Bushfire Development Report

for the Craigieburn West
Precinct Structure Plan

Report prepared for
the Victorian Planning Authority (VPA)

February 2020

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Terramatrix project code: VPA-2020-01 Cl1302_BPA-CraigieburnWestPSP
Cover image: Looking east at vegetation in the proposed Conservation Reserve.

Accountability

Stage	Date completed	Name	Title
Analysis & report preparation	2020-01-22	Hamish Allan	Manager, Bushfire Planning and Design
Peer review	2019-01-24	Jon Boura	Managing Director

Version Control

Version	Date issued	Comments	Issued by
1.0	2019-01-24	Bushfire Development Report (BDR) to client	Hamish Allan
1.1	2019-02-25	Amended BDR incorporating client comments	Hamish Allan

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Contents

Summary of recommendations and key findings

- ***The Craigieburn West Precinct Structure Plan (CWPSP) study area comprises approximately 564 hectares of land that, except for an area in the south of the precinct, is in a designated Bushfire Prone Area (BPA).***
- ***No part of the study area, or surrounding landscape for approx. 1.2km, is covered by the Bushfire Management Overlay (BMO).***
- ***Reliably low threat or non-vegetated areas will be created as development progresses, which will result in most of the precinct being able to be excised from the BPA.***
- ***The study area is in a relatively low bushfire risk location and the risk will lessen as development in and around the precinct is completed.***
- ***There are no identified obstacles to future development in the precinct complying with the applicable strategies at Clause 13.02-1S and the building regulations invoked by BPA coverage.***
- ***The hazard to development in the precinct is limited to Grassland and potentially, subject to the future vegetated state, one or more small areas of Woodland.***
- ***Most, or all, of the Grassland hazard to the north, east and south will be transformed into non-vegetated areas or areas of low threat vegetation associated with urban residential or other development in the abutting precincts.***
- ***The Mickleham Road reserve along the western boundary of the precinct will provide a 60m wide area of low threat or non-vegetated land. This will greatly assist in preventing a large-scale grassfire impacting the precinct. It will also provide the BAL setbacks required for future development and contribute to the likely excision of most of the precinct from the BPA.***
- ***The terrain in the precinct and in the surrounding landscape is relatively benign from a bushfire perspective, being predominantly flat or gently sloping. There are some minor downslopes associated with drainage lines, and under Grassland to the southwest.***
- ***A 19m setback of buildings from Grassland in the 'All upslopes and flat land' slope class, would be required for BAL-12.5 development.***
- ***At this early stage in the precinct planning process, the location, size and future state of vegetation in the precinct has not been finalised. Hence, it is not possible to be definitive about the location and extent of the applicable setbacks that will be required.***
- ***No setbacks will be needed from smaller or isolated areas of unmanaged vegetation that lack connectivity with larger areas and meet one or more of the exclusion criteria for low threat vegetation in AS 3959-2018.***
- ***The proposed planning scheme amendment giving effect to the PSP, should include an application requirement that all subdivision/development permits provide a Site Management Plan that addresses bushfire risk during and, where necessary, after construction, which is approved by the Responsible Authority.***

- ***A perimeter road should be provided between future development and the Conservation and Drainage Reserves, where development will have a permanent interface with classified Grassland.***
- ***A typical residential road network would provide acceptable access/egress, with the principle of providing at least two ways in and out for site occupants and emergency management vehicles, in directions away from the hazard.***
- ***An appropriate water supply for fire fighting can be achieved via a conventional reticulated hydrant system.***
- ***The creation of lots that back directly onto hazardous vegetation should be avoided.***

Glossary

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 expected 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 AS 3959-2018 *Construction of building in bushfire prone areas*.
Defendable space	An area of land around a building where vegetation is modified and managed to reduce the effects of flame contact and radiant heat associated with bushfire.
DELWP	*Department of Environment, Land Water 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* - 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.
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.
VPA	*Victorian Planning Authority*

1 Introduction

This Bushfire Development report has been prepared for the Victorian Planning Authority (VPA), to assess how the proposed development of the Craigieburn West Precinct Structure Plan (CWPSP) area can respond to the bushfire risk and the applicable Victorian planning and building controls that relate to bushfire. In particular, the objective and applicable strategies of Clause 13.02-1S *Bushfire planning* in the Planning Policy Framework (PPF) (Hume Planning Scheme, 2018b).

The VPA and Hume City Council, in conjunction with other stakeholders, are currently preparing a Place Based Plan (PBP) for the CWPSP. The precinct comprises approximately 564 hectares of land in the northern growth corridor of Melbourne, approximately 25km north of the Melbourne CBD (see Figure 1). The western boundary of the precinct is formed by Mickleham Road, which also comprises the Urban Growth Boundary (UGB), and therefore farming, rural living and low density residential land in Green Wedge Zone (GWZ) occurs to the west, northwest and southwest. Mt Ridley Road forms the northern boundary of the precinct, beyond which is the recently approved Lindum Vale PSP area. The soon to be completed Craigieburn PSP residential area abuts the precinct to the east, and the Greenvale North PSP area, which was approved in 2010, occurs to the south (Elton Consulting, 2019) The Greenvale North PSP includes the proposed R1 Investigation Area, which is likely to, largely or wholly, comprise residential development (see Map 1).

The PBP for the precinct will include a large residential area with open space networks, local parks, and an anticipated two new primary schools, along with community and recreation facilities (see Figure 2) (Elton Consulting, 2019). Approximately 38ha of land, located centrally within the northern part of the precinct, will be managed as a Conservation Reserve to protect an area of Grassy Eucalypt Woodland and Golden Sun Moth habitat. This area is identified as Conservation Area No. 29 in the Biodiversity Conservation Strategy (BCS) for Melbourne's growth corridors (DEPI, 2013) (see Map 1).

A stakeholder design workshop for the CWPSP agreed on a number of outcomes for the precinct including:

- *'Link creek lines, scatter tree, drainage lines and trees of landscape character to create linear parks and active open space*
- *Co-locate assets wherever possible, especially around the school precincts and town centre*
- *Retain water assets in their natural state as much as possible*
- *Create a shared path network along drainage lines*
- *Create a distinct identity based on the heritage and natural assets*
- *Include placemaking opportunities aligned with heritage and natural assets*
- *Extend the connector road south of Craigieburn Road*
- *Run connector streets along tree lines and the edge of BCS'* (Elton Consulting, 2019).

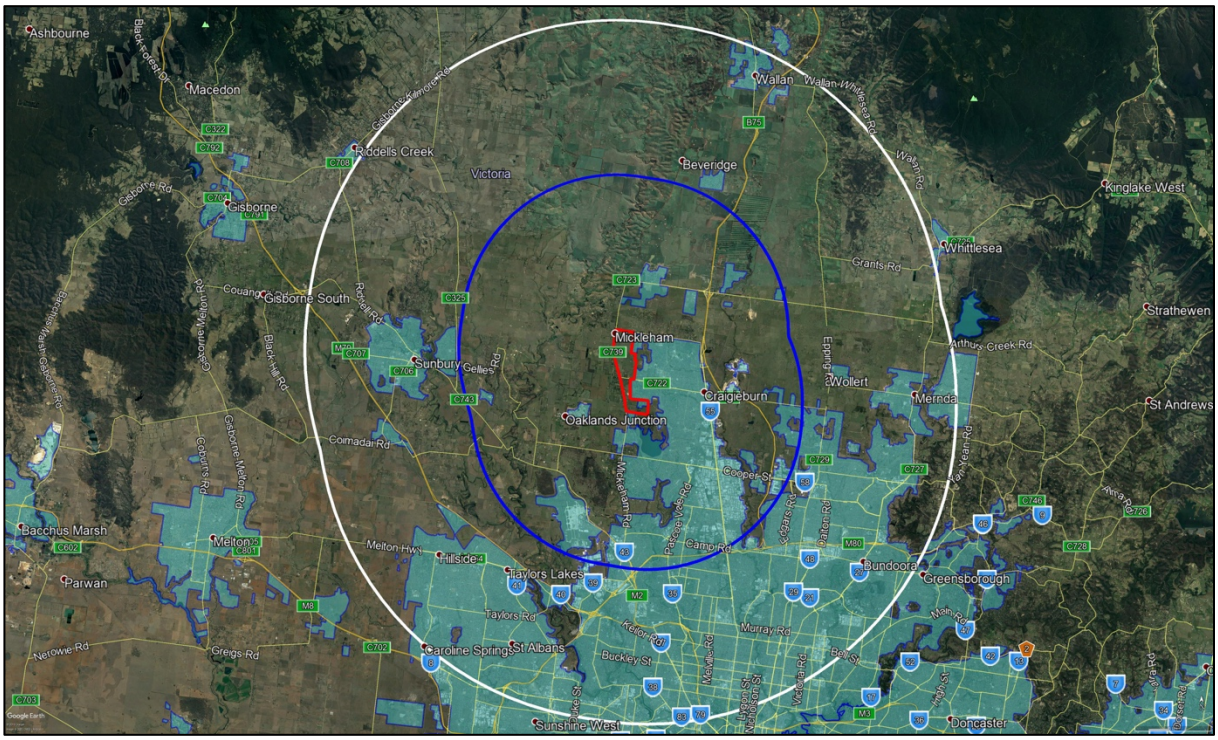
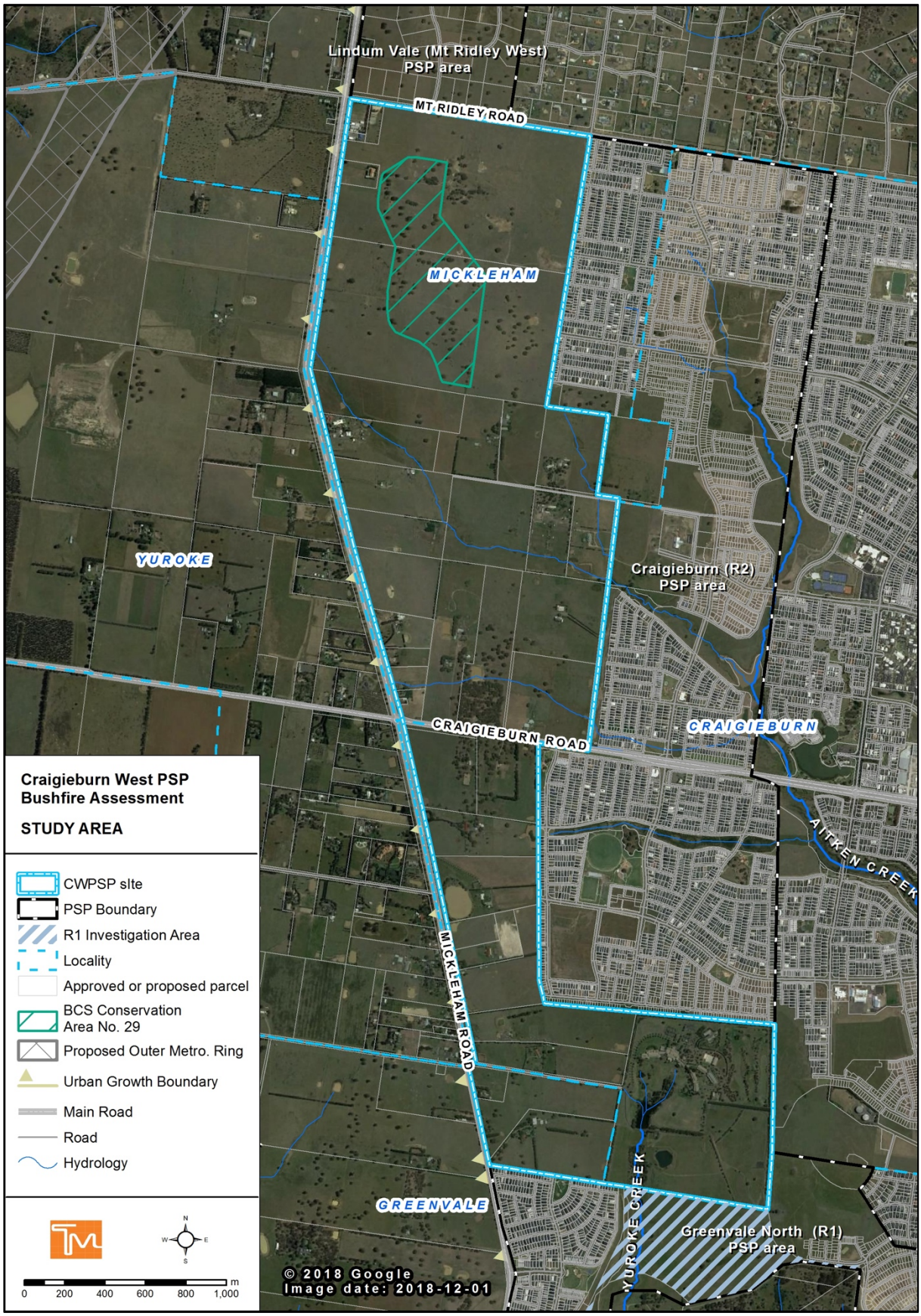


