Final Report

Ballarat North Precinct Structure Plan: Strategic Bushfire Development Report and Risk Assessment

Prepared for

Victorian Planning Authority

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Ecology and Heritage Partners Pty Ltd

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Ecology and Heritage Partners acknowledge the Traditional Owners of the country we live and work on, and we pay our respect to Elders past, present and emerging.

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EXECUTIVE SUMMARY

Ecology and Heritage Partners Pty Ltd was commissioned by the Victorian Planning Authority (VPA) to prepare a Strategic Bushfire Development Report and Risk Assessment for the Ballarat North Precinct Structure Plan (PSP) core area and an additional area known as the 'expanded area' (collectively known as the study area).

A bushfire hazard risk assessment has been undertaken for the study area by assessing the environmental conditions (i.e. vegetation type and extent, topography, weather) and the resultant bushfire risk posed at four scales. The presence of urban areas immediately bordering the study area to the south and west means that a landscape-scale fire approaching from the south-west is extremely unlikely to impact the study area (apart from embers) given the replacement of fuel with hard surfaces close to the study area. A landscape-scale fire approaching from the north-west and impacting the study area is more likely (albeit still unlikely) given the higher coverage of unmanaged grasses in this direction, however the presence of roads, ornamental gardens and managed lawns would greatly reduce the momentum and severity of a fire approaching form this direction. While it is possible for a grassfire to approach the study area from the north-east, east and south-east, these wind directions are not associated with days of severe fire weather in Victoria. In the very unlikely event a fire approaches from one of these directions, it would likely be of less severity than a fire approaching from the north-west or south-west. There is the potential for a fire beginning within the Ballarat Town Common or Ballarat North Water Reclamation Plant to pose a risk to the study area given the size of these areas.

Clause 13.02-1S places a large emphasis on strategic bushfire planning, with its objective being to '*strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life*' (p1). This clause applies to land in the BPA, BMO or proposed to be used or developed in a way that may create a bushfire hazard.

The current extent of the Bushfire Management Overlay (BMO) within the Ballarat North Water Reclamation Plant and for approximately 150 metres into the study area (Attachment 7) is appropriate given that the mature Radiata Pine plantations within the Plant have the potential to generate a large amount of heat, embers and flames. While this report discusses the potential to revegetate Burrumbeet Creek with trees and shrubs, this linear corridor of Forest vegetation would not constitute an extreme bushfire hazard and thus it is not considered that the BMO be applied to it.

The minimum permissible BAL construction standard within the BPA and BMO is BAL-12.5 as per *Building Amendment (Bushfire Construction) Regulations 2011*. BAL-12.5 is also the maximum building construction standard allowable under Clause 13.02-1S as part of a planning scheme amendment.

1 INTRODUCTION

1.1 Background

The City of Ballarat has experienced high levels of growth since 2018. In order to facilitate the release of residential land, the City of Ballarat prepared the Ballarat Long-term Growth Options Investigation paper (2018), which reviewed four growth areas in the municipality. This paper was informed by several documents, including the Bushfire Planning Assessment for the Northern Growth Investigation Area (Bushfire Planning 2020). The Ballarat North precinct scored well during these investigations, with this precinct corresponding to the 'core area' as identified in this report.

Ecology and Heritage Partners Pty Ltd was commissioned by the Victorian Planning Authority (VPA) to prepare a Strategic Bushfire Development Report and Risk Assessment for the Ballarat North Precinct Structure Plan (PSP) core area and an additional area known as the 'expanded area' (collectively known as the study area). The core and expanded areas are currently zoned Urban Growth Zone and Farming Zone, respectively. This report will assist in understanding the existing bushfire risk and provide opportunities and constraints regarding the bushfire situation, which will be used to inform the preparation of the Ballarat North PSP.

While this report assesses both the core and expanded area, at the time of writing, no decision has been made about the inclusion of the expanded area in the final PSP.

The following information was assessed as part of this report:

- Identify the bushfire hazard and undertake an appropriate risk assessment as set out in the criteria in Clause 13.02-1S Bushfire of the Ballarat Planning Scheme;
- As a result of the bushfire risk assessment, provide advice and recommendations relating to appropriate bushfire controls based on vegetation within and surrounding the study area, including:
    - The Burrumbeet Creek corridor;
    - The Equine Precinct and farming to the north;
    - Ballarat Town Common;
    - The Ballarat North Water Reclamation Plant; and
    - Mt Rowan.
- Provide appropriate mitigation measures that would be able to be implemented via the planning scheme amendment;
- Review the core and expanded area and provide advice from a bushfire perspective as to what parcels would/would not be appropriate for development, or if there are mitigation measures that could be implemented;
- If applicable, clearly identify any land in the study area which does not meet the requirements of Clause 13.02-1S Bushfire, for which mitigation measures are either not possible/impracticable or prohibitively expensive;

- Consider whether the Bushfire Management Overlay (BMO) should be applied to any vegetation within the precinct or immediately adjacent it; and,
- Given the study area is designated a Bushfire Prone Area (BPA) under the *Building Act 1993*, consider as relevant any applicable regulations made under that Act.

1.2 Study Area

The study area includes 104 contiguous land parcels across Mount Rowan and Miners Rest, Victoria and is located directly north of Ballarat's urban area (Attachment 1). The study area covers approximately 832 hectares, of which 561 hectares is the core area and 271 hectares is the expanded area (Attachment 2). It is bound by Garlands Road, Sharpes Road and private property to the north, Midland Highway and Gillies Road to the east, Western Freeway and the Ballarat North Water Reclamation Plant to the south, and several residential roads and larger private properties to the west.

The study area is characterised by grasslands in the form of agricultural pastures and crops across a large extent of the study area, with grasslands also present in the Ballarat Town Common to the study area's south-west. The Miners Rest Recreation Reserve is in the study area's north-western corner and contains a wetland area and small plantation of Radiata Pines *Pinus radiata*. There are areas of managed grass and ornamental gardens on smaller properties associated with dwellings, and around dwellings on larger agricultural properties. The road reserves also contained managed grass.

The highest point within the study area is the peak of Mount Rowan at 518 metres above sea level (a.s.l), which is approximately located at the northern end of Parcel 47 on Attachment 2. The slope then descends steeply at a gradient of approximately 10 degrees to approximately 470 metres a.s.l towards the southern boundary of Parcels 46, 47 and 49. The topography is flat to gently sloped for the remaining study area, with the topography subtly decreasing in elevation from the base of Mount Rowan southwards and westwards. The lowest points in the study area are along Burrumbeet Creek to the south at approximately 440 metres a.s.l and the same creek and wetland area along the study area's western boundary at approximately 430 metres a.s.l.

The entire study area is in the BPA, while the Ballarat North Water Reclamation Plant and adjoining land within approximately 150 metres of it are in the BMO (Attachment 2).

2 METHODS

2.1 Desktop Assessment

Relevant literature, online-resources and databases were reviewed to provide an assessment of bushfire and biodiversity values associated with the study area. The following information sources were reviewed:

- Australian Standard 3959-2018 Construction of buildings in bushfire-prone areas (AS 3959:2018) (Standards Australia 2018);
- Relevant Victoria Planning Provision (VPP) clauses, including Clause 13.01-1S Natural Hazard and Climate Change, Clause 13.02-1S Bushfire, Clause 44.06 Bushfire Management Overlay, Clause 53.02 Bushfire Planning and Clause 71.02 Operation of the Planning Policy Framework (specifically Clause 72.01-3 Integrated decision making);
- Relevant Victorian Government Practice Notes and Fact Sheets, including Planning Practice Note 64 Local planning for bushfire protection (Department of Environment, Land, Water and Planning [DELWP] 2015) and Bushfire Mapping Methodology and Criteria (DELWP 2019);
- Victorian Department of Transport and Planning's (DTPs) Planning Maps Online (DTP 2023) for the planning overlays (including the Bushfire Management Overlay [BMO]) and Bushfire Prone Area (BPA) mapping applicable to the study area;
- Bushfire Planning Assessment (Bushfire Planning 2020) prepared for the Northern Growth Investigations Area; and,
- Aerial photography.

In addition, discussions were held with the Country Fire Authority (CFA) to gain their input into this report. Additional commentary was also provided on appropriate bushfire mitigation measures from a bushfire risk perspective and measures that would assist in the operational aspect of their service.

2.2 Site Assessment

A site assessment was undertaken by Ecology and Heritage on foot and by vehicle on 14 and 15 August 2023 to assess the site conditions within and adjoining the study area, including the vegetation present and topography. Of the 104 land parcels that formed the study area, Ecology and Heritage Partners were not given permission to enter 43 of these parcels (Attachment 2). This was either stated verbally or via email, or the landowner did not respond to the VPAs or Ecology and Heritage Partners' calls/emails to gain access. The assessor was able to view a large majority of the parcels they couldn't access by viewing the parcel from the road and/or from adjoining parcels where Ecology and Heritage Partners were granted access to.

Despite not being able to access all parcels in the study area, the site assessment provided all the necessary baseline data to inform the results and discussion provided in this bushfire report.

3 BUSHFIRE HAZARD RISK ASSESSMENT

A bushfire hazard risk assessment has been undertaken for the study area by assessing the environmental conditions (i.e. vegetation type and extent, topography, weather) and the resultant bushfire risk posed at four scales. These assessment scales align within Clause 13.02-1S Bushfire under the Bushfire hazard identification and assessment strategy, which are:

- Landscape conditions – meaning the conditions in the landscape within 20 kilometres from a site;
- Local conditions – meaning the conditions in the area within approximately 1 kilometre from a site;
- Neighbourhood conditions – meaning conditions in the area within 400 metres of a site; and
- The site for the development, i.e. the study area.

3.1 Bushfire Hazard Landscape Assessment

The landscape condition within 20 kilometres of the study area is characterised predominantly by agricultural properties (Attachment 3). One large contiguous area of forest exists approximately four kilometres east and three kilometres north-east of the study area and consists of the Creswick Regional Park, Glen Park State Forest, Nerrina Historic Area and Creswick Plantation. The length (north-south) of this forest is approximately 18 kilometres. A second large contiguous area of forest exists approximately 17 kilometres south-west of the study area and includes state parks, a historic area and plantations. The urban area of Ballarat is immediately south of the study area on the southern side of the Western Freeway and extends southward for approximately 10 kilometres.

The most likely directions of bushfire attack on severe fire weather days are from the north-west or south-west in Victoria (and to a lesser extent from the north and west). At the landscape-scale, both directions are dominated by cleared agricultural land beyond the urban areas of Ballarat, with forests occurring several kilometres away to the south-west. A fire travelling through the forested area to the south-west (including on adjoining treed rural properties closer to the study area) has the potential to generate embers on days of severe bushfire weather that can travel for many kilometres before landing in paddocks/grasslands close to or within the study area and promoting the ignition of grassfires (Attachment 3). Alternatively, a grassfire could ignite through natural or anthropogenic means and travel towards the study area if the wind direction facilitated it. There is, however, a lack of connectivity in the landscape where the fuel loads are considered large on a continual basis due to several roads intersecting the land, crops being periodically harvested and farm animals grazing the paddocks, which would likely greatly reduce the amount of fuel available. These factors would likely make it difficult for a fire to build momentum to the severity required to be a significant threat to the study area.

While it is possible for a grassfire to approach the study area from the north-east, east and south-east, these wind directions are not associated with days of severe fire weather in Victoria. In the very unlikely event a fire approaches from one of these directions, it would likely be of less severity than a fire approaching from the north-west or south-west.

