assessment. The previous version of the report was updated to address the regulator review of the exposure draft MDP Ecology Chapter and addresses comments received on the document from the regulator. Results within this report reflect the updated impact area for the project (received on 2 June 2021). This document reports on the ecological values present within the project area. It is a technical report that outlines the ecological survey methods, details the findings of the ecological surveys and provides a significance assessment of the project's likely impacts on threatened species, ecological communities, listed migratory species and relevant ecological features on Commonwealth land. Implications for the project were assessed in relation to key Commonwealth biodiversity legislation and policy. This document also provides estimates of environmental offsets that are likely to be required to offset the project's residual significant impacts on threatened species and ecological communities.

This report does not cover the following items:

- Targeted surveys for rare or threatened species listed under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) or Victorian Advisory Lists (DSE 2009; DSE 2013; DEPI 2014).
- Vegetation Quality Assessments (VQA) for patches of native vegetation not representative of EPBC Act listed threatened ecological communities (TECs).
- Assessment of the impacts and implications of the project under State legislation or policy relating to biodiversity or planning.
- Detailed assessment of downstream or offsite impacts that may occur as a result of the project.
- Sourcing, assessing or securing appropriate environmental offsets.
- Preparation of an over-arching Offset Strategy or MDP ecology chapter summarising the residual impacts and proposed offset package for the project.

1.4 Project area description

The project area is approximately 834 hectares in size, includes Commonwealth and freehold land associated with Melbourne Airport in Tullamarine, Victoria, approximately 19 kilometres north-west of the Melbourne Central Business District (Figure 1). All report figures are located in Appendix 1.

The project area is located within the:

- Victorian Volcanic Plain and Central Victorian Uplands bioregions.
- Catchment area of:
  - Maribyrnong River
  - Arundel Creek
  - Moonee Ponds Creek.
- Management area of Melbourne Water (waterways).
- City of Hume (freehold land portions).

The project area supports a range of land uses, including:

- Airside – active operational airfield containing runways, taxiways and other infrastructure associated with the operation of the airfield. This area is predominately a highly modified and managed environment.

- Landside – various land uses including undeveloped areas, roads, concrete recycling plants, grazing land, dams, waterways, drainage lines, stockpile sites and golf courses. This land ranges from highly modified to relatively intact (e.g. some of the waterways and woodland habitats are intact).

1.4.1 Impact area description

The impact area (Figure 1) is approximately 772 hectares in size and includes land within the project area that is not subject to the existing approvals for the Taxiway Zulu, Northern Access development. This is reduced from the 915-hectare impact area included within the exposure draft MDP.

2. Regulatory framework

This section provides a summary of key biodiversity legislation and government policy relevant to the project. A more detailed explanation of relevant Commonwealth legislation and policy is provided in Appendix 2.

2.1 Applicability of State and Commonwealth legislation and policy

[redacted]

2.2 Commonwealth legislation and policy

2.2.1 Airports Act 1996

The Airports Act and associated *Airports (Environment Protection) Regulations 1997* govern planning approvals and procedures on Commonwealth land at Melbourne Airport. A MDP is required for each major development on Commonwealth land at Melbourne Airport (Airports Act s.88). The Act defines actions that constitute a major development and therefore require an MDP (Airports Act s.89)[redacted]

2.2.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act applies to actions (e.g. developments and associated activities) that have the potential to significantly impact on MNES or the environment on Commonwealth land.

MNES are typically listed under the EPBC Act following listing advice provided for each MNES. The listing advice is the authoritative description of the MNES. Further policy documents may assist in clarifying listing advice and identifying the presence or absence of specific MNES[redacted]

[redacted]. The EPBC Act Significant Impact Guidelines 1.1 (DoE 2013) provide a framework against which potential significant impacts on MNES are assessed. Species-specific significant impact guidelines may further assist in defining significant impacts to certain listed threatened species (e.g. DEWHA 2009a; DEWHA 2009b; DoE 2015; DoEE 2017). An assessment against the Significant Impact Guidelines 1.1 (DoE 2013) (and any associated species-specific significant impact guidelines) is provided in Section 5.

Section 26 of the EPBC Act requires that APAM seek approval for any action that has, will have or is likely to have a significant impact on the environment on Commonwealth land. The EPBC Act Significant Impact Guidelines 1.2 (DSEWPaC 2013) provide guidance for identifying environmental values and assessing potential significant impacts to the environment on Commonwealth land. In accordance with the Significant Impact Guidelines 1.2 (DSEWPaC 2013), State environmental legislation and policy may assist in identifying special environmental values. The Significant Impact Guidelines 1.2 indicate that '*State government protected species lists and heritage lists may… assist in identifying components of the environment with special value'* and '*local government may also have information about rare or otherwise important elements of the environment*' (DSEWPaC 2013 p.8). [redacted]

2.3 Victorian legislation and policy

2.3.1 Flora and Fauna Guarantee Act 1988

The FFG Act is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes in Victoria.

The FFG Act does not apply to Commonwealth land at Melbourne Airport. It is excluded by the operation of the *Commonwealth Airports (Environment Protection) Regulations 1997*. Furthermore, the offences and permit requirements of the FFG Act for the handling of flora do not apply to private land (unless part of critical habitat for the flora). For the purposes of the FFG Act, private land includes land that APAM has leased or purchased at Melbourne Airport, since APAM has a right to exclusive possession of this leasehold and freehold land.

However, in accordance with the Significant Impact Guidelines 1.2, the FFG Act as a State government biodiversity protection mechanism is used as a guide for identifying ecological components of the environment that can be considered to have 'special value' (DSEWPaC 2013 p.8). Threatened taxa, threatened communities and threatening processes listed under Section 10 of the FFG Act, associated Action Statements, the *Flora and Fauna Guarantee Amendment Act 2019* (which came into effect on June 1, 2020) and Victorian Scientific Advisory Committee determinations, provide local context for an assessment of impacts to the environment on Commonwealth land under the Significant Impact Guidelines 1.2 (DSEWPaC 2013).

2.3.2 Planning and Environment Act 1987 (incl. Planning Schemes)

The Victorian *Planning and Environment Act 1987* (P&E Act) controls the planning and development of land in Victoria and provides for the development of a comprehensive set of planning provisions for Victoria (the Victoria Planning Provisions) and specific planning schemes for all municipalities. The local Hume Planning Scheme recognises the Commonwealth's exclusive power to legislate in respect of Commonwealth land at Melbourne Airport, identifying it as 'Commonwealth Land not controlled by Planning Scheme' (Hume Planning Scheme Map Numbers 15, 16, 21, 22, 25 and 26).

Removal, destruction and lopping of native vegetation in Victoria is regulated through the planning schemes and through Victoria's Guidelines for the Removal, Destruction or Lopping of Native Vegetation (DELWP 2017), which is an incorporated document of all planning schemes in Victoria. These Guidelines provide a policy

setting for defining native vegetation, assessing its values, making decisions regarding clearing and providing compensatory offsets. Although the P&E Act, and therefore the Guidelines, do not directly apply to Commonwealth land at Melbourne Airport, the Guidelines provide standard methods for defining and assessing native vegetation. These methods have been applied in the absence of any standard Commonwealth approach to native vegetation assessment.

3. Approach

Desktop assessments were initially undertaken to inform the level of field investigation that was required to assess the project in relation to key Commonwealth biodiversity legislation and policy.

3.1 Desktop assessment

3.1.1 Climate, soil, geomorphology and land use history (physical conditions)

Climate, soils, geomorphology and the history of land use within the project area has influenced the type, extent and condition of native vegetation and habitat that is present. A review of these influences formed part of the assessment of Ecological Vegetation Classes (EVCs), threatened species habitat, TECs and listed migratory species habitat within the project area or with potential to occur within the project area. The following resources formed the basis of the physical conditions review (Figures 2-8):

- Historical subdivision plans of the Parish of Tullamarine, drafted by government surveyors (Kemp 1840; Doll c.1849; Hoddle 1850).
- Historical maps of Sunbury, prepared by the Australian Government Department of Defence (DoD 1915; DoD 1938).
- Historical photo map of Sunbury, produced by the Victorian Government Department of Crown Lands and Survey (DCLS 1946).
- An inventory of sites of botanical significance in the western region of Melbourne (McDougall 1987).
- EVC modelling as displayed on the Victorian Government Department of Environment Land Water and Planning's (DELWP's) NatureKit (DELWP 2020).
- Geological data, including the 1:63.360 Geological Survey of Victoria (Mines Department 1973), 1:250,000 Geological Survey of Victoria (Mines Department 1970; DNRE 1997) and geological mapping inferred from geological testing performed as part of this project (Senversa 2020, unpublished).
- Climate data available from the Australian Government Bureau of Meteorology (BoM), which maintains an active weather station at Melbourne Airport.

3.1.2 Determining natural values for assessment

Preliminary desktop assessments identified the key threatened species, TECs, listed migratory species and other natural values (such as native vegetation) with potential to be present within the project area. Natural values were identified based on:

- Their known occurrence within the Victorian Volcanic Plain and Central Victorian Uplands bioregions (e.g. the TEC Natural Temperate Grassland of the Victorian Volcanic Plain).
- Database records within 10 kilometres of the centre of the project area.
- Previous ecological investigations within and around the project area, such as (Figures 9-14):
  - An inventory of sites of botanical significance in the western region of Melbourne (McDougall 1987).
  - Vegetation mapping of the Port Phillip and Westernport region (Oates and Taranto 2001).

- A flora and fauna assessment for much of Melbourne Airport for the Runway Development Program (Biosis 2015).
- Vegetation mapping at Melbourne Airport FY19 (Biosis 2019a).
- Fauna survey program for Hume City Council (Biosis 2016a).
- Initial habitat hectare and net gain assessment of the Grey Box Woodland (GAGIN 2007).
- Biodiversity assessment for Taxiway Zulu and Northern Compound (Biosis 2016b).
- Melbourne Airport Ecology gaps study report (Biosis 2018a).
- Melbourne Airport Elevated Road MDP Specialist Study: Flora and Fauna (Biosis 2013a)
- Melbourne Airport Grey Box Woodland Environmental Management Plan and associated monitoring reports (Biosis 2013b; 2014a; 2016c; 2017c; Biosis 2018b.
- Striped Legless Lizard *Delma impar* survey Melbourne Airport Business Park (Biosis 2014b).
- Golden Sun Moth *Synemon plana* surveys by GAGIN (GAGIN 2008; 2009; 2010).
- Swift Parrot *Lathamus discolor* surveys (Steele & Peter 2019).
- Grey-headed Flying Fox *Pteropus poliocephalus* surveys (Ecology & Infrastructure International 2018).
- Sites of Faunal Significance in the Western Region of Melbourne (inland of Princes Freeway) (Beardsell 1991).
- FY19 Growling Grass Frog *Litoria raniformis* surveys (Biosis 2019b, unpublished).
- FY10 Golden Sun Moth habitat survey (Biosis 2019c).

Searches of the following databases and online tools were undertaken:

- DELWP's Victorian Biodiversity Atlas (VBA), including the 'VBA_FLORA25, FLORA100 & FLORA Restricted' and 'VBA_FAUNA25, FAUNA100 & FAUNA Restricted' datasets (accessed for preliminary desktop assessment on 12 July 2019, on 11 March 2020 for the exposure draft MDP report and the 26 July 2021 for this version of the report, supporting the preliminary draft MDP.
- DAWE's Protected Matters Search Tool (PMST) for MNES protected under the EPBC Act (accessed for preliminary desktop assessment on 12 July 2019, on 11 March 2020 for the exposure draft MDP report and the 26 July 2021 for this version of the report, supporting the preliminary draft MDP.
- Birdlife Australia New Atlas database (accessed 17 March 2020).

Following the database searches, threatened species, TECs and listed migratory species were categorised as having a negligible, low, medium or high likelihood of occurring within the project area or, if the species was observed during field surveys, as having been recorded within the project area. These categorisations were determined with reference to surrounding records of the species, expert knowledge of the species ecology and knowledge of the habitat types present in the project area. The rationale for the categorisation is provided for each species in Appendices 4 and 5. Those species or TECs for which there is little or no suitable habitat within the project area were assigned a likelihood of low or negligible and were not considered further. Natural values subject to further assessment are listed below in Sections 3.1.2.1, 3.1.2.2 and 3.1.2.3.

Species listed as threatened under the EPBC Act were the subject of detailed targeted field surveys, if all of the following criteria were satisfied:

- The species had not been previously recorded anywhere at Melbourne Airport despite suitable habitat being present.
  or
  There were parts of the project area where no targeted surveys were known to have taken place despite suitable habitat being present (e.g. recently acquired land).

  or
  Where survey data was considered outdated (i.e. more than three years since last survey).

- The species was considered to have a medium to high likelihood of occurring within the project area.
- There was potential for the project to have a significant impact on the species.

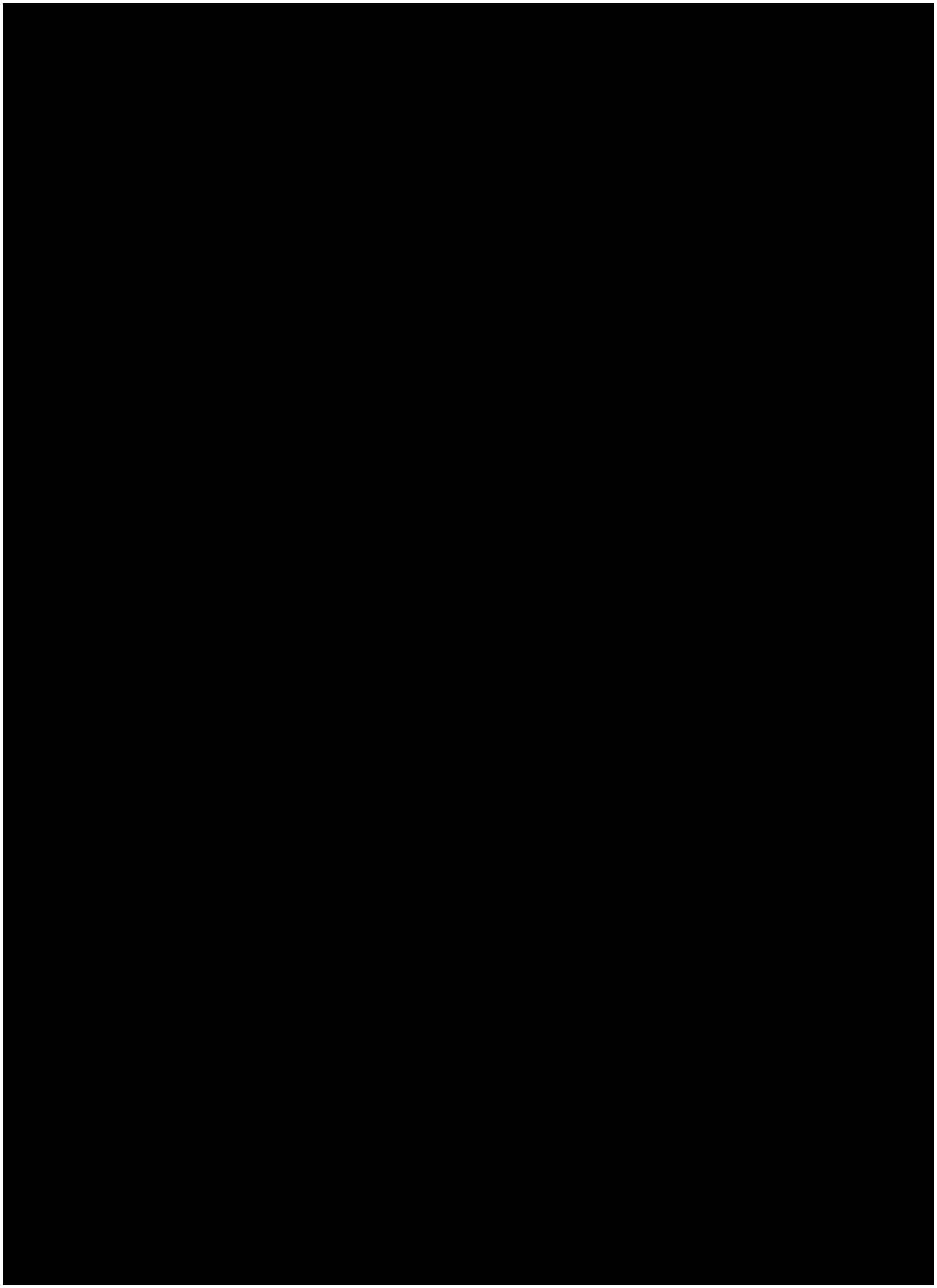
The purpose of targeted field surveys was to establish the presence or absence of the species or ecological community and to gain a better understanding of the species' use of habitat across the project area.

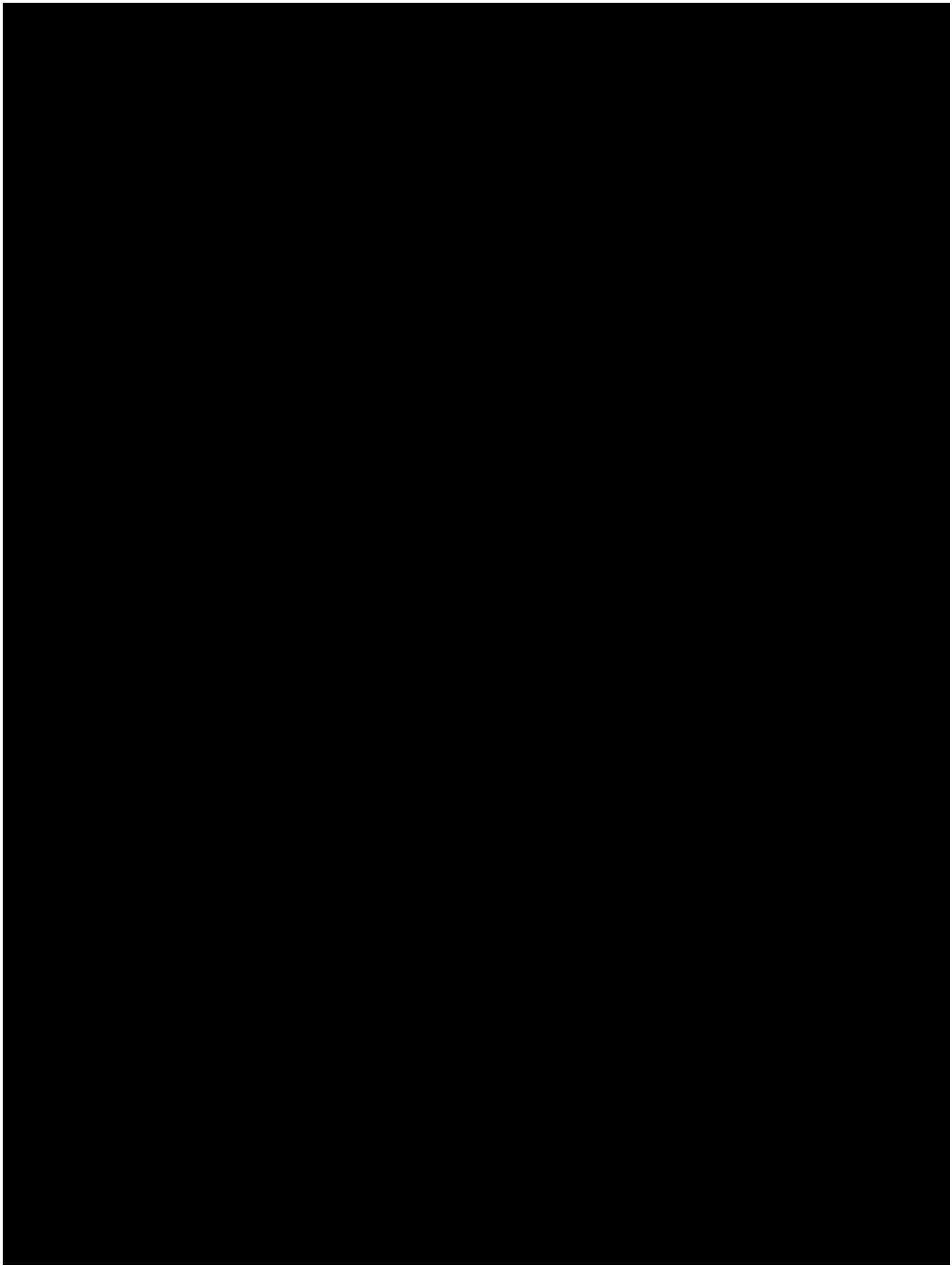
No targeted field surveys were undertaken for FFG Act listed flora, fauna or TECs.

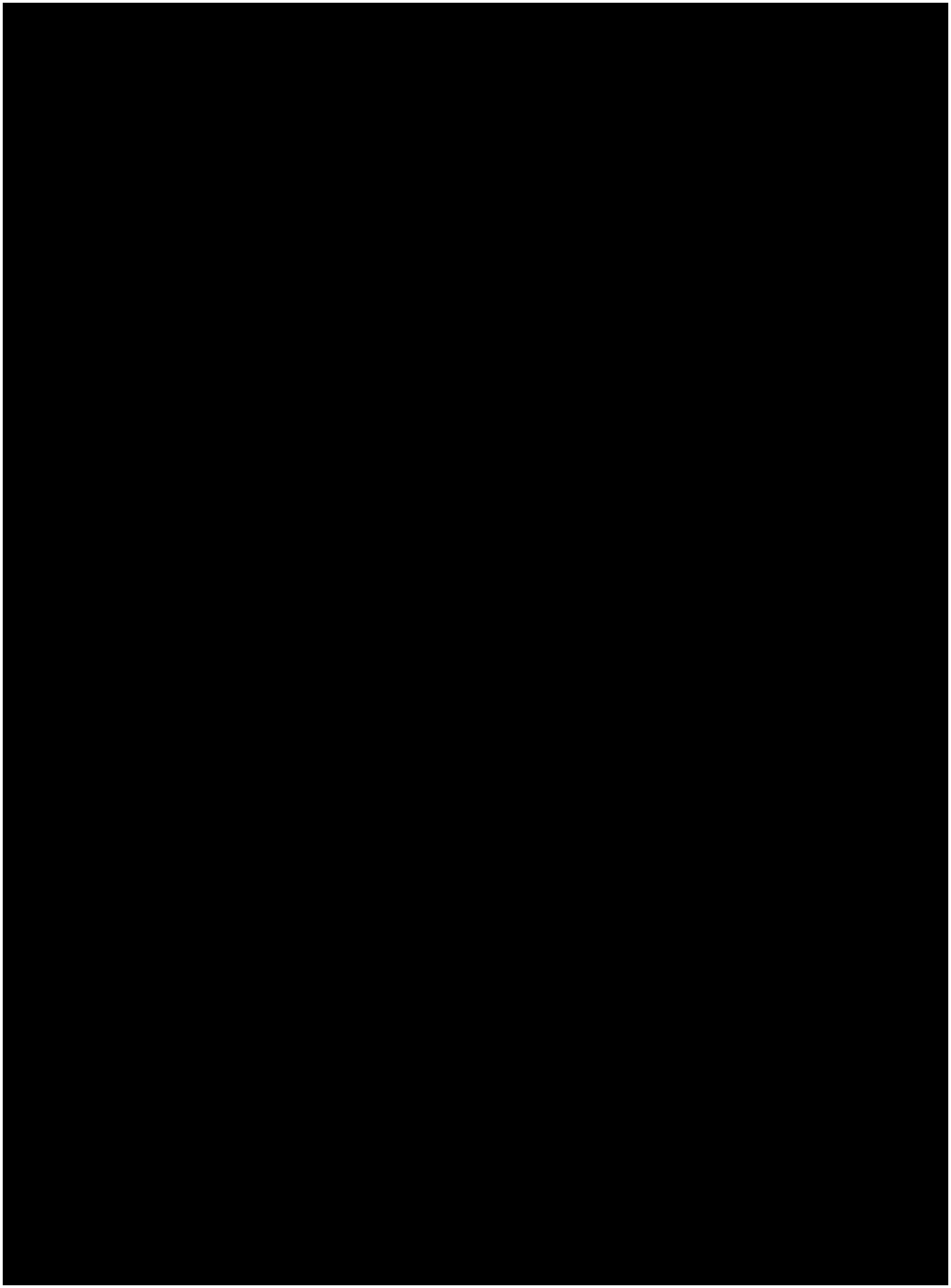
The following list of EPBC Act listed threatened species, TECs, migratory species and FFG Act listed species and communities were identified for further consideration.

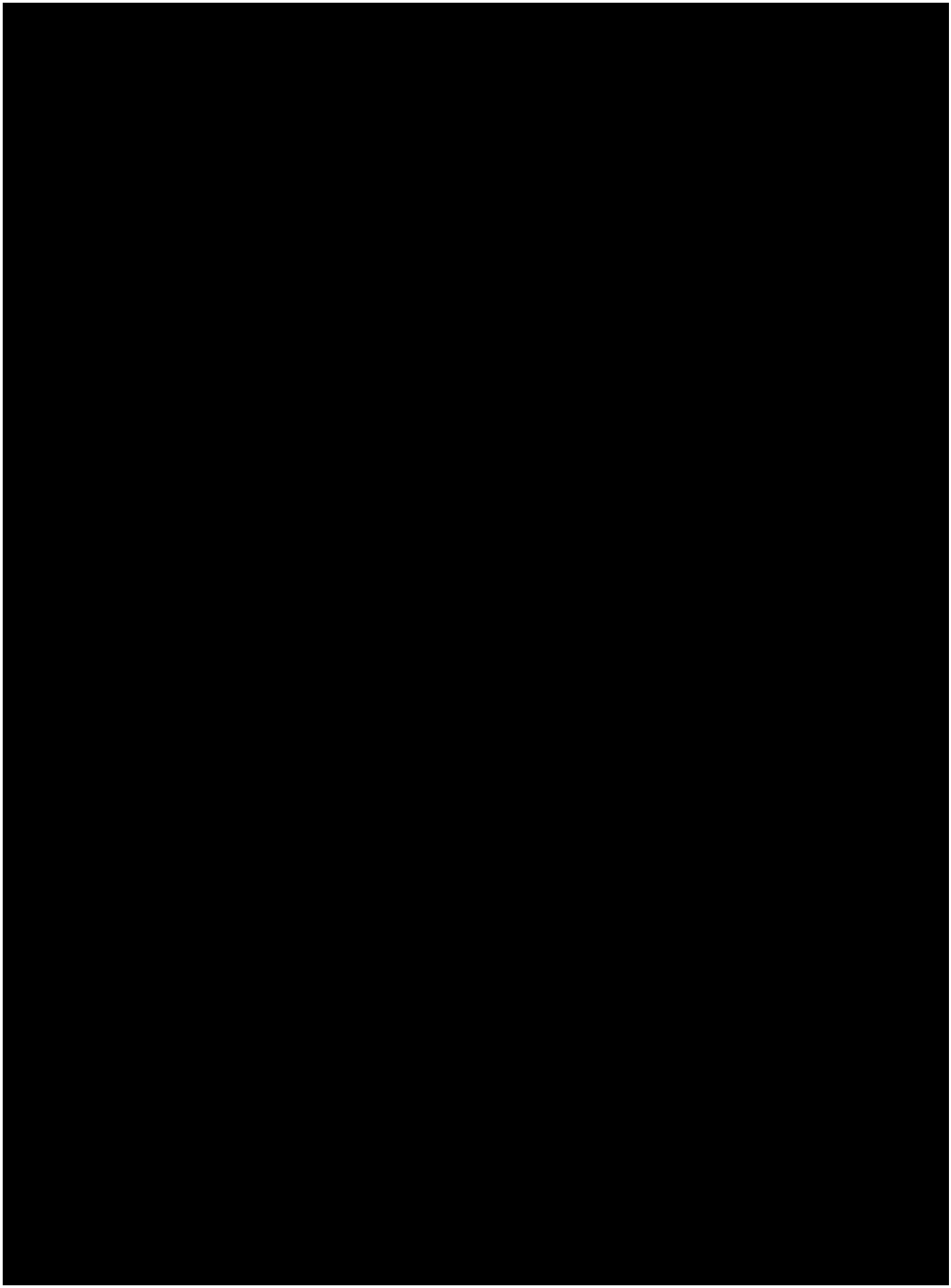
3.1.2.1 Threatened flora

3.1.2.2 Threatened fauna

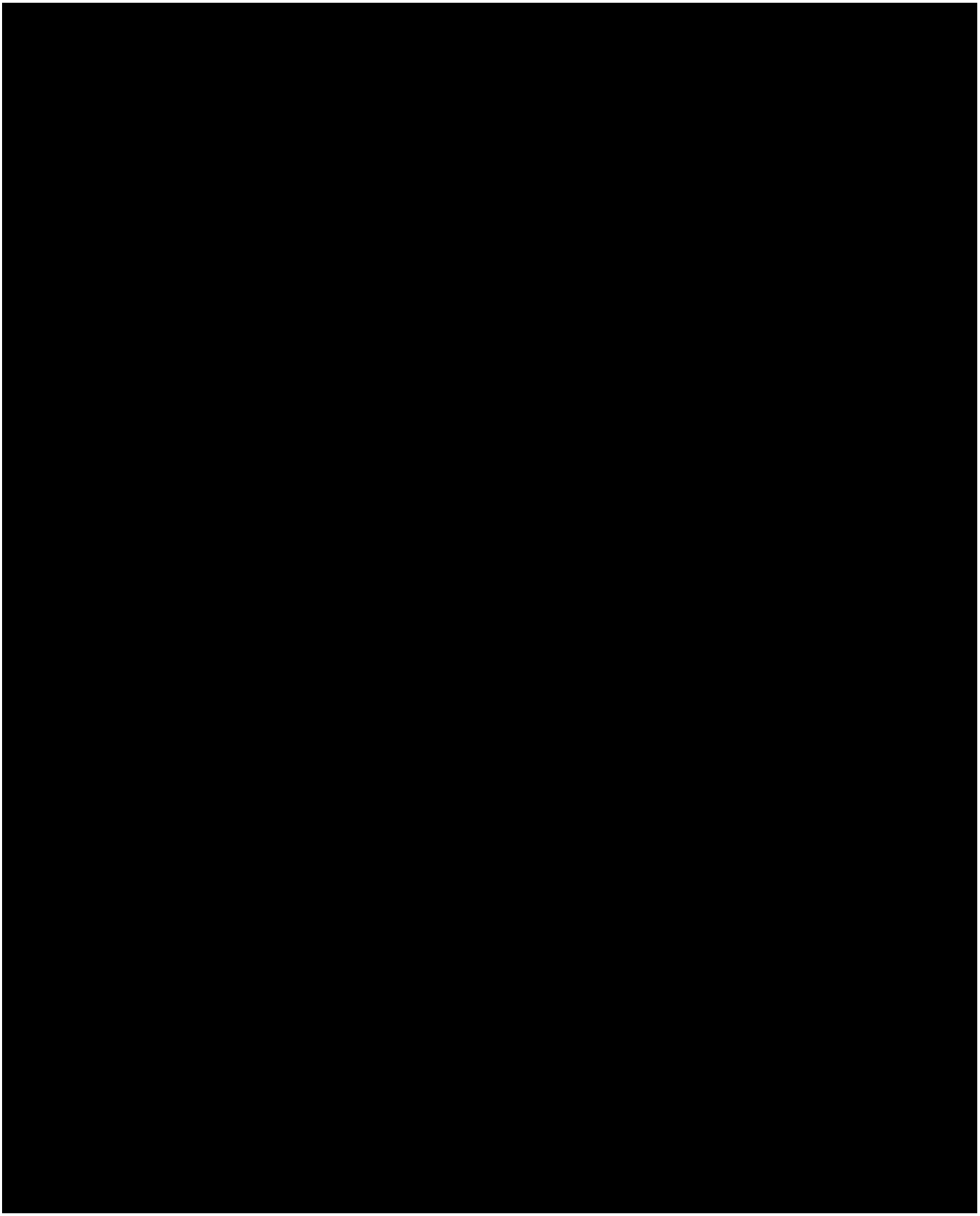




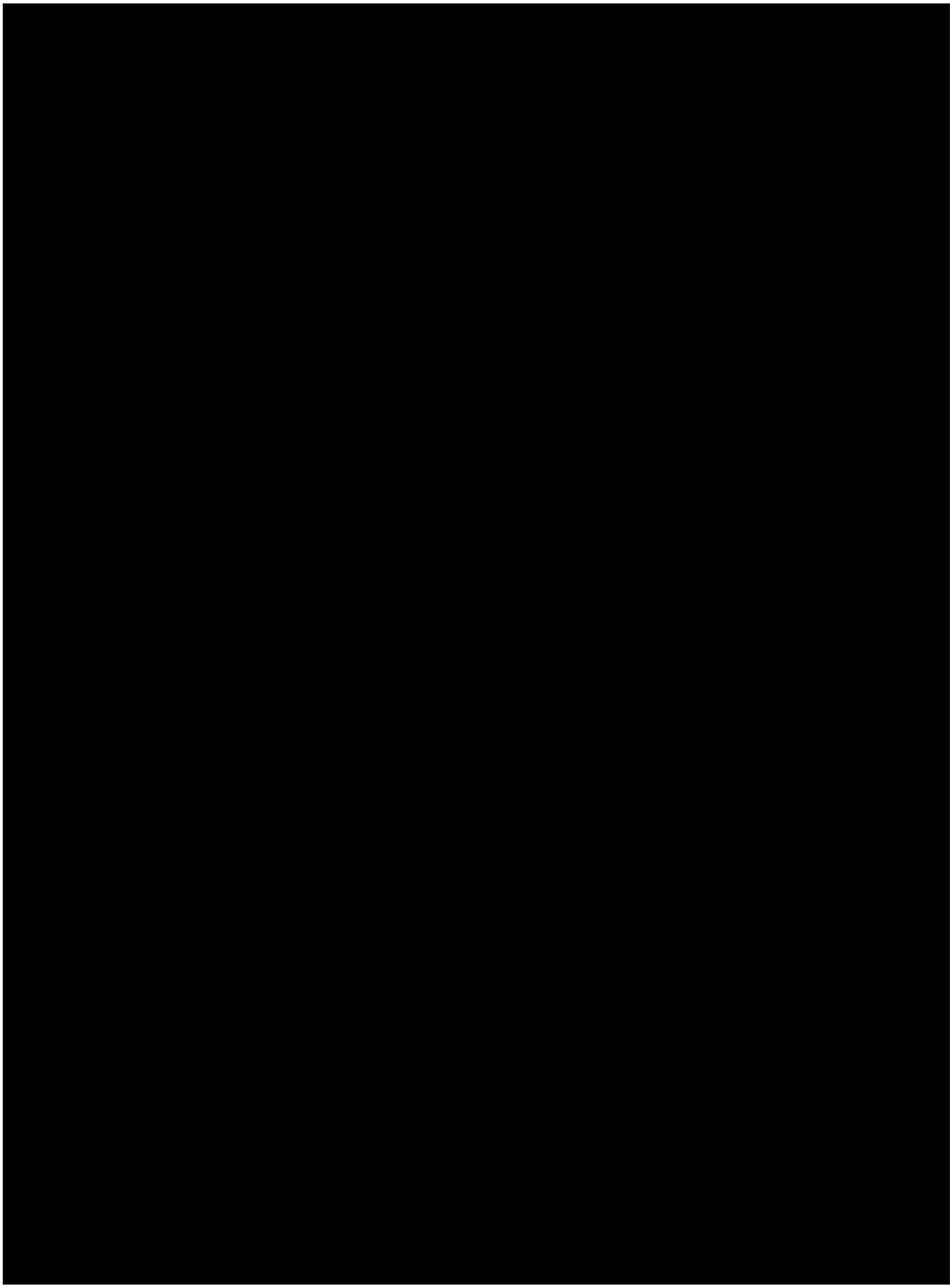




3.1.2.3 Migratory species



3.1.2.4 Threatened ecological communities



3.2 Threatened species survey methods

[redacted] For some species, investigations extended beyond the project area to include the local area, in order to provide a broader understanding of landscape context and to capture areas adjacent to the project area that may have represented more suitable habitat for the species (thereby increasing the likelihood of detection). EPBC listed species for which targeted surveys were undertaken as part of this current assessment included:

- Striped Legless Lizard (SLL)
- Golden Sun Moth (GSM)
- Growling Grass Frog (GGF).

Detailed survey methods for each of the species are provided in Appendix 3. Survey effort and location of targeted survey for listed species is provided in Figure 15, Appendix 1.

3.2.1 Golden Sun Moth

[redacted]. Previous surveys on Melbourne Airport land west of Sunbury Road failed to detect the species but, due to the presence of suitable habitat, feedback from the Commonwealth, and lack of current knowledge for the species within the project area, targeted surveys for this species were recommended.

Four surveys were conducted on days of appropriate weather conditions and were undertaken in accordance with the Commonwealth survey guidelines (DEWHA 2009a).

3.2.2 Growling Grass Frog

Previous habitat assessments and targeted surveys for GGF were undertaken in February 2019 (Biosis 2019b, unpublished) across all of Melbourne Airport land. Since those surveys were undertaken, additional land has been purchased and added to Melbourne Airport. A habitat assessment and targeted survey t for GGF was undertaken within the new land, located at 270 and 300 Arundel Road, in February 2020. The information and data obtained in February 2019 and 2020 was utilised for this assessment.

Targeted surveys for GGF were undertaken in accordance with Commonwealth survey guidelines (DEWHA 2010).

3.2.3 Striped Legless Lizard

To determine the presence or absence of SLL, targeted surveys were conducted from September through to December 2019 following the Commonwealth referral guidelines for the vulnerable striped legless lizard, *Delma impar* (DoE 2011). Arrays of terracotta roof tiles were placed in areas of potential habitat within and adjacent to the project area. Twenty tile grids were deployed, each grid consisting of 50 tiles set out at 5 metre spacing between tiles, arranged in a grid of 10 x 5 tiles and were checked 15 times at weekly intervals between September and December 2019.

3.2.4 Australian Grayling

Australian Grayling surveys were undertaken between 2013 and 2014 by Biosis for the Runway Development Program, detailed survey methods are recorded within the Biosis 2015 report (Biosis 2015). Although these surveys were undertaken longer than three years ago additional surveys for the species was not recommended because targeted surveys for the species are almost always unsuccessful. The species is very difficult to catch, even in dense populations. Additional surveys will not further enhance our understanding of this species use of the Maribyrnong River.

3.2.5 Swift Parrot

Swift Parrot assessments were not undertaken by Biosis. The most recent Swift Parrot survey was undertaken in autumn 2019 (Steele and Peter 2019). This report and other available reports were utilised for assessing the presence of the species within the project area and the subsequent significant impact self-assessment.

3.2.6 Grey-headed Flying-fox

Grey-headed Flying-fox assessments were not undertaken by Biosis. The most recent Grey-headed Flying-fox survey was undertaken by Ecology and Infrastructure International (2018). This report and other available reports/databases were utilised for assessing the presence of the species within the project area and the subsequent significant impact self-assessment.

3.2.7 Threatened flora

All EPBC listed threatened flora species are considered to have a low likelihood of occurrence within the project area and therefore no targeted surveys were undertaken. No other threatened flora (i.e. FFG Act) were categorised as having a medium or high likelihood of occurring within the project area and none were recorded during field survey and vegetation mapping (see Section 4 and Appendix 4 of this report).

3.3 Threatened ecological communities and native vegetation survey methods

Threatened ecological communities are unique assemblages of plants, animals and ecological interactions. Although the species that make up an ecological community may be common and widespread, it is their occurrence in a particular part of the landscape that makes them important. Ecological communities become threatened when landscape scale modifications, such as land clearing for agriculture on fertile soils, causes loss of a community and its functioning across widespread geographical areas. Ecological communities may also be threatened if they are inherently restricted to small geographical areas or highly localised environmental conditions.

Threatened ecological communities are protected under both State and Commonwealth legislation. From background research, three TECs listed under the FFG Act and five TECs listed under the EPBC Act were considered to have some potential to occur in the project area (Table 4, and Appendix 4). In many instances there is overlap in the listing of a community between State and Commonwealth legislation, whereby broadly similar communities are listed and given different names in each jurisdiction. Furthermore, each jurisdiction

has its own thresholds for delineating a TEC based on location, characteristics and condition. EPBC Act listed communities tend to have a much narrower and well-articulated set of key diagnostics that are published by the Australian Government. FFG Act communities have broader descriptions and less well defined condition thresholds contained in Victorian Scientific Advisory Committee nomination documents.

Usually ecological communities would require separate consideration for the purposes of identification and impact assessment across the two jurisdictions but, given that the project is assumed to occur entirely on Commonwealth land, the provisions of the FFG Act do not apply (see Section 2.1). While impacts to EPBC Act TECs have been assessed in detail according to the Significant Impact Guidelines 1.1 (DoE 2013), impacts to FFG Act listed communities have only been considered as part of an assessment of impacts on the environment on Commonwealth land, in accordance with the Significant Impact Guidelines 1.2 (DSEWPaC 2013).

Identifying EPBC Act listed TECs is conducted in accordance with listing advice and supporting policy statements produced by the Commonwealth government. The process to identify whether a particular patch of native vegetation is a TEC relies on an assessment of:

- Bioregional context
- Landscape setting
- Vegetation structure
- Tree size and density (for treed communities)
- Plant cover
- Plant species richness (species diversity)
- Ecological function.

These considerations were incorporated into the following three-step approach to assessing EPBC Act listed TECs within the project area:

1. Identifying and mapping all native vegetation within the project area using the Victorian EVC classification system.
2. Identifying and mapping all areas of native vegetation that satisfy the criteria for TEC listed under the EPBC Act.
3. Assessing the quality of all TECs present.

3.3.1 Identifying and mapping native vegetation

Survey effort and location of the current native vegetation assessment is provided in Figure 16, Appendix 1.

Native vegetation within the project area was identified and mapped for two reasons. First, the type and extent of native vegetation assisted with an assessment of the project's impacts on the environment on Commonwealth land. Second, the type and extent of native vegetation assisted in identifying the potential presence of TECs.

The listing advice for TECs refer to EVC equivalents that indicate the potential presence of each TEC (TSSC 2008; TSSC 2010; TSSC 2012). The Victorian system of classifying native vegetation into EVCs was therefore used to define and map native vegetation within the project area (DELWP 2017; Appendix 3). The key terms used for identifying and mapping native vegetation are explained in Table 5. Patches of native vegetation were assigned to an appropriate EVC, with reference to EVC benchmarks for the bioregion (DSE 2004a; DSE 2004b). Where native vegetation patches crossed the project area boundary, mapping and assessment of the

native vegetation often extended beyond the project area to include some of the local area, in order to provide a better understanding of the quality of the native vegetation and its landscape context.

Table 5 Key definitions used for identifying, mapping and assessing native vegetation and TECs

Term	Definition	Reference
Native vegetation	Plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses.	VPP cl. 73.01
Patch of native vegetation	An area of vegetation where at least 25% of total perennial understorey plant cover is native or any area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy (note that the Current Wetlands Map has been excluded from this definition.)	DELWP 2017 p. 6
Habitat zone	A habitat zone is a single continuous patch of vegetation of the same EVC and condition. New habitat zones are only defined when one of the following conditions is met: • The EVC changes. • A clear physical boundary occurs. • The site condition score (out of 75) varies by at least 15 points through sampling and the extent of the continuous patch of vegetation to be removed is greater than 1 hectare.	DELWP 2018 p. 15
Scattered tree	A native canopy tree that does not form part of a patch.	DELWP 2017 p. 6
Canopy tree	A mature tree (i.e. it is able to flower) greater than 3 metres in height and normally found in the upper layer of the relevant vegetation type (EVC).	DELWP 2017 p. 35
Ecological Vegetation Class (EVC)	A native vegetation type classified on the basis of a combination of its floristics, lifeforms and ecological characteristics.	DELWP 2017 p. 35
Patch of a Threatened Ecological Community (TEC)	A discrete and uniform area that comprises the ecological community. It does not include substantial elements of other ecological communities, such as woodlands dominated by other tree species and other types of grasslands. However, a patch of the listed ecological community may include small-scale variations in vegetation, and small-scale disturbances, such as tracks or breaks, that do not alter its overall functionality – including the easy movement of wildlife or dispersal of plant spores and seeds.	TSSC 2008 p. 50 TSSC 2010 p. 10

3.3.2 Identifying and mapping TECs

Where a patch of native vegetation was suspected to be a TEC, the listing advice and policy statements for the TEC provided key diagnostic characteristics and condition thresholds that allowed for an objective

determination of TEC presence. The methods used to identify listed TECs, define their spatial extent and assess their condition are outlined below for the relevant communities. These methods vary based on community type (e.g. grassland, woodland or wetland) and the information required to accurately define, map and assess the condition of the TEC. The methods are linked to standard practices outlined in Commonwealth listing advice but also utilise Victorian methods for defining vegetation extent and metrics for quality assessment (Table 5).

3.3.2.1 Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Listing advice (TSSC 2010) and the supporting policy statement (DSEWPaC 2012a) describe this community in two condition states: an intact woodland form (treed) and a derived native grassland form where tree cover has been historically removed. The methods used to identify this community in both of its states, and restored areas, are summarised in Table 6 and are taken from TSSC (2010). A randomised sampling approach was used to collect ground layer condition information for the woodland community. This method is outlined in detail in Appendix 3.

All samples were analysed to determine proportional cover of non-grass weeds. Samples with native grasses present, were analysed to determine proportional cover of perennial native grasses (as per TSSC 2010).

Samples without native grass cover were excluded as there are areas of Hills Herb-rich Woodland (EVC 71) and Plains Woodland (EVC 803) that are dominated by natural patches of bare ground, high cover of organic litter, mosses/ lichens / algae/ fungi and these locations skew the mean values for native grass cover.

The listing advice and conservation advice for this TEC outlines that sampling for species cover and richness to test against community listing condition thresholds, should be undertaken in the best quality part of a patch to avoid biasing or underestimating results (TSSC 2010; DSEWPaC 2012a).

Table 6 Approach for identifying Grey Box Grassy Woodland community

Criteria	Condition thresholds	Method used to test patch against threshold
Tree cover	If tree crown cover is at least 10%, the 'treed' condition state is present. If tree crown cover is less than 10%, the 'derived grassland' condition state is present.	Assessment of tree crown cover from aerial photography and ground observations.
Dominant tree species	For treed patches, Grey Box must be the dominant or co-dominant tree species in the canopy layer. For derived grassland, there must be evidence that the vegetation was once woodland dominated or co-dominated by Grey Box.	For treed patches, identification of dominant tree species on site. For derived grassland, assessment of historical records (e.g. aerial imagery) and observations of trees stumps, logs, recruitment or regeneration Grey Box.
Patch size	Patch must be greater than 0.5 ha to firstly qualify as the community, and then different native cover and diversity thresholds apply based on a 2 ha threshold for patches in the 'treed' condition states.	Patches were mapped to determine size and areas. Minor physical barriers were aggregated based on ecological function (e.g. fauna movement prospects, seed/genetic dispersal, water and nutrient cycling, recruitment and regeneration).

Criteria	Condition thresholds	Method used to test patch against threshold
Weediness	The vegetation cover of non-grass weeds in the ground layer is less than 30% at any time of the year. Any site that has >30% cover of non-grass weeds in the ground layer is not the community.	For treed patches, plant cover data was collected according to a comprehensive life form schema using 47 randomly located 50 m x 1 m point intercept transects (i.e. 2350 data points across the site, Appendix 3). For derived grassland patches, plant covers were estimated with reference to cover charts and, if required, 1x1 m quadrats.
Tree stem size and density	For treed patches ≥2 ha in size there must be at least 8 trees/ha that are >60 cm DBH or hollow-bearing. For treed patches ≥2 ha in size that do not meet the large tree and hollow tree density requirements above there must be at least 20 live trees/ha that are >12 cm DBH.	Tree size, hollow status and density sampling was undertaken using 31 randomly allocated 1 ha plots.
Species richness/diversity	For treed patches <2 ha, there must be at least 8 perennial native species in the mid and ground layers. For derived grassland patches, there must be at least 12 perennial native species in the ground layer.	For treed patches, plant cover data was collected according to a comprehensive life form schema using 47 randomly located 50 m x 1 m point intercept transects (i.e. 2350 data points across the site, Appendix 3). For derived grassland patches, plant covers were estimated with reference to cover charts and, if required, 1x1 m quadrats. Plant species richness data in derived patches was collected using the VQA method.
Perennial native species cover	For treed patches ≥2 ha with at least 8 trees/ha that are >60 cm DBH or hollow-bearing, perennial native grasses must make up ≥10% perennial native grass cover in the ground layer. For all other patches (derived grassland, treed patches <2 ha in size or treed patches ≥2 ha in size with at least 20 live trees/ha that are >12 cm DBH), perennial native species must make up ≥50% of total perennial ground layer vegetation cover.	For treed patches, plant cover data was collected according to a comprehensive life form schema using 47 randomly located 50 m x 1 m point intercept transects (i.e. 2350 data points across the site, Appendix 3). For derived grassland patches, plant covers were estimated with reference to cover charts and, if required, 1x1 m quadrats. Tree size, hollow status and density sampling undertaken using 31 randomly allocated 1 ha plots.

3.3.2.2 Natural Temperate Grassland of the Victorian Volcanic Plain

A field checklist (Appendix 3) was used to identify the presence or absence of NTGVVP in areas mapped as suitable EVCs (i.e. Heavier-soils Plains Grassland). The checklist was based on key diagnostic characteristics

and condition thresholds outlined in the listing advice for the TEC (TSSC 2008). Where the Listing Advice was unclear, further clarity was sought from the NTGVVP Information Sheet (DSEWPaC 2011) and, if required, from guidance provided by DAWE (and its predecessors).

The approach to completing the field checklist is outlined in Table 7. The percentage cover of native flora within each grassland patch was estimated with reference to pre-defined cover charts. Where cover estimates were close to the condition threshold, gridded 1x1 metre quadrats were used to objectively sample plant covers within the grassland patch and confirm the veracity of cover estimates.

For the purposes of assessing minimum contiguous size thresholds, the 'grassland patch' was taken to be the area of contiguous grassland that otherwise met all other key diagnostic characteristics and condition thresholds for the TEC, rather than the (generally larger) Heavier-soils Plains Grassland patch. In addition, the 'native vegetation remnant' was taken to be the contiguous area of native vegetation, whether or not belonging to more than one EVC. DAWE has confirmed that this interpretation is correct and upholds the intention of the listing advice (J. Vranjic, DAWE, pers. comm., March 2020).

Table 7 Approach for identifying Natural Temperate Grassland community

Criteria	Condition thresholds	Method used to test patch against threshold
Location	With limited exceptions, the grassland patch must be associated with Quaternary basalt soils within the Victorian Volcanic Plain bioregion.	The position of the grassland patch relative to modelled geological and bioregional boundaries was reviewed. Surface soil texture observations were made during vegetation mapping on site.
Perennial native flora cover	Native flora must make up ≥50% of total vegetation cover, excluding introduced annuals, within the grassland patch.	The percentage cover of native flora within each grassland patch was estimated with reference to cover charts and, if required, 1x1 m quadrats.
Dominant grass genera	Grasses in the genera *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* make up ≥50% of total native species cover.	The percentage cover of the four key native grass genera within each grassland patch was estimated with reference to cover charts and, if required, 1x1 m quadrats.
Weediness	For grassland patches where *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* are the dominant native genera, one of the following thresholds must be met: • *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* must also make up ≥50% of total perennial tussock cover or • Perennial non-grass weeds must be <30% of total vegetation cover.	The percentage cover of the four key native grass genera and perennial non-grass weeds within each grassland patch was estimated with reference to cover charts and, if required, 1x1 m quadrats.
Native forb cover	For grassland patches where *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* are not the dominant native species, native forbs must make up ≥50% of total vegetation cover	The percentage cover of native forbs within each grassland patch was estimated with reference to cover charts and, if required, 1x1 m quadrats.

Criteria	Condition thresholds	Method used to test patch against threshold
	during spring-summer (September to February).	
Patch size	For a native vegetation remnant ≤1 ha, the grassland patch must be ≥0.05 ha and the crown cover of shrubs/trees >1 m tall must be ≤5%. For a native vegetation remnant >1 ha, the grassland patch must be ≥0.5 ha and there must be <2 mature trees per ha.	Contiguous native vegetation remnants and grassland patches were mapped to determine size and areas. Minor physical barriers were aggregated based on ecological function (e.g. fauna movement prospects, seed/genetic dispersal, water and nutrient cycling, recruitment and regeneration). Mature trees were counted and the crown cover of shrubs/trees >1 m estimated with the assistance of recent aerial imagery (i.e. from the past 6 months), where required.

3.3.2.3 Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains

The listing advice for this TEC provides different condition thresholds that apply under different environmental conditions (TSSC 2012). Part A of the condition thresholds were used because field surveys were not undertaken during a prolonged period of drought (i.e. more than one year). Rather, field surveys were undertaken in summer, during typical seasonal wetting and drying, including after periods of heavy rain. The approach to completing the field assessment is outlined in Table 8.

Table 8 Approach for identifying Seasonal Herbaceous Wetlands community

Criteria	Condition thresholds	Method used to test patch against threshold
Landscape	The patch must be in temperate Australia, on flat plains grading into slopes, lower than 500 m above sea level and generally of poorly draining clay soils, receiving 400-800 mm mean annual rainfall.	The desktop assessment revealed that the project area's location, climate, soil and geomorphology was suitable.
Hydrology	The patch must be on isolated drainage lines or depressions which are seasonally inundated (typically during winter-spring) and subsequently dry (typically by late summer). Rainfall must be the main water source and the salinity of the water is fresh to slightly brackish.	The position of the patch of vegetation in the landscape and types of plants present allowed for hydrological inferences to be made in the field.
Trees and shrubs	Trees and shrubs must be sparse or absent such that the cover of woody species accounts for ≤10% projective foliage cover across the patch.	The cover of trees, shrubs and other woody vegetation was visually estimated in the field, with the assistance of recent aerial imagery (i.e. from the past 6 months), where required.

Criteria	Condition thresholds	Method used to test patch against threshold
Dominant species	Native wetland graminoids and/or native wetland forbs characteristic of the community must make up ≥50% of total vegetative cover in the ground layer.	Flora were identified and the cover of native wetland graminoids/forbs was estimated with reference to cover charts.
Native wetland graminoids	One or more of the following native wetland graminoids is typically present: *Amphibromus* spp., *Carex tereticaulis*, *Deyeuxia* spp., *Glyceria* spp., *Lachnagrostis* spp., *Poa labillardierei* and/or *Rytidosperma duttonianum*.	Flora were identified and checked against the list of species typical of the community.
Native wetland forbs	At least one species of native wetland forb must be present.	Flora were identified and checked against the list of species typical of the community.
Contra-indicators	The wetland must not be dominated by or have a significant cover (>25% vegetative cover) of contra-indicative species (e.g. Cumbungi *Typha* spp., Common Reed *Phragmites australis*, Spike Rushes *Eleocharis* spp. etc.) or otherwise display hydrological and/or landscape features of contra-indicative EVCs (e.g. Tall Marsh EVC 821).	The position of the patch of vegetation in the landscape and types of plants present allowed for hydrological inferences to be made in the field. Flora were identified and the cover of contra-indicative species estimated with reference to cover charts.
Patch size	If the wetland occurs as a single isolated wetland, it must be ≥0.5 ha. If the wetland occurs as a cluster of many small wetlands in reasonably close proximity, the wetlands within the cluster must collectively be ≥0.5 ha across a total area ≥5 ha (i.e. wetland must account for ≥10% of the total area). If an individual wetland or wetland cluster is <0.5 ha, it must be ≥0.1 ha in size and contiguous with a native vegetation remnant that together with the wetland or wetland cluster is ≥1 ha.	Contiguous native vegetation remnants and wetland patches were mapped to determine size and areas. Minor physical barriers were aggregated based on ecological function (e.g. fauna movement prospects, seed/genetic dispersal, water and nutrient cycling, recruitment and regeneration). Where required, aerial imagery was examined to determine whether wetland vegetation belonged to a cluster of wetlands across the broader landscape.

3.3.3 Assessing the quality of TECs

To determine and properly assess the impact on TECs, the quality of native vegetation corresponding to a TEC was assessed using the vegetation quality assessment (VQA habitat hectare) method (DSE 2004c). DAWE has previously endorsed the habitat hectare method as an appropriate means of assessing the condition of TECs such as GBW, NTGVVP and SHW in Victoria. This method is further explained in Appendix 3. For the purposes of assessing impacts and calculating offset requirements, each TEC (or condition state, in the case of GBW) was assigned a weighted average quality score. The average score was weighted such that the contribution

that a given patch of TEC made to the average score of its TEC was proportional to the area of the patch relative to the total area of the TEC within the impact area.

3.3.4 Quantifying loss of TECs

The impact on TECs was quantified by determining the extent (in hectares) of each TEC that would be directly or indirectly lost as a result of the project. Direct losses occur where TECs are located within the impact area. Indirect losses correspond with consequential loss of TECs. Consequential loss occurs where part of a patch of a TEC is removed and, as a consequence, the part that is retained no longer meets the size thresholds for the TEC. It was assumed that there would be no other forms of indirect loss of TECs outside of the impact area (an Environmental Management Plan should be prepared to address other forms of indirect loss). Other natural values

3.4 Other natural values

3.4.1 Common species

Information on common flora and fauna species was collected during targeted and incidental survey efforts and have been added to the flora/ fauna recorded lists in Appendices 4 and 5.

3.4.2 Landscape

Landscape values were defined based on existing bioregional reports and landscape ecology principles such as physical and functional connectivity for fauna.

3.5 Impact assessment approach

In accordance with the Significant Impact Guidelines 1.1, significant impact self-assessments were undertaken for all EPBC Act listed species, ecological communities and migratory species recorded or assessed as having a medium to high likelihood of occurring within the project area (DoE 2013). Where available, species-specific significant impact guidelines were relied on to make impact assessments (e.g. DEWHA 2009a; DEWHA 2009b; DoE 2015; DoEE 2017).

For actions on or adjacent to Commonwealth land, impacts on the environment as a whole must be considered. A significant impact self-assessment for relevant ecological features of the environment on Commonwealth land was conducted in accordance with the Significant Impact Guidelines 1.2 (DSEWPaC 2013).

3.5.1 Likelihood of significant impact

A significant impact on the environment is 'likely' if there is a real or not remote chance or possibility of the impact occurring (DoE 3013). The significant impact criteria outlined in the Significant Impact Guidelines 1.1 (DoE 3013), Significant Impact Guidelines 1.2 (DSEWPaC 2013) and species-specific (e.g. DEWHA 2009a; DEWHA 2009b; DoE 2015; DoEE 2017) significant impact guidelines were assessed for the project. The likelihood of impact criteria (provided by APAM) in Table 9 were used for this assessment. All categories except for rare are 'likely' to result in a significant impact on the environment as per (DoE 3013).

Table 9 Likelihood of impact criteria

Likelihood of impact	Criteria
Almost certain	Very likely to occur as a result of the proposed project construction and/or operations; could occur multiple times during relevant impacting period (probability > 90%)

Likely	Event likely to occur once or more during period of the project (probability 70- 90%)
Possible	Event could occur during period of the project (probability 30-70%
Unlikely	Event is unlikely to occur, but it is possible during period of the project (probability 10-30%)
Rare	May occur only in exceptional circumstances - can be assumed not to occur during period of the project (probability <10%)
Not applicable	Not assessed in this report

3.6 Limitations

The survey effort was underpinned by a comprehensive coverage of grassland vegetation and a sampling approach for woodland vegetation. A discussion of important assessment limitations and relevant government guidelines is provided below and specific limitations for particular survey methods are detailed in Appendix 3, where relevant.