Figure 1 - Craigieburn West PSP landscape location (site in red outline, 10km buffer in blue outline and 20km buffer in white outline) (©Google 2019, Image ©2020 CNES/Airbus). Land *not* designated as a Bushfire Prone Area (BPA) is shown in semi-transparent blue shading (as per most recent gazettal of the BPA, 2019-09-11).

Most of the precinct, and land abutting it, is a Bushfire Prone Area (BPA). BPAs are those areas subject to or likely to be subject to bushfires, as determined by the Minister for Planning. Land that is not designated as a BPA is shown in Figure 1. Higher hazard land within a BPA that may be subject to extreme bushfire behaviour, is covered by the Bushfire Management Overlay (BMO). No part of the precinct is affected by the BMO and the nearest BMO coverage is 1.2km to the west (see Map 4).

This report assesses the bushfire hazard and identifies how development of the precinct can appropriately mitigate any bushfire risk, and respond to and comply with the applicable bushfire planning and building controls. It has been prepared in accordance with applicable guidance for the assessment of, and response to bushfire risk, provided in:

- *Bushfire State Planning Policy Amendment VC140*, Planning Advisory Note 68 (DELWP, 2018);
- *Local planning for bushfire protection*, Planning Practice Note 64 (DELWP, 2015a);
- AS 3959-2018 *Construction of buildings in bushfire prone areas* (Standards Australia, 2019), and in relation to the classification of landscape risk;
- *Planning Permit Applications Bushfire Management Overlay* Technical Guide (DELWP, 2017).



Map 1 - Study area.

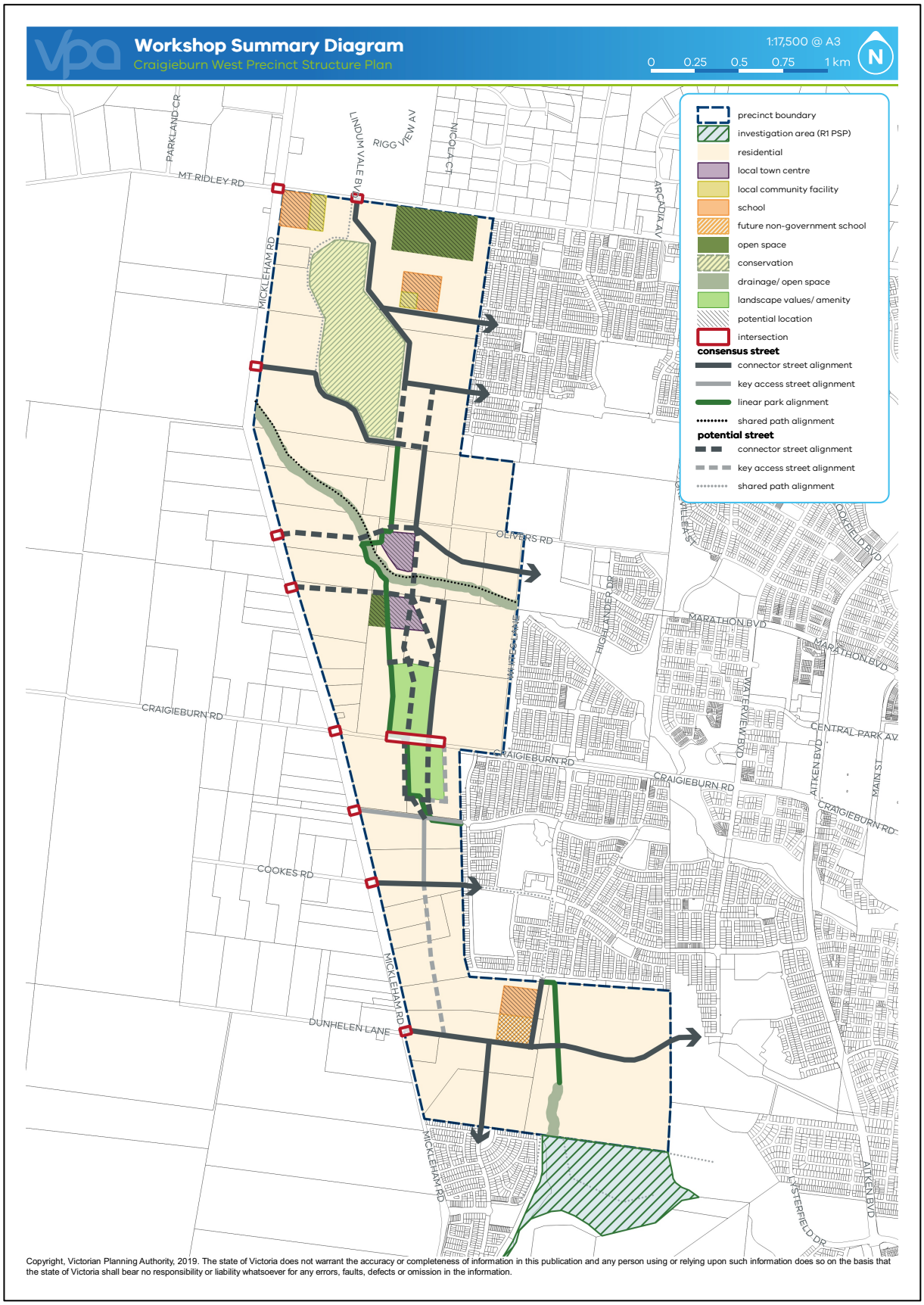


Figure 2 - Draft Place Based Plan (PBP) for the CWPSP (VPA, 2020).

2 Bushfire planning and building controls

This section summarises the applicable planning and building controls that relate to bushfire. Section 4 describes how planning and design for the PSP can respond to and comply with the controls.

2.1 Clause 13 Environmental risks and amenity

This clause in the Planning Policy Framework (PPF) has two key provisions pertinent to bushfire.

2.1.1 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. Specified strategies to achieve the objective are:

- *'Consider 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 or risk adaptation strategies to be implemented.*
- *Site and design development to minimise risk to life, property, the natural environment and community infrastructure from natural hazards'* (Hume Planning Scheme, 2018b).

Especially in southern and eastern Australia, since the 1950's 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, 2018). The Australasian Fire and Emergency Service Authorities Council (AFAC) identify that a failure of building codes and land use planning to adequately adapt to climate change is a significant risk (AFAC, 2018).

2.1.2 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*' (Hume Planning Scheme, 2018b). 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 Bushfire Prone Area;
- Subject to a Bushfire Management Overlay; or
- Proposed to be used or developed in a way that may create a bushfire hazard.

Priority must 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'* (Hume Planning Scheme, 2018b).

Key strategies are stipulated that require strategic planning documents, planning scheme amendments and development plan approvals to properly assess bushfire risk and include 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; and
- Any application for development that will result in people congregating in large numbers.

Development should not be approved 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*' (Hume Planning Scheme, 2018b).

This study assesses the hazard and identifies the bushfire protection measures that will be required for future development in the CWPSP area. It is considered that development can appropriately prioritise the protection of human life, and meet the objectives of Clause 13.02-1S, largely by ensuring future dwellings will not be exposed to RHF above 12.5kW/m^2, which is commensurate with a BAL-12.5 construction standard.

The maximum 12.5kW/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 3959-2009*'[1] (Hume Planning Scheme, 2018b).

Climate change in relation to fire weather is discussed in the hazard assessment in Section 3.5 of this report. Analysis of how the PSP can respond to the strategies in Clause 13.02-1S is provided in Section 4.5.

[1] AS 3959-2009 has been superseded by AS 3959-2018, which was invoked in the National Construction Code (NCC) in May 2019, therefore, all references to AS 3959-2009 should be read as the most recent version of the standard.

