Bushfire Risk Assessment Report

to inform the
Merrifield North Employment Precinct

Prepared for
Victorian Planning Authority

May 2026

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Cover photo – Looking north-west into the precinct from the corner of Gunns Gully Road and the Hume Freeway.

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Spatial data was supplied by the State Government of Victoria. Care was taken with the creation of maps used in this report, however the accuracy cannot be guaranteed. Users of the maps should make appropriate enquiries to ascertain the useability of this information.

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Glossary

AS 3959:2018	AS 3959:2018 *Construction of buildings in Bushfire Prone Areas.* Australian standard invoked by the National Construction Code and Victorian building regulations for the assessment of BALs and the design and construction of defined building classes in a BPA.
BAL	*Bushfire Attack Level* - A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire e.g. a building constructed to a BAL-12.5 standard is designed to be exposed to radiant heat not exceeding 12.5 kW/m^2.
BMO	*Bushfire Management Overlay* - A planning scheme provision used to guide the development of land in areas of high bushfire hazard. The BMO applies to areas where there is potential for extreme bushfire behaviour, such as a crown fire and extreme ember attack and radiant heat
BPA	*Bushfire Prone Area* - An area that is subject to, or likely to be subject to, bushfire attack as determined by the Minister for Planning.
Bushfire	An unplanned fire burning in vegetation; sometimes referred to as wildfire. A generic term which includes grass fires, forest fires and scrub fires.
Bushfire attack	Attack by wind, burning embers, radiant heat or flame generated by a bushfire.
Bushfire hazard	A specific source of potential damage or harm, typically consisting of three key elements; vegetation, weather and topography.
Bushfire risk	The chance or probability of damage or harm if exposed to a bushfire hazard and the severity of the impact i.e. consideration of the likelihood and consequences of impacts from bushfire.
Classified vegetation	Vegetation deemed to be a bushfire hazard in accordance with the Bushfire Management Overlay (BMO) and/or AS 3959:2018 *Construction of buildings in bushfire prone areas*.
CFA	*Country Fire Authority*
DTP	*Department of Transport and Planning*
Effective slope	The slope of the land (gradient, measured in degrees) under the classified vegetation which most influences the bushfire attack. The slope is determined on the basis of the fire moving towards the building and the rate of spread of the fire and not solely on the basis of the relative elevation of the vegetation.

Ember attack	Attack by smouldering or flaming windborne debris that is capable of entering or accumulating around a building, and that may ignite the building or other combustible materials and debris.
EVC	*Ecological Vegetation Class* - The standard unit for classifying vegetation types in Victoria. EVCs are described through a combination of floristics, lifeforms and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities (i.e. lower level in the classification) that occur across a biogeographic range and, although differing in species, have similar habitat and ecological processes operating.
FFDI	*Forest Fire Danger Index* – A numerical index representing the chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long- and short-term drought effects.
OMR	*Outer Metropolitan Ring Road*
PSP	*Precinct Structure Plan* – Strategic masterplans for local areas that usually cater for between 5,000 to 30,000 people, 2,000 to 10,000 jobs or a combination of both. They are the 'blueprint' for localised development and investment that will occur over many years, and will incorporate any relevant directions already outlined in a higher level Framework Plan.
RHF	*Radiant heat flux* - The heat transfer rate per unit area from thermal (electromagnetic) radiation, expressed as kilowatts per metre squared. Calculated or measured for a specific surface to determine the radiant heat received by that surface from flames associated with a bushfire.

1 Summary

The Victorian Planning Authority are planning the Merrifield North Employment Precinct, to guide the future urban development of land west of the Hume Freeway near Kalkallo. The southern part of the precinct, south of Gunns Gully Road, is in the City of Hume LGA whilst the northern section is in Mitchell Shire. Approximately the eastern half of the precinct and smaller areas in the west are Urban Growth Zone (UGZ), the Kalkallo Retarding Basin in the south-west of the precinct is Public Use Zone – Schedule 1 (PUZ1), and there are an area of Farming Zone and a narrow band of Urban Floodway Zone (UFZ) in the northern part of the precinct. The land is intended to be rezoned to Urban Growth Zone to facilitate development as a predominantly industrial area.

The precinct is within a designated Bushfire Prone Area (BPA) but not covered by the Bushfire Management Overlay (BMO). The re-zoning requires a planning scheme amendment to the Hume Planning Scheme and Mitchell Planning Scheme and constitute settlement planning, as such Clause 13.02-1S *Bushfire Planning* requires that bushfire risk be considered (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-01S Mitchell Planning Scheme).

Key points:

- The precinct is within a designated BPA.
- The precinct is close to the developing residential areas of the Lockerbie and Merrifield West PSPs and immediately north of the Merrifield Central Employment Area, that include areas that would be rated as BAL-Low using the AS 3959:2018 site assessment methodology.
- Grassland adjacent to and within the precinct comprises a bushfire hazard that must be considered in the development and use of the precinct.
- Large parts of the precinct are anticipated to comprise conservation reserves or drainage reserves. These will likely comprise a Grassland bushfire hazard that must be considered in the development of adjacent land.
- The terrain within and around the precinct is benign from a bushfire perspective, being essentially flat and hence in the 'Flat land and all upslopes' slope class under AS 3959:2018, other than for a small area of gentle downslope to the north-east of the precinct.
- To reduce radiant heat flux to less than 12.5 kW/m^2 as required by Clause 13.02-1S *Bushfire Planning* for a planning scheme amendment that will result in the introduction or intensification of development in a BPA, buildings will need to be setback 19 m or 22 m from classified Grassland or Shrubland, depending on the effective slope.
- Large areas of the precinct will achieve the less than 12.5 kW/m^2 threshold upon the completion of development.
- The UGZ, or other appropriate planning instrument, can stipulate bushfire protection measures, including setback of buildings from classified vegetation, provision of

perimeter roads, provision of multiple egress roads away from the enduring bushfire hazard outside the precinct, provision of fire brigade access and a reticulated hydrant system, inclusion of bushfire in emergency management plans for businesses operating in the precinct, maintenance of low threat vegetation on private property within the precinct, and requirement for a Bushfire Site Management Plan for staged subdivisions.

- Much of the precinct is likely to be rendered low threat by the planned urban development and may become eligible for excision from the BPA as development proceeds.

2 Introduction

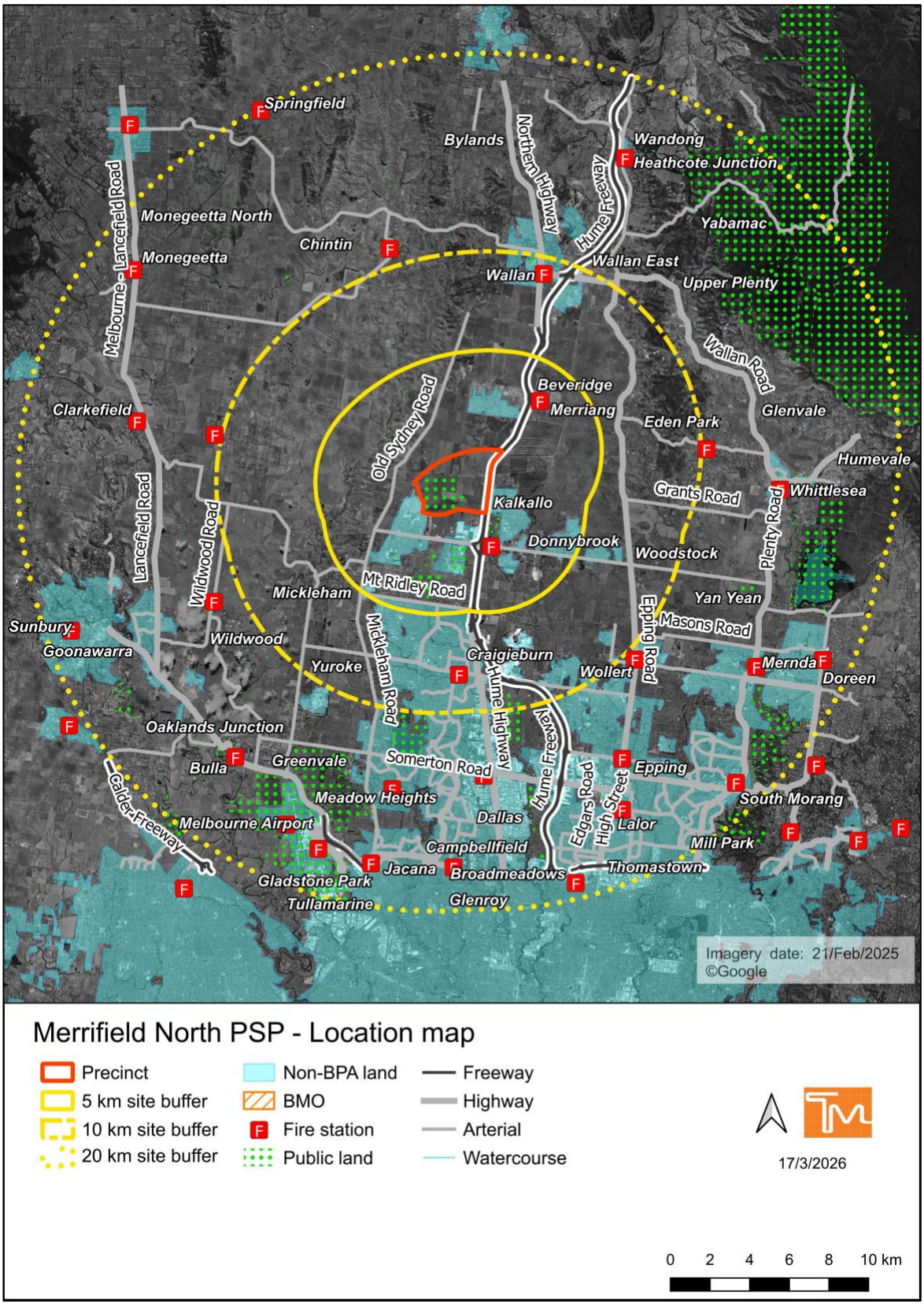
The Department of Transport and Planning (DTP) is currently planning the Merrifield North Employment Precinct to guide the future urban development of the land west of the Hume Freeway and north of Donnybrook Road. This Bushfire Risk Assessment Report has been prepared for the DTP to assess how development in the Merrifield North Employment Precinct can respond to the bushfire risk and comply with the applicable planning and building controls that relate to bushfire, especially the objectives and strategies of the Planning Policy Framework (PPF) at Clause 13.02-1S *Bushfire Planning* in the Hume and Mitchell Planning Schemes.

The precinct is in a designated Bushfire Prone Area (BPA). Adjacent agricultural land, to the west and north of the precinct, is also in the BPA but the developing urban areas to the north at Beveridge, east at Kalkallo (Lockerbie PSP) and south at Mickleham North (Merrifield West PSP) are not a designated BPA. None of the precinct or surrounding land from more than 3 km is covered by the Bushfire Management Overlay (BMO), which denotes areas of higher bushfire hazard. The closest BMO coverage is a small area around Summit Drive in Mickleham to the south. The closest large area of BMO coverage is more than 7.5 km to the north-east.

It is anticipated the precinct will be developed in stages over several years.

This report has been prepared in accordance with guidance for the assessment of, and response to, bushfire risk, provided in:

- *Local planning for bushfire protection,* Planning Practice Note 64 (DELWP, 2015)
- *Design Guidelines, Settlement Planning at the Bushfire Interface* (DELWP, 2020a)
- *Planning Permit Applications – Bushfire Management Overlay,* Technical Guide (DELWP, 2017a)
- *Bushfire State Planning Policy Amendment VC140,* Planning Advisory Note 68, (DELWP, 2018).
- *Applying the Bushfire Hazard Landscape Assessment in a Bushfire Management Overlay* (CFA, 2022a).



Map 1 – Location of the Merrifield North Employment Precinct.

3 Overview of the precinct

The Merrifield North Employment Precinct is in the North Growth Corridor, adjacent to the existing residential areas of Kalkallo and Mickleham North, and south of Beveridge and the future urban area that will extend northwards up the Hume Freeway corridor (see Map 1). The precinct straddles the boundary between the City of Hume and Mitchell Shire (see Map 2). The precinct comprises approximately 998 ha of land, generally bounded by:

- Hume Freeway to the east
- Proposed Outer Metropolitan Ring Road (OMR) to the west and north
- Merrifield West residential precinct to the south-west
- Future Beveridge South West residential precinct to the north (see Map 1).

The southern part of the precinct, south of Gunns Gully Road, is in the City of Hume LGA whilst the northern section is in the Mitchell Shire LGA. Approximately the eastern half of the precinct and smaller areas in the west are Urban Growth Zone (UGZ). Most of the western half south of Gunns Gully Road is Public Use Zone – Schedule 1 (PUZ1) containing the Kalkallo Retarding Basin, with an area of Farming Zone (FZ) north of Gunns Gully Road. A narrow band of Urban Floodway Zone (UFZ) covers an unnamed drainage line extending into the precinct from the north (see Map 2).

Terramatrix understand the land will be rezoned to Urban Growth Zone (UGZ) to facilitate development as a predominantly industrial area. The precinct will be developed with industrial and commercial buildings, with no residential component.

The Kalkallo Retarding Basin, Inverlochy Wetland and associated marram baba Merri Creek Regional Parklands are important environmental features of the precinct and immediate surrounds. We understand the precinct will contain conservation and drainage reserves based on some or all of these features but the location, size and nature of the vegetation the reserves will contain is not known at the time of this report. Thus, this Bushfire Risk Assessment Report provides a high-level assessment of how industrial or commercial development in the precinct can respond to the bushfire hazard in accordance with the requirements of Clause 13.02-1S in the Hume and Mitchell planning schemes.

4 Bushfire planning and building controls

This section summarises the applicable planning and building controls that relate to bushfire.

4.1 Planning provisions

4.1.1 Clause 12.03-1S River and riparian corridors, waterways, lakes, wetlands and billabongs

As the Merrifield North Employment Precinct will likely incorporate areas of wetland in drainage reserves, this Clause may have implications for the precinct. Strategies of the clause relevant to bushfire are:

- *'Retaining, enhancing and re-establishing indigenous riparian vegetation along waterway systems, ensuring it responds to the bushfire risk of a location.*
- *Retaining and re-establishing vegetation, including grasslands and canopy trees, surrounding waterway systems to enhance and connect to the landscape setting, ensuring it responds to the bushfire risk of a location'* (Clause 12.03-1S, Hume Planning Scheme and Clause 12.03-1S, Mitchell Planning Schemes).

4.1.2 Clause 12.03-1L River Corridors (Hume)

The strategies are:

- '*Protect the deeply incised creek valleys and escarpments of Jacksons Creek, Emu Creek, Harpers Creek, Deep Creek and Merri Creek and their tributaries from intrusive built form outcomes and changes to the topography.*
- *Ensure that development along the Merri Creek is planned in a manner that protects the creek environs and enables the creation of a linear regional park*' (Clause 12.03-1L, Hume Planning Scheme).