One bushfire occurred in the south-eastern corner of the study area in 2018, with five others occurring within five kilometres of the study area since 2016 (Attachment 4). These fires were all relatively small. Several planned burns are planned for the upcoming year or have been undertaken in the past two years within five kilometres of the study area, including within the wetland are of the Miners Rest Recreation Reserve (Attachment 4).

The closest neighbourhood safer place to the study area is at the Invermay Recreation Reserve, Invermay, which is approximately four kilometres east of the south-eastern corner of the study area via the road network (Attachment 4).

3.2 Bushfire Hazard Local and Neighbourhood Assessment

The local (one kilometre) (Attachment 5) and neighbourhood scale (400 metre) (Attachment 6) bushfire assessments illustrate the same landscape at both scales. They highlight the presence of urban residential properties along a large majority of the study area's western boundary, dense urban areas and the Western Freeway along the southern boundary, and mixture of rural residential lots, a racecourse and agricultural paddocks along the northern and eastern boundaries. The extent of grassland in the Ballarat Town Common and forest in the Ballarat North Water Reclamation Plant can also be clearly observed at these scales.

The presence of urban areas immediately bordering the study area to the south and west means that a landscape-scale fire approaching from the south-west is extremely unlikely to impact the study area (apart from embers) given the replacement of fuel with hard surfaces close to the study area. A landscape-scale fire approaching from the north-west and impacting the study area is more likely (albeit still unlikely) given the higher coverage of unmanaged grasses in this direction, however the presence of roads, ornamental gardens and managed lawns would greatly reduce the momentum and severity of a fire approaching form this direction. Similarly, a landscape-scale fire approaching from the north-east (i.e., east of Gillies Road) is unlikely, given the presence of roads (including a major highway running north-south [Midland Highway]), ornamental gardens and managed lawns reducing fire potential, momentum and severity.

There is the potential for a fire beginning within the Ballarat Town Common or Ballarat North Water Reclamation Plant to pose a risk to the study area given the size of these areas. Appropriate bushfire mitigation measures therefore need to be provided that respond to this hazard.

3.3 Bushfire Hazard Site Assessment

The bushfire hazard site assessment is an application requirement in response to AS 3959:2018 (Standards Australia 2018) and describes the bushfire hazard within 100 or 150 metres of the study area through vegetation and slope classification in accordance with its site methodology. An assessment area of 100 metres is applied when the subject land is in the BPA and a 150-metre assessment area is applied to land in the BMO (Attachment 7). The results of this assessment are used to determine the Bushfire Attack Level (BAL) construction standards for buildings and their commensurate separation distance (for land in the BPA) or defendable space distance (for land in the BMO) from classified (i.e. unmanaged) vegetation. For consistency, the term 'separation distance' is used, as the BPA applies to the whole study area, while the BMO only applies to a portion of it (Attachment 2).

Classified vegetation consisted of Grassland, Shrubland, Scrub, Woodland and Forest as per the vegetation classifications in Table 2.3 of AS 3959:2018 (Standards Australia 2018) (Attachment 7). This classified vegetation is described below:

- Grassland was present within the study area, in all directions, within the 100/150-metre assessment zone in the form of paddocks, crops and public spaces (i.e. Ballarat Town Common, Miners Rest Recreation Reserve) (Plate 1 in Section 6). It is understood that the Ballarat Town Common will remain in its current state into the foreseeable future, i.e. irregular slashing in which the fuel (grass) is able to build up, and thus this vegetation has been classified as Grassland for the purposes of determining the separation distance. The wetland area within the Miners Rest Recreation Reserve has also been classified as Grassland, as it contains enough emergent and fringing vegetation that could become a fire hazard if the wetland dried up during the warmer months.
- Shrubland was observed within the Ballarat Town Common where there were dense patches of European Gorse *Ulex europaeus* (Plate 2).
- Scrub was recorded along the western and northern sides of the study area along Burrumbeet Creek, which contained shrubby plants (Plate 3);
- Woodland occurs where the projective foliage cover of the tree canopies is between 10-30%. Sparsely treed areas with scattered shrubs were observed as small patches across the study area that aligned with a Woodland classification, including along the Burrumbeet Creek corridor, within the Ballarat Town Common and within private properties (Plate 4).
- Forest occurs where the projective foliage cover of the tree canopies is greater than 30%. Mature Radiata Pine plantations adjoining the Miners Rest Recreation Reserve and within the Ballarat North Water Reclamation Plant were both classified as Forest (Plate 5). Forest was also observed along the Burrumbeet Creek corridor where native trees had been planted in recent years and were not mature but are likely to result in a projective foliage cover of 30% or greater when mature. A corridor of Willows *Salix* spp. also occurred along the creek corridor immediately south of Cummins Road. Other small patches of Forest were present within the Ballarat Town Common and on private property.

Areas of Low Threat/managed vegetation and non-vegetated areas are excluded from classification in the bushfire hazard site assessment methodology (Section 2.2.3.2, AS 3959:2018, Standards Australia 2018) and thus do not require a separation distance to be provided from them. Low Threat vegetation and non-vegetated areas in this case included ornamental gardens, managed lawns, windrows (Plate 6), dwellings, roads, Burrumbeet Creek and dams. The road reserves were also generally maintained in a Low Threat state, i.e. maximum grass height of 100 millimetres, during the field assessment (Plate 7) and are expected to remain in a well-managed state into the future, particularly with the urbanisation of the area.

The effective slope is the slope under the classified vegetation and is referred to as 'Upslope/Flat land' or 'Downslope'. An Upslope refers to a fire travelling downhill towards a building (i.e. being upslope of the building) and a Downslope refers to a fire travelling uphill towards a building (i.e. being downslope of a building). A Downslope is further categorised into five-degree blocks, i.e. Downslope >0 to 5 degrees, Downslope >5 to 10 degrees, up to 20 degrees. The effective slope is illustrated on Attachment 7 under classified vegetation within the 100/150 metre assessment zone adjoining the study area. The effective slope

has also been shown within the study area where development will not occur, which are within the Ballarat Town Common and Miners Rest Recreation Reserve, being classified as Upslope/Flat Land.

Two separation distances have been applied to Mount Rowan. Mount Rowan contains steep slopes that are approximately 10 degrees in gradient on its eastern, southern and western faces, with the northern face being less steep. The separation distance along the study area's northern boundary has been provided in response to a Downslope >5 to 10 degree slope category (i.e. 25 metres) on the northern half of Mount Rowan (Attachment 7d). A second separation distance has been applied around the 470-metre contour line within the study area, which is generally where the land starts to flatten out. This second line assumes that the steeper slopes will not be developed and a separation distance of 19 metres has been applied due to the slope being classified as an Upslope/Flat land in this instance.

Based on the classified vegetation and effective slope illustrated on Attachment 7, the minimum separation distance required for habitable buildings constructed to Bushfire Attack Level (BAL)-12.5 under AS 3959:2018 (Table 2.4, Standards Australia 2018) is shown on Attachment 8 and provided in Table 1. The minimum permissible BAL construction standard within the BPA and BMO is BAL-12.5 as per *Building Amendment (Bushfire Construction) Regulations 2011*. BAL-12.5 is also the maximum building construction standard allowable under Clause 13.02-1S as part of a planning scheme amendment.

Table 1. Separation distance calculations for the study area using Table 2.4 to AS 3959:2018 (Standards Australia 2018).

Vegetation Classification	Grassland	Grassland	Shrubland	Scrub
Effective Slope	Upslope/Flat land	Downslope >5-10°	Upslope/Flat land	Upslope/Flat land
BAL Construction Standard	BAL-12.5	BAL-12.5	BAL-12.5	BAL-12.5
Separation Distance	19 metres	25 metres	19 metres	27 metres

Vegetation Classification	Woodland	Forest
Effective Slope	Upslope/Flat land	Upslope/Flat land
BAL Construction Standard	BAL-12.5	BAL-12.5
Separation Distance	33 metres	48 metres

The separation distances shown in Table 1 and mapped on Attachment 8 were based on the following considerations:

- The 19-metre separation distance was applied to the areas of Grassland that were assumed to remain within the study area. This included buffering the 19-metre separation distance off the Ballarat Town Common, Grassland areas within the Miners Rest Recreation Reserve and steeper slopes of Mount Rowan.
- Where a road reserve adjoins the study area (e.g. Gillies Road), the Grassland 19-metre separation distance begins on the opposite side of the road reserve within private/public parcels, as the road reserve was classified as Low Threat. Furthermore, whilst some properties on the opposite side of the road reserve adjoining the study area contained Low Threat vegetation (i.e. ornamental gardens and managed lawns), a 19-metre separation distance was applied along the length of the road reserve to provide a uniform response to the broader Grassland hazard.

- Two sets of separation distances along the Burrumbeet Creek corridor have been applied to Attachment 8. The first was based on the existing vegetation type and extent. Where Grassland currently exists along the creek line, a four-meter buffer either side (eight metres in total) was applied, which was the assumed width (for lack of any other distance) in which the grass would remain unmanaged. The second separation distance was based on the potential for the corridor to be revegetated with trees, shrubs and grasses, and thus be classified as Forest at maturity, which corresponds to a 48-metre separation distance from the outer edge of the revegetated corridor. The width of the revegetated corridor was assumed to be 30 metres for the purposes of this assessment but may be a different uniform width or varied widths along its corridor during the PSP design stage, if revegetation is considered.
- Classified vegetation within the study area not discussed in the above three points was assumed to be removed as part of the PSP development, or classified as 'Low Threat' due to factors such as flammability, moisture content or fuel load (Section 2.2.3.2 in AS 3959:2018 [Standards Australia 2018]). This includes, among others, maintained public reserves and parklands, sporting fields, nature strips and windbreaks (i.e., a single row of trees used as a screen or to reduce the effect of wind on the leeward side of the trees). The relevant separation distance for 'Low Threat' vegetation is detailed in Section 4.2.1.
- The creek line along the northern boundary of the Ballarat Town Common travels through a large basin/wetland area containing water loving plants such as rushes *Juncus* spp., which is shown as a permanent waterbody on Attachments 8c and 8e. The Grassland separation distance (i.e. 19 metres) has been applied to the northern boundary of this waterbody area, as it's assumed that this will not be developed.
- The Ballarat North Water Reclamation Plant contains a mosaic of Grassland and Forest vegetation, with Low Threat and non-vegetated areas also present. A single separation distance of 48 metres was applied from the Plant's property boundary into the study area where Forest and/or Grassland was present along or close to its boundary, as Forest is the higher threat vegetation type and it provided a uniform response.

4 BUSHFIRE MITIGATION MEASURES

Bushfire mitigation measures have been provided based on the field assessment and data analysis undertaken in Section 3 and illustrated on Attachments 3 to 7. The mitigation measures cover separation distances, vegetation management, emergency access and emergency water supply.

Based on the low landscape bushfire risk (up to moderate risk adjoining the Ballarat North Water Reclamation Plant) and ability to easily comply with the following bushfire mitigation measures, all parcels within the core and expanded areas are considered appropriate for development.

4.1 Separation Distances from Classified Vegetation

A separation distance is the distance between the edge of classified vegetation and the wall/face of a habitable building. The separation distance must only contain managed vegetation (e.g. lawns, ornamental gardens, recreational parkland-settings) and/or is non-vegetated (e.g. roads, footpaths, paved areas, pools). Separation distances have been determined from areas of classified vegetation within and adjoining the study area and range from 19 metres to 48 metres (Table 1; Attachment 8).