2.2 Clause 21.08 Natural environment and environmental risk

2.2.1 Clause 21.08-1 Natural heritage

The objective of this Clause is '*To protect, conserve and enhance natural heritage for biodiversity, amenity and landscape character purposes*' (Hume Planning Scheme, 2017a). A decision guideline for proposals that involve the removal or retention of native vegetation is '*The capacity to manage bushfire, grassfire and public safety risks*' (Hume Planning Scheme, 2017a).

2.2.2 Clause 21.08-4 Bushfire and flood risks

This clause identifies that the municipality encompasses areas of significant bushfire (grassfire) and flood risks (Hume Planning Scheme, 2017b). The stated objective is to minimise the risk to life, property and the environment from flood and bushfire. Identified strategies to achieve the objective are to:

- *'Ensure that subdivisions are appropriately designed to mitigate flood and bushfire risk.*
- *Ensure that development is appropriately sited to provide protection from flood and bushfire.*
- *Encourage planning decisions to prioritise protection of human life and adopt a precautionary approach.*
- *Consider the following principles for development in areas at risk of bushfire:*
  - *direct development to locations of lower bushfire risk and away from areas of high bushfire risk*
  - *avoid development in areas of extreme bushfire risk (BMO)*
  - *avoid development in areas where planned bushfire protection measures may be incompatible with other environmental objectives* (Hume Planning Scheme, 2017b).

These strategies are consistent with those in the PPF and it is considered that they can be appropriately implemented via the bushfire protection measures discussed in Section 4.

2.3 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 and sustainable development. However, in bushfire affected areas, the protection of human life must be prioritised over all other policy considerations (Hume Planning Scheme, 2018c).

2.4 Bushfire Prone Area (BPA)

Most of precinct and much of the surrounding land, is a designated Bushfire Prone Area (BPA) (see Map 4 and Map 5). BPAs are those areas subject to or likely to be subject to bushfire, as determined by the Minister for Planning. Those areas of highest bushfire risk within the BPA are designated as BMO areas.

In a BPA, the Building Act 1993 and associated Building Regulations 2018, through application of the National Construction Code (NCC), require bushfire protection standards for class 1, 2 and 3[2] buildings, 'Specific Use Bushfire Protected Buildings'[3] and associated class 10A buildings[4] or decks. The applicable performance requirement in the NCC is:

> *'A building that is constructed in a designated bushfire prone area must, to the degree necessary, be designed and constructed to reduce the risk of ignition from a bushfire, appropriate to the —*
>
> *(a) potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire; and*
>
> *(b) intensity of the bushfire attack on the building'* (ABCB, 2019).

Compliance with *AS 3959-2018 Construction of buildings in bushfire prone areas* (Standards Australia, 2019) is 'deemed-to-satisfy' the performance requirement[5].

Applicable buildings must be constructed to a minimum Bushfire Attack Level (BAL)-12.5, or higher, as determined by a site assessment or planning scheme requirement.

A BAL is a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. There are six BALs defined in AS 3959-2018, which range from BAL-LOW, which has no bushfire construction requirements to BAL-FZ (Flame Zone) where flame contact with a building is expected (see Appendix 1).

Larger developments and certain vulnerable uses in a BPA (see Section 2.1.2) are also required by Clause 13.02-1S *Bushfire planning* 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'* (Hume Planning Scheme, 2018b).

There are no significant obstacles to future development in the CWPSP complying with the applicable strategies at Clause 13.02-1S and the building regulations invoked by the BPA coverage. Reliably low threat or non-vegetated areas will be created as development progresses, which will result in the urbanised parts of the precinct being able to be removed from the BPA.

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

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[2] 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.

[3] Specific Use Bushfire Protected Buildings are defined in the Victorian *Building Regulations 2018,* they generally comprise 'vulnerable' uses and include schools, kindergartens, childcare facilities, aged care facilities and hospitals.

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

[5] For Class 1 and associated Class 10a buildings, the *NASH Standard for Steel Framed Construction in Bushfire Areas* is also deemed to satisfy the performance requirement.

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

- At least 300m from areas of classified vegetation (except grassland) larger than 4ha in size; and
- At least 150m from areas of classified vegetation (except grassland) 2 to 4ha in size; and
- At least 60m from areas of unmanaged grassland more than 2ha in size (DELWP, 2015b).

For isolated areas of vegetation greater than 1ha but less than 2ha, the shape of the area and connectivity to any other hazardous vegetation is a further consideration (DELWP, 2015b).

2.5 Other controls

2.5.1 Zoning

Approximately the northern two-thirds of the precinct is in the Farm Zone (FZ), with the balance of the land being Urban Growth Zone (UGZ). It is anticipated that all of the CWPSP area will become Urban Growth Zone (UGZ) with an associated Schedule. The existing or potential future zoning does not have any significant bushfire safety implications. Whilst the UGZ, or another urban residential zone, will facilitate more intensive development in a BPA, the existing building and planning controls will be able to appropriately mitigate the relatively low bushfire risk. As identified above, as development progresses, large areas within the precinct will become eligible for excision from the BPA.

It is noted that in many PSP growth areas, UGZ schedules[6] include a requirement that an application for residential subdivision, includes a Site Management Plan to be approved by the responsible authority, which addresses bushfire risk during, and where necessary, after construction, including specifying:

- The staging of development and the likely bushfire risks at each stage;
- An area of land between the development edge and non-urban areas consistent with the separation distances specified in AS 3959-2018, where bushfire risk is managed;
- The land management measures to be undertaken by the developer to reduce the risk from fire within any surrounding rural or undeveloped landscape to protect residents and property from the threat of grassfire and bushfire; and
- How adequate opportunities for access and egress will be provided for early residents, construction workers and emergency vehicles.

This requirement should be considered for the CWPSP as it helps to ensure that bushfire risk is managed during the pre-development and construction phase, when areas of interim hazard may be retained in proximity to new or existing development. It also enables subdivision applications to demonstrate how bushfire risk will be mitigated in a Clause 13.02-1S response/application.

[6] Including the UGZ 11 in the Lindum Vale PSP area to the north of the CWPSP area (Hume Planning Scheme, 2019).

2.5.2 Overlays

Neither existing, nor any future overlay controls, have any appreciable implications for bushfire safety. It is noted that the nearest area of BMO coverage is a relatively small area over 1.2km to the west of the precinct.

3 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 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'* (Hume Planning Scheme, 2018b).

This section includes a bushfire assessment at:

- The wider landscape scale, for at least 20km around the site (see Figure 1 and Map 4);
- The local landscape scale extending up to 1km from the site (see Map 5);
- The neighbourhood scale up to 400m around the precinct boundary to identify any risk arising around the site beyond the BAL assessment zone (see Map 5); and
- The site scale, for 150m around the precinct to determine classified vegetation, slope and likely future BALs (see Map 2).

The BPA coverage invokes AS 3959-2018, which requires a site assessment of the vegetation and topography up to 100m around a building, for the purposes of determining the applicable BAL construction standard for that building (Standards Australia, 2019).

3.1 Classified vegetation

Vegetation within a 150m assessment zone around the site has been classified in accordance with the AS 3959-2018 methodology. Classified vegetation is vegetation that is deemed hazardous from a bushfire perspective. Note that for the purposes of determining BAL construction standards for buildings, vegetation and topography within 100m of the building or site is assessed. As a precaution, a more conservative 150m assessment zone has been applied in this study.

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 is largely based on the structural characteristics of the vegetation at maturity, but the key determinant should be the likely fire behaviour that it will generate.

The classification is based on the current and likely future long-term state of the vegetation, according to the draft Place Based Plan for the CWPSP and the proposed future urban structure of adjacent PSPs (see Map 6 and Map 7).

3.1.1 Grassland

The dominant hazard in and around the precinct is Grassland. Grassland is defined as all forms of vegetation (except Tussock Moorlands) including situations with shrubs and trees, if overstorey foliage cover is less than 10% (includes pasture and cropland) (Standards Australia, 2019).

Grassland is considered hazardous and therefore classifiable, when it is not managed in a minimal fuel condition. Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (e.g. short-cropped grass, to a nominal height of 100 mm) (Standards Australia, 2019). Grassland areas are assumed to be unmanaged and classifiable unless there is 'reasonable assurance' that they will be managed in perpetuity, in a low threat state, no more than 100mm high.

Except for the proposed Conservation Reserve and potentially Drainage Reserves (see Section 4.1.2), all areas of Grassland that currently occur within the precinct are a short to medium-term hazard, as they will be transformed into low threat vegetation (i.e. domestic gardens, local parks and streetscapes), or will become non-vegetated land, as the precinct is developed. Similarly, most of the land to the north, south and east comprises, or will comprise, non-vegetated areas and areas of low threat vegetation, as development in neighbouring precincts is completed (see Figure 13). Any areas of unmanaged Grassland within 100m of buildings will be hazardous and classifiable if they do not meet one or more of the exclusion criteria under which land can be deemed to be non-hazardous (see Section 3.3). It is noted that there is a proposed Conservation Reserve in the Lindum Vale PSP immediately to the north of Mt Ridley Road to the north-northeast of the Craigieburn West precinct (see Map 4).

Extensive areas of Grassland occur for tens of kilometres beyond Mickleham Road to the west, northwest and southwest, which will remain a hazard as this land is beyond the Urban Growth Boundary (see Figure 5). It is noted that the Mickleham Road reserve is anticipated to provide an approximately 60m wide low threat and non-vegetated setback from Grassland in these directions (see Figure 6 and Figure 16). To the north, Mt Ridley Road is anticipated to provide a 40m wide low threat and non-vegetated setback (see **Figure 12**). Further north of Mt Ridley Road, most of the land in the Lindum Vale PSP will comprise low threat and non-vegetated land as development in this recently approved PSP occurs (see Map 6).

Most, or all, of the proposed Conservation Reserve located centrally in the northern part of the CWPSP area, and potentially other reserves (such as the proposed east-west oriented Drainage Reserve) will comprise hazardous Grassland if they are not managed in a minimal fuel condition. If so, such areas will need to be sufficiently separated (setback) from future development by low threat or non-vegetated land (e.g. in response to flat or upslope Grassland, a 19m setback is required for BAL-12.5 construction of future buildings (see Section 4.1)). If natural recruitment over time, and/or active revegetation, occurs within reserves, they may comprise higher hazard Woodland vegetation for which greater setback of development would be required (see discussion below).