3.6.1 Vegetation surveys

- The dynamic nature of grassy ecosystems means that, over time, vegetation communities naturally change in response to seasonal conditions and also change due to land management practices (e.g. grazing, slashing). Given that vegetation communities are dynamic and that assessments are only a snapshot at particular periods, there are a number of limiting factors influencing the results of the assessment. These limiting factors are not mutually exclusive and the influence of those factors varies throughout the assessment period. Land management practices influence vegetation structure and floristics at short to medium temporal scales and, as such, patch delineation and quality assessments (e.g. habitat hectares assessments) rely on the observed conditions at the time of assessment.
- Use of hand-held uncorrected GPS means that vegetation boundaries are generally accurate to 3-5 metres vertically. Where required, this has been corrected through aerial photography interpretation.
- For most temperate grassy ecosystems the majority of species grow and flower through winter to mid-summer. Assessments were conducted over most of the flowering season, allowing detectability in plant traits, cover and species richness across seasons that would contribute to the overall quality assessment outcomes.
- The boundaries between Hills Herb-rich Woodland (EVC 71), Plains Woodland (EVC 803) and Plains Grassland (EVC 132) were mapped according to floristics as observed on the ground, historical records (e.g. historical plans and 1946 aerial imagery) and soil/geology. However, the transition between these vegetation types typically occurs over an ecocline, meaning that the boundary between the vegetation types can be diffuse and difficult to define at the site scale. At Melbourne Airport, defining a boundary between woodland and grassland is made more challenging by historical and present land uses, which have resulted in the removal of mature trees from areas of Plains Woodland (EVC 803) in the airside zone, thereby converting woodland into derived grassland. While every effort was made to accurately map boundaries between woodland and grassland vegetation types, it should be understood that these boundaries are a construct and do not necessarily represent a clear point of transition that would be visible at all times of the year.

3.6.2 Fauna surveys

- The current survey program was largely undertaken in the spring and summer months, which is when the majority of fauna species are present, active and readily detectable. However species that are active in the autumn and winter months may be present within the project area and not detected during the current survey period.
- Targeted surveys for EPBC listed species were undertaken during timeframes recommended in the Commonwealth survey guidelines for each of those species.
- Striped Legless Lizard is a cryptic species and may not be detected by surveys even when present at a site (DSEWPaC 2011b). Biosis considers the current targeted surveys effort, along with the extensive previous surveys undertaken across a large proportion of Melbourne Airport (Figure 9), sufficient to conclude that the species is highly unlikely to be present within the project area.
- An additional 65.5 hectares of land was included within the project area, landside, after the completion of targed fauna surveys. Additional targeted surveys for fauna were considered unnecessary, given the extent of surrounding targeted fauna surveys and knowledge of the area.

4. Results

4.1 Environmental features

4.1.1 Climate, soil, geomorphology and land use history

Climate, soil and geomorphology influence the vegetation and habitat types that are observable within the project area. DELWP's pre-1750 EVC modelling is available via NatureKit and predicts that, before the industrial revolution, the northern two thirds of the project area (including areas where there are now runways) mostly supported Plains Grassy Woodland, while the southern third of the project area (including a projection north along Arundel Creek) mostly supported Plains Grassland.

Although DELWP's pre-1750 EVC modelling uses climate, soil and geomorphological data as inputs, it is a coarse representation of vegetation types at a landscape scale, ranging from 1:25,000 to 1:100,000 (DELWP 2020). Historical survey plans, historical aerial imagery, geological maps and contemporary on-ground floristics strongly suggest that DELWP's pre-1750 EVC modelling is not an accurate representation of the vegetation types that were and, to some extent, still are present at Melbourne Airport.

Historical parish and subdivision plans from 1840, c.1849 and 1850 suggest that the distribution of woodland and grassland across the project area was similar in the mid-1800s to their distribution in 2020 (Figures 2, 3 and 4). The historical plans of 1840 and c.1849 describe a 'thick scrubby forest of stringy bark' at the current location of the woodland and describe the vegetation to the south, where grassland is currently the predominant vegetation type, as 'open plains', 'plains thinly wooded' or 'good pasture' (Kemp 1840; DoL c.1849; Figures 2 and 3). Robert Hoddle's 1850 subdivision plan places a curved label for 'box forest' along the curved south-western boundary of the present-day woodland and labels the area immediately south as 'open plain red soil', in an area that is currently grassland but described by NatureKit as Plains Grassy Woodland (Hoddle 1850; DELWP 2020; Figure 4).

Maps produced by the Australian Government Department of Defence (DoD 1915; DoD 1938) and Victorian Government Department of Crown Lands and Survey (DCLS) in the early 1900s provide further weight to contemporary vegetation mapping as opposed to NatureKit modelling. DoD maps from 1915 and 1938 depict a dense stand of 'timber' in the vicinity of the present-day woodland and very sparse trees in what is now grassland further south (DoD 1915; DoD 1938; Figures 5 and 6). Similarly, a 1946 photo map covering part of the project area shows that the woodland boundary in 1946 extended almost as far south and east as the current runways, very similar to the present-day distribution of woodland and derived grassland (DCLS 1946; Figure 7).

In line with historical maps and plans, geomorphology and floristics suggest that the majority of the project area would have been grassland, with woodland concentrated around a granodiorite rise and outwash known as Radar Hill in the north of the project area (Figure 8). Radar Hill is represented on some historical plans of the area (e.g. DoL c.1849; Figure 3). Geological maps show that Radar Hill is a granodiorite or granite intrusion surrounded by plains of basalt lava flows (Mines Department 1970; Mines Department 1973; DNRE 1997; Senversa 2020, unpublished). While the basalt plains are characteristic of the Victorian Volcanic Plain bioregion and mapped as such on NatureKit (DELWP 2020), the granodiorite rise of Radar Hill is likely to be an outlier of the nearby Central Victorian Uplands bioregion.

Over time, as the main geological formations have weathered, relatively infertile granodiorite-derived soils (supporting woodland) have developed at Radar Hill and relatively fertile basalt-derived soils (supporting grassland) have formed on the surrounding plain. In addition, granodiorite has weathered and washed out over areas of basalt immediately surrounding Radar Hill, leading to diffuse soil boundaries, which in some

cases are reflected by diffuse vegetation boundaries between woodland and grassland. Climate, soil and geomorphology have influenced the following floristic patterns observable today and documented in various maps since 1840:

- The granodiorite rise of Radar Hill supports a central patch of Hills Herb-rich Woodland, which is often found on granite hill landforms and well drained-soils (DSE 2004a).
- A ring of Plains Woodland encircles the Hills Herb-rich Woodland on the basalt surrounding the granodiorite. Plains Woodland generally occurs on silty, loamy or clay topsoils, with heavy subsoils. The soils in this area are predominantly basalt-derived and therefore heavy, although weathered granodiorite is present at or near the surface (washed away from the central rise) and adds a silty component. Gilgai micro-relief is also present in the Plains Woodland, which is typical of heavy clay soils.
- The ring of Plains Woodland appears incomplete, due to the removal of trees from the southern and eastern sides (i.e. airside), resulting in the presence of Plains Woodland in derived grassland form.
- Within the project area, the derived grassland form of Plains Woodland is typically distinguishable from Plains Grassland on the basis of floristic composition, as follows:
  - Characteristic woodland species, such as Eucalypts *Eucalyptus* spp. (including stumps or suspected stumps), Golden Wattle *Acacia pycnantha*, Gold-dust Wattle *Acacia acinacea* and Common Eutaxia *Eutaxia microphylla*, are present in derived grassland, albeit in stunted or prostrate form due to being regularly slashed. The outermost occurrences of these species (i.e. those records that were most distant from Radar Hill) typically corresponded closely to the woodland boundary observable in 1946 (DCLS 1946; Figure 7).
  - Silky Blue-grass *Dichanthium sericeum* subsp. *sericeum* and/or Red-leg Grass *Bothriochloa macra* seem to favour areas of historical disturbance (e.g. tree removal) and soils that appeared to be basaltic with granodiorite (granitic sand) at the surface. Therefore, the boundary between the derived grassland form of Plains Woodland and Plains Grassland often corresponds closely with the point at which there is a strong transition between grassland dominated almost entirely by Silky Blue-grass and/or Red-leg Grass (Plains Woodland) and grassland dominated by Wallaby Grasses *Rytidosperma* spp. and Spear Grasses *Austrostipa* spp. (Plains Grassland).
- DELWP's pre-1750 EVC modelling suggests that most woodland within the project area would have been Plains Grassy Woodland (EVC 55_61), which is typically dominated by River Red-gum *Eucalyptus camaldulensis* (DSE 2004b). Woodland around Radar Hill is in fact dominated by Grey Box *Eucalyptus microcarpa*, making Hills Herb-rich Woodland (EVC 71) and Plains Woodland (EVC 803) more appropriate EVCs to assign to this vegetation.
- The mean annual rainfall within the project area is 531.3 millimetres (BoM 2020), meaning that grassland within the project area is more likely to be Heavier-soils Plains Grassland (EVC 132_61), which occurs in areas with a mean annual rainfall of at least 500 millimetres.

4.1.2 Wetlands and waterways

Melbourne Airport land is located on broad expanses of basalt plains with a low rise (Radar Hill) in the north-west. These plains and Radar Hill are bounded by watercourses surrounded by escarpment, hillslopes, cliffs and floodplains to the north-west (Deep Creek), south / south-west (Maribyrnong River) and east (Moonee Ponds Creek), and cutting through the middle of the land from north to south (Arundel Creek and Steele Creek/ Steele Creek North). Other smaller drainage lines and channels associated with these waterways are dispersed across Melbourne Airport. The three catchment areas for Melbourne Airport are the Maribyrnong

River, Arundel Creek and Moonee Ponds Creek that ultimately discharge into the Yarra River and on to Port Phillip Bay.

Deep Creek is characterised by a deep and narrow valley cut through the surrounding basalt plains with steep escarpments rising up from the edges of the waterway, which in places rise immediately adjacent to the waterway and in others rise beyond areas of floodplain. In Melbourne Airport, Deep Creek has many bends which forms permanent, still pools of water, and the creek is well vegetated. Deep Creek reaches a confluence with Jackson's Creek where they join and form the Maribyrnong River, a wide, deep and permanent waterway which drains into the Yarra River. The section of Maribyrnong River in Melbourne Airport is wide and fast flowing. Arundel Creek runs north to south through the centre of Melbourne Airport and connects with the Maribyrnong River south of Melbourne Airport. Arundel Creek is a narrow waterway for most of its length, interspersed with small impoundments and two inline dams.

Moonee Ponds Creek flows in the north-east of the project area and is a system that can be considered a semi-permanent waterway. During years of below average rainfall the majority of pools within the creek are dry. Historically, Moonee Ponds Creek was known as Moonee Moonee Chain of Ponds which is descriptive of the nature of this waterway.

Other unnamed tributaries/ drainage channels occur throughout the project area. These areas have been modified and consist of a series of impoundments and drainage lines and were dry at the time of assessment (contained little to no water). Some dams are located in paddocks where there is livestock access, resulting in highly turbid water, pugged embankments and little to no fringing or aquatic vegetation. Other dams are fenced from livestock and are in better condition.

The majority of Arundel Creek is located within the impact area. Only small areas of the terrestrial land adjacent to Deep Creek and the Maribyrnong River are included within the impact area.

4.1.3 Existing conditions

The existing conditions in the Melbourne Airport local area can be divided into airside and landside which represent significantly different land use and conditions.

Airside is a highly managed environment that contains the active airfield, runways, taxiways, and other infrastructure directly associated with the operation of the airfield. Airside is a large flat expanse characterised by hard surfaces, PFAS soil stockpile sites, outbuildings and technical equipment, and is surrounded by large expanses of grassed areas.

Relevant management activities that occur within the airfield include:

- Regular slashing of grasses, with some areas (e.g. near critical infrastructure) mowed up to once per week.
- Use of bird deterrents, such as motion-activated noise generators and shooting.
- Insecticides are applied alongside some lengths of runway to reduce foraging by birds in these high risk wildlife strike zones.

Currently airside is undergoing significant construction works with major earthworks being undertaken for the construction of the Taxiway Zulu and Northern Access project.

Landside is a highly variable landscape with some areas highly modified and developed (i.e. business park) and other areas used for cattle grazing. Some of these areas have been subject to pasture improvement and others are relatively intact. A large intact woodland area is located in the north-west. An operational construction materials plant is located south-west of the woodland. Much of landside has been degraded through past land uses and contains expanses of weedy areas punctuated with native vegetation.

4.1.4 Flora species and vegetation types

A total of 298 plant taxa were recorded in the project area. Of the species recorded, 136 were native and 162 were introduced. A flora species list is presented in Appendix 4.

Site investigations identified seven terrestrial and two wetland EVCs, including:

- Plains Grassy Woodland 55
- Creekline Grassy Woodland EVC 68
- Hills Herb-rich Woodland EVC 71
- Heavier-soils Plains Grassland EVC 132
- Riparian Woodland EVC 641
- Plains Woodland EVC 803
- Escarpment Shrubland EVC 895
- Aquatic Herbland EVC 653
- Tall Marsh EVC 821.

The remaining vegetation and land cover in the project area is predominantly introduced vegetation and highly modified areas. Open water also occurs associated with local creeks and farm dams.

Vegetation types are described in detail in Table 10 and photos of each EVC are provided in Appendix 6. It was determined that the patch of Hills Herb-rich Woodland at Radar Hill corresponded with an outlier of the Central Victorian Uplands bioregion (see Section 4.1.1 of this report) and was therefore assessed accordingly (Note: the EVC benchmarks for Hills Herb-rich Woodland are identical for the Victorian Volcanic Plain and Central Victorian Uplands bioregions).

4.1.5 Fauna species and habitat

A total of 72 native and four introduced fauna species were recorded within and adjacent to the project area. A list of all fauna species recorded during the current field assessment and the FY19 GGF survey is provided in Appendix 5. A breakdown of detection method for each species is also included. Habitat types for the fauna groups present are described in Table 10 and waterways are described in Section 4.1.2.

4.1.6 Landscape context

The project area is located in Melbourne's northern suburbs. Native vegetation has been cleared or become degraded on most land within 5 kilometres of the project area, either due to agricultural activities (mostly livestock grazing) or industrial and residential development. Nearby waterways (Deep Creek, Jacksons Creek, Arundel Creek, Maribyrnong River and Moonee Ponds Creek) provide the most intact dispersal corridors for fauna. The largest and most intact areas of native vegetation outside the project area but within the local area, are Woodlands Historic Park to the north-east and Organ Pipes National Park to the west.

Table 10 Summary of vegetation and fauna habitat values within the project area (see Figure 17)

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Plains Grassy Woodland EVC 55			
Structure: Small patches dominated by introduced weed species and disturbance-tolerant native species. **Character species:** The dominant overstorey species is River Red-gum *Eucalyptus camaldulensis*. Understorey species include Golden Wattle *Acacia pycnantha*, Lightwood *Acacia implexa* and Hedge Wattle *Acacia paradoxa*. The ground layer includes native grasses such as Wallaby Grasses *Austrodanthonia* spp. and Spear Grasses *Austrostipa* spp. Small herbs are generally present, however prostrate shrubs are the most common non-grass ground cover, particularly Berry Saltbush *Atriplex semibaccata* and Nodding Saltbush *Einadia nutans*. **Weeds:** High threat species such as Serrated Tussock *Nassella trichotoma*, Chilean Needle-grass *Nassella neesiana* and Panic Veldt-grass *Ehrharta erecta* occur.	Plains Grassy Woodland provides habitat for a range of common fauna species such as possums, birds, macropods, bats, reptiles, and amphibians. It provides potential nesting and roosting areas for large birds of prey such as Wedge-tailed Eagle *Aquila audax* and owl species. Where the ground cover is dominated by appropriate food species (see Section 4.3.2) and canopy cover is dispersed it has the potential to provide habitat for the critically endangered GSM. Plains Grassy Woodland present in the project area is too disturbed to provide habitat for SLL.	This EVC has limited distribution in the project area and is highly modified.	This EVC does not represent a TEC. **Note:** EVC 55 has affinities with the 'Grassy Eucalypt Woodland of the Victorian Volcanic Plain Critically Endangered Community' when River Red-gum is dominant canopy species but all patches of this EVC recorded are less than 0.5 ha and highly fragmented so therefore do not meet the size condition thresholds to qualify as a TEC (TSSC 2009). May be visited by the vulnerable Grey-headed Flying-fox when trees in flower.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Creekline Grassy Woodland EVC 68			
Structure: An open woodland growing along seasonal creeks and drainage lines with a grassy/sedgy understorey. In some areas the overstorey is a mix of native species and planted trees. **Character species:** Overstorey is River Red-gum with an understorey of Cumbungi *Typha* sp., Common Reed *Phragmites australis*, Club-rush *Schoenoplectus tabernaemontani*, Hollow Rush *Juncus amabilis*, Pale Knotweed *Persicaria lapathifolia*, Little Club-sedge *Isolepis marginata*, Common Tussock-grass *Poa labillardierei* and Weeping grass *Microlaena stipoides* var. *stipoides*. **Weeds:** Common weed species include Spiny Rush *Juncus acutus*, Creeping Buttercup *Ranunculus repens*, Drain Flat-sedge *Cyperus eragrostis*, Panic Veldt-grass *Ehrharta erecta* and Water Couch *Paspalum distichum*.	Provides habitat for a range of common fauna species such as possums, birds, macropods, bats, reptiles, and amphibians. Significant species likely to utilise this habitat include GGF. Migratory waterbird species may use this habitat on occasion including Latham's Snipe.	Along the riparian zones of Arundel Creek and Deep Creek.	This EVC does not represent a TEC as associated riparian vegetation does not fit the key landscape setting and floristic diagnostics of any listed woodland or wetland community. Growling Grass Frog terrestrial habitat is associated with this vegetation type in the project area. May be visited by the vulnerable Grey-headed Flying-fox when trees in flower. Habitat for Latham's Snipe.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Hills Herb-rich Woodland EVC 71			
Structure: An open woodland with a sparse shrub layer and grassy ground layer on gently rising elevated locations. **Character species:** Overstorey is dominated by Grey Box *E. microcarpa* with occasional Yellow Box *E. melliodora*. The understorey shrub layer is consistently sparse with occasional Fragrant Saltbush *Rhagodia parabolica*, Tree Violet *Melicytus dentatus*, Golden Wattle and Lightwood. The ground layer includes native graminoids and herbs such as Wallaby Grasses, Spear Grasses, Finger Rush *Juncus subsecundus*, Black Anther Flax-lily *Dianella revoluta*, Kidney Weed *Dichondra repens* and Grassland Wood-sorrel *Oxalis perennans*. The resurrection Rock Fern *Cheilanthes austrotenuifolia* also occurs on dry well-drained soils that typify this EVC. This EVC is floristically and structurally similar to EVC 803 but has a lower cover of chenopods and less bare ground and bryophyte cover. **Weeds:** Weed cover is variable and dominated by annual species such as Annual Veldt-grass *Ehrharta longiflora*, Rat's-tail Fescue *Vulpia myuros* and Hair-grass *Aira* sp. Perennial high threat species have a moderate cover and include Serrated Tussock, Galenia *Galenia pubescens* var. *pubescens*, African Box-thorn *Lycium ferocissimum*, Prickly Pear *Opuntia* sp. and Horehound *Marrubium vulgare*.	This habitat type is frequented by macropods, a diverse range of woodland bird species and provides habitat for bats, reptiles, frogs, possums and other mammals and invertebrates. This habitat type is synonymous with the FFG listed Victorian Temperate Woodland Bird Community.	A contiguous patch of habitat embedded in EVC 803 in the north-west part of the project area. Occurs on areas of outcropping granite and well-drained granitic outwash soils	The treed areas of the Airport woodland represent the EPBC listed Grey Box Grassy Woodland TEC. This area provides habitat for the critically endangered Swift Parrot and the vulnerable Grey-headed Flying Fox.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Plains Grassland EVC 132			
Structure: Typically a low growing treeless vegetation community dominated by grasses and herbs. Scattered trees and shrubs are often present. Dominant tussock-forming grass species vary across seasons, soil types and according to disturbance history. **Character species:** Dominant C3 grasses include Wallaby Grasses and Spear Grasses. Dominant C4 grasses include Silky Blue-grass *Dichanthium sericeum* subsp. *sericeum*, Red-leg Grass *Bothriochloa macra*, Windmill Grass *Chloris truncata*, Kangaroo Grass *Themeda triandra*, Rigid Panic *Walwhalleya proluta* and Hairy Panic *Panicum effusum*. Commonly encountered herbs include Lemon Beauty-heads *Calocephalus citreus*, Blue Devil *Eryngium ovinum*, and Bindweed *Convolvulus spp.* **Weeds:** Annual and perennial grass weeds dominate the weed flora in grassland vegetation and include Rat-tail Grass *Sporobolus africanus*, Paspalum *Paspalum dilatatum*, Cocksfoot *Dactylis glomerata*, Toowoomba Canary-grass *Phalaris aquatica*, Kikuyu *Cenchrus clandestinus*, Couch *Cynodon dactylon*, Chilean Needle-grass, Serrated Tussock, Brome-grasses *Bromus* spp., Wimmera Rye-grass *Lolium rigidum* and Oat *Avena* spp. Woody and herbaceous weeds include Artichoke Thistle *Cynara cardunculus* subsp. *flavescens*, Ribwort *Plantago lanceolata*, Buck's-horn Plantain *Plantago coronopus*, Ox-tongue *Helminthotheca echioides*,	Plains Grassland provides habitat for a broad range of reptile species, birds and mammals. It is important habitat for reptiles and invertebrates. This area generally represents ideal habitat for the GSM, however the species has not been recorded within this habitat type in the project area. Tussock Skink was recorded broadly across the project area during the tile grid checks. The species was recorded in Plains Grassland habitat both airside and landside. The Plains Grassland present within the project area appears to be providing good habitat for the species.	Plains Grassland is the dominant native vegetation community throughout the project area. It is predominantly found in areas where some form of active land management or disturbance is occurring, i.e. grazing or slashing in landside area and slashing only in airside areas.	Some areas of EVC 132 represent the 'Natural Temperate Grassland of the Victorian Volcanic Plain critically endangered community' other areas do not meet the size or condition thresholds.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
African Box-thorn, Galenia, Clover *Trifolium* spp., Medic *Medicago* spp., and Peppercress *Lepidium* spp.			

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Plains Woodland EVC 803 (treed condition state)			
Structure: Open woodland with variable shrub cover including restored areas. **Character species:** Overstorey is dominated by Grey Box *E. microcarpa* with very occasional Yellow Box on well-drained soils and River Red-gum in seasonally inundated areas. The understorey varies in species richness and weed cover but generally includes a medium shrub layer of Golden Wattle, Gold-dust Wattle *Acacia acinacea*, Hedge Wattle *Acacia paradoxa*. Chenopods such as Ruby Saltbush *Enchylaena tomentosa*, Berry Saltbush *Atriplex semibaccata* and Nodding Saltbush *Einadia nutans* dominate the ground layer with occasional herbs, grasses and sedges including Rough Spear-grass *Austrostipa scabra* subsp. *falcata*, Wallaby Grasses, Kidney Weed, Grassland Wood-sorrel, Knob Sedge *Carex inversa*, Wattle Mat-rush *Lomandra filiformis* subsp. *coriacea* and New Holland Daisies *Vittadinia* spp. Bare ground and bryophyte cover is high in places reflective of local climatic and soil conditions. Restored areas support a higher diversity of planted small trees and medium shrubs including Sweet Bursaria *Bursaria spinosa*, Drooping She-oak *Allocasuarina verticillata* and Sticky Hop-bush *Dodonaea viscosa*. **Weeds:** Weed cover is highly variable with core areas of the woodland having low weed cover and edges supporting higher weed cover. Key high threat species include Galenia, Bridal Creeper, Serrated Tussock, Chilean Needle-grass, African Box-thorn and Horehound.	This habitat type is frequented by macropods, a diverse range of woodland bird species and provides habitat for bats, reptiles, frogs, possums and other mammals and invertebrates. This habitat type is synonymous with the FFG listed Victorian Temperate Woodland Bird Community.	Occurs on the transition between granitic outwash soils and heavy basalt-derived clays with gilgai micro-relief. A contiguous patch of habitat in the north-west part of the project area.	The treed areas of the Airport woodland represent the EPBC listed Grey Box Grassy Woodland TEC. This area provides habitat for the critically endangered Swift Parrot and the vulnerable Grey-headed Flying Fox. Disturbed small patches of regenerating Wattles such as Lightwood to the west and south of the Airport Woodland do not represent this community as they do not meet the size or condition thresholds that define the community.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Plains Woodland EVC 803 (derived grassland condition state)			
Structure: The derived grassland condition state of Plains Woodland has less than 10% tree cover with occasional scattered remnant trees and slashed Grey Box saplings. There are also tree stumps present in these areas indicating the historical woodland structure. The vegetation structure is a low grassland dominated by native graminoids, scattered herbs and slashed shrubs. **Character species:** Grey Box occurs as scattered trees and the understorey is dominated by Silky Blue-grass, Red-leg Grass, Windmill Grass, Wallaby Grasses, Spear Grasses, Black-anther Flax-Lily and Wattle Mat-rush *Lomandra filiformis*. A number of shrub species are present including Gold-dust Wattle, Golden Wattle and Common Eutaxia *Eutaxia microphylla* var. *microphylla*. Herb species include Lemon Beauty-heads *Calocephalus citreus* and Tufted Bluebell *Wahlenbergia communis s.l.* **Weeds:** Dominant weeds include Paspalum, Serrated Tussock, Chilean Needle-grass and Ribwort.	Provides habitat for a broad range of reptile species, birds and mammals. It is important habitat for reptiles and invertebrates. This area generally represents habitat for the GSM, however the species has not been recorded within this habitat type in the project area.	Occurs in the Airside land management zone to the east of the Airport Woodland in a transitional zone between Plains Grassland and Plains Woodland/Hills Herb-Rich Woodland.	The derived grassland areas represent the EPBC listed Grey Box Grassy Woodland TEC.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Riparian Woodland EVC 641			
Structure: An open Eucalypt woodland community with an understorey of native shrubs and woody weeds, and a grassy/sedgy ground layer. **Character species:** The dominant canopy species is River Red-gum. Understorey species include Blackwood *Acacia melanoxylon*, River Bottlebrush *Callistemon sieberi*, Club-rush , Cumbungi, Common Reed, Hollow Rush, Streaked Arrowgrass *Triglochin striata*, Little Club-sedge, Common Tussock-grass *Poa labillardierei* and Kangaroo Grass. Herbs include *Verbena* sp., Water Pepper *Persicaria hydropiper*, Small-leaved Clematis *Clematis microphylla* and Angled Lobelia *Lobelia anceps*. **Weeds:** Common weeds include Willow *Salix* spp., Rat-tail, Cocksfoot, Toowoomba Canary-grass, Serrated Tussock, Panic Veldt-grass, Drain Flat-sedge *Cyperus eragrostis*, Spiny Rush, Common Blackberry *Rubus anglocandicans* and Blue Periwinkle *Vinca major*.	Provides habitat for a range of common fauna species such as possums, birds, macropods, bats, reptiles, and amphibians. Significant species likely to utilise this habitat include GGF. Migratory waterbird species may use this habitat on occasion including Latham's Snipe.	Riparian Woodland occurs on the western boundary of the project area in the riparian zone of major creeks and waterways such as Deep Creek, the Maribyrnong River and their tributaries.	This EVC does not represent a TEC as associated riparian vegetation does not fit the key landscape setting and floristic diagnostics of any listed woodland or wetland community. Growling Grass Frog terrestrial habitat is associated with this vegetation type in the project area. May be visited by the vulnerable Grey-headed Flying-fox when trees in flower. Habitat for Latham's Snipe.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Escarpment Shrubland EVC 895			
Structure: Due to high level of modification to this EVC, the structure and composition is simplified and the community is now dominated by a small suite of hardy native species. Woody weeds dominate the structure and plant diversity with the remaining small areas. **Character species:** The dominant species found within the project area include *Eucalyptus* spp., Wattles *Acacia* spp., Tree Violet *Melicytus dentatus s.l.*, Berry Saltbush, Nodding Saltbush and Wallaby Grasses and Spear Grasses. **Weeds:** Dominant weeds include Chilean Needle-grass, Serrated Tussock, Artichoke Thistle, Boneseed *Chrysanthemoides monilifera* and African Box-thorn.	Provides habitat for common reptile and bird species.	On steep slopes of incised gullies and tributaries leading down to Deep Creek and Maribyrnong River in the west of the project area.	This EVC does not represent a TEC as associated escarpment vegetation does not fit the key landscape setting and floristic diagnostics of any listed shrubland or woodland community.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Aquatic Herbland EVC 653			
Structure: Aquatic Herbland occupies open, semi-permanent pools where water depth and seasonality limits the dominance of Bulrush and Common Reed. This community is typically treeless with occasional over-hanging trees from adjacent communities. **Character species:** Common species include low densities of Bulrush and Common Reed, Loose-flower Rush *Juncus pauciflorus*, Club Sedge *Isolepis* spp., Small Loosestrife *Lythrum hyssopifolia*, Water Milfoil *Myriophyllum* spp., Swamp Lily *Ottelia ovalifolia* subsp. *ovalifolia*, Streaked Arrowgrass and Duckweed *Lemna* spp. **Weeds:** Dominant weeds include Willow species, Jointed Rush *Juncus articulatus* subsp. *articulatus*, Ribwort, Water Couch, Water Buttons *Cotula coronopifolia*, Panic Veldt-grass, Cocksfoot and Toowoomba Canary-grass.	Significant species likely to utilise this habitat include GGF. Migratory waterbird species may use this habitat on occasion including Latham's Snipe.	Aquatic Herbland occurs as very small patches along Arundel Creek, where it is a transitional zone between Tall Marsh and Creekline Grassy Woodland / Riparian Woodland. One isolated patch is also present within a seasonally inundated drainage dam or depression beside a disused track near the western boundary of the project area.	This EVC does not represent a TEC as associated wetland vegetation does not meet the key diagnostic characteristics or condition thresholds of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains Critically Endangered Community. Most Aquatic Herbland within the project area occurs along Arundel Creek and not as isolated, depressional wetlands. The single isolated patch lacks sufficient native graminoid/forb cover (it is dominated by introduced species). In all cases, the size thresholds for the TEC are also not met. Along Arundel Creek, this vegetation type is associated with Growling Grass Frog habitat. Habitat for Latham's Snipe.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Tall Marsh EVC 821			
Structure: Occurs as reed beds to 2 m tall in slow flowing or still waterbodies where water depth reaches 1 m. Trees are typically absent, however, in some areas planted trees occur within the canopy layer. **Character species:** Dominated by large graminoids Bulrush and Common Reed. Open areas have similar structure and floristics to Aquatic Herbland described above. **Weeds:** Common weeds include Water Couch, Cocksfoot, Toowoomba Canary-grass, Drain Flat-sedge, and Spiny Rush, Panic Veldt-grass and Aster-weed *Symphyotrichum subulatum*.	Significant species likely to utilise this habitat include GGF. Migratory waterbird species may use this habitat on occasion including Latham's Snipe.	Scattered throughout the central and southern parts of the project area as small patches. Associated with Arundel Creek and modified drainage systems.	This EVC does not represent a TEC as associated wetland vegetation does not fit the key landscape setting and floristic diagnostics of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains Critically Endangered Community. This is due to Tall Marsh being dominated by 'contra-indicator species' (tall native graminoids) and occurring in creek systems not as depressional wetlands. Growling Grass Frog terrestrial habitat is associated with this vegetation type where it is located along Moonee Ponds Creek and Arundel Creek in the project area. Habitat for Latham's Snipe.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Scattered trees			
Scattered remnant trees occur as isolated individuals and include mostly River Red-gum, Grey Box, Lightwood and dead trees. The understorey associated with these trees is predominantly introduced vegetation with the occasional disturbance-tolerant native species such as Nodding Saltbush and Berry Saltbush.	Trees within the project area provide habitat for a broad range of bird species and mammals such as possums and bats.	Throughout the project area.	Although Grey Box occurs as a scattered trees these areas do not represent the Grey Box Grassy Woodland TEC community as they do not meet the size or condition thresholds that define the community. Swift Parrot and Grey-headed Flying Fox may visit scattered trees on occasion.
Planted vegetation			
Tree plantings that are a mix of non-indigenous native species such as Sugar Gum *Eucalyptus cladocalyx*, Lemon-scented Gum *Corymbia citriodora* subsp. *citriodora*, Spotted Gum *Corymbia maculata*, native shrubs, introduced conifers and ornamental species.	Planted vegetation is unlikely to provide habitat to any significant fauna species however it does provide habitat for reptiles, amphibians, birds and mammals.	Mostly occurs landside associated with old buildings, grazing paddocks and farm infrastructure.	Planted vegetation does not represent a TEC.

Vegetation description	Fauna values	Location	Matters of National Environmental Significance
Predominantly introduced vegetation			
A large proportion of the project area supports predominantly introduced vegetation. Within airside zones pasture grasses such as Chilean Needle-grass, Serrated Tussock, Paspalum, Toowoomba Canary-grass, Rat-tail Grass, and Cocksfoot are the dominant species. Throughout landside areas the above pasture grasses are also dominant in addition to woody and herbaceous weeds including Sweet Briar *Rosa rubiginosa*, Boneseed, Galenia, African Box-thorn, Artichoke Thistle, Ox-tongue, Plantain and other broad-leaf weeds.	Introduced vegetation provides habitat for reptiles, amphibians, birds and mammals. Areas where predominantly introduced vegetation is comprised of Chilean Needle Grass represents habitat for the GSM.	Throughout the project area in disturbed locations	Predominantly introduced vegetation does not represent a TEC. Golden Sun Moth are known to occur in an area of Chilean Needle Grass predominantly introduced vegetation in the northern section of the impact area.

4.2 Native vegetation extent

The project area supports 268.47 hectares of native vegetation cover from the nine EVCs described above (reduced from 424.54 hectares). Of the 268.47 hectares of native vegetation in the project area 247.96 hectares is located within the impact area (reduced from 403.86 hectares). [redacted]

4.3 Threatened species

Threatened flora

No threatened flora species were recorded within the project area.

Threatened fauna

The following summarises the results of the current targeted surveys for threatened fauna species and additional background information for those species that were not subject to current surveys in this assessment but impact assessments were undertaken for.

Growling Grass Frog and GSM were recorded within the project area during the current assessment. Swift Parrot and Grey-headed Flying-fox have previously been recorded in the project area (Steele & Peter 2019; Ecology and Infrastructure International 2018) and Australian Grayling is known to occur downstream outside of the project area in the Maribyrnong River (Biosis 2015). Striped Legless Lizard was not detected during the

assessment and is considered unlikely to occur within the project area. Habitat for threatened fauna species within the project area is shown in Figure 18 and within the impact area in Figure 19.

4.3.1 Growling Grass Frog

Targeted survey

Growling Grass Frog was recorded in Deep Creek, Arundel Creek, the quarry lake near Deep Creek, and the dam adjacent to the Golf Course within or adjacent to the project area (Figure 18). Metamorphling GGF were recorded in Arundel Creek and Deep Creek in 2019 and small adults (juveniles) were recorded in the Arundel Creek dams in 2020.

Seven other non-threatened frog species were observed during the surveys across all waterways, including: Eastern Common Froglet *Crinia signifera*, Eastern Banjo Frog *Limnodynastes dumerilii*, Striped Marsh Frog *Limnodynastes peronii*, Spotted Marsh Frog *Limnodynastes tasmaniensis*, Southern Brown Tree Frog *Litoria ewingii,* Southern Stony-creek Frog *L. lesueuri* and Whistling Tree Frog *Litoria verreauxii verreauxii*.

Habitat survey

Waterways and adjacent farm dams, quarries and drainage lines were assessed for habitat values for GGF. Classifications which were used to determine habitat type is listed in the Methods section (Appendix 3.8.1). There is 64.34 hectares of GGF Frog habitat within the impact area. This includes 57.07 hectares of terrestrial habitat, 4.05 hectares of breeding habitat and 3.21 hectares of aquatic habitat. A map depicting the habitat values for GGF as a result of this assessment can be viewed in Figure 20. A description of each waterway within or adjacent to the project area and the value for GGF is described in further detail below.

Arundel Creek

The lower reaches and middle section (around the two water holding dams) of Arundel Creek offer important breeding habitat for GGF. The lower reach of Arundel Creek on Airport land, specifically 200 Arundel Road, contains deeper pools, slow moving water and abundant emergent and fringing vegetation with presence of logs/ branches above the water. In the middle of Arundel Creek there are two large constructed dams. These waterbodies can be classified as deep permanent open freshwater wetlands using the Victorian wetland classification framework 2014 (DELWP 2016) and are characterised by being more than 2 meters deep and retaining water for longer than 12 months, however they can have periods of drying. They are fringed by emergent aquatic vegetation and basalt boulders. The upper section of Arundel Creek between the two dams and Mcnabs Road provides aquatic habitat for the species but at the time of assessment there were no pools suitable for breeding. North of Mcnabs Road where Arundel Creek is diverted under the road there was no suitable aquatic, terrestrial or breeding habitat for GGF at the time of assessment. The upper reaches of Arundel Creek in this area are likely to be used by the species during dispersal only. There is no connected habitat in the vicinity of the upper reaches of Arundel Creek and these upper reaches are unlikely to provide any important habitat for GGF. The large dam located adjacent to the golf course is connected to Arundel Creek by dried-out drainage lines. These drainage lines do not provide habitat for GGF. However, it is likely the species has moved up the drainage line into the dam where one individual GGF was recorded.

The majority of the section of Arundel Creek located within the properties of 270 and 300 Arundel Road is terrestrial or a movement corridor only. This section of creek does not provide permanent aquatic habitat for the species and has been subject to direct access by cattle with the surrounding terrestrial habitat heavily pugged and damaged. There were some areas within this property that did contain small pools and the area closer to the outflow point above 200 Arundel Road held water at the time of assessment.

Moonee Ponds Creek

At the time of assessment Moonee Ponds Creek was relatively dry with the occasional pool of water along the creek. Moonee Ponds Creek is a system which dries out regularly leaving pools of water in deeper sections of the creek. Historically, Moonee Ponds Creek was known as Moonee Moonee Chain of Ponds which is descriptive of the nature of this waterway. Moonee Ponds Creek is used as aquatic habitat by GGF and the remaining pools of water are likely to be utilised as breeding habitat. At the time of assessment the remaining pools were drying out and unsuitable as breeding habitat. However this is likely to vary between years and the creek is considered breeding and aquatic habitat.

Growling Grass Frog were not detected in Moonee Ponds Creek itself. However the species was heard calling in an adjacent quarry lake outside of Melbourne Airport land.

Deep Creek

The section of Deep Creek located adjacent to the Melbourne Airport land contains high quality GGF habitat. A total of 12 GGF were found in this section of Deep Creek where the creek contained permanent waterbodies with floating aquatic vegetation. The majority of Deep Creek is lined with basalt rocks, which is an ideal habitat feature for GGF. A single GGF was recorded in the large quarry dam towards the north of Deep Creek. Several Common Long-necked Turtles *Chelodina longicollis* and Murray River Turtles *Emydura macquarii* were also found in the quarry dam.

Maribyrnong River

Maribyrnong River is wide, fast-flowing, and its banks are extremely steep making access difficult. For this reason, it is likely that GGF would only use this section as a dispersal corridor, rather than breeding habitat. Maribyrnong River was not surveyed for GGF due to poor access.

Other waterways, drainage lines and farm dams

Figure 20 depicts the habitat value for other waterbodies within Melbourne Airport land. Many of these smaller drainage lines and farm dams are not suitable aquatic or breeding habitat for GGF. Most of the drainage lines were dry and contained little to no water. The dams are located in paddocks where there is livestock access, resulting in highly turbid water, pugged embankments and little to no aquatic vegetation. These areas have not been considered habitat for GGF but some have been mapped as 'Potential dispersal and ephemeral aquatic habitat'. Impacts to these areas are to be considered for the possibility for indirect impacts to GGF further downstream (i.e. as the result of sedimentation and altered hydrology).

4.3.2 Golden Sun Moth

Targeted surveys for GSM confirmed the presence of this species in the GSM survey site Northern area only, where eight males were recorded on one of the four surveys (Appendix 5). Prior to commencement of the targeted surveys, one single male was recorded within the project area on the 6 December 2019 flying in the GSM survey site Northern area.

Golden Sun Moth were recorded flying within Chilean Needle Grass habitat north of the Grey Box Woodland, characterised by Chilean Needle Grass ground cover with scattered occurrences of native Wallaby Grass and Spear Grass. The GSM habitat is bounded by Sunbury Road to the north, the Grey Box Woodland to the south, east and west. The north-west of the GSM habitat is bounded by a pasture improved paddock (Phalaris dominated).

Golden Sun Moth records and habitat within the project area can be viewed in Figure 19. Golden Sun Moth habitat was classified as all suitable habitat for the species connected to where the moths were recorded. There is 9.74 hectares of GSM habitat within the impact area, the broader contiguous patch of GSM habitat is 12.68 hectares.

Although the survey area expands further in the northern area than where GSM habitat was mapped, there were areas included within the survey area that did not constitute typical GSM habitat such as a pasture improved paddock. This, however, was included in the survey due to the scattered presence <5% cover of Chilean Needle Grass.

Golden Sun Moth were not recorded within any other survey area. Due to the extent and previous effort (Figure 9) of GSM surveys it is highly unlikely that the species is present within these areas.

4.3.3 Striped Legless Lizard

Striped Legless Lizard was not detected within the project area during targeted surveys (Appendix 5). This is despite the substantial survey effort within suitable habitat during the period when known nearby populations were observed to be active.

There has been a substantial survey effort for SLL at Melbourne Airport. A total of 62 tile grids and 52 pit fall traps have been surveyed over approximately 840 hectares of potential habitat to date with no record of the species being detected. It is therefore considered unlikely that the species is present within the project area. With records of the species within 5 kilometres south of Melbourne Airport, and recently recorded within 5 kilometres north of Melbourne Airport (Biosis 2020 unpublished) it is probable that potential habitat at Melbourne Airport would have once been colonised by the species. It is possible that the bulk earth works required to establish the airfield at Melbourne Airport rendered that particular area unsuitable for the species. It is also possible that the long history of the land utilised for farming purposes including pasture improvement, cropping, stocking, and recently small block farming (Barbiston Road area) have caused a local extinction of the species in the area, or even that the species was never historically present within the area.

4.3.4 Swift Parrot

There is 68.02 hectares of suitable foraging habitat for the Swift Parrot located within the impact area. The broader Grey Box Woodland at Melbourne Airport is 154 hectares in size and a large intact area of key tree species (Grey Box) which provide both nectar and lerp foraging opportunities for Swift Parrot. Originally the entire 154 hectares of Grey Box Woodland was included within the exposure draft footprint, the proposed impact to potential Swift Parrot habitat has been reviewed for the preliminary draft and significantly reduced.

Five Swift Parrots were recorded within the Grey Box Woodland in April 2019 (Steele & Peter 2019). Targeted surveys occurred fortnightly between March – April and weekly between April and May 2019 for the species. Previously only one other bird has been recorded within the Grey Box Woodland in 1991 (Beardsell 1991).

In the broader landscape, there are regular records of Swift Parrots in the past 10 years from Bulla, Woodlands Historic Park and Keilor (Birddata 2020).

Previous survey effort included targeted surveys of varying durations and efforts over the following years within the Grey Box Woodland, Melbourne Airport: 1990, 1991 (one individual detected), 1994/95, 1997, 1998, 1999, 2001/02, 2009, 2014 (Grey Box Woodland and Barbiston Road), 2015, 2016, 2019 (five individuals detected).

4.3.5 Australian Grayling

Historic records exist south of the project area in the Maribyrnong River from 2002 (Victorian Biodiversity Atlas, recorded by Tarmo Raadik) and in 2015 in the Maribyrnong River (Victorian Biodiversity Atlas, recorded by Frank Amtstaetter). Suitable habitat for the species is present throughout the Maribyrnong River and its tributaries.

4.3.6 Grey-headed Flying-fox

There is 68.02 hectares of suitable foraging habitat for the Grey-headed Flying-Fox located within the Grey Box Woodland in the impact area. The broader Grey Box Woodland at Melbourne Airport is 154 hectares in size and a large intact area of foraging habitat when in flower between March-May.

The Grey-headed Flying-fox is currently considered a high risk species for aircraft wildlife collision with 22 strikes reported in the last five years at Melbourne Airport (Biosis 2021) and several of these occurring at the northern end of the airfield, suggesting there could be an association with the woodland. The Yarra Bend camp that is most likely to support flying-foxes that forage in the woodland is approximately 22 km to the south-east of the airport, which would mean that direct flight to the woodland is potentially across aircraft flight paths.

An assessment undertaken in 2018 by Ecology and Infrastructure International recorded a total of 20 Grey-headed Flying Fox over four of the six survey nights across Melbourne Airport land. There was no consistent or predictable stream of movement of Grey-headed Flying-fox entering into the same section of airspace each night. The report confirmed that the species visits flowering trees planted within the airport boundary and the Grey Box Woodland.

4.3.7 FFG Act listed species

Four species listed under the Victorian FFG Act were detected during the current survey (Appendix 5) and another four species were recorded within the project area during previous surveys or exist within database records. These species include:

- Swift Parrot (previous assessment)
- Grey-headed Flying-fox (previous assessment)
- Growling Grass Frog (current assessment)
- Golden Sun Moth (current assessment)
- Hooded Robin (database record)
- Speckled Warbler (database record)
- Little Eagle (database record)
- Tussock Skink (current assessment)
- Murray River Turtle *Emydura macquarii* (current assessment).

Habitat for the Platypus occurs adjacent to the project area, whilst no habitat is present within the project area, the recent database records from adjacent waterways warrant potential impacts to the species to be considered.

Habitat in the project area for the four EPBC listed species; Swift Parrot, Grey-headed Flying-fox, Growling Grass Frog and Golden Sun Moth is described in detail above.

There is one database record each for Hooded Robin and Speckled Warbler within the Grey Box Woodland.

Tussock Skink was recorded broadly across the project area during the tile grid checks. The species was recorded in Plains Grassland habitat both airside and landside. The Plains Grassland present within the project area appears to be providing good habitat for the species with seventeen individuals recorded during the tile checks.

One Murray River Turtle was recorded within the quarry dam located above Deep Creek. The species is native to the Murray River and its tributaries in Northern Victoria. It is thought that there is a local naturalised population around Melbourne which has established from pet release. Habitat at Melbourne Airport is outside of this species native range and unlikely to provide critical habitat for the species.

4.4 Threatened ecological communities

Two EPBC Act listed TECs and two FFG Act listed TECs were recorded in the project area and will be impacted by the development. These are described below. The results of the assessments against condition thresholds and EVC benchmarks are in Appendix 7 for the EPBC Act listed TECs.

EPBC Act listed TECs

4.4.1 Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Community background

Grey Box Grassy Woodlands is listed as an endangered ecological community under the EPBC Act. This community may occur on a range of substrates but typically occurs in landscapes of low relief on productive soils derived from alluvial or colluvial materials. It also occurs where the original tree canopy has been cleared but the native ground layer is intact resulting in a derived native grassland condition state. It is found along the transitional landscape zone between the temperate woodlands and forests of the lower slopes and tablelands and the semi-arid communities further inland. Outliers occur in rainshadow areas of southern Victoria. The community is generally dominated by Grey Box with a sparse shrub layer and a species rich ground layer of grasses and herbs.

The community provides valuable habitat for fauna including resident and transient visitors, particularly birds. The main ongoing threats to this community are incremental clearing for a variety of purposes (cropping, infrastructure and maintenance), inappropriate grazing regimes, fragmentation into small remnants, loss or decline of mature trees, lack of natural regeneration, invasive exotic species, salinity, misuse of herbicides, firewood collection and addition of fertilisers to develop pastures (TSSC 2010). There is no adopted or made Recovery Plan for this ecological community.

In southern Victoria, large intact examples of the Grey Box Grassy Woodland community (i.e. those >50 hectares in size) are now restricted to three remnant stands; Eynesbury Woodland, Pinkerton Forest (both near Melton) and Melbourne Airport. The remaining occurrences of Grey Box near Melbourne are isolated trees along road or rail corridors and highly modified small patches.

Occurrence in the project area

The Grey Box threatened community aligns with EVC71 Hills Herb-rich Woodland and EVC 803 Plains Woodland. These EVCs were recorded as large stands of remnant and restored woodland in the north of the project area (land side) and as derived grassland between the existing runways and woodland remnants. Grey Box is the dominant canopy species in treed remnants and there is strong evidence of suppressed Grey Box recruitment in regularly slashed derived native grassland areas.

Listing advice and the supporting policy statement describe this community in two condition states: an intact woodland form and a derived native grassland form where tree cover has been historically removed (TSSC 2010). The community was recorded in both condition states and has also been restored along the northern boundary of the project area. A summary of results used to verify community occurrence is provided in Table 12. All ground layer cover plot data and woodland tree demographic data used to verify assigning woodland stands to the TEC are provided in Appendix 7. In accordance with the listing advice, only samples from the highest quality areas where used to define whether a larger patch of functional woodland habitat qualified as the community (TSSC 2010, page 10).

An area of restored and naturally regenerated woodland habitat occurs to the north of the main stands of EVC 71 and EVC 803 in the project area. This area is contiguous with remnant woodland vegetation and functions as part of the larger patch of habitat supporting native flora, woodland birds, mammal, reptiles, frogs and invertebrates. This area is structurally different from the old growth remnant woodland as it generally lacks large old trees and tree spacing is closer. However, native shrubs occur in the understorey and the ground layer supports native grasses, herbs, cryptogams and a well-developed litter layer. Natural processes such as native plant recruitment are also occurring in this restored area. The restored area was sampled to identify whether or not it qualifies as the listed TEC. This approach was used as the advice in the TEC policy statement (DSEWPaC 2012a, pages 17 and 63) states that diagnostic and condition assessments of woodland patches should also include areas that have naturally regenerated or have been restored / revegetated. Results from restored area samples were aggregated with other results for the overall determination of TEC presence as the restored areas are now considered to be part of a larger patch of functional woodland habitat.

The current assessment recorded a total patch size of 154.00 hectares of the treed condition state (extending beyond the project area) of which 68.02 hectares is within the impact area and 15.68 hectares of the derived native grassland condition state of which 10.72 hectares is in the impact area (Figure 19).

Table 12 Verification for presence of Grey Box Grassy Woodland TEC

Criteria	Thresholds	Results
Tree cover	If tree crown cover is at least 10%, the 'treed' condition state is present. If tree crown cover is less than 10%, the 'derived grassland' condition state is present.	Aerial imagery and on-ground observations indicate that tree crown cover is >10% in EVC 71 and most patches of EVC 803. Four patches of EVC 803 have tree crown cover <10%, but evidence the Grey Box was once dominant and are therefore derived grassland.
Dominant tree species	For treed patches, Grey Box must be the dominant or co-dominant tree species in the canopy layer. For derived grassland, there must be evidence that the vegetation was once woodland dominated or co-dominated by Grey Box.	Grey Box is the dominant tree species in all patches of EVC 803 and EVC 71, including restored areas and areas in the derived grassland condition state. Only minor occurrences of River Red-gum and Yellow Box are present. The presence of regenerating but slashed Grey Box, large Grey Box stumps, slashed woodland shrub species, nearby treed Grey Box Woodland and historical aerial imagery showing tree cover >10% support the conclusion that the areas of derived grassland once had a canopy dominated by Grey Box.
Patch size	Patch must be greater than 0.5 ha to firstly qualify as the community and then different native cover and diversity thresholds apply based on a 2 ha threshold for patches in the 'treed' condition states	All derived grassland patches are greater than 0.5 ha. All treed 'patches' are greater than 2 ha and are considered contiguous functional examples of the ecological community despite minor fragmentation caused by roads, tracks and fences. Functioning of the ecological community relates to wildlife movement, water

Criteria	Thresholds	Results
		and nutrient cycling and recruitment processes. Therefore, the condition threshold is met.
Weediness	The vegetation cover of non-grass weeds in the ground layer is less than 30% at any time of the year. Any site that has >30% cover of non-grass weeds in the ground layer is not the community.	Point intercept transect results for treed patches and cover estimates for derived grassland indicate that total vascular plant cover (i.e. native and non-native plants excluding cryptogams and bare ground) in treed areas is 36% and in derived areas is 69%. Of this plant cover, non-grass weeds occupy 4.3% cover in treed areas and 12.5% in derived grassland. Therefore, non-grass weeds proportionally occupy less than 30% of all plant cover (i.e. 12% non-grass weeds in treed areas and 18% in derived grassland). Therefore, the condition threshold is met and on average treed and derived grassland areas are not dominated by non-grass weeds.
Tree stem size and density	For treed patches ≥2 ha in size there must be at least 8 trees/ha that are >60 cm DBH or hollow-bearing. For treed patches ≥2 ha in size that do not meet the large tree and hollow tree density requirements above there must be at least 20 live trees/ha that are >12 cm DBH	All treed patches of EVC 803 and EVC 71 are >2 ha. Tree sampling undertaken (n=31 x 1 ha samples) indicates a mean density of 15 trees/ha that are >60 cm DBH. Hollow tree sampling undertaken (n=31 x 1 ha samples) indicates a mean density of 11 hollow-bearing trees/ha. Therefore, the condition threshold is met. The second threshold test for this criterion is not relevant.
Species richness/diversity	For treed patches <2 ha there must be at least 8 perennial native species in the mid and ground layers For derived patches there must be at least 12 perennial native species in the ground layer.	All treed patches of EVC 71 and EVC 803 are >2 ha so this test does not apply. • All derived grassland patches contain at least 19 perennial native species in the ground layer.
Perennial native species cover	For treed patches ≥2 ha with at least 8 trees/ha that are >60 cm DBH or hollow-bearing, perennial native grasses must make up ≥10% perennial native grass cover in the ground layer. For all other patches (derived grassland, treed patches <2 ha in size or treed patches ≥2 ha in size with at least 20 live trees/ha that are >12 cm DBH), perennial native species	Point intercept transect results for treed patches with grass cover (all of which are >2 ha) indicate that total vascular plant cover (i.e. native and non-native plants excluding cryptogams and bare ground) in treed areas is 35% and in derived areas is 68%. Of this plant cover, perennial native grasses occupy 5.4% cover in treed areas and 37% in derived grassland. Therefore, perennial native grass cover proportionally occupies at least 10% of all plant cover (i.e. 15% perennial native grass cover in treed areas and 54% in

Criteria	Thresholds	Results
	must make up ≥50% of total perennial ground layer vegetation cover.	derived grassland). Therefore, the condition threshold is met. Cover estimates for derived grassland indicate that total vascular plant cover (i.e. native and non-native plants excluding cryptogams and bare ground) is 69%. Of this plant cover, perennial native species occupy 49% cover. Therefore, perennial native grass cover proportionally occupies at least 50% of all plant cover (i.e. 71% perennial native species cover in derived grassland). Therefore, the condition threshold is met for derived grassland.

4.4.2 Natural Temperate Grassland of the Victorian Volcanic Plain

Community background

NTGVVP is listed as a critically endangered ecological community under the EPBC Act. It generally occurs in low-lying areas on soils of volcanic origin, typically heavy grey to red cracking clays that have poor drainage. Remnant patches of this community are mostly small and fragmented within a landscape that has been impacted by ongoing clearing. This TEC is dominated by one or more of the following native tussock-forming grass genera: Kangaroo Grass *Themeda* spp., Wallaby Grass *Rytidosperma* spp., Spear Grass *Austrostipa* spp. and/or Tussock Grass *Poa* spp. (TSSC 2008). Native herbs often have a scattered or mosaic presence amongst the native grasses while trees and large woody shrubs are sparse to absent. NTGVVP is a complex and variable community where the composition and appearance of species are subject to the influences of seasonal weather patterns and land management practices (TSSC 2008). There is no adopted or made Recovery Plan for this ecological community.

Occurrence in the project area

NTGVVP is associated with EVC 132_61 Heavier-soils Plains Grassland. Heavier-soils Plains Grassland was recorded throughout the project area, but particularly in areas with a history of active land management (e.g. grazing, slashing and mowing). To some extent, past and present management regimes, including regularly slashing and mowing, are likely to have maintained NTGVVP in a similar way to fire, by reducing biomass accumulation from introduced species, particularly weedy grasses. However, these management regimes are also likely to have influenced the composition of NTGVVP across the project area. For example, NTGVVP within the project area is generally species poor and dominated by Wallaby Grass and/or Spear Grass. Kangaroo Grass and native herbs are rare, scattered and certainly not dominant. A summary of results used to justify community occurrence is provided in Table 13.

Areas of Heavier-soils Plains Grassland that did not satisfy the key diagnostic characteristics or condition thresholds of NTGVVP were either dominated by other native grasses, such as Silky Blue-Grass and Red-leg Grass, or high threat weeds, including Blanket Weed *Galenia pubescens*, Chilean Needle-grass and Serrated Tussock.

The current assessment recorded 97.90 hectares of NTGVVP from the project area, of which 87.94 hectares is within the impact area (Figure 19). A further 2.55 hectares of NTGVVP is outside the impact area but would be

consequentially lost because they would no longer meet the size threshold requirements to qualify as NTGVVP. In total, the project would therefore result in the loss of 90.49 hectares of NTGVVP.

Table 13 Verification for presence of Natural Temperate Grassland TEC

Criteria	Condition thresholds	Results
Location	With limited exceptions, the grassland patch must be associated with Quaternary basalt soils within the Victorian Volcanic Plain bioregion.	Most (if not all) NTGVVP patches within the project area occur on basalt-derived soils of the Victorian Volcanic Plain. Geology maps position most of the project area within Quaternary Newer Volcanics geology (Qvn; DNRE 1997), with the exception of watercourses and Radar Hill.
Perennial native flora cover	Native flora must make up ≥50% of total vegetation cover, excluding introduced annuals, within the grassland patch.	Vegetation cover within all NTGVVP patches is ≥50% native, allowing for some small-scale disturbances. Plains Grassland was not mapped as NTGVVP if native flora made up <50% of total vegetation cover.
Dominant grass genera	Grasses in the genera *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* make up ≥50% of total native species cover.	*Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* make up ≥50% of total native species cover in all NTGVVP patches within the project area, although *Themeda* and *Poa* are rare.
Weediness	For grassland patches where *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* are the dominant native genera, one of the following thresholds must be met • *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* must also make up ≥50% of total perennial tussock cover or • Perennial non-grass weeds must be <30% of total vegetation cover.	All NTGVVP patches within the project area meet one or both of these thresholds. One NTGVVP patch within the project area does not meet the first of these thresholds, but nevertheless meets the second threshold. Three NTGVVP patches within the project area do not meet the second of these threshold, but nevertheless meet the first threshold. All other NTGVVP patches meet both thresholds.
Native forb cover	For grassland patches where *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* are not the dominant native species, native forbs must make up ≥50% of total vegetation cover during spring-summer (September to February).	Native forbs make up <50% of total vegetation cover in all NTGVVP patches. However, *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* make up ≥50% of total native species cover in all NTGVVP patches within the project area, meaning this condition threshold is not applicable.
Patch size	For a native vegetation remnant ≤1 ha, the grassland patch must be ≥0.05 ha and the crown cover of shrubs/trees >1 m tall must be ≤5%. For a native vegetation remnant >1 ha, the grassland patch must be ≥0.5 ha and there must be <2 mature trees per ha.	All NTGVVP patches within the project area satisfy this size threshold. No NTGVVP patches are <0.05 ha. Where NTGVVP patches are part of a native vegetation remnant >1 ha, the NTGVVP patch is ≥0.5 ha.