The second strategy may affect development in the vicinity of the marram baba Merri Creek Regional Parklands.

4.1.3 Clause 12.03-1L River Health (Mitchell)

The strategy is:

- '*Encourage sustainable land management on private land to improve river health*' (Clause 12.03-1L, Mitchell Planning Scheme).

4.1.4 Clause 13.01-1S Natural hazards and climate change

The objective of this Clause is to minimise the impacts of natural hazards and adapt to the impacts of climate change through risk-based planning. Strategies to achieve the objective are:

- *'Respond to the risks associated with climate change in planning and management decision making processes.*

- *Identify at risk areas using the best available data and climate change science.*
- *Integrate strategic land use planning with emergency management decision making.*
- *Direct population growth and development to low risk locations.*
- *Develop adaptation response strategies for existing settlements in risk areas to accommodate change over time.*
- *Ensure planning controls allow for risk mitigation and climate change adaptation strategies to be implemented.*
- *Site and design development to minimise risk to life, health, property, the natural environment and community infrastructure from natural hazards'* (Clause 13.01-1S, Hume Planning Scheme and Clause 13.01-1S, Mitchell Planning Scheme).

Especially in southern and eastern Australia, since the 1950s there has been an increase in the length of the fire weather season and a greater number of higher risk days associated with climate change (CSIRO/BOM, 2024). The Australian and New Zealand Council for Fire and Emergency Services identify that a failure of building codes and land use planning to adequately adapt to climate change is a significant risk (AFAC, 2020).

Clause 13.01-1S supports the adoption of a precautionary and conservative approach to assessing and responding to bushfire risk. Fire weather is discussed further in Section 5.4.

4.1.5 Clause 13.02-1S Bushfire Planning

Clause 13.02-1S has the objective '*To strengthen the resilience of settlements and communities to bushfire through risk based planning that prioritises the protection of human life'* (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-1S, Mitchell Planning Scheme). The policy must be applied to all planning and decision making under the Planning and Environment Act 1987, relating to land which is:

- Within a designated BPA
- Subject to a BMO
- Proposed to be used or developed in a way that may create a bushfire hazard.

The policy requires priority to be given to the protection of human life by:

- *'Prioritising the protection of human life over all other policy considerations.*
- *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.*
- *Reducing the vulnerability of communities to bushfire through consideration of bushfire risk in decision-making at all stages of the planning process'* (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-1S, Mitchell Planning Scheme).

Key strategies are stipulated in Clause 13.02-1S, which require regional growth plans, precinct structure plans and planning scheme amendments to assess the bushfire hazard and respond with appropriate bushfire protection measures. This also applies to planning permit applications for:

- Subdivisions of more than 10 lots

- Accommodation
- Child care centre
- Education centre
- Emergency services facility
- Hospital
- Indoor recreation facility
- Major sports and recreation facility
- Place of assembly
- Any application for development that will result in people congregating in large numbers.

This study assesses the bushfire hazard in accordance with hazard identification and assessment strategies of Clause 13.02-1S and identifies the bushfire protection measures that will be required for future development in accordance with the settlement planning strategies. It is considered that development in the Merrifield North Employment Precinct can appropriately prioritise the protection of human life and meet the objective of Clause 13.02-1S. Key features to achieve this are appropriate subdivision design, including lot layout, perimeter roads and separation from hazardous vegetation during and after development. Minimum separation distances should ensure future development will not be exposed to radiant heat flux above 12.5 kW/m^2.

The maximum 12.5 kW/m^2 safety threshold is required in settlement planning as the upper limit for acceptable risk. Responsible authorities must '*Not approve 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*' (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-1S, Mitchell Planning Scheme).

A detailed response to the strategies in Clause 13.02-1S and recommendations for development are provided in Section 7.

4.1.6 Clause 71.02-3 Integrated Decision Making

Clause 71.02-3 states that planning and responsible authorities should endeavour to integrate policies and balance conflicting objectives in favour of net community benefit. However, in bushfire affected areas, it states that the protection of human life must be prioritised over all other policy considerations (Clause 71.02-3, Hume Planning Scheme and Clause 71.02-3, Mitchell Planning Scheme).

4.2 Bushfire Prone Area (BPA)

BPAs are those areas subject to or likely to be subject to bushfire, as determined by the Minister for Planning. All land within the precinct is currently designated as a BPA, however as development occurs, some of it will likely become eligible for excision from the BPA.

Note that land not within the BPA is defined as an area of low bushfire hazard, where the extent, configuration and/or management of vegetation results in low potential for bushfire spread (DELWP, 2019).

Map 5 and Map 6 show the extent of BPA coverage in and around the precinct and the surrounding broader landscape. In a BPA, the Building Act 1993 and associated Building Regulations 2018, through application of the National Construction Code 2022 (NCC), require specific design and construction standards for Class 1, 2 and 3[1] buildings, certain Class 9 and 4 buildings[2], and Class 10A buildings[3] or decks adjacent to, or connected with, these classes of buildings.

We understand that the precinct will contain industrial and/or commercial buildings that will likely be of a class that does not need to be built to a BAL construction standard under the Victorian Building Regulations.

4.2.1 Land use planning in a BPA

In a BPA, larger developments and certain vulnerable uses, including applications for subdivision of more than 10 lots, are required by Clause 13.02-1S to:

- *'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'* (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-1S, Mitchell Planning Scheme).

There are no obstacles to future development in the Merrifield North Employment Precinct complying with the applicable strategies at Clause 13.02-1S and the building regulations invoked in a BPA. BAL-LOW land, where the BPA has been removed, will likely be created within the precinct as reliably low threat and non-vegetated areas are created as development progresses.

DTP review and excise areas from the BPA approximately every 6 months, particularly in growth areas where the hazard is removed as urban development occurs.

Land becomes eligible for excision if it satisfies statewide hazard mapping criteria, including that the land needs to be:

- At least 300 m from areas of classified vegetation (except grassland) larger than 4 ha in size; and

[1] Class 1, 2 and 3 buildings are defined in the NCC and are generally those used for residential accommodation, including houses and other dwellings, apartments, hotels and other buildings with a similar function or use.

[2] Applicable Class 9 buildings are Class 9a health-care buildings, Class 9b early childhood centres, primary and secondary schools, Class 9c residential care buildings, and any Class 4 parts of a building associated with these Class 9 buildings.

[3] Class 10a buildings are defined in the NCC as non-habitable buildings including sheds, carports, and private garages.

- At least 150 m from areas of classified vegetation (except grassland) 2 to 4 ha in size; and
- At least 60 m from areas of unmanaged grassland more than 2 ha in size (DELWP, 2019).

For isolated areas of vegetation greater than 1 ha but less than 2 ha, the shape of the area and connectivity to any other hazardous vegetation is a further consideration (DELWP, 2019).

4.3 Other controls

4.3.1 Zoning

Approximately the eastern half of the precinct and smaller areas in the west are Urban Growth Zone (UGZ). Most of the western half south of Gunns Gully Road is Public Use Zone – Schedule 1 (PUZ1) containing the Kalkallo Retarding Basin, with an area of Farming Zone (FZ) north of Gunns Gully Road. A narrow band of Urban Floodway Zone (UFZ) covers an unnamed drainage line extending into the precinct from the north (see Map 2).

The intent is to re-zone the Farming Zone (FZ) land to Urban Growth Zone (UGZ).

4.3.2 Overlays

Clause 42.01 Environmental Significance Overlay

Schedule 10 to the Environmental Significance Overlay (ESO10) protects high value vegetation in rural conservation areas and covers a small area on the southern side of Gunns Gully Road (Clause 42.01, Hume Planning Scheme).

Clause 42.02 Vegetation Protection Overlay

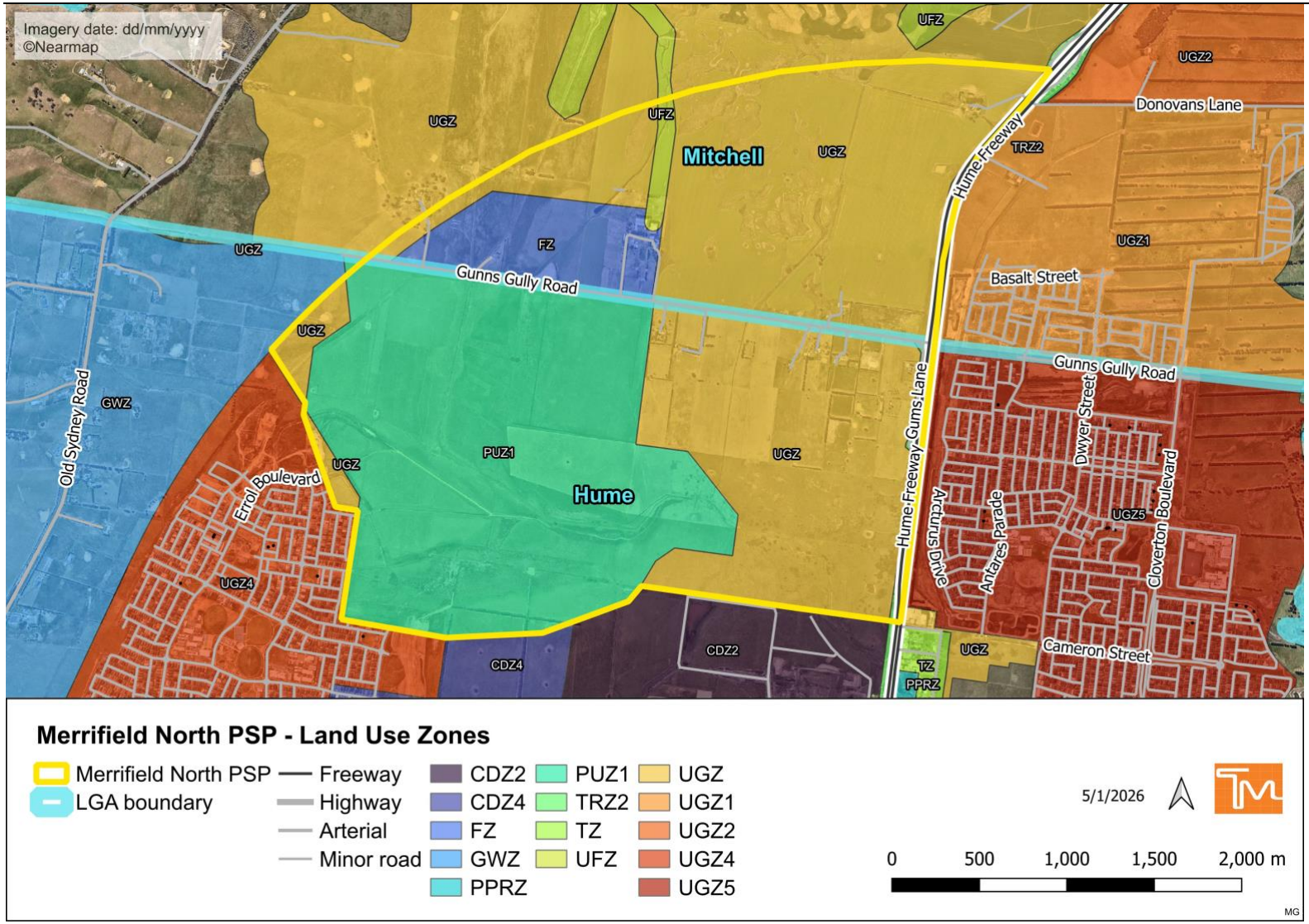
Schedule 2 to the Vegetation Protection Overlay (VPO2) seeks to protect trees and other significant vegetation and habitat on significant roadsides and linear reserves (Clause 42.02, Mitchell Planning Scheme). It applies to the Hume Freeway on the eastern boundary of the precinct.

Clause 44.03 Floodway Overlay

A Floodway Overlay (RFO) (Clause 44.03, Mitchell Planning Scheme) covers a drainage line that extends from the large areas of LSIO land (see below) to the Hume Freeway in the east. It will likely influence the location and extent of drainage reserves and other public open space that may comprise classified vegetation within the precinct.

Clause 44.04 Land Subject to Inundation Overlay

The Land Subject to Inundation Overlay identifies areas that would be inundated in a 1:100 year flood (Clause 44.04, Hume Planning Scheme). It affects a large area south of Gunns Gully Road and a drainage line that extends to the Hume Freeway in the east and will likely influence the location and extent of drainage reserves and other public open space that may comprise classified vegetation within the precinct.



Map 2 - Planning scheme zoning.

Clause 45.01 Public Acquisition Overlay

Land potentially required for widening of the Hume Freeway on the eastern boundary of the precinct is covered by Schedule 1 to the Public Acquisition Overlay (PAO1) in the Hume Planning Scheme (Clause 45.01, Hume Planning Scheme) and Schedule 5 (PAO5) in the Mitchell Planning Scheme (Clause 45.01, Mitchell Planning Scheme).

Land reserved for the Outer Metropolitan Ring Road along the western and northern boundary of the precinct is covered by Schedule 3 (PAO3) in the Hume Planning Scheme (Clause 45.01, Hume Planning Scheme) and Schedule 7 (PAO7) in the Mitchell Planning Scheme (Clause 45.01, Mitchell Planning Scheme).

Clause 45.06 Development Contributions Plan Overlay

Schedule 4 (DCPO4) applies the Merrifield West PSP Development Contributions Plan Clause 45.06, Hume Planning Scheme). It appears to cover a small area of the Merrifield North Employment Precinct but is not considered relevant to this study.

5 Bushfire hazard assessment

One of the bushfire hazard identification and assessment strategies in Clause 13.02-1S is to use the best available science to identify the hazard posed by vegetation, topographic and climatic conditions. The basis for the hazard assessment should be:

- *'Landscape conditions - meaning the conditions in the landscape within 20 kilometres and potentially up to 75 kilometres from a site;*
- *Local conditions - meaning conditions within approximately 1 kilometre from a site;*
- *Neighbourhood conditions - meaning conditions within 400 metres of a site; and,*
- *The site for the development'* (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-1S, Mitchell Planning Scheme).

This section includes a bushfire assessment at:

- The wider landscape scale, for up to 20 km around the site (see Map 5).
- The local and neighbourhood scales extending up to 400 m and 1 km respectively from the site (see Map 6).
- The site scale up to 150 m around the precinct boundary (see Map 3 and Map 4).

The BPA invokes AS 3959:2018 *Construction of buildings in bushfire prone areas,* which requires a site assessment of the vegetation and topography up to 100 m around a building (Standards Australia, 2020). For vulnerable uses and larger developments in a BPA, a 150 m assessment zone may be required (DELWP, 2018) as has been applied in this bushfire assessment.