One of the main bushfire controls will involve applying the separation distances from classified vegetation to be retained within and adjoining the study area to attain a BAL-12.5 construction standard for habitable buildings. Bushfire policies have been prioritised to protect human life, which include ensuring all habitable buildings are set back the appropriate separation distance from classified vegetation to achieve a BAL-12.5 construction standard.

Appropriate bushfire controls relating to the separation distances for the following landscape features are discussed specifically:

- The Burrumbeet Creek corridor: Two sets of separation distances have been applied to the corridor (Attachment 8), with one being based on the existing vegetation status along the length of the corridor (Table 1). A second distance based on a classification of Forest has also been applied to account for potential future potential rehabilitation and revegetation works along the corridor at a width of 30 metres. Some creek line revegetation has already occurred along the study area's western boundary adjoining the recently constructed residential subdivision area, with the nominated 30 metre width being based on this area, although the width would be determined by the authorities and may vary along the corridor's length. Further discussion about vegetation management within and adjoining the corridor is provided in Section 4.2.1.
- The Equine Precinct and farming to the north: This area contains a mixture of managed and unmanaged grass. As a conservative measure, a separation distance of 19 metres has been applied along the length of the southern property boundaries of these parcels that face the study area in response to Grassland (even though some areas are managed lawns and ornamental gardens) and an effective slope classification of Upslope/Flat land.
- Ballarat Town Common: This area contains Grassland, Shrubland, Woodland and Forest, with Grassland being the vegetation type along this parcel's northern boundary (i.e. closest to the

developable area), and thus the most relevant when applying the separation distance. Applying a separation distance assumes the Ballarat Town Common will not be managed in a Low Threat state (i.e. grass will not be maintained to a maximum height if 100 millimetres) during the Fire Danger Period. Even if the relevant authority committed to managing (i.e. slashing) this parcel on a regular basis to meet the Low Threat requirement, it is still recommended that the 19-metre separation distance still apply in case the grass is not managed for any reason.

- The Ballarat North Water Reclamation Plant: A 48-metre separation distance has been applied from its property boundary into the study area where Forest or Grassland was present to provide a uniform separation distance based on the highest threat vegetation type of Forest. By applying the Forest separation distance from the property boundary, it accounts for any further tree plantings up to the Plant's property boundary.
- Mt Rowan: The slopes rise at a gradient of approximately 10 degrees on its eastern, southern and western aspects. Two sets of separation distances have been applied, with one being from the study area's boundary in response to the Downslope >5 to 10 degrees north of the study area (on Mount Rowan's eastern and western aspects), with an Upslope/Flat land slope category being applied to the 470-metre contour line within the study area on Mount Rowan's generally southern aspect.

4.2 Vegetation Management

Vegetation is expected to be managed across the developed areas of the study area as would be typical of any urban setting. The below sections provide specific vegetation management recommendations within the separation distance, within public open spaces and along the Burrumbeet Creek corridor.

4.2.1 Separation Distance

Vegetation within the separation distance illustrated on Attachment 8 (or a different separation distance location depending on the VPAs/Council's chosen boundary of unmanaged vegetation) is recommended to be managed in a Low Threat state. The BMO specifies vegetation management requirements for Low Threat vegetation within the defendable space in Table 6 to Clause 53.02-5 (i.e. analogous to the separation distance under the BPA), which are:

- Grass must be short cropped (i.e. height no greater than 100 millimetres) and maintained during the declared Fire Danger Period;
- All leaves and vegetation debris must be removed at regular intervals during the declared fire danger period;
- Within 10 metres of a building, flammable objects must not be located close to the vulnerable parts of the building;
- Plants greater than 10 centimetres in height must not be placed within 3 metres of a window or glass feature of the building;
- Shrubs must not be located under the canopy of trees;
- Individual and clumps of shrubs must not exceed 5 square metres in area and must be separated by at least 5 metres;

- Trees must not overhang or touch any elements of the building;
- The canopy of trees must be separated by at least 5 metres; and,
- There must be a clearance of at least 2 metres between the lowest tree branches and ground level of mature trees.

While the study area is not in an area of extreme fire risk (which is why the BMO has not been placed over a large majority of it, with the BMO only overlapping the study area from the Ballarat North Water Reclamation Plant), these vegetation management prescriptions are still relevant and should be applied to the separation distance as a best practice measure.

4.2.2 Public Open Spaces, Community and Education Facilities and Residential Areas

Vegetation in public open spaces (i.e. parklands, shared paths/linear walks, sports reserves), community/commercial precincts, education facilities and residential areas are generally associated with managed lawns, trees (either scattered, in groups or as avenues), shrubs and garden beds. Vegetation maintained in this state is a very low bushfire risk due to the absence of large amounts of fuel (particularly dead fuel such as cured grass and ground debris) that can generate bushfires. This vegetation is generally also set amongst highly developed areas, with roads, buildings and other structures present, which further reduces any chance of a bushfire occurring.

As part of the Low Threat vegetation management prescriptions defined in Section 4.2.1, the canopies of trees should be separated by at least five metres. As per any normal urban setting, the canopy of trees within public and residential areas will be closer than five metres, such as treed avenues along streets and in parks. Furthermore, The Ballarat Strategy 2040 (City of Ballarat 2015) outlines the City's vision and long-term plan to manage change in Ballart to 2040, with one of the targets being to increase the average canopy coverage across the municipality from 17% (as of 2014, City of Ballarat 2019) to 40% by 2040. This increased tree canopy coverage would lead to denser tree planting and therefore result in areas were tree canopies are in close contact. However, the bushfire risk is considered negligible in highly urban areas and it is therefore recommended that no vegetation management requirements be applied to these areas.

The only exception to this is where the urban area falls within the separation distance from classified vegetation (Attachment 8). In these cases, it is recommended that vegetation be managed in a Low Threat state as per Section 4.2.1.

4.2.3 Burrumbeet Creek Corridor

Vegetation along the Burrumbeet Creek Corridor is highly variable, which includes areas of Grassland, Scrub, Woodland and Forest (Attachment 7). While vegetation along the corridor could remain in its current state with the applicable separation distances shown in Table 1 and Attachment 8, rehabilitating the creek line and planting indigenous trees, shrubs and groundcover species would not only return local flora species to the area, but provide major benefits for native terrestrial and aquatic fauna species as opportunities for shelter, roosting and food resources. This rehabilitation has occurred along a section of Burrumbeet Creek along the study area's western boundary, which also provides a series of ponds adjoining the creek (south and west of Parcel 41 on Attachment 7c). A nominal width of 30 metres has been assumed along the creek (i.e. 15 metres either side) to facilitate potential rehabilitation and revegetation works, which is assumed to become a Forest

vegetation type. The separation distance would therefore be 48 metres off the Forest along the corridor. The revegetation works along the Burrumbeet Creek corridor to the west of the study area (i.e. west of Parcels 41 and 44) provides a good example of how the separation distance can be utilised, as it contains mown grass for recreational purposes, walking tracks and a playground.

From a bushfire risk perspective, using indigenous plants along the creek corridor is considered acceptable based on bushfire behaviour and the data inputs used to calculate separation distances. From a bushfire behaviour perspective, it is extremely unlikely that a bushfire would establish and run along these corridors to become a large threat, as the ignition point, wind direction and speed, fuel moisture content, and vegetation composition/structure would have to align to enable this. Furthermore, the creek corridors will be surrounded by urban development and emergency services would be able to attend to a fire in a short amount of time. From a separation distance perspective, AS 3959:2018 (Standards Australia 2018) uses several data inputs to calculate the separation distance. For Forest, the data inputs basically align with an extensive treed area with a dense understorey in which a fire has reached a quasi-steady state rate of spread (i.e. has had time to build up to full speed) and a fire front width of 100 metres. The creek corridor configuration does not allow for these assumptions and thus a separation distances of 48 metres accounts for a greater bushfire threat then what can be achieved within the creek corridor.

As an alternative, the desired revegetation works maybe more analogous to Woodland (i.e. sparser arrangement/density of plants compared to a Forest classification) and thus the required separation distance would be 33 metres.

4.3 Emergency Access and Road Network Specifications

Emergency access is required throughout the PSP to ensure emergency vehicles can access bushfires and structural fires in a timely manner and be positioned to respond to a fire in the safest and most effective way. The following sections discuss recommended road and path designs to provide the most effective emergency access and response outcomes.

4.3.1 Road Network Widths

Clause 56.06 provides widths for different road categories. However, these road widths have proven to be very restrictive for emergency service vehicles when trying to attend to a fire quickly and in a safe manner. For example, providing a road width of seven metres with parking on both sides, which is the minimum width allowed for an Access Street – Level 2 under Clause 56.06, results in a narrow width in which a fire truck has to navigate through when cars are parked on both sides. Plate 8 provides an example of a 7-metre-wide kerb to kerb street in Armstrong Creek (near Geelong), which demonstrates that if any of the cars were parked further away from the kerb, or large utes were parked (such as a Ram), there is a chance fire truck could not drive down the street. Furthermore, if an emergency requires a ladder platform fire truck with outriggers, the situation shown in Plate 8 would not allow it to be used.

Emergency vehicle access guidelines published by the fire authorities (CFA 2022; Metropolitan Fire Brigade [MFB] 2014) provide recommended widths that have been specifically designed to accommodate fire trucks in urban road networks. These widths have been provided in this report as the recommended minimum widths for the road network.

In areas where residential development is up to two storeys, the recommended minimum trafficable widths (kerb to kerb) for fire truck access to a hard stand area are:

- 3.5 metres with no parking on either side (with appropriate signage restricting parking on both sides);
- 5.5 metres with parking on one side (with appropriate signage restricting parking on one side); and
- 7.3 metres with parking on both sides.

For higher density development where buildings of three or more storeys are planned (such as along major shopping strips or in areas with multi-level apartment-style living), the recommended minimum trafficable widths (kerb to kerb) for fire truck access to a hard stand area are:

- 3.5 metres with no parking on either side (with appropriate signage restricting parking on both sides);
- 5.8 metres with parking on one side (with appropriate signage restricting parking on one side). This includes a 2.3 metre parking lane and 3.5 metre carriageway; and
- 8.1 metres with parking on both sides. This includes two 2.3 metre parking lanes and a 3.5 metre carriageway.

Other road design features that provide safe passage for emergency vehicles, particularly fire trucks, are provided below (CFA 2022):

- All-weather construction;
- A load limit of at least 15 tonnes;
- Provide a minimum trafficable width of 3.5 metres;
- Be clear of encroachments for at least 0.5 metres on each side and at least 4 metres vertically;
- Curves must have a minimum inner radius of 10 metres;
- The average grade mush be no more than 1 in 7 (14.4%) (8.1°) with a maximum grade of no more than 1 in 5 (20%) (11.3°) for no more than 50 metres; and
- Dips must have no more than a 1 in 8 (12.5%) (7.1°) entry and exit angle.

Parking and traffic congestion are related matters that can hinder an emergency vehicle's ability to attend to a fire. With more and more young adults remaining at home for longer, the number of cars per household grows. Facilitating off-street parking and/or wider roads to accommodate parking on both sides is a serious consideration at the PSP development stage.

4.3.2 PSP Perimeter Road

Perimeter roads are strongly recommended along interface areas between urban development and areas of unmanaged vegetation, particularly higher threat vegetation such as Woodland and Forest, as they provide a firebreak and assist emergency vehicles with access/egress and firefighting activities. In this case perimeter roads already exist along most of the study area's northern and eastern boundaries (Attachment 8). The most critical location for a perimeter road based on the extent of existing vegetation is along the northern boundary of the Ballarat North Water Reclamation Plant, as this contains Forest vegetation.