4.4.3 Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains

No vegetation corresponding to SHW occurs within the project area. Wetland EVCs within the project area (i.e. EVC 653 Aquatic Herbland and EVC 821 Tall Marsh) do not meet the key diagnostic characteristics or condition thresholds for this TEC due to one or more of the following:

- The patches of Aquatic Herbland associated with Arundel Creek and all patches of Tall Marsh do not match the hydrological characteristics of SHW. Most Aquatic Herbland and all Tall Marsh within the project area is characterised by a near permanent waterbody. In contrast, the TEC is located in seasonally inundated, isolated drainage lines or depressions, disconnected from rivers and creeks (TSSC 2012).
- While the single, isolated patch of Aquatic Herbland near the western boundary of the project area may have the hydrological characteristics of SHW, it does not have sufficient cover of native wetland graminoids and/or forbs. At the time of assessment, native wetland graminoids and forbs made up approximately 30% of vegetative cover, as opposed to the minimum 50% required for SHW.
- In many instances, wetlands within the project area, including the isolated patch of Aquatic Herbland near the western boundary, are not dominated by native vascular species i.e. native vascular species make up less than 50% of vegetative cover. In other cases (e.g. Tall Marsh), the vegetative cover may be dominated by native vascular species but there is a significant cover (>25% vegetative cover) of contra-indicative species (e.g. Cumbungi *Typha* spp.).
- Wetland vegetation patches within the project area do not meet the size thresholds for SHW. All patches of Aquatic Herbland and Tall Marsh are less than 0.5 hectares. Similarly, there is no cluster of wetland vegetation that collectively would be 0.5 hectares or more when considered across a broader 5-hectare landscape (across the entire project area, the total area of all wetland EVCs is only 0.51 hectares). There is also no patch of wetland vegetation that is 0.1 hectares or more and contiguous with a native vegetation remnant such that they are collectively more than 1 hectare in size.

FFG Act listed TECs

4.4.4 Victorian Temperate Woodland Bird Community

This community is defined by a group of bird species which are totally or largely restricted to temperate woodland habitats and commonly associated with Box Iron- Bark, Yellow Box, Cypress Pine (and other) woodland tree species (SAC 2001). The full list of bird species associated with this community is provided within the Final Recommendation on Nomination for Listing of the community (SAC 2001). A large percentage of the species recorded in the woodland by the current and previous assessments are included within this community. Many other species associated with this community are likely to utilise the woodland within Woodlands Historic Park to the immediate north of the project area, increasing the likelihood that the species may visit the Grey Box Woodland at Melbourne Airport.

This TEC corresponds directly with the Grey Box Woodland TEC described above in section 4.4.1of which there is 68.02 hectares within the impact area. Listed woodland birds within this community that have been recorded or may occur are Swift Parrot, Speckled Warbler, Jacky Winter, and Hooded Robin.

4.4.5 Western (Basalt) Plains Grassland

The Western (Basalt) Plains Grasslands Community is an open grassland community found mainly on undisturbed, poorly-drained heavy clay soils on the basalt plains of western Victoria. These soils are usually waterlogged in winter and very hard, dry and cracking in summer. The vegetation is characteristically dominated by perennial native grasses, with very few eucalypts and shrubs.

There are no minimum patch size or condition thresholds for this community, and its presence is generally considered affiliated with the presence of EVC 132 Plains Grassland.

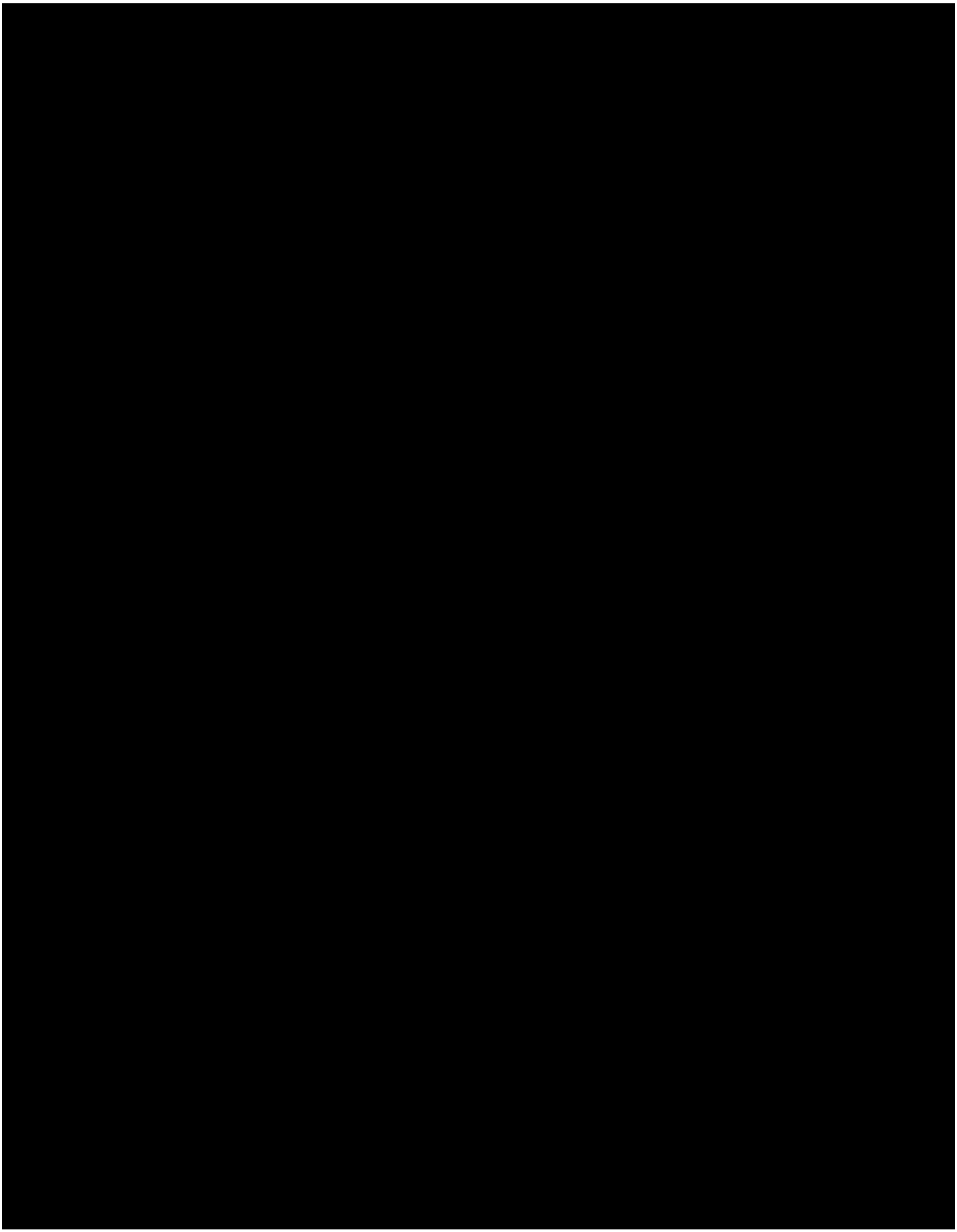
This TEC corresponds directly with all Plains Grassland EVC 132 mapped within the project area in a degraded form. There is 161.37 hectares of Plains Grassland within the impact area. Better quality examples of this TEC corresponds with the NTGVVP TEC described above in section 4.4.2.

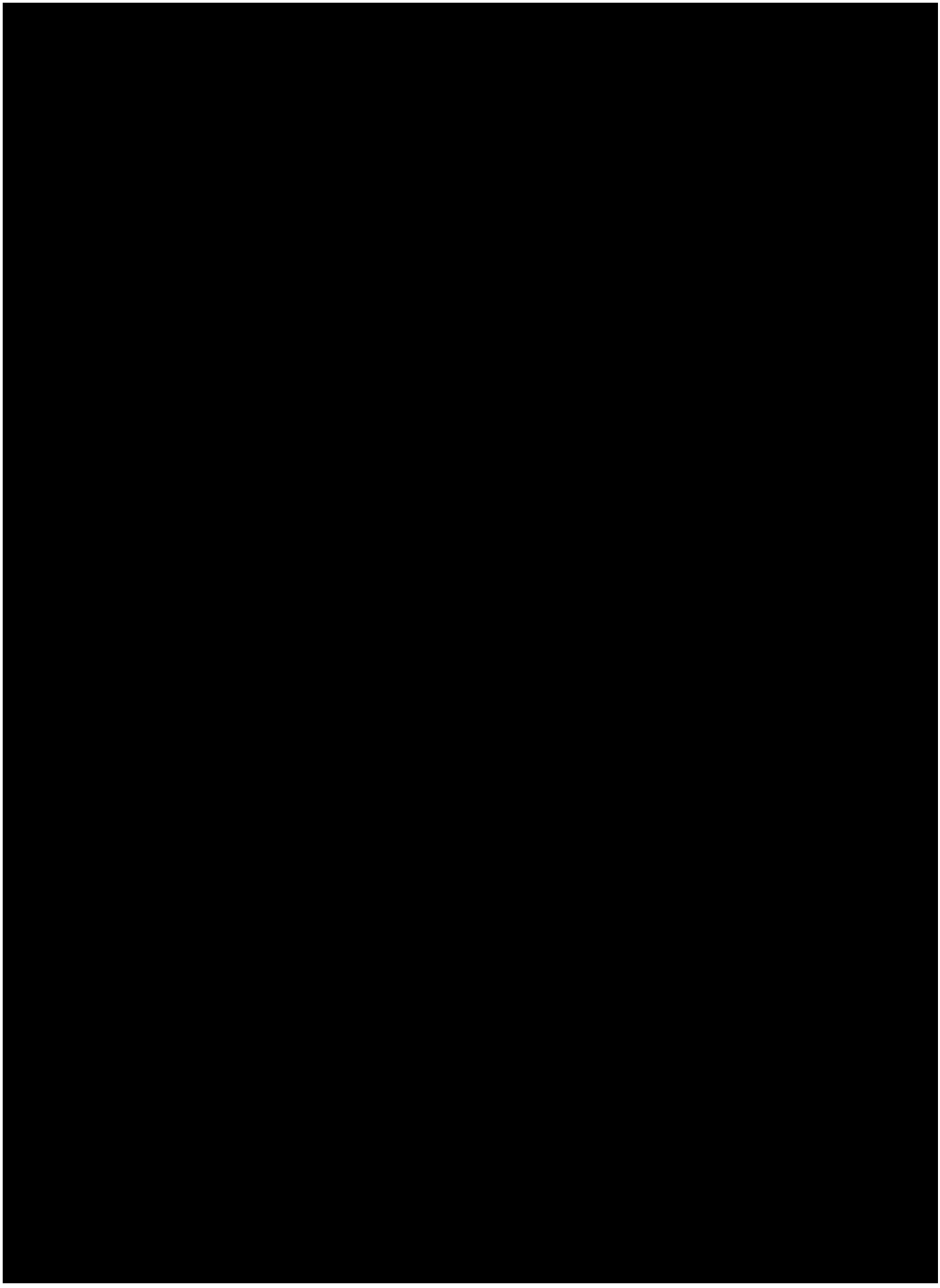
4.5 Listed migratory species

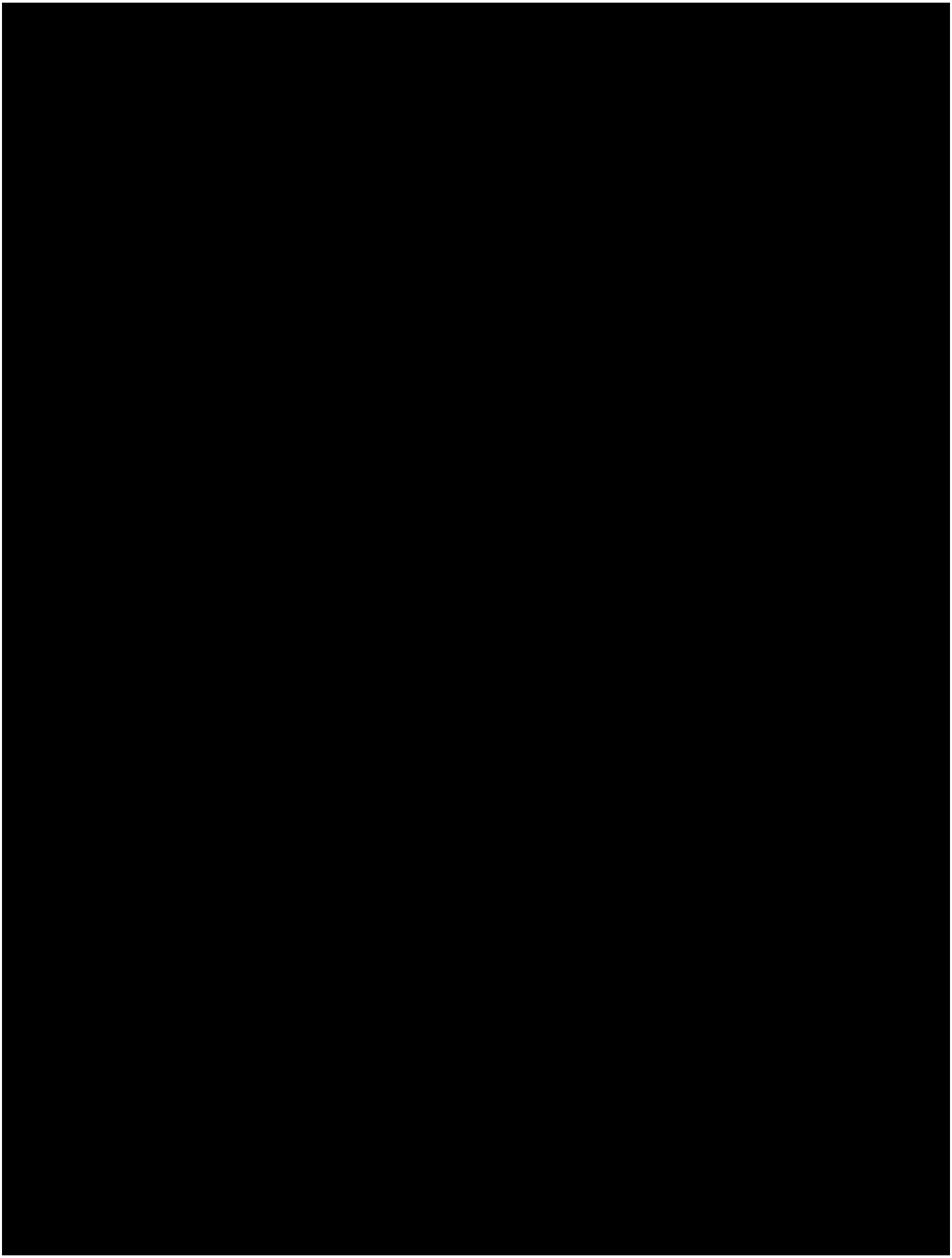
No listed migratory species were recorded during the current ecological assessment. Rufous Fantail and White-throated Needletail have previously been recorded from within the project area.

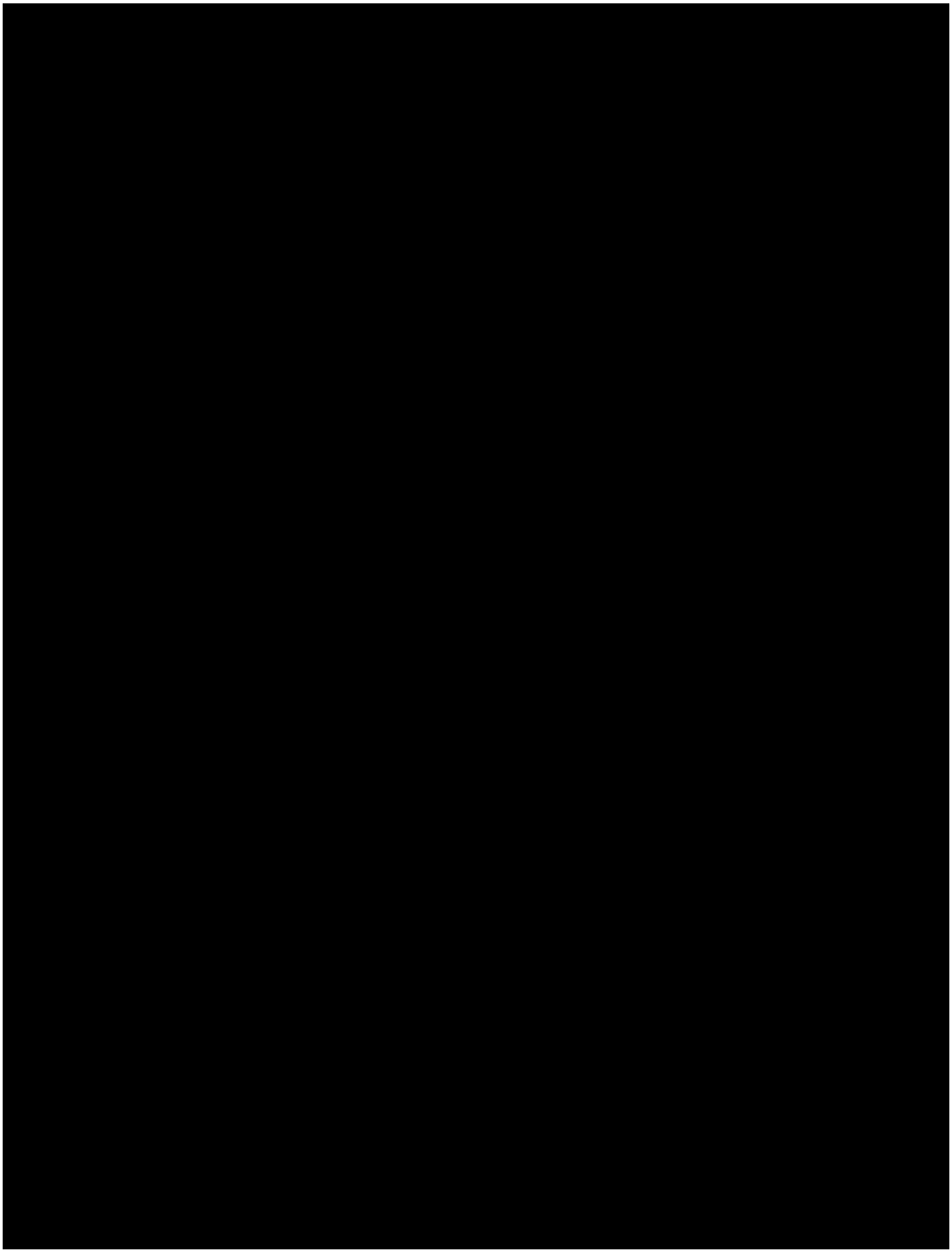
5. Significant impact self-assessment

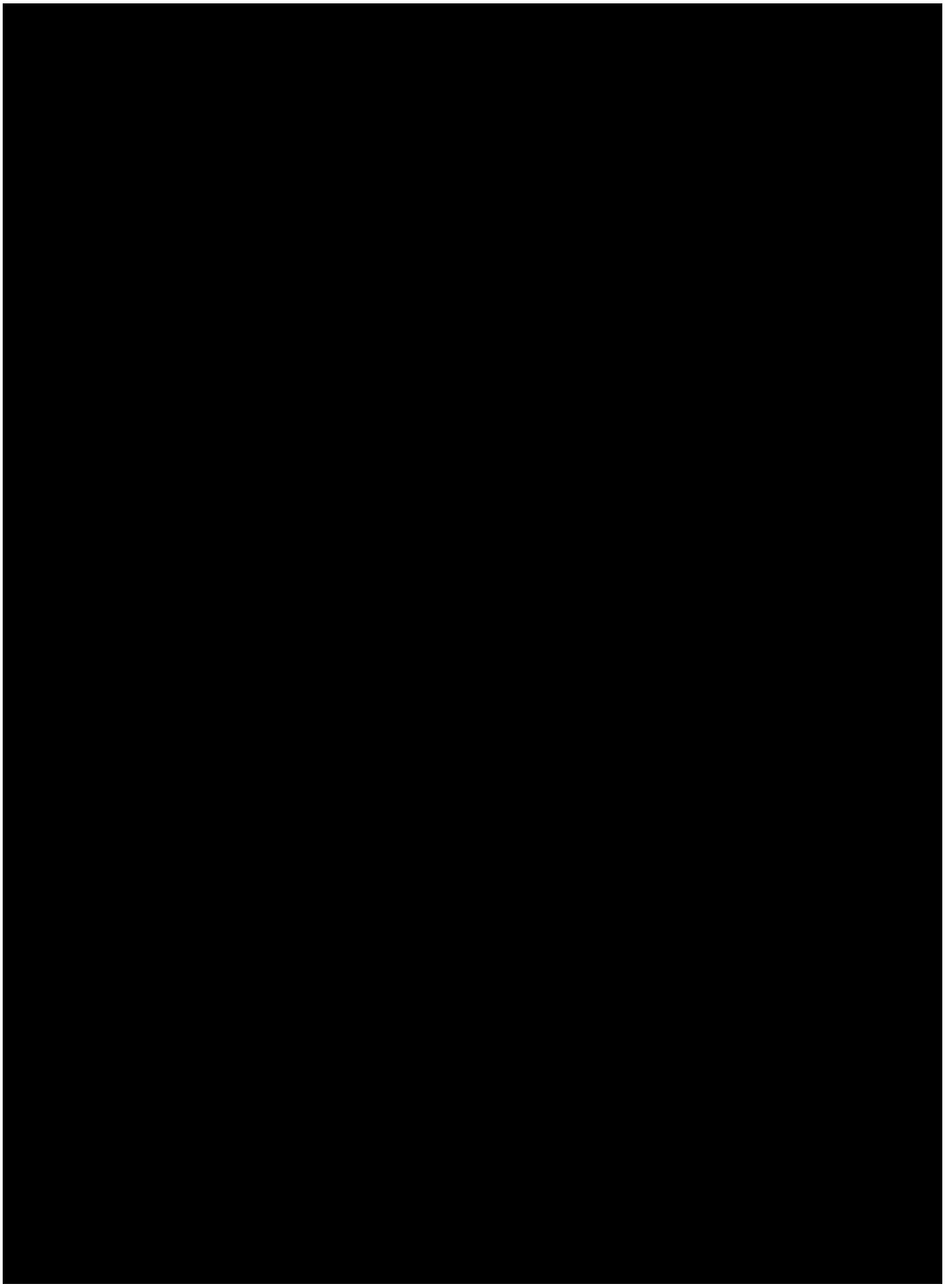
5.2 Significant Impact guidelines 1.2











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5.3 Significant Impact guidelines 1.1

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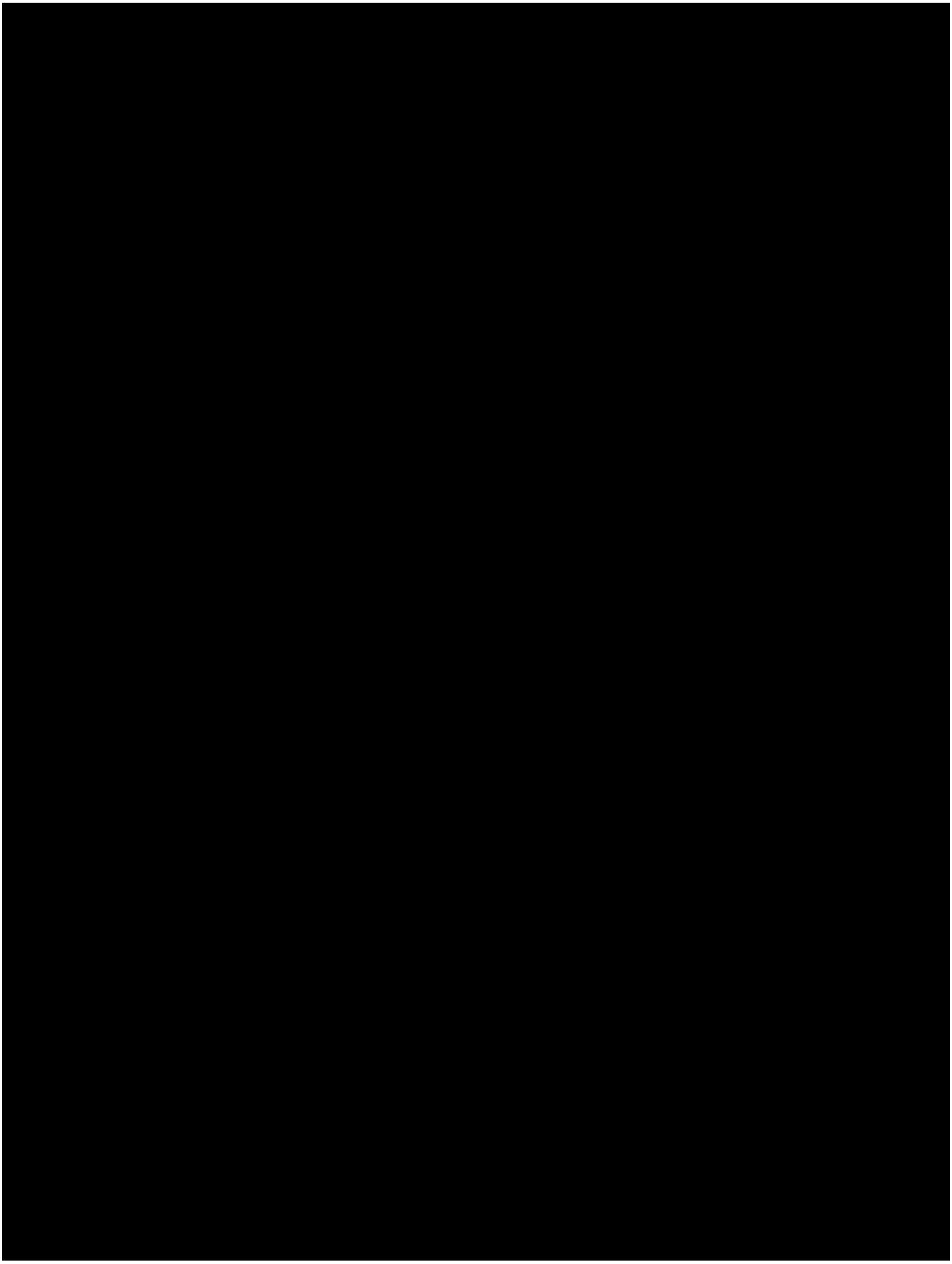

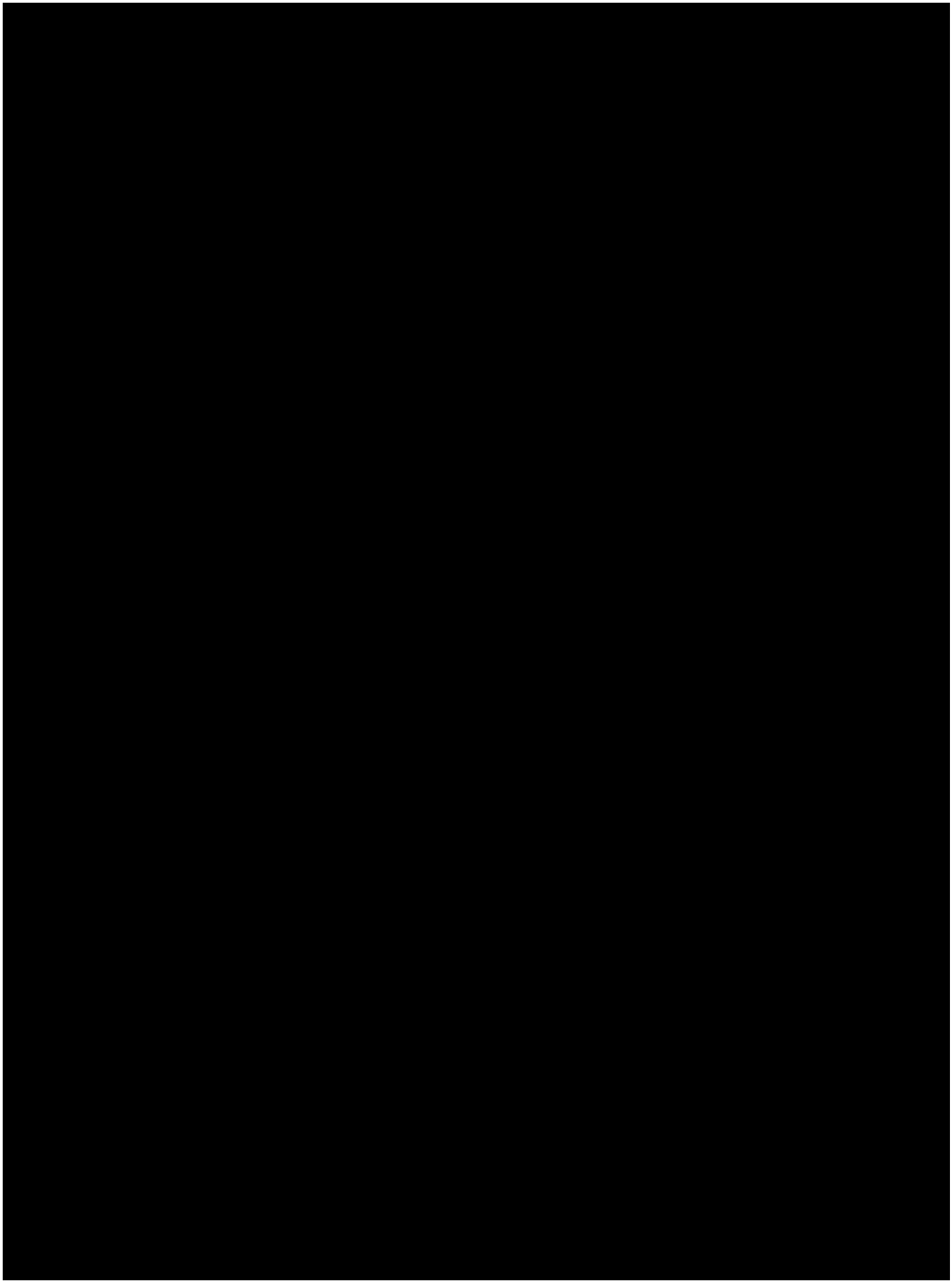

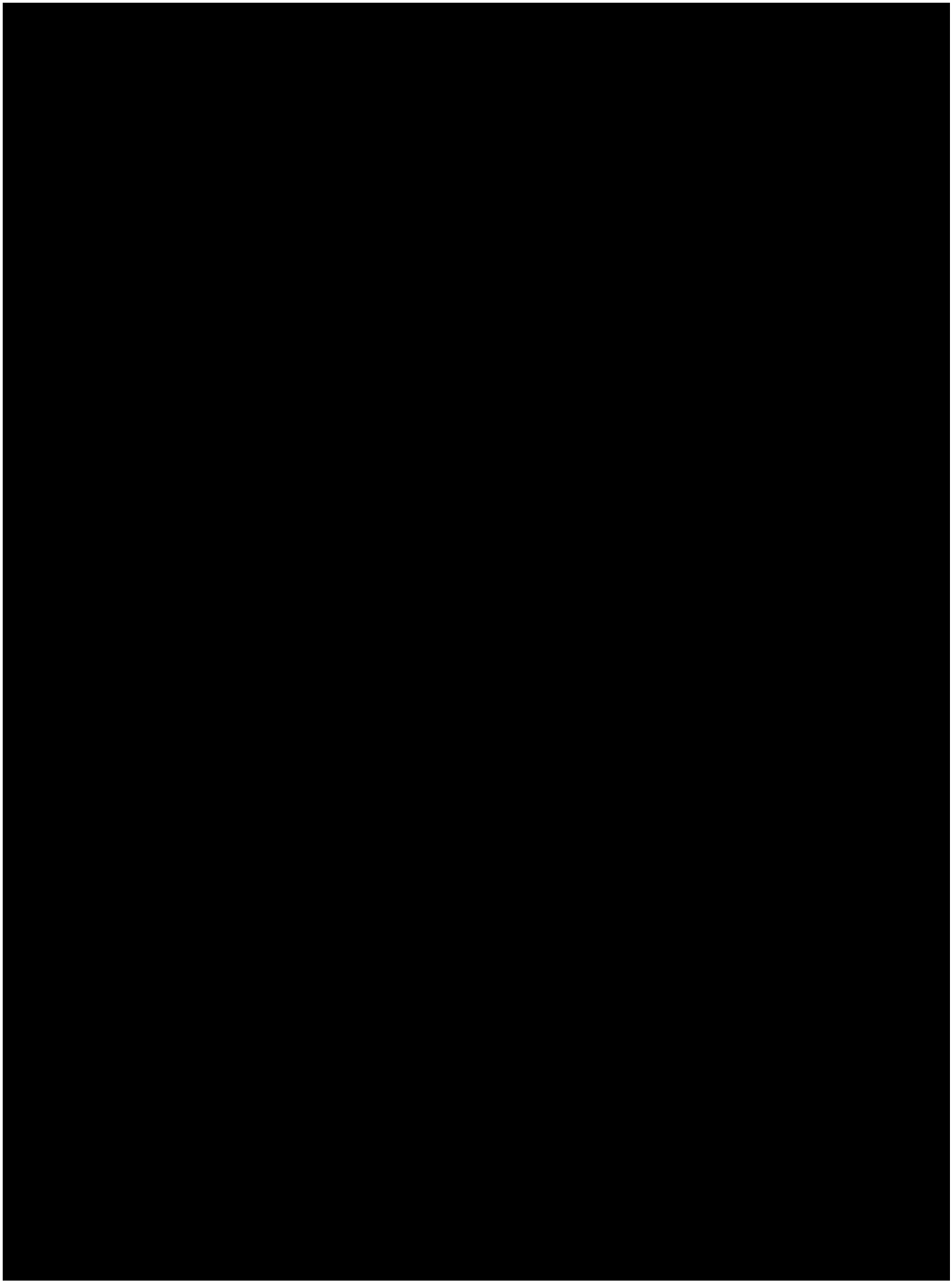

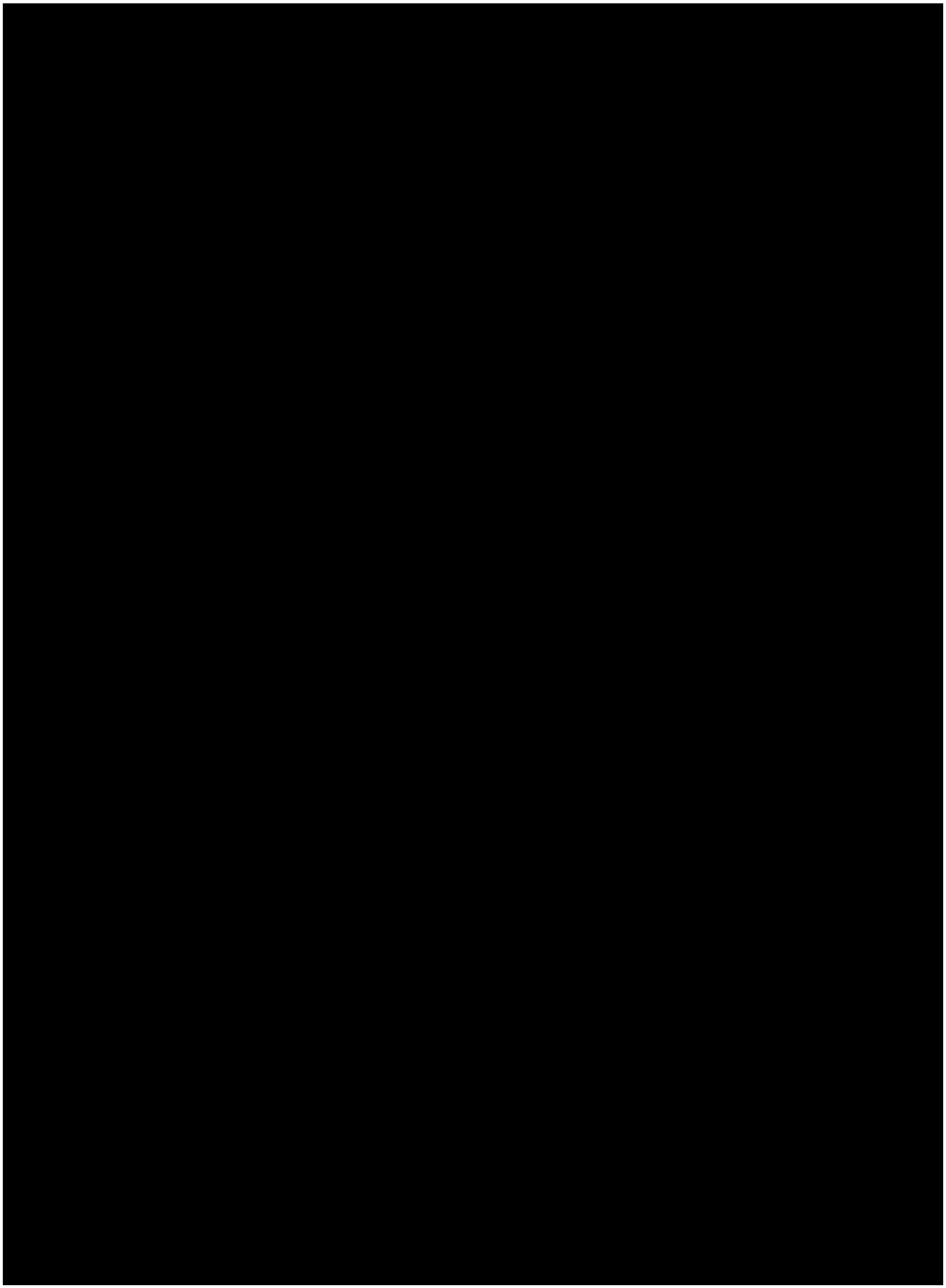

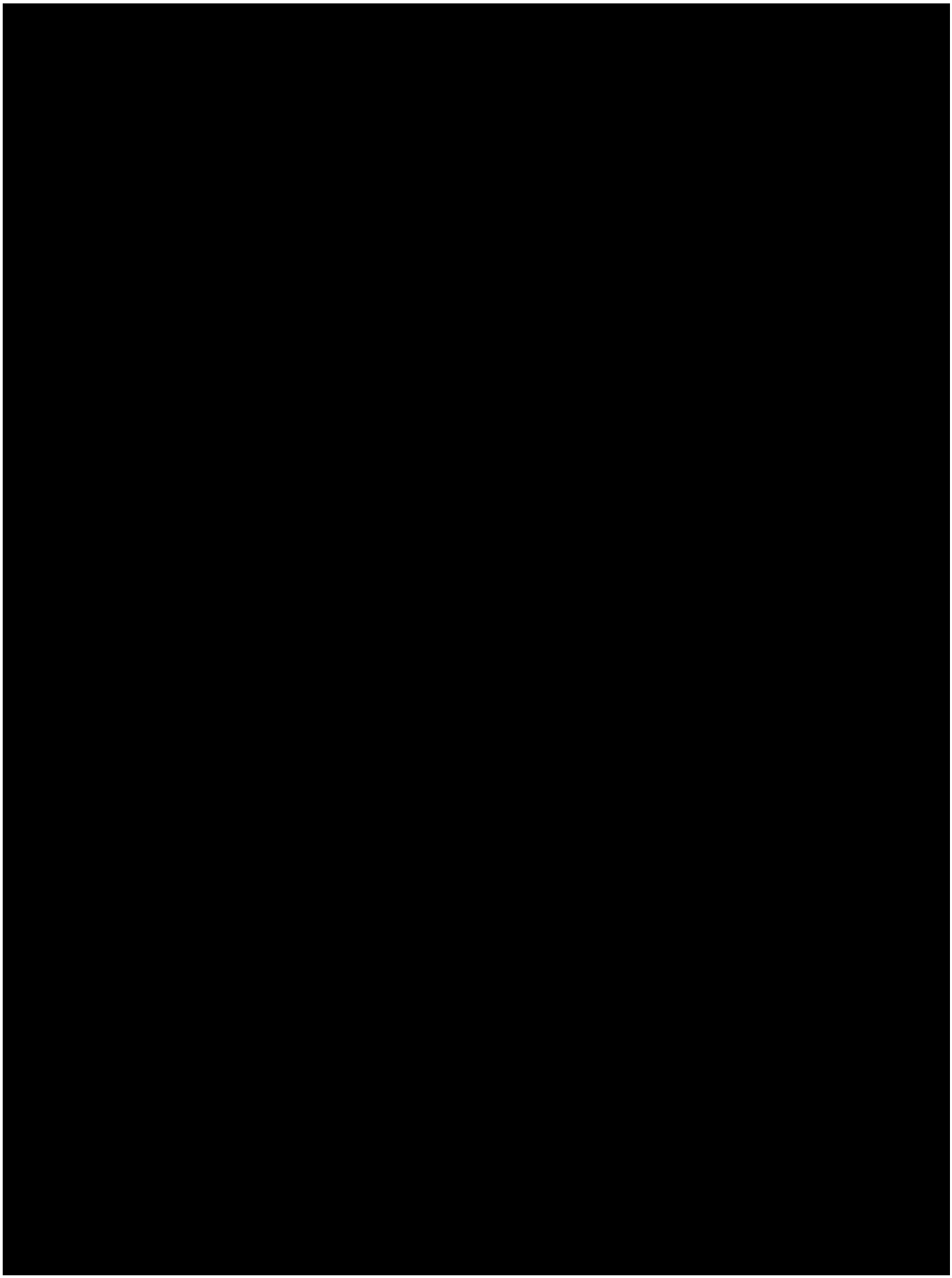

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5.3.1.4 Growling Grass Frog

For assessment of the project against the significant impact criteria it is important to define an important population of GGF and understand whether the population present within Melbourne Airport land is 'important'.

An important population of GGF is described as:

Any viable population is considered to be an important population for the persistence and recovery of the Growling Grass Frog. For this species, a viable population is one which is not isolated from other populations or water bodies, such that it has the opportunity to interact with other nearby populations or has the ability to establish new populations when water bodies fill and become available (DEWHA 2009b).

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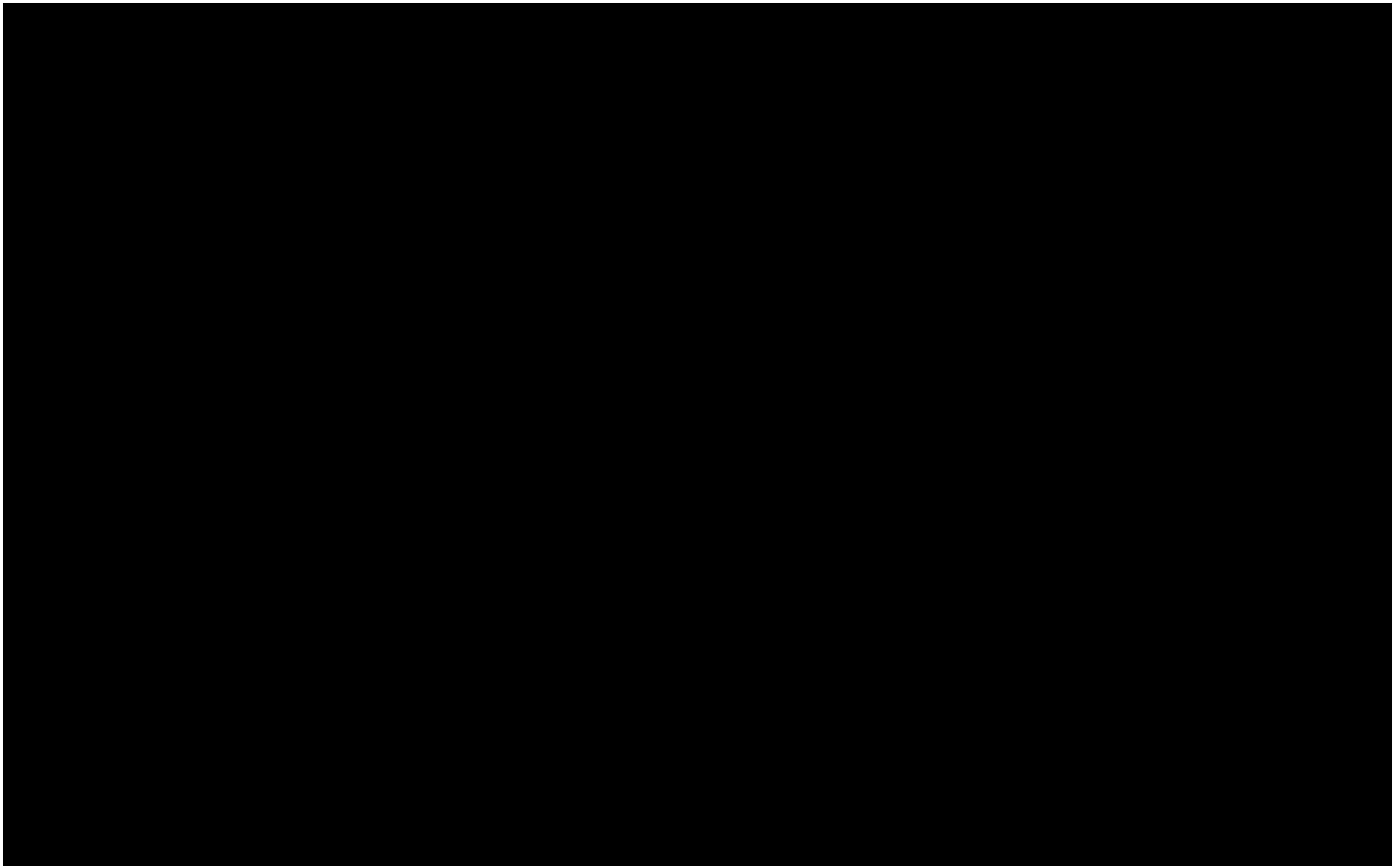
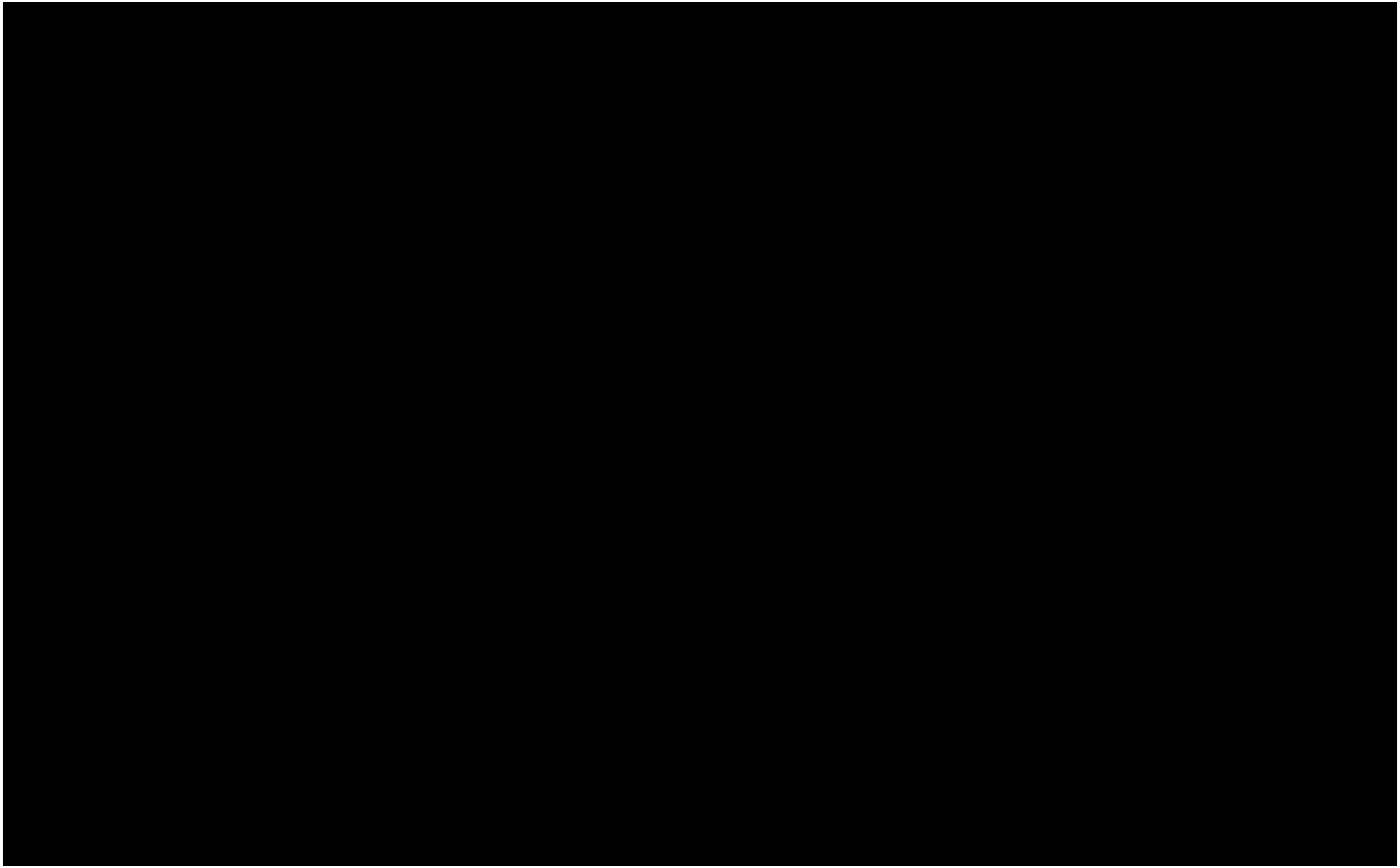
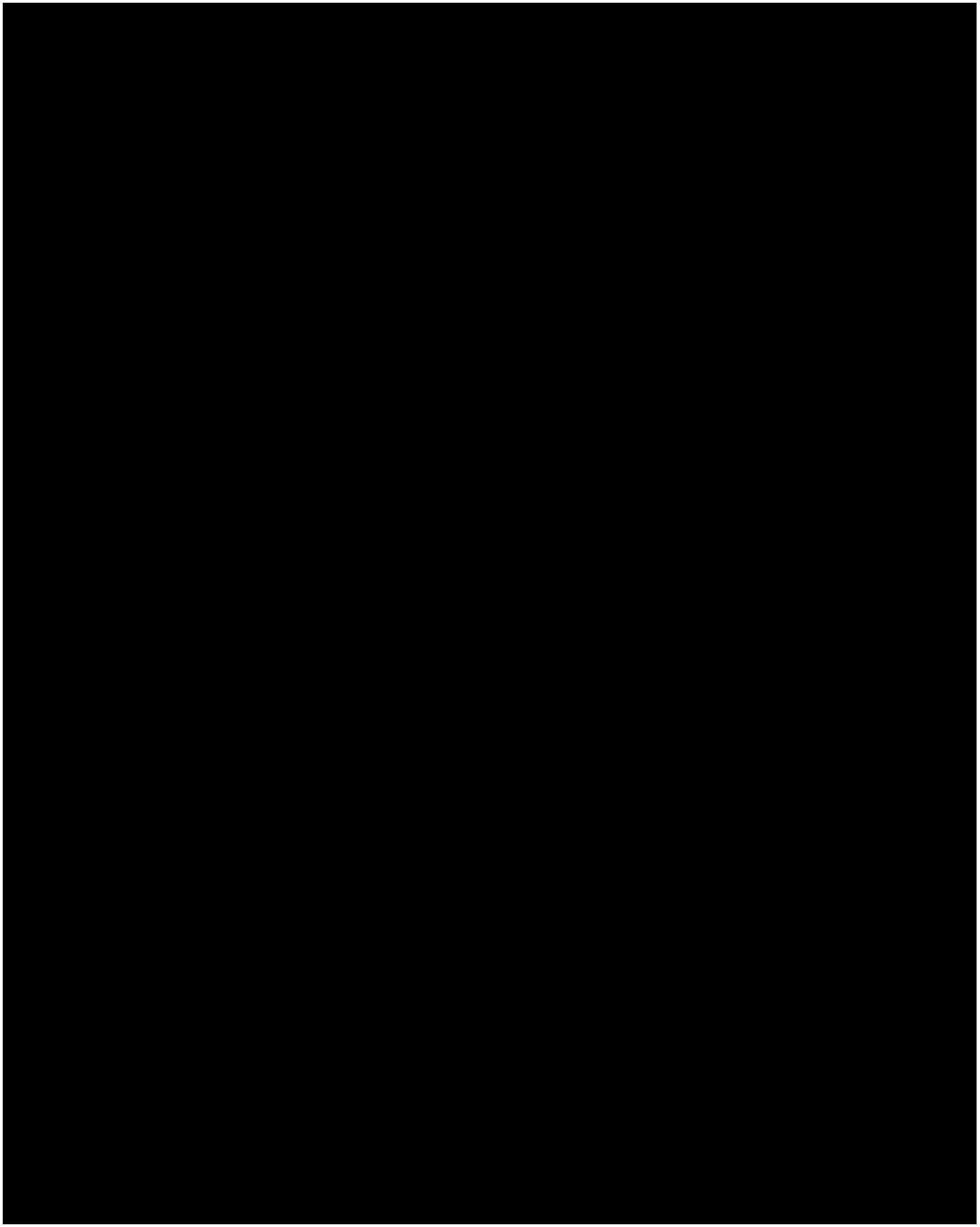
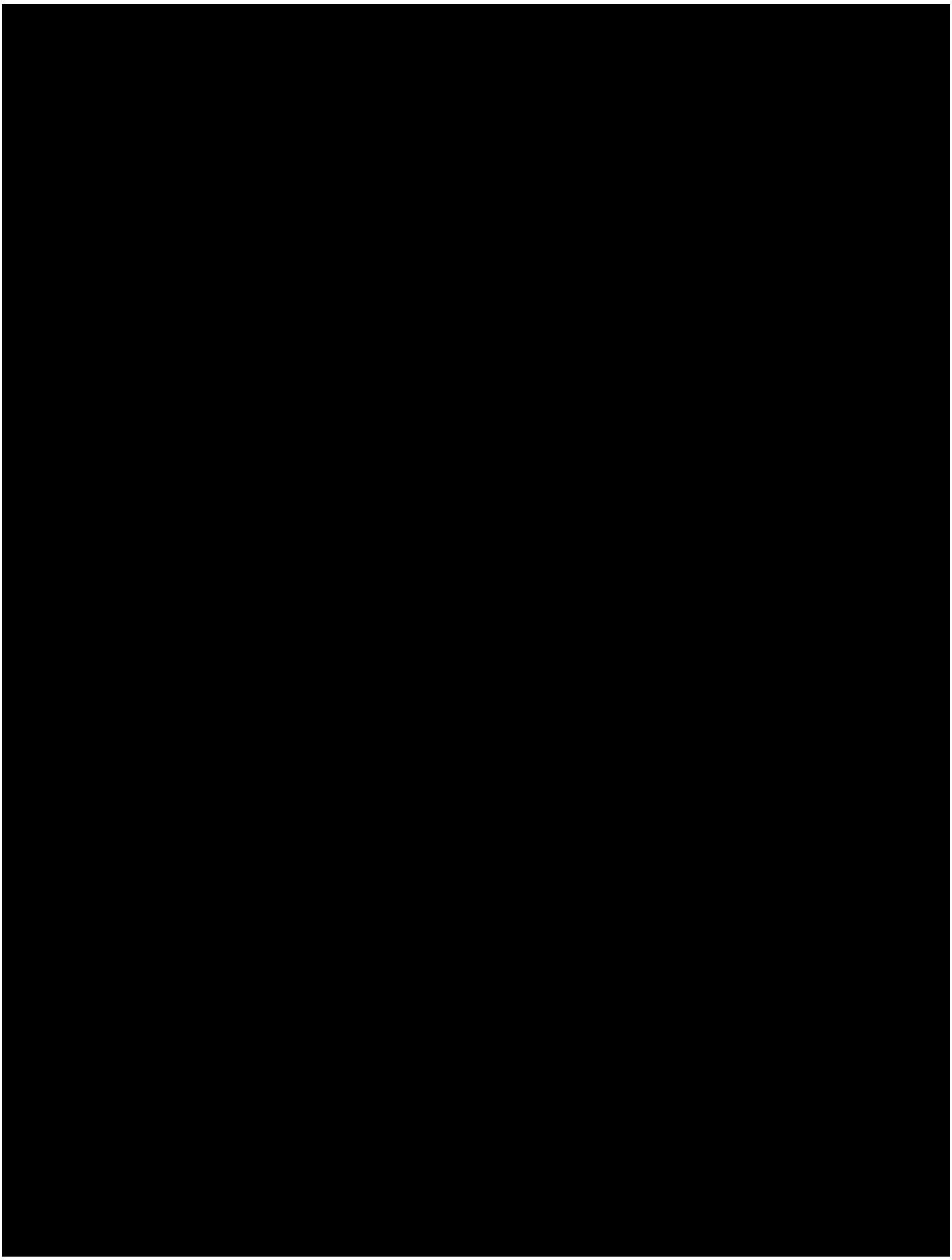
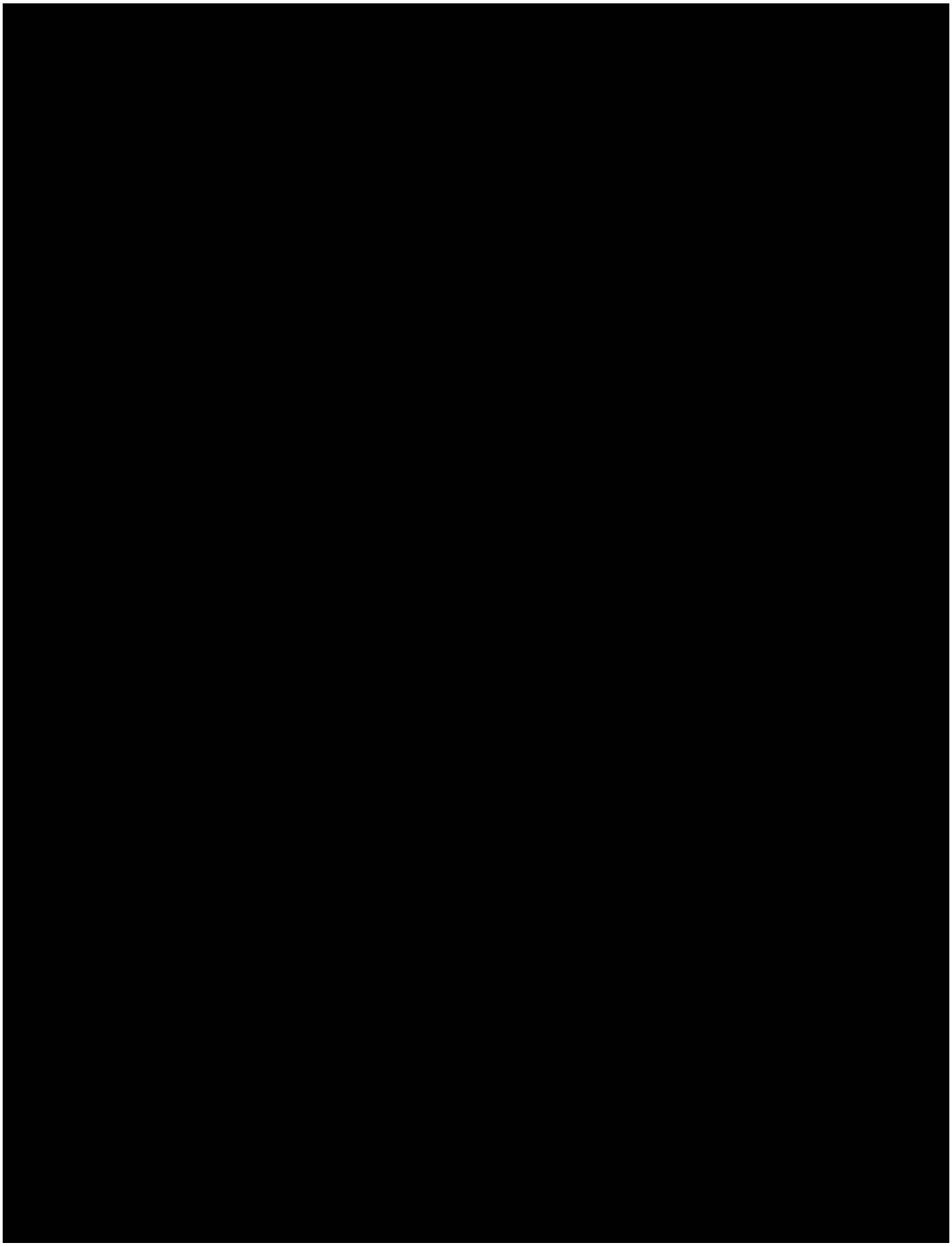
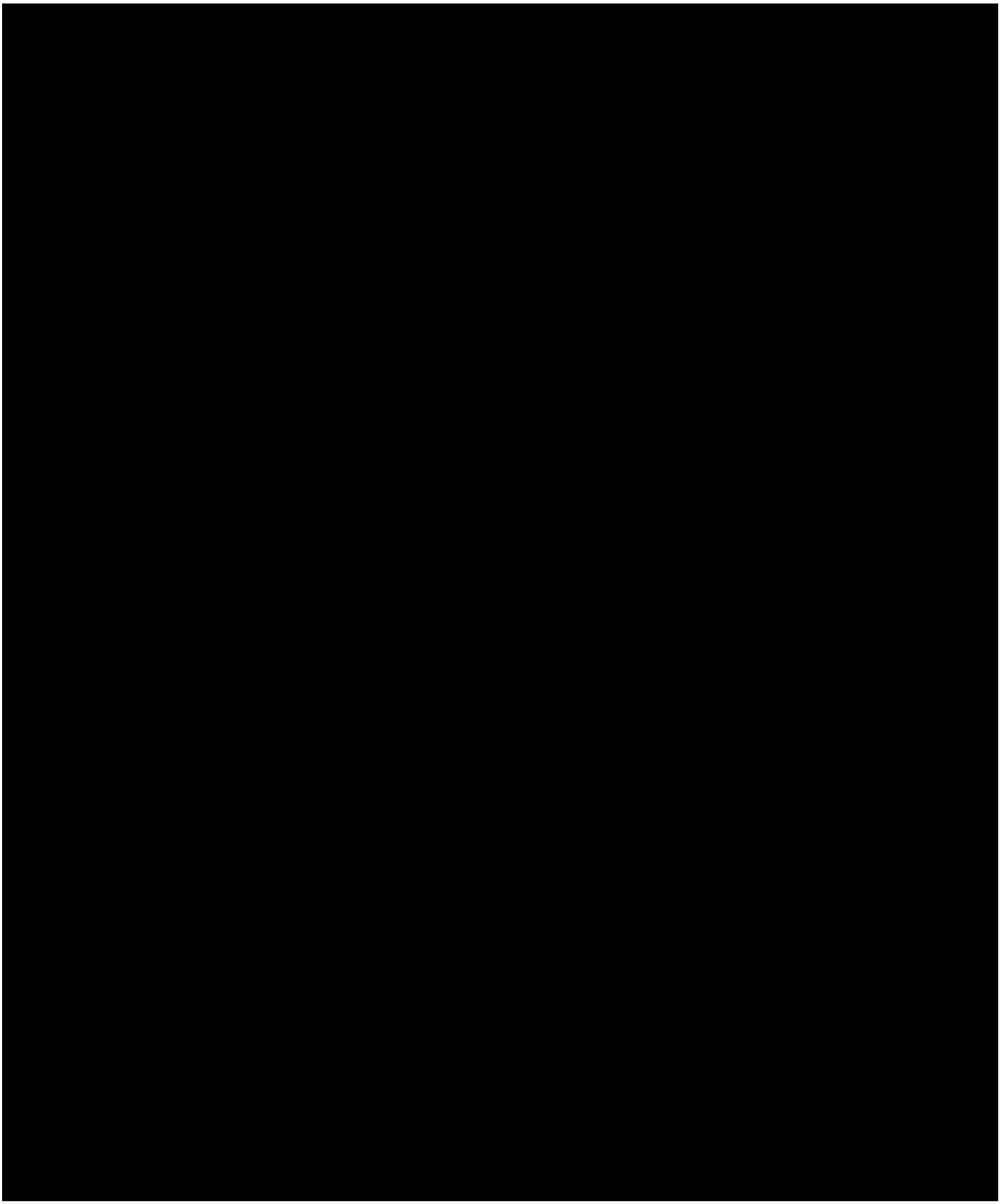