5.1 Vegetation

Classified vegetation is vegetation that is deemed hazardous from a bushfire perspective and is classified in accordance with the AS 3959:2018 methodology.

The classification system is not directly analogous to Ecological Vegetation Classes (EVCs) but uses a generalised description of vegetation based on the AUSLIG (Australian Natural Resources Atlas: No. 7 - Native Vegetation) classification system. The classification should be based on the likely fire behaviour that it will generate and, for settlement planning purposes, the long-term structure of the vegetation in its mature state.

5.1.1 Grassland

Grassland is the predominant vegetation type within the Merrifield North Employment Precinct (see Map 3 and Map 4 and Figure 1, Figure 2 and Figure 3) and in the 150 m site assessment zone adjacent to the northern (Figure 4), western (see Figure 5) boundaries and east of the Hume Freeway (see Figure 6).

Areas of grassy vegetation greater than 100 mm high with an overstorey foliage cover of less than 10% are classifiable in the Grassland group of AS 3959:2018, which is defined as '*All forms* (of vegetation) *including areas with shrubs and trees, if overstorey foliage cover is less than 10%'* (Standards Australia, 2020).

Grassland vegetation is considered hazardous, and therefore classifiable, when it is unmanaged, i.e. more than 100 mm tall. Settlement planning should apply a conservative and precautionary approach, and assume Grassland areas will be unmanaged and classifiable, unless there is reasonable assurance they will be managed in a low threat state, no more than 100 mm high, in perpetuity.

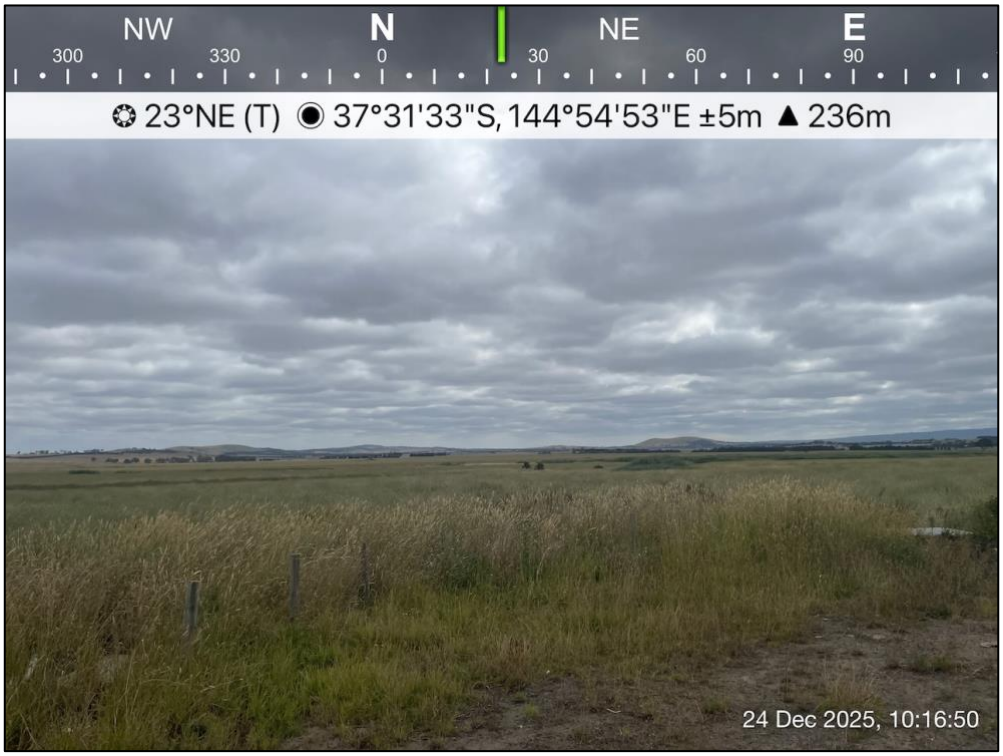


Figure 1 – Looking at classified Grassland in the Kalkallo Retarding Basin in the south-west corner of the precinct, from the southern boundary at Rosehill Boulevard.

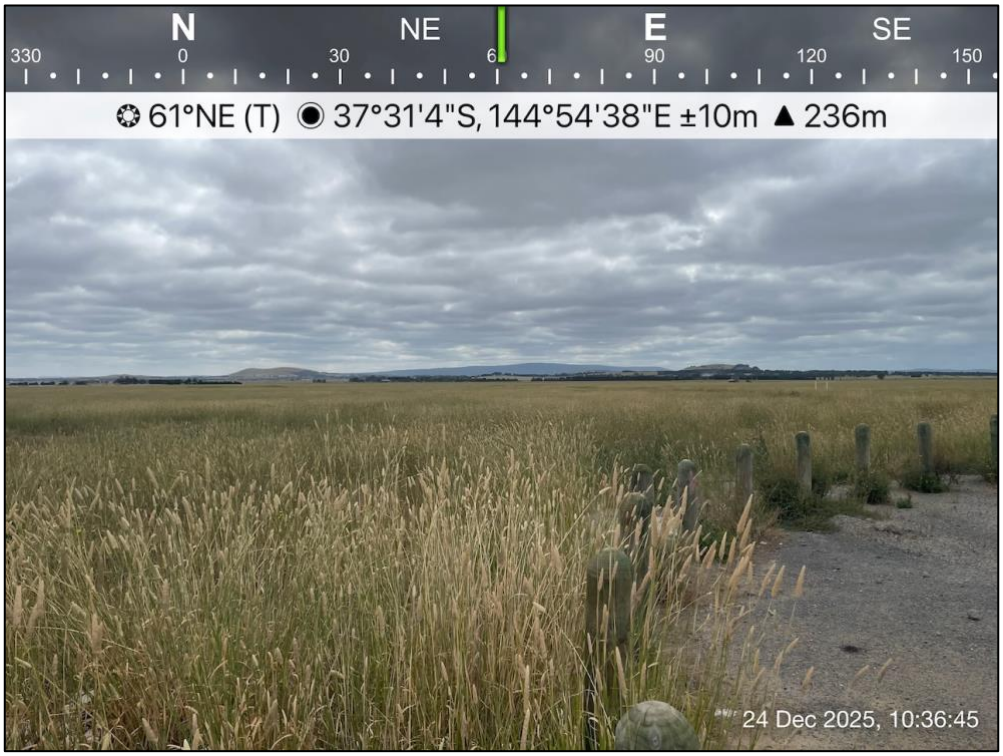


Figure 2 – Looking into the Kalkallo Retarding Basin from the western boundary at Errol Boulevard.

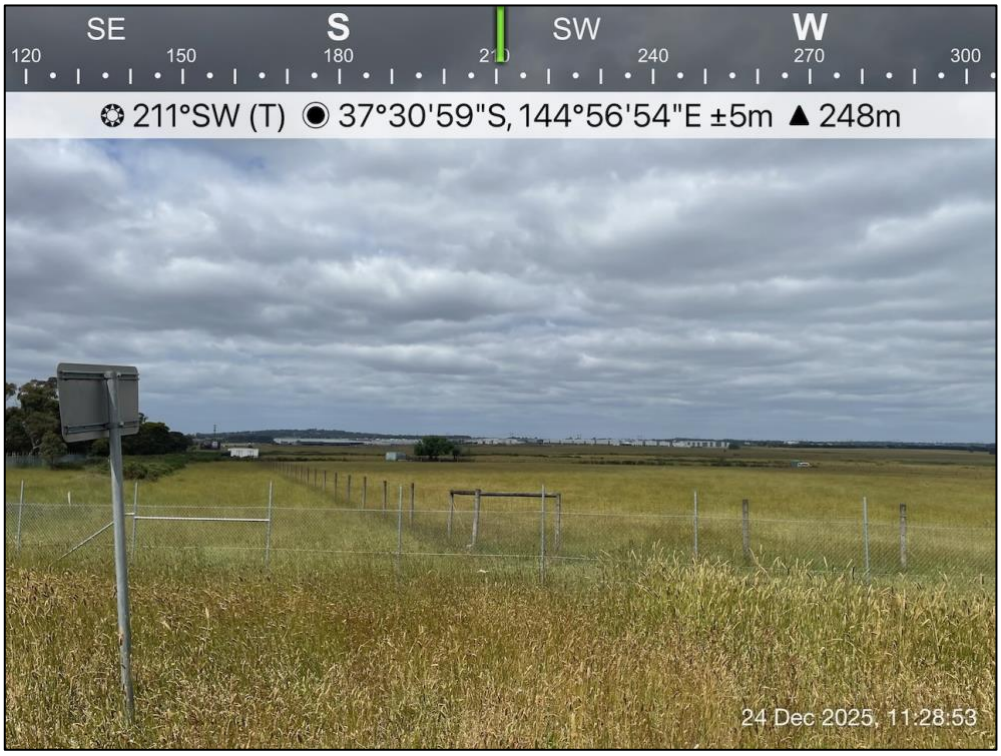


Figure 3 – Looking south-west from Gunns Gully Road at classified Grassland in the northern section of the Kalkallo Retarding Basin.

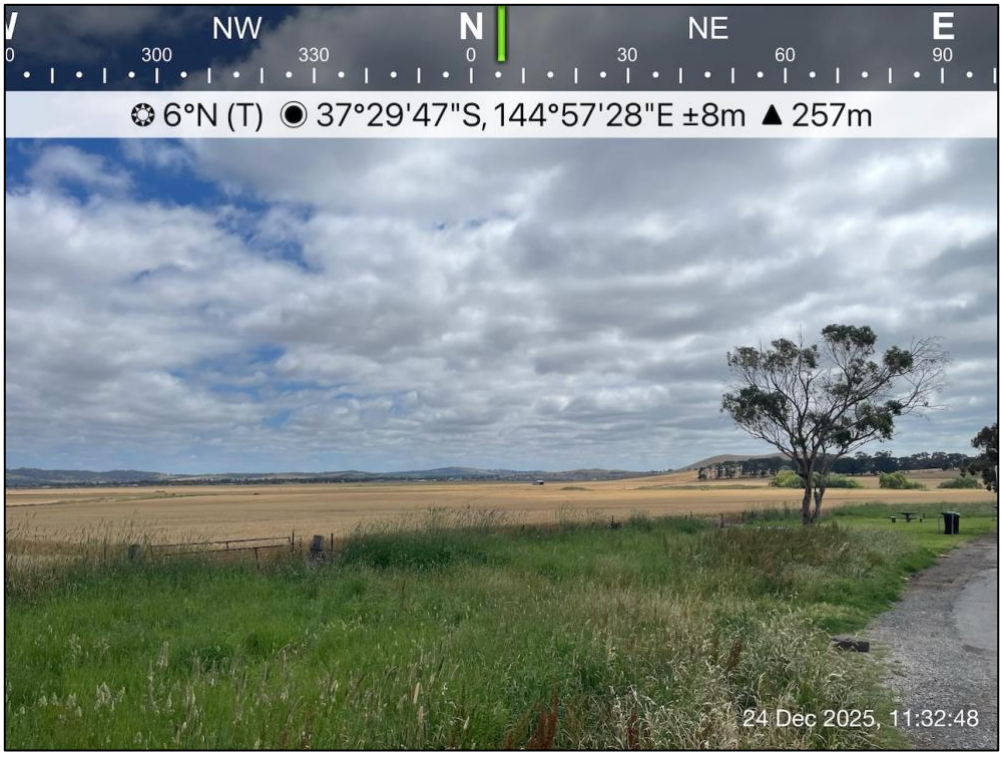


Figure 4 – Looking north at classified Grassland north of the precinct, from the north-bound Beveridge truck park.

Figure 5 – Looking west from the western end of Gunns Gully Road, towards Grassland beyond the western boundary of the precinct.

Figure 6 – Looking south-east from Donovans Lane at classified Grassland east of the precinct.

5.1.2 Woodland

There is a small group of trees on private land just beyond the north-western boundary of the precinct, in the vicinity of the land reserved for the OMR, that was not accessed by Terramatrix. From aerial imagery, tree density does not appear to warrant classification as Woodland, but this should be assessed as development plans proceed. Woodland typically comprises areas with trees up to 30 m tall and 10-30% foliage cover dominated by eucalypts (and/or callitris), with a prominent grassy understorey that may contain isolated shrubs (Standards Australia, 2020).

It is not clear whether this area will remain after the OMR has been constructed or which side of the OMR it would be on. If retained and determined to be Woodland, and within 100 m of a future development area, it may be necessary to provide Woodland setbacks.

5.1.3 Excluded vegetation and non-vegetated areas

Areas of low threat vegetation and non-vegetated areas can be excluded from classification in accordance with Section 2.2.3.2 of AS 3959:2018, if they meet one or more of the following criteria:

(a) 'Vegetation of any type that is more than 100 m from the site.
(b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified vegetation.
(c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other, or of other areas of vegetation being classified vegetation.
(d) Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified vegetation.
(e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.
(f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition[4], mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks' (Standards Australia, 2020).

The cultivated gardens and lawns of the residential properties and local parks in the Merrifield West PSP comprise low threat vegetation (see Map 3 and Map 4). The roads and buildings within the site assessment zone are non-vegetated areas excluded from classification.

[4] Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack, recognisable as short-cropped grass for example, to a nominal height of 100 mm (Standards Australia, 2020).

It is reasonable to assume that all the proposed industrial/commercial areas will be either non-vegetated or comprise low threat vegetation such as maintained lawns, roadsides or cultivated gardens. It is also reasonable to assume that any local parks will be managed in a low threat state.

5.2 Future vegetated form

Urban development in the Merrifield North Employment Precinct will result in the removal of classified Grassland from within the precinct boundary. We understand, however, that potentially large conservation and drainage reserves will be created that will likely comprise classified vegetation. As development plans have not yet been prepared and in the absence of knowledge of what vegetation each reserve may contain, we provide general advice on the setbacks that might be required at Section 6.1 below.

The precinct will contain five significant areas where vegetation is anticipated to be retained. These are discussed briefly below.

5.2.1 Inverlochy Swamp

The future state and extent of the Inverlochy Swamp is yet to be determined and it is not shown on Map 3. At its maximum (pre-European) extent it occupied nearly a third of the area of the precinct north of Gunns Gully Road.

The Inverlochy Swamp may comprise a mosaic of permanent and non-permanent wetlands, classified Grassland and potentially classified Shrubland. Shrubland comprises areas with shrubs that are no more than 2 m tall on average with greater than 30% foliage cover. Understorey may contain grasses (Standards Australia, 2020).

Areas of freshwater wetland should be classified unless comprising reliably open water or wet areas with little or no vegetation, as seasonally inundated wetlands may be dry and vegetated during the Fire Danger Period.

5.2.2 Kalkallo Retarding Basin

We understand that the future use of the Kalkallo Retarding Basin in the west of the precinct (see Map 3 and Map 4) is yet to be determined. Vegetation in the Kalkallo Retarding Basin is currently predominantly Grassland and is anticipated to remain so unless actively revegetated with trees and shrubs. Melbourne Water should clarify the future vegetated form of the basin.