Figure 3 - Looking northeast from Whites Lane at Grassland in the precinct, north of Craigieburn Road.

Figure 4 - Looking north across a drainage/open space reserve that comprises Grassland, in the Craigieburn PSP to the west of the precinct. This reserve is proposed to extend west through the CWPSP (see Map 6).

Figure 5 – Looking northwest from the CWPSP at Grassland vegetation with scattered trees and shelterbelts. Note that treed vegetation with a grassy understorey is classifiable as Grassland if overstorey foliage cover does not exceed 10% and the understorey fuel hazard does not increase significantly as a result of natural recruitment or revegetation.

Figure 6 - Looking north along the Mickleham Road reserve, which will provide an approximately 60m wide low threat and non-vegetated setback from hazardous Grassland to the west of the precinct.

3.1.2 Forest

A small pine plantation on private land to the west of the precinct, north of Craigieburn Road, is likely to be within 100m of future buildings in the CWPSP (see Map 2 and Map 6). Pine (and Eucalypt) plantations are classified as Forest. Whilst it may generate a localised increase in ember attack, it will be more than 48m from future buildings[7] and therefore, due also to its relatively small size, it is not a significant hazard or influence on BAL outcomes and bushfire safety in the precinct.

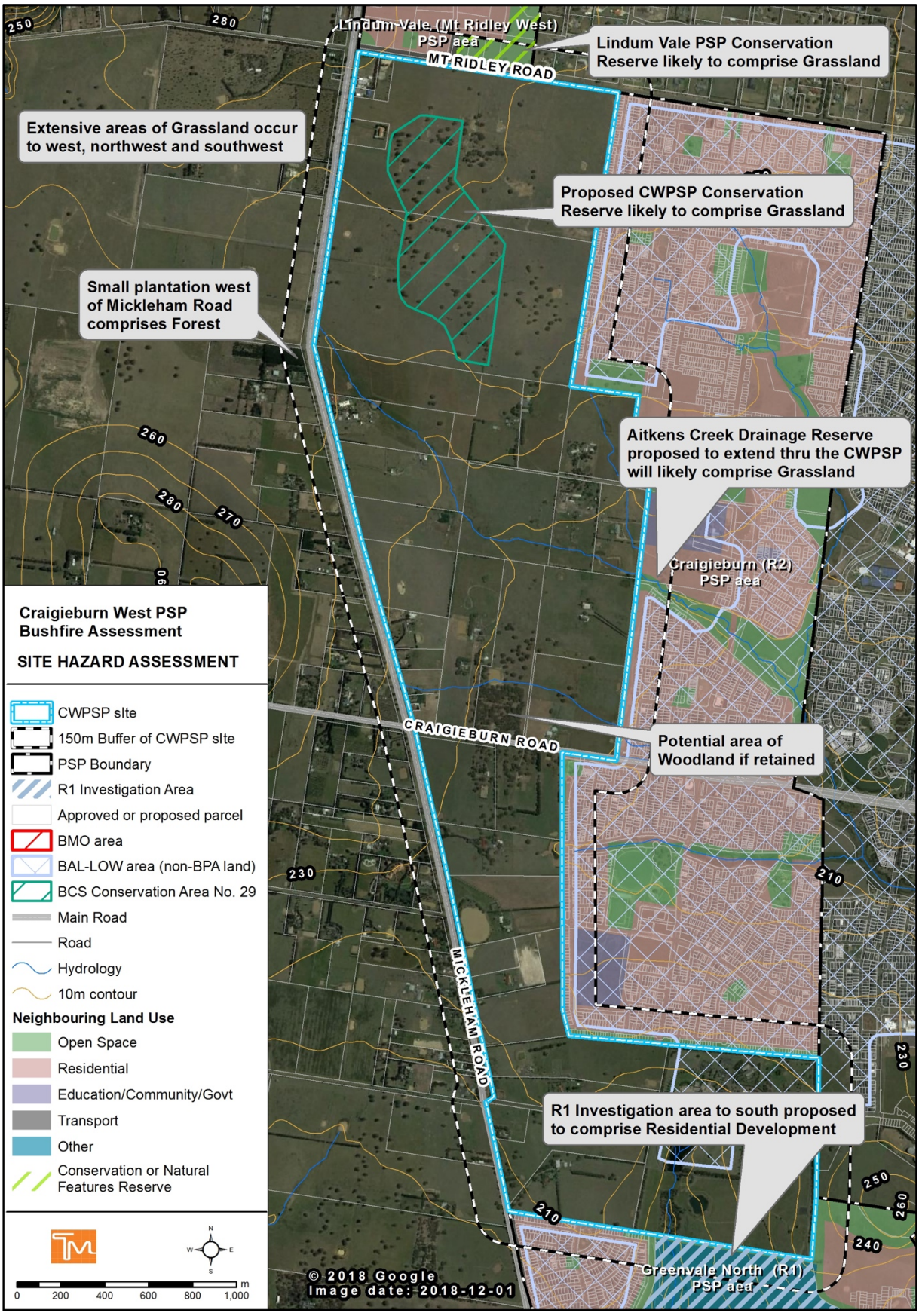
3.1.3 Woodland

Areas of tree and shrub vegetation in and/or around the precinct, where overstorey foliage cover exceeds 10%, will be classifiable within the Woodland group of AS 3959-2018 if they do not meet one or more of the exclusion criteria (see Section 3.3). Woodland is defined as vegetation with trees 10-30m tall, 10–30% foliage cover dominated by eucalypts (and/or callitris) with a prominent grassy understorey, and may contain isolated shrubs (Standards Australia, 2019).

Some areas of regenerating Woodland that may be more of a hazard than Grassland, occur around the precinct, including west of Mickleham Road opposite the Mickleham Primary School (see Figure 7 and Figure 10). These areas are, however, relatively small and may pose no more than a Grassland hazard if they do not develop a significant elevated fuel layer. They are likely to be sufficiently distant from the precinct not to be a concern or influence on BALs of future buildings.

Figure 7 - Looking west at a potential Woodland area, west of Mickleham Road opposite Mickleham Primary School. The area does not currently pose more than a Grassland hazard.

[7] 48m is the required minimum setback from Forest on flat or upslope land, for BAL-12.5 construction of buildings.



Map 2 - Bushfire hazard site assessment map.

3.2 Open space reserves

Areas of managed open space, such as local parks in the precinct and road reserves in and around the precinct, are likely to meet one or more of the criteria for low threat vegetation and be deemed non-hazardous. However, the Conservation Reserve and Drainage Reserves are likely to comprise hazardous vegetation, from which buildings will need to be appropriately setback (see Section 4.1.2, Map 6 and Map 7).

3.2.1 Conservation reserves

The proposed Conservation Reserve (and any other areas of unmanaged parkland) is unlikely to pose a greater hazard than classified Grassland. This is based on previous assessment and analysis by Terramatrix of the Plains Grassy Woodland EVC[8] that occurs in the precinct and wider region, including in the Mount Ridley Grasslands Nature Conservation Reserve (MRGNCR) approximately 1.4km to the northeast of the CWPSP area (see Map 4).

River Red gums (*Eucalyptus camaldulensis*) are the dominant tree species, occurring generally as scattered or small patches of trees, approximately 10-20m tall. In most place their overall foliage cover appears not to exceed 10%, which is the benchmark canopy cover figure for this EVC (DSE, 2004). The understorey is dominated by grasses, other graminoids and herbs. This matches the benchmark descriptor for EVC 55-61 Plains Grassy Woodland:

> *'An open, eucalypt woodland to 15 m tall. Occupies poorly drained, fertile soils on flat or gently undulating plains at low elevations. The understorey consists of a few sparse shrubs over a species-rich grassy and herbaceous ground layer. This variant occupies areas receiving approximately 500 – 700 mm annual rainfall'* (DSE, 2004).

If foliage cover were to exceed the 10% threshold and a more extensive shrubby understory develop, there may be an argument to classify areas of remnant treed vegetation in the higher hazard Woodland classification.

The AS 3959-2018 approach considers that Woodland is a greater threat to development than Grassland. Woodland is presumed to have a relatively high fuel load (15 t/ha understorey fuel and 25 t/ha total fuel load), whereas unmanaged grassland has a presumed fuel load of 4.5 t/ha (Standards Australia, 2019). Different equations are used to calculate rates of spread, flame lengths and resultant radiant heat impacts from fires burning in these vegetation types. A greater setback of buildings (defendable space distance) is required from Woodland than from unmanaged Grassland.

The assumptions about the increased hazard of Woodland at this site are considered less valid. The River Red-gums (in their mature state) are generally scattered, they contribute very little bark fuel hazard and any increase in surface fuel due to litter fall is restricted to their immediate vicinity. There is no significant elevated fuel layer, and the density of grass and other near-surface fuel appears to be broadly consistent regardless of the overstorey.

[8] Ecological Vegetation Class (EVC) No. 55, *Plains Grassy Woodland,* in the Victorian Volcanic Plains Bioregion (DEPI, 2013).

Trees can in fact contribute to a reduction in the speed of the wind reaching the flame front of a fire burning through the grass, and hence actually serve to moderate fire behaviour in respect to forward rate of spread and intensity. The relatively low fuel load, paucity of ladder fuels (e.g. shrubs and bark) and large gaps in the tree canopy will preclude crown fire. Cheney and Sullivan (2008) state that fire behaviour in woodland and open forests with a grassy understorey is similar to that of a grass fire but with the rate of spread approximately half to one third of that in open grassland due to the trees reducing the speed of the wind reaching the flames.

Luke and McArthur (1978) also state that the McArthur Forest Fire Danger Meter used for predicting fire behaviour should not be used in woodland communities where the ground cover consists of grasses and herbs and instead recommend application of the Grassland meter adjusted to account for a lower wind speed relationship (in Yeo *et al.*, 2014).

Note that AS 3959-2018 classifies open woodland and low open woodland as grassland, on the basis of the understorey (Standards Australia, 2019).

The BCS identifies that the proposed Conservation Reserve meets the definition of Grassy Eucalypt Woodland under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DEPI, 2013). The EPBC listing advice for this vegetation type identifies that *'The structure of the Grassy Eucalypt Woodland of the Victorian Volcanic Plain is an open eucalypt woodland with a predominantly grassy understorey...*' (Threatened Species Scientific Committee, 2008).