While the state of the vegetation along Burrumbeet Creek is variable and there is currently little Forest vegetation, converting the riparian zone to Forest (and/or Woodland) would heighten the need for an interfacing perimeter road. This scenario has already been undertaken on the western side of Burrumbeet Creek, west of Parcels 41 and 44, where there are the dwellings, a perimeter road, managed parklands/ponds and then the Forest vegetation along the creek line (Attachment 8c). The distance between the dwellings and Forest creek line vegetation in this case is approximately 120 metres, which is more than double the minimum separation distance of 48 metres.

4.4 Emergency Water Supply

Clause 56.09-3 of the VPP specifies the fire hydrant objective for subdivisions, which is to '*Provide fire hydrants and fire plugs in positions that enable fire fighters to access water safely, effectively and efficiently*' (p1). This is achieved under standard C29, whereby:

> *Fire hydrants should be provided:*
>
> - *A maximum distance of 120 metres from the rear of each lot*.
> - *No more than 200 metres apart*.
>
> *Hydrants and fire plugs must be compatible with the relevant fire service equipment. Where the provision of fire hydrants and fire plugs does not comply with the requirements of standard C29, fire hydrants must be provided to the satisfaction of the relevant authority.*

There is no reason to believe that this PSP cannot comply with these requirements given it is on the fringe of existing urban areas and the ability to expand the mains water network throughout the PSP is easily achievable, if it isn't available already.

Static water supplies (i.e. water tanks) for emergency use are required for properties in the BMO under Clause 53.02-4.3. Static water supplies will therefore be required for properties within the BMO adjoining the Ballarat North Water Reclamation Plant when they apply for a subdivision or single building (i.e. non-subdivision) planning application.

5 RESPONDING TO BUSHFIRE LEGISLATION, POLICY AND OTHER DOCUMENTS

5.1 Clause 13.02-1S Bushfire

Clause 13.02-1S places a large emphasis on strategic bushfire planning, with its objective being to '*strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life*' (p1). This clause applies to land in the BPA, BMO or proposed to be used or developed in a way that may create a bushfire hazard.

Clause 13.02-1S contains five key strategies to meet this objective, being the:

- Protection of human life;
- Bushfire hazard identification and assessment;
- Settlement planning;
- Areas of biodiversity conservation value; and
- Use and development control in a BPA.

Table 2 provides the full list of strategies under Clause 13.02-1S and how they are addressed in this report. All land in the study area meets the requirements of Clause 13.02-1S and all proposed mitigation measures in Section 4 can be implemented at no extra cost than what would typically be required as part of a PSPs development.

Table 2. Clause 13.02-1S Strategies and the bushfire measures incorporated in this report to address them.

Clause 13.02-1S Strategy	Response
Protection of Human Life Strategy	
Prioritising the protection of human life over all other policy considerations.	Bushfire policies have been prioritised to protect human life, which include ensuring all habitable buildings are set back the appropriate separation distance from classified vegetation to achieve a BAL-12.5 construction standard.

Clause 13.02-1S Strategy	Response
Directing population growth and development to low risk locations and ensuring the availability of, and safe access to, areas where human life can be better protected from the effects of bushfire.	The risk of a severe bushfire impacting the study area is inherently low given it is in an agricultural setting with urban/residential land to the south and west. There are discrete patches of existing Forest and Forest that is assumed to be created along the creek corridors that could pose a low to moderate bushfire risk; however, these patches and corridors are/will be bound by Grassland and/or urban land that significantly reduce the potential for a severe bushfire to establish due to their relatively small size. As the study area is developed, the urbanisation of the land will itself create a low bushfire risk environment. Residents and other occupants will not need to travel far to access low risk locations, which will involve moving (either by foot or vehicle) further into the developed/urban areas of the study area (or part thereof during the construction stage) to be better protected from the effects of bushfire.
Reducing the vulnerability of communities to bushfire through the consideration of bushfire risk in decision making at all stages of the planning process.	This report considers the vulnerability of communities to bushfire, which has been undertaken as part of the PSPs planning process. This is an early stage in the planning process, which will enable bushfire mitigation measures to be incorporated into the PSP and thus all future planning stages will already have these measures incorporated when assessing, for example, planning permit applications for residential subdivisions.
Bushfire Hazard and Identification Assessment Strategies	
Applying the best available science to identify vegetation, topography and climatic conditions that create a bushfire hazard.	This report identifies the bushfire hazard and applies the standard site assessment methodology used in AS 3959:2018 (Standards Australia 2018), which is applied to developments in the BPA and BMO and is based on the best available science. The bushfire modelling inputs that form the basis for this methodology factor in vegetation type (e.g. Grassland, Woodland), potential fuel-loads in a long-unburnt vegetation community, weather conditions on higher bushfire risk days (e.g. wind speed, fuel moisture content, days since last rainfall) and the effect of slope gradient on the way fire travels through unmanaged vegetation. The desktop assessment using GIS software and site assessment process have determined the most appropriate vegetation type and corresponding slope category (Table 1; Attachment 6), which has produced the commensurate separation distances for BAL-12.5 construction within the study area as per Table 2.4 in AS 3959:2018 (Standards Australia 2018) (Table 1; Attachment 7).
Considering the best available information about bushfire hazard including the map of designated BPAs prepared under the Building Act 1993 or regulations made under the Act.	The BPA applies to the entire study area and surrounding properties due to the prevalence of agricultural pasture and crops across the landscape and the Ballarat Town Common (i.e. all Grassland).
Applying the Bushfire Management Overlay to areas where the extent of vegetation can create an extreme bushfire hazard.	The BMO has been applied to Forest within the Ballarat North Water Reclamation Plant and for an additional 150 metres around it (Attachment 7).
Considering and assessing the bushfire hazard on the basis of landscape, local, neighbourhood and site conditions.	The bushfire hazard has been considered at these scales in Section 3.

Clause 13.02-1S Strategy	Response
Consulting with emergency management agencies and the relevant fire authority early in the process to receive recommendations and implement appropriate bushfire protection measures.	The CFA has been consulted as part of the preparation of this report and reviewed the report before it was finalised.
Ensuring that strategic planning documents, planning scheme amendments, planning permit applications and development plan approvals properly assess the bushfire risk and include appropriate bushfire protection measures.	This report has been prepared to inform the PSP strategic planning documents, which specifically assesses the bushfire risk and recommends appropriate bushfire protection measures.
Not approving development where a landowner or proponent has not satisfactorily demonstrated that the relevant policies have been addressed, performance measures satisfied or bushfire protection measures can be adequately implemented.	Clause 13.02-1S, the Precinct Structure Planning Guidelines: New Communities in Victoria (VPA 2021) and AS 3959:2018 (Standards Australia 2018) are the main documents in which their requirements must be met in order to provide appropriate bushfire mitigation strategies. This report satisfies the performance measures in these documents, which can be adequately implemented in the PSP. Other policies reviewed as part of this report did contribute to determining the appropriate bushfire mitigation strategies.
Settlement Planning Strategies	
Directing population growth and development to low risk locations, being those locations assessed as having a radiant heat flux of less than 12.5 kilowatts/square metre under AS 3959:2018 (Standards Australia 2018).	The study area's location is low risk due to it being in an agricultural setting bordered by a highly urban area to the south and residential development to the west. Forested areas within and adjoining the study area pose a low to moderate risk, however these patches are relatively small. All habitable buildings directly facing classified vegetation within and adjoining the study area will be setback an appropriate distance to achieve a BAL-12.5 construction standard (i.e. a maximum radiant heat flux of 12.5 kilowatts/square metre on a building's wall), with the amount of radiant heat potentially impacting those buildings further away from the classified vegetation rapidly diminishing.
Ensuring the availability, and safe access to, areas assessed as a BAL-LOW rating under AS 3959:2018 (Standards Australia 2018) where human life can be better protected from the effects of bushfire.	Areas/buildings assessed as a BAL-LOW rating are positioned more than 50 metres from vegetation classified as Grassland and more than 100 metres from any other vegetation classification. The land within this 50/100-metre distance must contain non-vegetated areas and/or Low Threat vegetation. Non-vegetated areas such as buildings, roads, carparks and footpaths, and Low Threat vegetation such as managed grass and ornamental gardens are considered part of a landscape that would meet the BAL-LOW criteria (Standards Australia 2018). Once the study area is developed, a large majority of it will be classified as BAL-LOW, with the occupants of properties that interface existing/future classified vegetation needing to only move more than 50/100 metres from these boundaries to be in a location that is assessed as BAL-LOW.

Clause 13.02-1S Strategy	Response
Ensuring the bushfire risk to existing and future residents, property and community infrastructure will not increase as a result of future land use and development.	The development will not increase bushfire risk to existing and future residents, property or community infrastructure due to the bushfire mitigation measures put in place, including the BAL-12.5 construction standard and commensurate separation distance from the classified vegetation. The study area will contain largely Low Threat vegetation (i.e. managed lawns, parks and ornamental gardens) and non-vegetated areas (i.e. buildings, roads, carparks, footpaths). These measures will reduce the fire risk within the study area and therefore provide fire behaviour and management benefits for the surrounding community.
Achieving no net increase in risk to existing and future residents, property and community infrastructure, through the implementation of bushfire protection measures and where possible reducing bushfire risk overall.	The study area's development will result in a reduction of the overall fuel available in the landscape due to the replacement of classified vegetation with buildings, roads, managed parks and other non-vegetated areas and Low Threat vegetation. The bushfire protection measures discussed in Section 4 will not result in a net increase in bushfire risk.
Assessing and addressing the bushfire hazard posed to the settlement and the likely bushfire behaviour it will produce at a landscape, settlement, local, neighbourhood and site scale, including the potential for neighbourhood-scale destruction.	This report addresses the bushfire hazard posed to the study area at a range of scales in Section 3. There is potential for a large-scale fire to travel across the landscape through the agricultural properties in the wider area, however grazing and cropping in these pastures and presence of roads across the landscape would reduce a fire's severity. The presence of urban areas to the south and west of the study area, and managed gardens and lawns on rural residential properties to the north would greatly reduce a fire's severity (if not stop a fire) in the lead up to the study area. The potential for neighbourhood-scale destruction is therefore considered to be extremely unlikely given the adjoining land uses. Furthermore, all habitable buildings will be set back an appropriate distance from areas of classified vegetation to facilitate BAL-12.5 construction and a perimeter road is proposed towards the study area's northern, southern and western boundaries where it adjoins Grassland and Forest that is to remain within and adjoining the study area.
Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.	The Ballarat Long-term Growth Options Investigation paper (City of Ballarat 2018) assessed the suitability of four growth areas in the municipality. This study area was found to be the most suitable for development based on a multi-criteria assessment. This study area is within a low risk location due to the wider area containing agricultural crops and pastures, rural residential properties and urban areas. The land adjoining the Ballarat North Water Reclamation Plant could be considered a low to moderate bushfire risk, however the Forest in this plant is in discrete patches and not part of a large contiguous forest.