5.2.3 Biodiversity Conservation Area 23

A large area of the marram baba Merri Creek Regional Parklands in the south of the precinct, between the Kalkallo Retarding Basin and the Hume Freeway, forms Biodiversity Conservation Area 23 (see 'BCA 23' on Map 3) comprising Golden Sun Moth habitat.

The habitat requirements for the Golden Sun Moth include avoiding excessive biomass accumulation that can impede emergence, flight and egg-laying. Grass should be reduced periodically using low intensity targeted grazing, slashing outside of the flying season (i.e. before October and after January) with grass cut to 6-10 cm in height so tussocks remain intact, or controlled burning in late summer or autumn fire (DCCEEW, 2021).

Trees and shrubs are generally deleterious to Golden Sun Moth habitat (DCCEEW, 2021) and, as Biodiversity Conservation Area 23 is currently sparsely treed, we consider it likely that this area will comprise classified Grassland.

5.2.4 Biodiversity Conservation Area 34

Biodiversity Conservation Area 34 is an area of the marram baba Merri Creek Regional Parklands along Kalkallo Creek in the south-east corner of the precinct (see 'BCA 34' on Map 4) that has been designated to preserve Growling Grass Frog habitat.

The terrestrial area adjacent to wetlands and streams (within 100 m – Heard *et al.*, 2010) is important habitat for Growling Grass Frogs. The frogs prefer relatively open terrestrial habitats that facilitate foraging and movement, with vegetation structure more important than plant species (Heard *et al*., 2008).

The following terrestrial habitat design requirements are from DELWP (2017b):

- A minimum 50 m buffer from development must surround each wetland, in which major infrastructure such as roads, car parks, and buildings should be avoided.
- Shared use paths, other minor infrastructure for passive recreation and stormwater assets must not be constructed closer than 30 m from the normal water level of a breeding wetland.
- Approximately 50% of the area within 10 m of the wetland's normal water level must be designed to be maintained as low, grassy vegetation up to 10 cm in height.
- Where tussock-forming grasses and sedges are used in the zone that is within 10 m of normal water level, planting density should allow for no greater than 20% cover when mature.
- Mulch must not be used within 50 m of a wetland.
- Shrubs must not be planted within 10 m of the wetland's normal water level.
- Rock piles at least 1 m deep must be constructed adjacent to the wetland margin using a variety of rock sizes between 10 cm and 1 m in diameter.
- Where possible, the area between 10 m and up to 100 m (where space is available) from the wetland should be designed to be maintained primarily as short, mown grass with an open structure (for example 20% cover).
- Tree cover within 100 m of a wetland should not exceed 10%.
- Shrub cover within 100 m of a wetland should not exceed 10%.
- A patchy arrangement of denser plantings of tussock-forming species is encouraged to maintain some potential terrestrial shelter sites.

- Low, grassy vegetation areas do not need to be native vegetation (mown pasture grasses and even lawn are acceptable).
- Invasive plant species must not be used anywhere within the terrestrial habitat zone.

If managed to this standard, Biodiversity Conservation Area 34 will comprise classified Grassland. Some areas may be periodically low threat if the grass is cut to less than 10 cm in height.

5.2.5 Wallan Wallan Regional Park

A feasibility study is being undertaken into the Wallan Wallan Regional Park, which might extend into the precinct from the north and link to the Kalkallo Retarding Basin. The extent and future vegetated state of this area, if a park is to be created, is not known to Terramatrix, but we note it currently contains classified Grassland. If it were to be re-vegetated it could comprise a higher hazard vegetation type, such as Woodland. As creation of the park has not been decided, it is not shown on Map 3 and Map 4.

5.2.6 Development Services Scheme (DSS) reserves

Proposed waterway reserves and sediment basins are shown on Map 3 and Map 4. The reserves are virtually flat, and the vegetation is currently Grassland and anticipated to remain so unless actively revegetated with trees and shrubs

5.2.7 Vegetation beyond the precinct boundary

It is assumed that classified Grassland on private property outside of the precinct to the north and west will remain, at least in the short-term.

It is assumed the road reserves around the perimeter of the precinct will be maintained in a low threat condition (grass generally < 100 mm in height) during the declared Fire Danger Period.

It is likely that further land to the south, south-west and east will be rendered low threat in the short term as development in the Merrifield West PSP, Merrifield Central Employment Area and Lockerbie PSP proceeds.

In the longer term, the Lockerbie North PSP to the north-east and Beveridge South West PSP to the north will substantially remove any bushfire hazard in those directions as well.

5.3 Topography

AS 3959:2018 requires that the 'effective slope' be identified to determine the BAL and applicable development setback distances from classified vegetation. This is the slope of the land under classified vegetation that will most significantly influence the bushfire attack on a building. Two broad types apply:

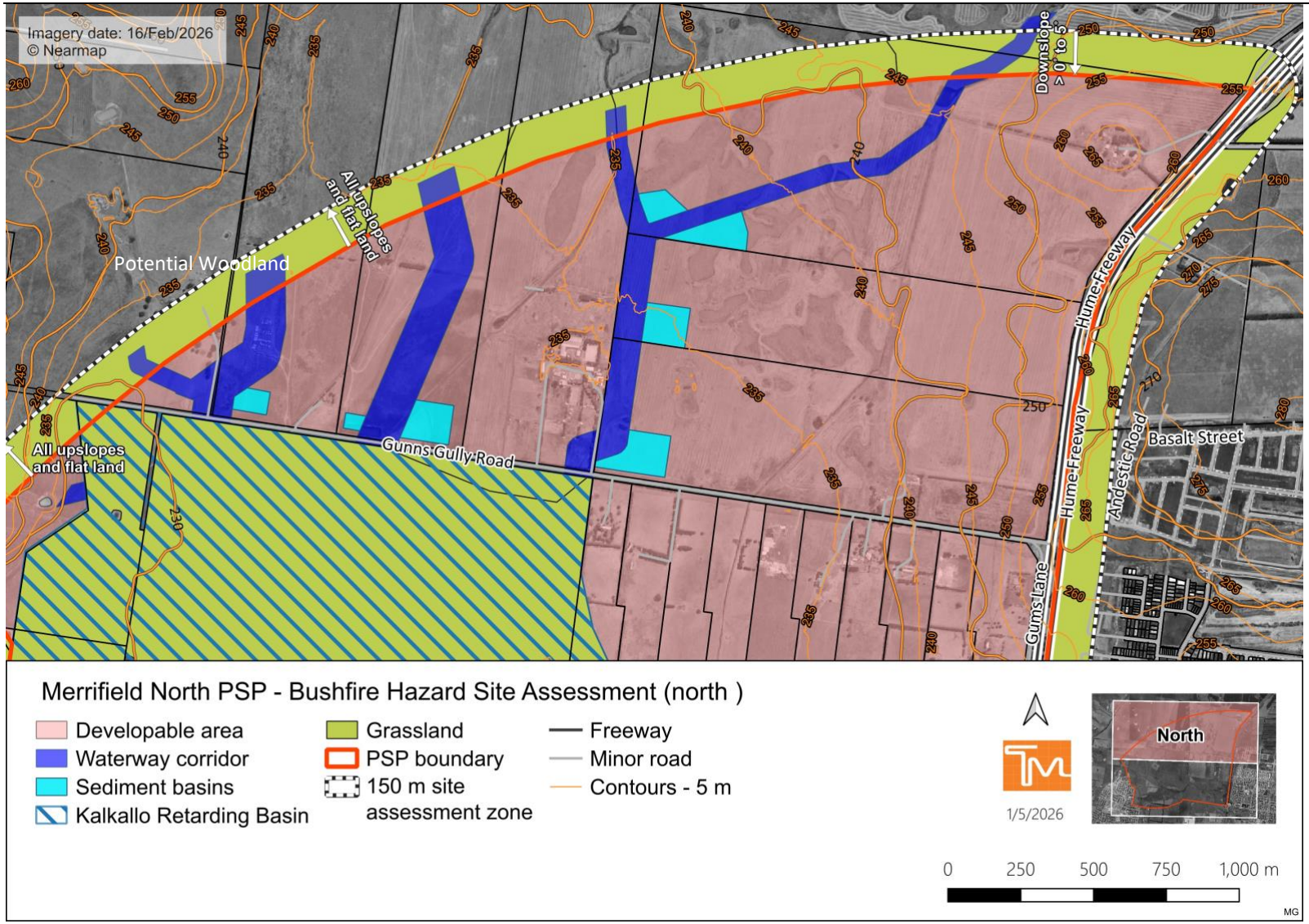
- Flat and/or Upslope - land that is flat or on which a bushfire will be burning downhill in relation to the development. Fires burning downhill (i.e. on an upslope) will generally be moving more slowly with a reduced intensity.
- Downslope - land on which a bushfire will be burning uphill in relation to the development. As the rate of spread of a bushfire burning on a downslope (i.e. burning uphill towards a development) is significantly influenced by increases in slope, downslopes are grouped into five classes in 5˚ increments from 0˚ up to 20˚[5].

The Merrifield North Employment Precinct and immediately surrounding landscape is essentially flat (see Map 3 and Map 4), without significant changes in elevation that would appreciably influence bushfire behaviour.

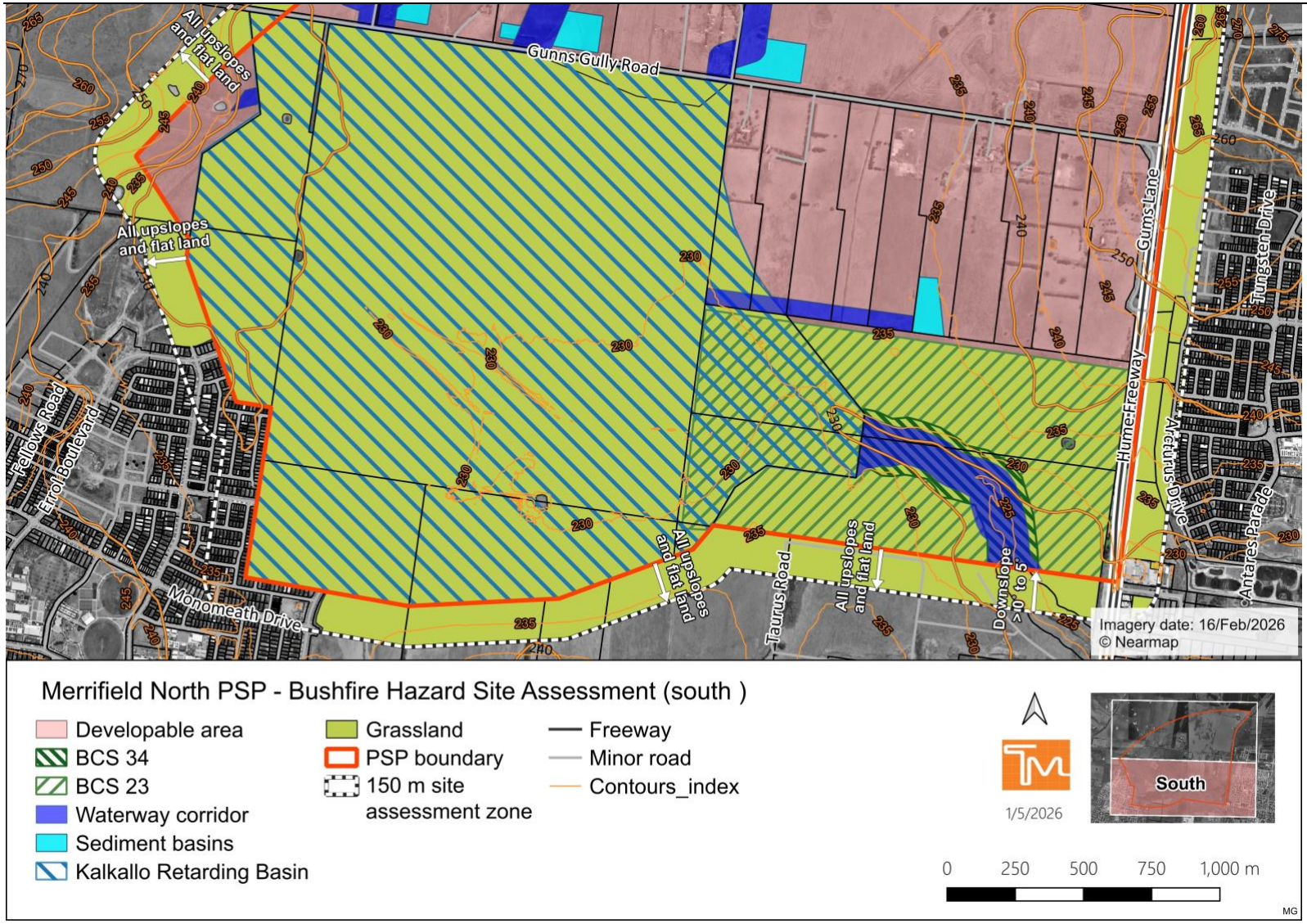
For the purposes of determining BALs and defendable space/vegetation setback distances for future development, the applicable slope class for vegetation outside the precinct boundary is 'All upslopes and flat land' other a small area to the north (near the Hume Freeway) that is in the 'Downslope >0˚-5˚' slope class.

If classified vegetation is to be retained or created in drainage and conservation reserves within the precinct, it is likely that slopes in the 'All upslopes and flat land' would apply, but it is possible that in places slopes up from drainage lines could be in the 'Downslope >0˚-5˚' slope class.

[5] For downslope gradients over 20˚ and up to 30˚, the detailed 'Method 2' procedure of AS 3959:2018 is used to determine the BAL.



Map 3 – Bushfire hazard site assessment – Northern section. Vegetation classification as per AS 3959:2018 – classified vegetation within 150 m assessment zone and anticipated to be retained within the precinct.



Map 4 – Bushfire hazard site assessment – Southern section. Vegetation classification as per AS 3959:2018 – classified vegetation within 150 m assessment zone and anticipated to be retained within the precinct.

5.4 Fire weather

The Forest Fire Danger Index (FFDI) and the Grassland Fire Danger Index (GFDI) represent the level of bushfire threat based on weather (and fuel) conditions. An FFDI 100/GFDI 130 is applied in non-alpine areas of Victoria by the building system, to establish a BAL based on building setback distances from classified vegetation in accordance with AS 3959:2018.

The indices were also used for predicting fire behaviour including the difficulty of suppression, forecasting Fire Danger Ratings (FDRs) and determining an appropriate level of preparedness for emergency services. However, in September 2022 the FFDI/GFDI were replaced by the Fire Behaviour Index (FBI) as a new Australian Fire Danger Rating System (AFDRS) for determining FDRs in all jurisdictions. Table 1 displays the new FDRs, their FBI range, the anticipated fire behaviour and recommended actions for each FDR.