If the future management strategy for the Conservation Reserve is to manage the vegetation in accordance with the EVC benchmark and Grassy Woodland vegetation type, the vegetation assessment and Grassland classification will remain valid.

It is noted that the Conservation Management Plan for the MRGNCR states that vegetation quality should remain within 10% of the baseline data or otherwise be higher and improve in condition every year. A key strategy is to implement a fire regime within the MRGNCR with the objective of burning the whole of the conservation area on at least a four year rotation to maintain inter-tussock spaces and manage tree and shrub cover at the relatively low levels associated with the grassy woodland community as described in the EVC benchmark (Mueck, 2012).

The Conservation Management Plan states that without management, the vegetation will develop dense swards of rank grass with few inter-tussock spaces. Biomass management essential to maintain areas of habitat in optimal condition, particularly for the Golden Sun Moth, which occurs in the CWPSP area and requires inter-tussock spaces for mating success (Mueck, 2012).

Burning is also proposed to manage regeneration of the River Red-gums. *'While some regeneration of this canopy species is desirable, in the absence of fire this species is likely to reproduce prolifically and produce dense stands of small saplings. This is undesirable as dense regeneration provides a more significant fire hazard, is likely to have an adverse impact on mature trees and is also likely to suppress the species richness of the ground-cover*' (Mueck, 2012).

It is also noted that a proposed Grassy Eucalypt Woodland Conservation Reserve occurs in the Lindum Vale PSP immediately to the north of Mt Ridley Road to the north-northeast of the Craigieburn West precinct (see Map 5).

Figure 8 - Looking west at Grassy Eucalypt Woodland, which is classified as Grassland, in the proposed Conservation Reserve.

Figure 9 - Mature and regenerating Eucalypts in the CWPSP area north of Craigieburn Road, which has been identified in the draft Place Based Plan for the precinct as an area of "Landscape value/amenity" (see Map 6).

Figure 10 – Area of regenerating canopy trees near the southwest corner of the CWPSP area. Regenerating eucalypts may increase the elevated fuel hazard and/or canopy cover, and require a Woodland classification, with resultant need for increased development setbacks.

3.2.2 Roadsides

Vegetation along Mickleham Road and Mt Ridley Road has been excluded from classification, as non-hazardous vegetation, because it is likely to be managed in a low threat state during the fire danger period (see Figure 11).

This is in accordance with the Municipal Fire Management Plan for Hume, which identifies that Mickleham Road (from Somerton Road to the northern Hume LGA boundary) and Mt Ridley Road (from Konagaderra Road to the Hume Highway/Grand Boulevard) are primary fire breaks (Hume City Council, 2017). '*A first cut is usually done in late October to early November and is a three metre cut from road shoulder or to fence line, whichever occurs first. A second fence to fence cut is conducted in mid-November to late December'* (Hume City Council, 2019). Whites Lane, along the eastern side of the precinct, north of Craigieburn Road, is identified as a secondary fire break that will have a single fence to fence 100mm cut between mid-November to end of December.

Roadsides (and narrow waterways or drainage lines that retain patches of remnant vegetation or are revegetated), can also be excluded from classification as low threat, non-hazardous vegetation if they are no more than 20m wide and are separated by at least 20m from future buildings and any other narrow strips or other areas of classified vegetation.

Currently, trees planted along Mickleham Road comprise single row windbreaks that can also be deemed to be low threat. If additional planting and landscaping increases the hazard, then the exclusion criteria based on a 20m setback for future dwellings may need to be met (see Section 4).

Figure 11 - Looking south along Mickleham Road, showing low threat road reserve to the left of the image and a narrow and potentially classifiable patch of revegetation to the west of the road and the precinct (in the right of the image).

Figure 12 - Looking east along Mt Ridley Road at the northern boundary of the CWPSP area.

3.2.3 Drainage and other reserves

The proposed Drainage (or other) Reserves may comprise Grassland, or Woodland if larger areas of remnant or planted treed vegetation are either retained within them or created through natural

recruitment or revegetation. Potentially applicable exclusion criteria that could be applied to ensure classified vegetation does not occur in proximity to buildings, are the small patch criteria for:

- Single areas of vegetation less than 1 ha in area and not within 100m of other areas of classified vegetation;
- Multiple areas of vegetation less than 0.25ha in area and not within 20m of the site/building, or each other, or of other areas of classified vegetation; and
- Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site/building or each other, or other areas of classified vegetation.

Any water sensitive urban design (WSUD) features with reliably open water or wet areas and little or no vegetation, may be deemed non-vegetated or low threat. However, large, seasonally inundated wetlands or WSUD features that may be dry and vegetated during the fire danger period could, comprise classifiable Grassland (or Scrub/Shrubland). Note that the applicable BAL-12.5 setbacks for Shrubland are the same as for Grassland.

It is reasonable to assume that all other recreation reserves or local parks in the draft Place Based Plan, such as the open space area located in the northeast of the precinct (see Figure 2), will comprise low threat vegetation.

3.3 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 100m from the site.

b) Single areas of vegetation less than 1 ha in area and not within 100m of other areas of vegetation being classified vegetation.

c) Multiple areas of vegetation less than 0.25ha in area and not within 20m of the site, or each other, or of other areas of vegetation being classified vegetation.

d) Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m 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, 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, 2019).

Residential and other urban areas in the precinct will comprise low threat vegetation with maintained lawns and cultivated gardens. Non-vegetated areas will include the roads, driveways and structures.

Figure 13 – Looking south along Whites Lane, showing residential development in the Craigieburn PSP area to the east and southeast of the precinct, which comprises low threat and non-vegetated land.

3.4 Topography

AS 3959-2018 requires that the 'effective slope' be identified to determine the BAL and applicable vegetation setback distances. This is the slope of the land under the classified vegetation[9] 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 under the classified vegetation 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˚.

The topography was analysed by site assessment and by creating an elevation model for the site and surrounding land, using a GIS TIN (Triangulated Irregular Network) generated from publicly available 1m contour data (see Map 3).

The terrain on the site and in the surrounding landscape is relatively benign from a bushfire perspective, being predominantly flat, or gently sloping or undulating. There are some minor

[9] The slope of the land between the classified vegetation and the building is called the site slope, which in the method 1 procedure of AS 3959-2018, is assumed to be the same as the effective slope.

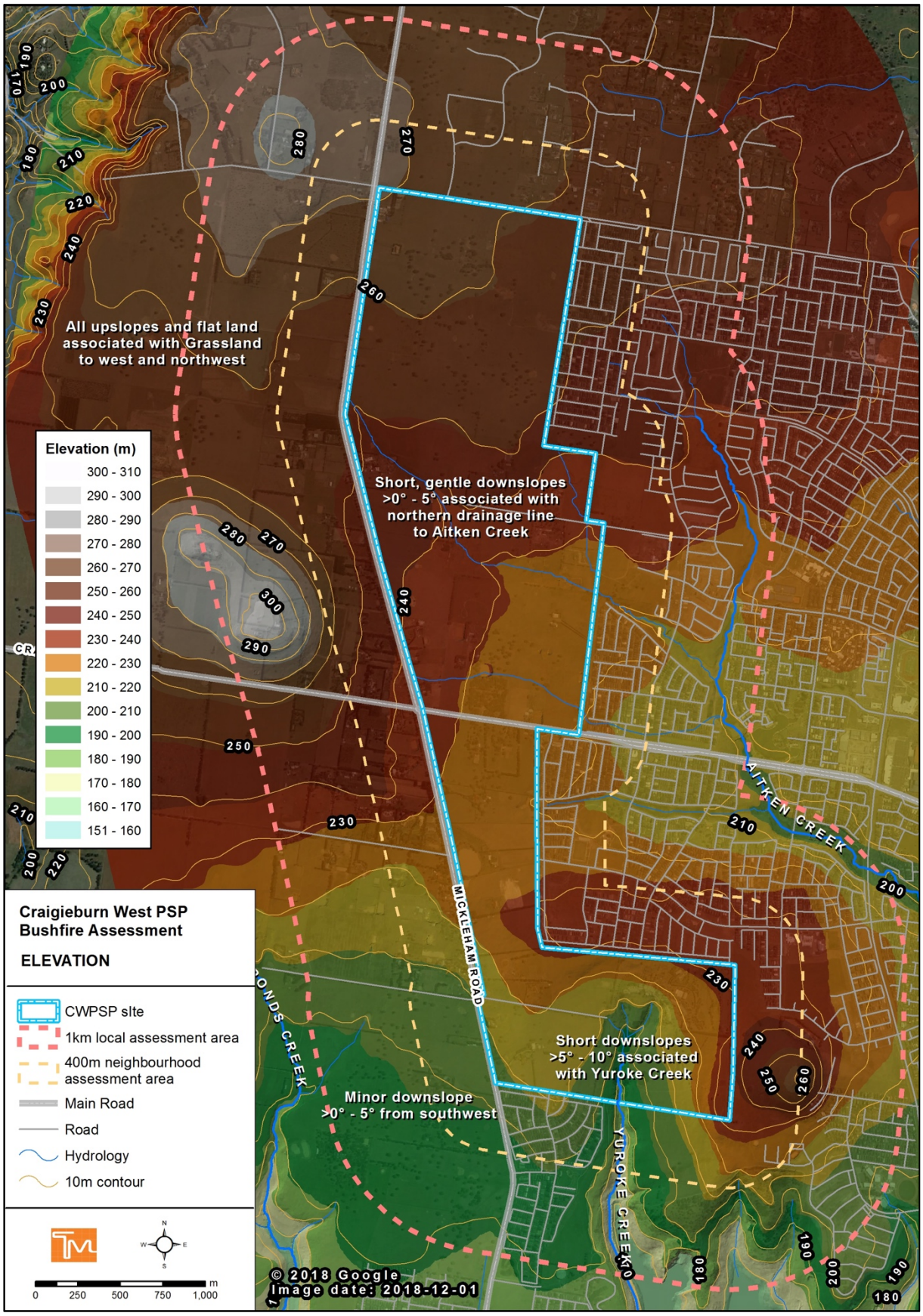
downslopes associated with the drainage line that runs west to east through the northern half of the precinct to Aitken Creek, however these are generally only 1˚-2˚ and will not influence BAL outcomes unless they are associated with hazardous vegetation.

Downslopes associated with the Yuroke Creek are steeper, up to 10˚, however they too may not influence BAL outcomes unless they are associated with hazardous vegetation.