Clause 13.02-1S Strategy	Response
Not approving any strategic planning document, local planning policy, or planning scheme amendment that will result in the introduction or intensification of development in an area that has, or will on completion have, more than a BAL-12.5 rating under AS 3959:2018 (Standards Australia 2018).	All habitable buildings can achieve a BAL-12.5 construction standard.
Areas of Biodiversity Conservation Value Strategy	
Ensure settlement growth and development approvals can implement bushfire protection measures without unacceptable biodiversity impacts by discouraging settlement growth and development in bushfire affected areas that are of high biodiversity conservation value.	Determining areas that are of high conservation value are outside the scope of this report.
Use and Development Control in a Bushfire Prone Area Strategy	
In a BPA designated in accordance with regulations made under the *Building Act 1993*, bushfire risk should be considered when assessing planning applications for several land uses and development types.	The entire study area is covered by the BPA. The bushfire risk has been considered and addressed through several mitigation measures in Section 4.
When assessing a planning permit application for the above uses and development: • Consider the risk of bushfire to people, property and community infrastructure. • Require the implementation of appropriate bushfire protection measures to address the identified bushfire risk. • Ensure new development can implement bushfire protection measures without unacceptable biodiversity impacts.	While this report is not for a planning permit application, it has considered the bushfire risk to people, property and community infrastructure and responded with appropriate bushfire protection measures regarding the BAL construction standard, separation distances, vegetation management and road network design.

5.2 Bushfire Management Overlay

The BMO is applied to areas where there is the potential for extreme bushfire behaviour, including crown fires and extreme ember attack and radiant heat (DELWP 2019). The current extent of the BMO within the Ballarat North Water Reclamation Plant and for approximately 150 metres into the study area (Attachment 7) is appropriate given that the mature Radiata Pine plantations within the Plant have the potential to generate a large amount of heat, embers and flames.

The 150-meter buffer that extends past the pine plantations and into the study area is in line with the mapping methodology used when determining areas subject to the BMO. The BMO Mapping Methodology and Criteria Planning Advisory Note (Department of Environment, Land, Water and Planning [DELWP] 2019) states that the 150-meter buffer accounts for ember attack, as this distance is based on house loss research which indicates that 92% of house loss occurs within 150 metres of the bushfire hazard.

No other areas of vegetation within or adjoining the study area can generate extreme bushfire behaviour given a large majority of it is Grassland, i.e. there are no large areas of Woodland or Forest. While this report discusses the potential to revegetate Burrumbeet Creek with trees and shrubs, this linear corridor of Forest vegetation would not constitute an extreme bushfire hazard and thus it is not considered that the BMO be applied to it.

5.3 Bushfire Prone Area

Land is designated as a BPA under the *Building Act 1993*, with the BPA applying to the entire study area due to the dominance of Grassland in the form of pastures, crops and other grasslands (i.e. the Ballarat Town Common). The only relevant regulation made under the Act at this high-level stage is that the minimum building construction standard permissible in the BPA is BAL-12.5 as per *Building Amendment (Bushfire Construction) Regulations 2011*. This applies even if the site assessor deems the BAL construction standard for a habitable building to be BAL-LOW as per the site assessment methodology in Section 2.2 of AS 3959:2018 (Standards Australia 2018). BAL-LOW applies where the building is at least 50 metres from Grassland and 100 metres from all other vegetation types.

6 SITE PHOTOS

Plate 1. Grassland vegetation within Parcel 26 (Ecology and Heritage Partners Pty Ltd 14/08/2023).

Plate 2. Patches of Shrubland (yellow-flowered bushes in background) within Parcel 45 (Ecology and Heritage Partners Pty Ltd 14/08/2023).

Plate 3. Looking into Parcel 37 with Scrub vegetation (Ecology and Heritage Partners Pty Ltd 15/08/2023).

Plate 4. Woodland within Parcel 51 (Ecology and Heritage Partners Pty Ltd 15/08/2023).

Plate 5. Pine plantation classified as Forest in the Miners Rest Recreational Reserve (Ecology and Heritage Partners Pty Ltd 14/08/2023).

Plate 6. Windrow of eucalypts and cypress along the northern boundary of Parcel 42 (Ecology and Heritage Partners Pty Ltd 14/08/2023).

Plate 7. Generally well-managed condition of the road reserves within the study area (Ecology and Heritage Partners Pty Ltd 15/08/2023).

Plate 8. A fire truck driving along a 7-metre-wide street with parking on both sides in Armstrong Creek, which results in a narrow space in which to navigate (Fire Rescue Victoria).

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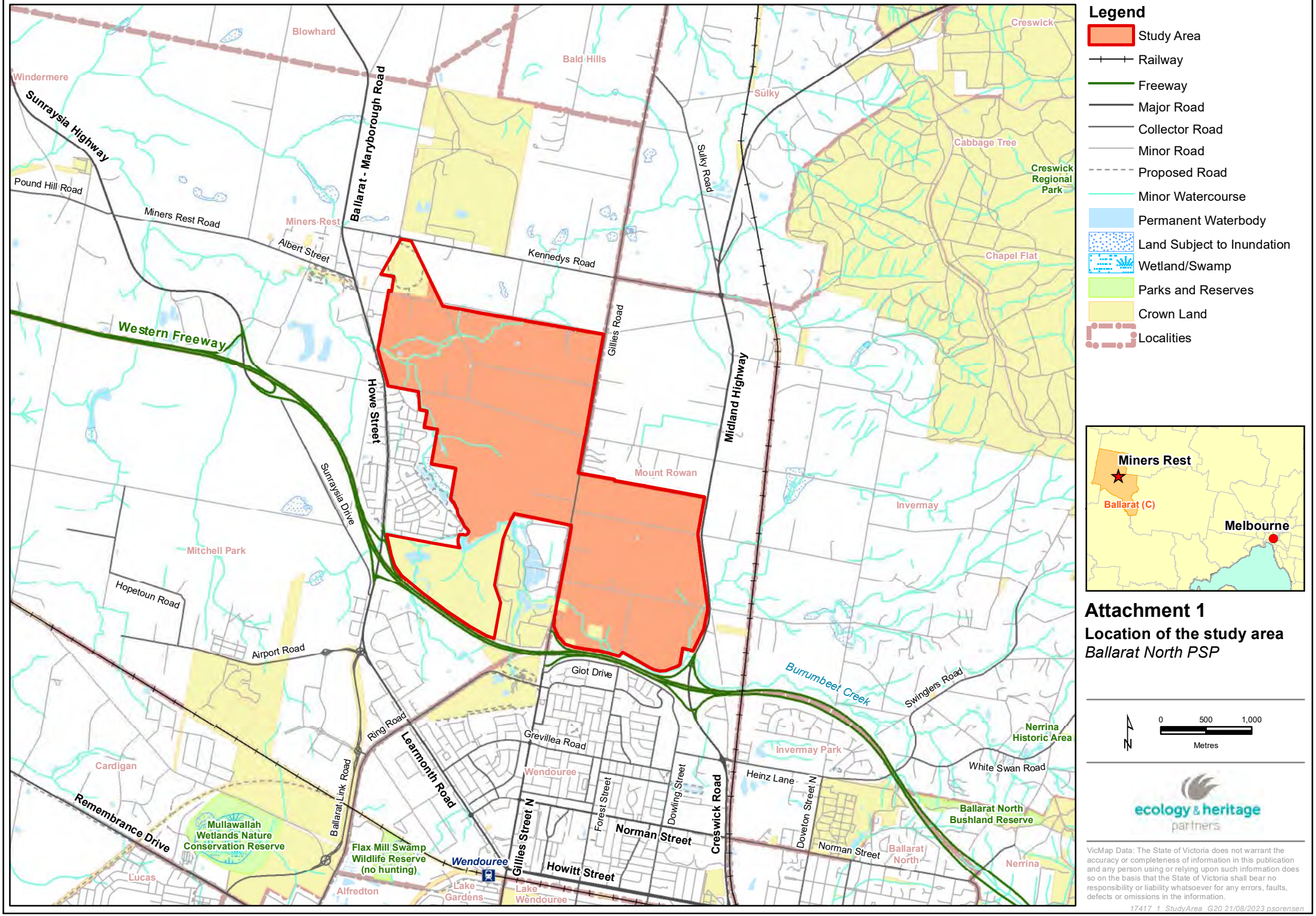
ATTACHMENTS



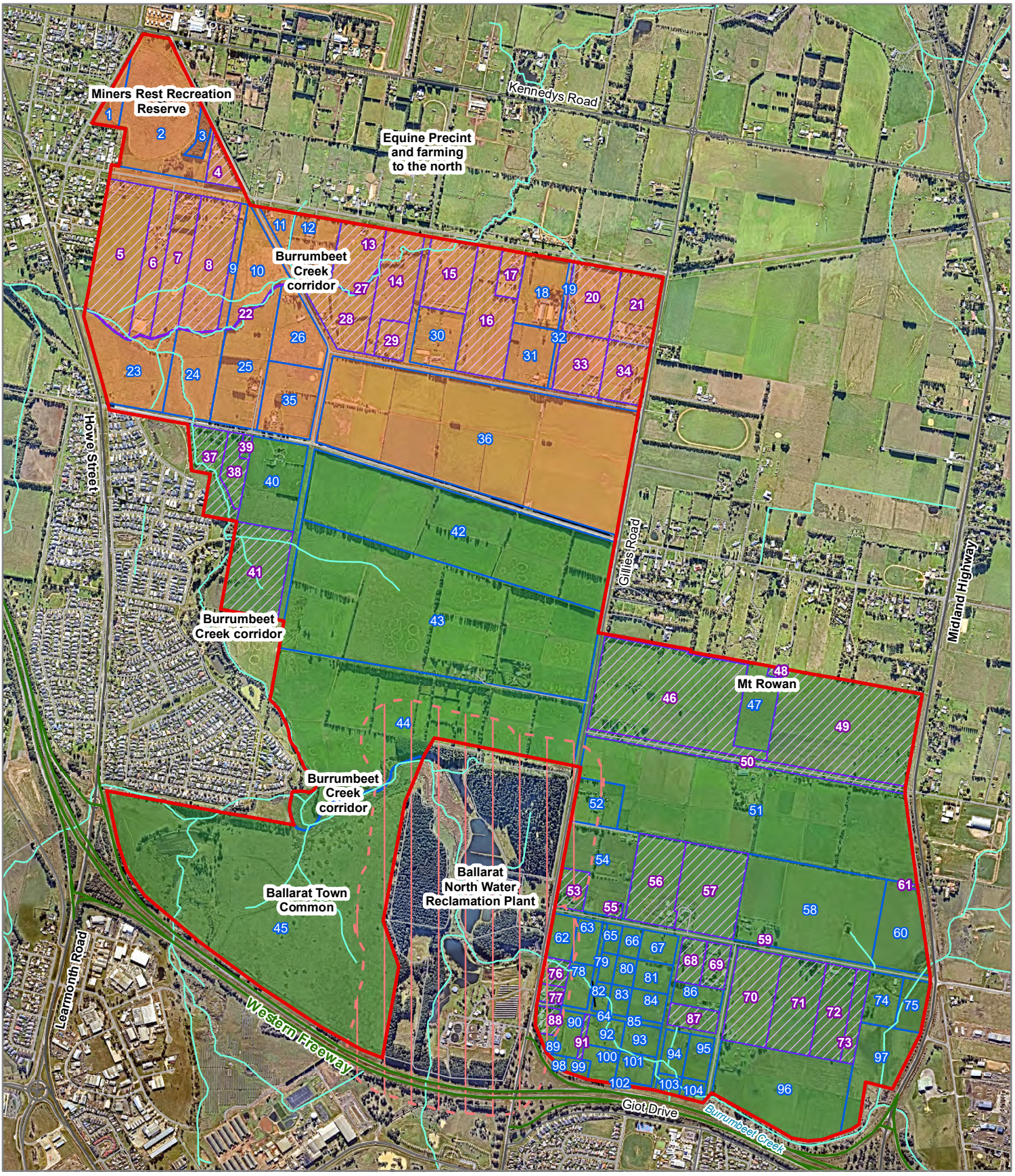
Attachment 1

Location of the study area

Ballarat North PSP

ecology & heritage partners

17417_1_StudyArea_G20 21/08/2023 psorensen



Attachment 2

Study Area overview

Ballarat North PSP

Legend

- Study Area
- Property boundaries
- Core area
- Expanded area (inclusion in final boundary TBC)
- Permission not granted to access this parcel for the site assessment. Permission was granted to access all other parcels for the site assessment.