Note that the AFDRS and FBIs do not correlate directly with the FFDI/GFFDI indices applied in the planning and building system. However, the benchmark FFDI 100 used to represent a 'one size fits all' model of extreme fire weather conditions (and the threshold for the previous ‘Code Red’ FDR), can be considered analogous to the FBI 100 ‘Catastrophic’ FDR. Note that these extreme conditions have been exceeded during significant fire events, including at some locations in Victoria on ‘Black Saturday’ 2009. Therefore, it is important to note that this FDR threshold is not necessarily the *worst-case* conditions for any particular location.

Additionally, as identified in Section 4.1.4, in southern and eastern Australia since the 1950’s there has been an increase in the length of the fire weather season and an increase in extreme fire weather (CSIRO/BOM, 2024). The trend of a longer fire season and increased number of dangerous fire weather days is projected to continue. Climate change is contributing to these changes in fire weather including by affecting temperature, relative humidity and associated changes to the fuel moisture content (CSIRO/BOM, 2024).

The Hume (covering Mitchell Shire) and Metropolitan (covering City of Hume) Bushfire Management Strategies state that in Victoria, climate change is forecast to extend the length of the fire danger period, make bushfires larger, more severe and frequent, and increase the frequency of days of elevated fire danger (DELWP, 2020b; DELWP, 2020c).

There is a ‘high confidence’ that climate change will result in a harsher fire weather climate for the Southern Slopes (Victoria West) sub-cluster region that the precinct is in; with a ‘very high confidence’ that average temperatures will continue to increase in all seasons. Generally, less rainfall in the cool season (winter and spring) is projected with’ high confidence’. Changes to summer and autumn rainfall are possible but less certain. The magnitude of the change depends on the rainfall projection and its seasonal variation. Enhanced summer rainfall projected in some scenarios could moderate the number of severe fire weather days (CSIRO/BOM, 2025).

Climate change trends associated with the risk of bushfire, support the adoption of a precautionary and conservative approach in identifying and responding to the risk. However, as CFA and DTP have no published policy on FFDI recurrence intervals there is no compelling reason to apply a different

FFDI/GFDI from the FFDI 100/GFDI 130 threshold used throughout non-Alpine areas of Victoria in the planning and building system[6].

Table 1 - Fire Danger Ratings (AFDRS, 2022).

Forest Behaviour Index	Fire Danger Rating (FDR)	Fire Behaviour	Action
>=100	Catastrophic	If a fire starts and takes hold, lives are likely to be lost.	○ These are the most dangerous conditions for a fire. ○ Your life may depend on the decisions on you make, even before there is a fire. ○ For your survival, do not be in bushfire risk areas. ○ Stay safe by going to a safer location early in the morning or the night before. ○ If a fire starts and takes hold, lives and properties are likely to be lost. ○ Homes cannot withstand fires in these conditions. You may not be able to leave and help may not be available.
50-99	Extreme	Fires will spread quickly and be extremely dangerous.	○ These are dangerous fire conditions. ○ Check your bushfire plan and that your property is fire ready. ○ If a fire starts, take immediate action. If you and your property are not prepared to the highest level, go to a safer location well before the fire impacts. ○ Reconsider travel through bushfire risk areas. ○ Expect hot, dry and windy conditions. ○ Leaving bushfire risk areas early in the day is your safest option.
24-49	High	Fires can be dangerous.	○ There is a heightened risk. Be alert for fires in your area. ○ Decide what you will do if a fire starts. ○ If a fire starts, your life and property may be at risk. The safest option is to avoid bushfire risk areas.
12-23	Moderate	Most fires can be controlled.	○ Stay up to date and be ready to act if there is a fire.

5.5 Landscape assessment

5.5.1 Location description and context

The Merrifield North Employment Precinct is located west of the Hume Freeway, between Mickleham and Beveridge. To the south are the established and developing urban areas of the Merrifield West PSP and the Merrifield Central Employment Area, whilst to the east is the Lockerbie PSP.

In the longer term, the Lockerbie North PSP to the north-east and Beveridge South West PSP to the north will also be developed, consolidating the precinct into the North Growth Corridor.

[6] In Alpine areas of Victoria an FFDI 50 applies for determining BALs using Method 1 of AS 3959:2018.

The landscape to the west is overwhelmingly rural and pastoral and likely to remain so as it is outside of the urban growth area. The precinct is on the Victorian Volcanic Plain, which is a broad, flat to gently undulating landscape formed by ancient basalt lava flows. West of Old Sydney Road the land is more broken (but not rugged) as it falls to Deep Creek further to the west, but then flattens out and is predominantly pastoral until it reaches the forest around Riddells Creek more than 20 km to the north-west of the precinct.

5.5.2 Broader landscape scale hazard

To assist in assessing landscape risk, four 'broader landscape types', representing different landscape risk levels, are described in the technical guide *Planning Applications Bushfire Management Overlay*[7]. These descriptors are intended to streamline decision-making and support more consistent decisions based on the landscape risk (DELWP, 2017a).

The four types range from low risk landscapes, where there is little hazardous vegetation beyond 150 m of a site and extreme bushfire behaviour is not credible, to extreme risk landscapes with limited or no evacuation options and where fire behaviour could exceed BMO/AS 3959:2018 presumptions (see Table 2).

The landscape setting of the Merrifield North Employment Precinct accords best with the lower risk Landscape Type 2. Whilst a large grass fire could approach the precinct from the north-west or west, directions typically associated with fire approach under extreme fire weather (Long, 2006), and Deep Creek, and the broken land associated with it, may hinder fire control efforts, there are limited trees in the landscape and spotting should not be severe. Impact on the precinct would be by a grass fire, which whilst potentially fast moving would be of lesser intensity and produce much less ember attack than a fire in forest.

Map 5 shows a history of large grass fires, including the 2014 Mickleham-Kilmore fire that started near Mickleham Road and spread northwards, generally away from the precinct, but burnt a small area in the west of the precinct. The fire burnt nearly 23,000 ha, destroyed 13 homes, a large number of livestock and other farm assets (AIDR, 2026).

The development of the precinct will extend the large, reliably low threat area of Mickleham North and Kalkallo that could provide a place of relative safety during bushfire.

[7] Whilst no part of the precinct is covered by the BMO, the broader landscape types provide a commonly used description of landscape-scale risk.

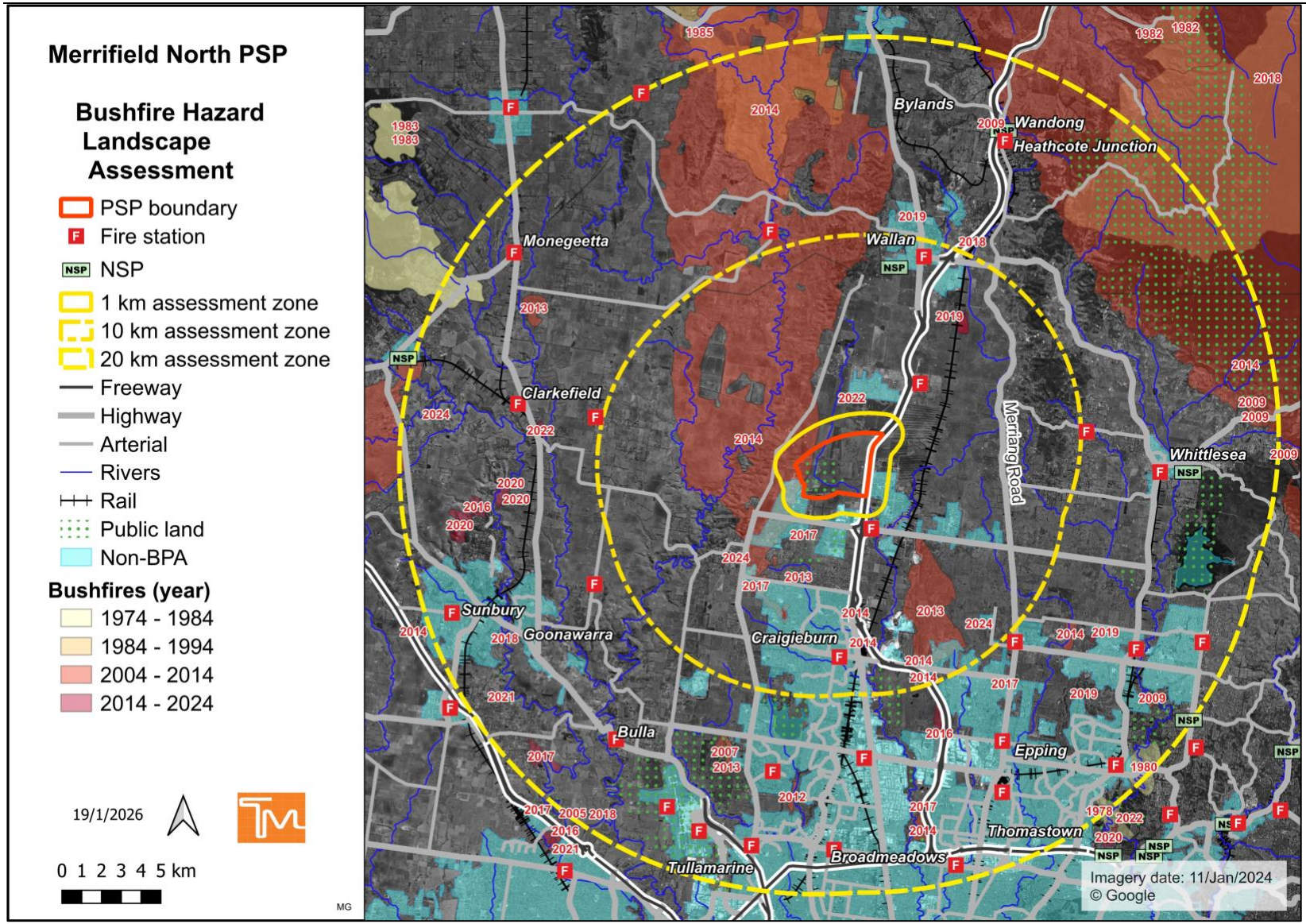
Table 2 - Landscape risk typologies (from DELWP, 2017a).

Broader Landscape Type 1	Broader Landscape Type 2	Broader Landscape Type 3	Broader Landscape Type 4
• *There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation).* • *Extreme bushfire behaviour is not possible.* • *The type and extent of vegetation is unlikely to result in neighbourhood-scale destruction of property.* • *Immediate access is available to a place that provides shelter from bushfire.*	• *The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site.* • *Bushfire can only approach from one aspect and the site is located in a suburban, township or urban area managed in a minimum fuel condition.* • *Access is readily available to a place that provides shelter from bushfire. This will often be the surrounding developed area.*	• *The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site.* • *Bushfire can approach from more than one aspect.* • *The site is located in an area that is not managed in a minimum fuel condition.* • *Access to an appropriate place that provides shelter from bushfire is not certain.*	• *The broader landscape presents an extreme risk.* • *Evacuation options are limited or not available.* • *Fires have hours or days to grow and develop before impacting.*
I N C R E A S I N G R I S K →			

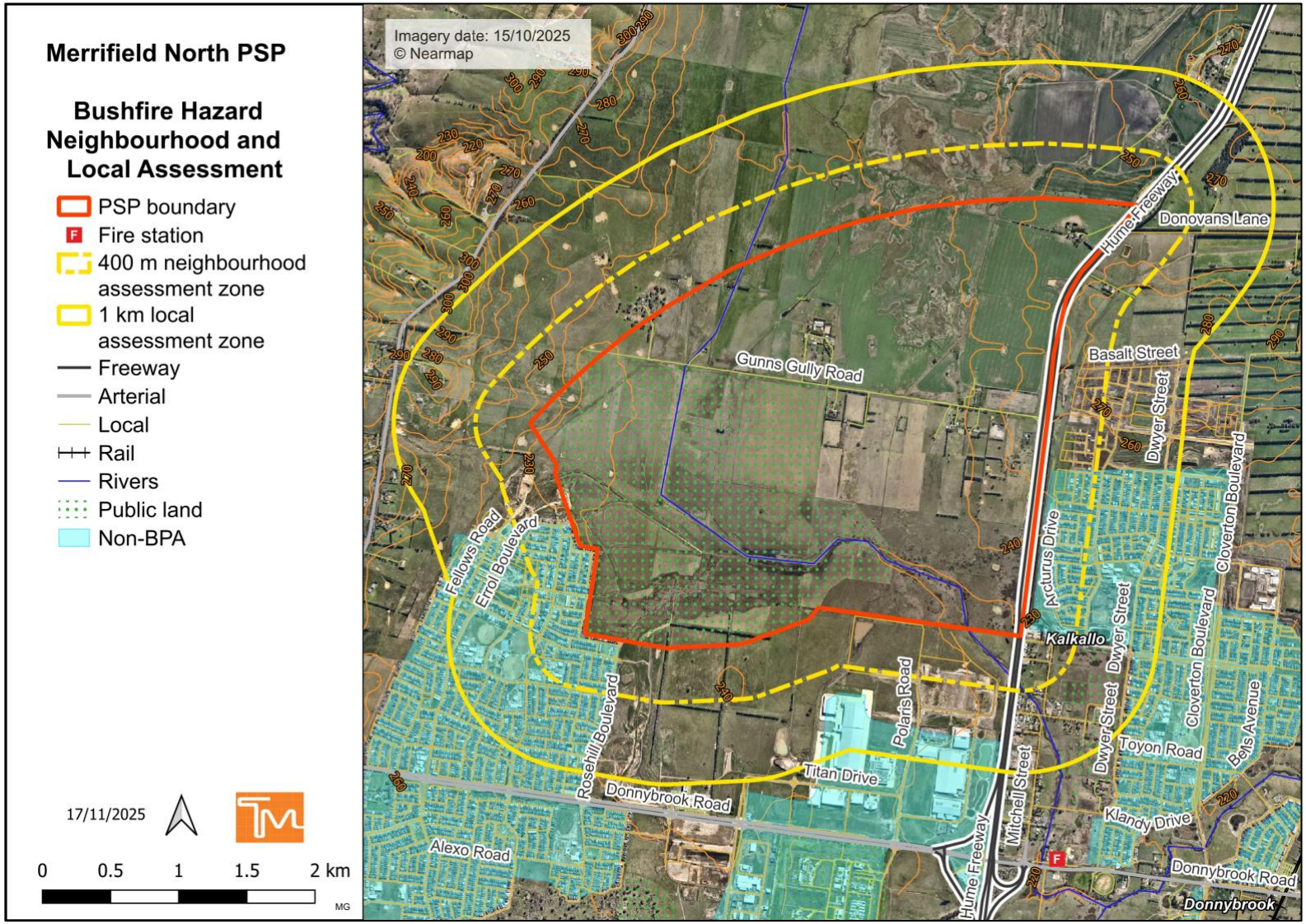
5.5.3 Local and neighbourhood scale hazard

The hazard within 400 m and 1 km of the precinct is flat grassland. A fire could start in paddocks to the north or west and spread rapidly towards the precinct under strong winds, with the potential to impact the edge of the precinct with little warning.