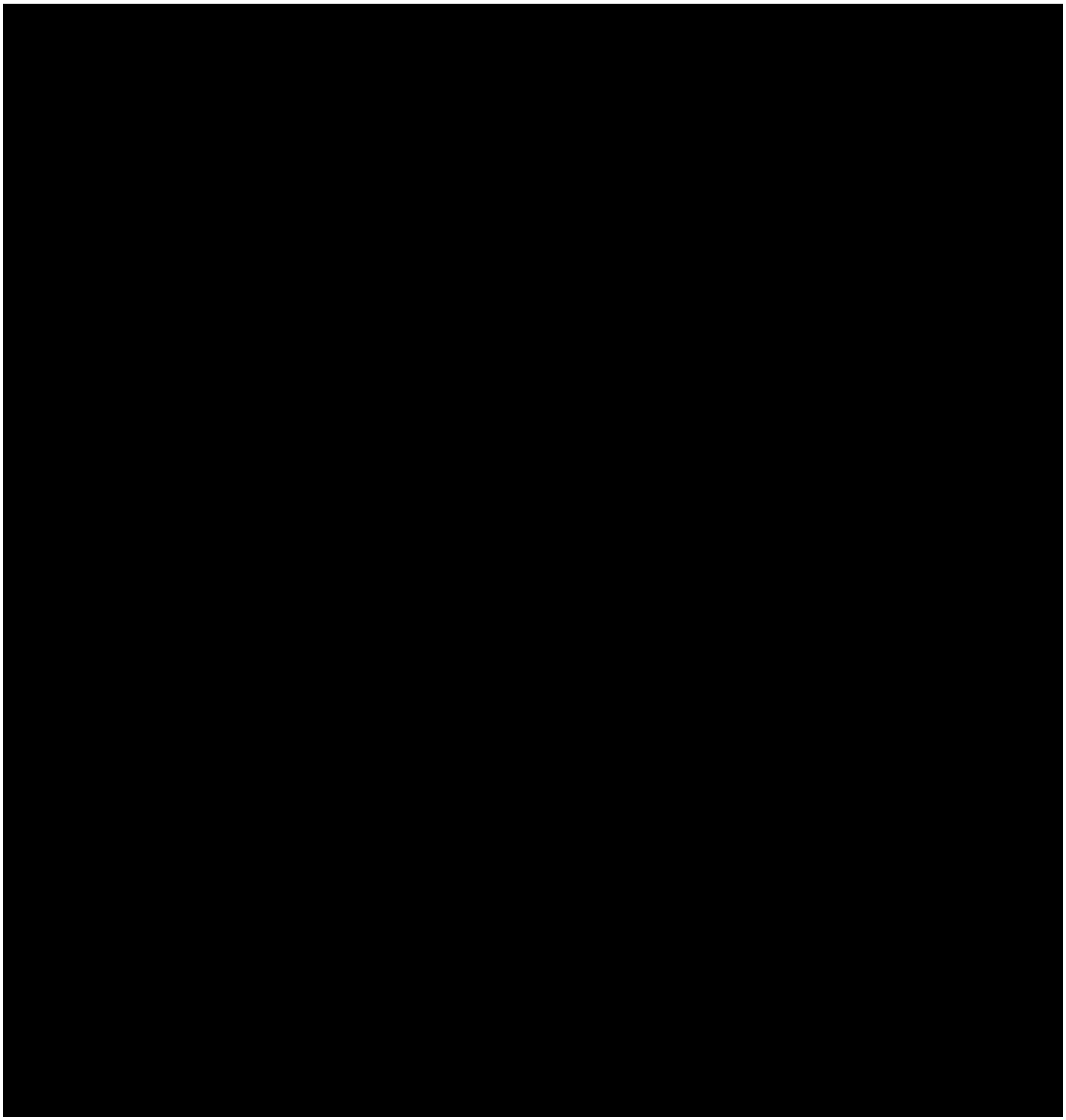


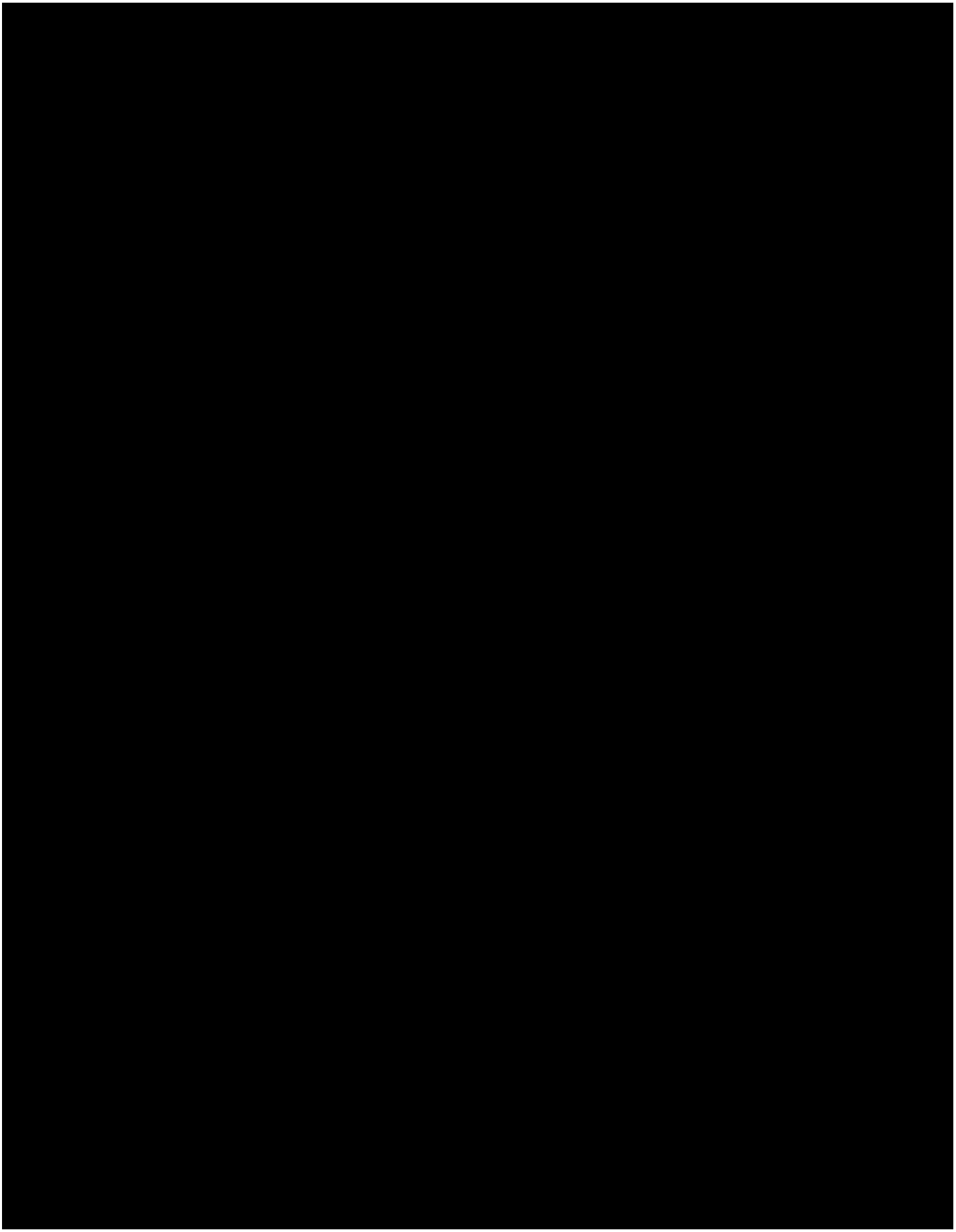


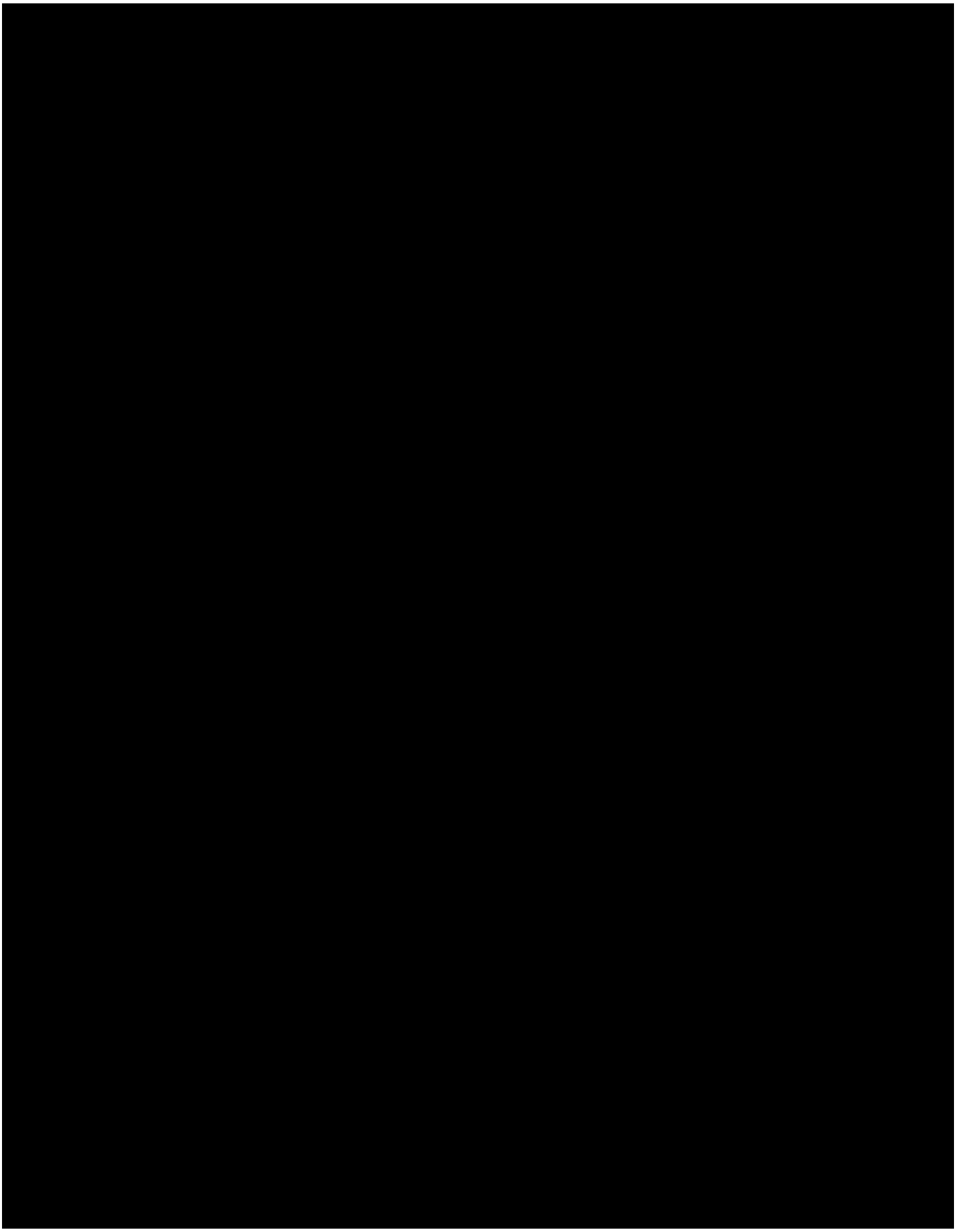


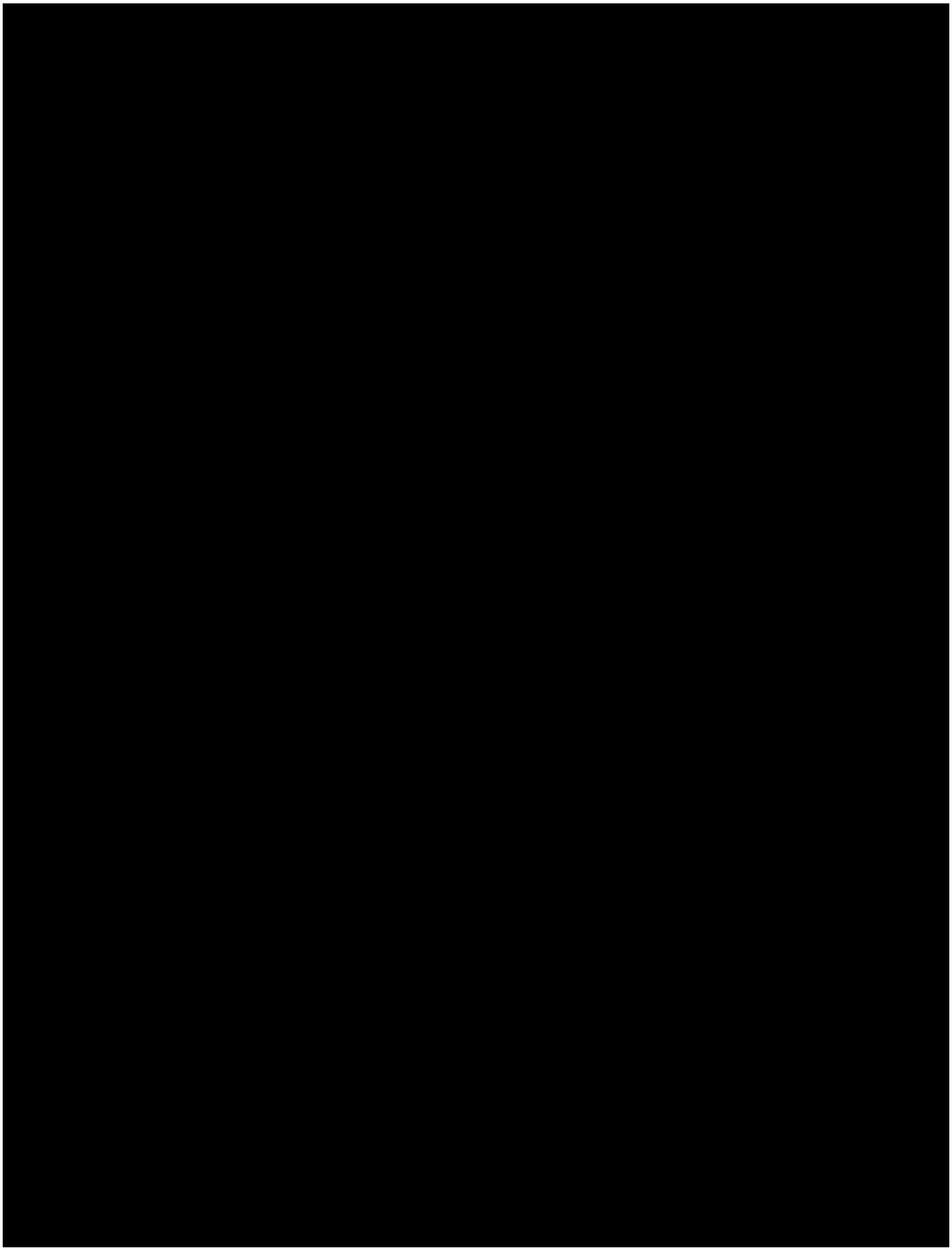


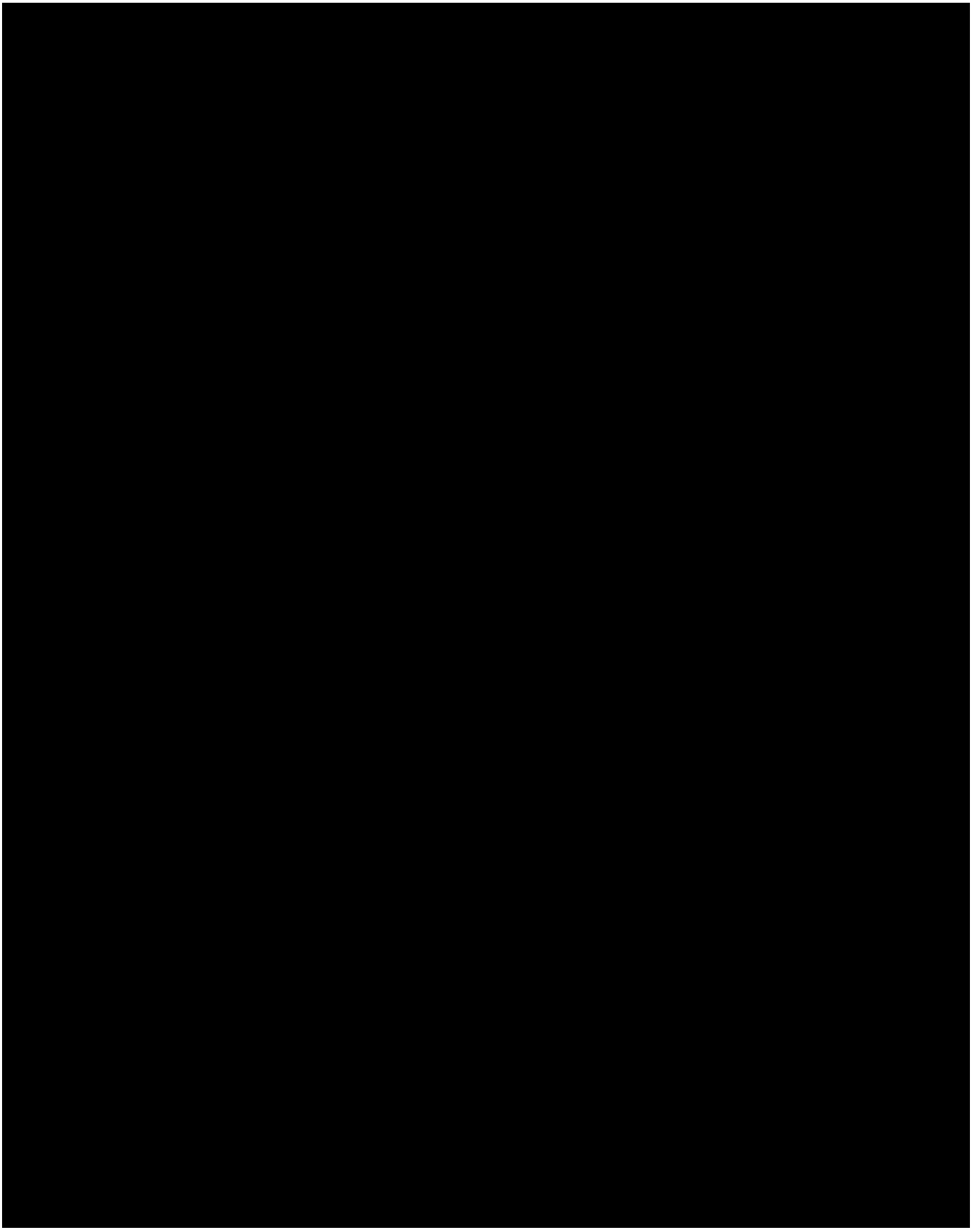


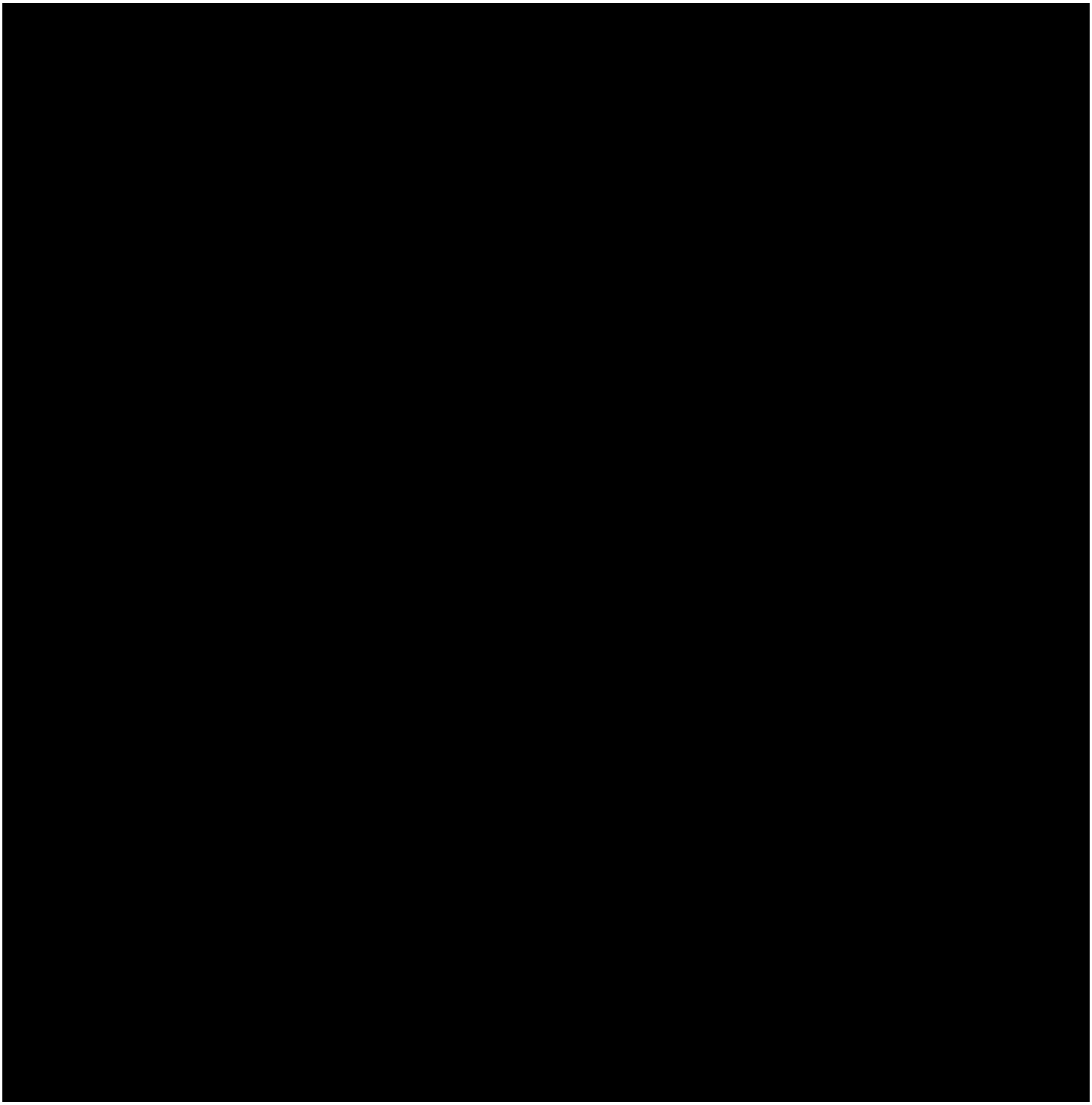




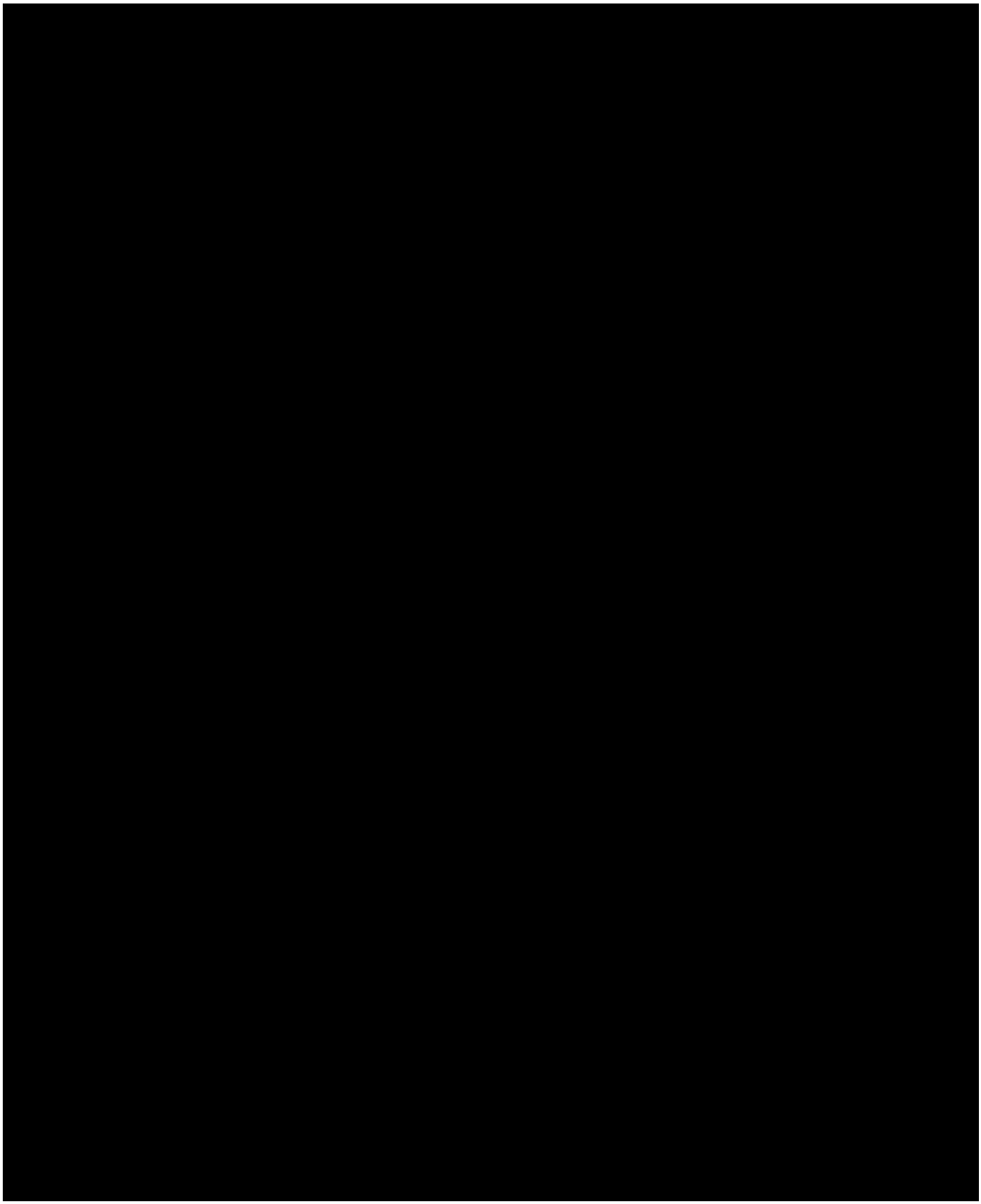






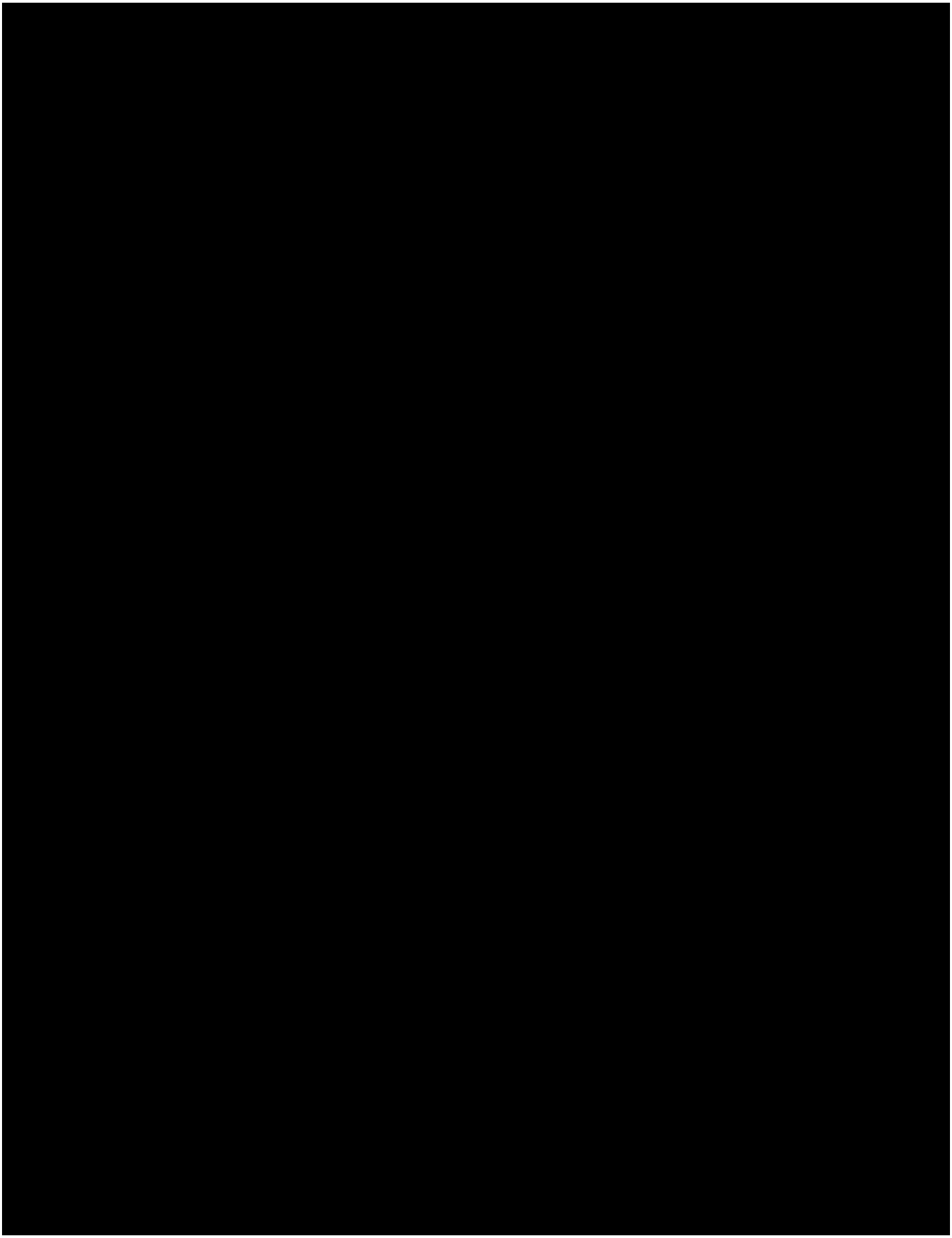


6. Offsets



7. Conclusion

7.1 Conclusion



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7.2 Recommendations

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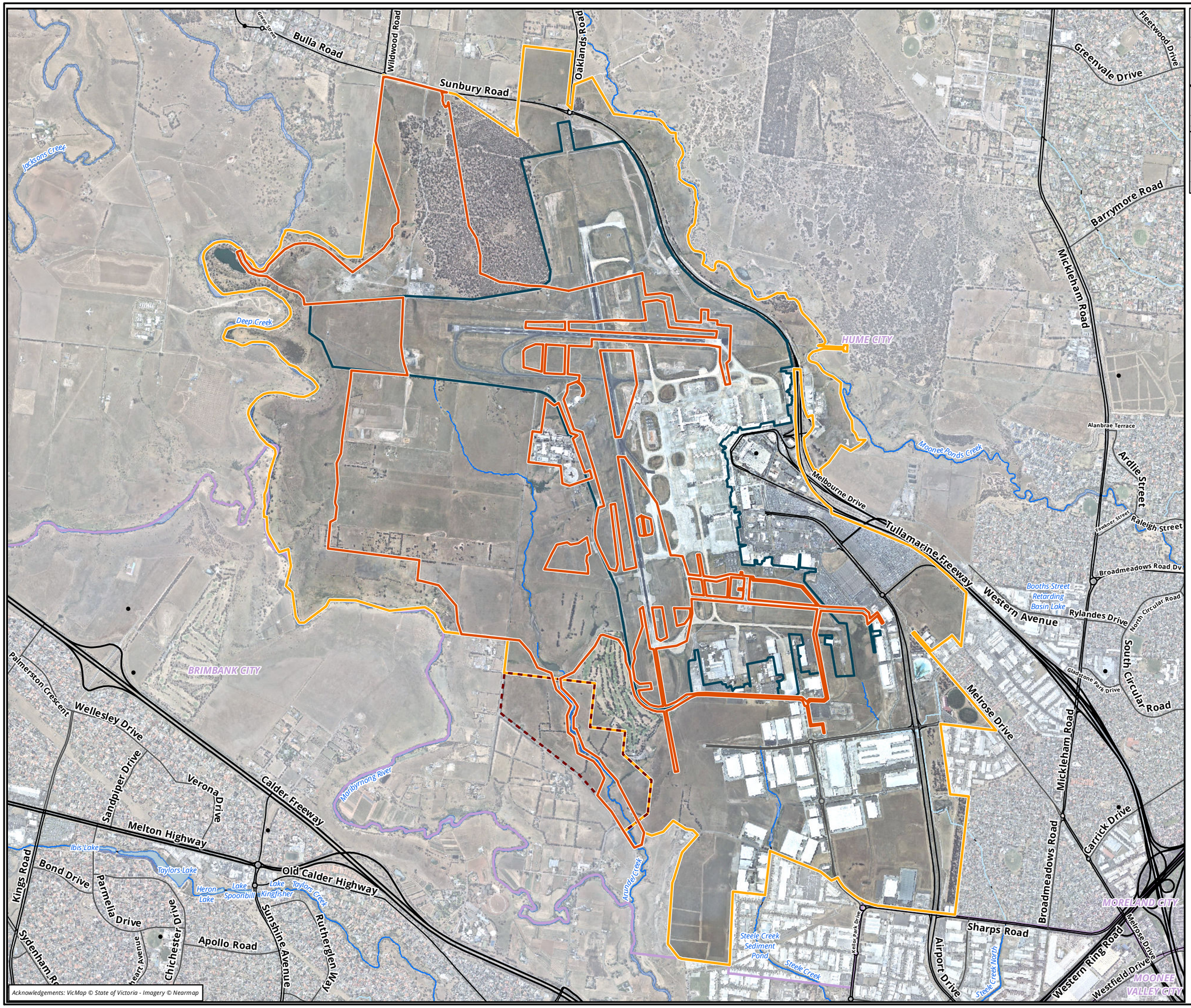
Appendices

Appendix 1 Figures



Legend

- Melbourne Airport Third Runway Project area
- Airside boundary

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 1 Location of the study area, Melbourne Airport Third Runway Project area

0 300 600 900 1,200 1,500

Metres
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Coordinate System: GDA 1994 MGA Zone 55

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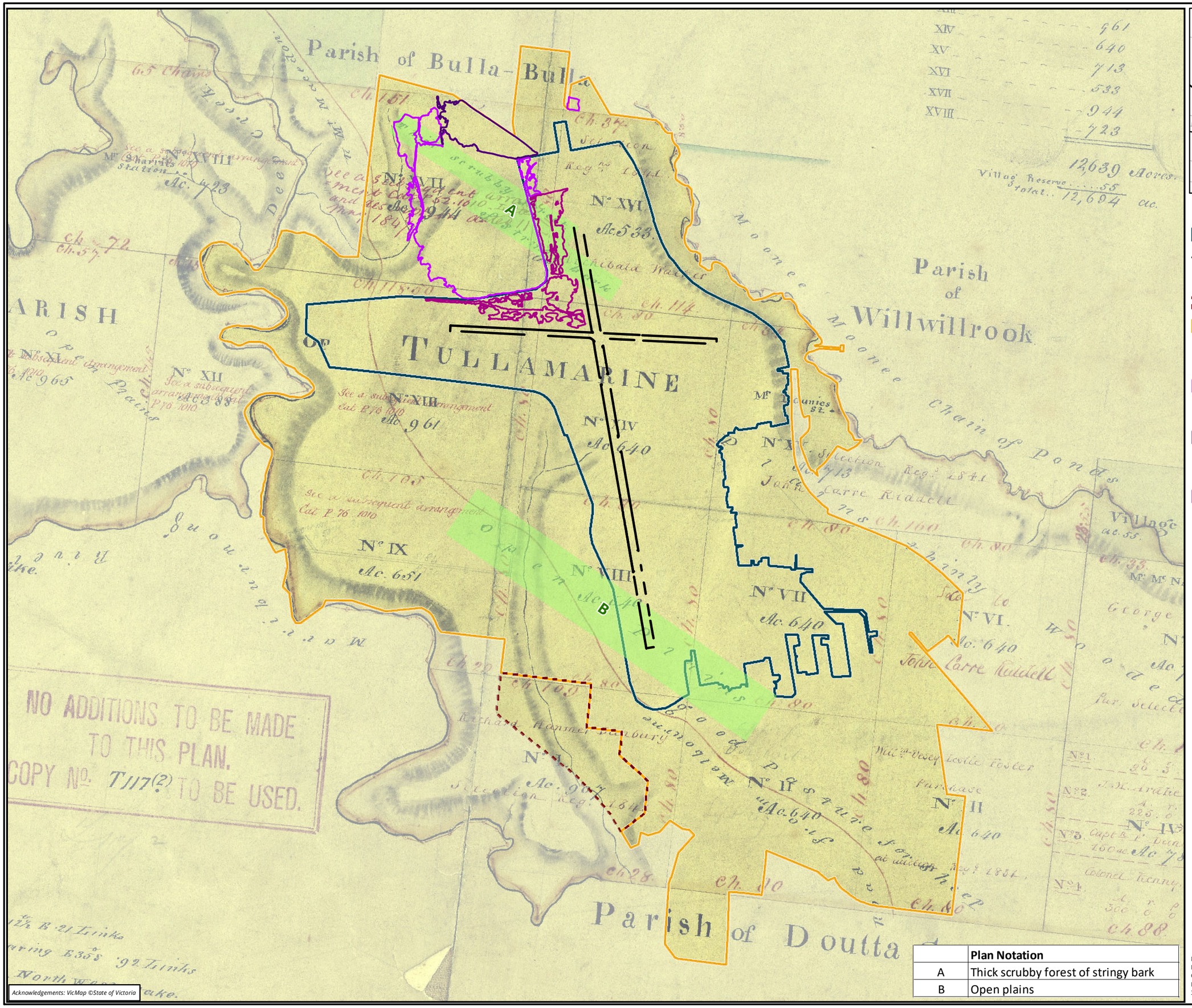

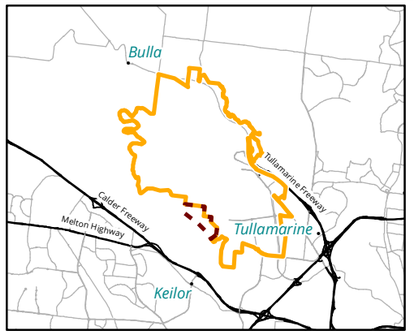

Legend

- Airside boundary
- Runway boundary

Melbourne Airport

- Freehold land
- Commonwealth land

EPBC vegetation communities

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived Grassland

	Plan Notation
A	Thick scrubby forest of stringy bark
B	Open plains

Figure 2 Plan of the Parish of Tullamarine (Kemp 1840), superimposed with contemporary mapping (Biosis 2019-2020)

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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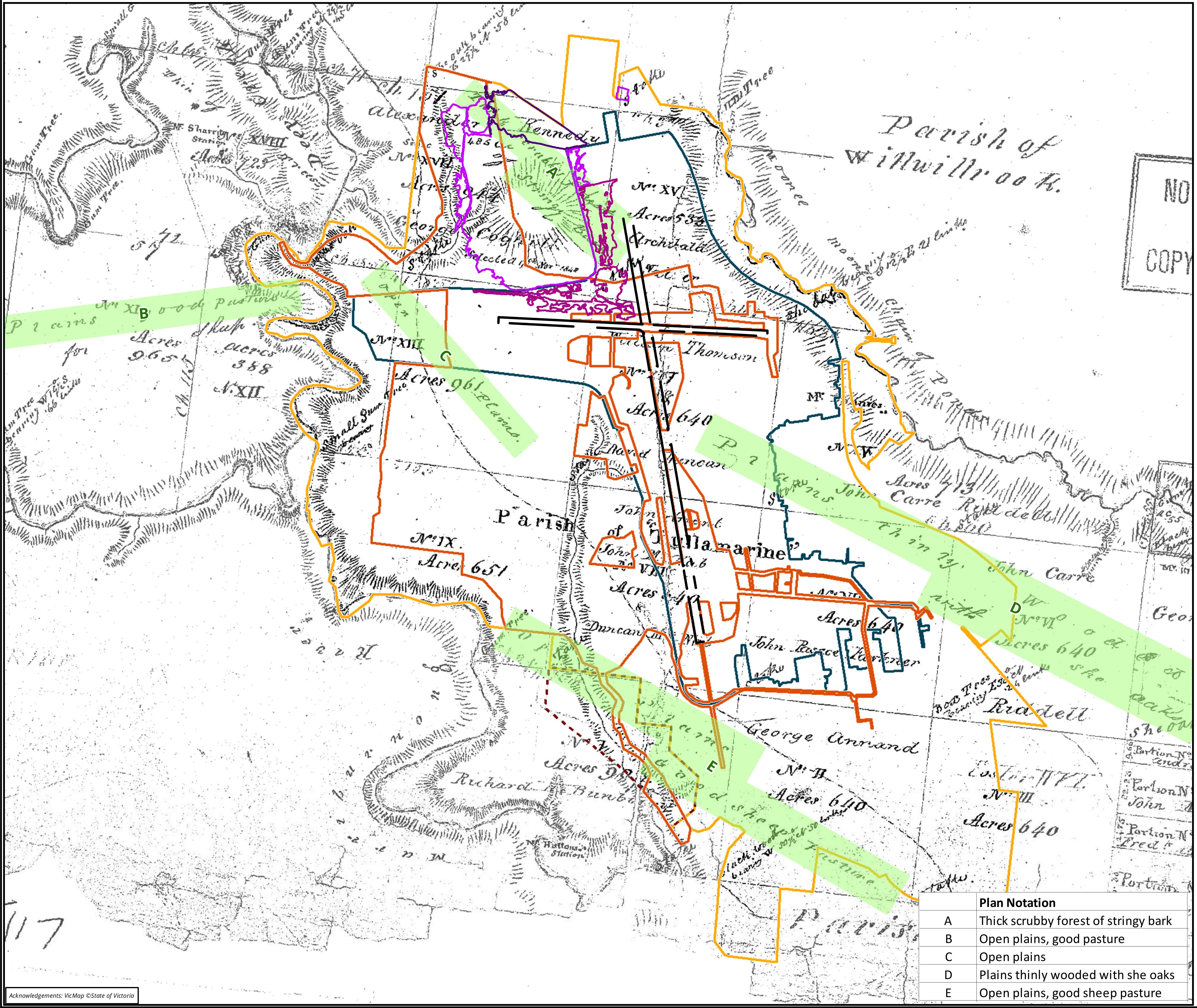
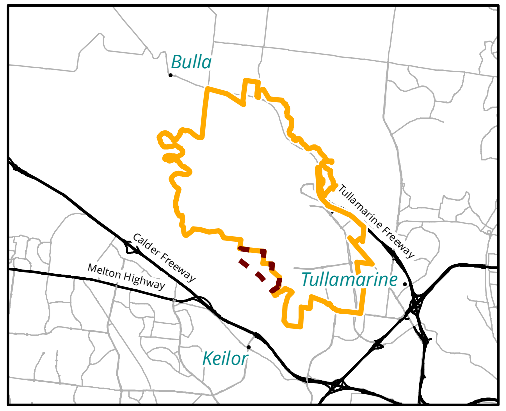


	Plan Notation
A	Thick scrubby forest of stringy bark
B	Open plains, good pasture
C	Open plains
D	Plains thinly wooded with she oaks
E	Open plains, good sheep pasture

Acknowledgements: VicMap ©State of Victoria



Legend

- Melbourne Airport Third Runway Project area
- Airside boundary
- Runway boundary

Melbourne Airport

- Freehold land
- Commonwealth land

EPBC vegetation communities

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived Grassland

Figure 3 Historical subdivision plan of the Parish of Tullamarine (DoL c.1849), superimposed with contemporary mapping (Biosis 2019-2020)

0 300 600 900 1,200 1,500

Metres

Scale: 1:30,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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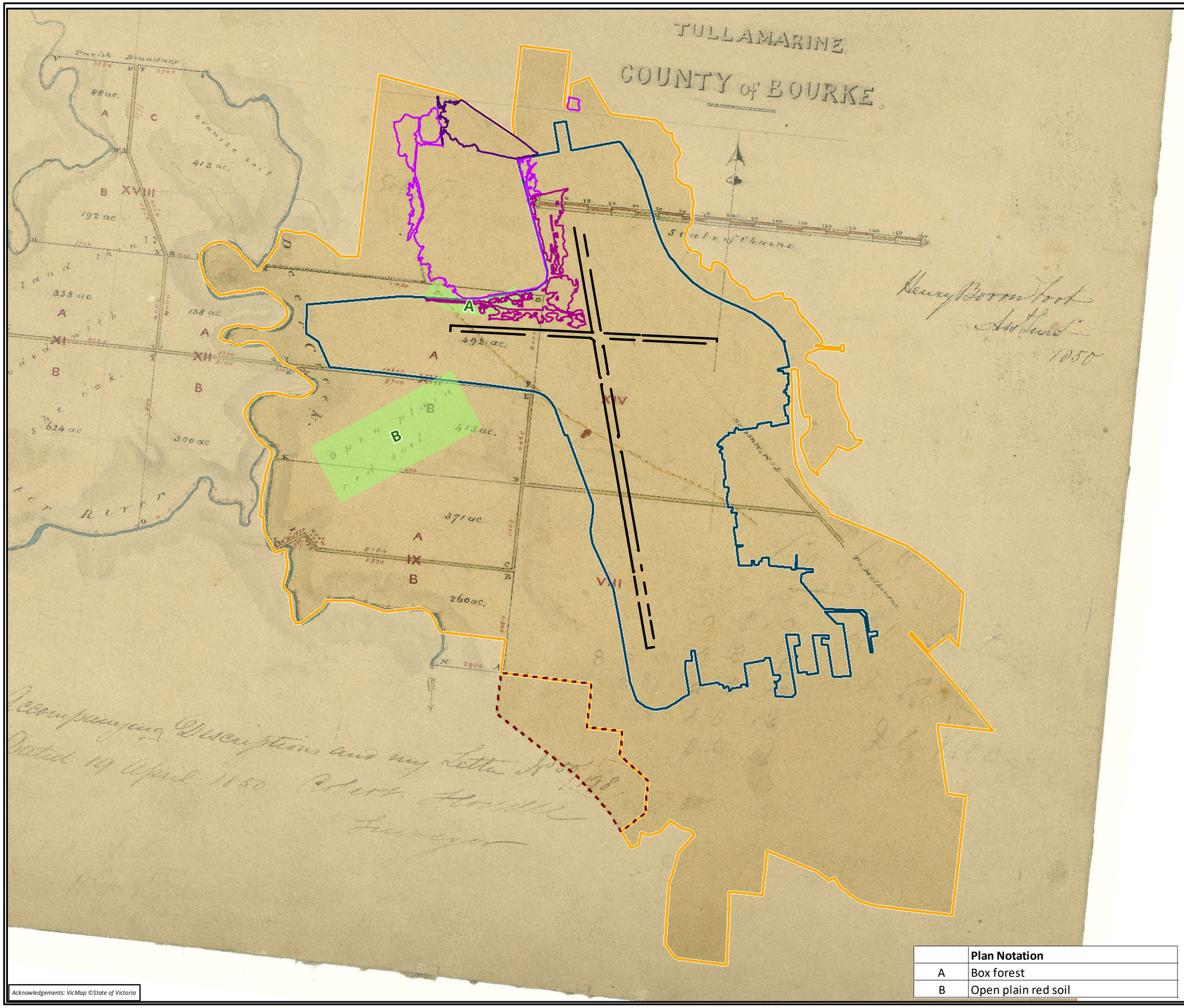

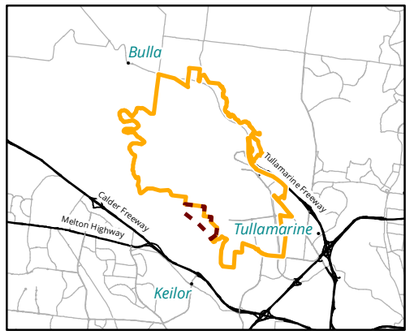

Legend

- Airside boundary
- Runway boundary

Melbourne Airport

- Freehold land
- Commonwealth land

EPBC vegetation communities

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived Grassland

	Plan Notation
A	Box forest
B	Open plain red soil

Figure 4 Subdivision plan for the Parish of Tullamarine (Hoddle 1850), superimposed with contemporary mapping (Biosis 2019-2020)

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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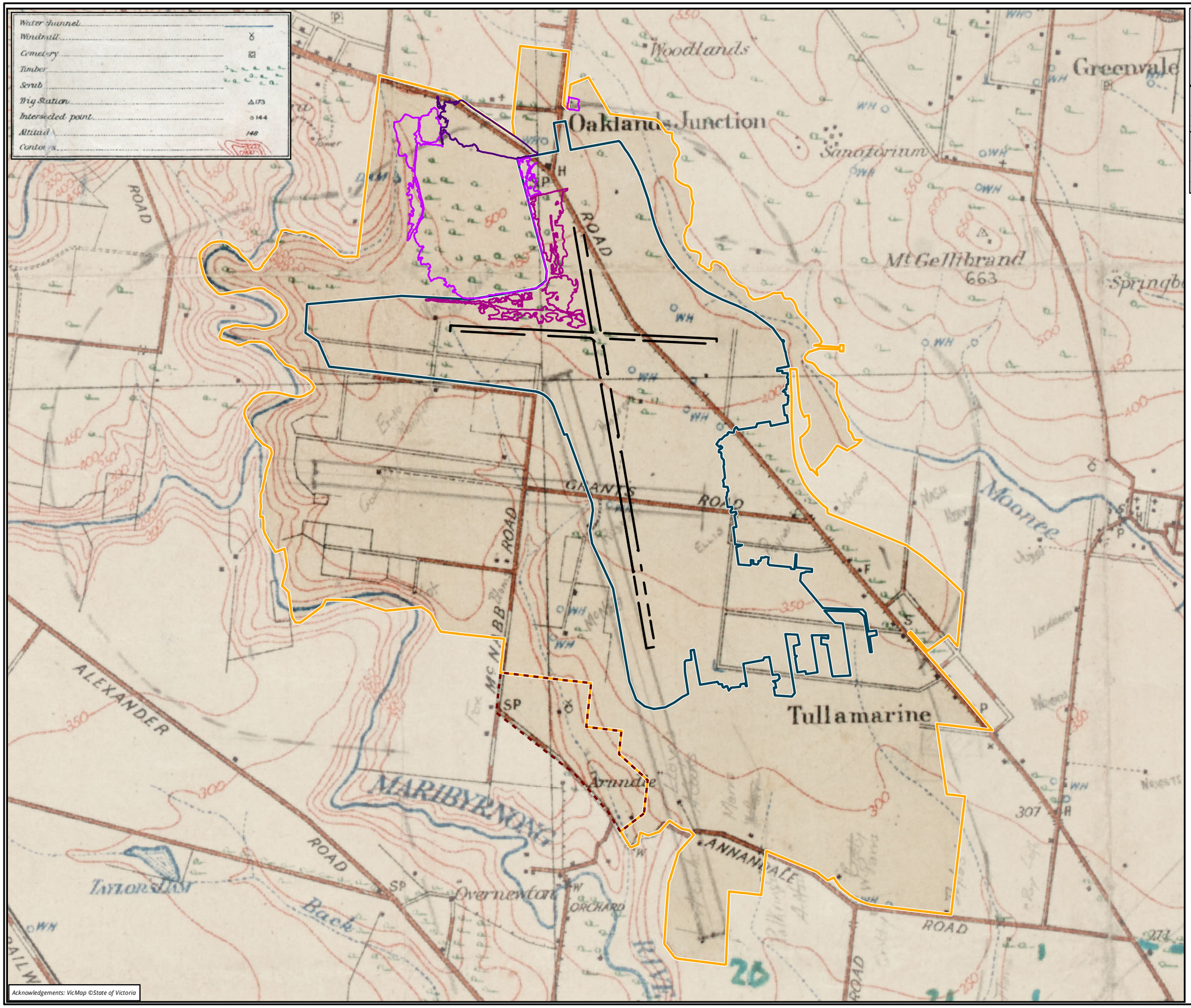

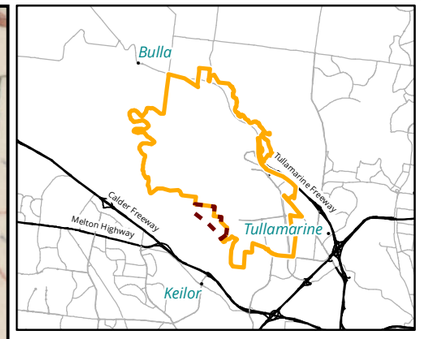

Legend

- Airside boundary
- Runway boundary

Melbourne Airport

- Freehold land
- Commonwealth land

EPBC vegetation communities

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived Grassland

Figure 5 Map of Sunbury (DoD 1915), superimposed with contemporary mapping (Biosis 2019-2020)