Other features

- Bushfire Management Overlay. The entire study area is within the Bushfire Prone Area.
- Minor Watercourse
- Freeway
- Major Road
- Collector Road
- Minor Road

N

0 300 600

Metres

17417_2_StudyArea_OV_P_G20 16/07/2024 dvaladares

ecology & heritage partners

Aerial source: Nearmap 2023

Legend

- Study Area
- 20km Landscape Assessment Zone
- Freeway and Major Roads
- Collector Road
- Minor Road
- Major Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Wetland/Swamp
- Parks and Reserves

Attachment 3

Bushfire Hazard Landscape Assessment

Ballarat North PSP

N

0 3,000 6,000

Metres

ecology & heritage partners

17417_3_LS_Assessment_G20 16/07/2024 dvaladares

Legend

- Study Area
- 5km Assessment Zone
- Freeway and Major Roads
- Collector Road
- Minor Road
- Fire tower
- Dam / waterpoint

Fire History

- Bushfires since 2000
- DEECA Planned Burns 2021/22 - 2023/24

Neigbourhood Safer Place

- Neighbourhood Safer Place
- Access to Neighbourhood Safer Place

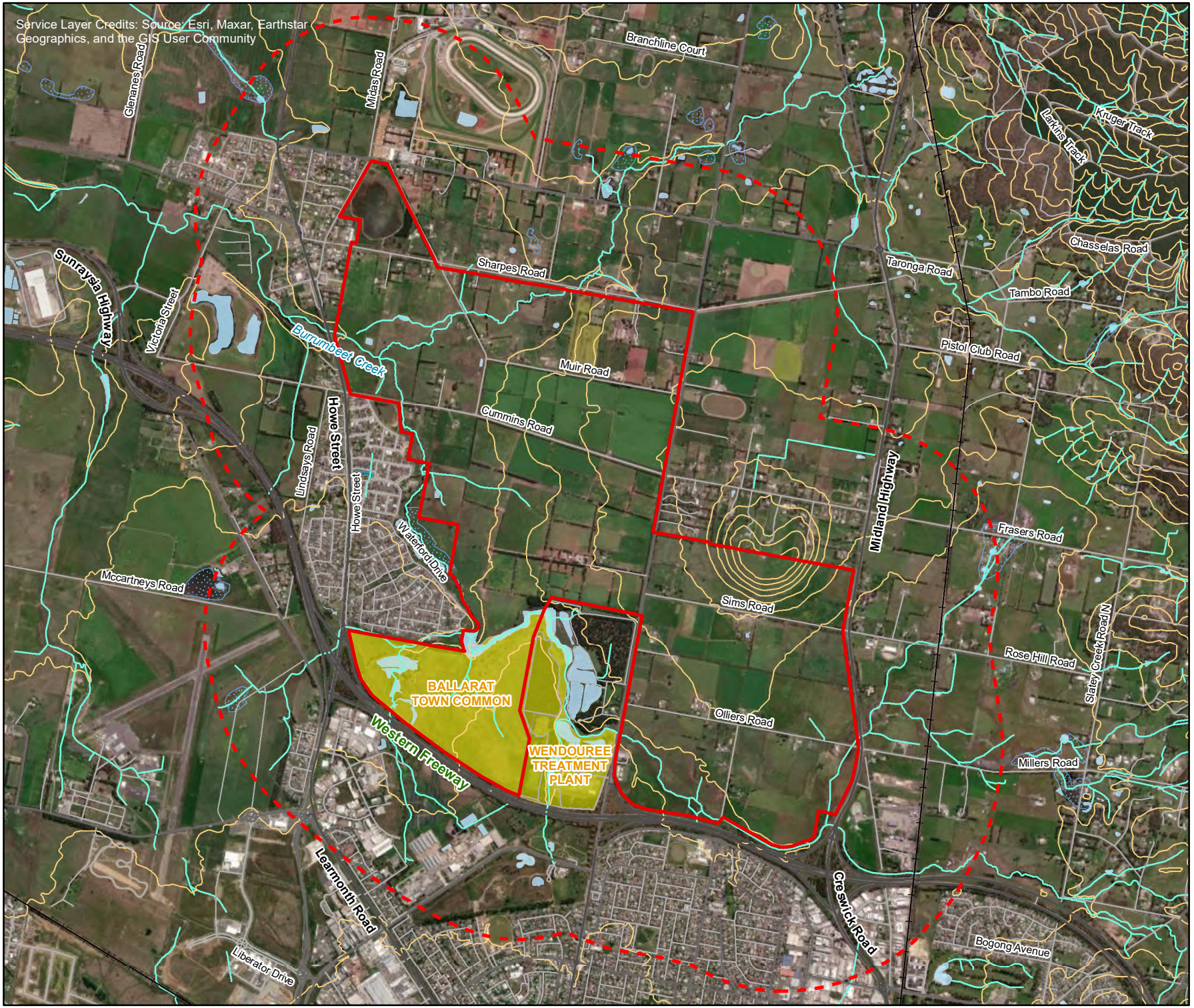
Attachment 4

Fire History and Neighbourhood Safer Place Assessment

Ballarat North PSP

0 1,000 2,000
Metres

ecology & heritage partners



Legend

- Study Area
- 1km Local Assessment Zone
- Freeway and Major Roads
- Collector Road
- Minor Road
- Minor Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Wetland/Swamp
- Contour (10m)

Attachment 5

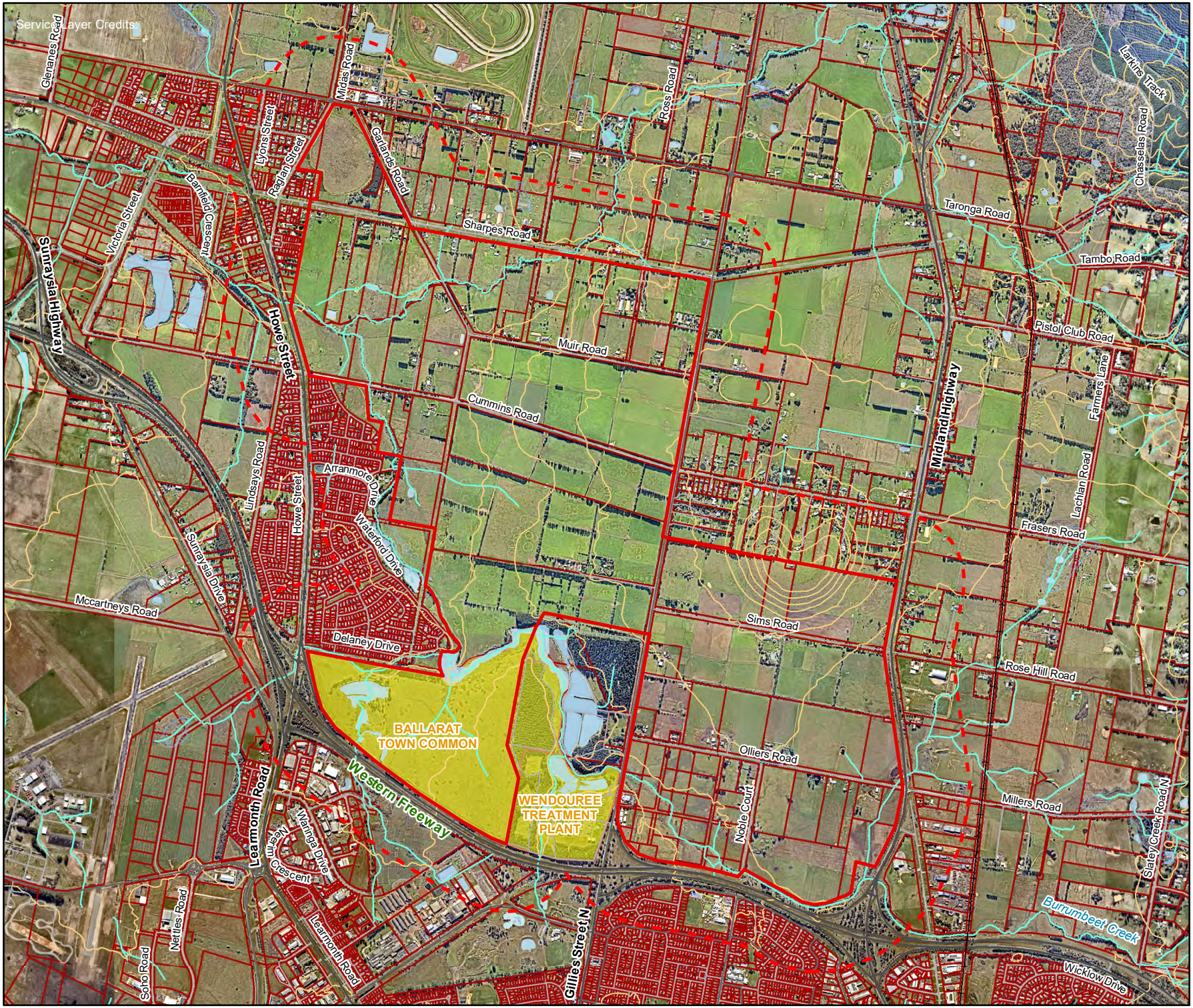
Bushfire Hazard Local Assessment

Ballarat North PSP

0 500 1,000

Metres

ecology & heritage partners



Legend

- Study Area
- 400m Neighbourhood Assessment Zone
- Property Boundaries
- Freeway and Major Roads
- Collector Road
- Minor Road
- Minor Watercourse
- Permanent Waterbody
- Land Subject to Inundation
- Wetland/Swamp
- Contour (10m)