Access for people in the Merrifield North Employment Precinct would be readily available to large, reliably low threat or non-vegetated areas, either within the precinct after development or within neighbouring urban areas.



Map 5 - Bushfire hazard landscape assessment.



Map 6 - Bushfire hazard neighbourhood and local assessment.

5.6 Agency strategies and plans

5.6.1 Regional Bushfire Planning Assessments

As part of the response to the 2009 Victorian Bushfires Royal Commission, Regional Bushfire Planning Assessments (RBPAs) were undertaken across six regions that covered the whole of Victoria. The RBPAs provide information about 'identified areas' where a range of land use planning matters intersect with a bushfire hazard to influence the level of risk to life and property from bushfire. The RBPAs state that '*This information should be addressed as part of strategic land use and settlement planning at the regional, municipal and local levels'* (DPCD, 2012a; DPCD, 2012b).

The *Regional Bushfire Planning Assessment – Metropolitan Region* covers the City of Hume and the *Regional Bushfire Planning Assessment – Hume Region* covers Mitchell Shire. The area around the Merrifield North Employment Precinct is identified in the Hume RBPA as being in the Urban Growth Boundary and zoned for future growth but no specific bushfire issues are raised (DPCD, 2012a), whilst it is not mentioned in the Metropolitan RBPA (DPCD, 2012b).

5.6.2 Bushfire Management Strategies 2020

Strategic bushfire management planning in Victoria is jointly delivered by FFMVic, CFA, FRV, EMV and local government. A key output is a Bushfire Management Strategy for each of the six planning regions that cover the state. Each strategy informs more detailed operational-level planning, including municipal fire prevention planning, the Joint Fuel Management Program, and readiness and response planning.

The Metropolitan Bushfire Management Strategy covers the City of Hume, and the Hume strategy covers Mitchell Shire. Neither strategy makes specific mention of bushfire risk for the area around the Merrifield North Employment Precinct (other than the historical bushfires mentioned previously), whilst highlighting the hazard in the urban-forest interface to the east of Melbourne (DELWP, 2020b) and the large areas of mountainous forest in Hume Region (DELWP, 2020c).

Bushfire behaviour and house loss modelling show the area along the Hume Freeway, between the current urban edge and Wallan is rated as having the least risk (i.e. less than the lowest risk rating of 'Low-intermediate risk') for potential house loss in the both the Metropolitan (see Figure 7) and Hume (see Figure 8) regions (DELWP, 2020b; DELWP, 2020c).

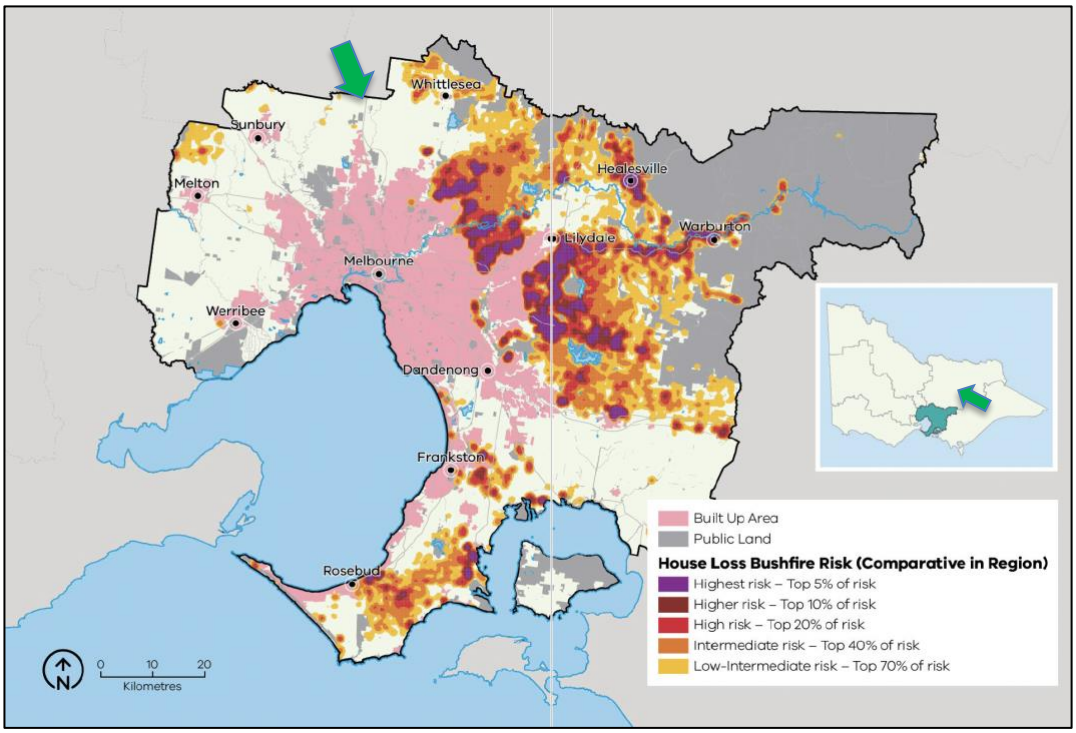


Figure 7 - Modelled risk of house loss – Metropolitan Region (DELWP, 2020b). Approximate location of precinct indicated by tip of green arrow.

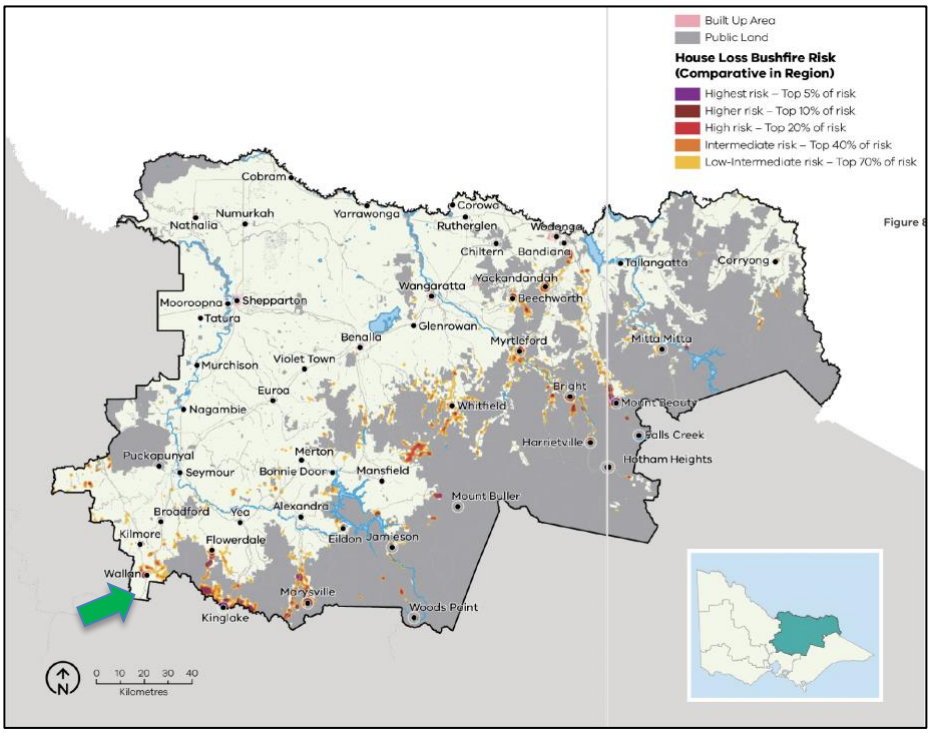


Figure 8 - Modelled risk of house loss – Hume Region (DELWP, 2020c). Approximate location of precinct indicated by tip of green arrow.

5.6.3 Joint Fuel Management Program

There are no Fire Management Zones or mechanical fuel management scheduled in the vicinity of the Merrifield North Employment Precinct (FFMVic, 2026). Further afield, public land at Mount Ridley Nature Reserve to the south is Landscape Management Zone (see Figure 9), where planned burning will focus on maintaining and improving ecosystem resilience, and fuel management will also be undertaken for risk reduction (FFMVic, 2026).

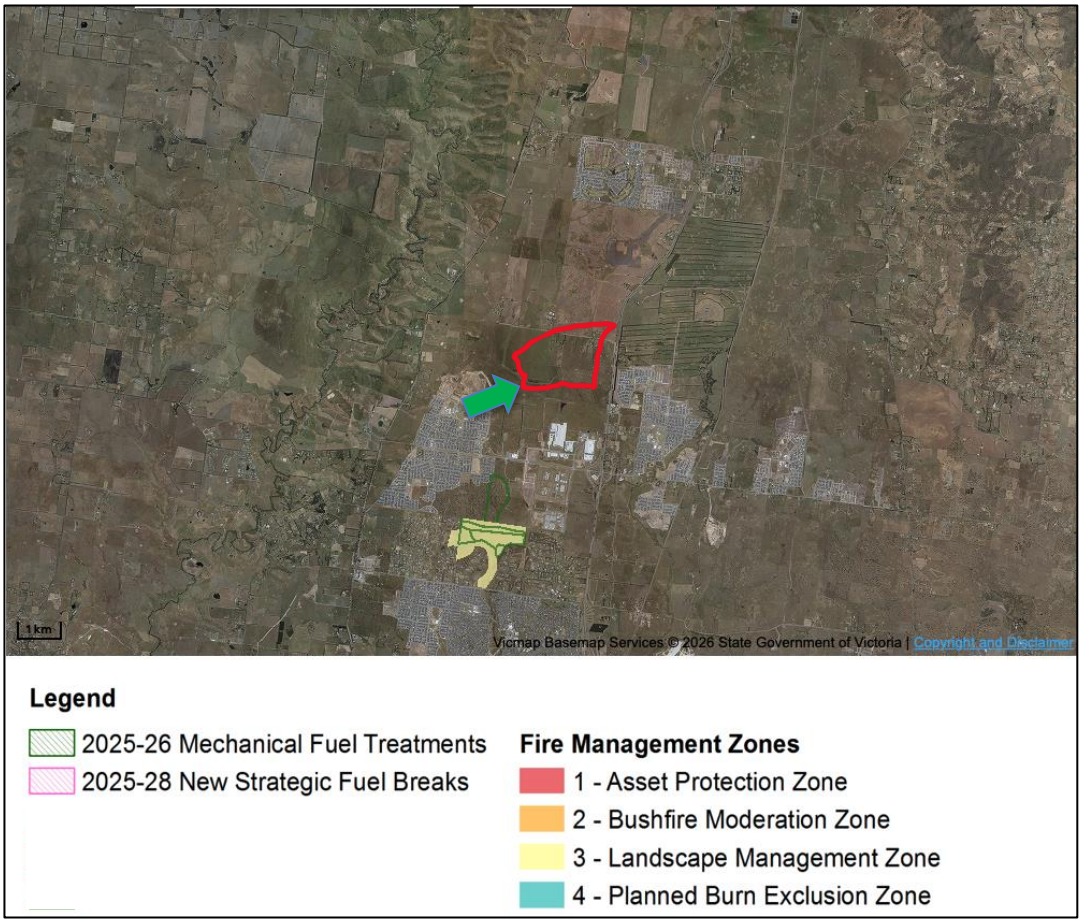


Figure 9 - Fire Management Zones in the vicinity of the Merrifield North Employment Precinct (FFMVic, 2026). Approximate location of precinct indicated by tip of green arrow and red outline.

6 Planning and design response

This section identifies how future development can respond to the bushfire risk, including the requirements of Clause 13.02-1S, published CFA and DTP guidance and the building regulations applicable to construction in a BPA.

6.1 Building setbacks

6.1.1 Setback distances

The 'Settlement planning' strategies at Clause 13.02-1S require:

- *'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 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018).*
- *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'* (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-1S, Mitchell Planning Scheme).

All future buildings, regardless of whether they are a building class that requires construction to a BAL under the Victorian building regulations, will need to be sufficiently setback[8] from classified vegetation so that radiant heat flux will be less than 12.5 kW/m^2. The setbacks required for Grassland, Shrubland and Woodland[9], based on the hazard assessment in Section 5 and determined using the simple Method 1 procedure of AS 3959:2018, are shown in Table 3 and an indicative map of potential setback requirements is provided in Map 7. This mapping is indicative only as the size and location of remnant vegetation being retained within the precinct has not been determined and there are not currently any draft development plans against which to show any overlaps into the developable area.

[8] The setback distance is measured from the edge of the classified vegetation to the external wall of the building, or for parts of the building that do not have external walls (including carports, verandas, decks, landings, steps and ramps), to the supporting posts or columns. The following parts of a building are excluded:

a) Eaves and roof overhangs.
b) Rainwater and domestic fuel tanks.
c) Chimneys, pipes, cooling or heating appliances or other services.
d) Unroofed pergolas.
e) Sun blinds (Standards Australia, 2020).

[9] A small area of Woodland may occur near the OMR to the north-west of the precinct, and Woodland is also a possible outcome if the small patches of Plains Woodland in the east of the precinct (DEECA, 2026) are protected and expanded.

Table 3 - Building setbacks for BAL-12.5.

Slope class	Vegetation	BAL-12.5 setback distance (defendable space)
All upslopes and flat land	Grassland	19 m
	Shrubland	19 m
	Woodland	33 m
Downslope >0-5°	Grassland	22 m
	Shrubland	22 m
	Woodland	41 m

The setbacks need to be measured from the edge of any classified vegetation. Classified vegetation outside of the precinct includes:

- Dry crops and pasture (classified as Grassland).
- Potentially a small area of trees near the site of the OMR, north-west of the precinct (potentially classifiable as Woodland).
- Areas of freshwater wetland (classified as Grassland or Shrubland), unless comprising reliably open water or wet areas with little or no vegetation (n.b. seasonally inundated wetlands that may be dry and vegetated during the fire danger period will comprise classified vegetation).

Conservation reserves and drainage reserves within the precinct could comprise a range of classified vegetation, including:

- Woodland (e.g. containing the patches of EVC 55 Plains Grassy Woodland found in the east of the precinct).
- Grassland (e.g. predominantly containing remnant EVC 132 Plains Grassland or introduced grasses).
- Shrubland (e.g. if some areas of wetland are considered hazardous).

The size of the reserves, their setback from buildings and other patches of classified vegetation, and how the naturally occurring and/or planted vegetation within them is managed during the fire danger period, will determine whether they are excludable as non-hazardous vegetation

Classified vegetation outside of the precincts all in the 'All upslopes and flat land' slope class, whilst vegetation retained along drainage lines within the precinct could be in the 'Downslope >0°-5°' slope class.