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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Matter: 35215,
Date: 14 December 2021,
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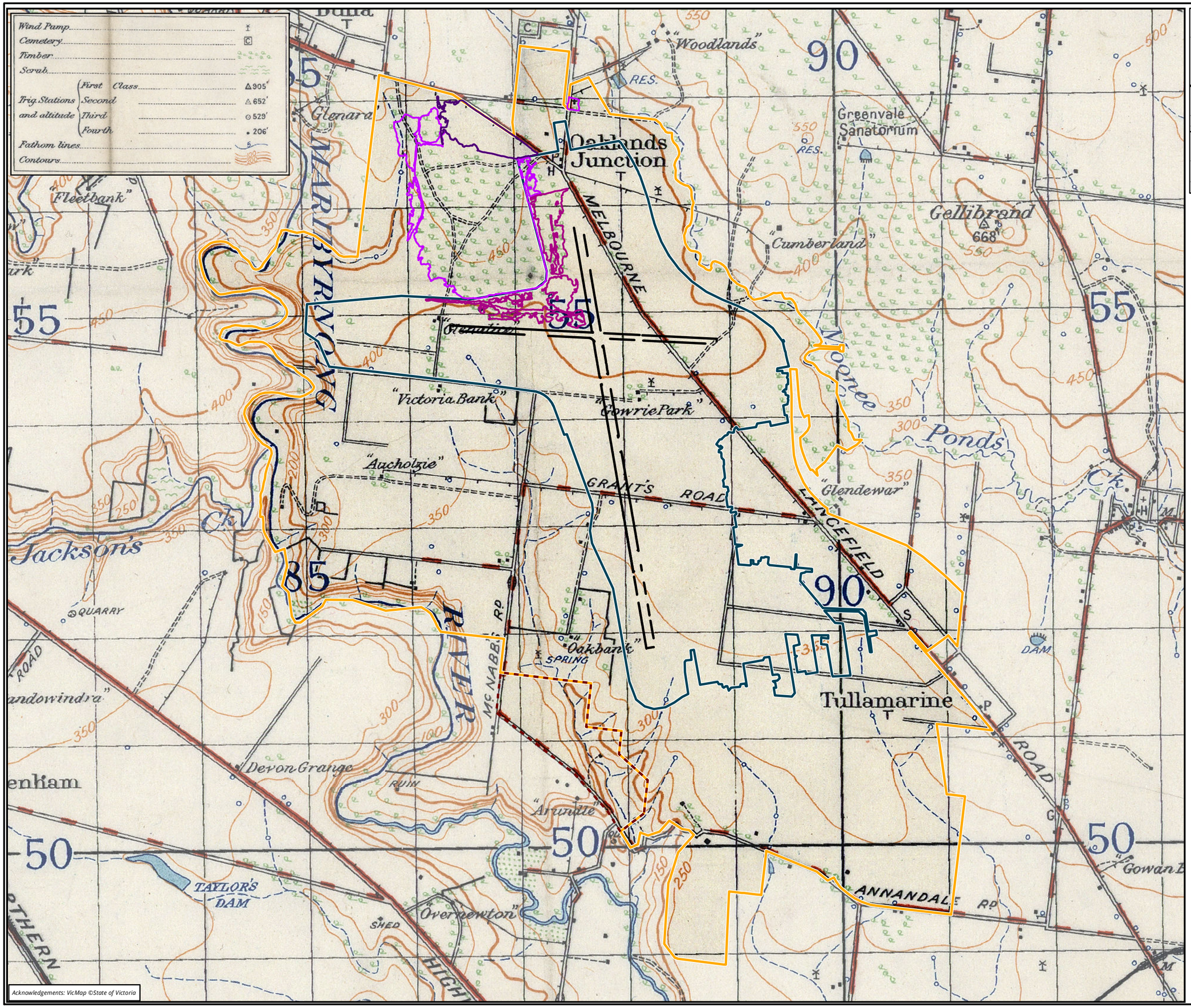

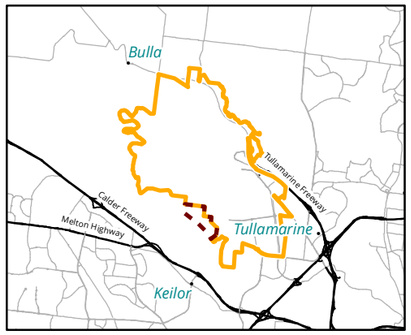

Legend

- Airside boundary
- Runway boundary

Melbourne Airport

- Freehold land
- Commonwealth land

EPBC vegetation communities

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived Grassland

Figure 6 Map of Sunbury (DoD 1938), superimposed with contemporary mapping (Biosis 2019-2020)

0 300 600 900 1,200 1,500

Metres

Scale: 1:30,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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Date: 14 December 2021,
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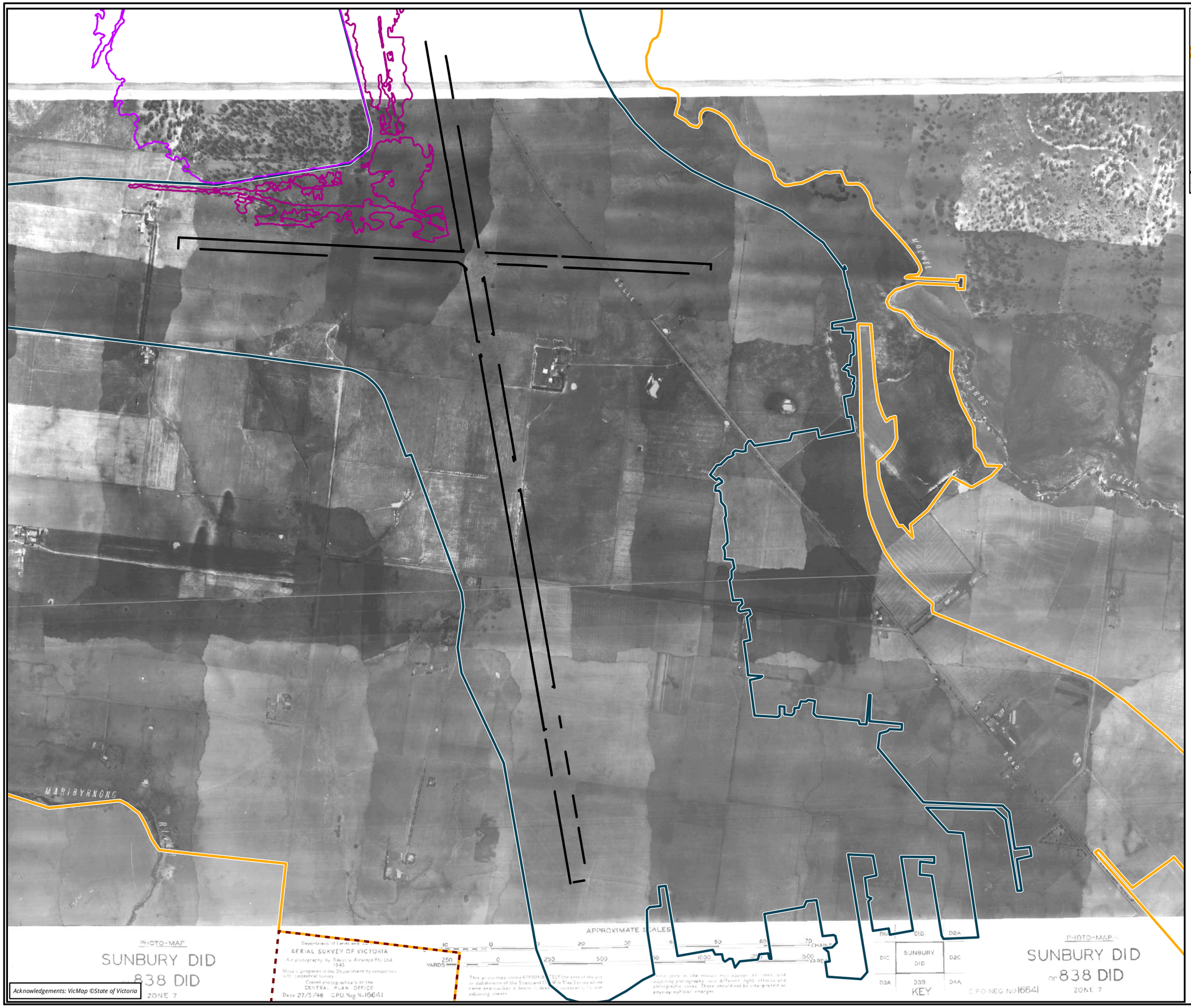

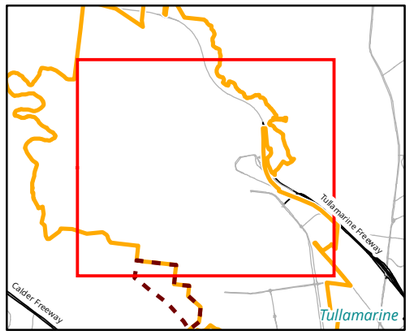

Legend

- Airside boundary
- Runway boundary

Melbourne Airport

- Freehold land
- Commonwealth land

EPBC vegetation communities

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived Grassland

Figure 7 Historical photo map of Sunbury (DCLS 1946), superimposed with contemporary mapping (Biosis 2019-2020)

0 150 300 450 600 750

Metres
Scale: 1:15,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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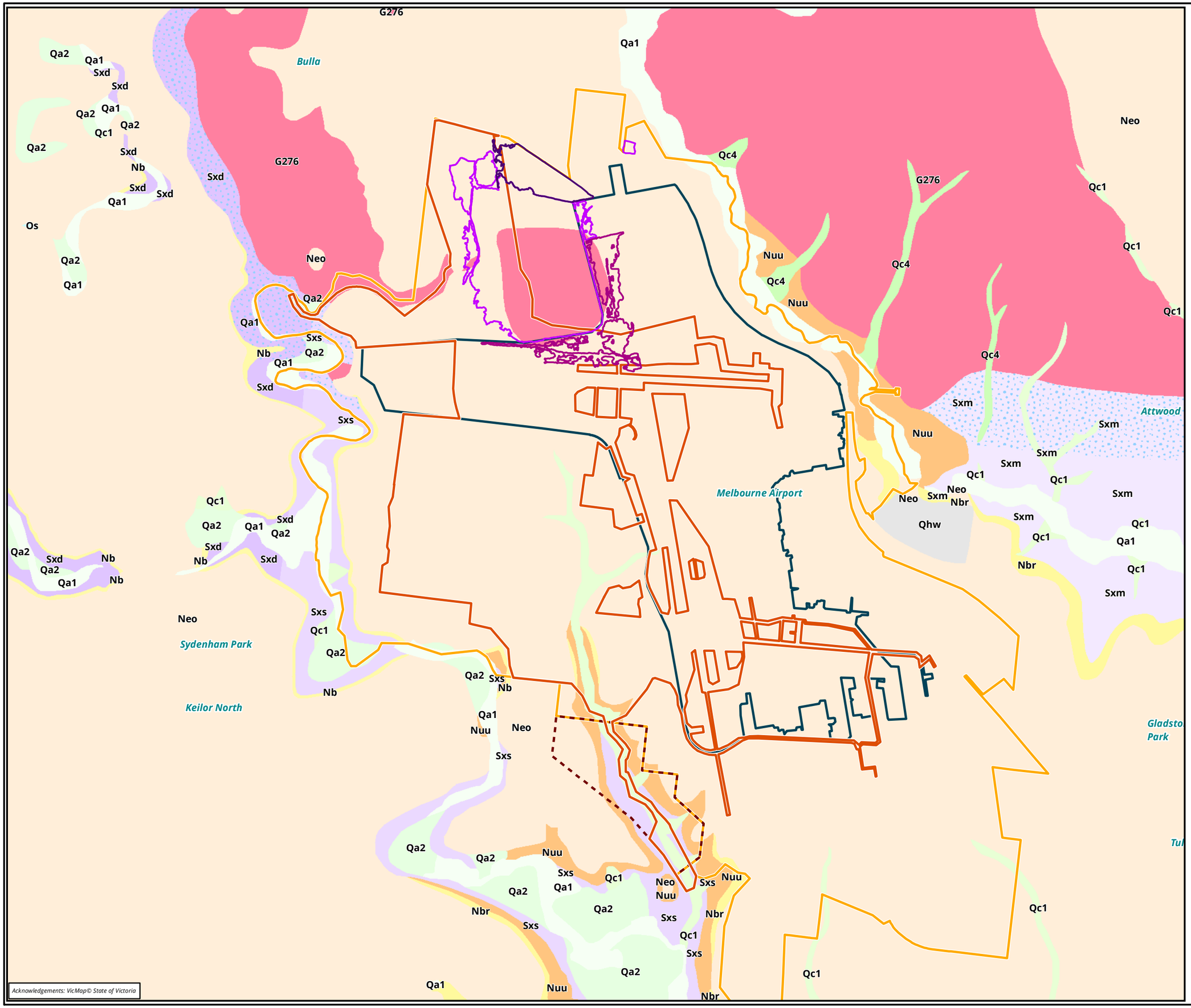

Legend

- Melbourne Airport Third Runway Project area
- Airside boundary

EPBC vegetation communities

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived Grassland

Geological units 50k

- Bulla Granodiorite - G276
- Brighton Group - Nb
- Red Bluff Sandstone - Nbr
- Newer Volcanic Group - basalt flows - Neo
- Tullamarine Basalt - Nuu
- Sunbury Group - Os
- alluvium - Qa1
- alluvial terrace deposits - Qa2
- colluvium - Qc1
- granite-derived colluvium - Qc4
- waste deposits - Qhw
- Deep Creek Siltstone - hornfels - Sxd
- Deep Creek Siltstone - generic - Sxd
- Melbourne Formation - hornfels - Sxm
- Melbourne Formation - generic - Sxm
- Springfield Sandstone - hornfels - Sxs
- Springfield Sandstone - generic - Sxs

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 8 Geological features of the project area, superimposed with woodland mapping (Biosis 2019-2020)

0 300 600 900 1,200 1,500

Metres

Scale: 1:30,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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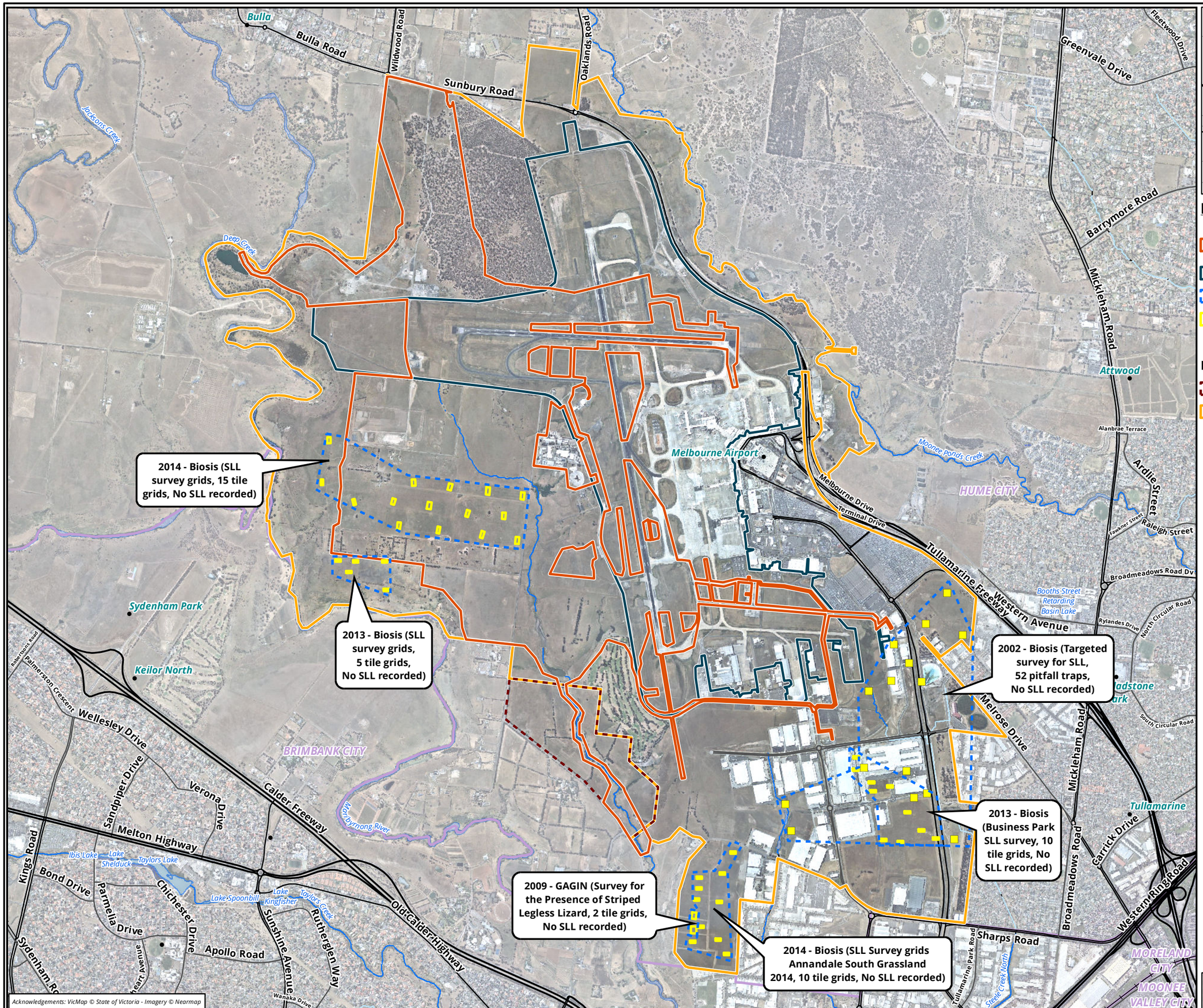

Legend

- Melbourne Airport Third Runway Project area
- Airside boundary
- Annotation areas
- Survey grids
- Pitfall traps

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 9 Striped Legless Lizard (SLL) previous survey effort – Melbourne Airport

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Location:P:\28400s\28408\Mapping\35215_ETR_F9_PSEA_SLL_Overview.mxd

2013/2014 - Biosis (2013/2014 GSM targeted survey, Site surveyed four times during GSM flight season, No GSM detected)

2013/2014 - Biosis (2013/2014 GSM targeted survey, Site surveyed four times during GSM flight season, No GSM detected)

2018 - Biosis (2018 GSM habitat assessment, Site surveyed once during GSM flight season, GSM detected)

2013/2014 - Biosis (2013/2014 GSM targeted survey, Site surveyed four times during GSM flight season, No GSM detected)

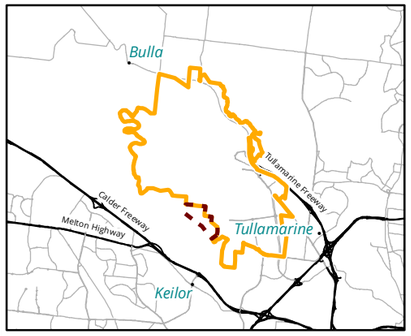
2014 - Biosis (2014 GSM targeted survey, Site surveyed four times during GSM flight season, No GSM detected)

2013/2014 - Biosis (2013/2014 GSM targeted survey, Site surveyed four times during GSM flight season, No GSM detected)

2018 - Biosis (2018 GSM habitat assessment, Site surveyed once during GSM flight season, No GSM detected)

2010 - GAGIN (2010 GSM habitat assessment, Each site surveyed at least once during GSM flight season, No GSM detected)

2018 - Biosis (2018 GSM habitat assessment, Site surveyed once during GSM flight season, No GSM detected)



Legend

- Melbourne Airport Third Runway Project area
- Airside boundary

GSM survey areas

- GAGIN
- Biosis

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 10 Golden Sun Moth (GSM) previous survey effort – Melbourne Airport

0 300 600 900 1,200 1,500

Meters
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Date: 29 July 2021,
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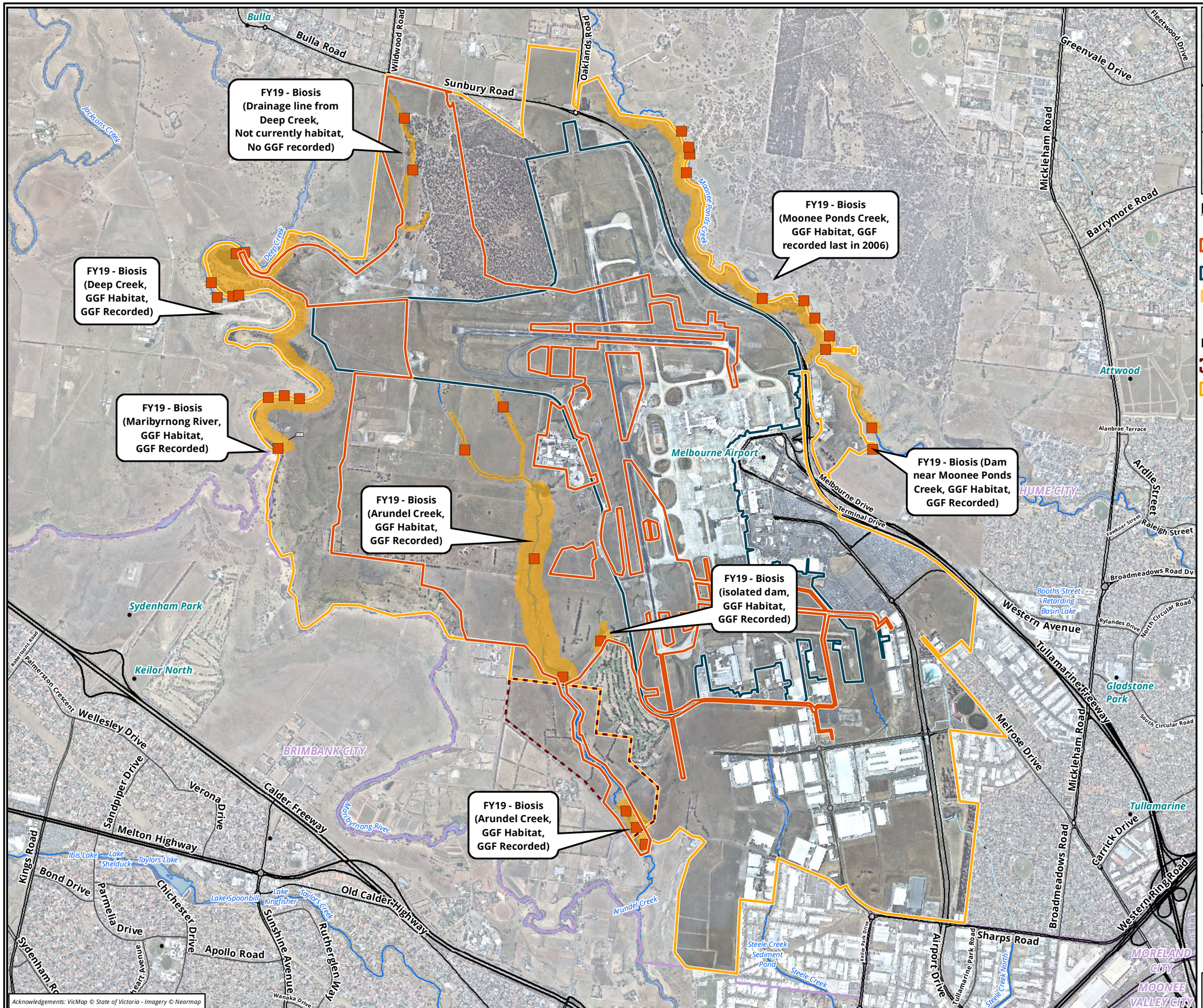

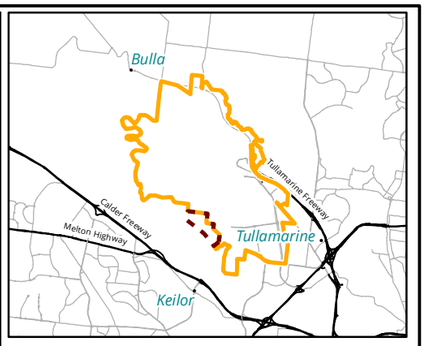

Legend

- Melbourne Airport Third Runway Project area
- Airside boundary
- Survey area
- Call play back

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 11 Growling Grass Frog (GGF) previous survey effort – Melbourne Airport

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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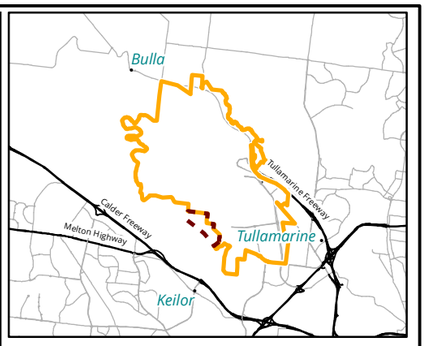
2019 - EcologyBalance (William Steele), Woodland, Fortnightly March- April 6. Weekly April 6- early May, Five individuals

Previous survey years: 1990,1991 (one individual detected), 1994/95, 1997, 1998, 1999, 2001/02, 2009 2014, 2015, 2016. No Swift Parrots detected except one individual in 1991

2014 - Biosis, Barbiston Road, 23 weekly surveys March-Sept, No Swift Parrots



Legend

- Melbourne Airport Third Runway Project area
- Airside boundary
- Survey area

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 12 Swift Parrot previous survey effort – Melbourne Airport

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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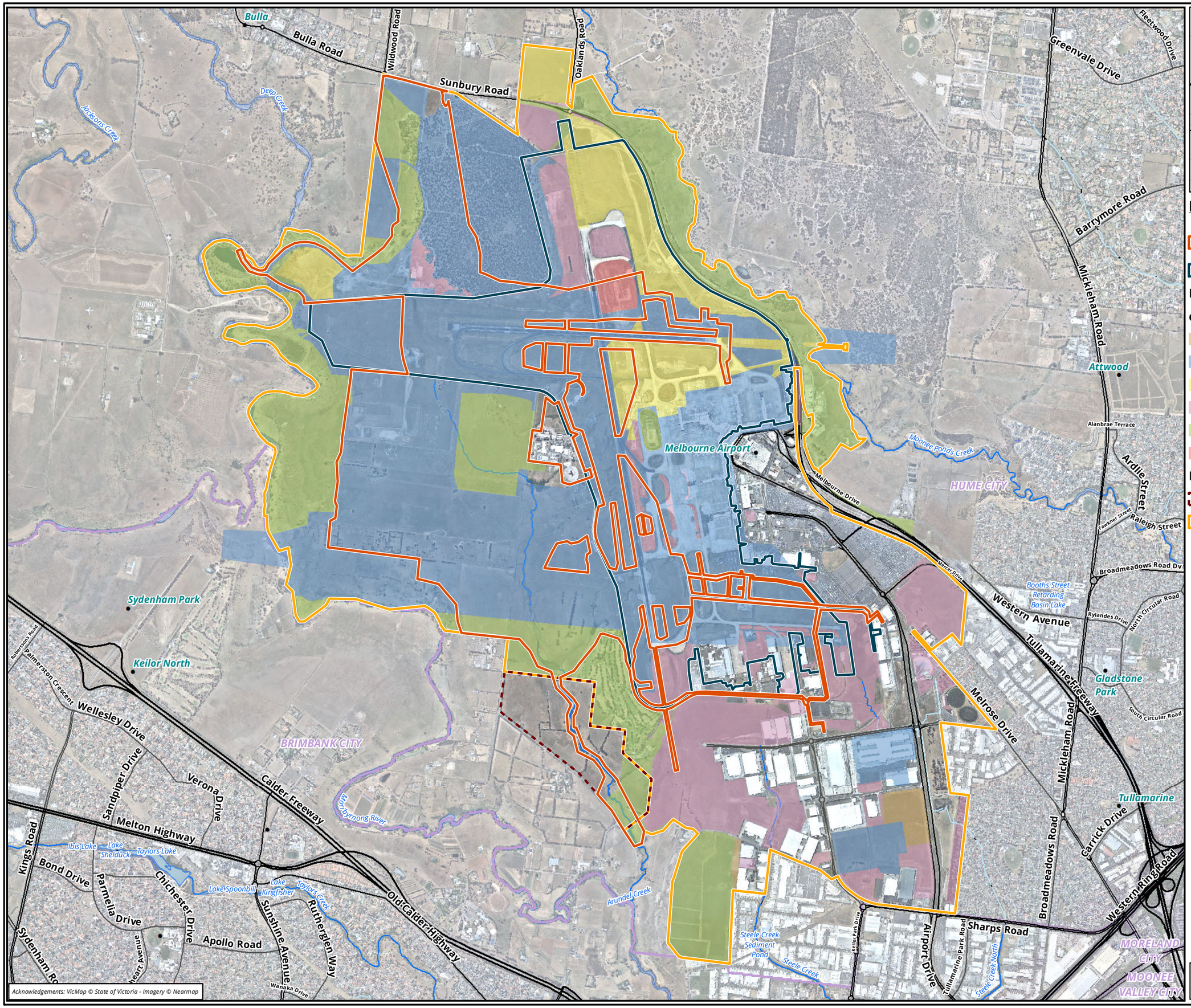

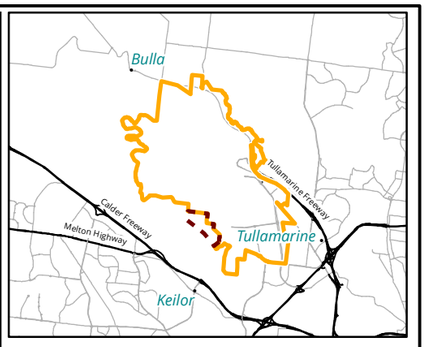

Legend

- Melbourne Airport Third Runway Project area
- Airside boundary

EPBC listed ecological communities Survey areas

- 2011, Brett Lane and associates
- 2013, Biosis
- 2014, Biosis
- 2017, Biosis
- 2018, Biosis
- 2019, Biosis

Melboure Airport

- Freehold land
- Commonwealth land

Figure 14 Native vegetation previous survey effort – Melbourne Airport

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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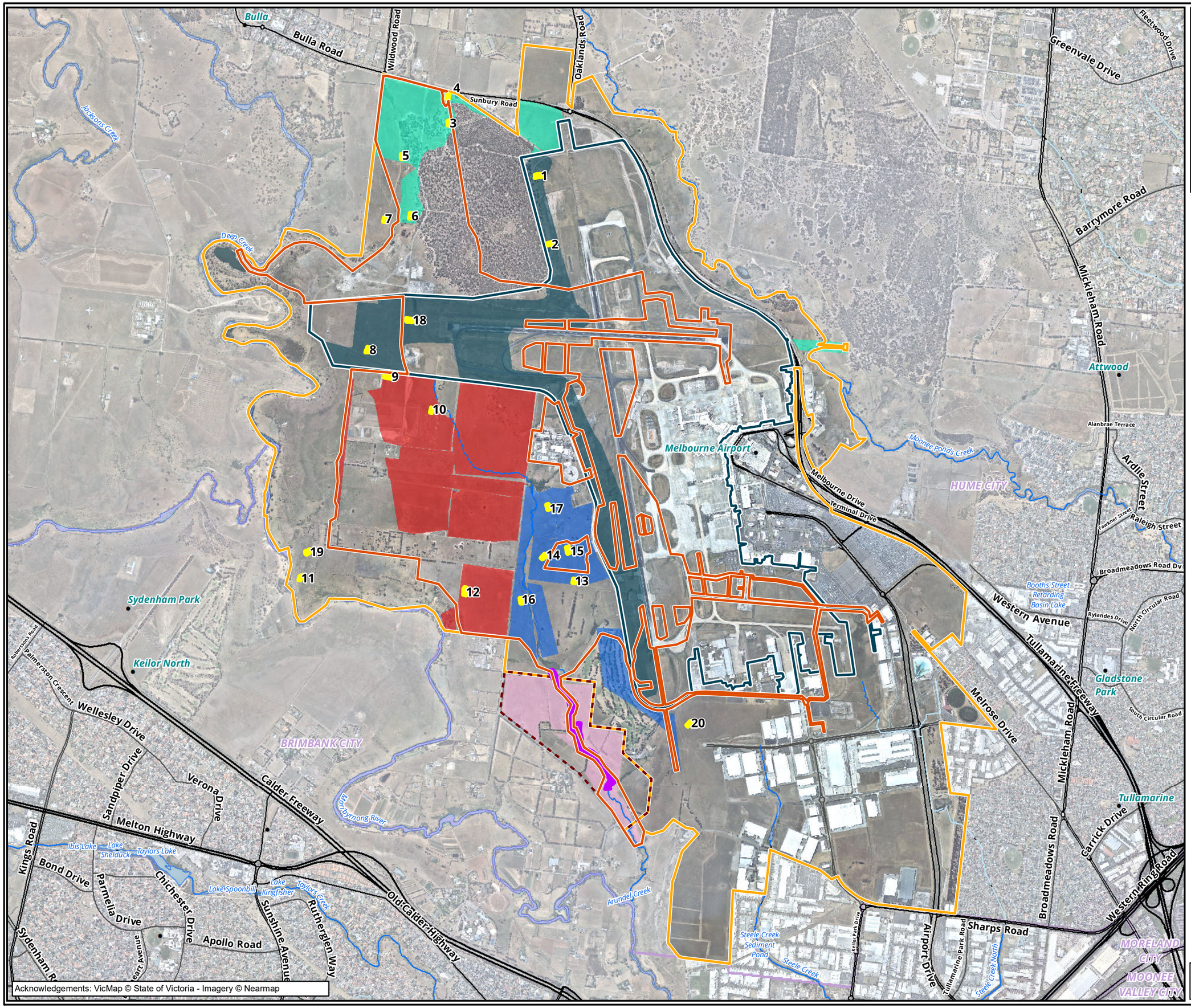

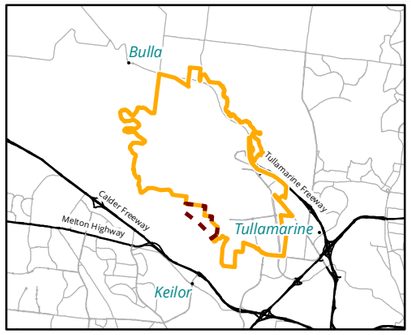

Legend

- Melbourne Airport Third Runway Project area
- Airside boundary

Survey sites

- GGF Survey 2020
- SLL Survey Grid 2019
- GSM Survey site Airside
- GSM Survey site Arundel Creek
- GSM Survey site Mcnabs Rd west
- GSM Survey site Northern area
- GSM Survey site Southern area

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 15 Targeted fauna survey - current survey effort

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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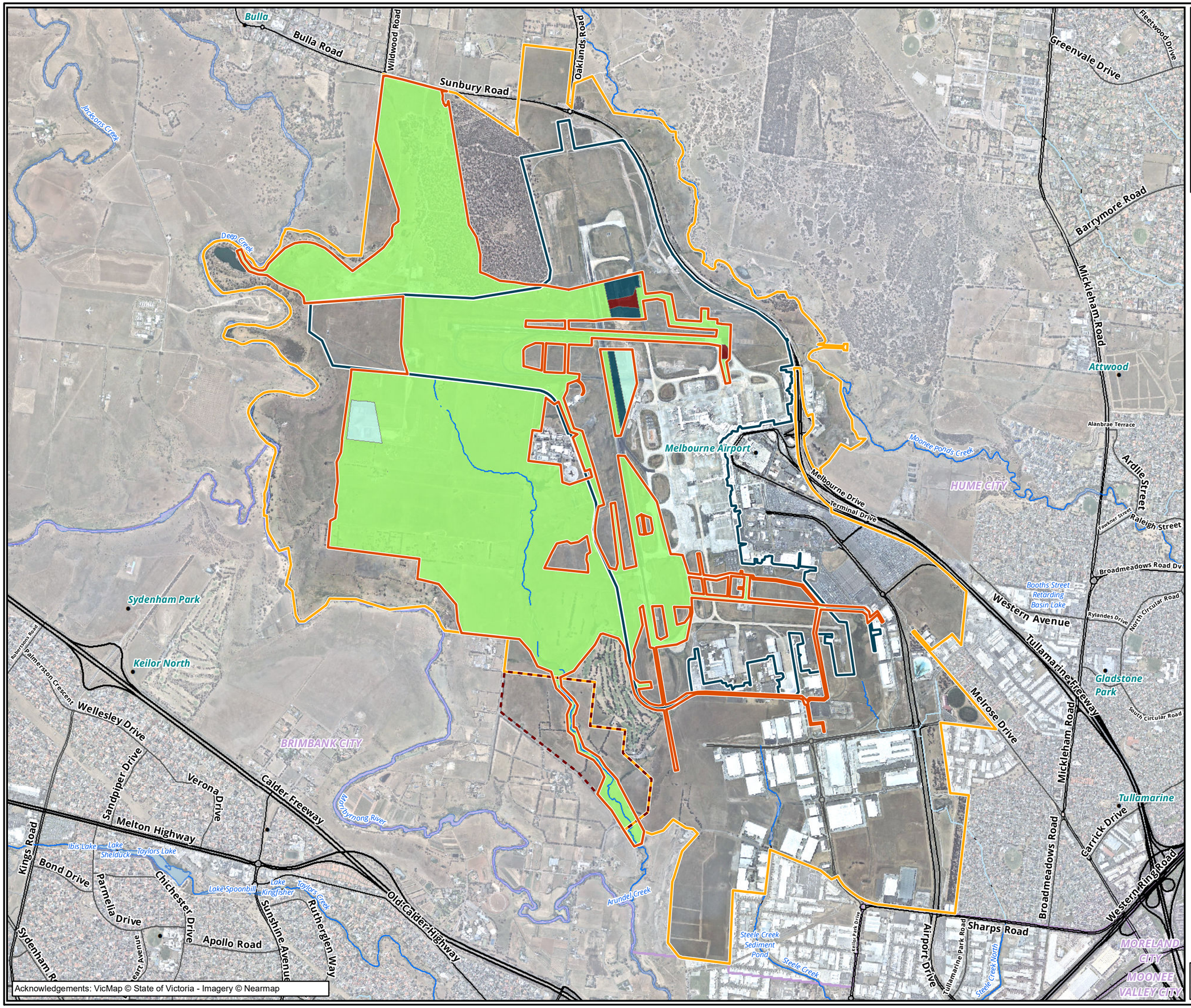

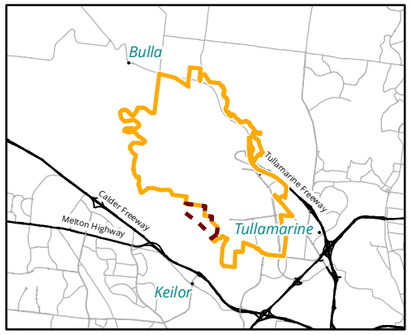

Legend

- Melbourne Airport Third Runway Project area
- Airside boundary
- Native vegetation survey area
- Area not assessed in current assessment
- Area not assessed in current assessment - inaccessible area
- Area not accessible - native vegetation extents assumed or estimated

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 16 Current survey effort - Native vegetation

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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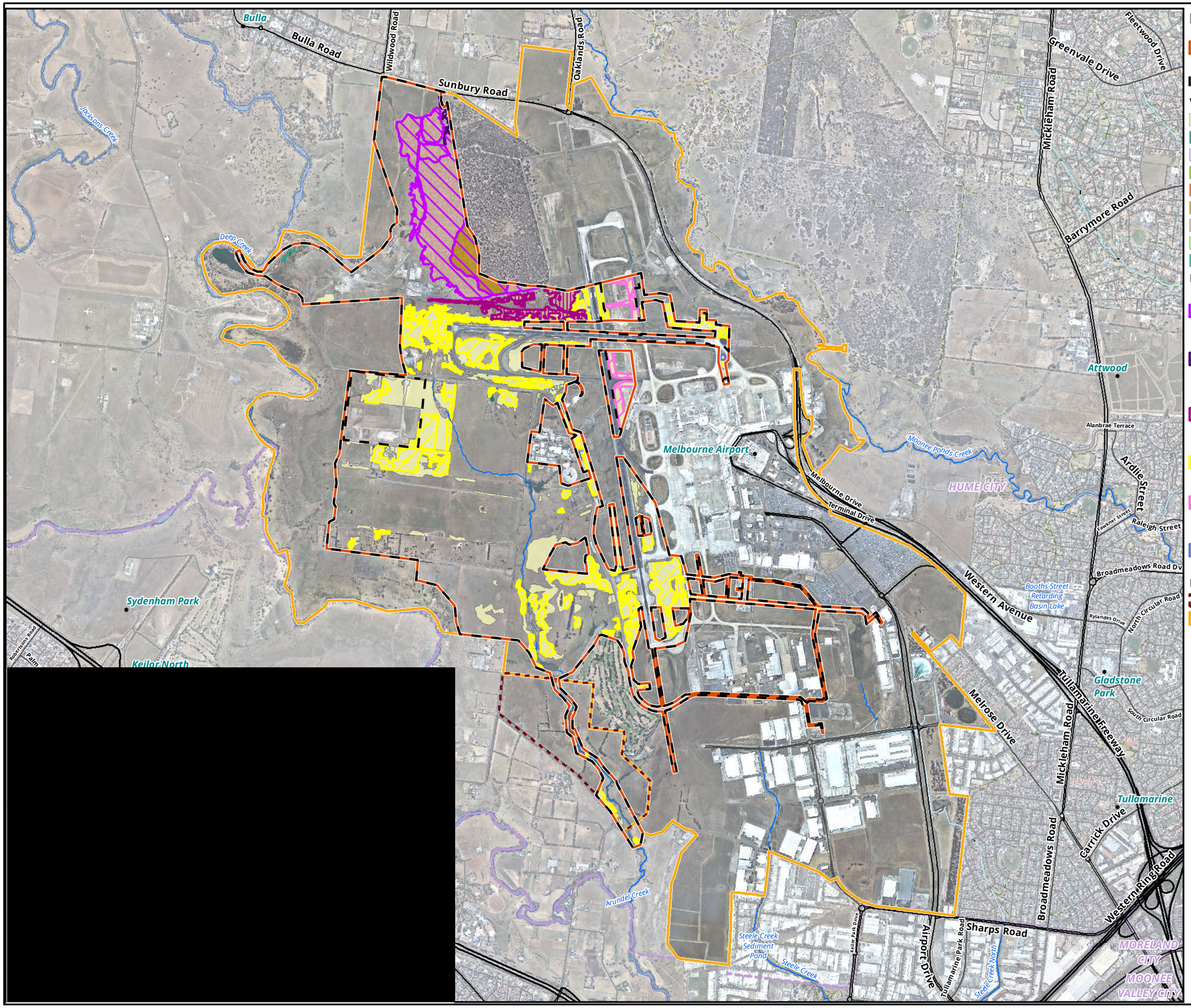

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 55 Plains Grassy Woodland
- 641 Riparian Woodland
- 653 Aquatic Herbland
- 68 Creekline Grassy Woodland
- 71 Hills Herb-rich Woodland
- 803 Plains Woodland
- 821 Tall Marsh
- 895 Escarpment Shrubland

EPBC listed community

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived grassland
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Natural Temperate Grassland of the Victorian Volcanic Plain - Assumed
- Natural Temperate Grassland of the Victorian Volcanic Plain - Estimated

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 17 Native vegetation in the project area – Melbourne Airport Third Runway - overview

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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Acknowledgements: VicMap ©State of Victoria - Imagery- Nearmap

Matter: 35215,
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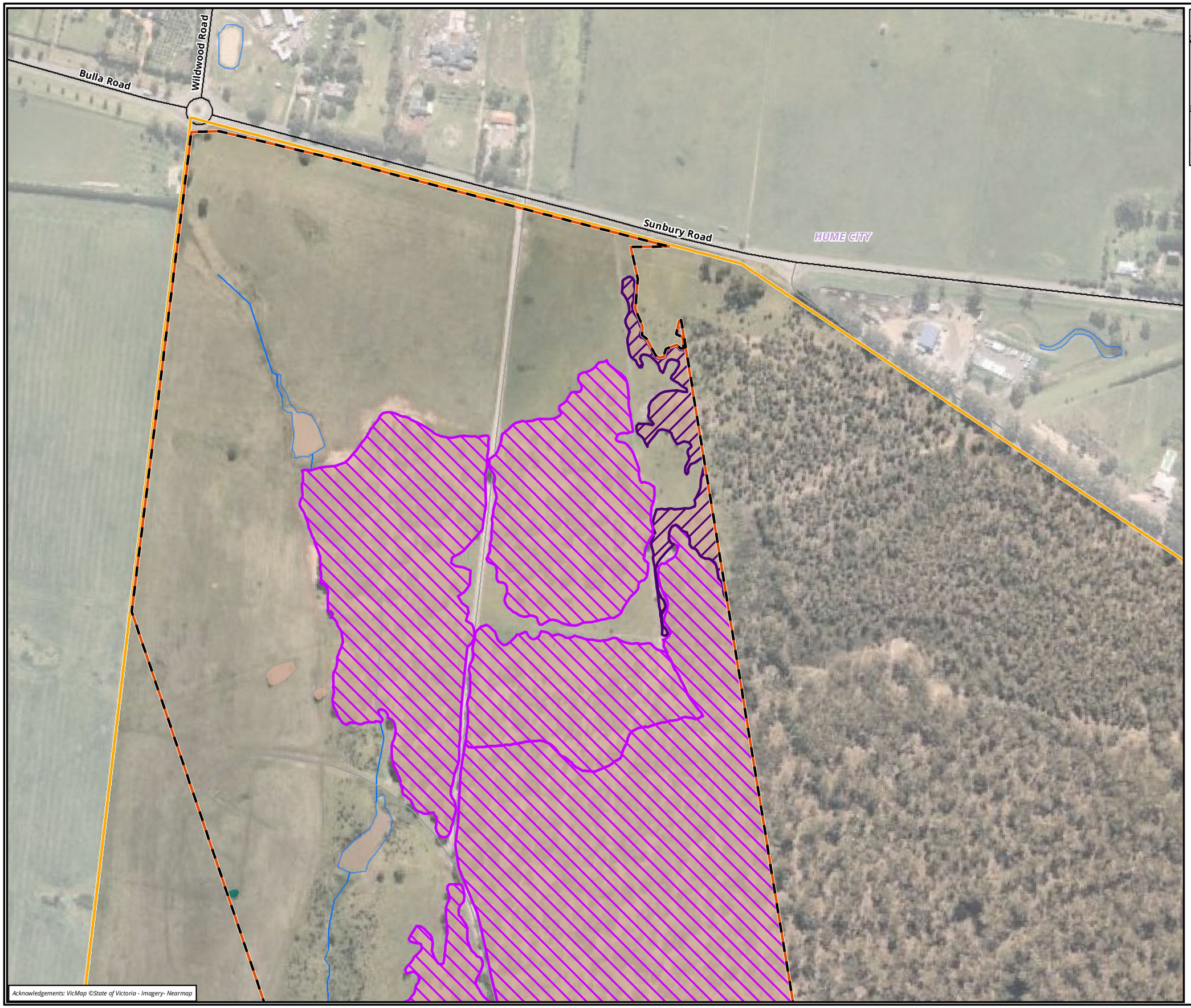

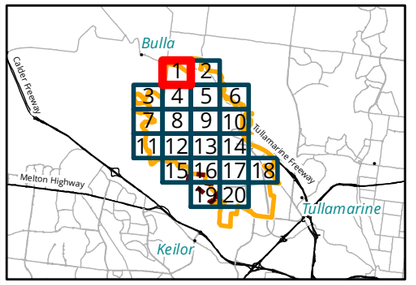

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 55 Plains Grassy Woodland
- 803 Plains Woodland

EPBC listed community

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored

Melbourne Airport

- Commonwealth land

Figure 17.1 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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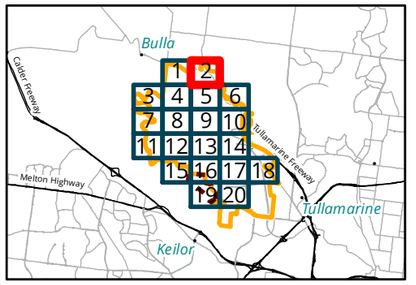

Legend

Vegetation community

803 Plains Woodland

EPBC listed community

Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia

Melbourne Airport

Commonwealth land

Figure 17.2 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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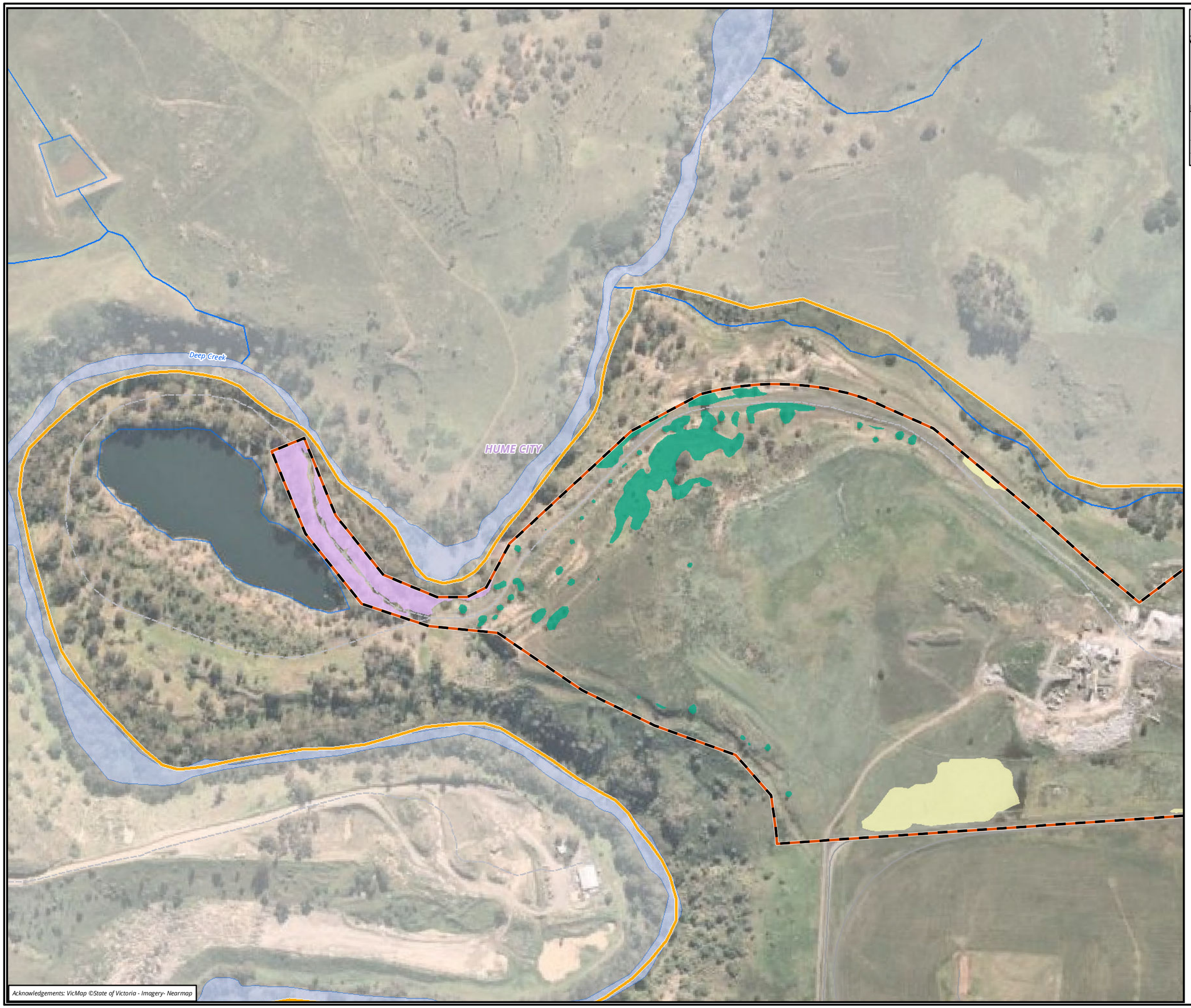

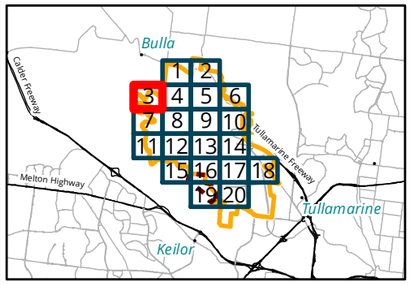

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 641 Riparian Woodland
- 895 Escarpment Shrubland

Melbourne Airport

- Commonwealth land

Figure 17.3 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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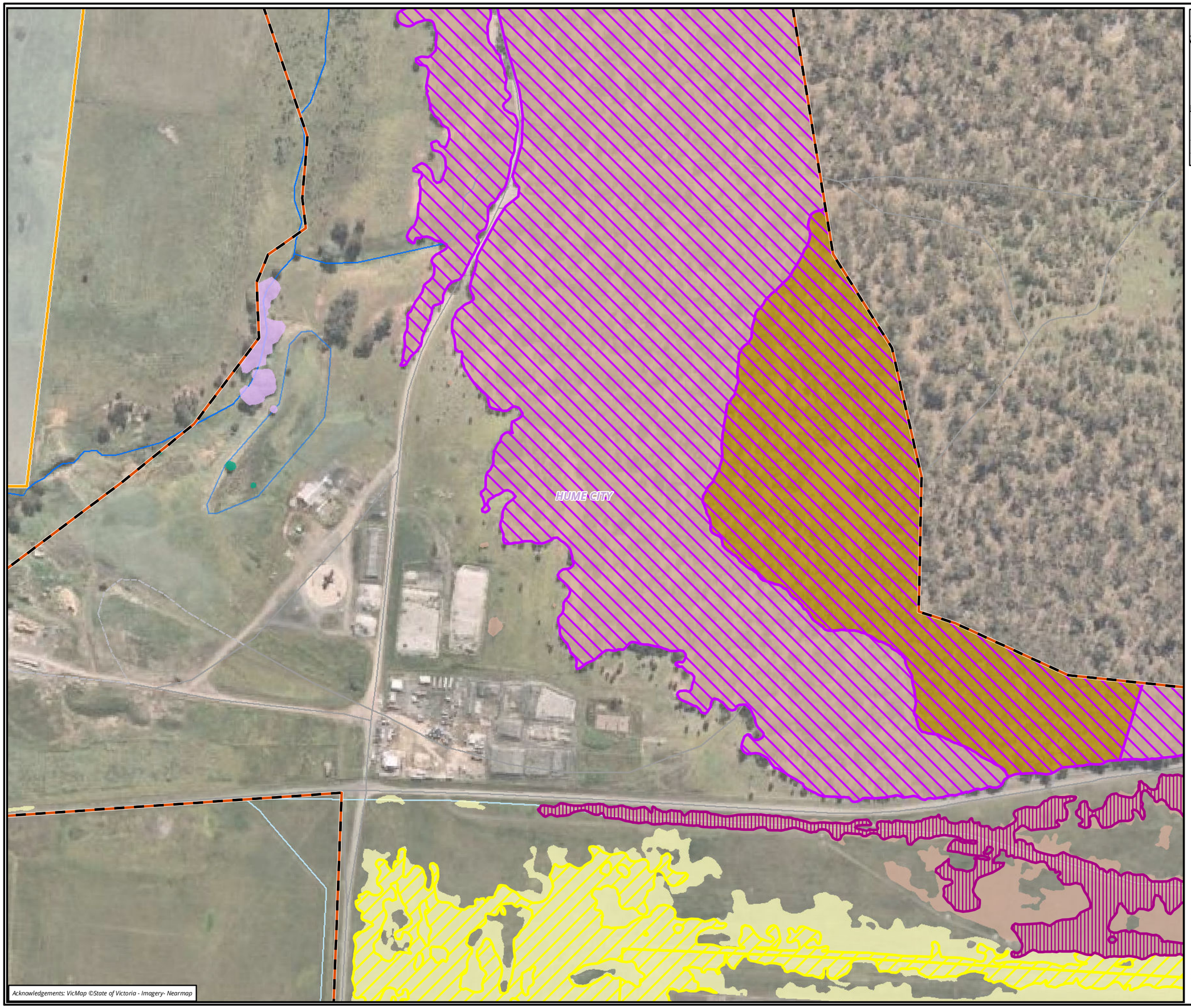

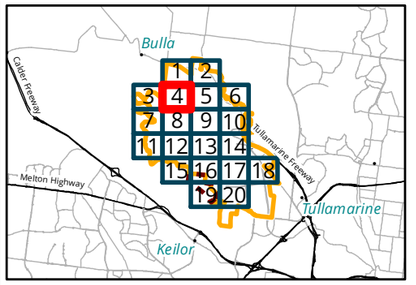

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 641 Riparian Woodland
- 71 Hills Herb-rich Woodland
- 803 Plains Woodland
- 895 Escarpment Shrubland

EPBC listed community

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived grassland
- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Commonwealth land

Figure 17.4 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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Date: 14 December 2021,
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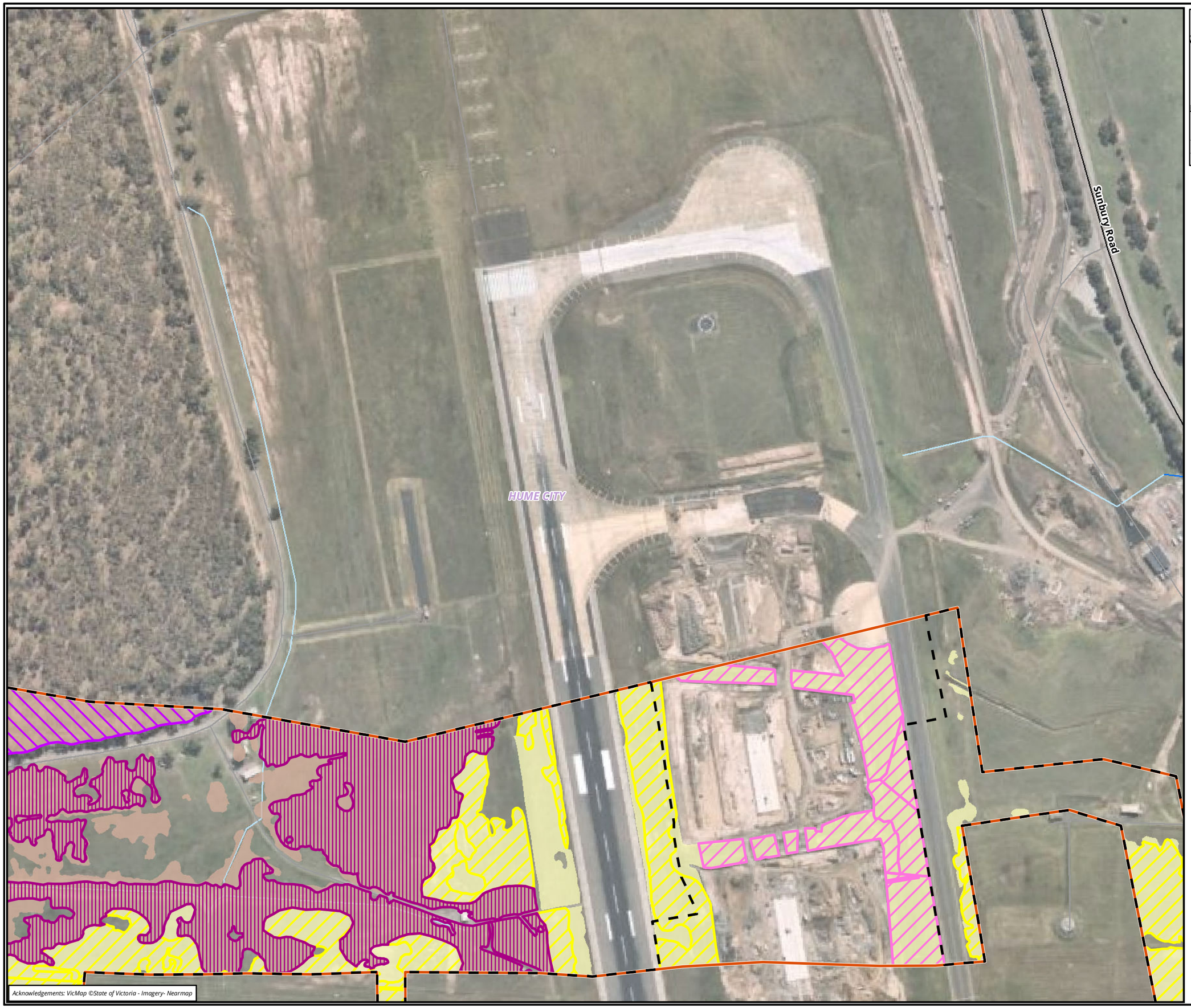