A downslope of approximately 2˚ occurs to the southwest of the precinct as the land slopes gently down in that direction.

For the purposes of determining future BALs and vegetation setback distances for buildings, the likely applicable slope class is 'All upslopes and flat land'. However, depending on the location and extent of future unmanaged vegetation (likely to be Grassland), the 'Downslope >0˚ to 5˚' and 'Downslope >5˚ to 10˚' slope classes may also be applicable.

Note that if areas of the precinct are excised from the BPA, then there is by definition, no effective slope to consider and BAL-LOW applies to future buildings.



Map 3 - Elevation map of the precinct and surrounding land.

3.5 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 building setback distances from classified vegetation in accordance with AS 3959-2018.

The indices are 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. Table 1 displays the FDRs, their FFDI range[10] and the description of conditions for each FDR.

Note that the benchmark of an FFDI 100 represents a 'one size fits all' model of extreme fire weather conditions for the state, but which has been exceeded during some significant fire events, including at some locations in Victoria on 'Black Saturday' 2009. Therefore, it is important to note that this is not necessarily the *worst-case* conditions for any particular location, including the CWPSP area.

It should be noted that, especially in eastern and southern 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 (CSIRO/BOM, 2018). There is a 'high confidence' that climate change will result in a harsher fire weather climate for the Southern Slopes Victoria West sub-region that the CWPSP area is in; with a 'low confidence' in the magnitude of the expected change (CSIRO/BOM, 2019).

However, currently the CFA and DELWP have no published policy on FFDI recurrence intervals. There is, therefore, no compelling rationale for applying a different FFDI/GFDI from the 'default' FFDI 100/GFDI 130 threshold used throughout non-Alpine areas of Victoria in the planning and building system[11].

[10] The GFDI ranges for each FDR in Table 1 may vary in some jurisdictions.

[11] In alpine areas of Victoria an FFDI 50 applies for determining BALs using Method 1 of AS 3959-2018.

Table 1 - Fire Danger Ratings (Source: AFAC, 2017; CFA 2017).

Forest Fire Danger Index	Grassland Fire Danger Index	Fire Danger Rating (FDR)	Description of conditions
100+	150+	Code Red	The worst conditions for a bush or grass fire. Homes are not designed or constructed to withstand fires in these conditions. The safest place to be is away from high risk bushfire areas.
75-99	100-149	Extreme	Expect extremely hot, dry and windy conditions. Fires will be uncontrollable, unpredictable and fast moving. Spot fires will start, move quickly and will come from many directions. Homes that are situated and constructed or modified to withstand a bushfire, that are well prepared and actively defended, may provide safety. You must be physically and mentally prepared to defend in these conditions.
50-74	50-99	Severe	Expect hot, dry and possibly windy conditions. If a fire starts and takes hold, it may be uncontrollable. Well prepared homes that are actively defended can provide safety. You must be physically and mentally prepared to defend in these conditions.
25-49		Very High	If a fire starts, it can most likely be controlled in these conditions and homes can provide safety. Be aware of how fires can start and minimise the risk. Controlled burning off may occur in these conditions if it is safe – check to see if permits apply.
12-24		High	
0-11		Low – Moderate	

3.6 Landscape assessment

3.6.1 Location description and context

The CWPSP area is located in the northern growth corridor of Melbourne, approximately 25 kilometres north of the Melbourne CBD. The western boundary of the precinct is formed by Mickleham Road, which also comprises the western Urban Growth Boundary (UGB). Farming, rural living and low-density residential land in the Green Wedge Zone (GWZ) occurs to the west, northwest and southwest (see Map 1).

Mt Ridley Road forms the northern boundary of the precinct, beyond which is the recently approved Lindum Vale PSP area, which comprises low density residential allotments, although the PSP includes an approximately 7ha Conservation Reserve that will be located immediately north of Mt Ridley Road (see Map 5). To the northeast are more low density allotments, which generally comprise low threat vegetation.

The soon to be completed Craigieburn PSP residential area, which comprises low threat vegetation and non-vegetated areas, abuts the precinct to the east and southeast (see Figure 13). The low threat nature of the landscape to the east is evidenced by the excision of most of this land from the

BPA (see Map 5). It is likely that as development to the east is completed, all of the land in this direction will be removed from the BPA.

The Greenvale North PSP area, which was approved in 2010, occurs to the south (Elton Consulting, 2019) (see Map 5). The northwest corner of the Greenvale North precinct comprises established urban residential development along the southern boundary of the CWPSP area, west of Yuroke Creek. Also to the south, east of Yuroke Creek, the Craigieburn West precinct abuts an area of Grassland that is contiguous with Woodland and Grassland in the Greenvale Reservoir, which is located approximately 400m south of the CWPSP area.

3.6.2 Neighbourhood, local and broader landscape risk

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

The CWPSP area is not affected by the BMO, and the nearest area of BMO coverage is a relatively small area approximately 1.2 km to the west of the precinct, associated with Pine and Eucalypt plantations. Irrespective of BMO coverage, the BMO landscape typologies are useful descriptors of bushfire risk at the neighbourhood, local and broader landscape scales.

The four types range from low risk landscapes where there is little hazardous vegetation beyond 150m 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 assumptions (see Table 2).

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

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.* • *Fires have hours or days to grow and develop before impacting.* • *Evacuation options are limited or not available.*
I N C R E A S I N G R I S K →			

Local and neighbourhood risk

It is considered that the local landscape best accords with Landscape Type 2. The topography is relatively benign, and the predominant hazard is Grassland. Whilst long fire runs in the directions of highest risk[12] are possible, they are largely through a cleared, rural living and agricultural/pastoral landscape. As development in the precincts to the north and south is completed, the risk will be largely restricted to the west.

Notable hazards within the 1km local neighbourhood assessment zone around the CWPSP area are:

- Woodland and Grassland vegetation associated with the Greenvale Reservoir approximately 400m to the south. This is a relatively small and isolated area that, as development around it is completed, will increasingly be an island of hazardous vegetation within an urban-residential area. It is also in a direction not typically associated with severe or higher fire danger weather.
- The proposed Grassy Eucalypt Woodland Conservation Reserve in the Lindum Vale PSP immediately (approx. 40m) to the north across Mt Ridley Rd. As the Lindum Vale PSP is developed this reserve will also comprise a relatively small and isolated hazard.

[12] i.e. from the northwest, west and southwest, directions typically associated with severe or higher fire weather in Victoria (Long, 2006).

- The small pine plantation to the west of the precinct, north of Craigieburn Road, is likely to be within 100m of future buildings in the CWPSP (see Map 2). If involved in a fire, this patch of Forest may generate a localised increase in ember attack on nearby areas of the precinct. However, it is a relatively small area of hazard that will be setback at least 60m from future buildings in the precinct, by the Mickleham Road reserve.

These three identified hazards are not a significant influence on BAL outcomes and bushfire safety in the precinct. The provision of BAL-12.5 setbacks, application of the building controls for development in a BPA, the urban residential road network and reticulated water supply can be deemed to appropriately mitigate the risk.

Landscape risk - 1km to 5km

At the landscape scale, beyond 1km and up to 5km around the site, the landscape has characteristics that evolve towards the higher risk broader landscape type 3. The topography becomes more undulating to dissected where associated with the Deep Creek, approximately 2.5km to the northwest. A large fire, as envisaged in the BMO/AS 3959 model, could impact the precinct (as occurred in 2014 when a large grassfire burnt through the precinct from the north. Smaller fires have also occurred relatively frequently around the precinct; in 2007, 2013, 2014 and 2017(see Map 4).

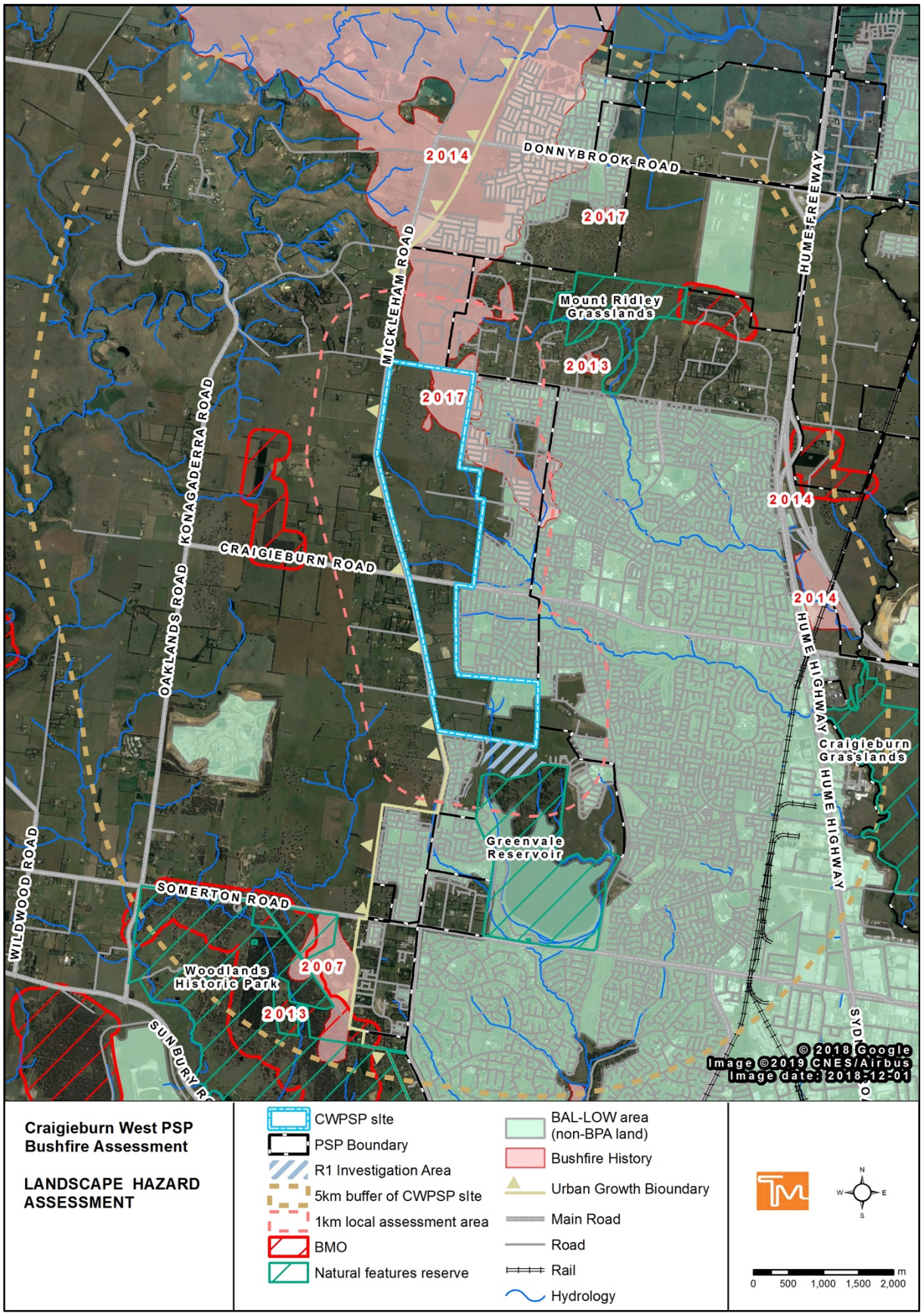
Identified hazards within 1km to 5km of the CWPSP area include (see Map 4):

- Woodland and Grassland vegetation in the Woodlands Historic Park, approximately 3km to the southwest.
- The Craigieburn Grasslands Conservation Reserve, approximately 4km to the east.
- The Mount Ridley Grasslands Conservation Reserve, approximately 1.5km to the northeast.
- Patches of treed vegetation to the west and east-northeast, including plantations that invoke areas of BMO coverage.