Attachment 6

Bushfire Hazard Neighbourhood Assessment

Ballarat North PSP

N

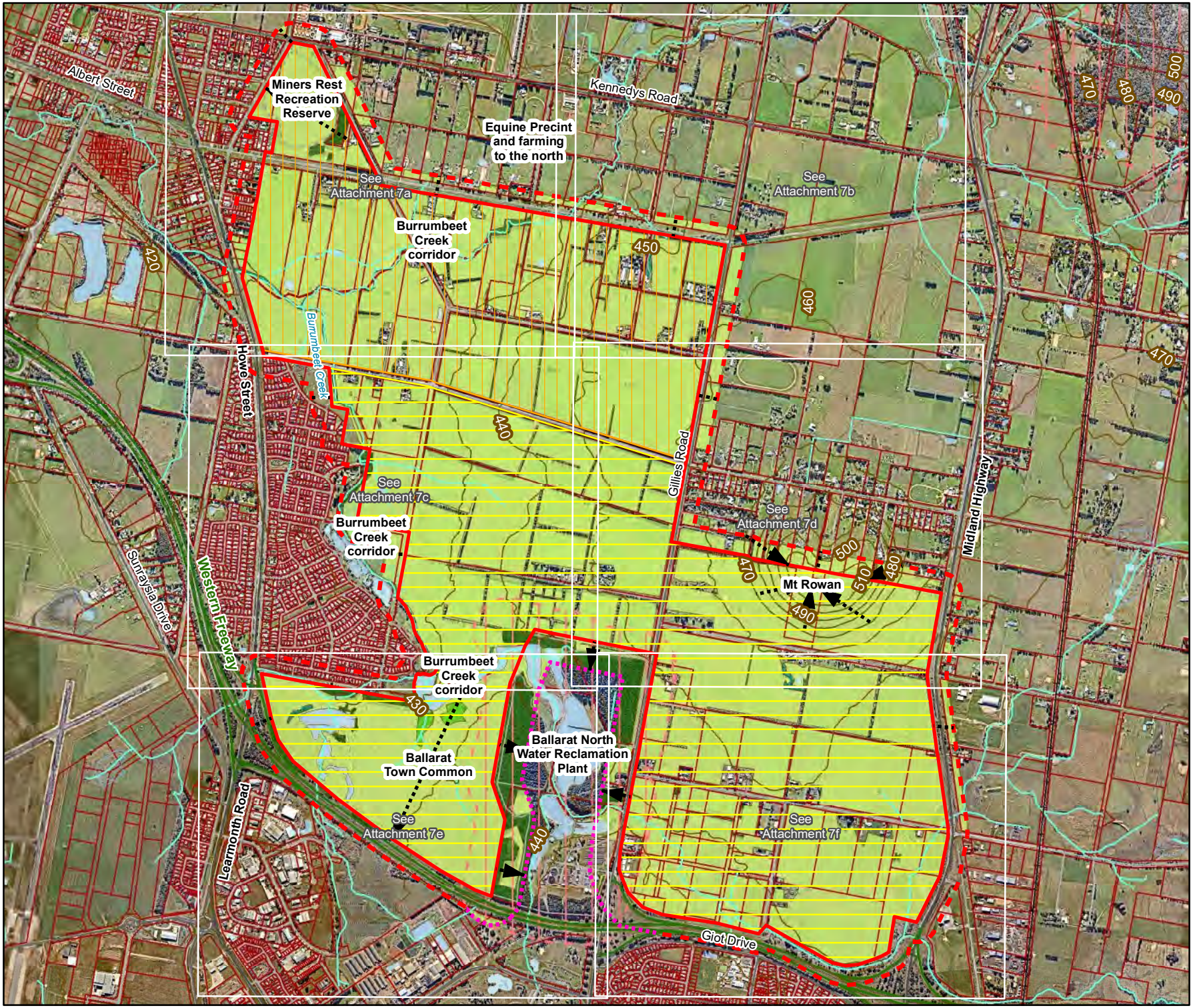
0 400 800

Metres

ecology & heritage partners

17417_6_NH_Assessment_G20 16/07/2024 dvaladares

Aerial source: Nearmap 2023



Legend

- Study Area
- Core area
- Expanded area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Bushfire Management Overlay

Other features

- Property boundaries
- Permanent Waterbody
- Land Subject to Inundation
- Minor Watercourse
- Contour (10m)
- Freeway
- Major Road
- Collector Road
- Minor Road
- Proposed Road

Classified vegetation

- Grassland
- Shrubland
- Scrub
- Woodland
- Forest

Attachment 7 Overview

Bushfire Hazard Site Assessment

Ballarat North PSP

Site Size: 831.8 ha

N

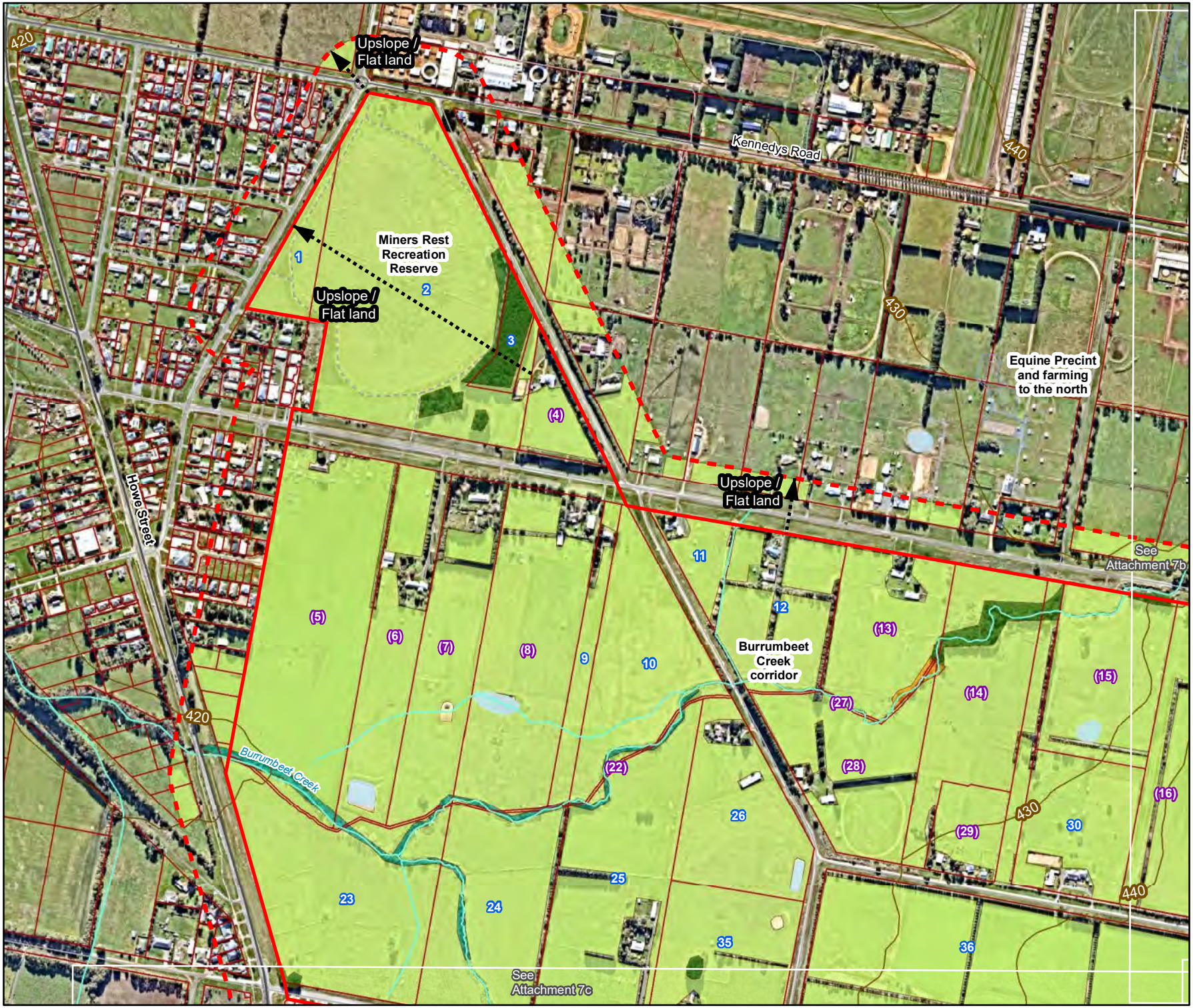
0 300 600

Metres

ecology & heritage partners

17417_7_Site_Assessment_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023



Legend

- Study Area
- 100m Site Assessment Zone

Other features

- Property boundaries
- Permanent Waterbody
- Land Subject to Inundation
- Minor Watercourse
- Contour (10m)
- Major Road
- Collector Road
- Minor Road
- Proposed Road

Classified vegetation

- Grassland
- Scrub
- Woodland
- Forest

Site access permission

- 1 Permission granted to access this parcel for the site assessment
- (4) Permission not granted to access this parcel for the site assessment

Attachment 7a

Bushfire Hazard Site Assessment

Ballarat North PSP

Site Size: 831.8 ha

N

0 100 200

Metres

ecology & heritage partners

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone

Other features

- Property boundaries
- Permanent Waterbody
- Land Subject to Inundation
- Minor Watercourse
- Contour (10m)
- Collector Road
- Minor Road

Classified vegetation

- Grassland
- Woodland
- Forest

Site access permission

- 1 Permission granted to access this parcel for the site assessment
- (4) Permission not granted to access this parcel for the site assessment

Attachment 7b

Bushfire Hazard Site Assessment

Ballarat North PSP

Site Size: 831.8 ha

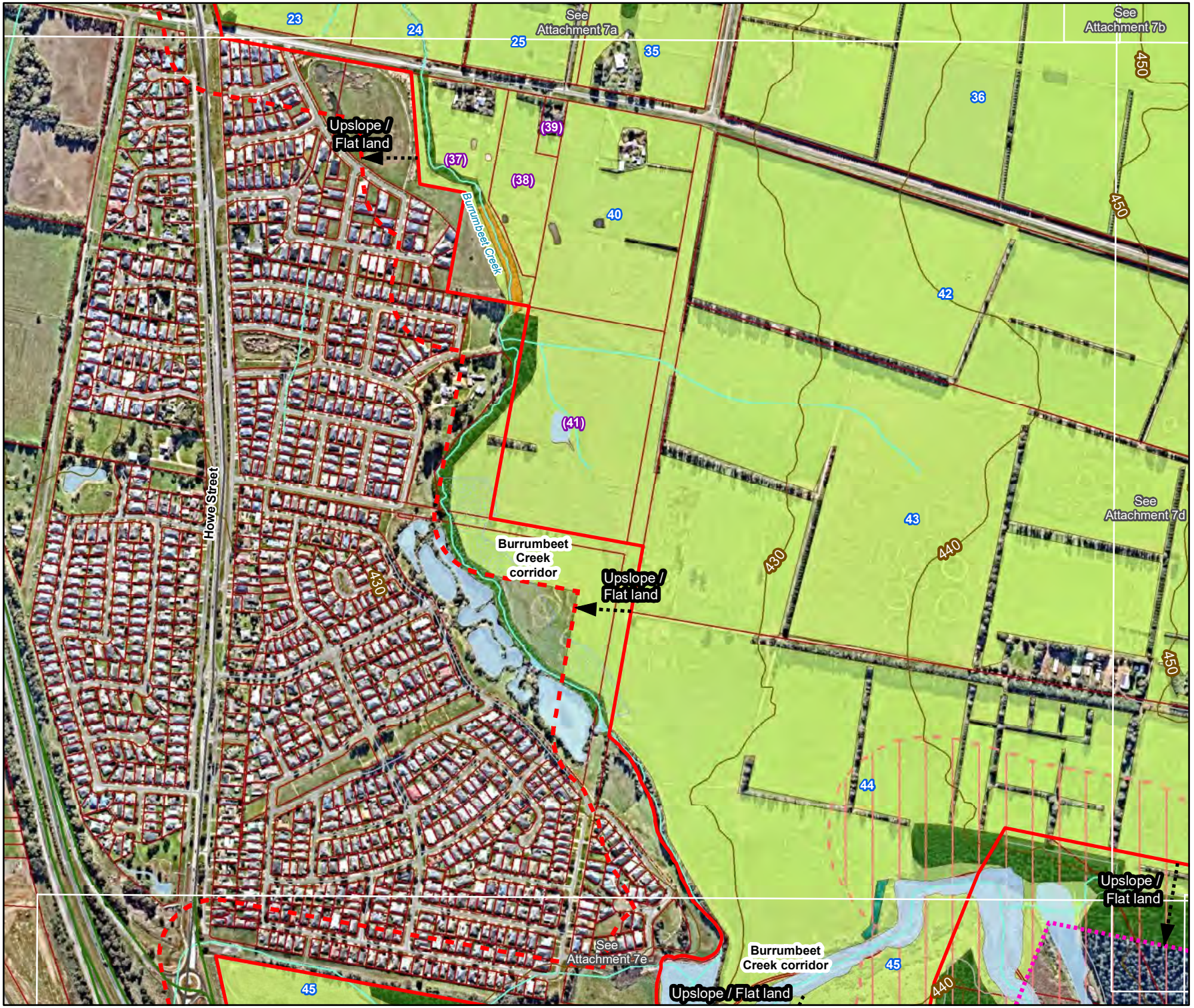
N

0 100 200

Metres

ecology & heritage partners

Aerial source: Nearmap 2023



Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Bushfire Management Overlay

Other features

- Property boundaries
- Permanent Waterbody
- Land Subject to Inundation
- Minor Watercourse
- Contour (10m)
- Freeway
- Major Road
- Collector Road
- Minor Road
- Proposed Road