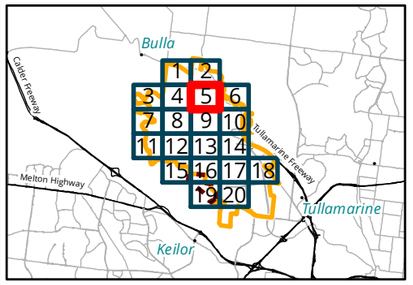

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 803 Plains Woodland
- 821 Tall Marsh

EPBC listed community

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived grassland
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Natural Temperate Grassland of the Victorian Volcanic Plain - Assumed

Melbourne Airport

- Commonwealth land

Figure 17.5 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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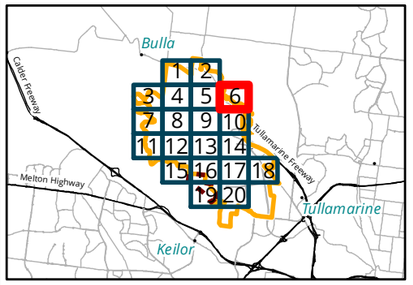

Legend

Melbourne Airport Third Runway Project area

Melbourne Airport Third Runway Impact area

Vegetation community

132 Plains Grassland

EPBC listed community

Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

Commonwealth land

Figure 17.6 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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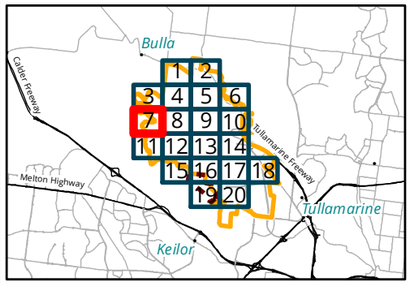

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland

Melbourne Airport

- Commonwealth land

Figure 17.7 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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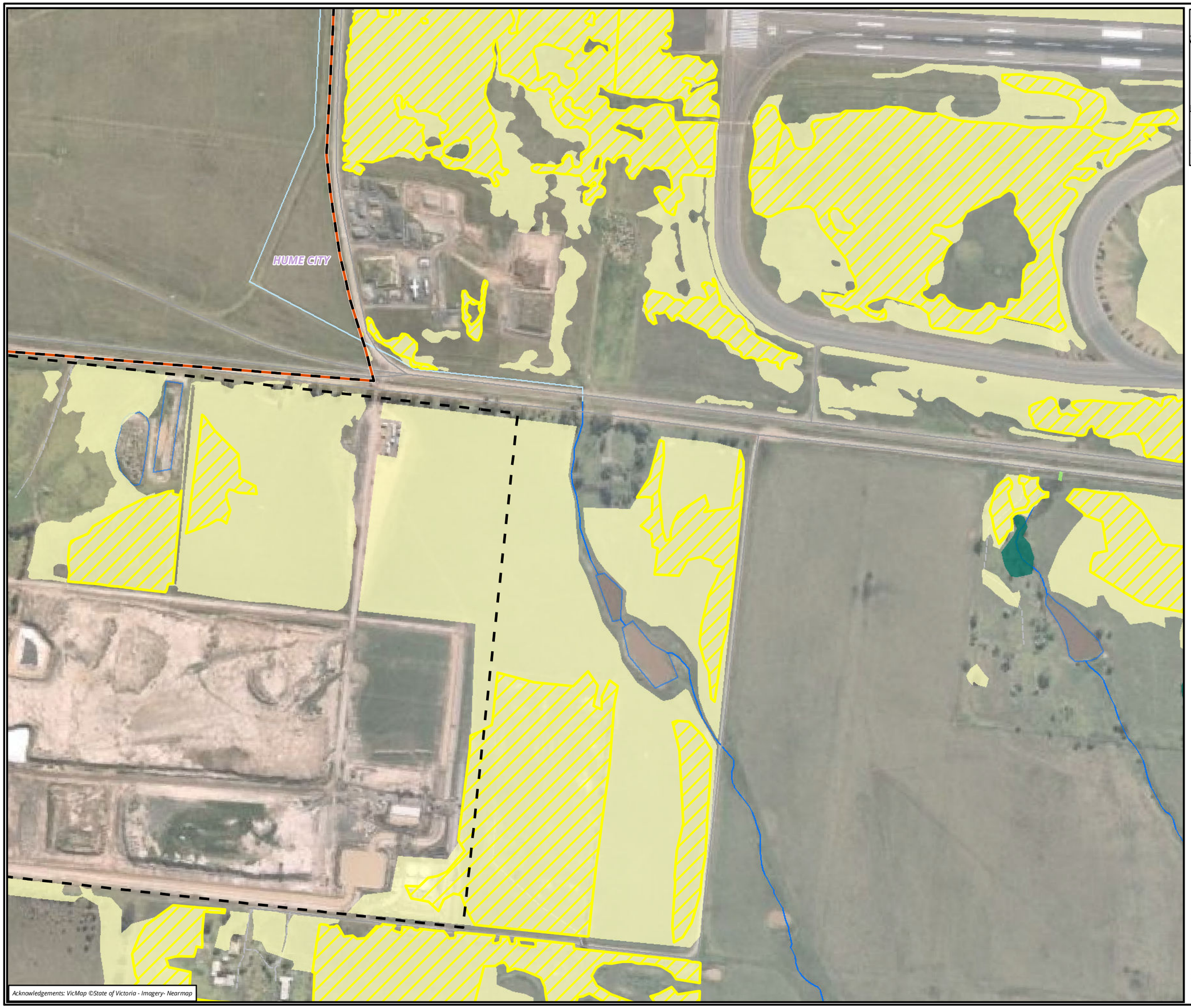

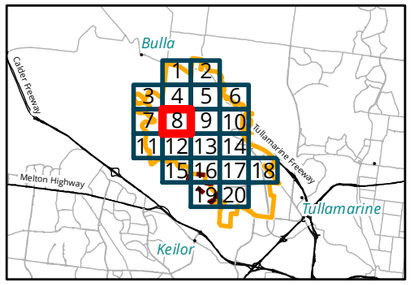

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 55 Plains Grassy Woodland
- 821 Tall Marsh

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Commonwealth land

Figure 17.8 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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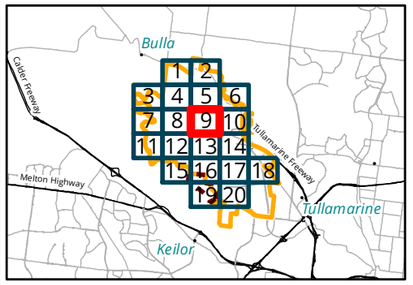

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 55 Plains Grassy Woodland

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain
- Natural Temperate Grassland of the Victorian Volcanic Plain - Assumed
- Natural Temperate Grassland of the Victorian Volcanic Plain - Estimated

Melbourne Airport

- Commonwealth land

Figure 17.9 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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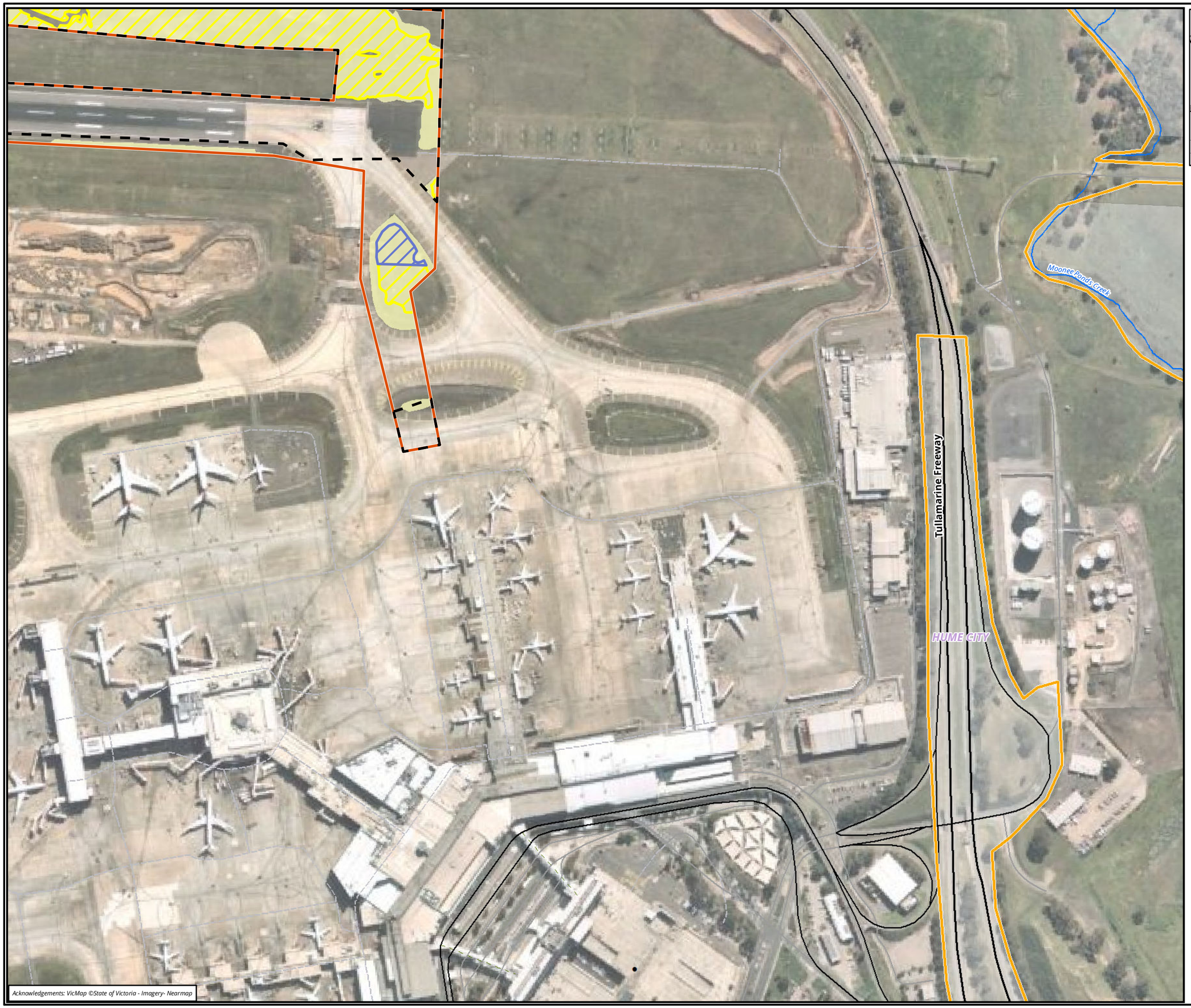

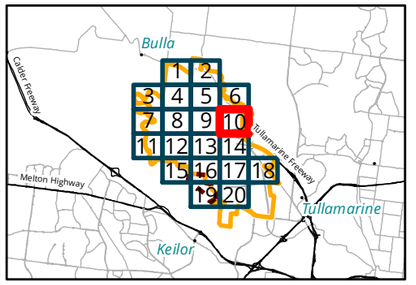

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain
- Natural Temperate Grassland of the Victorian Volcanic Plain - Estimated

Melbourne Airport

- Commonwealth land

Figure 17.10 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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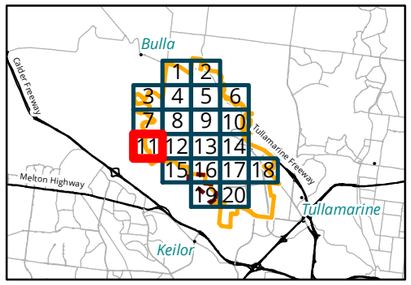

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 653 Aquatic Herbland

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Commonwealth land

Figure 17.11 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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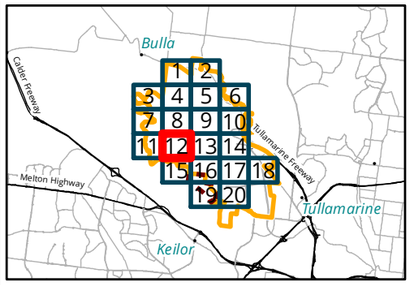

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Commonwealth land

Figure 17.12 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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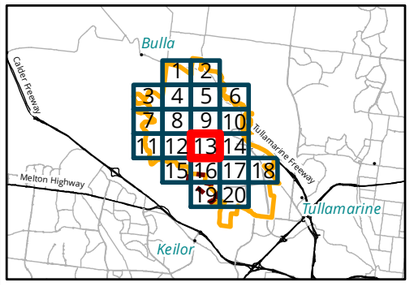

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 55 Plains Grassy Woodland
- 821 Tall Marsh

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Commonwealth land

Figure 17.13 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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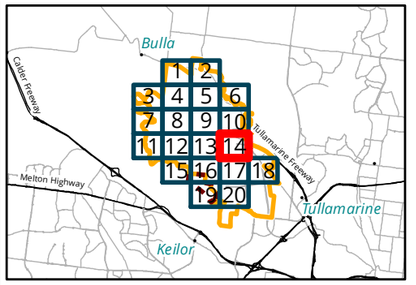

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Commonwealth land

Figure 17.14 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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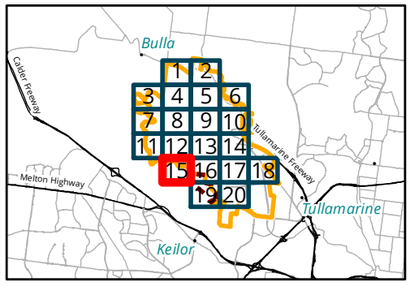

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area
- 270 and 300 Arundel Creek study area

Vegetation community

- 132 Plains Grassland

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 17.15 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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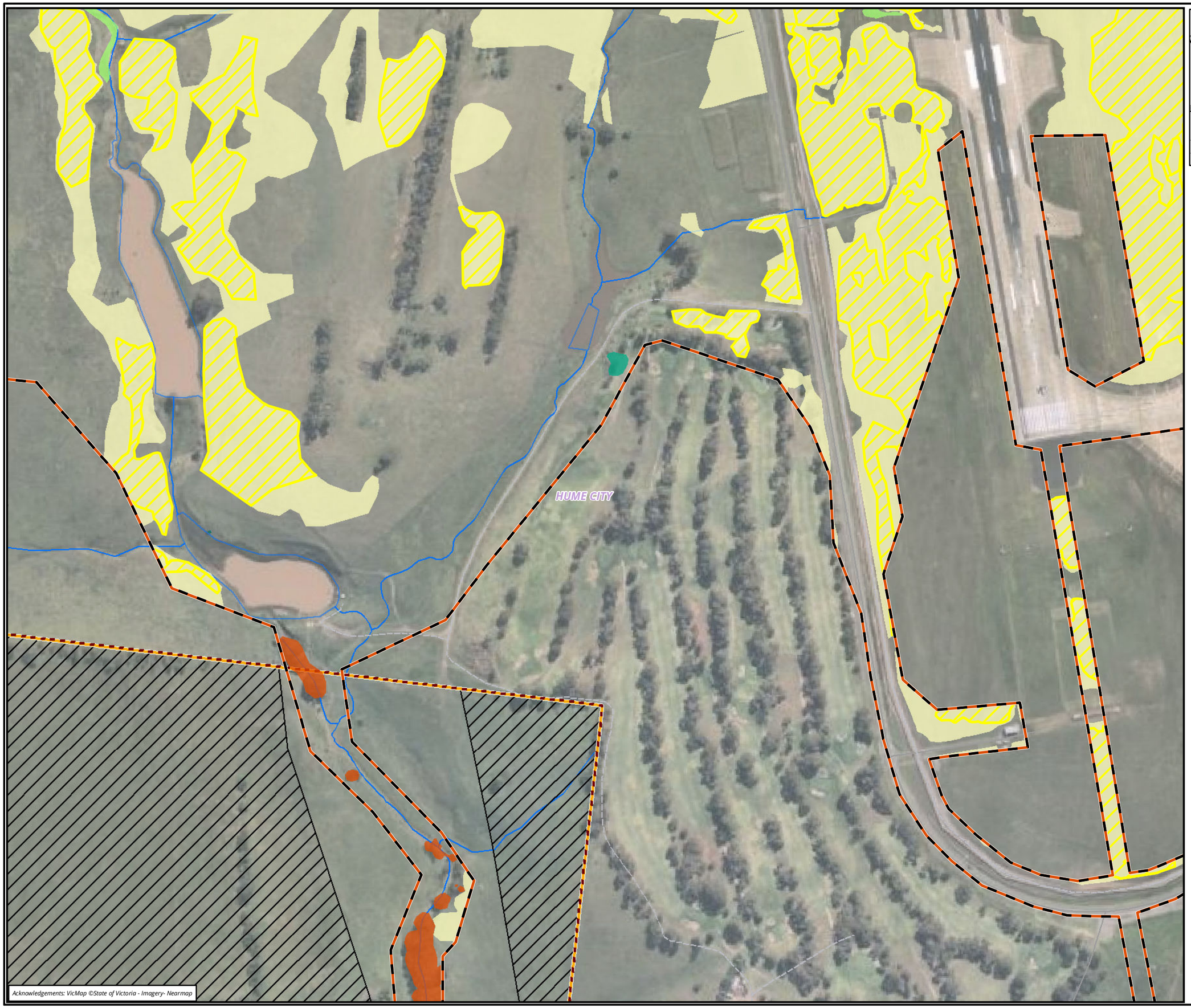

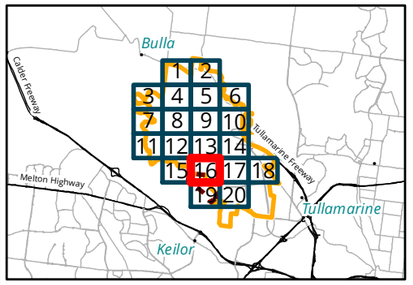

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area
- 270 and 300 Arundel Creek study area

Vegetation community

- 132 Plains Grassland
- 55 Plains Grassy Woodland
- 68 Creekline Grassy Woodland
- 821 Tall Marsh
- 895 Escarpment Shrubland

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 17.16 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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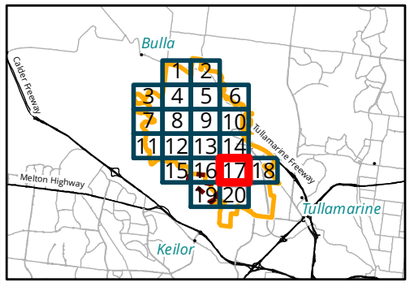

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 821 Tall Marsh

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Commonwealth land

Figure 17.17 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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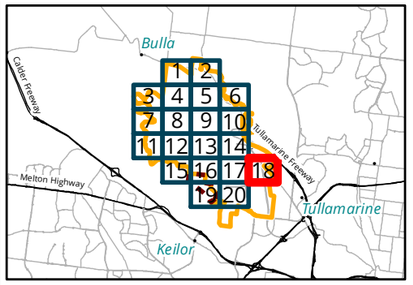

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland
- 821 Tall Marsh

Melbourne Airport

- Commonwealth land

Figure 17.18 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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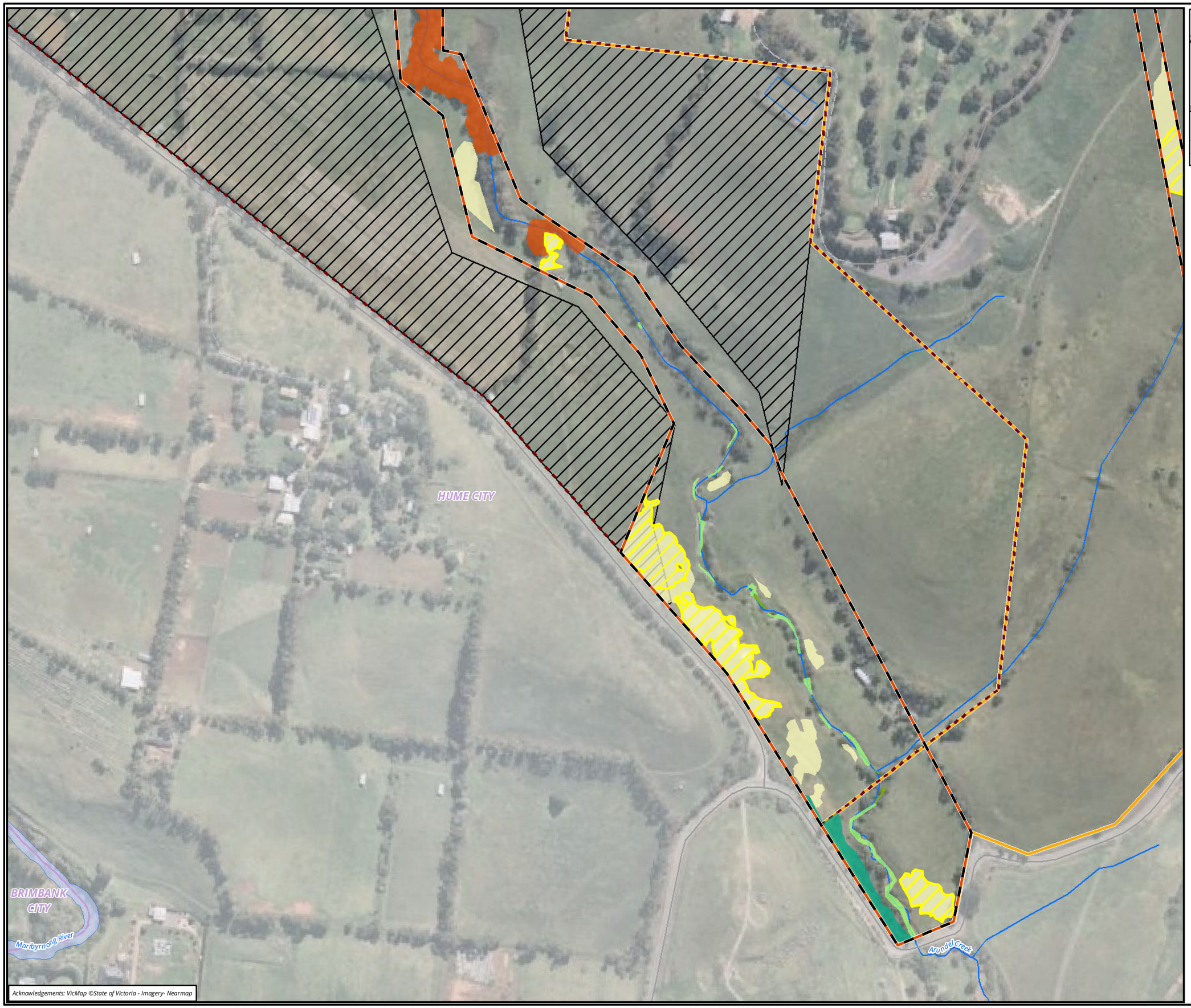

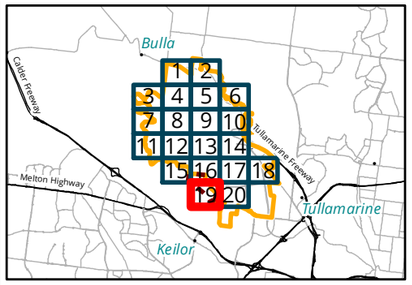

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area
- 270 and 300 Arundel Creek study area

Vegetation community

- 132 Plains Grassland
- 653 Aquatic Herbland
- 68 Creekline Grassy Woodland
- 821 Tall Marsh
- 895 Escarpment Shrubland

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 17.19 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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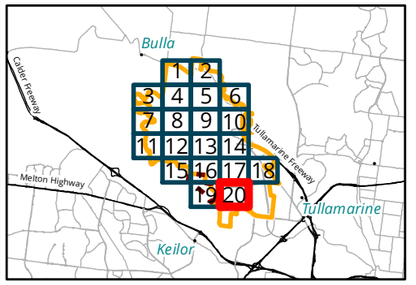

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area

Vegetation community

- 132 Plains Grassland

EPBC listed community

- Natural Temperate Grassland of the Victorian Volcanic Plain

Melbourne Airport

- Commonwealth land

Figure 17.20 Native vegetation in the project area – Melbourne Airport Third Runway

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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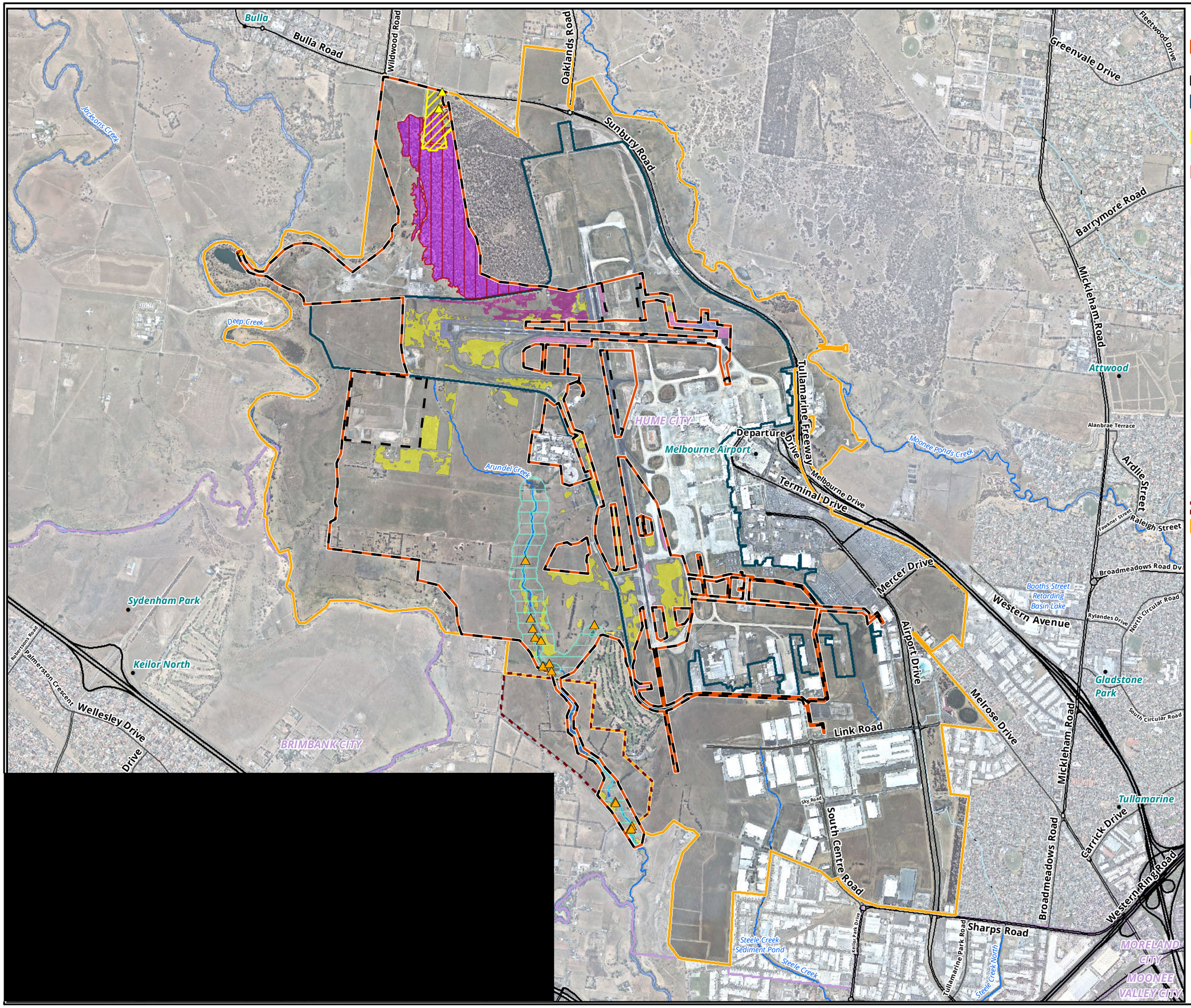

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area
- Airside boundary

Fauna habitat

- Golden Sun Moth
- Growling Grass Frog
- Swift Parrot

EPBC

- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Restored
- Grey Box Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia - Derived grassland
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Natural Temperate Grassland of the Victorian Volcanic Plain - Assumed
- Natural Temperate Grassland of the Victorian Volcanic Plain - Estimated

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 19 EPBC listed species and ecological communities within the impact area – Melbourne Airport

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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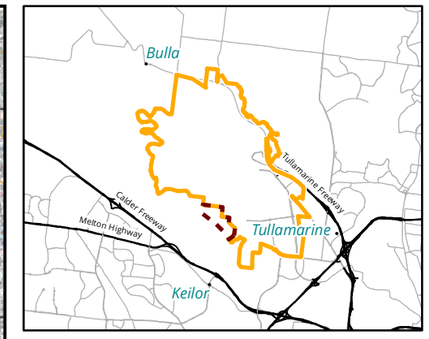

Legend

- Melbourne Airport Third Runway Project area
- Melbourne Airport Third Runway Impact area
- Airside boundary

Growling Grass Frog habitat

- Aquatic
- Breeding
- Terrestrial
- Potential dispersal and ephemeral aquatic habitat

Melbourne Airport

- Freehold land
- Commonwealth land

Figure 20 Growling Grass Frog habitat – Melbourne Airport

0 300 600 900 1,200 1,500

Metres
Scale: 1:30,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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Appendix 2 Regulatory Framework

Commonwealth legislation

Airports Act (1996)

The Airports Act and associated Airport (Environment Protection) Regulations 1997 govern planning approvals and procedures on Commonwealth land at Melbourne Airport.

Master Plan and Environment Strategy

The Airports Act requires Melbourne Airport and other core regulated Australian airports to develop and implement a Master Plan (Airports Act s.71). The 2018 Melbourne Airport Master Plan was approved by the Australian Government Minister for Infrastructure and Transport on 14 February 2019 (APAM 2018).

Melbourne Airport's Master Plan must specify an Environment Strategy that, among other details, outlines the following (Airports Act s.71(2)(h)):

- Areas within the airport that are environmentally significant.
- Sources of environmental impact associated with airport operations.
- Studies, reviews and monitoring to be carried out by Melbourne Airport in connection with those sources of environmental impact.
- Timeframes for completion of those studies and reviews and for reporting on that monitoring.
- Measures to be carried out by Melbourne Airport to prevent, control or reduce environmental impacts associated with airport operations.
- Timeframes for completion of those measures.

Major Development Plan

A Major Development Plan (MDP) is required for each major development on Commonwealth land at Melbourne Airport (Airports Act s.88). The Act defines actions that constitute a major development and therefore require an MDP (Airports Act s.89). Importantly, a major development includes (but is not limited to):

- A development of a kind that is likely to have significant environmental or ecological impact (s.89(m)).
- A development which affects an area identified as environmentally significant in the Environment Strategy (s.89(n)).

MDPs must be consistent with the approved Master Plan and Environment Strategy (Airports Act s.91(1A)). Any MDP for Melbourne Airport must also describe:

- Melbourne Airport's assessment of the environmental impacts that might reasonably be expected to be associated with the development (s.91(1)(h)).
- Melbourne Airport's plans for dealing with these environmental impacts, including plans for ameliorating or preventing environmental impacts (s.91(1)(j)).

Melbourne Airport head lease

Under the Airports Act, APAM is the airport-lessee company that holds the head lease for Melbourne Airport. The head lease requires APAM to manage Melbourne Airport for 50 years (until 2047), with an option to extend the lease by 49 years to 2096.

Under the head lease, APAM is required to develop Melbourne Airport to the quality standards reasonably expected of a major international airport in Australia. In developing Melbourne Airport, APAM must take into account anticipated traffic demand at Melbourne Airport and good business practice.

The head lease also requires APAM to consider environmental implications of Melbourne Airport operations and development. Clause 6.2 of the lease requires APAM to maintain the environment of Melbourne Airport in accordance with legislative requirements and meeting the commitments of the Melbourne Airport Environment Strategy. The lease therefore imposes biodiversity and conservation management obligations on APAM.

Environment Protection and Biodiversity Conservation Act (1999)

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.

Link for further information including a guide to the referral process is available at: http://www.environment.gov.au/epbc/index.html.

Environment protection

Under the EPBC Act, it is an offence to take an action on Commonwealth land if that action has, will have or is likely to have a significant impact on the environment (EPBC Act s.26(1)). It is also an offence to take an action outside Commonwealth land where the action has, will have or is likely to have a significant impact on the environment on Commonwealth land (EPBC Act s.26(2)).

For the purposes of these provisions, the environment includes (but is not limited to) ecosystems and their constituent parts, including people and communities (EPBC Act s.528).

Matters of National Environmental Significance (MNES)

The EPBC Act protects MNES anywhere in Australia, whether on Commonwealth land or otherwise. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on one or more MNES.

MNES include (but are not limited to):

- Wetlands of international importance listed under the Ramsar Convention (s.16)
- Listed threatened species and listed threatened ecological communities (s.18)
- Listed migratory species (s.20).

Migratory species are listed under a specific provision (s.20) of the EPBC Act because they may move between Australia and other international jurisdictions. Section 20 of the EPBC Act gives legislative effect to Australia's obligations under the Bonn Convention and agreements with Japan, China and South Korea for conservation of migratory species. Species listed as migratory under the EPBC Act include a large number of species that are widespread but not under any category of threatened status.

Species listed as threatened under the EPBC Act are placed in to one of the following categories (EPBC Act s.178 and s.179):

- Extinct, where there is no reasonable doubt that the last member of the species has died.
- Extinct in the wild, where the species only survives in cultivation, captivity or naturalised populations well outside its past range or where exhaustive surveys have not recorded the species in its known or expected habitat.
- Critically endangered, where the species is facing an extremely high risk of extinction in the wild in the immediate future.
- Endangered, where the species is facing a very high risk of extinction in the wild in the near future.
- Vulnerable, where the species is facing a high risk of extinction in the wild in the medium-term future.
- Conservation dependent, where the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered.

The threatened species categories determine the significant impact criteria under which an action is assessed.

Significant impact

A significant impact on the environment or on an MNES is an impact that is "important, notable, or of consequence, having regard to its context or intensity" (DoE 2013; DSEWPaC 2013). The significance of an impact is determined according to criteria outlined in the EPBC Act Significant Impact Guidelines (DoE 2013; DSEWPaC 2013).

A significant impact is considered likely if there is "a real or not remote chance or possibility" of the impact occurring (DoE 2013 p.3; DSEWPaC 2013p.3). There does not need to be a greater than 50% chance of the significant impact happening. The likelihood of a significant impact is assessed according to the sensitivity, value and quality of the environment that is impacted and according to the intensity, duration, magnitude and geographic extent of the impacts (DoE 2013; DSEWPaC 2013).

Under the Significant Impact Guidelines, APAM is responsible for undertaking a self-assessment of any proposed action with potential to significantly impact upon the environment at Melbourne Airport (Commonwealth land) or upon one or more MNES. If the self-assessment reveals that the proposed action is likely to have a significant impact or that the significance or likelihood of the impact is unknown, APAM is to prepare a MDP for the proposed action which is to be submitted to the Minister for Infrastructure and Transport. The Minister for Infrastructure and Transport then refers the action to the Minister for the Environment and Energy. The Minister for the Environment and Energy then determines whether the proposed action is a controlled action, which requires assessment and approval under the EPBC Act, or not a controlled action, which does not require approval if undertaken in accordance with the referral.

Referrals and Major Development Plans

The Australian Government Minister for Infrastructure and Transport, who is responsible for assessing and approving Major Development Plans (MDPs), is required to seek the advice of the Australian Government Minister for the Environment prior to approving a draft MDP (DSEWPaC 2013). Actions taken as part of an MDP do not require referral or approval under the EPBC Act because the Minister for the Environment considers significant impacts on the environment on Commonwealth land as part of the MDP approval process.

If a proposed action is likely to result in significant impacts to MNES or the environment on Commonwealth land an MDP must be prepared and submitted for approval by the Minister for the Environment.

Permits

The EPBC Act (Part 13) requires a permit for activities which may kill, injure, take, trade, keep or move a member of a listed threatened species or ecological community, a member of a listed migratory species or a member of a listed marine species in or on Commonwealth land. This permit requirement is separate from the EPBC Act requirement to refer actions that have the potential to significantly impact on the environment of Commonwealth land or on MNES.

Actions that do not need to be referred to the Australian Government Minister for the Environment may still require a permit under Part 13 of the EPBC Act. For example, removal of a small area of listed threatened ecological community may not trigger the need for a referral when assessed according to the Significant Impact Guidelines (DoE 2013), yet the action will still require a permit under Part 13 of the EPBC Act.

Notifications

In accordance with Part 13 of the EPBC Act, APAM is responsible for notifying the Secretary of the Australian Government Department of the Environment and Energy (DEE) within seven days of becoming aware of an unauthorised action at Melbourne Airport. An unauthorised action is an action that has not been granted a permit under Part 13 and results in the unintentional death, injury, trading, taking, keeping or moving of a member of a listed threatened species (except a conservation dependent species), a member of a listed migratory species or a member of a listed threatened ecological community.

There are many circumstances under which unauthorised actions may occur at Melbourne Airport. For example, environmental incidents (e.g. aircraft accidents, fuel spill etc.), emergency infrastructure maintenance works (e.g. burst water mains, gas leaks) or collisions between aircraft and wildlife could all result in the unintentional death or injury of a significant species or member of a threatened ecological community. Part 13 of the EPBC Act allows for unauthorised actions in certain exceptional circumstances, including (but not limited to) unauthorised actions that are:

- Reasonably necessary to prevent a risk to human health (s.197(f) and s.212(f)).
- Reasonably necessary to deal with an emergency involving a threat to human life or property (s.197(h) and s.212(h).
- The result of an unavoidable accident, other than an accident caused by negligent or reckless behaviour (s.197(i) and s.212(i)).

Under these circumstances, an unauthorised action at Melbourne Airport is not an offence, provided APAM notifies the Secretary of the Environment department within seven days of becoming aware of the unauthorised action.

Appendix 3 Detailed survey methods

A3.1 Vegetation survey methods

Vegetation assessments followed a three-step approach:

1. Identifying and mapping all native vegetation using the Victorian EVC classification system.
2. Identifying and mapping all areas of native vegetation that satisfy the criteria for a TEC listed under the EPBC Act.
3. Assessing the quality of all TECs present.

Native vegetation surveys were undertaken over the following dates:

- Grassland and all other EVCs (excluding Grey Box Woodland) with a team of four Botanists (35 days), six botanists (5 days) and two botanists (8 days):
  - 18, 19, 20, 25, 26 and 27 November 2019
  - 2, 3, 6, 9, 10, 11, 16, 18 December 2019
  - 6, 8, 9, 10, 13, 15, 16, 17, 20, 21, 22, 23, 24, 28, 29, 30, 31 January 2020
  - 3, 4, 5, 6, 10, 11, 12, 13, 14 February 2020
  - 4, 5, 6, 7, 8, 13, 16, 17 October 2021 (completed areas previously describes as 'not assessed').
- Grey Box Woodland surveys were undertaken over six days with a team of four Botanists:
  - 8, 9, 10, 15, 16 and 17 January.

A3.1.1 Native vegetation

First, native vegetation patches and scattered trees were identified and mapped using ArcGIS Collector on a GPS-enabled tablet. This mapping relied on definitions provided in the Victoria Planning Provisions (VPP; DELWP 2020) and Guidelines for the Removal, Destruction or Lopping of Native Vegetation (DELWP 2017). Key definitions are outlined in Table A3.1. Patches of native vegetation were assigned to appropriate Ecological Vegetation Classes (EVCs), with reference to EVC benchmarks for the appropriate bioregion (DSE 2004a ; DSE 2004b), NatureKit's EVC modelling (DELWP 2020), historical maps dating back to 1840 (Kemp 1840; DoL c.1849; Hoddle 1850; DoD 1915; DoD 1938; DCLS 1946), geological mapping (Mines Department 1970; Mines Department 1973; DNRE 1997; Senversa 2020, unpublished) and previous studies (McDougall 1987; Biosis 2015; Biosis 2019).

Vegetation patches were mapped at a scale of 10 square metres (0.001 hectares) for the following reasons:

- The EPBC Act Offset Assessment Guide (DSEWPaC 2012) requires a scale of at least 0.01 hectares for quantifying impacts on threatened ecological communities. Our mapping, on a 0.001-hectare scale (i.e. one order of magnitude finer resolution), allows for accurate addition and rounding of impacts.
- A scale of 0.001 hectares is the scale required to map 0.001 habitat hectares (assuming a perfect vegetation condition score), which is the scale required by DELWP's Native Vegetation Offset Register for securing offset sites in Victoria.
- A scale of 10 square metres was approximately within the resolution of the error of the GPS-enabled tablet.

Table A3.1 Key definitions used for identifying and mapping native vegetation at Melbourne Airport

Term	Definition	Reference
Native vegetation	Plants that are indigenous to Victoria, including trees, shrubs, herbs, and grasses.	VPP cl. 73.01
Patch of native vegetation	An area of vegetation where at least 25% of total perennial understorey plant cover is native or any area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy (note that the Current Wetlands Map has been excluded from this definition).	DELWP 2017 p.6
Scattered tree	A native canopy tree that does not form part of a patch.	DELWP 2017 p.6
Canopy tree	A mature tree (i.e. it is able to flower) greater than 3 metres in height and normally found in the upper layer of the relevant vegetation type (EVC).	DELWP 2017 p.35
Ecological Vegetation Class (EVC)	A native vegetation type classified on the basis of a combination of its floristics, lifeforms and ecological characteristics.	DELWP 2017 p.35

A3.1.2 Threatened communities

Second, vegetation corresponding to a Threatened Ecological Community (TEC) listed under the EPBC Act (a Matter of National Environmental Significance or MNES) was identified and mapped using ArcGIS Collector on a GPS-enabled tablet. EVC mapping assisted with identification of the potential presence of TECs. The following TECs were identified and mapped within the project area:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (endangered)
- Natural Temperate Grassland of the Victorian Volcanic Plain (critically endangered)

The specific methods used for these TECs are outlined below. When mapping TECs, the following considerations applied:

- Only naturalised flora species were considered. Planted vegetation was not considered as contributing to total vegetation cover.
- Vegetation boundaries were mapped as they appeared on the ground at the time of the assessment. For example, the presence and cover of introduced annuals is not considered when mapping Natural Temperate Grassland. When we encountered introduced species that may have annual or perennial life histories (e.g. Ox-tongue *Helminthotheca echioides*), only the life history traits that the plants appeared to be exhibiting at the time of the assessment were considered. Therefore, if plants appeared to be one year old and were persisting in favourable conditions (e.g. high nutrient drainage lines), they were considered to be perennial. When there was doubt, it was assumed that the plants were annual.

A3.1.2.1 Natural Temperate Grassland of the Victorian Volcanic Plain

A field checklist was devised for determining the presence of this community (Appendix 7). The checklist relied on the diagnostic characteristics and condition thresholds outlined in the listing advice (TSSC 2008).

Where the listing advice was unclear, further clarity was sought from the Natural Temperate Grassland Information Sheet (DSEWPaC 2011) and, if required, from guidance provided by the Australian Government Department of the Environment and Energy (and its predecessors).

The field checklist was used to identify the presence or absence of NTGVVP in areas mapped as suitable EVCs (i.e. Heavier-soils Plains Grassland). The checklist was also used in areas of predominantly introduced vegetation that had previously been mapped as NTGVVP to confirm that these areas no longer satisfied the key diagnostic characteristics and condition thresholds of the TEC. All field data for Natural Temperate Grassland was collected between 18 November 2019 and 14 February 2020 by Michael Goddard, Samantha Barron, Matt Dell, Jane Kenny, Jack Tate, Matt Gibson and Josh Howard.

The field checklist relies on accurate plant cover estimates being obtained. To ensure that assessments were consistent and standardised, cover estimates were made with reference to pre-defined cover charts. Where cover estimates were close to a condition threshold, gridded 1x1 m quadrats were used to objectively sample plant covers within the grassland patch and confirm the veracity of cover estimates. The 1x1 m quadrats were gridded with 10 horizontal and 10 vertical string lines, resulting in 100 intersection points at which flora species were recorded, allowing for an objective estimate of the percentage cover of each plant species across the square metre. Where the gridded 1x1 m quadrats were used, patches were randomly sampled to avoid sampling bias.

The listing advice includes minimum contiguous size thresholds for a grassland patch to qualify as NTGVVP. It uses terms such as 'native vegetation remnant' and 'grassland patch' (TSSC 2008 p.3). For the purpose of assessing size thresholds, the 'grassland patch' was taken to be the NTGVVP patch rather than the (generally larger) Heavier-soils Plains Grassland patch. In addition, the 'native vegetation remnant' was taken to be the contiguous 'patch of native vegetation', as defined in Table A3.1, rather than a contiguous area of one or more TECs. DAWE confirmed that this is an appropriate interpretation of the listing advice (J. Vranjic, DAWE, pers. comm., March 2020).

This literal interpretation of the NTGVVP Listing Advice size thresholds had the following implications for grassland patches that otherwise met all other key diagnostic characteristics and condition thresholds for NTGVVP:

- The grassland patch was not considered to be NTGVVP if the grassland patch was less than 0.05 hectares, even if all other key diagnostic characteristics and condition thresholds were met.
- Where the grassland patch was contiguous with other native vegetation that did not satisfy key diagnostic characteristics or condition thresholds for NTGVVP, together forming a native vegetation remnant of 1 hectare or less, the grassland patch was only considered to be NTGVVP if the grassland patch was at least 0.05 hectares.
- Where the grassland patch was contiguous with other native vegetation that did not satisfy key diagnostic characteristics or condition thresholds for NTGVVP, together forming a native vegetation remnant of more than 1 hectare, the grassland patch was only considered to be NTGVVP if the grassland patch was at least 0.5 hectares.

This literal interpretation results in the anomaly whereby small patches of grassland (at least 0.05 hectares but less than 0.5 hectares) are considered to be NTGVVP when they are part of small native vegetation remnants (1 hectare or less) but not when they form part of larger vegetation remnants (greater than 1 hectare). In effect, small patches of grassland with greater connectivity with surrounding native vegetation are less likely to meet the minimum size thresholds for NTGVVP. DAWE has confirmed that this anomaly is nevertheless the correct interpretation of the listing advice (J. Vranjic, DAWE, pers. comm., 19 March 2020).

A3.1.2.2 Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

In order to determine if areas of Hills Herb-rich Woodland EVC 71 and Plains Woodland EVC 803 (both the treed and derived grassland condition states) met the key diagnostic characteristics and condition thresholds to qualify as the Grey Box Grassy Woodland TEC, a range of floristic, cover and structural data was collected. A field checklist was devised for determining the presence of this community (Appendix 7). The criteria to classify an area as the listed TEC include (see Table 6):

1. Dominant tree species (i.e. presence of Grey Box)
2. Patch size
3. Weediness
4. Tree cover
5. Tree stem size and density
6. Species richness/diversity
7. Perennial native species cover.

Criterion 1, 2, 4 and 6 can readily be addressed through simple observations, patch mapping, ground-based or aerial photograph interpretation of canopy cover estimates and floristic surveys of a patch. Criterion 3, 5 and 7 require collection of plant cover and lifeform type information, as well as collection of woodland demographic data. To ensure a transparent and repeatable approach to collecting data on plant cover, lifeforms and woodland demographics, a randomised method was applied to all areas of treed Hills Herb-rich Woodland EVC 71 and Plains Woodland EVC 803, while a holistic checklist approach was used for any derived grassland condition states (similar to the checklist approach for Natural Temperate Grassland). All field data collection was undertaken by Matt Looby, Michael Goddard, Jack Tate, Jane Kenny, Jack Fursdon and Imogen Merlo between 8 January and 10 February 2020.

Method for treed condition state

Survey design and randomisation

All patches of EVC 71, EVC 803 and immediately surrounding areas (mostly contained within the Airport Woodland and adjacent airside derived native grassland areas) were overlaid with a 100 metre x 100 metre (1 hectare) grid surface in a GIS environment. Within each grid square a central point (centroid) was also allocated in the GIS. From this, 216 grid squares and 216 centroids were established with unique identifiers to assist with randomisation of survey effort. The grid and centroids were then loaded to hand held GPS-capable Tablets running Collector for ArcGIS with aerial photography and topographic base maps.

Point intercept transects for cover data

For collecting ground layer plant cover a lifeform schema was developed for use with a 50 metre point intercept transect method. Ground layer plant cover was defined as species that were observed as less than 1 metre tall. The lifeform schema and coding for point intercept field data collection included:

- N = native grass
- A = annual native forb
- F = perennial native forb
- S = native sub-shrub

- W = annual non-grass weed
- X = perennial non-grass weed
- G = annual grass weed
- P = perennial grass weed
- C = cryptogams
- = litter/logs
- B = bare soil/rock
- R = rubbish.

A field data sheet template is provided at the end of this method statement.

The location of point intercept transects was randomised at two levels to determine where data would be collected:

- The grid centroid to be surveyed was selected using a random number generator application (e.g. grid 1 to 216).
- The degrees bearing for the transect direction was then generated using a random number generator (i.e. 0 to 360^{o}).

Field method for point intercept transects

The following process was applied in the field for the 50 metre point intercept transects:

- Each randomly selected survey point (i.e. grid centroid) was navigated to on foot or vehicle using Collector for ArcGIS.
- A random compass bearing was generated and then a measuring tape was pegged at the grid centroid and extended out on the random bearing for 50 metres.
- Meta-data on the survey site was firstly collected such as:
  - Recorders
  - Date
  - Time
  - Grid/centroid ID
  - Bearing (degrees)
  - Transect (always 50 metres long)
  - EVC.
- Two operators (one observer and one scribe) then collected ground layer cover data at 1 metre intervals along the tape starting at the 1 metre mark and ending at the 50 metre mark (i.e. 50 cover hits along the transect).
- Each hit was assigned to the codified life form scheme described earlier in the data sheet template at the end of this method statement.

Analysis for point intercept transects

In total, 47 point intercept transects were completed across the two EVCs in treed and derived grassland condition states to objectively determine non-grass weed cover and native grass cover. This equates to 2350 data points across the contiguous patches of EVC 71 and EVC 803.

This data was entered into a spreadsheet and analysed to determine:

- Native ground layer cover totals and native grass proportional cover from:
  - Native grass cover
  - Perennial native forb cover
  - Annual native forb cover
  - Native sub-shrub cover
- Introduced ground layer plant cover total and proportional cover from:
  - Annual non-grass weed cover
  - Perennial non-grass weed cover
  - Annual grass weed cover
  - Perennial grass weed cover
- Other ground layer cover totals from:
  - Cryptogam cover
  - Litter/log cover
  - Bare soil/rock cover
  - Rubbish cover
- Total vascular plant (vegetative) cover.

Raw data results are provided in Appendix 7. All samples were analysed to determine proportional cover of non-grass weeds and the samples with native grass cover present were analysed to determine proportional cover of perennial native grasses (as per TSSC 2010).

Woodland tree demographic data collection

Tree size density data (DBH) and presence of hollows are important criteria for determining the presence of the TEC. Tree demographic data was collected in a randomised subset set of the 1 hectare grid squares described above. The large tree DBH size threshold used in the EPBC TEC listing advice is greater than 60 centimetres DBH. The large tree size threshold is greater than or equal to 70 centimetres DBH in the bioregional benchmarks for EVC 71 and EVC 803. On this basis all trees greater than 60 centimetres DBH (i.e. above 60.1 centimetres DBH) were measured in the randomly selected grid squares and ground observations were used to determine whether a tree was hollow-bearing or not. Other tree variables such as health and stem morphology were also collected. The DBH data and additional variables were also used to determine large tree density and health scores for VQA habitat hectares in EVC 71 and EVC 803.

Field method for woodland trees

The following process was applied in the field for tree data collection:

- Each randomly selected grid square was navigated to on foot or vehicle using Collector for ArcGIS.

- Every tree in the 1 hectare grid square greater than 60 centimetres DBH was mapped as a point using a data collection layer in Collector for ArcGIS. Tree variables measured included:
  - Species Name
  - DBH (cm)
  - Hollows Present (Yes/No)
  - Multi stemmed below DBH (Yes/No)
  - Canopy Health (<30%, 30-70%, >70%)
  - Coordinates.
- Two operators (one measuring DBH and looking hollows by eye or with binoculars and the other entering data) used the boundaries of the 1 hectare grid square on the Tablet to collected all tree data.
- For derived grassland areas and fragmented woodland areas in the airside zone all individual trees were mapped.

Analysis for woodland trees

In total, 31 grid squares were surveyed (31 hectares) to determine mean tree and hollow density values per hectare. This data was entered into a spreadsheet and analysed to determine density values. A total of 457 trees with a DBH greater than 60 centimetres were mapped in the 31 grid plots and used for analysis of mean large tree and hollow density per hectare.

Individuals trees mapped in derived grassland areas and fragmented woodland areas in the airside zone were excluded from the analysis of summary statistics and this data was used separately to test if the airside areas met the TEC condition thresholds.

Tree data results summaries are provided in Appendix 7.

Method for derived grassland condition state

The method for assessing the derived grassland condition state of Grey Box Woodland was the same as that used for assess Natural Temperate Grassland, although a separate field checklist was devised and based on the diagnostic characteristics and condition thresholds outlined in the Grey Box Woodland listing advice (TSSC 2010; Appendix 7). Cover estimates were made with reference to pre-defined cover charts. Where cover estimates were close to a condition threshold, gridded 1x1 m quadrats were used to objectively sample plant covers within the grassland patch and confirm the veracity of cover estimates.

A3.2 Quality assessments

Third, the quality of native vegetation corresponding to a TEC was assessed using the habitat hectare (vegetation quality assessment) methodology (DSE 2004). DAWE has endorsed the habitat hectare methodology as an appropriate means of assessing the condition of threatened ecological communities such as Natural Temperate Grassland and Grey Box Woodland in Victoria. The habitat hectare score consisted of the following:

- A condition score (out of 75), incorporating values for understorey, lack of weeds, recruitment, organic litter and, where relevant, large trees, canopy cover and logs. The following qualifications should be noted:

- Condition scores were determined with reference to relevant EVC benchmarks maintained by DELWP.
- Where components of the score were not relevant (e.g. values for large trees, canopy cover and logs are not part of the benchmark for Heavier-soils Plains Grassland), the condition score was standardised to provide a score out of 75.
- The condition score only considered the condition of native vegetation corresponding to the threatened ecological community. The condition of any contiguous vegetation of the same EVC was not considered. For example, where a patch of Natural Temperate Grassland TEC formed part of a broader patch of Heavier-soils Plains Grassland EVC, the condition score only considered what was present within the smaller Natural Temperate Grassland patch.
- In accordance with the habitat hectare methodology, vegetative life forms in the understorey were 'assessed according to their current appearance and height, not according to their predicted mature expression' (DSE 2004 p.18), with reference to the life form category definitions provided in Appendix 6 of the Vegetation Quality Assessment Manual (DSE 2004 p.58). As a result, if a grass species (e.g. Spear Grass Austrostipa spp.) that would normally have an inflorescence more than 1 metre in height had been slashed to a height of 20 centimetres, it was recorded as a medium tufted graminoid, rather than a large tufted graminoid. Similarly, if both woody and non-woody individuals of a species (e.g. Berry Saltbush *Atriplex semibaccata* or Ruby Saltbush *Enchylaena tomentosa* var. *tomentosa*) were observed, they were recorded in both shrub (woody) and herb (non-woody) life form categories.

- A landscape score (out of 25), incorporating values for patch size, percentage of native vegetation in the surrounding area (neighbourhood) and distance to core area. The following qualifications should be noted:
  - Patch size was taken to be the size of the entire contiguous patch of native vegetation, as defined in the table above, rather than the size of the threatened ecological community that may have been a subset of the broader patch of native vegetation. For example, where a patch of Natural Temperate Grassland TEC was part of a larger patch of contiguous Heavier-soils Plains Grassland EVC patch, patch size was taken to be the size of the broader Heavier-soils Plains Grassland patch. This means that threatened ecological communities, buffered by areas of native vegetation that did not meet the criteria of the threatened ecological community, nevertheless received slightly higher patch size values than threatened ecological communities with no native vegetation buffers.
  - Percentage of native vegetation in the neighbourhood was determined with reference to contemporary native vegetation mapping that we had completed in the surrounding area as part of the same project and, where areas of the neighbourhood had not been assessed, DELWP's 2005 EVC modelling available via NatureKit.

The following field checklists were used to assess the presence/absence of Natural Temperate Grassland and the derived grassland condition state of Grey Box Woodland. The numbered criteria outlined in Table A7.1 and Table A7.2 correspond with the numbered questions on these checklists.

Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)

	Habitat zone:	Date:	Recorder: MG / SMB / JDT / JK
1.	Time since mowing/grazing/burning: Days	Weeks	Months
2.	Do native flora make up ≥50% of total vegetation cover, ex. introduced annuals? % cover of all native flora (incl. native annuals): % cover perennial weeds:		Y / N
3.1	Do *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* (circle genera that are present) make up ≥50% native cover AND ≥50% of total perennial tussock cover? % cover of *Themeda*/*Rytidosperma*/*Austrostipa*/*Poa*: % cover of all perennial tussocks (native and introduced):		Y / N
3.2	If total perennial tussock cover represented by *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* is <50%, then is ground cover of native forbs (wildflowers) ≥50% of total vegetation cover during spring-summer (September to February)? % cover of all vegetation (native and introduced, ex. moss, lichen and introduced annuals): % cover of native forbs:		Y / N
3.3	Do *Themeda*, *Rytidosperma*, *Austrostipa* and/or *Poa* (circle genera that are present) make up ≥50% native cover AND is cover of perennial non-grass weeds <30% of total vegetation cover at any time of the year? % cover of all vegetation (native and introduced, ex. moss, lichen and introduced annuals): % cover of perennial non-grass weeds:		Y / N
4.1	For native vegetation remnant of ≤1ha: is contiguous grassland patch ≥0.05ha AND do shrubs/trees >1m tall have % crown cover of ≤5%? Area (ha) of contiguous grassland patch: % crown cover of shrubs and trees >1m tall:		Y / N
4.2	For native vegetation remnant of >1ha: is contiguous grassland patch ≥0.5ha AND are there <2 mature (*not defined) trees/ha? Area (ha) of contiguous grassland patch: # mature trees within patch:		Y / N
5.	Is NTGVVP present (i.e. responded Y to 2, 3 and 4)? If Y, proceed to VQA.		Y / N

Grey Box Grassy Woodlands (GBW) and Derived Grasslands (DG) of South-Eastern Australia

Habitat zone:	Date:	Recorder: MG / SMB

Time since mowing/grazing/burning: Days Weeks Months

1b	Is Grey Box the (co-)dominant tree species in the canopy layer or is no canopy present?	Y / N
1c	Do non-grass perennial weeds make up <30% of total perennial GL vegetation cover? Ground Layer (GL) is undefined but assumed to include all vascular plants <1m high.	Y / N
	% cover of all perennial GL vegetation:	
	% cover of perennial non-grass weeds in GL:	
	% cover of perennial grass weeds in GL:	
1a	Is the GBW or DG patch ≥0.5ha?	Y / N
	Area (ha) of GBW or DG patch (may include small disturbances e.g. tracks):	

If canopy is well developed (≥10% crown cover) and patch <2ha, proceed to **2**.
If canopy is well developed (≥10% crown cover) and patch ≥2ha, proceed to **3** and **4**.
If canopy is absent or less developed (<10% crown cover), proceed to **5**.