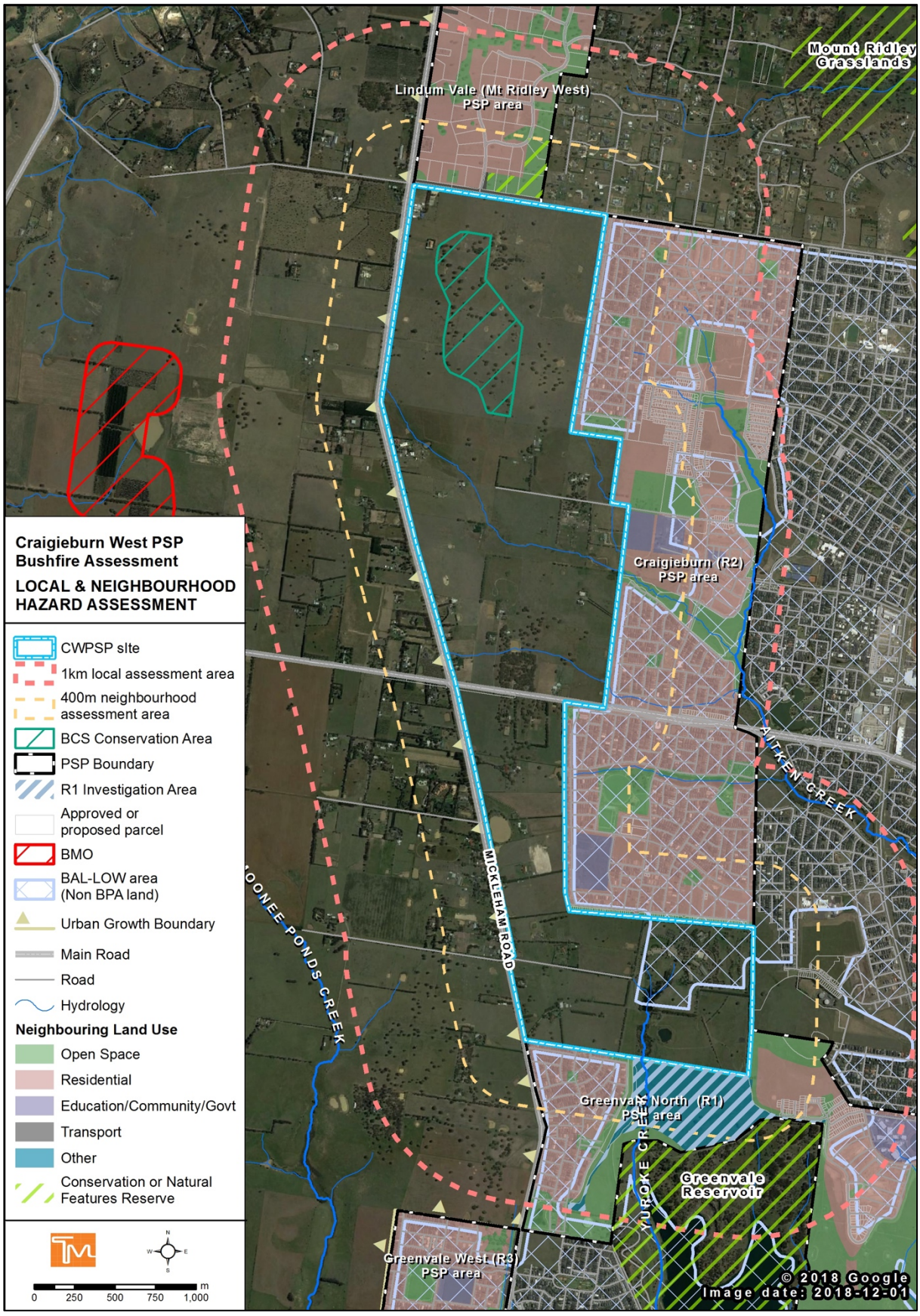
Broader landscape risk - beyond 5km

Beyond 5km of the precinct, the landscape is largely rural and pastoral, extending up to approximately 20km to the north, east and west. To the south, beyond approximately 5km, is the low threat and non-vegetated urban area of Melbourne, most of which has been excised from the BPA (see Figure 1).

Whilst a large grassfire from the west could be fast moving and unpredictable, as development proceeds to the north, south and east and the land becomes urbanised, the risk will lessen considerably due to elimination of the hazard and establishment of easy access to reliably low threat areas. Most of the precinct will become eligible for excision from the BPA (see Map 5). For any area retained within the BPA, acceptable safety can be deemed to be achievable through BAL-12.5 construction standard as specified for settlement planning in Clause 13.02-1S.



Map 4 - Bushfire Hazard Broad Landscape Assessment Map.



Map 5 - Bushfire Hazard Local Landscape Assessment Map.

3.6.3 Regional bushfire risk assessments and plans

Northern and Western Metropolitan Regional Strategic Fire Management Plan (RSFMP) 2015-2025

Regional Strategic Fire Management Planning Committees have prepared ten-year Regional Strategic Fire Management Plans, which were developed around the concept of resilience, and have a strategic focus on preventing and minimising the impact of bushfire. The plans identify broad fire management risks across the eight regions covering Victoria and identify strategies for addressing the issues.

The Hume LGA is in the Northern and Western Metropolitan Region. The Northern and Western Metropolitan RSFMP recognises the growth the region will experience and the potential for fire risk; but no specific matters are identified relevant to the CWPSP (Northern and Western Metropolitan Regional Strategic Fire Management Planning Committee, 2015). A description of grassfire risk in the Lower Hume RSFMP sub-region further to the north of the precinct, is appropriate to the CWPSP area:
'The main bushfire threat west of the Hume Freeway is a fast moving grassfire. While grassfires may have lower flame heights and lower intensity than forest fires, the combination of open ground and fine fuels can produce very fast moving destructive fires. This speed can catch people and stock in the open without protection from the fire.

Weather conditions and climate also impact on fire management. For example, the Hume Region has a long bushfire danger period with fire danger restrictions usually in place from November until mid-April, depending on the prevailing weather conditions. The region also has a pattern of spring rainfall that promotes grass growth accompanied by hot dry summers, resulting in high fuel loads.

The usual weather pattern during the summer months is north westerly winds accompanied by high daytime temperatures, low relative humidity and a south westerly wind change later in the day. This has a particular fire risk in that a fire that is burning during the day will turn direction; and what was the side of the fire will become a large fire front when the wind change happens' (Hume Regional Strategic Fire Management Planning Committee, 2011).

Regional Bushfire Planning Assessment (RBPA) - Melbourne Metropolitan Region

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, 2012). DEWLP state that the plans are a, '*resource to assist councils to support community resilience to bushfire with their strategic planning such as preparing a planning scheme amendment*' (DELWP website, 2020).

The *Regional Bushfire Planning Assessment – Melbourne Metropolitan Region* covers the Hume City Council local government area. The plan recognises the rapid growth in the region including the

Craigieburn urban centre and notes that '*..much of the rural land in the City is characterised by a flat and sparsely treed landscape that enables open views across wide expanses of cleared grazing land and valleys'* (DPCD, 2012).

No matters of specific interest or concern are identified for the precinct or immediately surrounding land.

Hume City Council Municipal Fire Management Plan (MFMP) 2020-2023 (draft)

The Hume MFMP aligns with the RFMP framework and notes the history of major grassfires. The focus of the plan is on the grassfire risk environment, using the Victorian Fire risk Register (VFRR) as an informing tool. The residual risk rating for Grassfire/Bushfire is identified as 'Extreme' (Hume City Council, 2019).

As noted in Section 3.2.2 of this report, the MFMP lists Mickleham Road and Mt Ridley Road as 'primary fire breaks' and Whites Lane, to the east of the precinct, as a 'secondary fire break'. Mickleham Road, near Craigieburn Road, and the Mickleham Primary School in the northwest corner of the CWPSP area, are identified as 'High Risk' fire danger areas.

Under the planning and building strategy, the plan notes that '*CFA and the Hume City have regulatory and referral obligations under various acts and building codes, to ensure that fire protection is considered and incorporated into the design of all new developments'* (Hume City Council, 2019).

4 Planning and design response

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

4.1 Building setbacks

4.1.1 BAL-12.5 construction

To satisfy key settlement planning strategies of Clause 13.02-1S, future dwellings and other buildings requiring a BAL (see Section 2.4), should be sufficiently setback[13] from classified vegetation to enable a BAL-12.5 construction standard. These strategies aim to strengthen the resilience of settlements and communities and prioritise protection of human life, including by:

- *'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[14] under AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).*
- *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 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009)'* (Hume Planning Scheme, 2018b).

The BAL-12.5 setbacks potentially required in response to Grassland and any patches of Woodland or Forest, based on the hazard assessment in Section 3 and determined using the simple Method 1 procedure of AS 3959-2018, are shown in Table 3 below.

[13] 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, 2019).