Classified vegetation

- Grassland
- Scrub
- Woodland
- Forest

Site access permission

- 1 Permission granted to access this parcel for the site assessment
- (4) Permission not granted to access this parcel for the site assessment

Attachment 7c

Bushfire Hazard Site Assessment

Ballarat North PSP

Site Size: 831.8 ha

N

0 100 200

Metres

ecology & heritage partners

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Bushfire Management Overlay

Other features

- Property boundaries
- Permanent Waterbody
- Minor Watercourse
- Contour (10m)
- Major Road
- Collector Road
- Minor Road

Classified vegetation

- Grassland
- Woodland
- Forest

Site access permission

- 1 Permission granted to access this parcel for the site assessment
- (4) Permission not granted to access this parcel for the site assessment

Attachment 7d

Bushfire Hazard Site Assessment

Ballarat North PSP

Site Size: 831.8 ha

N

0 100 200

Metres

ecology & heritage partners

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Bushfire Management Overlay

Other features

- Property boundaries
- Permanent Waterbody
- Minor Watercourse
- Contour (10m)
- Freeway
- Major Road
- Collector Road
- Minor Road
- Proposed Road

Classified vegetation

- Grassland
- Shrubland
- Woodland
- Forest

Site access permission

- 1 Permission granted to access this parcel for the site assessment
- (4) Permission not granted to access this parcel for the site assessment

Attachment 7e

Bushfire Hazard Site Assessment

Ballarat North PSP

Site Size: 831.8 ha

N

0 100 200

Metres

ecology & heritage partners

17417_7_Site_Assessment_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Bushfire Management Overlay

Other features

- Property boundaries
- Permanent Waterbody
- Minor Watercourse
- Contour (10m)
- Freeway
- Major Road
- Collector Road
- Minor Road

Classified vegetation

- Grassland
- Woodland
- Forest

Site access permission

- 1 — Permission granted to access this parcel for the site assessment
- (4) — Permission not granted to access this parcel for the site assessment

Attachment 7f

Bushfire Hazard Site Assessment

Ballarat North PSP

Site Size: 831.8 ha

N

0 100 200

Metres

ecology & heritage partners

17417_7_Site_Assessment_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Property boundaries

Classified vegetation to remain

- Grassland
- Shrubland
- Scrub
- Woodland
- Forest

Separation distances based on remaining classified vegetation

- 19m from Grassland
- 25m from Grassland
- 27m from Scrub
- 33m from Woodland
- 48m from Forest

Proposed Burrumbeet Creek revegetation corridor

- 30m wide revegetation corridor. Assumed to become Forest
- 48m separation distance from the revegetation corridor

Other features

- Permanent Waterbody
- Land Subject to Inundation
- Minor Watercourse
- 270m contour

7 = Parcel number

Attachment 8 Overview

Separation Distances from Classified Vegetation

Ballarat North PSP

N

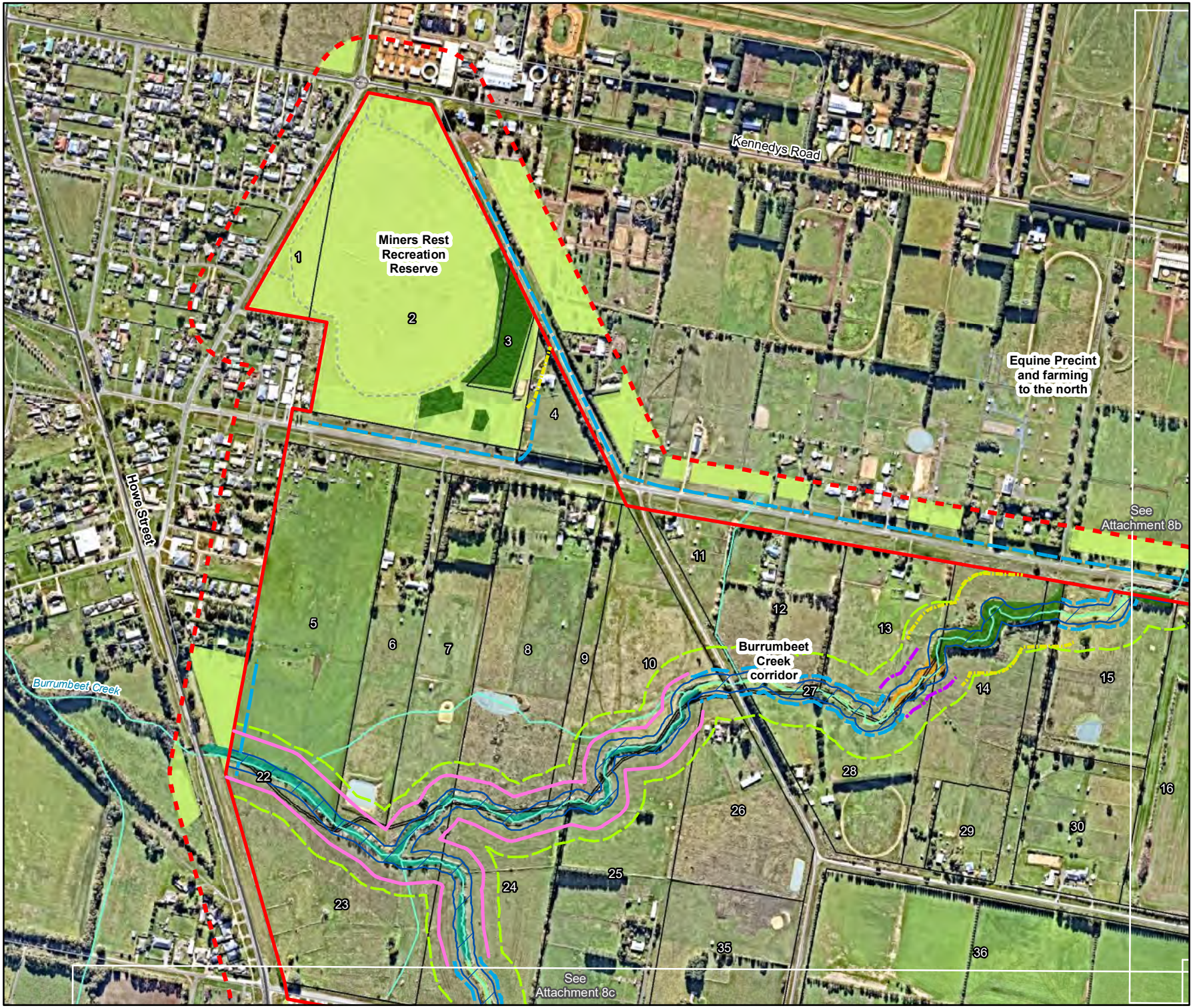
0 300 600

Metres

ecology & heritage partners

17417_8_SepDist_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023



Legend

- Study Area
- 100m Site Assessment Zone
- Property boundaries

Classified vegetation to remain

- Grassland
- Scrub
- Woodland
- Forest

Separation distances based on remaining classified vegetation

- 19m from Grassland
- 27m from Scrub
- 33m from Woodland
- 48m from Forest

Proposed Burrumbeet Creek revegetation corridor

- 30m wide revegetation corridor. Assumed to become Forest
- 48m separation distance from the revegetation corridor

Other features

- Permanent Waterbody
- Land Subject to Inundation
- Minor Watercourse

7 = Parcel number

Attachment 8a

Separation Distances from Classified Vegetation

Ballarat North PSP

N

0 100 200

Metres

ecology & heritage partners

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Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- Property boundaries

Classified vegetation to remain

- Grassland
- Woodland
- Forest

Separation distances based on remaining classified vegetation

- 19m from Grassland

Proposed Burrumbeet Creek revegetation corridor

- 30m wide revegetation corridor. Assumed to become Forest
- 48m separation distance from the revegetation corridor

Other features

- Permanent Waterbody
- Land Subject to Inundation
- Minor Watercourse

7 = Parcel number

Attachment 8b

Separation Distances from Classified Vegetation

Ballarat North PSP

N

0 100 200

Metres

ecology & heritage partners

17417_8_SepDist_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Property boundaries

Classified vegetation to remain

- Grassland
- Scrub
- Woodland
- Forest

Separation distances based on remaining classified vegetation

- 19m from Grassland
- 27m from Scrub
- 33m from Woodland
- 48m from Forest

Proposed Burrumbeet Creek revegetation corridor

- 30m wide revegetation corridor. Assumed to become Forest
- 48m separation distance from the revegetation corridor

Other features

- Permanent Waterbody
- Land Subject to Inundation
- Minor Watercourse

7 = Parcel number

Attachment 8c

Separation Distances from Classified Vegetation

Ballarat North PSP

N

0 100 200

Metres

ecology & heritage partners

17417_8_SepDist_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Property boundaries

Classified vegetation to remain

- Grassland
- Forest

Separation distances based on remaining classified vegetation

- 19m from Grassland
- 25m from Grassland
- 48m from Forest

Other features

- Permanent Waterbody
- Minor Watercourse
- 270m contour

7 = Parcel number

Attachment 8d

Separation Distances from Classified Vegetation

Ballarat North PSP

N

0 100 200

Metres

ecology & heritage partners

17417_8_SepDist_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Property boundaries

Classified vegetation to remain

- Grassland
- Shrubland
- Woodland
- Forest

Separation distances based on remaining classified vegetation

- 19m from Grassland
- 48m from Forest

Proposed Burrumbeet Creek revegetation corridor

- 30m wide revegetation corridor. Assumed to become Forest
- 48m separation distance from the revegetation corridor

Other features

- Permanent Waterbody
- Minor Watercourse

7 = Parcel number

Attachment 8e

Separation Distances from Classified Vegetation

Ballarat North PSP

N

0 100 200

Metres

ecology & heritage partners

17417_8_SepDist_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023

Legend

- Study Area
- 100m Site Assessment Zone
- 150m Site Assessment Zone
- Property boundaries

Classified vegetation to remain

- Grassland
- Forest

Separation distances based on remaining classified vegetation

- 19m from Grassland
- 48m from Forest

Proposed Burrumbeet Creek revegetation corridor

- 30m wide revegetation corridor. Assumed to become Forest
- 48m separation distance from the revegetation corridor

Other features

- Permanent Waterbody
- Minor Watercourse

7 = Parcel number

Attachment 8f

Separation Distances from Classified Vegetation

Ballarat North PSP

0 100 200

Metres

ecology & heritage partners

17417_8_SepDist_G20_MB 1/09/2023 melsley

Aerial source: Nearmap 2023