2a	Do perennial native species make up ≥50% of total perennial GL vegetation cover?	Y / N
	% cover of all perennial GL vegetation:	
	% cover of all perennial native species in GL:	
2b	Are there ≥8 perennial native species in the mid and ground layers? Mid Layer (ML) and GL include all vascular plants <4m high.	Y / N
	Number of perennial native species in ML and GL:	
3a	Are there ≥8 trees/ha that are hollow-bearing or have DBH ≥60cm?	Y / N
	Number of trees that are hollow-bearing or have DBH ≥60cm:	
3b	Do perennial native grasses make up ≥10% of the vegetative cover in the GL?	Y / N
	% cover of all perennial GL vegetation:	
	% cover of perennial native grasses in GL:	
4a	Are there ≥20 trees/ha that have DBH ≥12cm?	Y / N
	Number of trees that have DBH ≥12cm:	
4b	Do perennial native species make up ≥50% of total perennial GL vegetation cover?	Y / N
	% cover of all perennial GL vegetation:	
	% cover of all perennial native species in GL:	

5a	Does woodland density not meet criteria 3a or 4a OR is DG present (<10% crown cover) with evidence (presence of species from canopy/ML, tree stumps, logs, nearby GBW and/or historical records) that it was once woodland (co-)dominated by Grey Box?	Y / N
5b	Do perennial native species make up ≥50% of total perennial GL vegetation cover?	Y / N
	% cover of all perennial GL vegetation:	
	% cover of all perennial native species in GL:	
5c	Are there ≥12 perennial native species in the GL?	Y / N
	Number of perennial native species in GL:	
6a	Is GBW present (i.e. responded Y to all of 1 and all of 2, 3 or 4)? If Y, proceed to VQA.	Y / N
6b	Is DG present (i.e. responded Y to all of 1 and all 5)? If Y, proceed to VQA.	Y / N

Point intercept transect method for ground layer - N = native grass, A = annual native forb, F = perennial native forb, S = native sub-shrub, W = annual non-grass weed, X = perennial non-grass weed, G = annual grass weed, P = perennial grass weed, C = cryptogams, O = litter/logs, B = bare soil/rock, R = rubbish

Recorders	Date	Time	Site

1 ha plot ID										
Bearing (degrees)										
Transect (m)										
1										
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A3.3 Targeted fauna survey methods

A3.3 Golden Sun Moth

Previous survey effort

A desktop review was undertaken of all previous Golden Sun Moth survey reports at the Melbourne Airport. These reports include:

- GAGIN 2008. Habitat Assessment and Presence of *Synemon plana* (Golden Sun Moth), Melbourne Airport, Tullamarine. Report prepared for Australia Pacific Airports Melbourne
- GAGIN 2009. Second Report Presence of the Golden Sun Moth *Synemon plana* Melbourne Airport 2008. Report prepared for Australia Pacific Airports Melbourne.
- GAGIN 2010. Survey for the Presence of Golden Sun Moth *Synemon plana* Melbourne Airport, Tullamarine 2009. Report prepared for Australia Pacific Airports Melbourne.
- Biosis 2015. Flora and fauna assessment of the Runway Development Program, Melbourne Airport: Existing conditions and impact assessment report. Authors: Kay K, Smales I & Byrne A, Biosis Pty Ltd, Melbourne.
- Biosis 2019. Melbourne Airport Golden Sun Moth habitat survey. Letter report to Australia Pacific Airports Melbourne. Author: Campbell, K, Biosis Pty Ltd, Melbourne.

This data was utilised to compile Figure 9 which outlines previous survey effort for the species. This information was then used to determine whether adequate survey effort existed for the species and if not what the level of additional survey was to be.

It was determined that there were no surveys undertaken within the Melbourne Airport Third Runway project area in the last three years and as such an updated assessment for the entire project area was to occur.

Habitat assessment

Prior to the Golden Sun Moth flight season between October–November the entire project area was traversed by one zoologist experienced in Golden Sun Moth habitat surveys to determine the project area habitat values.

The project area was subsequently classified as:

- Not habitat
  - Pasture improved paddocks
  - Paddocks with no food plants
  - Degraded areas covered in fill with no food plants
  - Areas of infrastructure, roads, stockpiles etc.
- Potential habitat
  - Any areas where there was cover of known food plants.

All areas of potential habitat located within and immediately adjacent to the project area were subject to targeted surveys.

The areas of potential habitat were divided into five survey areas. Each survey area was assessed four times during the targeted surveys. Targeted survey areas for Golden Sun Moth can be viewed in Figure 15.

A summary of the survey areas and habitat descriptions are provided in Table A3.2 below.

Table A3.2 Melbourne Airport Third Runway Project Golden Sun Moth survey sites and details

GSM survey site	Site size (hectares)	Transect type	Number of surveyors	Distance between transects	Site characteristics
GSM survey site Northern area	62.88	Walk	3	Approx. 100 meters	**North of the woodland** Open Grey Box woodland with mixed understory of Chilean Needle Grass *Nassella neesiana*, Blanket Weed *Galenia pubescens*, Serrated Tussock Nassella *trichotoma*, scattered wallaby grass *Rytidosperma* sp. and Spear Grass *Austrostipa* sp. there are also some larger expanses of open Chilean Needle Grass patches throughout. **Area up the hill from Deep Creep tributary**. Characterised by Serrated Tussock and Chilean Needle Grass. Thistles and Blanket weed. Sub-optimal habitat but scattered Wallaby Grass present. **Sunbury Road Paddock.** A mix of Phalaris *Phalaris aquatica*, brassicas and scattered occurrence of Chilean Needle Grass and Wallaby Grass. **HIAL** disturbed ground story.
GSM survey site Mcnabs Road West	178.81	All areas of native grassland walked. In some degraded areas transects were driven	2	Approx. 100 meters	Broad area that includes habitat ranging from high cover of wallaby grass and optimal habitat to degraded areas with scattered occurrence of wallaby grass and paddocks dominated by Chilean Needle Grass, Rye *Lolium* Sp., Oat *Avena* sp., Phalaris and grazed by cattle in areas.
GSM survey site Arundel Creek	71.32	Walked/ driven were possible	2	Approx. 100 meters	Predominantly Phalaris, Oat, Blanket Weed, one square patch of Chilean Needle Grass. Includes some areas dominated by Wallaby Grass.

GSM survey site	Site size (hectares)	Transect type	Number of surveyors	Distance between transects	Site characteristics
GSM survey site Southern area	50.66	Walk	2	Approx. 100 Meters	Areas of native grassland dominated by Wallaby Grass and other areas dominated by Phalaris with scattered occurrences of Chilean Needle Grass, *Brassica* Sp., Oat and Wallaby Grass.
GSM survey site Airside	172	Walk	2	Approx. 100 meters	Dominated by Wallaby Grass and Spear Grass throughout with scattered areas of Chilean Needle Grass and Serrated Tussock.

Targeted surveys

Targeted surveys were conducted on 8, 17, 23, 24 and 29 December 2019. All four surveys were conducted on days of appropriate weather conditions as set out in the survey guidelines within the *Significant impact guidelines for the critically endangered golden sun moth (*Synemon plana*)* (DEWHA 2009a). The weather conditions and results of the targeted surveys are in Appendix 5.

Adults of the species, especially males, can be observed during their diurnal flights. However, their flights are generally restricted to sunny days with little wind and when temperatures are above 20°C by 10 am. Hence, capacity to detect the species is limited to active searching when conditions are precisely appropriate.

To detect any Golden Sun Moth within the site, two or three ecologists experienced in Golden Sun Moth identification walked transects approximately 100 metres apart. Where possible transects were driven across the survey sites.

A3.4 Growling Grass Frog

Previous survey effort

Targeted surveys for Growling Grass Frog were previously undertaken in Deep Creek, Moonee Ponds Creek, Arundel Creek and surrounding waterbodies located on Melbourne Airport land in 2019 (Biosis 2019b). The current habitat values and distribution for the species is well known for Melbourne Airport.

Since the previous surveys undertaken in 2019 new land was acquired at 270 and 300 Arundel Road, this land had not been subject to previous surveys and was surveyed in February 2020 to determine habitat values for Growling Grass Frog and presence/ absence of the species.

Habitat assessment

Suitable habitat was identified during diurnal site investigations of Arundel Creek, Moonee Ponds Creek, Deep Creek and surrounding farm dams and drainage lines within Melbourne Airport in January 2019 and the section of Arundel Creel located at 270 and 300 Arundel Road in January 2020. Particular attention was given to identifying sections of waterways considered to be high-value breeding habitat for Growling Grass Frogs. Breeding habitat was defined as permanent, still or slow-moving waterbodies with floating and emergent

aquatic vegetation and lined with basaltic rock. Nocturnal targeted surveys for Growling Grass Frog were focused on these potential breeding habitats.

Access to the Maribyrnong River beyond the confluence of Jackson's Creek was not possible with the area inaccessible due to heavy thistle infestations at the time and no visible access tracks to the area. A visual habitat assessment from the escarpment above the Maribyrnong River was made for this location.

It is important to have an understanding of Growling Grass Frog habitat and presence across all waterbodies at Melbourne Airport not just in the sections of the waterways located within the impact area therefore the results for surveys across all waterbodies are included within this report.

Further information defining habitat classifications are set out in Table A3.3. Growling Gras Frog habitat at Melbourne Airport can be viewed in Figure 20.

Table A3.3 Growling Grass Frog habitat classification.

Growling Grass Frog habitat classification	Habitat value	Description of classification and rationale
Breeding	High	• Areas of habitat suitable for Growling Grass Frog to breed in. • Permanent, still or slow-moving waterbodies with floating and emergent aquatic vegetation and lined with basaltic rock.
Aquatic	High	• Areas of predominantly aquatic habitat that have been assessed by zoologists during targeted survey for the species. • Aquatic vegetation is diverse and of moderate to high abundance; hydroperiod likely to be constant; still or slow moving water with low turbidity. • Growling Grass Frog records from the particular waterbody or those immediately adjacent.
Terrestrial	High	• Terrestrial habitat generally includes a 100 metre buffer around waterways known to support Growling Grass Frogs which is utilised for foraging/ movement during the active season. The 100 metre buffer has been further refined and reduced or expanded in areas of suitable adjacent habitat. For example, where a steep escarpment abuts a waterway, the top of an escarpment is not terrestrial habitat and the buffer from the waterway has been reduced following landforms and contours. In areas of low lying flood plains the 100 metre buffer has been expanded to incorporate the low lying floodplain.
Potential dispersal and ephemeral aquatic habitat	Low	• Small waterways or tributaries that are unlikely to provide suitable long-term habitat for Growling Grass Frog but where an impact on these waterways is required to be assessed for its potential to have indirect impacts on breeding, aquatic or terrestrial habitat (above). • These waterways have little or no aquatic vegetation present, the period in which the waterbody contains water is intermittent; likely to be dry for extended periods and/or water level is generally low or absent. • Sections of waterbodies that were not suitable aquatic habitat for Growling Grass Frog during the FY19 targeted survey, however during periods of appropriate rainfall have the potential to become aquatic/ breeding habitat. During other times these waterways are predominately used as movement corridors. • The majority of this habitat type at Melbourne Airport does not provide connectivity to other waterbodies.

Targeted surveys

Targeted surveys for adult Growling Grass Frogs were conducted over four nights: 22, 23, 24 and 31 January 2019 and the section of Arundel Creek located at 270 and 300 Arundel Road on the 30 January and 10 February 2020. Two zoologists surveyed suitable waterbodies and streams within Melbourne Airport for the species by listening for the characteristic calls of adult males and using call playback (broadcasting recorded calls) to elicit response calls. Call playback points were established in sections of waterways considered to be breeding or aquatic habitat. Spotlighting was undertaken to actively search for the individuals of the species. Opportunistic listening for calls was undertaken during all visits to the project area. Waterbodies where Growling Grass Frog were not detected during the first survey were visited again for a second survey one week after the first survey, waterbodies where Growling Grass Frog were detected during the first survey were visited once.

Targeted surveys for Growling Grass Frogs were undertaken following the Growling Grass Frog survey protocol within the Survey guidelines for Australia's threatened frogs – Guidelines for detecting frogs listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010).
For each night of survey, weather data was recorded at the beginning, middle and end of the survey period (only the start and end temperatures were recorded for 2020) (Table A3.4).

Table A3.4 Weather information recorded during Growling Grass Frog surveys over four nights.

Survey date		Temperature	Cloud cover (%)	Wind speed (avg km/h)	Humidity (%)
22/1/2019	start	22.7	0	8	66
	mid	21	0	0	70
	end	20	0	3	70
23/1/2019	start	20.5	5	6.4	64
	mid	22	0	0	70
	end	18	0	0	74
24/1/2019	start	32	0	0	33
	mid	33	0	0	34
	end	31	0	0	30
31/1/2019	start	16.4	20	9	50.8
	mid	16.4	20	5	50
	end	16.4	25	1	51
30/1/2020	start	28	0	11	26
	end	18	0	6	31
10/2/2020	start	20.1	80%	22	88
	end	19	100%	12	89

A3.5 Striped Legless Lizard

Previous survey effort

Suitable potential habitat for Striped Legless Lizard is present within the project area. Potential habitat areas constitute tussock-forming grasslands, especially where these are growing on cracking soils. Previous surveys for Striped Legless Lizard at Melbourne Airport failed to detect the species. A review of recent database records revealed a record on the Atlas of Living Australia from 2011 (ALA 2020) approximately 4 kilometres south of the southern point of the project area. There is an additional record from 2017 within 10 kilometres of the project area in the Victorian Biodiversity Atlas database (Appendix 5).

A desktop assessment was undertaken of all previous reports where Striped Legless Lizard surveys had been undertaken at Melbourne Airport. These reports include:

- Biosis 2014. Melbourne Airport Business Park: Striped Legless Lizard survey 2013. Draft report for Australia Pacific Airports (Melbourne). Author: I. Smales, Biosis Pty Ltd, Melbourne.
- Biosis 2015. *Flora and fauna assessment of the Runway Development Program, Melbourne Airport: Existing conditions and impact assessment report*. Authors: Kay K, Smales I & Byrne A, Biosis Pty Ltd, Melbourne.

This data was utilised to compile Figure 9 which outlines previous survey effort for the species at Melbourne Airport. This information was then used to determine whether adequate survey effort existed for the species and if not what the level of additional survey was to be. It was recommended that due to the presence of suitable habitat that had not been subject to previous targeted surveys additional surveys for Striped Legless Lizard were warranted.

Targeted survey

Artificial shelter (tile surveys) technique, was used for targeted surveys as this is widely recognized as the most effective technique to survey for the species. Twenty survey grids with each grid consisting of 50 tiles set out at 5 metre spacing between tiles, arranged in a grid of 10 x 5 tiles (1000 tiles) were placed in areas of suitable habitat within the project area landside on the 12-13/8/2019 and airside on the 19/8/2019, targeting areas of habitat which had not been subject to previous surveys. Tile grid locations can be viewed in Figure 15.

All tiles were checked once per week by two zoologists from the 18/9/2019 until the end of December 2019, a total of 15 checks were undertaken for each tile grid during the targeted survey. A final check was conducted in conjunction with the decommissioning of the survey grids. All species detected during the surveys were recorded along with weather details at the time of survey.

Appendix 4 Flora and ecological communities

The following abbreviations and symbols are relevant to this Appendix:

Code	Meaning	Reference
National listings (EPBC Act)		
EX	Extinct	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
CR	Critically endangered	
EN	Endangered	
VU	Vulnerable	
PMST	Protected Matters Search Tool	
State listings (FFG Act and DELWP Advisory List)		
x	Extinct	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
cr	Critically endangered	
e	Endangered	
v	Vulnerable	
t	Threatened	
P	Protected (public land only)	
(e)	Endangered	DELWP's Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014a)
(v)	Vulnerable	
(r)	Rare	
(k)	Poorly known	
Weed status (CaLP Act, DAWE Weeds of National Significance and DELWP Advisory List[2])		
SP	State prohibited species	Victorian *Catchment and Land Protection Act 1994* (CaLP Act)
RP	Regionally prohibited species	
RC	Regionally controlled species	

[2] The DELWP Advisory List for Rare or Threatened Plants was revoked in 2021 and are superseded by the current list of threatened species under the FFG Act 1988.

R	Restricted species	
WoNS	Weed of National Significance	Australian Weeds Strategy (DAWR 2017)
Other		
#	Native species outside its natural range	Victorian Biodiversity Atlas (VBA)

A4.1 Flora species recorded from the project area

Table A4.1 Flora species recorded from the project area

Status	Scientific Name	Common Name
Indigenous species		
P	*Acacia acinacea* s.s.	Gold-dust Wattle
	Acacia implexa	Lightwood
P	*Acacia mearnsii*	Black Wattle
	Acacia melanoxylon	Blackwood
	Acacia paradoxa	Hedge Wattle
P	*Acacia pycnantha*	Golden Wattle
	Acaena agnipila	Hairy Sheep's Burr
	Acaena echinata	Sheep's Burr
	Aizoaceae spp.	Ice Plant
	Allocasuarina verticillata	Drooping Sheoak
	Anthosachne scabra s.s.	Common Wheat-grass
	Aphanes spp.	Piert
	Arthropodium minus	Small Vanilla-lily
P	*Asperula conferta*	Common Woodruff
	Atriplex semibaccata	Berry Saltbush
	Austrostipa bigeniculata	Kneed Spear-grass
	Austrostipa curticoma	Short-crown Spear-grass
	Austrostipa densiflora	Dense Spear-grass
	Austrostipa elegantissima	Feather Spear-grass
	Austrostipa gibbosa	Spurred Spear-grass
	Austrostipa mollis	Supple Spear-grass
	Austrostipa oligostachya	Fine-head Spear-grass
	Austrostipa scabra subsp. *falcata*	Rough Spear-grass
	Austrostipa spp.	Spear Grass
	Barbula crinita	Dusky Beard-moss
	Bothriochloa macra	Red-leg Grass
	Bromus spp.	Brome
	Bursaria spinosa subsp. *spinosa*	Sweet Bursaria
	Callistemon sieberi	River Bottlebrush
P	*Calocephalus citreus*	Lemon Beauty-heads
	Carex breviculmis	Common Grass-sedge
	Carex inversa	Knob Sedge
P	*Cassinia longifolia*	Shiny Cassinia
P	*Cheilanthes austrotenuifolia*	Green Rock-fern
	Chloris truncata	Windmill Grass
	Clematis microphylla s.s.	Small-leaved Clematis
	Convolvulus angustissimus subsp. *angustissimus*	Blushing Bindweed

Status	Scientific Name	Common Name
	Convolvulus spp.	Bindweed
	Crassula spp.	Crassula
	Crassula decumbens var. *decumbens*	Spreading Crassula
	Crassula sieberiana s.l.	Sieber Crassula
	Cynoglossum suaveolens	Sweet Hound's-tongue
	Cyperus spp.	Flat Sedge
	Daucus glochidiatus	Australian Carrot
	Dianella revoluta s.l.	Black-anther Flax-lily
	Dichondra repens	Kidney-weed
	Dichanthium sericeum	Silky Blue-grass
	Einadia nutans	Nodding Saltbush
	Einadia nutans subsp. *nutans* (s.s.)	Nodding Saltbush
	Eleocharis acuta	Common Spike-sedge
	Enchylaena tomentosa var. *tomentosa*	Ruby Saltbush
	Enneapogon nigricans	Dark Bottle-washers
	Enteropogon acicularis	Spider Grass
	Epilobium billardiereanum subsp. *intermedium*	Variable Willow-herb
	Epilobium hirtigerum	Hairy Willow-herb
	Epilobium pallidiflorum	Showy Willow-herb
	Epilobium spp.	Willow Herb
P	*Eremophila deserti*	Turkey Bush
	Eryngium ovinum	Blue Devil
	Eucalyptus camaldulensis	River Red-gum
	Eucalyptus camaldulensis var. *camaldulensis*	River Red-gum
	Eucalyptus melliodora	Yellow Box
	Eucalyptus microcarpa	Grey Box
	Eutaxia microphylla var. *microphylla*	Common Eutaxia
	Geranium spp.	Crane's Bill
P	*Gnaphalium* spp.	Cudweed
	Gonocarpus tetragynus	Common Raspwort
	Goodenia ovata	Hop Goodenia
	Haloragis heterophylla	Varied Raspwort
	Hypericum gramineum	Small St John's Wort
	Hypnum cupressiforme var. *cupressiforme*	Common Plait-moss
	Isolepis cernua	Nodding Club-sedge
	Isolepis inundata	Swamp Club-sedge
	Isolepis spp.	Club Sedge
	Juncus bufonius	Toad Rush
	Juncus flavidus	Gold Rush
	Juncus pauciflorus	Loose-flower Rush
	Juncus spp.	Rush

Status	Scientific Name	Common Name
	Juncus subsecundus	Finger Rush
	Lachnagrostis aemula s.l.	Leafy Blown-grass
	Lachnagrostis filiformis s.s.	Common Blown-grass
P	*Laphangium luteoalbum*	Jersey Cudweed
	Lemna spp.	Duckweed
	Leptodontium paradoxum	Tall Beard-moss
	Linum spp.	Flax
	Linum marginale	Native Flax
	Lobelia anceps	Angled Lobelia
	Lomandra filiformis subsp. *coriacea*	Wattle Mat-rush
	Lomandra longifolia	Spiny-headed Mat-rush
	Lythrum hyssopifolia	Small Loosestrife
	Maireana decalvans s.s.	Black Cotton-bush
	Maireana spp.	Bluebush
	Melicytus dentatus s.l.	Tree Violet
	Microlaena stipoides var. *stipoides*	Weeping Grass
P	*Microseris walteri*	Yam Daisy
P	*Microtis* spp.	Onion Orchid
P	*Microtis unifolia*	Common Onion-orchid
	Myriophyllum spp.	Water Milfoil
	Ottelia ovalifolia subsp. *ovalifolia*	Swamp Lily
	Oxalis perennans	Grassland Wood-sorrel
	Oxalis spp.	Wood Sorrel
P	*Ozothamnus obcordatus*	Grey Everlasting
	Panicum effusum	Hairy Panic
	Persicaria hydropiper	Water Pepper
	Phragmites australis	Common Reed
	Pimelea linifolia	Slender Rice-flower
	Pimelea spp.	Rice Flower
	Poa labillardierei	Common Tussock-grass
k	*Poa labillardierei* var. (Volcanic Plains)	Basalt Tussock-grass
	Portulaca oleracea	Common Purslane
	Rumex brownii	Slender Dock
	Rumex spp.	Dock
	Rytidosperma auriculatum	Lobed Wallaby-grass
	Rytidosperma bipartitum s.s.	Leafy Wallaby-grass
	Rytidosperma caespitosum	Common Wallaby-grass
	Rytidosperma duttonianum	Brown-back Wallaby-grass
	Rytidosperma erianthum	Hill Wallaby-grass
	Rytidosperma fulvum	Copper-awned Wallaby-grass
	Rytidosperma racemosum var. *racemosum*	Slender Wallaby-grass

Status	Scientific Name	Common Name
	Rytidosperma setaceum	Bristly Wallaby-grass
	Rytidosperma spp.	Wallaby Grass
	Rytidosperma tenuius	Purplish Wallaby-grass
	Salsola tragus	Prickly Saltwort
	Schoenoplectus tabernaemontani	River Club-sedge
	Schoenus apogon	Common Bog-sedge
	Sclerolaena muricata	Black Roly-poly
	Sclerolaena muricata var. *villosa*	Grey Roly-poly
	Sclerolaena spp.	Copperburr
P	*Senecio pinnatifolius var. lanceolatus*	Lance-leaf Groundsel
P	*Senecio quadridentatus*	Cotton Fireweed
	Senna artemisioides s.l.	Desert Cassia
	Spergularia spp.	Sand Spurrey
	Themeda triandra	Kangaroo Grass
	Tortula antarctica	Bristly Screw-moss
	Tortula muralis	Common Wall-moss
	Tricoryne elatior	Yellow Rush-lily
	Triglochin striata	Streaked Arrowgrass
	Triquetrella papillata	Common Twine-moss
	Typha domingensis	Narrow-leaf Cumbungi
	Typha spp.	Bulrush
	Verbena spp.	Verbena
P	*Vittadinia cuneata*	Fuzzy New Holland Daisy
P	*Vittadinia cuneata* var. *cuneata*	Fuzzy New Holland Daisy
P	*Vittadinia muelleri*	Narrow-leaf New Holland Daisy
	Wahlenbergia communis s.s.	Tufted Bluebell
	Wahlenbergia luteola	Bronze Bluebell
	Walwhalleya proluta	Rigid Panic
Introduced species		
	Acacia baileyana	Cootamundra Wattle
	Agave spp.	Agave
	Agrostis capillaris	Brown-top Bent
	Aira elegantissima	Delicate Hair-grass
	Aira spp.	Hair Grass
	Aloe spp.	Aloe
	Anthoxanthum odoratum	Sweet Vernal-grass
	Aptenia cordifolia	Heart-leaf Ice-plant
	Arctotheca calendula	Cape weed
R, WoNS	*Asparagus asparagoides*	Bridal Creeper
	Asparagus officinalis	Asparagus
	Asphodelus fistulosus	Onion Weed

Status	Scientific Name	Common Name
k	*Austrostipa verticillata*	Bamboo Spear-grass
	Avena barbata	Bearded Oat
	Avena fatua	Wild Oat
	Avena sativa	Oat
	Avena spp.	Oat
	Bartsia trixago	Bellardia
	Berkheya rigida	African Thistle
	Brassica fruticulosa	Twiggy Turnip
	Brassica spp.	Turnip
	Briza maxima	Large Quaking-grass
	Briza minor	Lesser Quaking-grass
	Bromus alopecuros	Mediterranean Brome
	Bromus catharticus	Prairie Grass
	Bromus diandrus	Great Brome
	Bromus hordeaceus	Soft Brome
	Bromus rubens	Red Brome
	Carex divulsa subsp. divulsa	Grey Sedge
RC	*Carthamus lanatus*	Saffron Thistle
	Cassinia sifton	Drooping Cassinia
	Catapodium rigidum	Fern Grass
	Cenchrus clandestinus	Kikuyu
	Cenchrus spp.	Burr Grass
	Centaurium erythraea	Common Centaury
	Centaurium spp.	Centaury
	Centaurium tenuiflorum	Slender Centaury
	Cerastium glomeratum s.l.	Common Mouse-ear Chickweed
	Cerastium glomeratum s.s.	Sticky Mouse-ear Chickweed
	Chenopodium album	Fat Hen
	Chloris gayana	Rhodes Grass
RC, WoNS	*Chrysanthemoides monilifera*	Boneseed
RC	*Cirsium vulgare*	Spear Thistle
RC	*Convolvulus arvensis*	Common Bindweed
	Cortaderia spp.	Pampas Grass
	Corymbia citriodora subsp. *citriodora*	Lemon-scented Gum
	Cotula coronopifolia	Water Buttons
	Cucumis myriocarpus subsp. *myriocarpus*	Paddy Melon
	Cupressus spp.	Cypress
RC	*Cynara cardunculus* subsp. *flavescens*	Artichoke Thistle
	Cynodon dactylon var. *dactylon*	Couch
	Cyperus eragrostis	Drain Flat-sedge

Status	Scientific Name	Common Name
	Dactylis glomerata	Cocksfoot
	Daucus carota	Carrot
	Delairea odorata	Cape Ivy
RC	*Dittrichia graveolens*	Stinkwort
	Ecballium elaterium	Squirting Cucumber
RC	*Echium plantagineum*	Paterson's Curse
	Ehrharta erecta	Panic Veldt-grass
	Ehrharta longiflora	Annual Veldt-grass
	Eleusine spp.	Crows-foot Grass
	Eleusine tristachya	American Crows-foot Grass
RC	*Eragrostis curvula*	African Love-grass
	Erigeron bonariensis	Flaxleaf Fleabane
	Erigeron canadensis s.l.	Canadian Fleabane
	Erigeron spp.	Fleabane
	Erodium botrys	Big Heron's-bill
	Eruca vesicaria subsp. *sativa*	Purple-vein Rocket
	Eucalyptus cladocalyx	Sugar Gum
	Euphorbia peplus	Petty Spurge
	Festuca arundinacea	Tall Fescue
R	*Foeniculum vulgare*	Fennel
	Galenia pubescens var. *pubescens*	Galenia
	Gaudinia fragilis	Fragile Oat
	Gazania spp.	Gazania
RC	*Genista monspessulana*	Montpellier Broom
	Geranium dissectum	Cut-leaf Crane's-bill
	Geranium molle	Dove's Foot
	Helminthotheca echioides	Ox-tongue
	Hirschfeldia incana	Buchan Weed
	Holcus lanatus	Yorkshire Fog
	Hordeum leporinum	Barley-grass
	Hordeum marinum	
	Hordeum murinum s.l.	Barley-grass
	Hordeum spp.	Barley Grass
RC	*Hypericum perforatum* subsp. *veronense*	St John's Wort
	Hypochaeris radicata	Flatweed
RC	*Juncus acutus* subsp. *acutus*	Spiny Rush
	Juncus articulatus subsp. *articulatus*	Jointed Rush
	Juncus effusus subsp. *effusus*	Soft Rush
	Juncus ensifolius	Sword Rush
	Lactuca serriola	Prickly Lettuce
	Leontodon saxatilis subsp. *saxatilis*	Hairy Hawkbit

Status	Scientific Name	Common Name
	Lepidium africanum	Common Peppercress
	Lepidium heterophyllum	Perennial Fieldcress
	Linum trigynum	French Flax
	Lolium perenne	Perennial Rye-grass
	Lolium rigidum	Wimmera Rye-grass
	Lophopyrum ponticum	Tall Wheat-grass
RC	*Lycium ferocissimum*	African Box-thorn
	Lysimachia arvensis	Pimpernel
RC	*Marrubium vulgare*	Horehound
	Medicago polymorpha	Burr Medic
	Medicago spp.	Medic
	Medicago minima	Little Medic
	Melilotus indicus	Sweet Melilot
	Melilotus spp.	Melilot
	Modiola caroliniana	Red-flower Mallow
	Nassella hyalina	Cane Needle-grass
	Nassella leucotricha	Texas Needle-grass
R, WoNS	*Nassella neesiana*	Chilean Needle-grass
RC, WoNS	*Nassella trichotoma*	Serrated Tussock
	Olea europaea	Olive
R	*Opuntia* spp.	Prickly Pear
RC	*Opuntia stricta*	Common Prickly-pear
R	*Oxalis pes-caprae*	Soursob
	Oxalis spp. (naturalised)	Wood Sorrel
	Parapholis strigosa	Slender Barb-grass
	Parentucellia latifolia	Red Bartsia
	Paspalum dilatatum	Paspalum
	Paspalum distichum	Water Couch
	Petrorhagia dubia	Velvety Pink
	Phalaris aquatica	Toowoomba Canary-grass
	Phalaris spp.	Canary Grass
RC	*Physalis hederifolia*	Sticky Ground-cherry
	Plantago coronopus	Buck's-horn Plantain
	Plantago lanceolata	Ribwort
	Poa annua s.s.	Annual Meadow-grass
	Polycarpon tetraphyllum	Four-leaved Allseed
	Polygonum aviculare s.s.	Hogweed
	Polypogon monspeliensis	Annual Beard-grass
	Raphanus raphanistrum	Wild Radish
	Roepera sessilifolia	Cape Twin-leaf

Status	Scientific Name	Common Name
	Romulea rosea	Onion Grass
RC	*Rosa rubiginosa*	Sweet Briar
RC, WoNS	*Rubus anglocandicans*	Common Blackberry
	Rumex conglomeratus	Clustered Dock
	Rumex crispus	Curled Dock
R, WoNS	*Salix* spp.	Willow
	Salvia verbenaca var. *verbenaca*	Wild Sage
	Schinus molle	Pepper Tree
RC	*Scolymus hispanicus*	Golden Thistle
	Scorzonera laciniata var. *laciniata*	Scorzonera
R	*Senecio madagascariensis*	African Fireweed
	Setaria parviflora	Slender Pigeon Grass
	Sherardia arvensis	Field Madder
	Silene spp.	Catchfly
	Silene latifolia subsp. *alba*	White Campion
RC	*Solanum linnaeanum*	Apple of Sodom
	Solanum nigrum s.s.	Black Nightshade
	Sonchus asper s.s.	Rough Sow-thistle
	Sonchus oleraceus	Common Sow-thistle
	Sporobolus africanus	Rat-tail Grass
	Stenotaphrum secundatum	Buffalo Grass
	Symphyotrichum subulatum	Aster-weed
	Tragopogon spp.	Salsify
	Tribolium spp.	Desmazeria
	Trifolium angustifolium var. *angustifolium*	Narrow-leaf Clover
	Trifolium arvense var. *arvense*	Hare's-foot Clover
	Trifolium campestre var. *campestre*	Hop Clover
	Trifolium glomeratum	Cluster Clover
	Trifolium pratense	Red Clover
	Trifolium spp.	Clover
	Tritonia crocata	Orange Tritonia
	Trifolium striatum	Knotted Clover
RC, WoNS	*Ulex europaeus*	Gorse
	Vicia hirsuta	Tiny Vetch
	Vicia sativa	Common Vetch
	Vicia spp.	Vetch
	Vinca major	Blue Periwinkle
	Vulpia bromoides	Squirrel-tail Fescue
	Vulpia muralis	Wall Fescue
	Vulpia myuros	Rat's-tail Fescue

Status	Scientific Name	Common Name
	Vulpia spp.	Fescue
RC	*Xanthium spinosum*	Bathurst Burr

A4.2 Threated ecological communities

The following table includes the listed flora species that have potential to occur within the project area. The list of species is sourced from the Victorian Biodiversity Atlas (last accessed on 12.07.2021), and the Protected Matters Search Tool (DoEE; last accessed on 12.07.2021).

Table A4.2 Listed ecological communities predicted to occur within 10 km of the project area.

Ecological community	Status	Comments
Grassy Eucalypt Woodland of the Victorian Volcanic Plain Critically Endangered Community	EPBC	EVC 55 in the project area has affinities with this community when River Red-gum is dominant canopy species but all patches of this EVC recorded are less than 0.5 ha and highly fragmented so therefore do not meet the size condition thresholds to qualify as a TEC (TSSC 2009).
Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia Endangered Community	EPBC	Grey Box is the most common Eucalypt within treed areas of the project area and is present as a regenerating species in derived native grassland. It is associated with EVC 71 and EVC 803.
Natural Temperate Grassland of the Victorian Volcanic Plain Critically Endangered community	EPBC	This community is present as a naturally treeless native grassland throughout the project area.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains Critically Endangered Community	EPBC	Wetland EVCs in the project area do not represent this community as associated wetland vegetation does not fit the key landscape setting and floristic diagnostics. This is due to the wetland EVCs present occurring in creek systems (and not as depressional wetlands), the lack of low growing wetland grass and herb species, and the dominance of large emergent graminoids that are contra-indicator species for this community.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered	EPBC	The eucalypt species that define this community are not present in the project area except for the occasional Yellow Box tree which is associated with EVC 71 and EVC 803 that represent the Grey Box Grassy Woodland community listed above.
Grey Box - Buloke Grassy Woodland Community	FFG	This FFG listed community will be similar to the EPBC woodland present in the project area.

Ecological community	Status	Comments
Victorian Temperate Woodland Bird Community	FFG	This community includes the woodlands stands in the project area. Listed woodland birds within this community that have been recorded or may occur are Swift Parrot, Brown Treecreeper, Speckled Warbler, Yellow-tufted Honeyeater, Fuscous Honeyeater, Black-chinned Honeyeater, Painted Honeyeater, Jacky Winter, Red-capped Robin, Hooded Robin and Diamond Firetail.
Western (Basalt) Plains Grassland i.e. all the Plains Grassland that we have mapped	FFG	This FFG listed community will be similar to the EPBC grassland community present in the project area.
Western Basalt Plains (River Red Gum) Grassy Woodland	FFG	EVC 55 in the project area has affinities with this community when River Red-gum is dominant canopy species but all patches of this EVC are highly modified and unlikely to represent this community.

A4.3 Listed flora species

The following table includes the listed flora species that have potential to occur within the project area. The list of species is sourced from the Victorian Biodiversity Atlas (last accessed on 12.07.2021) and the Protected Matters Search Tool (DoEE; last accessed on 12.07.2021).

Table A4.3 Listed flora species recorded / predicted to occur within 10 km of the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
National significance									
Amphibromus fluitans	River Swamp Wallaby-grass	VU			2020	PMST	Largely confined to permanent swamps, mainly along the Murray River between Wodonga and Echuca, with scattered records from southern Victoria.	**Low**	Some dam edges offer potential habitat but are of low suitability for the species due to the dominance of introduced grasses, as a result of historical land uses and, presumably, elevated nutrient loads.
Caladenia orientalis	Eastern Spider-orchid	EN	e	e	1770		Heath and heathy woodlands in coastal areas between the Mornington Peninsula and Wilsons Promontory.	**Negligible**	Very old record > 20 yrs, no suitable heathy habitat present within the project area.
Dianella amoena	Matted Flax-lily	EN	e	cr	2020	PMST	Lowland grassland and grassy woodland, on well-drained to seasonally waterlogged fertile sandy loam soils to heavy cracking clays.	**Low**	Most grassland within the project area is highly modified and species-poor, having recolonised land that has been subject to earthworks and/or rock removal. Historical land uses and disturbances mean that this species is unlikely to be present. The extent and coverage of vegetation surveys over the past decade is likely to have detected

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
									an important population if one existing in the project area.
Diuris basaltica	Small Golden Moths	EN	e	cr	1962	PMST	Plains Grassland dominated by tussock-forming perennial grasses (including Kangaroo Grass), often with embedded surface basalt.	**Negligible**	No recent records from the local area. Most grassland within the project area is highly modified and species-poor, having recolonised land that has been subject to earthworks and/or rock removal.
Diuris fragrantissima	Sunshine Diuris	EN	e	cr	1974	PMST	Grassland dominated by *Themeda trianda*, on plains with heavy basalt soils and embedded boulders; only known naturally occurring population is in Sunshine.	**Negligible**	No recent records from the local area. Most grassland within the project area is highly modified and species-poor, having recolonised land that has been subject to earthworks and/or rock removal. Only known extant population is approximately 12 km south of the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Dodonaea procumbens	Trailing Hop-bush	VU	v			PMST	Sandy or clay soils in low-lying, winter-wet areas in grasslands, woodlands, and low-open forest.	**Negligible**	Although some suitable habitat may exist within the project area (e.g. in the woodland), the species has never been recorded from the local area or during detailed vegetation surveys within the project area over the past decade. The project area is outside the known distribution for the species, the nearest record being approximately 45 km west.
Eucalyptus crenulata	Buxton Gum	EN	e	e	2017		Alluvial soils in seasonally inundated depressions along river flats; records away from Buxton and Yering in the northeast are likely to be introductions.	**Negligible**	Outside current range. Naturalised plants likely to be from cultivation.
Glycine latrobeana	Clover Glycine	VU	v	v	1995	PMST	Grasslands and grassy woodlands, particularly those dominated by Kangaroo Grass. Widespread but sporadic distribution.	**Low**	Limited records within the local area. Most recent record is old >20yrs. Suitable habitat present on-site, however modification of the project area means that site is unlikely to support a population.
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	v	e		PMST	Low-lying, seasonally wet or swampy areas of plains communities, often in slightly saline conditions.	**Low**	Suitable habitat with moist saline soils is not present or very limited in the project area and most records of this species are from south-west Victoria with only a

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
									few occurrences near Craigieburn north of Melbourne.
Lepidium hyssopifolium s.s.	Basalt Peppercress	EN	e	e	2018		Basalt plains grassland and woodland communities.	**Low**	Suitable habitat present on-site, however modification of the project area means that site is unlikely to support a population.
Leucochrysum albicans subsp. *tricolor*	White Sunray	EN	e	e		PMST	Grasslands of the Victorian Volcanic Plains, primarily on acidic clay soils derived from basalt, with occasional occurrences on adjacent sedimentary, sandy-clay soils.	**Low**	Potential grassland habitat in the project area is modified and species poor. This species is generally known from intact species rich basalt plains grasslands in south-west Victoria. This obvious species is likely to have been detected during the past decade of vegetation surveys if it were present.
Pimelea spinescens subsp. *spinescens*	Spiny Rice-flower	CR	e	cr	2020	PMST	Primarily grasslands featuring a moderate diversity of other native species and inter-tussock spaces, although also recorded in grassland dominated by introduced perennial grasses.	**Low**	Suitable habitat present on-site. Project area is unlikely to support a population due to the high levels of past landscape modification and current land management practices. The extent and coverage of vegetation surveys over the past decade is likely to have detected a population if one existing in the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Prasophyllum frenchii	Maroon Leek-orchid	EN	e	e		PMST	Grassland and grassy woodland environments on sandy or black clay loam soils, which are generally damp but well drained.	**Low**	Very little suitable habitat present on-site and records of this species are from south-east of Melbourne or in south-west Victoria. The project area is unlikely to support a population due to the high levels of past landscape modification and current land management practices. The extent and coverage of vegetation surveys over the past decade is likely to have detected a population if one existing in the project area.
Prasophyllum suaveolens	Fragrant Leek-orchid	EN	e	cr	1962		Open, species rich grasslands dominated by Themeda triandra on poorly draining red-brown soils in western Victoria.	**Negligible**	Limited records within the area. Closest record is old >20 yrs. Habitat is also highly modified and is likely unsuitable.
Pterostylis cucullata	Leafy Greenhood	VU				PMST	Protected areas of stabilised coastal sand dunes within scrub communities with an open ground layer; occasionally in Coastal Manna Gum woodland.	**Negligible**	Suitable habitat not present in the project area as this subspecies is known mostly from coastal habitats scrub habitats.
Rutidosis leptorhynchoides	Button Wrinklewort	EN	e	e	2015	PMST	Higher quality Plains Grassland and Grassy Woodland in Western Victoria, particularly	**Negligible**	Recent record <20 yrs. Project area is unlikely to support a population due to the high levels of land modification and land management practices. The

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
							those with fertile soil and light timber cover.		species is generally only known from relatively undisturbed native grassland remnants.
Senecio macrocarpus	Large-headed Fireweed	VU	e	cr	2018	PMST	Grassland, shrubland and woodland habitats on heavy soils subject to waterlogging and/or drought conditions in summer.	**Negligible**	Recent record <20 yrs. Project area is unlikely to support a population due to the high levels of land modification and land management practices. This large obvious herb is likely to have been detected during the past decade of vegetation surveys if an important population was present.
Senecio psilocarpus	Swamp Fireweed	VU	v			PMST	Seasonally inundated herb-rich swamps, growing on peaty soils or volcanic clays.	**Negligible**	No suitable habitat located within the project area, species is not known to be present in the local area.
Thesium australe	Austral Toad-flax	VU	v	e	1904		Most commonly in damp grassland and woodland, including subalpine grassy heathlands.	**Negligible**	No suitable habitat located within the project area, species is not known to be present in the local area.
Xerochrysum palustre	Swamp Everlasting	VU	v	cr	2005	PMST	Sedge-swamps and shallow freshwater marshes and swamps in lowlands, on black cracking clay soils.	**Negligible**	Recent record <20 yrs, however, the project area does not support suitable wetland habitat.
State significance									

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Acacia howittii	Sticky Wattle		r	v	2016		Moist forest. Natural occurrences are confined to South Gippsland and Central Highlands.	**Low**	Outside current range (not indigenous to the area). Naturalised plants likely to be from cultivation.
Acacia rostriformis	Bacchus Marsh Wattle		v	e	2020		Occurs in low hilly areas in Eucalyptus woodland.	**Negligible**	No suitable habitat located within the project area, species is not known to be present in the local area. This large obvious large shrub is likely to have been detected during the past decade of vegetation surveys if a population was present.
Allocasuarina luehmannii	Buloke		e	cr	2009		Non-calcareous soils in drier areas on slopes and plains; often in woodlands associated with Grey Box.	**Low**	Recent record <20 yrs. Suitable habitat present. This large obvious large tree is likely to have been detected during the past decade of vegetation surveys if a population was present in the project area.
Amphibromus pithogastrus	Plump Swamp Wallaby-grass		e	cr	1989		Seasonally damp depressions in grassland or grassy wetland.	**Negligible**	Limited records within the area. Closest record is old >20 yrs. Habitat is modified and unsuitable.
Atriplex billardierei	Glistening Saltbush		x	x	1980		Scattered along sandy seashores from the western to eastern extremities of Victoria.	**Negligible**	This is a coastal species that is considered extinct in Victoria.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Botrychium australe	Austral Moonwort		v	cr	1983		Lowland forest and scrubland to subalpine grasslands, lightly wooded plains, at the base of granitic hills, alongside subalpine streams, and in some disturbed environments.	**Negligible**	There are limited records within the area and the most recent record is >20 yrs. Habitat is not suitable for the species.
Carex tasmanica	Curly Sedge		v	e	2001		Seasonally wet areas, such as around drainage lines and freshwater swamps, on fertile, clay soils derived from basalt.	**Negligible**	Limited records within the area. Closest record is old >20 yrs. Habitat is modified and unsuitable.
Chloris ventricosa	Plump Windmill Grass		v	e	2011		Woodlands. Mainly found on clay soils, sometimes in winter-wet depressions.	**Medium**	Limited records within the area. Closest record is located within habitat similar to habitat present within Melbourne Airport.
Cladium procerum	Leafy Twig-sedge		r	e	2018		Waterlogged soils, often along slow-flowing streams and lake margins.	**Low**	Species unlikely to be present within modified wetland habitat. Species is used regularly in reconstructed wetland projects in the broader area. Closest record is from Jacana Wetlands which was revegetated in 2018.
Comesperma polygaloides	Small Milkwort		v	cr	2014		Grasslands on the western basalt plains; less commonly in grassy woodlands between Bendigo and the Wimmera.	**Negligible**	No suitable habitat located within the project area, species is not known to be present in the local area. This obvious sub-shrub is likely to have been detected during the past decade of

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
									vegetation surveys if a population was present.
Coronidium gunnianum	Pale Swamp Everlasting		v	cr	2015		Widespread and sometimes locally common, particularly in high-rainfall areas of Victoria; often in moist sites in open forests and woodlands.	**Low**	No suitable wetland habitat onsite.
Corymbia maculata	Spotted Gum		v	v	2018		In Victoria, naturally confined to a small population near Mt Tara in the east of the state.	**Negligible**	Outside of natural range of this species. Specimens in the region are likely to be planted.
Cullen parvum	Small Scurf-pea		e	e	2006		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	**Low**	Limited records within the local area. Suitable habitat present on-site, however modification of the project area means that site is unlikely to support a population.
Cullen tenax	Tough Scurf-pea		e	e	2017		Lowland grasslands, including pastures and occasionally in otherwise disturbed grassy areas.	**Low**	Limited records within the local area. Suitable habitat present on-site, however modification of the project area means that site is unlikely to support a population

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Dianella longifolia var. *grandis*	Flax-lily		v	cr	2020		The habitat requirements of this species are poorly known.	**Low**	Recent records in the area, <20 yrs. Suitable habitat present on-site, however modification of the project area means that site is unlikely to support a population. Species likely to have been encountered during the extensive native vegetation surveys if present within the project area.
Diuris palustris	Swamp Diuris		v	e	1979		Grasslands and open woodlands, often in swampy depressions; confined to the west of the State.	**Negligible**	No suitable habitat located within the project area, species is not known to be present in the local area. Most recent record is old >20yrs.
Diuris punctata var. *punctata*	Purple Diuris		v	e	1982		Fertile, loamy soils and periodically wet areas in lowland grasslands, grassy woodlands, heathy woodlands and open heathlands.	**Negligible**	No suitable habitat located within the project area, species is not known to be present in the local area. Most recent record is old <20yrs.
Diuris X palachila	Broad-lip Diuris		r	e	1904		Heathlands, grasslands, open woodlands and dry open forests.	**Negligible**	No suitable habitat located within the project area, species is not known to be present in the local area. Most recent record is old <20yrs.
Eleocharis plana	Flat Spike-sedge		v	cr	1986		Shallow freshwater pools and the margins of lakes and rivers.	**Negligible**	No suitable habitat within project area
Eragrostis trachycarpa	Rough-grain Love-grass		r	e	1996		Moist grassland or grassy woodland sites.	**Low**	Old nearby record >20 yrs. Suitable habitat present on-site, however modification of the

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					project area means that site is unlikely to support a population.
Eucalyptus globulus subsp. *globulus*	Southern Blue-gum		r	e	2020		Damp forest communities. Restricted to South Gippsland and the Otway Ranges.	**Negligible**	Outside of natural range of this species. Specimens in the region are likely to be planted.
Eucalyptus leucoxylon subsp. *connata*	Melbourne Yellow-gum		v	e	2017		Well-drained slopes in a restricted area around Melbourne and Geelong.	**Negligible**	Nearby records are <20 yrs old, however this is a large conspicuous species that would have been identified during previous survey efforts.
Eucalyptus leucoxylon subsp. *megalocarpa*	Large-fruit Yellow-gum		e	cr	2018		Coastal, near Nelson.	**Negligible**	This large obvious large tree is likely to have been detected during the past decade of vegetation surveys if a remnant (not planted) population was present in the project area.
Eucalyptus sideroxylon subsp. *sideroxylon*	Mugga		r	e	2020		Typically found on poor, shallow soils, including sands, gravels, ironstones and clays.	**Low**	This large obvious large tree is likely to have been detected during the past decade of vegetation surveys if a remnant (not planted) population was present in the project area.
Geranium solanderi var. *solanderi s.s.*	Austral Crane's-bill		v	e	2019		Grasslands or grassy woodlands where hydrology is not a limiting factor.	**Medium**	Recent records nearby <20 yrs. Suitable habitat onsite and can be present in disturbed grasslands and grassy woodlands.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Geranium sp. *1*	Large-flower Crane's-bill		e	cr	2019		The habitat requirements of this species are poorly known.	**Low**	There are limited species records within the local area. Habitat may be present, but the species potential to persist on the site is unknown due to limited habitat information.
Geranium sp. *3*	Pale-flower Crane's-bill		r	e	2016		Grasslands and dry woodlands.	**Medium**	Recent records nearby <20 yrs. Suitable habitat onsite and can be present in disturbed grasslands and grassy woodlands.
Goodia medicaginea	Western Golden-tip		r	e	2016		Drier sites within wet or dry sclerophyll forests.	**Low**	Suitable habitat present within the woodland however this is a conspicuous shrub that would have been recorded during previous survey efforts.
Lachnagrostis semibarbata var. *semibarbata*	Purple Blown-grass		r	e	2001		Wet marshes and slightly saline swamps and depressions in plains communities.	**Medium**	Limited records within the area. Closest record is located within habitat similar to habitat present within Melbourne Airport.
Leiocarpa leptolepis	Pale Plover-daisy		e	e	1912		Grasslands and grassy woodlands, often in disturbed areas. In Victoria, confined to one known population approximately 4km east of Mildura.	**Negligible**	Species is not known to be present in the local area. One old record >20 yrs.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Leionema bilobum subsp. *bilobum*	Truncate Leionema		r	v	2006		Endemic to heathland and heathy woodland, in the Grampians and mostly in the north and east (e.g. Mt Difficult, Mt William, Wonderland and Serra Ranges), but with isolated occurrences at Mt Zero and Wallaby Rocks. Usually in rocky, elevated sites.	**Negligible**	Outside of natural range of this species. Specimens in the region are likely to be planted.
Melaleuca armillaris subsp. *armillaris*	Giant Honey-myrtle		r	e	2020		Near coastal heath/scrub, rocky coast and foothill outcrops.	**Negligible**	No suitable habitat within the project area. Nearby records are likely to be planted. Species is indigenous to East Gippsland with a naturalised population from cultivated specimens in the west of the state (around Melbourne).
Nicotiana suaveolens	Austral Tobacco		r	e	2017		Areas of sandy or gravelly soil typically associated with streams, gullies and other drainage lines; also grasslands and escarpment shrublands.	**Low**	Suitable habitat present within the project area along Arundel Creek, Deep Creek and the Maribyrnong however species was likely to be detected during the extensive native vegetation surveys if present.
Podolepis linearifolia	Basalt Podolepis		e	e	2015		Grasslands and grassy woodlands.	**Low**	Nearby records are recent <20 yrs, however, modification of the project area means that site is unlikely to support a population.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Pterostylis cucullata subsp. *cucullata*	Leafy Greenhood		e	e	1770		Protected areas of stabilised coastal sand dunes within scrub communities with an open ground layer; occasionally in Coastal Manna Gum woodland.	**Negligible**	Species is not known to be present in the local area. One old record >20 yrs.
Pterostylis truncata	Brittle Greenhood		e	cr	1931		Grassland and grassy woodland habitats, largely to the west of Melbourne.	**Negligible**	Species is not known to be present in the local area. One old record >20 yrs.
Rhagodia parabolica	Fragrant Saltbush		r	v	2020		Plains and escarpment grassland, shrubland and woodland.	**Low**	Suitable habitat present, however not detected during surveys. An obvious shrub that would have likely been detected if present.
Senecio cunninghamii var. *cunninghamii*	Branching Groundsel		r	e	1981		Heavy soils that are sometimes winter-wet, or dry rocky soils; often on embankments or escarpments.	**Negligible**	Old record >20 yrs, very few within local area. Project area is unlikely to support a population due to the high levels of land modification and land management practices. This large obvious herb is likely to have been detected during the past decade of vegetation surveys if an important population was present.
Thelymitra gregaria	Basalt Sun-orchid		e	cr	1953		Open, species-rich grassland dominated by Themeda triandra on poorly draining soils of the volcanic plains.	**Negligible**	Species is not known to be present in the local area. One old record >20 yrs.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Tripogonella loliiformis	Rye Beetle-grass		r	e	2016		Dry sites in association with escarpments and rocky outcrops.	**Medium**	Species was recorded within suitable habitat in the woodland in 1994 however has not been recorded since.

Appendix 5 Fauna

The following abbreviations and symbols are relevant to this Appendix:

Code	Meaning	Reference
National listings (EPBC Act)		
EX	Extinct	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
CR	Critically endangered	
EN	Endangered	
VU	Vulnerable	
NT	Near threatened	
CD	Conservation dependent	
PMST	Protected Matters Search Tool	
State listings (FFG Act and DELWP Advisory List)[3]		
x	Extinct	Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act)
cr	Critically endangered	
e	Endangered	
v	Vulnerable	
t	Threatened	
P	Protected (fish only)	
(ex)	Extinct	DELWP's Advisory Lists of Threatened Fauna in Victoria (DSE 2009; DSE 2013)
(rx)	Regionally extinct	
(ew)	Extinct in the wild	
(cr)	Critically endangered	
(en)	Endangered	
(vu)	Vulnerable	

[3] The DELWP Advisory Lists for Threatened Terrestrial and Invertebrate Fauna were revoked in 2021 and are superseded by the current list of threatened species under the FFG Act 1988.

Code	Meaning	Reference
(nt)	Near threatened	
(dd)	Data deficient	
Pest animal status (CaLP Act and Fisheries Act)		
PS	Declared pest animal	Victorian *Catchment and Land Protection Act 1994* (CaLP Act)
N	Declared noxious aquatic species	Victorian *Fisheries Act 1995*
Other		
*****	Introduced species	Victorian Biodiversity Atlas (VBA)

Most recent database records are from the Victorian Biodiversity Atlas unless otherwise specified as follows:

- PMST – Protected Matters Search Tool.
- Birdlife – Birdlife Australia database search or manual interrogation of Birdlife Australia Bird data.

A5.1 Fauna species recorded from the project area

Table A5.1 Fauna recorded from the project area (current assessment and FY19 GGF surveys)

Scientific Name	Common Name	Status			Survey Method				
		EPBC	VIC	FFG	Incidental	SLL Tile survey	M3R GGF Spotlighting/ Call Play back	GSM survey	FY19 GGF surveys
Indigenous species									
Birds									
Acanthiza chrysorrhoa	Yellow-rumped Thornbill				X				
Acanthiza pusilla	Brown Thornbill				X				
Alauda arvensis	Eurasian Skylark				X				
Anas superciliosa	Pacific Black Duck				X				
Anthus novaeseelandiae	Australasian Pipit				X				
Aquila audax	Wedge-tailed Eagle				X				
Ardea pacifica	White-necked Heron				X				
Artamus cyanopterus	Dusky Woodswallow				X				
Cacatua galerita	Sulphur-crested Cockatoo				X				
Cacatua tenuirostris	Long-billed Corella				X				
Cacomantis pallidus	Pallid Cuckoo				X				
Chrysococcyx lucidus	Shining Bronze-Cuckoo				X				
Cincloramphus mathewsi	Rufous Songlark				X				
Coracina novaehollandiae	Black-faced Cuckoo-shrike				X				
Cormobates leucophaea	White-throated Treecreeper				X				
Corvus mellori	Little Raven				X				
Dacelo novaeguineae	Laughing Kookaburra				X				
Egretta novaehollandiae	White-faced Heron				X		X		
Eolophus roseicapilla	Galah				X				

Scientific Name	Common Name	Status			Survey Method				
		EPBC	VIC	FFG	Incidental	SLL Tile survey	M3R GGF Spotlighting/ Call Play back	GSM survey	FY19 GGF surveys
Falco berigora	Brown Falcon				X				
Glossopsitta concinna	Musk Lorikeet				X				
Gymnorhina tibicen	Australian Magpie				X				
Lalage tricolor	White-winged Triller				X				
Malurus cyaneus	Superb Fairy-wren				X				
Manorina melanocephala	Noisy Miner				X				
Melithreptus brevirostris	Brown-headed Honeyeater				X				
Ninox boobook	Southern Boobook						X		
Ocyphaps lophotes	Crested Pigeon				X				
Pardalotus punctatus	Spotted Pardalote				X				
Pardalotus striatus	Striated Pardalote				X				
Petrochelidon nigricans	Tree Martin				X				
Platycercus elegans	Crimson Rosella				X				
Platycercus eximius	Eastern Rosella				X				
Psephotus haematonotus	Red-rumped Parrot				X				
Ptilotula penicillata	White-plumed Honeyeater				X				
Rhipidura albiscapa	Grey Fantail				X				
Rhipidura leucophrys	Willie Wagtail				X				
Smicrornis brevirostris	Weebill				X				
Synoicus ypsilophorus	Brown Quail				X			X	
Taeniopygia guttata	Zebra Finch				X				
Threskiornis spinicollis	Straw-necked Ibis				X				
Todiramphus sanctus	Sacred Kingfisher				X				
Trichoglossus haematodus	Rainbow Lorikeet				X				
Vanellus miles	Masked Lapwing				X				

Scientific Name	Common Name	Status			Survey Method				
		EPBC	VIC	FFG	Incidental	SLL Tile survey	M3R GGF Spotlighting/ Call Play back	GSM survey	FY19 GGF surveys
Mammals									
Macropus giganteus	Eastern Grey Kangaroo				X				
Pseudocheirus peregrinus	Eastern Ring-tailed Possum						X		X
Tadarida australis	White-striped Freetail Bat						X		
Wallabia bicolor	Black-tailed Wallaby				X				
Reptiles									
Amphibolurus muricatus	Tree Dragon				X				
Chelodina longicollis	Eastern Snake-necked Turtle		dd				X		X
Christinus marmoratus	Marbled Gecko				X				
Ctenotus robustus	Large Striped Skink					X			
Emydura macquarii	Murray River Turtle		vu	cr					X
Eulamprus tympanum tympanum	Southern Water Skink								X
Lampropholis guichenoti	Pale-flecked Garden Sunskink					X			
Lerista bougainvillii	Bougainville's Skink					X			
Parasuta flagellum	Little Whip Snake					X			
Pseudemoia pagenstecheri	Tussock Skink		vu	e		X			
Pseudonaja textilis	Eastern Brown Snake								X
Saproscincus mustelinus	Weasel Skink					X			
Tiliqua scincoides	Common Blue-tongued Lizard					X			
Frogs									
Crinia signifera	Common Froglet						X		X
Limnodynastes dumerilii	Eastern Banjo Frog						X		X
Limnodynastes peronii	Striped Marsh Frog						X		X
Limnodynastes tasmaniensis	Spotted Marsh Frog					X	X		X
Litoria ewingii	Southern Brown Tree Frog				X		X		X

Scientific Name	Common Name	Status			Survey Method				
		EPBC	VIC	FFG	Incidental	SLL Tile survey	M3R GGF Spotlighting/ Call Play back	GSM survey	FY19 GGF surveys
Litoria lesueuri	Southern Stony-creek Frog								X
Litoria raniformis	Growling Grass Frog	VU	en	v	X		X		X
Litoria verreauxii verreauxii	Verreaux's Tree Frog								X
Fish									
Anguilla australis	Southern Shortfin Eel						X		
Invertebrates / crustaceans									
Cherax destructor destructor	Common Yabby								
Synemon plana	Golden Sun Moth	CR	cr	v	X			X	
Introduced species									
Cyprinus carpio	European Carp								X
**Mus musculus*	House Mouse		PS						
Rattus rattus	Black Rat						X		
Vulpes vulpes	Red Fox		PS		X				

A5.2 Listed fauna species

The following table includes a list of the listed fauna species that have potential to occur within the project area. The list of species is sourced from the Victorian Biodiversity Atlas (last accessed on 12.07.2021), the Protected Matters Search Tool (DoEE; last accessed on 12.07.2021) and Birdlife Australia Records (Birdlife Australia; accessed 11.03.2020).