The setbacks would need to comprise low threat vegetation or non-vegetated areas.

Note that setbacks are not required from areas of unmanaged vegetation that meet one or more of the exclusion criteria for low threat vegetation (see Section 5.1.2), including:

- Single areas of vegetation less than 1 ha in area and at least 100 m from other areas of classified vegetation.
- Multiple areas less than 0.25 ha (2,500 m^2) in area that are at least 20 m from a building or each other.
- Strips of vegetation less than 20 m wide that are at least 20 m from a building, other strips or any other area of classified vegetation.

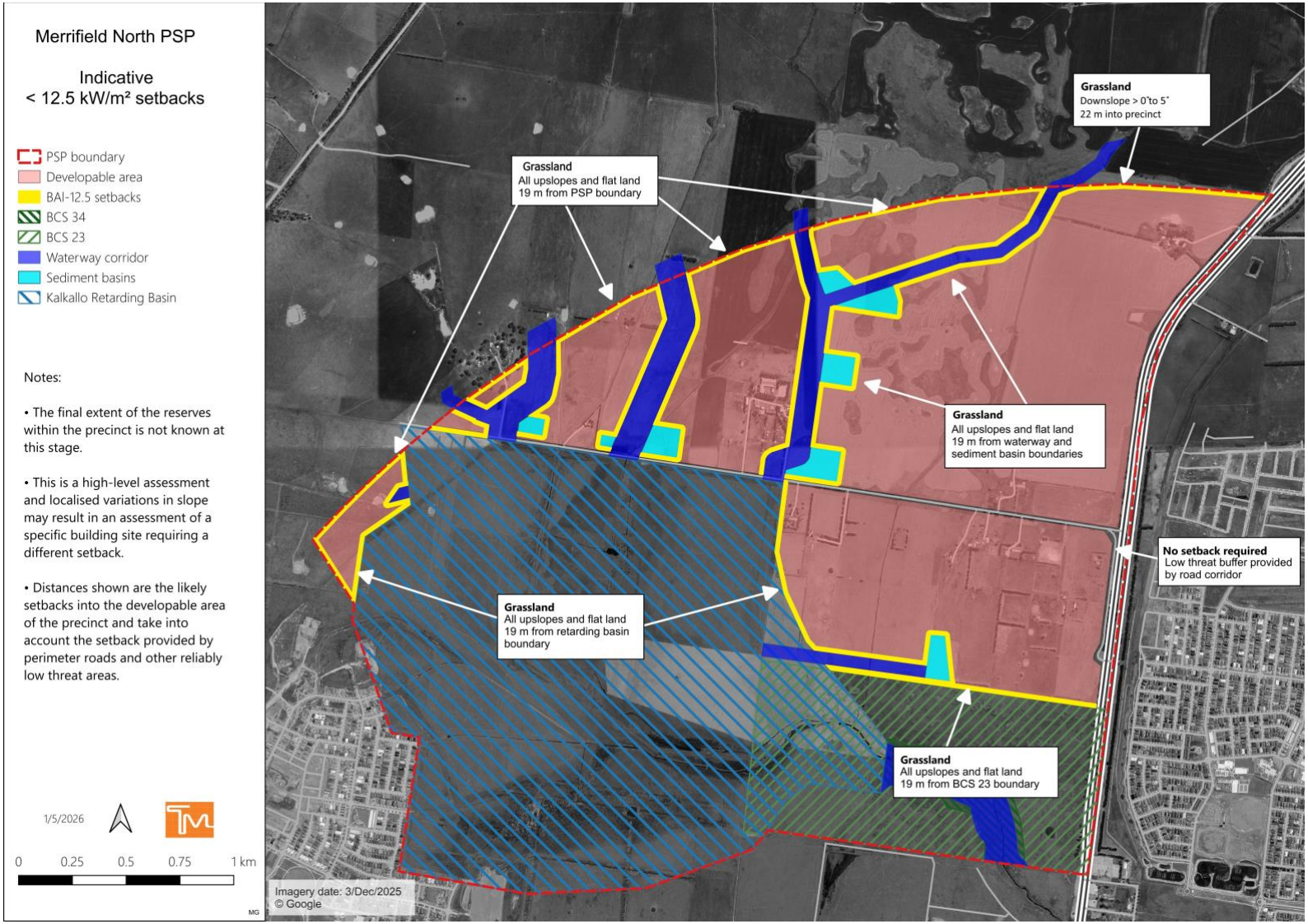
6.1.2 Interface design

The low threat setback can be achieved by a combination of:

- Setback of buildings within adjacent lots
- A perimeter road around the precinct or around an internal reserve (which is the desirable outcome)
- A managed low threat strip within or adjacent to the reserve.

These options are illustrated for a residential setting in Figure 10, but the principles can apply to a commercial/industrial setting such as the Merrifield North Employment Precinct.

Figure 10 – An example of a perimeter road, managed parkland and wetland with fringing vegetation. File photograph from Ballarat.



Map 7 - Indicative 12.5 kW/m² setbacks from classified vegetation outside the precinct and in potential conservation and drainage reserves.

6.1.3 Perimeter roads

Perimeter roads are a useful bushfire protection measure to provide a firm edge to the urban area and to facilitate property protection and fire fighting (see Figure 11) and can be included within the low threat setback area. Perimeter roads should meet the guidelines detailed in *Vehicle Access and Water Supply Requirements in Residential Developments* (CFA, 2022b).

In the long term, the future OMR will provide a substantial perimeter road for much of the western and northern boundary of the precinct; but as this is likely to occur after development of the precinct, interim bushfire setbacks will need to be provided. To the east, the Hume Freeway provides a perimeter road. The southern boundary is less critical as it abuts the developing low threat areas of the Merrifield West PSP and Merrifield Central Employment Area.

Perimeter roads should also be provided for all substantial conservation or drainage reserves to be created within the precinct. It appears likely that large areas of classified vegetation will be retained in the Kalkallo Retarding Basin and the marram baba Merri Creek Regional Parklands, incorporating Biodiversity Conservation Areas 23 and 34. The internal perimeter roads could provide most, or all, of the low threat setback required in response to Grassland or Shrubland. If the perimeter roads are to form part of the low threat setback, the roadsides will need to be maintained in a low threat state.

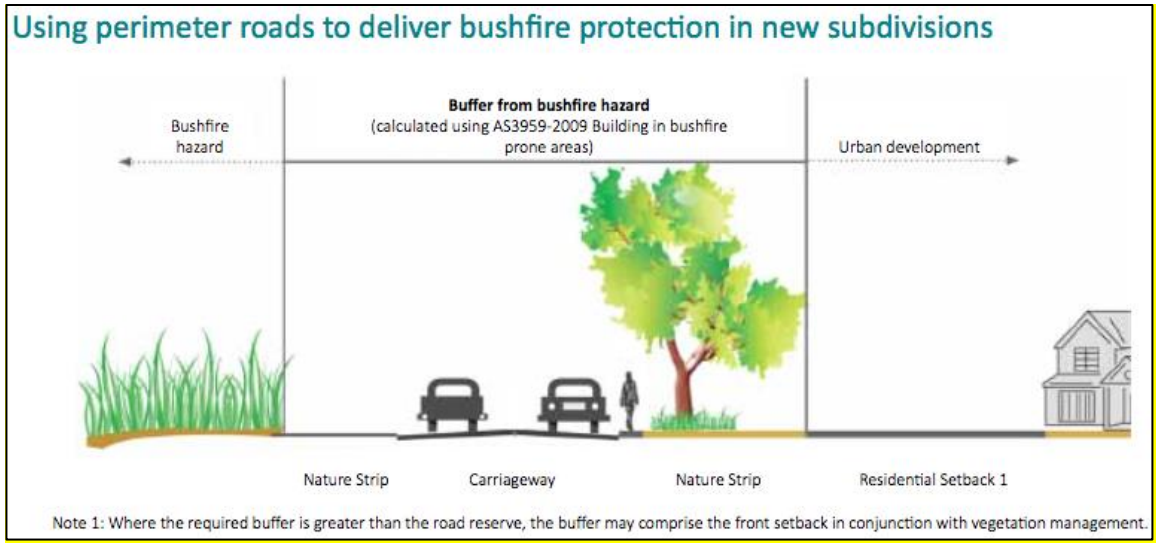


Figure 11 - Illustration of a perimeter road to provide required development setbacks (DELWP, 2015).

6.2 Bushfire Attack Level (BAL) construction standard

6.2.1 Industrial or commercial buildings

Industrial and commercial buildings are typically not of a building class that is required by the Victorian building regulations to be built to a BAL construction standard[10]. Thus, whilst they need to be sufficiently setback from classified vegetation (see Section 6.1), they will not need to be built to a BAL.

6.2.2 Accommodation buildings

We understand that the precinct is not intended for residential use. If, however, any Class 1, 2 or 3 buildings are to be built, they will need to be setback the required distance from classified vegetation (see Section 6.1.1) and constructed to a minimum BAL-12.5 in accordance with AS 3959:2018 *Construction of buildings in bushfire prone areas* or, for Class 1 buildings and associated decks only, the NASH Standard – *Steel Framed Construction in Bushfire Areas* (NASH, 2021).

6.2.3 Certain Class 9 buildings

The National Construction Code (NCC) 2025 (ABCB, 2026) requires additional bushfire protection measures for certain Class 9 buildings; namely Class 9a healthcare, Class 9b early childhood centres, primary or secondary schools, Class 9c residential care and a Class 4 part of a building associated with the nominated Class 9 uses.

If these types of buildings are constructed in the future, Specification 43 of NCC 2025 applies as a 'deemed-to-satisfy' pathway for buildings with a BAL rating of no more than BAL-12.5. Specification 43 prescribes minimum standards for:

- S43C1 Scope
- S43C2 Separation from classified vegetation
- S43C3 Separation between buildings
- S43C4 Separation from allotment boundaries and carparking areas
- S43C5 Separation from hazards
- S43C6 Non-combustible path around building
- S43C7 Access pathways
- S43C8 Exposed external areas
- S43C9 Internal tenability
- S43C10 Building envelope
- S43C11 Supply of water for fire fighting purposes

[10] Unless they are covered by the Bushfire Management Overlay (BMO) and trigger the requirement for a planning permit.

- S43C12 Emergency power supply
- S43C13 Signage
- S43C14 Vehicular access.

The ability of a Class 9 building to comply with S43C2, S43C3, S43C4, S43C8 and S43C14 may be influenced by the precinct design and for building compliance additional analysis and a performance-solution may be required for this type of development.

6.3 Access and egress

The *Design Guidelines: Settlement Planning at the Bushfire Interface* (DELWP, 2020a) list the elements of an effective road network as:

- Ensuring the spacing of roads leading away from the hazard are no more than 120 m apart on average.
- Designing road widths to meet planning scheme requirements and those of the relevant fire authority.
- Providing multiple roads leading away from the hazard edge.
- Ensuring travel to and from a location is not alongside a bushfire hazard and providing multiple access and egress routes within developed areas to minimise the use of perimeter roads during bushfire.
- Effectively connecting roads to the broader road network within the settlement (DELWP, 2020a).

The precinct is adjacent to the Hume Freeway in the east and will be serviced by the extension of Aitken Boulevard from the south. In the future, the OMR may abut the western boundary of the precinct. Subdivision design should provide for multiple roads linking to these major roads.

Future subdivisions should be designed to achieve the relevant characteristics outlined above[11] and provide adequate emergency vehicle access (see CFA, 2022b). This requirement should be included in the UGZ or another appropriate planning instrument intended to guide development in the precinct.

6.4 Vegetation management within the precinct

Vegetation on private property throughout the precinct should be maintained in a low threat state. This requirement should be included in the UGZ or another appropriate planning instrument intended to guide development in the precinct.

[11] The first dot point relating to the frequency of roads leading away from the hazard is intended for residential areas and may be more than is required for an industrial/commercial area.

Table 6 to Clause 53.02-5 in the Hume and Mitchell planning schemes can be used as a guide to managing vegetation in a low threat condition:

- Grass must be short cropped 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 m of a building, flammable objects must not be located close to the vulnerable parts of the building.
- Plants greater than 10 cm in height must not be placed within 3 m 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 sqm in area and must be separated by at least 5 m.
- Trees must not overhang or touch any elements of the building.
- The canopy of trees must be separated by at least 5 m.
- There must be a clearance of at least 2 m between the lowest tree branches and ground level (Clause 53.02-5, Hume Planning Scheme and Clause 53-02-5, Mitchell Planning Scheme).

Note these requirements apply to defendable space in higher hazard locations covered by the BMO and could be varied within the Merrifield North Employment Precinct. In practice, given the industrial/commercial focus of the precinct, vegetation on the private land within the precinct is likely to be limited to small areas of cultivated garden (e.g. at the front of premises) and areas of potentially unmanaged grass at the rear and/or on vacant lots.

6.5 Bushfire Site Management Plan

If the precinct is to be developed in stages, a Bushfire Site Management Plan or similar could be required to ensure that undeveloped land adjacent to areas being developed is managed in a low threat state (i.e. grass cut to less than 100 mm in height during the declared Fire Danger Period) until it in turn is rendered permanently low threat through urban development. This requirement should be included in the UGZ, or other appropriate planning instrument, intended to guide development in the precinct.

6.6 Excision of areas from the BPA

It is likely that as development progresses, some land within the Merrifield North Employment Precinct will become eligible to be excised from the BPA. DTP review and excise areas from the BPA approximately every 6 months, particularly in growth areas where the hazard is removed as urban development occurs.

Areas that may be eligible for excision as urban development progresses are:

- Land more than 60 m from classified Grassland, e.g. from the pasture and cropping outside precinct or grassland drainage or conservation reserves within the precinct; and
- Land more than 300 m from classified Woodland, e.g. from any substantial treed revegetation area.

Given the extent and distribution of the potential reserves within the precinct, the area able to be excised from the BPA may be limited.

6.7 Incorporating bushfire protection measures in the UGZ or other planning instrument

The inclusion of bushfire protection measures in the UGZ, or another appropriate planning instrument, can address bushfire risk early in the planning process. It can provide firm direction regarding bushfire protection measures to be determined at the planning permit stage for individual development applications.

The bushfire protection measure requirements can be incorporated into the planning ordinance as a sub-section titled 'Bushfire Management Requirements'. The following content is recommended:

- Direction that buildings are to be setback from classified vegetation external to and within the precinct to ensure radiant heat flux on buildings will be less than 12.5 kW/m^2 (see Section 6.1).
- Setback distances from Table 3 of this report presented in a table and/or shown on a map/s.
- Provision of perimeter roads on the interface with areas of enduring bushfire hazard external to and within the precinct. The perimeter road can form part of the low threat setback (see Section 6.1.3).
- Provision of multiple egress routes, away from the external and internal bushfire hazard interface (see Section 6.3).
- Roads are to comply with fire service requirements for emergency access/egress.
- Provision of water for fire fighting via a reticulated hydrant network, supplemented by static water supplies if required by NCC 2022 for the class and size of building (see Section 6.3).
- Inclusion of bushfire in the emergency management plans for businesses exposed to a bushfire hazard.
- Vegetation on private property to be maintained in a low threat condition (see Section 6.4).
- Requirement for subdivision applications to include a Bushfire Site Management Plan (see Section 6.5) identifying and confirming:
    - The staging of development.