Table A5.3 Listed fauna species recorded, or predicted to occur, within 10 km of the project area

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
National significance									
Pedionomus torquatus	Plains-wanderer	CR	cr	cr	1979	PMST	Native grassland with a sparse, open structure.	**Low**	There is no structurally suitable habitat to support a population of the species within the project area and the species is now very rarely recorded in Southern Victoria.
Rostratula australis	Australian Painted-snipe	EN	cr	cr	1977	PMST	Generally found in shallow, terrestrial freshwater wetlands with rank, emergent tussocks of grass, sedges and rushes. Australian Painted Snipe can occur in well-vegetated lakes, swamps, inundated pasture, saltmarsh and dams.	**Low**	Dams and waterways within the project area do not provide suitable habitat for this species.
Botaurus poiciloptilus	Australasian Bittern	EN	en	cr	1950	PMST	Occurs in wetlands with tall, dense vegetation where it forages in shallow water. Prefers permanent freshwater habitats, particularly	**Low**	Dams and waterways within the project area do not provide suitable habitat for this species.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
							when dominated by sedges, rushes and reeds.		
Falco hypoleucos	Grey Falcon	VU	en	v		PMST	Lightly timbered plains and Acacia scrub.	**Low**	Species unlikely to occur south of the Great Dividing Range in Victoria, therefore the project area does not provide habitat for this species.
Calyptorhynchus banksii graptogyne	Red-tailed Black-Cockatoo (south-eastern)	EN	en	e	1846		The south-eastern Red-tailed Black-Cockatoo only occurs in the south-east of South Australia and south-west Victoria. Red-tailed Black-Cockatoos rely on stringybark, buloke and gum woodland habitats and scattered trees throughout the range for feeding and nesting. They are highly nomadic, moving throughout their range in response to food availability.	**Negligible**	The contemporary range of this species does not extend east of the Grampians.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Polytelis swainsonii	Superb Parrot	VU	en	e	1846		Found along timbered waterways and nearby well-watered woodlands. It is found in the Riverina area of New South Wales and Victoria and Northern New South Wales in winter.	**Negligible**	The species does not naturally occur in the Melbourne region.
Polytelis anthopeplus	Regent Parrot	VU	vu	v	1897		Two separate populations: eastern population are found in south-western New South Wales, north-western Victoria and the Murray Mallee region of South Australia, this population is found in River Red Gum, floodplain, woodland and mallee habitats. The western population is found in south west Western Australia where they are found in open forest and woodland.	**Negligible**	This record is of aviary escapees (VBA record interrogation). The species does not naturally occur in the Melbourne region.
Neophema chrysogaster	Orange-bellied Parrot	CR	cr	cr	1977		Coastal vegetation including saltmarshes, dunes, pastures, shrublands, sewage plants, saltworks, islands, and beaches.	**Negligible**	No suitable habitat.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Lathamus discolor	Swift Parrot	CR	en	cr	2019	Birdlife, PMST	A range of forests and woodlands, especially those supporting nectar-producing tree species. Also well-treed urban areas.	**Recorded**	The species was recorded from the Grey Box Woodland within the project area in 2019 (Steele & Peter 2019). The Grey Box Woodland represents a large example of intact habitat for the species in the southern extent of its mainland range. Other scattered eucalyptus and planted trees may also provide foraging habitat for the species on occasion however scattered trees are unlikely to provide significant habitat for the species.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Hirundapus caudacutus	White-throated Needletail	VU	vu	v	2010	Birdlife, PMST	An almost exclusively aerial species within Australia, occurring over most types of habitat, particularly wooded areas.	**High**	It is likely that the species utilises all of the airspace at Melbourne Airport with the woodland providing preferable habitat for the species. Additional interrogation of Birdlife Australia's online database (Birddata) revealed there is an incidental record of the species from 2010 (Birdlife Australia) over Sky Road in Melbourne Airport and other records surrounding the Airport. The species is known to have a preference for foraging above wooded areas and is known to roost in the canopy and hollows of trees in in forests and woodlands.
Thinornis cucullatus	Hooded Plover	VU	vu	v		PMST	Sandy ocean beaches, estuaries and inland lakes.	**Negligible**	No suitable habitat.
Sternula nereis	Fairy Tern	VU	en	cr	1977		Fairy Terns inhabit coastal environments including intertidal mudflats, sand flats and beaches. Nests	**Negligible**	No suitable habitat.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
							above high-water mark on sandy shell-grit beaches.		
Charadrius mongolus	Lesser Sand Plover	EN	cr		1978		A migratory species that forages on exposed sand and mudflats. High tide roost sites are often located on beaches. This species has been recorded at Mud Islands within Port Phillip Bay, and Reef Island within Westernport Bay. The species has also previously been recorded along the coastline at the Western Treatment Plant.	**Negligible**	No suitable habitat.
Numenius madagascariensis	Eastern Curlew	CR	vu	cr	1977	PMST	Large intertidal sandflats, banks, mudflats, estuaries, inlets, sewage farms, saltworks, harbours, coastal lagoons and bays.	**Negligible**	No suitable habitat.
Limosa lapponica	Bar-tailed Godwit	VU			1977		Bar-tailed Godwits inhabit estuarine mudflats, beaches and mangroves. They are common in coastal areas around Australia. They are social birds and are often seen in large flocks and in the company of other waders.	**Negligible**	No suitable habitat.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Calidris ferruginea	Curlew Sandpiper	CR	en	cr	1977	PMST	Large intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	**Negligible**	No suitable habitat.
Grantiella picta	Painted Honeyeater	VU	vu	v		PMST	A migratory species that breeds in southern Australia, it occupies dry open woodlands and forests located on the inland foothills of the Great Dividing Range. Typically forages for fruit and nectar in mistletoes and in tree canopies.	**Low**	No records of the species in the local area and rarely recorded in the Melbourne area. Not detected in any of the surveys undertaken in the Grey Box Woodland.
Anthochaera phrygia	Regent Honeyeater	CR	cr	cr	1971	PMST	A range of dry woodlands and forests dominated by nectar-producing tree species.	**Low**	Now very rarely recorded in the Melbourne area. Not detected in any of the surveys undertaken in the Grey Box Woodland.
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll	EN	en	e	1883	PMST	Rainforest and wet and dry sclerophyll forests and woodlands.	**Negligible**	This species is locally extinct.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Dasyurus viverrinus	Eastern Quoll	EN	rx	e	1902		The Eastern Quoll is a medium-sized carnivorous marsupial that once occupied a broad range of forest, woodland and grassland habitats in Victoria. The species is now restricted to Tasmania and is considered to be extinct from mainland Australia.	**Negligible**	The species is now extinct in the wild in Victoria.
Perameles gunnii	Eastern Barred Bandicoot (Mainland)	VU	ew	e	2003	PMST	Natural temperate grasslands and grassy woodlands.	**Negligible**	This species is locally extinct. The 2003 record relates to the captive population introduced to Woodlands Historic Park.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	vu	v	2017	PMST	Rainforest, wet and dry sclerophyll forest, woodland and urban areas.	**Recorded**	The species is known to forage in flowering eucalypts within the project area (Ecology and Infrastructure International 2018). The closest 'camp' for the species is located approximately 20km south-east of the project area. Habitat present within the project area is unlikely to provide important habitat critical for the survival of this species.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Delma impar	Striped Legless Lizard	VU	en	e	2017	PMST	Natural temperate grassland, grassy woodland and exotic grassland.	**Low**	Extensive targeted surveys were undertaken for the species as part of the current ecological assessments. The species was not detected during the current assessment or during any of the numerous previous assessments undertaken.
Tympanocryptis pinguicolla	Grassland Earless Dragon	EN	cr	cr	1990	PMST	Natural temperate grassland.	**Low**	This species has not been reliably recorded in the wild for 50 years. It is therefore potentially extinct.
Litoria raniformis	Growling Grass Frog	VU	en	v	2019	PMST	Still or slow-flowing waterbodies and surrounding terrestrial vegetation.	**Recorded**	Growling Grass Frog have been recorded from Arundel Creek and Moonee Ponds Creek within the project area and Deep Creek and the Maribyrnong River adjacent to the project area. Breeding, aquatic and terrestrial habitat for the species occurs within the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Prototroctes maraena	Australian Grayling	VU	vu	e	2015	PMST	Adults inhabit cool, clear, freshwater streams.	**Medium**	Targeted surveys between 2013 and 2014 (Biosis 2015) did not record the species within the project area however the species is known to occur downstream from the project area in the Maribyrnong River and is therefore likely to utilise similar suitable habitat in the portion of the Maribyrnong River adjacent to the project area. Permanently altered run-off and water quality to be managed by design and relevant permit conditions to ensure integrity of adjacent waterways as habitat for the species.
Galaxiella pusilla	Dwarf Galaxias	VU	en	e		PMST	Slow-flowing or still freshwater wetlands such as swamps, drains and backwaters of streams.	**Low**	No Dwarf Galaxias were detected during previous aquatic surveys (Biosis 2015). This species has not been recorded from the Maribyrnong or Yarra River catchments. .

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Maccullochella macquariensis	Trout Cod	EN	cr	e	1908		Found within faster flowing sections of the Murray River and its tributaries, in deep holes or amongst fallen timber and other debris. Also occurs in upper reaches of rivers where water is clear and there is little fallen timber.	**Negligible**	Project area is outside accepted range of the species. Historic records represent failed translocations.
Maccullochella peelii	Murray Cod	VU	vu	e	1981	PMST	Found within the Murray River catchment usually in sluggish turbid rivers, in deep holes or amongst fallen timber and other debris. Also occurs in upper reaches of rivers where water is clear and there is little fallen timber. There is also a large viable population of the species in the Yarra River Catchment.	**Low**	The database records represent failed translocations. There are no contemporary records of this species from the Maribyrnong catchment.
Macquaria australasica	Macquarie Perch	EN	en	e	1970		Streams with clear water and deep, rocky holes with abundant cover.	**Negligible**	Project area is outside accepted range of the species. Historic records represent failed translocations.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Bidyanus bidyanus	Silver Perch	CR	vu	e	1981		Found in lowland rivers within the Murray-Darling Basin commonly found in deeper water adjacent to large woody habitats. Has been widely stocked in reservoirs and farm dams.	**Negligible**	Project area is outside accepted range of the species. Historic records represent failed translocations.
Synemon plana	Golden Sun Moth	CR	cr	v	2019	PMST	Natural temperate grassland, grassy woodland and pasture supporting spear grasses and wallaby grasses and exotic grassland dominated by Chilean Needle-grass.	**Recorded**	Species recorded from a small area of suitable habitat north of the Grey Box Woodland. The species was not recorded anywhere else within the project area during extensive current and previous surveys for the species. It is unlikely that that species occurs anywhere else in the project area.
Paralucia pyrodiscus lucida	Eltham Copper Butterfly	EN	en	cr	1922		Drier sclerophyll forests and woodlands supporting Sweet Bursaria Bursaria spinosa, especially along ridgelines.	**Low**	Planted habitat for this species occurs within the regeneration area of the woodland however, the species has not been recorded from the local area for close to 100 years, the nearest known population is in the Eltham – Greensborough area.
State significance									

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Anseranas semipalmata	Magpie Goose		nt	v	2016		Swamps, lakes, sewage ponds, flooded pasture, dams.	**Low**	Unlikely to utilise waterways at Melbourne Airport, not suitable habitat. Closest record from 2016 is from a residential area north of Jacana Wetlands, no details whether this record was a fly over or utilising habitat within the Jacana Wetlands.
Geopelia cuneata	Diamond Dove		nt	v	2009		Drier woodlands and scrub, spinifex and mulga.	**Low**	This species is a vagrant to southern Victoria.
Lewinia pectoralis	Lewin's Rail		vu	v	1991		Swamps, dense riparian vegetation and saltmarsh.	**Low**	Confined to vicinity of watercourses and dams however there is limited suitable habitat present in the project area for this species. May fly over the project area.
Burhinus grallarius	Bush Stone-curlew		en	cr	1846		Open woodland, treed farmland.	**Negligible**	This species is now extinct in southern Victoria.
Ardeotis australis	Australian Bustard		cr	cr	1846		Grassland, open dry woodlands of Mallee and mulga, arid heathland saltbush and bluebush.	**Negligible**	This species is now extinct in southern Victoria.
Egretta garzetta	Little Egret		en	e	2008		Swamps, billabongs, floodplain pools, mudflats, mangroves and channels; breeds in trees standing in water.	**High**	Suitable habitat present in watercourses and dams.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Ardea intermedia plumifera	Plumed Egret		en	cr	1982		Densely-vegetated freshwater wetlands including lakes, swamps and billabongs. Breeds in trees standing in water.	**High**	Suitable habitat present in watercourses and dams.
Ardea alba modesta	Eastern Great Egret		vu	v	2014		Flooded crops, pasture, swamps, lagoons, saltmarsh, sewage ponds, estuaries, dams, roadside ditches. Breeds in trees standing in water.	**High**	Suitable habitat present in watercourses and dams.
Ixobrychus dubius	Australian Little Bittern		en	e	1980		Inhabits terrestrial wetlands, preferably with dense emergent vegetation.	**Low**	Lack of suitable habitat. May rarely fly over the project area.
Stictonetta naevosa	Freckled Duck		en	e	2014		Large freshwater wetlands, generally with dense vegetation.	**Medium**	May occasionally use the large water storage dams on Arundel Creek.
Aythya australis	Hardhead		vu	v	2015		A mainly aquatic species preferring large, deep freshwater environments with abundant aquatic vegetation, including slow moving areas of rivers. Also occurs in brackish wetlands and may be found in deep dams and water storage ponds. Occasionally in estuarine and littoral habitats such as saltpans, coastal lagoons and sheltered inshore waters. Avoids	**Medium**	May visit the large water storage dams along Arundel Creek on occasion, may fly over the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
							main streams or rivers, except in calm reaches where aquatic flora is developed.		
Oxyura australis	Blue-billed Duck		en	v	2015		Deep, freshwater wetlands.	**Medium**	May visit the large water storage dams along Arundel Creek on occasion, may fly over the project area.
Biziura lobata	Musk Duck		vu	v	2013		A largely aquatic species preferring deep water on large, permanent swamps, lakes and estuaries with abundant aquatic vegetation. Often occurs in areas of dense vegetated cover within a wetland. Less commonly recorded in small or shallow waters, such as billabongs, sewage ponds, freshwater rivers and densely vegetated farm dams.	**Medium**	May visit the large water storage dams along Arundel Creek on occasion, may fly over the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Accipiter novaehollandiae	Grey Goshawk		vu	e	2009		Favours tall, wet forests in gullies but can occur in woodlands, dry forests, wooded farmlands and suburban parks. Relies on mature forests for breeding.	**Medium**	May occasionally use the Grey Box Woodland and to a lesser extent planted trees within the project area.
Haliaeetus leucogaster	White-bellied Sea-Eagle		vu	e	2009		Coastal areas such as beaches and estuaries, inland wetlands and major inland streams.	**Medium**	May visit waterways and dams in the project area on occasion, in particularly the Maribyrnong River and potentially the large water storage dams on Arundel Creek.
Falco subniger	Black Falcon		vu	cr	2011	Birdlife	Woodlands, open country and around terrestrial wetlands areas, including rivers and creeks. Mostly hunts over open plains and undulating land with large tracts of low vegetation.	**High**	Areas of grassland and woodland area suitable habitat for this species.
Ninox strenua	Powerful Owl		vu	v	2007		Eucalypt forests and woodlands, well-treed urban areas.	**Medium**	Although not previously recorded, this species may use the Grey Box Woodland. Targeted surveys for the species have not been undertaken.
Neophema pulchella	Turquoise Parrot		nt	v	2000		Grassy open forest and woodland	**Medium**	The species may use the Grey Box woodland on rare occasions.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Hieraaetus morphnoides	Little Eagle		vu	v	2019	Birdlife	Woodland and open areas. Rabbits are a key component of their diet. Nesting occurs in mature trees in open woodland or riparian vegetation.	**Recorded**	Multiple records of the species from the project area. Areas of grassland and woodland area suitable habitat for this species.
Hydroprogne caspia	Caspian Tern		nt	v	2007		Coastal waters and inland lakes and rivers.	**Low**	Lack of suitable habitat. May rarely fly over the project area.
Actitis hypoleucos	Common Sandpiper		vu	v		PMST	Migrates to Australia from Eurasia in August where it inhabits a wide variety of coastal and inland wetlands with muddy margins before departing north in March.	**Medium**	The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.
Tringa nebularia	Common Greenshank		vu	e		PMST	A variety of ephemeral and permanent inland wetlands and sheltered coastal wetlands.	**Medium**	The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.
Tringa stagnatilis	Marsh Sandpiper		vu	e	2018		Permanent or ephemeral wetlands, mudflats and saltmarshes in coastal and inland environments.	**Medium**	The water storage dams on Arundel Creek may provide temporary foraging habitat for this species when water levels are lower.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Melanodryas cucullata	Hooded Robin		nt	v	2002		Occupies a range of open woodlands including those dominated by Eucalypts, Acacias and Callitris spp. with an understorey of smaller trees, shrubs and grasses.	**Recorded**	Grey Box Woodland and woodland area along Barbiston Road provide suitable habitat for the species, one individual was recorded within the Grey Box Woodland in 2002. Species is an uncommon visitor to the local area, normally located north of the Great Dividing Range.
Pomatostomus temporalis	Grey-crowned Babbler		en	v	1846		Open forests and woodlands.	**Negligible**	The species is locally extinct.
Pyrrholaemus sagittatus	Speckled Warbler		vu	e	1990		Occurs in open forest and Box Ironbark Woodlands, usually with scattered shrubs and a cover of acacias. Seldom seen far from dense patches of shrubs.	**Recorded**	Habitat on-site is limited to woodland areas. The species was recorded in the Grey Box Woodland in the project area in 1990. The species has been recorded reliably across multiple years in nearby Woodlands Historic Park with the latest in 2019.
Stagonopleura guttata	Diamond Firetail		nt	v	1990		Occurs mostly in the lowlands and foothills in the north of Victoria. It has specific habitat requirements, which include grassy woodlands with tree cover for refuge	**Low**	There is a lack of contemporary records of this species from the local area including in the nearby Woodlands Historic Park. However, suitable habitat occurs in

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
							and an undisturbed ground layer with grasses.		the Grey Box Woodland and adjacent grassland
Phascogale tapoatafa	Brush-tailed Phascogale		vu	v	2017		Occurs in dry foothill forest, which is open with sparse ground cover. Favours areas dominated by box, ironbark and Stringybark eucalypts.	**Medium**	Due to the isolation of Melbourne Airport from other suitable habitat and known populations we consider it unlikely that there is a resident population of the species utilising suitable habitat in the Grey Box Woodland. A database record from 2017 at Oaklands Junction confirms that the species is in the nearby region however it is unknown whether that record is from a nearby unknown population or was a young dispersing male. Surveys for this species have not been undertaken in the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat		dd	v	2016		Occurring in most environments from treeless deserts to wet forests. The species roosts singly or in colonies typically in tree hollows, but where trees are absent they are known to utilise the burrows of terrestrial mammals.	**High**	Species recorded form Bulla Hill and School Hill approximately 1.5km north west of the project area (Biosis 2016). Treed areas, in particular the woodland provide habitat for this species in the project area.
Ornithorhynchus anatinus	Platypus		vu	v	1999		A variety of freshwater waterbodies, particularly those with stable banks suitable for burrows, and shallow waters for foraging.	**High**	Species known from Deep Creek in Bulla, north of Melbourne Airport, last recorded in 2018 in the Australian Platypus Conservancy records. The species is also known from Jacksons Creek and the Maribyrnong River adjacent to the project area.
Miniopterus schreibersii oceanensis	Common Bent-wing Bat (eastern ssp.)		vu	cr	2013		A variety of treed and treeless habitats. Roosts in caves and man-made structures.	**High**	Treed areas, in particular the woodland provide habitat for this species in the project area.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Pogona barbata	Bearded Dragon		vu	v	1988		Woodlands, forests and heathlands with abundant cover of course woody debris.	**Low**	Species is not common south of the Great Dividing Range in Victoria. Tey Grey Box Woodland within the project area represents habitat for the species it has been greatly modified and is unlikely to support a population of Bearded Dragon. The extensive field assessments undertaken within and around the habitat at melbourne Airport are likely to have identified this large lizard if present.
Pseudemoia pagenstecheri	Tussock Skink		vu	e	2019		On the ground in a range of grasslands or sparse grassy woodlands from alps to coast.	**Recorded**	Species recorded during targeted surveys for SLL. Seventeen Tussock Skink were captured and recorded during the SLL tile surveys. Suitable habitat is present within grassland habitat throughout the project area and was recorded from tile grids landside and airside.

Scientific name	Common name	Conservation status			Most recent database record	Other records	Habitat description	Likely occurrence in project area	Rationale for likelihood ranking
		EPBC	VIC	FFG					
Pseudophryne bibronii	Brown Toadlet		en	e	2010		A wide variety of woodland, forest and grassland habitats.	**Medium**	Suitable habitat present for the species around waterways and in woodland areas within the project area. Species has not been recorded within Melbourne Airport however typical ecological surveys undertaken at Melbourne Airport have been outside of the male calling season for the species
Neochanna cleaveri	Australian Mudfish		cr	e	2008		Freshwater habitats with abundant aquatic vegetation such as streams, backwaters, billabongs and floodplain wetlands.	**Medium**	Suitable habitat present within the project area in Arundel Creek and Moonee Ponds Creek when inundated.
Jalmenus icilius	Amethyst Hairstreak Butterfly		vu	e	2015		Larvae eat a wide range of plants favouring Acacia species and Cassia species. It is generally common except in the south-eastern end of its range in central and western Victoria, where it is now very scarce.	**Low**	One recorded from similar habitat within 10km of the project area. Records of this species in the Melbourne area are very uncommon and the species has not been observed during other various ecological surveys at Melbourne Airport to date.

A5.3 Migratory species (EPBC Act listed)

Table A5.4 Migratory fauna species recorded or predicted to occur within 10 km of the project area

Scientific name	Common name	Most recent record
Migratory species		
Gallinago hardwickii	Latham's Snipe	2014
Plegadis falcinellus	Glossy Ibis	2011
Hirundapus caudacutus	White-throated Needletail	2007
Apus pacificus	Fork-tailed Swift	2007
Pandion haliaetus	Osprey	PMST
Ardenna tenuirostris	Short-tailed Shearwater	2008
Stercorarius parasiticus	Arctic Jaeger	2008
Sterna hirundo	Common Tern	2006
Hydroprogne caspia	Caspian Tern	2007
Thalasseus bergii	Crested Tern	2013
Charadrius mongolus	Lesser Sand Plover	1978
Charadrius bicinctus	Double-banded Plover	2004
Numenius madagascariensis	Eastern Curlew	1977
Limosa lapponica	Bar-tailed Godwit	1977
Actitis hypoleucos	Common Sandpiper	PMST
Tringa nebularia	Common Greenshank	PMST
Calidris ferruginea	Curlew Sandpiper	1977
Calidris acuminata	Sharp-tailed Sandpiper	2009
Calidris alba	Sanderling	1977
Calidris melanotos	Pectoral Sandpiper	PMST
Motacilla flava	Yellow Wagtail	PMST
Rhipidura rufifrons	Rufous Fantail	2014
Myiagra cyanoleuca	Satin Flycatcher	2010
Monarcha melanopsis	Black-faced Monarch	PMST

Appendix 6 Photos of the project area

Plate 1 EVC 55 Plains Grassy Woodland

Plate 2 EVC 68 Creekline Grassy Woodland

Plate 3 EVC 71 Hills Herb-rich Woodland

Plate 4 EVC 132 Plains Grassland

Plate 5 EVC132 Plains Grassland

Plate 6 EVC 641 Riparian Woodland

Plate 7 EVC 803 Plains Woodland, intact high quality old growth woodland

Plate 8 EVC 803 Plains Woodland, restored area

Plate 9 EVC 803 Plains Woodland, derived native grassland

Plate 10 EVC 895 Escarpment Shrubland

Plate 11 EVC 653 Aquatic Herbland

Plate 12 EVC 821 Tall Marsh

Plate 13 Scattered tree

Plate 14 Planted vegetation

Plate 15 Predominantly introduced vegetation

Appendix 7 Vegetation condition data

Note: Field checklists were used to assess the presence/absence of Natural Temperate Grassland and the derived grassland condition state of Grey Box Woodland (see Appendix 3). The numbered criteria outlined in this tables in Appendix 3 correspond with the numbered questions on these checklists.

Table A7.1 Natural Temperate Grassland within the project area – results of assessments against condition thresholds and EVC benchmarks

Habitat Zone			5B	7B	8A	9B	18B	19A	19B	19C	19D	19E	23A	25A	26A	26B	27A	28A	29A
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria	**2**		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	3.1		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	3.2		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	3.3		Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
	4.1		Y	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA	NA	Y	Y	NA	Y
	4.2		NA	Y	Y	Y	Y	Y	NA	Y	Y	Y	Y	Y	Y	NA	NA	Y	NA
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	4	4	7	4	4	4	4	0	0	4	4	4	7	4	4	4	4
	Understorey	25	10	15	10	10	20	10	10	10	10	5	15	15	5	5	10	5	10
	Recruitment	10	3	3	3	6	10	3	3	6	3	3	6	6	3	3	6	3	3
	Organic Matter	5	4	4	4	4	5	4	4	4	5	4	4	5	4	4	4	4	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		21	26	24	24	39	21	21	20	18	16	29	30	19	16	24	16	21
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		**28.64**	**35.45**	**32.73**	**32.73**	**53.18**	**28.64**	**28.64**	**27.27**	**24.55**	**21.82**	**39.55**	**40.91**	**25.91**	**21.82**	**32.73**	**21.82**	**28.64**
Landscape Value	Patch Size	10	8	4	4	4	8	8	8	8	8	8	6	6	6	6	1	2	1
	Neighbourhood	10	5	3	5	2	4	4	4	4	4	4	4	4	4	4	3	5	3
	Distance to Core	5	3	3	3	1	3	1	1	1	1	1	1	1	3	3	3	3	3
	Total Landscape Score		**16**	**10**	**12**	**7**	**15**	**13**	**13**	**13**	**13**	**13**	**11**	**11**	**13**	**13**	**7**	**10**	**7**
HABITAT SCORE		100	44.64	45.45	44.73	39.73	68.18	41.64	41.64	40.27	37.55	34.82	50.55	51.91	38.91	34.82	39.73	31.82	35.64
Habitat points = #/100		1	**0.45**	**0.45**	**0.45**	**0.40**	**0.68**	**0.42**	**0.42**	**0.40**	**0.38**	**0.35**	**0.51**	**0.52**	**0.39**	**0.35**	**0.40**	**0.32**	**0.36**
Habitat Zone area (ha)			0.001	2.61	6.27	1.04	4.72	4.67	1.37	0.66	0.53	0.45	2.46	2.74	4.08	0.73	0.10	1.08	0.07
Habitat Hectares (Hha)			**0.000**	**1.19**	**2.80**	**0.41**	**3.22**	**1.94**	**0.57**	**0.27**	**0.20**	**0.16**	**1.24**	**1.42**	**1.59**	**0.25**	**0.04**	**0.34**	**0.03**

Habitat Zone			32A	34A	41A	41D	42A	66A	77A	78A	80A	90A	90B	90D	90E	90F	95A	97A	98A
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria	**2**		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	3.1		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	3.2		N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N
	3.3		Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	4.1		NA	NA	NA	Y	Y	Y	NA	Y	Y	Y	NA	NA	NA	Y	NA	NA	Y
	4.2		Y	Y	Y	NA	NA	NA	Y	NA	NA	NA	Y	Y	Y	NA	Y	Y	NA
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	4	2	7	7	6	4	4	6	6	6	6	2	6	9	7	4	0
	Understorey	25	15	5	15	10	5	5	15	5	5	5	5	5	5	5	15	15	5
	Recruitment	10	6	3	10	3	6	3	6	3	3	3	3	6	3	3	6	3	3
	Organic Matter	5	4	4	5	5	4	2	5	4	4	4	4	4	4	5	4	4	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		29	14	37	25	21	14	30	18	18	18	18	17	18	22	32	26	12
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		**39.55**	**19.09**	**50.45**	**34.09**	**28.64**	**19.09**	**40.91**	**24.55**	**24.55**	**24.55**	**24.55**	**23.18**	**24.55**	**30.00**	**43.64**	**35.45**	**16.36**
Landscape Value	Patch Size	10	6	2	8	8	1	1	4	1	1	8	8	8	8	8	8	8	1
	Neighbourhood	10	4	5	5	5	3	1	4	1	1	4	4	4	4	4	6	5	3
	Distance to Core	5	3	3	3	3	3	1	3	1	1	3	3	3	3	3	3	3	1
	Total Landscape Score		**13**	**10**	**16**	**16**	**7**	**3**	**11**	**3**	**3**	**15**	**15**	**15**	**15**	**15**	**17**	**16**	**5**
HABITAT SCORE		100	52.55	29.09	66.45	50.09	35.64	22.09	51.91	27.55	27.55	39.55	39.55	38.18	39.55	45.00	60.64	51.45	21.36
Habitat points = #/100		1	**0.53**	**0.29**	**0.66**	**0.50**	**0.36**	**0.22**	**0.52**	**0.28**	**0.28**	**0.40**	**0.40**	**0.38**	**0.40**	**0.45**	**0.61**	**0.51**	**0.21**
Habitat Zone area (ha)			7.90	1.14	13.78	0.50	0.20	0.06	0.01	0.13	0.33	0.66	4.03	1.27	1.45	0.53	1.03	0.17	0.21
Habitat Hectares (Hha)			**4.15**	**0.33**	**9.16**	**0.25**	**0.07**	**0.01**	**0.01**	**0.03**	**0.09**	**0.26**	**1.59**	**0.49**	**0.57**	**0.24**	**0.62**	**0.09**	**0.04**

Habitat Zone			100A	102A	102B	124A	146A	148A	188A	194A	198A	200A	202A	206A	212A	214A	216A	234A	1010A
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria	**2**		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	3.1		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	3.2		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	3.3		Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	4.1		Y	Y	Y	Y	Y	Y	NA	NA	NA	Y	NA	NA	Y	NA	NA	Y	Y
	4.2		NA	NA	NA	NA	NA	NA	Y	Y	Y	NA	Y	Y	NA	Y	Y	NA	NA
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Lack of Weeds	15	6	6	6	6	6	0	4	0	7	4	4	0	4	4	4	9	6
	Understorey	25	5	5	10	5	5	5	5	15	5	5	10	10	5	10	15	5	10
	Recruitment	10	3	3	3	3	3	6	6	3	3	3	6	3	3	3	6	6	3
	Organic Matter	5	4	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Total Site Score		18	19	24	19	18	15	19	22	19	16	24	17	16	21	29	24	23
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36
	Adjusted Site Score		**24.55**	**25.91**	**32.73**	**25.91**	**24.55**	**20.45**	**25.91**	**30.00**	**25.91**	**21.82**	**32.73**	**23.18**	**21.82**	**28.64**	**39.55**	**32.73**	**31.36**
Landscape Value	Patch Size	10	1	2	2	1	1	1	6	8	4	1	2	1	1	4	6	1	1
	Neighbourhood	10	2	2	2	1	3	2	4	5	4	4	3	3	2	4	4	2	1
	Distance to Core	5	3	3	3	1	1	1	1	3	3	3	1	1	1	1	1	1	3
	Total Landscape Score		**6**	**7**	**7**	**3**	**5**	**4**	**11**	**16**	**11**	**8**	**6**	**5**	**4**	**9**	**11**	**4**	**5**
HABITAT SCORE		100	30.55	32.91	39.73	28.91	29.55	24.45	36.91	46.00	36.91	29.82	38.73	28.18	25.82	37.64	50.55	36.73	36.36
Habitat points = #/100		1	**0.31**	**0.33**	**0.40**	**0.29**	**0.30**	**0.24**	**0.37**	**0.46**	**0.37**	**0.30**	**0.39**	**0.28**	**0.26**	**0.38**	**0.51**	**0.37**	**0.36**
Habitat Zone area (ha)			0.09	0.64	0.97	0.23	0.55	0.32	10.32	1.76	0.48	0.21	0.50	0.71	0.19	1.61	1.94	0.005	0.27
Habitat Hectares (Hha)			**0.03**	**0.21**	**0.39**	**0.07**	**0.16**	**0.08**	**3.81**	**0.81**	**0.18**	**0.06**	**0.19**	**0.20**	**0.05**	**0.60**	**0.98**	**0.002**	**0.10**

Habitat Zone			1016A	1037A	1038A	4050A	4077A	4099A	4103A	4103B	TOTAL
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	
EVC #: Name			132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	132_61: PG	
Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) criteria		**2**	Y	Y	Y	Y	Y	Y	Y	Y	
		3.1	Y	Y	Y	Y	Y	N	Y	Y	
		3.2	N	N	N	N	N	N	N	N	
		3.3	Y	N	Y	N	Y	Y	Y	Y	
		4.1	Y	NA	NA	NA	Y	Y	Y	Y	
		4.2	NA	NA	Y	Y	NA	NA	NA	NA	
EPBC Listed Community present			NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	NTGVVP	
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	
Site Condition	Large Old Trees	10	NA	NA	NA	NA	NA	NA	NA	NA	
	Canopy Cover	5	NA	NA	NA	NA	NA	NA	NA	NA	
	Lack of Weeds	15	4	7	7	6	6	6	6	6	
	Understorey	25	5	10	10	5	5	5	5	10	
	Recruitment	10	6	6	10	6	3	3	6	3	
	Organic Matter	5	5	3	5	5	2	4	5	3	
	Logs	5	NA	NA	NA	NA	NA	NA	NA	NA	
	Total Site Score		20	26	32	22	16	18	22	22	
	EVC standardiser (x 75/55)		2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	
	Adjusted Site Score		**27.27**	**35.45**	**43.64**	**30.00**	**21.82**	**24.55**	**30.00**	**30.00**	
Landscape Value	Patch Size	10	1	1	2	8	1	1	1	1	
	Neighbourhood	10	1	4	4	4	1	1	2	2	
	Distance to Core	5	3	3	3	1	3	3	3	3	
	Total Landscape Score		**5**	**8**	**9**	**13**	**5**	**5**	**6**	**6**	
HABITAT SCORE		100	32.27	43.45	52.64	43.00	26.82	29.55	36.00	36.00	
Habitat points = #/100		1	**0.32**	**0.43**	**0.53**	**0.43**	**0.27**	**0.30**	**0.36**	**0.36**	
Habitat Zone area (ha)			0.21	0.13	1.00	0.17	0.05	0.19	0.51	0.44	**90.49**
Habitat Hectares (Hha)			**0.07**	**0.06**	**0.53**	**0.07**	**0.01**	**0.06**	**0.18**	**0.16**	**42.75**

Table A7.2 Grey Box Woodland (including Derived Grassland or DG) within the project area – results of assessments against condition thresholds and EVC benchmarks

Habitat Zone			53A	93A	93B	3001	3002	3003	3004	3005	3006	3007	TOTAL
Bioregion			VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	VVP	CVU	
EVC #: Name			803: PW	803: PW	803: PW	803: PW	803: PW	803: PW	803: PW	803: PW	803: PW	71: HHrW	
Grey Box Grassy Woodlands (GBW) and Derived Grasslands (DG) of South-Eastern Australia criteria		**1B**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		1C	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		1A	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		2A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
		2B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
		3A	NA	NA	NA	Y	Y	Y	Y	Y	Y	Y	
		3B	NA	NA	NA	Y	Y	Y	Y	Y	Y	Y	
		4A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
		4B	NA	NA	NA	Y	Y	Y	Y	Y	Y	Y	
		5A	Y	Y	Y	N	N	N	N	N	N	N	
		5B	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	
		5C	Y	Y	Y	NA	NA	NA	NA	NA	NA	NA	
EPBC Listed Community present			GBW-DG	GBW-DG	GBW-DG	GBW	GBW	GBW	GBW	GBW	GBW	GBW	
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	
Site Condition	Large Old Trees	10	0	0	3	4	4	6	6	10	0	8	
	Canopy Cover	5	0	0	0	3	3	3	3	5	3	5	
	Lack of Weeds	15	4	4	4	4	4	0	4	9	9	9	
	Understorey	25	15	15	15	15	15	15	15	20	15	20	
	Recruitment	10	5	10	5	10	6	6	6	10	6	6	
	Organic Matter	5	4	5	5	5	5	3	3	3	3	5	
	Logs	5	0	0	0	4	4	5	4	4	2	5	
	Total Site Score		28	34	32	45	41	38	41	61	38	58	
	EVC standardiser (x 75/55)		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	Adjusted Site Score		**28**	**34**	**32**	**45**	**41**	**38**	**41**	**61**	**38**	**58**	
Landscape Value	Patch Size	10	8	8	8	8	8	8	8	8	8	8	
	Neighbourhood	10	6	5	5	4	4	4	3	5	4	5	
	Distance to Core	5	3	3	3	4	4	4	4	4	4	4	
	Total Landscape Score		**17**	**16**	**16**	**16**	**16**	**16**	**15**	**17**	**16**	**17**	
HABITAT SCORE		100	45.00	50.00	48.00	61.00	57.00	54.00	56.00	78.00	54.00	75.00	
Habitat points = #/100		1	**0.45**	**0.50**	**0.48**	**0.61**	**0.57**	**0.54**	**0.56**	**0.78**	**0.54**	**0.75**	
Habitat Zone area (ha)			3.47	1.27	5.97	4.12	2.97	6.30	3.23	39.51	0.99	10.89	**78.74**
Habitat Hectares (Hha)			**1.56**	**0.64**	**2.87**	**2.51**	**1.70**	**3.40**	**1.81**	**30.82**	**0.54**	**8.17**	**54.01**

1 ha plot ID	A60	A62	A66	A102	A90	A78	A84	A88	A75	A74	A73	A71	A83	A107	A108	A123	A97	A98	A110	A125	A43	A21	A34	A12	A6	A14	A41	A53	A50	A51	A140	A153	A152	A163
Bearing (degrees)	208	290	35	272	187	42	332	326	305	13	104	199	285	235	151	12	177	41	106	244	299	211	17	146	183	167	203	132	191	173	2	223	281	317
Transect (m)	803	803	803	803	803	803	803	803	803	803	803	803	903	71	71	71	71	803	71	71	803R	803R	803R	803R	803A	801	803	803	803	803	803	71	71	71
1	C	O	G	O	O	B	B	C	O	O	O	G	O	S	O	G	B	B	G	C	X	B	O	O	P	O	X	B	B	O	B	G	G	B
2	O	G	O	X	F	C	F	C	G	O	O	O	O	S	O	G	B	C	O	C	G	B	B	O	O	O	X	B	O	O	B	G	O	O
3	G	O	O	X	O	C	G	C	O	O	O	F	B	O	O	G	F	O	O	O	F	O	N	C	O	X	F	B	B	F	O	N	F	O
4	O	O	O	X	F	G	G	C	O	O	F	O	O	F	G	C	O	B	F	F	O	O	B	F	B	F	X	B	B	F	O	G	O	O
5	C	O	O	X	O	G	F	C	O	O	F	B	O	O	C	C	G	C	G	O	O	O	S	B	O	F	B	C	G	F	C	O	O	B
6	O	O	O	O	B	O	X	C	B	O	B	B	O	F	C	C	G	O	F	O	O	O	S	O	O	B	X	F	B	O	O	O	O	B
7	B	O	O	O	G	G	F	B	F	F	O	O	O	O	C	G	G	O	B	O	F	O	O	B	B	O	G	O	G	B	O	G	F	N
8	B	O	O	O	X	F	X	O	F	O	O	O	O	N	N	G	N	O	O	O	P	O	O	C	C	O	O	B	O	B	G	G	O	N
9	O	G	O	O	P	O	G	F	O	G	O	O	N	O	O	G	N	O	O	O	P	S	O	P	O	O	O	B	N	B	O	G	F	G
10	G	O	O	X	C	F	F	B	O	F	G	G	B	S	G	G	G	O	B	G	P	O	O	O	N	X	X	B	F	O	F	G	F	B
11	C	O	O	O	B	F	O	O	O	B	G	O	O	F	C	G	O	O	N	O	O	S	O	O	O	F	F	O	O	F	G	G	F	B
12	C	F	O	O	B	O	O	C	O	B	F	N	G	S	G	G	O	O	B	G	P	S	O	X	O	O	X	B	F	O	O	G	O	C
13	O	C	G	F	X	O	F	O	F	B	O	O	O	S	G	G	G	G	C	O	P	O	O	X	O	C	G	O	O	B	B	G	F	C
14	F	O	O	B	C	O	F	O	F	B	F	O	O	S	X	O	O	O	C	B	P	O	O	O	B	X	N	O	B	C	O	N	F	F
15	O	F	O	F	C	O	X	G	G	C	O	O	N	G	C	O	G	G	C	B	O	S	O	C	B	F	O	O	O	C	F	O	O	G
16	F	O	G	O	C	O	O	G	O	B	G	F	O	S	C	G	O	O	G	C	O	B	N	O	X	F	O	O	O	C	G	O	F	O
17	O	G	F	O	O	O	O	G	O	X	F	O	B	O	C	G	F	O	O	O	G	F	B	X	B	C	B	O	B	C	O	G	F	O
18	B	C	O	G	O	O	O	C	G	O	G	O	B	O	C	O	B	G	O	C	G	C	O	B	B	F	B	O	F	B	O	G	C	O
19	F	O	O	O	X	O	F	G	G	O	G	F	B	O	C	O	O	F	O	O	P	C	N	P	O	C	F	O	O	B	O	G	A	G
20	F	F	O	O	O	O	O	F	O	B	O	O	B	G	C	G	F	O	O	O	B	O	O	B	B	F	B	O	C	B	F	O	F	O
21	O	O	O	O	O	O	G	G	G	F	O	B	O	F	C	O	O	O	O	O	X	B	N	B	B	O	B	B	C	B	O	N	A	O
22	B	B	C	O	X	O	G	G	G	B	O	O	O	O	C	O	O	O	C	O	O	S	B	B	X	B	F	C	C	O	G	B	G	O
23	O	F	F	O	O	O	X	G	F	B	O	O	O	O	O	O	G	O	O	O	G	O	B	B	O	X	B	O	C	B	G	A	F	G
24	B	O	O	O	O	O	F	O	F	B	O	O	O	S	G	B	G	O	O	B	G	O	O	B	O	C	B	B	B	C	G	G	O	G
25	O	G	B	G	O	F	G	F	G	B	O	O	O	S	B	C	O	G	C	B	G	O	O	B	O	X	O	B	G	O	G	A	F	O
26	O	O	O	O	R	O	G	G	F	B	F	O	O	C	N	O	O	F	O	B	G	O	O	X	N	X	N	B	O	O	O	C	X	O
27	G	B	O	O	X	O	F	G	G	O	F	O	G	N	B	O	O	O	C	O	P	O	O	B	N	O	O	B	O	C	C	G	B	O
28	O	B	B	O	G	B	G	O	O	O	O	O	G	B	C	G	G	F	N	O	P	O	O	B	B	B	X	B	O	O	C	A	X	B
29	F	N	F	O	O	F	G	G	B	N	G	B	N	N	O	O	B	N	C	O	G	O	O	B	P	F	X	B	O	O	C	G	O	O
30	G	G	O	O	F	X	G	G	O	N	G	O	O	N	C	G	C	G	O	B	O	O	O	B	B	C	O	N	B	B	O	G	N	O
31	G	B	O	O	G	O	O	G	F	O	G	F	B	O	C	O	F	F	O	C	O	O	O	B	P	C	X	B	N	B	G	G	A	O
32	O	C	O	B	O	X	N	O	C	O	O	F	B	N	C	G	O	N	O	O	G	O	O	O	P	C	X	B	G	O	B	O	C	O
33	O	O	O	O	X	G	O	F	O	G	O	O	B	G	B	O	O	G	O	C	P	O	O	O	P	N	X	B	O	O	N	C	B	O
34	O	C	O	C	X	O	O	O	O	G	F	O	B	O	O	G	O	O	O	N	G	O	O	C	O	N	X	C	O	B	O	B	B	O
35	G	C	O	C	B	C	G	F	O	O	B	O	B	C	O	O	O	F	O	N	P	B	O	O	B	C	X	B	F	O	O	C	S	B
36	F	F	O	C	X	G	O	G	F	G	F	O	B	N	O	O	F	G	O	B	P	B	O	B	O	C	F	O	O	C	C	C	F	
37	O	O	G	O	O	O	G	G	O	G	G	B	C	N	C	O	O	G	G	B	G	O	B	O	P	B	F	F	F	O	C	A	C	B
38	G	B	G	O	O	G	O	G	O	O	F	O	B	G	O	G	O	F	C	O	X	O	B	B	B	C	G	O	X	O	O	B	A	B
39	O	B	O	O	O	X	O	O	O	F	F	O	F	S	N	G	O	O	O	O	P	O	O	B	X	B	G	B	X	F	C	B	F	B
40	O	O	O	O	O	O	O	F	F	F	O	N	N	G	C	O	F	N	C	G	O	O	N	C	B	B	F	B	X	F	O	B	C	C
41	F	G	O	O	F	X	C	F	C	G	O	B	G	O	G	O	G	G	N	G	G	B	B	N	B	B	X	B	O	O	C	G	O	O
42	G	O	O	C	O	B	O	O	G	O	F	O	O	C	O	O	B	G	O	G	P	O	O	C	B	B	X	N	F	O	B	O	O	C
43	O	C	G	C	O	O	G	C	O	O	G	O	O	X	C	O	O	F	O	G	P	O	O	B	O	B	X	B	G	F	C	G	O	O
44	O	G	F	F	X	B	G	O	G	G	G	G	G	G	F	G	N	F	B	O	O	O	B	F	N	F	X	B	F	O	O	G	B	O
45	F	O	O	O	X	G	C	O	O	O	B	N	B	G	O	G	O	F	C	B	O	O	O	O	O	O	X	B	O	O	B	C	O	C
46	F	F	O	O	O	F	F	O	O	G	O	O	O	G	F	G	O	O	O	B	O	B	B	O	O	X	O	B	B	F	A	O	C	B
47	C	O	F	O	F	G	O	O	O	F	O	O	O	O	N	O	O	O	O	B	O	B	C	O	O	X	B	B	F	O	O	C	C	B
48	G	O	F	O	F	O	O	F	F	O	C	O	N	O	C	O	O	G	O	B	O	B	O	O	O	O	X	O	B	O	G	G	C	O
49	F	O	C	O	O	X	G	O	F	G	O	C	O	G	G	G	C	O	O	G	P	B	O	O	C	O	O	O	F	F	O	C	A	O
50	O	O	B	O	O	O	O	F	O	O	O	O	O	O	C	G	O	O	G	G	P	B	B	O	P	F	O	O	O	O	O	A	A	G

	% cover																																	
ID/cover type	A60	A62	A66	A102	A90	A78	A84	A88	A75	A74	A73	A71	A83	A107	A108	A123	A97	A98	A110	A125	A43	A21	A34	A12	A6	A14	A41	A53	A50	A51	A140	A153	A152	A163
N - native grass	0.00	2.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	4.00	0.00	6.00	10.00	14.00	8.00	0.00	6.00	6.00	6.00	4.00	0.00	0.00	10.00	2.00	8.00	4.00	4.00	4.00	4.00	0.00	2.00	6.00	2.00	4.00
F - perennial native forb	20.00	12.00	12.00	6.00	12.00	12.00	20.00	18.00	24.00	12.00	24.00	10.00	2.00	8.00	4.00	0.00	12.00	18.00	4.00	2.00	4.00	2.00	0.00	4.00	0.00	20.00	12.00	6.00	18.00	18.00	6.00	0.00	26.00	4.00
A - annual native forb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	10.00	12.00	0.00
S - native sub-shrub	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
Native groundcover total	20.00	14.00	12.00	6.00	12.00	12.00	22.00	18.00	24.00	16.00	24.00	16.00	12.00	42.00	12.00	0.00	18.00	24.00	10.00	6.00	4.00	10.00	16.00	6.00	8.00	24.00	16.00	10.00	22.00	18.00	10.00	16.00	42.00	8.00
W - annual non-grass weed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X - perennial non-grass weed	0.00	0.00	0.00	10.00	20.00	10.00	8.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	0.00	8.00	4.00	18.00	38.00	0.00	6.00	0.00	0.00	0.00	4.00	0.00
G - annual grass weed	18.00	14.00	12.00	4.00	6.00	16.00	30.00	30.00	20.00	18.00	22.00	6.00	10.00	18.00	14.00	48.00	20.00	22.00	10.00	16.00	24.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	10.00	0.00	16.00	46.00	2.00	12.00
P - perennial grass weed	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.00	0.00	0.00	4.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Introduced cover total	18.00	14.00	12.00	14.00	28.00	26.00	38.00	30.00	20.00	20.00	22.00	6.00	10.00	20.00	16.00	48.00	20.00	22.00	10.00	16.00	64.00	0.00	0.00	12.00	18.00	18.00	46.00	0.00	16.00	0.00	16.00	46.00	6.00	12.00
C - cryptogam	10.00	12.00	4.00	10.00	8.00	6.00	4.00	18.00	4.00	2.00	2.00	2.00	2.00	6.00	42.00	8.00	4.00	4.00	20.00	12.00	0.00	4.00	2.00	12.00	4.00	20.00	0.00	4.00	8.00	14.00	18.00	14.00	16.00	10.00
O - litter/logs	42.00	48.00	66.00	66.00	42.00	48.00	34.00	30.00	48.00	40.00	46.00	64.00	48.00	30.00	24.00	42.00	48.00	46.00	52.00	42.00	30.00	62.00	62.00	34.00	38.00	22.00	20.00	32.00	34.00	44.00	44.00	16.00	26.00	46.00
B - bare soil/rock	10.00	12.00	6.00	4.00	8.00	8.00	2.00	4.00	4.00	22.00	6.00	12.00	28.00	2.00	6.00	2.00	10.00	4.00	8.00	24.00	2.00	24.00	20.00	36.00	32.00	16.00	18.00	54.00	20.00	24.00	12.00	8.00	10.00	24.00
R - rubbish	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other cover total	62.00	72.00	76.00	80.00	60.00	62.00	40.00	52.00	56.00	64.00	54.00	78.00	78.00	38.00	72.00	52.00	62.00	54.00	80.00	78.00	32.00	90.00	84.00	82.00	74.00	58.00	38.00	90.00	62.00	82.00	74.00	38.00	52.00	80.00
Total vascular plant (vegetative) cover	38.00	28.00	24.00	20.00	40.00	38.00	60.00	48.00	44.00	36.00	46.00	22.00	22.00	62.00	28.00	48.00	38.00	46.00	20.00	22.00	68.00	10.00	16.00	18.00	26.00	42.00	62.00	10.00	38.00	18.00	26.00	62.00	48.00	20.00
Total transect cover	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

1 ha plot ID	A161	A177	A194	A181	A197	A169	A143	A115	A34	A26	A57	A70	A81
Bearing (degrees)	341	193	35	195	202	262	344	156	162	242	330	150	317
Transect (m)	803	71	71	71	803	803	803	803	803R	803	803	803	803
1	O	F	G	O	O	X	B	B	B	O	F	O	P
2	C	O	G	O	X	F	B	B	O	N	C	C	P
3	G	O	O	O	O	G	F	B	F	O	C	F	P
4	C	F	O	N	O	X	O	B	B	O	N	P	N
5	B	F	G	F	B	G	O	G	B	O	N	F	O
6	B	F	G	N	F	G	O	X	B	B	O	O	O
7	O	F	O	O	O	G	F	X	B	F	B	F	P
8	O	F	O	O	P	F	F	X	O	G	C	O	X
9	O	G	O	B	F	O	B	X	O	N	N	F	P
10	G	G	O	G	B	G	B	O	B	N	O	F	P
11	O	O	O	O	F	F	O	X	O	O	C	F	P
12	C	O	B	F	B	O	O	C	O	O	C	P	P
13	F	B	G	O	G	G	O	F	G	F	O	P	P
14	F	O	O	O	F	F	B	O	X	O	N	O	P
15	O	O	G	N	B	O	O	G	F	N	C	P	N
16	G	O	F	O	O	F	F	F	F	B	O	O	N
17	O	G	G	G	G	O	O	O	O	O	B	N	S
18	G	F	G	O	O	O	O	G	X	F	N	O	S
19	O	O	C	O	O	G	O	O	O	F	C	C	C
20	G	O	G	P	O	F	O	O	G	O	N	O	P
21	O	O	O	F	O	O	B	O	X	F	N	O	N
22	G	O	F	F	O	O	F	G	S	F	N	O	N
23	G	O	O	B	O	O	O	O	X	O	N	C	S
24	O	O	O	F	G	G	O	O	X	O	S	P	N
25	F	O	G	O	X	O	F	F	X	B	P	N	P
26	O	C	B	O	P	O	O	O	X	F	S	N	P
27	B	O	O	O	O	F	O	O	G	B	N	N	N
28	C	O	B	F	O	F	B	O	O	C	C	N	N
29	O	O	B	G	C	G	O	G	P	C	N	N	P
30	F	O	O	O	C	O	F	G	C	O	N	N	N
31	O	G	F	O	O	F	F	O	P	F	N	O	X
32	O	F	F	O	B	O	O	O	F	P	N	O	P
33	O	F	O	O	B	O	F	O	F	B	O	P	C
34	O	F	G	G	O	F	B	O	F	B	N	P	S
35	O	F	F	F	B	F	B	O	G	N	C	N	N
36	O	O	B	F	B	C	B	O	C	F	P	N	N
37	O	C	O	O	F	O	O	O	O	O	N	N	N
38	O	B	B	O	O	B	F	O	C	O	O	N	P
39	O	C	O	F	O	B	F	B	G	O	P	O	N
40	O	F	C	G	B	C	B	O	C	F	N	N	N
41	G	N	O	C	X	B	O	B	F	F	N	O	N
42	O	B	G	O	X	B	F	O	O	O	N	N	S
43	C	O	F	O	X	B	F	O	O	P	P	O	N
44	O	O	B	C	G	F	O	G	O	P	C	O	N
45	N	C	O	O	P	B	O	F	F	N	N	O	N
46	G	F	O	C	B	O	O	X	C	O	O	F	O
47	O	O	B	O	B	F	O	X	O	O	P	O	N
48	O	B	B	C	X	F	O	X	F	F	O	O	N
49	B	O	B	B	X	G	O	O	X	F	P	O	N
50	O	O	O	F	X	O	F	O	F	P	P	O	N

ID/cover type	A161	A177	A194	A181	A197	A169	A143	A115	A34	A26	A57	A70	A81
N - native grass	2.00	2.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	12.00	40.00	26.00	44.00
F - perennial native forb	8.00	26.00	12.00	20.00	10.00	28.00	28.00	8.00	20.00	26.00	2.00	14.00	0.00
A - annual native forb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S - native sub-shrub	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	4.00	0.00	10.00
Native groundcover total	10.00	28.00	12.00	26.00	10.00	28.00	28.00	8.00	22.00	38.00	46.00	40.00	54.00
W - annual non-grass weed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
X - perennial non-grass weed	0.00	0.00	0.00	0.00	16.00	4.00	0.00	16.00	16.00	0.00	0.00	0.00	4.00
G - annual grass weed	18.00	8.00	24.00	10.00	8.00	20.00	0.00	14.00	10.00	2.00	0.00	0.00	0.00
P - perennial grass weed	0.00	0.00	0.00	2.00	6.00	0.00	0.00	0.00	4.00	8.00	14.00	14.00	32.00
Introduced cover total	18.00	8.00	24.00	12.00	30.00	24.00	0.00	30.00	30.00	10.00	14.00	14.00	36.00
C - cryptogam	10.00	8.00	4.00	8.00	4.00	4.00	0.00	2.00	10.00	4.00	20.00	6.00	4.00
O - litter/logs	54.00	48.00	40.00	48.00	34.00	32.00	50.00	48.00	26.00	36.00	16.00	40.00	6.00
B - bare soil/rock	8.00	8.00	20.00	6.00	22.00	12.00	22.00	12.00	12.00	12.00	4.00	0.00	0.00
R - rubbish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other cover total	72.00	64.00	64.00	62.00	60.00	48.00	72.00	62.00	48.00	52.00	40.00	46.00	10.00
Total vascular plant (vegetative) cover	28.00	36.00	36.00	38.00	40.00	52.00	28.00	38.00	52.00	48.00	60.00	54.00	90.00
Total transect cover	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Plot ID	Count of Trees >60 cm	Count of hollow trees
21	0	0
26	4	4
28	10	10
37	3	3
50	7	5
52	6	1
60	15	7
77	25	11
86	21	7
87	20	9
91	14	8
94	13	6
99	25	25
102	23	22
108	16	16
110	16	16
113	18	15
114	17	16
115	7	6
121	5	4
122	4	2
138	21	21
147	20	12
150	29	12
152	22	22
180	22	19
181	15	14
182	23	15
183	13	12
197	18	16
211	5	4
variable/ha	**15**	**11**
low range in plots	**0**	**0**
high range in plots	**29**	**25**

Appendix 8 EPBC Offset Guides