- Management of interim bushfire hazard setbacks (i.e. grass to be cut to less than 100 mm in height until land is rendered permanently low threat through urban development).

7 Clause 13.02-1S Bushfire Planning

The following sub-sections provide a summary response about how development in the Merrifield North Employment Precinct can respond to the objectives and strategies for bushfire safety in the Policy Planning Framework at Clause 13.02-1S.

7.1 Protection of human life strategies

Clause 13.02-1S requires that the priority be given to protection of human life.

Prioritising the protection of human life over all other policy considerations

As identified in Section 5.5, the Merrifield North Employment Precinct is in a relatively low bushfire risk location. The protection of human life can be prioritised by:

- Ensuring future buildings are located where a BAL-12.5 construction standard (or BAL-LOW) can be achieved (i.e. providing setbacks for future buildings from unmanaged vegetation, such that radiant heat impacting upon the buildings can be expected to be below 12.5 kW/m^2).
- Applying the existing building regulations for construction in a BPA.
- Providing access and water supplies for fire fighting.
- Ensuring businesses exposed to a bushfire hazard develop a Bushfire Emergency Management Plan (BEMP) that addresses the risk and appropriate to their business operations.

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.

If future buildings are setback sufficiently from any hazardous vegetation such that they achieve a BAL-12.5 rating, or lower, the risk can be deemed to be acceptably mitigated. The nearest *lowest* risk locations are the adjacent urban-residential areas of the Merrifield West PSP to the south-west and the Lockerbie PSP to the south-east of the precinct, that are not in the BPA (see Map 6).

Reducing the vulnerability of communities to bushfire through consideration of bushfire risk in decision-making at all stages of the planning process

This report provides the basis for incorporating bushfire risk into decision making associated with planning for development in the precinct.

The CFA consider that community resilience to bushfire will be strengthened (and hence, presumably, vulnerability to bushfire will be reduced) when a strategic planning proposal demonstrates that Clause 13.02-1S strategies have been applied, and where a proposal takes advantage of existing settlement patterns so that new development will not expose the community to increased risk from bushfire.

The CFA provide principles to respond to Clause 13.02-1S including that settlement planning decisions should:

- Direct development to locations of lower bushfire risk.
- Carefully consider development in locations where there is significant bushfire risk that cannot be avoided.
- Avoid development in locations of extreme bushfire risk.
- Avoid development in areas where planned bushfire protection measures may be incompatible with other environmental objectives, such as protected wetlands.

It is considered that development of the Merrifield North Employment Precinct can appropriately implement the strategies in Clause 13.02-1S that aim to prioritise protection of human life and will, therefore, meet the fire service's strategic planning principles for bushfire.

7.2 Bushfire hazard identification and assessment strategies

Clause 13.02-1S requires that the bushfire hazard be identified, and appropriate risk assessment be undertaken.

Applying the best available science to identify vegetation, topographic and climatic conditions that create a bushfire hazard.

This report identifies the hazard in accordance with the commonly accepted methodologies of AS 3959:2018 and, as appropriate, additional guidance provided in *Planning Practice Note 64 Local planning for bushfire protection* (DELWP, 2015), *Planning Advisory Note 68 Bushfire State Planning Policy Amendment VC140* (DELWP, 2018) and *Planning Permit Applications – Bushfire Management Overlay,* Technical Guide (DELWP, 2017a).

The type and extent of (hazardous) vegetation within and around the precinct has been identified. Classification is based on the anticipated long-term state of the vegetation, EVC mapping, aerial imagery, site assessment, published guidance on vegetation assessment for bushfire purposes and experience with the fuel hazard posed by the vegetation types that occur within the region.

Publicly available contour data for the area was accessed which, along with the site assessment, determined that the topography is benign from a bushfire perspective.

In relation to climatic conditions and fire weather, the AS 3959:2018 default FFDI 100/GFDI 130 benchmark used in the Victorian planning and building system, has been applied as discussed in Section 5.4.

Considering the best available information about bushfire hazard including the map of designated bushfire prone areas prepared under the Building Act 1993 or regulations made under that Act.

The extent of BPA coverage has been considered (see Section 4.2) and is shown in Map 5. This is based on the most recent BPA mapping for the state.

Applying the Bushfire Management Overlay in planning schemes to areas where the extent of vegetation can create an extreme bushfire hazard.

BMO coverage reflects BMO mapping in the Hume and Mitchell planning schemes, and no part of the precinct is affected.

Considering and assessing the bushfire hazard on the basis of:

- ***Landscape conditions - meaning the conditions in the landscape within 20 kilometres and potentially up to 75 kilometres from a site;***
- ***Local conditions - meaning 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.***

The hazard has been assessed and described at the regional, municipal and local (site and neighbourhood) scale (see Section 5).

At the site scale, the assessment classified vegetation and topography within a 150 m assessment zone around the precinct.

At the landscape scale a 20 km radius of the precinct has been applied (see Map 5) in accordance with guidance about assessing risk for planning scheme amendments provided in the Planning Advisory Note 68 (DELWP, 2018) and Planning Practice Note 64 (DELWP, 2015).

Consulting with emergency management agencies and the relevant fire authority early in the process to receive their recommendations and implement appropriate bushfire protection measures.

The precinct is currently wholly in the country area of Victoria and so CFA is the responsible fire authority. A copy of this report should be provided to CFA for review.

Ensuring that strategic planning documents, planning scheme amendments, planning permit applications and development plan approvals properly assess bushfire risk and include appropriate bushfire protection measures.

DTP and CFA advisory and practice notes, Clause 13.02-1S and the building regulations invoked by the BPA coverage, specify the general requirements and standards for assessing the risk. These have been used in this report as appropriate and bushfire protection measures have been identified commensurate with the risk. Relevant regional bushfire plans have been identified, reviewed and incorporated into this assessment as appropriate.

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.

The risk can be deemed to be acceptably mitigated such that development can proceed if the objectives and strategies of Clause 13.02-1S are successfully implemented as identified in this report.

7.3 Settlement planning strategies

Clause 13.02-1S requires that settlement planning must strengthen the resilience of settlements and communities and prioritise protection of human life.

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 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018).

The applicable distances for buildings to be setback from classifiable vegetation, such that RHF is calculated to be below 12.5 kW/m^2 have been identified. Taking into consideration the assessment of landscape risk, implementation of these setbacks, combined with appropriate design of the interface with classified vegetation, can be deemed to acceptably mitigate the risk.

Ensuring the availability of, and safe access to, areas assessed as a BAL-LOW rating under AS 3959-2018 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018) where human life can be better protected from the effects of bushfire.

The nearest existing *lowest* risk locations, where BAL-LOW can be achieved, are the adjacent urban-residential areas of the Merrifield West PSP to the south-west and the Lockerbie PSP to the south-east of the precinct, that are not in the BPA (see Map 6). It is likely that upon completion of the proposed development of the Merrifield North Employment Precinct some areas within the precinct would also be assessed as BAL-LOW, but this cannot be determined until the size and distribution of reserves containing classified vegetation is finalised.

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.

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 reduce bushfire risk overall.

There will be no increase in risk to existing residents or community infrastructure if:

- Future buildings are setback from hazardous vegetation such that RHF is calculated to be below 12.5 kW/m^2, an appropriate water supply for fire fighting is provided via a reticulated hydrant system (supplemented by static water supplies if required under NCC 2025), and appropriate access/egress for emergency vehicles and workers is provided via a conventional road network.
- It is ensured that any hazardous vegetation retained or re-established, does not create an increase in the hazard exposure for neighbouring properties.

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 appropriately assesses and addresses the risk at a range of scales.

Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.

No alternative low risk development locations have been identified or assessed as part of this study. It is noted that the precinct is part of the North Growth Corridor.

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

If the setback distances from any hazardous vegetation, as identified in this report, are implemented, then construction can achieve a BAL rating not exceeding BAL-12.5. For development not requiring a BAL construction standard, setbacks can be provided such that RHF is calculated to be below 12.5 kW/m^2.

In the future, parts of the Merrifield North Employment Precinct may be excised from the BPA, in which case buildings in non-BPA parts of the precinct would be rated BAL-LOW.

7.3.1 Areas of high biodiversity conservation value

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

The precinct is covered by the Biodiversity Conservation Strategy and the Melbourne Strategic Assessment.

Urban development can be setback from future reserves to avoid unacceptable ecological outcomes arising from the need to manage high value vegetation and/or habitat in a low threat state.

7.3.2 Use and development control in a Bushfire Prone Area

Clause 13.02-1S requires that '*In a bushfire prone area designated in accordance with regulations made under the Building Act 1993, bushfire risk should be considered when assessing planning applications for the following uses and development:*

- *Subdivisions of more than 10 lots.*
- *Accommodation.*
- *Child care centre.*
- *Education centre.*
- *Emergency services facility.*
- *Hospital.*
- *Indoor recreation facility.*
- *Major sports and recreation facility.*
- *Place of assembly.*
- *Any application for development that will result in people congregating in large numbers'* (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-1S, Mitchell Planning Scheme).

It further states that:
'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'* (Clause 13.02-1S, Hume Planning Scheme and Clause 13.02-1S, Mitchell Planning Scheme).

Future development applications in the BPA, can achieve acceptable bushfire safety if:

- Setbacks for future development from classified vegetation are provided such that RHF is calculated to be below 12.5 kW/m^2.
- Adequate access and egress for emergency management vehicles is provided by an internal road network, including where possible, a perimeter road between the urban area and unmanaged vegetation to assist property defence and fire fighting.
- A reliable water supply for fire fighting is provided via a reticulated hydrant system (supplemented by static water supplies if required under NCC 2022).

8 Conclusion

This study has assessed the bushfire hazard in and around the Merrifield North Employment Precinct, in accordance with Clause 13.02-1S in the Hume and Mitchell planning schemes, the AS 3959:2018 methodology invoked by the Victorian planning and building system, and additional guidance provided in DTP planning and advisory notes, including:

- *Local planning for bushfire protection,* Planning Practice Note 64 (DELWP, 2015).
- *Planning Permit Applications – Bushfire Management Overlay,* Technical Guide (DELWP, 2017a)
- *Bushfire State Planning Policy Amendment VC140,* Planning Advisory Note 68, (DELWP, 2018).

The precinct is a designated BPA but is not covered by the BMO.

The precinct is in a relatively low bushfire risk landscape. In the directions from which a bushfire threat typically arises (north, north-west, west or south-west (Long, 2006)) the landscape is generally pastoral or comprises existing urban areas. Exposure to bushfire hazard will decrease as adjoining precincts are developed further.

If future buildings are setback sufficiently from any hazardous vegetation so that radiant heat flux will be 12.5 kW/m^2 or less, and bushfire protection measures are applied as outlined in this report (see Section 6.7) the bushfire risk can be deemed to be acceptably mitigated.

There are low risk urban-residential areas to the south-west and south-east of the precinct that are not in the BPA, and which offer a place of shelter from any bushfire that may occur.

The topography within and around the precinct is benign, with no significant changes in elevation or slopes that would significantly exacerbate the bushfire attack. For the purpose of determining setbacks from classified vegetation, the applicable slope class is 'All slopes and flat land' or 'Downslope >0°-5°'.

The type and extent of (hazardous) vegetation within and around the precinct has been identified and classified into AS 3959:2018 vegetation groups, based on EVC mapping, aerial imagery and site assessment. The classification is based on the current and likely future state of the vegetation. Areas of open pasture more than 100 mm in height and dry cropping, with less than 10% overstorey foliage cover, comprise Grassland.

The proposed conservation and drainage reserves could comprise classified Grassland, Woodland or Shrubland, depending on what vegetation is retained or re-established and how it is managed into the future. Urban development adjacent to these areas will be required to provide setbacks commensurate to reduce radiant heat flux on adjacent buildings to less than 12.5 kW/m^2.

Applicable setbacks are shown in the following table.

Slope class	Vegetation	BAL-12.5 setback distance (defendable space)
All upslopes and flat land	Grassland	19 m
	Shrubland	19 m
	Woodland	33 m
Downslope >0-5°	Grassland	22 m
	Shrubland	22 m
	Woodland	41 m

If eligible parts of the Merrifield North Employment Precinct are excised from the BPA as urban development permanently removes the bushfire hazard, no setbacks would be required.

Perimeter roads around the precinct and around conservation and drainage reserves containing classified vegetation should be incorporated where possible, to contribute to the setbacks for future development from any potentially hazardous vegetation, and to facilitate property protection and fire fighting. Much of the perimeter of the precinct is bounded by existing or proposed major roads.

Good access and egress for emergency management vehicles and workers, in the event of a bushfire, can be achieved via a conventional road network with multiple links to the Hume Freeway and Aitken Boulevard.

A reliable water supply for fire fighting can be provided via a reticulated hydrant system.

The application of the existing bushfire controls in the planning and building system can be deemed adequate to address bushfire risk.

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10 Appendix: BAL construction standards

Bushfire Attack Level (BAL)	Risk Level	Construction elements are expected to be exposed to…	Comment
BAL-Low	VERY LOW: There is insufficient risk to warrant any specific construction requirements but there is still some risk.	No specification.	At 4 kW/m^2 pain to humans after 10 to 20 seconds exposure. Critical conditions at 10 kW/m^2 and pain to humans after 3 seconds. Considered to be life threatening within 1 minute exposure in protective equipment.
BAL-12.5	LOW: There is risk of ember attack.	A radiant heat flux not greater than 12.5 kW/m^2.	At 12.5 kW/m^2 standard float glass could fail and some timbers can ignite with prolonged exposure and piloted ignition.
BAL-19	MODERATE: There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat.	A radiant heat flux not greater than 19 kW/m^2.	At 19 kW/m^2 screened float glass could fail.
BAL-29	HIGH: There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.	A radiant heat flux not greater than 29 kW/m^2.	At 29 kW/m^2 ignition of most timbers without piloted ignition after 3 minutes exposure. Toughened glass could fail.
BAL-40	VERY HIGH: There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.	A radiant heat flux not greater than 40 kW/m^2.	At 42 kW/m^2 ignition of cotton fabric after 5 seconds exposure (without piloted ignition).
BAL- FZ (Flame Zone)	EXTREME: There is an extremely high risk of ember attack and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.	A radiant heat flux greater than 40 kW/m^2.	At 45 kW/m^2 ignition of timber in 20 seconds (without piloted ignition).

Adapted from Standards Australia (2020).