[14] Note that the first strategy is to ensure RHF is less than 12.5kW/m^2 (author's emphasis). The second strategy stipulates a maximum BAL-12.5 construction standard (which requires that RHF not exceed 12.5kW/m^2). It is assumed the intent of both strategies to ensure that BAL-12.5 is a maximum construction standard for settlement planning, which is consistent with the wording of the latter strategy and the criteria and setback distances for BAL-12.5 in AS 3959-2018.

Table 3 – Potentially applicable building-vegetation setbacks for BAL-12.5.

Vegetation	Slope class	Vegetation setback distance (defendable space)
Grassland	All upslopes and flat land	19m
	Downslope >0˚ to 5˚	22m
	Downslope >5˚ to 10˚	25m
Woodland	All upslopes and flat land	33m
Forest	All upslopes and flat land	48m

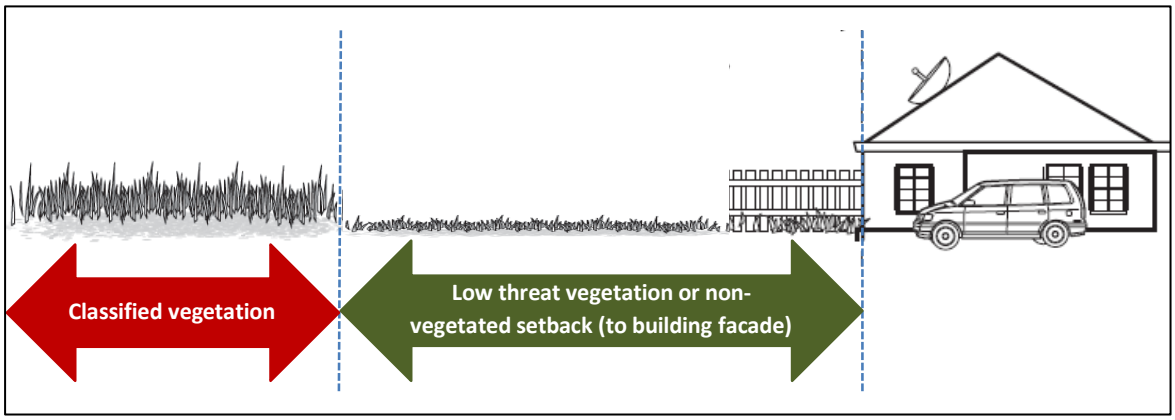


Figure 14 - Example of building-classified vegetation setback (adapted from CFA, 2013).

4.1.2 Hazardous vegetation

At this stage in the precinct planning process, the exact location, size and future state of vegetation in the precinct has not been confirmed. Hence, it is not possible to be certain about the location and extent of setbacks required. However, it is anticipated that the Conservation Reserve will comprise classifiable Grassland. It is also likely that drainage line/reserve that runs west to east through the precinct will comprise Grassland, as is the case with the reserve to the east in the adjacent Craigieburn PSP (see Figure 4). The Yuroke Creek reserve in the south of the precinct may also comprise classified Grassland.

It should be noted that for BAL compliance, no setbacks are needed from small or isolated areas of unmanaged vegetation that lack connectivity with larger areas and meet one or more of the AS 3959 exclusion criteria for low threat vegetation. These exclusion criteria that could potentially be used to inform vegetation retention and re-planting to ensure this vegetation can be deemed non-hazardous and/or does not occur in proximity to buildings, are the small patch criteria for:

- Single areas of vegetation less than 1ha in area and not within 100m of other areas of classified vegetation;
- Multiple areas of vegetation less than 0.25ha in area and not within 20 m of the site/building, or each other, or of other areas of classified vegetation; and
- Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site/building or each other, or other areas of classified vegetation.

Any retarding basins or other water sensitive urban design (WSUD) features with reliably open water or wet areas and little or no vegetation, may be deemed non-vegetated or low threat. However, larger, seasonally inundated wetlands or WSUD features that may be dry and vegetated during the fire danger period could, could comprise classifiable Grassland (or higher hazard vegetation if they have shrubs and/or trees).

Accordingly, the Place Based Plan being developed for the CWPSP should aim to ensure minimum BAL-12.5 Grassland setbacks can be achieved for future residential areas from the Conservation and Drainage Reserves. As development in the precinct commences, the final detail of setbacks can then be resolved through the subdivision and development approvals process, i.e. the final details about future areas of classifiable vegetation and appropriate development setbacks from them, can be confirmed as part of the planning permit stage of precinct development.

As part of the statutory approvals process, it is recommended the planning scheme amendment giving effect to the PSP include an application requirement for all subdivision/development permits to require:
'A Site Management Plan that addresses bushfire risk during, and where necessary, after construction, which is approved by the Responsible Authority. The plan must specify, amongst other things:

- The staging of development and the likely bushfire risks at each stage;
- An area of land between the development edge and non-urban areas consistent with the separation distances specified in AS 3959-2018, where bushfire risk is managed to enable the development, on completion, to achieve a BAL-12.5 construction standard in accordance with AS3959-2018;
- The land management measures to be undertaken by the developer to reduce the risk from fire within any surrounding rural or undeveloped landscape to protect residents and property from the threat of grassfire and bushfire; and
- How adequate opportunities for access and egress will be provided for early residents, construction workers and emergency vehicles'.

4.2 Access and egress

A typical urban-residential road network, in accordance with Clause 56.06 *Access and mobility management,* is considered to provide adequate access and egress for emergency management vehicles and residents. The road network should aim to provide at least 'two ways in and out', in directions away from any hazard.

4.2.1 Perimeter roads

Perimeter roads are a highly desirable design feature to achieve or contribute to BAL setbacks, separate future development from hazardous vegetation with a 'hard' non-vegetated edge, and facilitate access/egress, property protection and fire fighting (see Figure 15). The creation of lots that back onto a reserve or any other large area of hazardous vegetation, should be avoided.

To this end, a perimeter road should be provided between future development and the Conservation and Drainage Reserves. A road along the southern boundary to separate the area of grassland to the south, which is contiguous with the Greenvale Reservoir, would also be a desirable feature.

Mickleham Road and Mount Ridley Road will provide perimeter roads to the west and north respectively (see Section 4.2.2), whilst to the east is only low threat urban area.

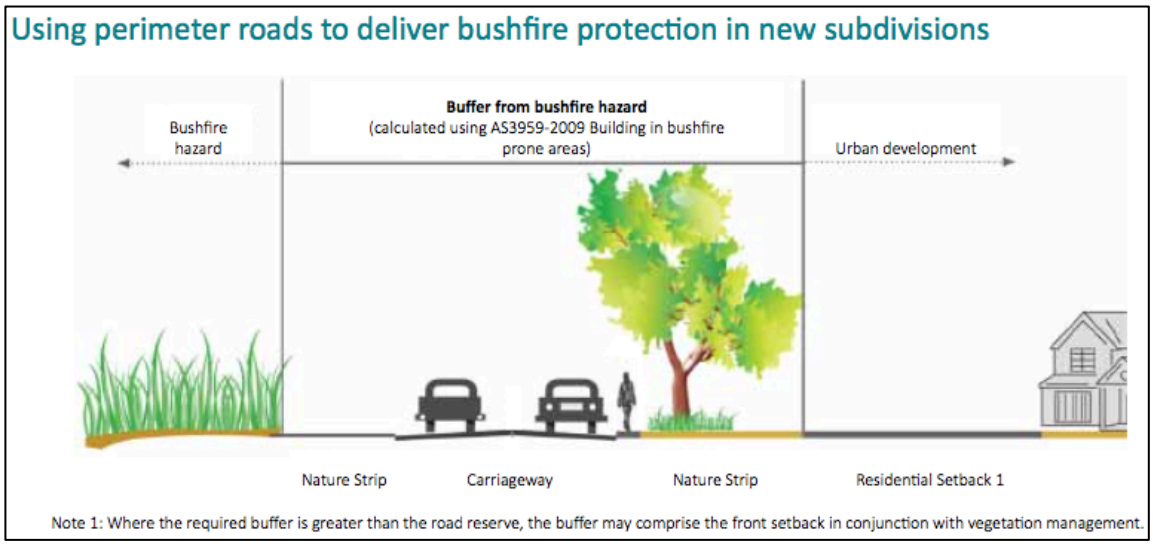


Figure 15 - Illustration of a perimeter road to provide required development setbacks (DELWP, 2015a).

4.2.2 Mickleham Road and Mt Ridley Road interfaces

All, or most, of Mickleham Road is anticipated to provide a 60m low threat and non-vegetated setback from the extensive Grassland hazard to the west. An indicative cross section is shown in Figure 16. It is not clear if the whole length of the Mickleham Road reserve will provide a 60m setback, as the southern section appears to narrow at the southwest corner of the precinct (see Map 7).

The road reserve needs to provide a minimum 19m setback for future development from Grassland, (and 33m or 48m from Woodland and Forest respectively), i.e. commensurate with a BAL-12.5 construction standard on flat or upslope land in accordance with AS 3959-2018.

Mt Ridley Road is anticipated to provide a minimum 40m setback along the northern CWPSP boundary, which will provide sufficient separation for BAL-12.5 development from the proposed Lindum Vale Conservation Reserve to the north of the CWPSP area (see Map 5).

4.3 Water supply

A reliable water supply for fire-fighting can be provided via a conventional reticulated hydrant system, in accordance with the hydrant objective for residential subdivision at Clause 56.09-3.

4.4 BPA excision

Large areas of the CWPSP area will become eligible for excision from the BPA. If land is excised from the BPA prior to the design and construction of dwellings, BAL-LOW will apply, which means no specific bushfire design or construction requirements would be needed for buildings (i.e. a BAL-12.5 construction standard is not required). An area in the southern part of the precinct has already been excised from the BPA (see Map 7).

DELWP review and excise areas from the BPA approximately every 6 months, particularly in growth areas where the hazard will be removed as urban development occurs. Land becomes eligible for excision if it satisfies state-wide hazard mapping criteria, including that the land needs to be:

- At least 300m from areas of classified vegetation (except grassland) larger than 4ha in size; and
- At least 150m from areas of classified vegetation (except grassland) 2 to 4ha in size; and
- At least 60m from areas of unmanaged grassland more than 2ha in size (DELWP, 2015b).

For isolated areas of vegetation greater than 1ha but less than 2ha, the shape of the area and connectivity to any other hazardous vegetation is a further consideration (DELWP, 2015b).

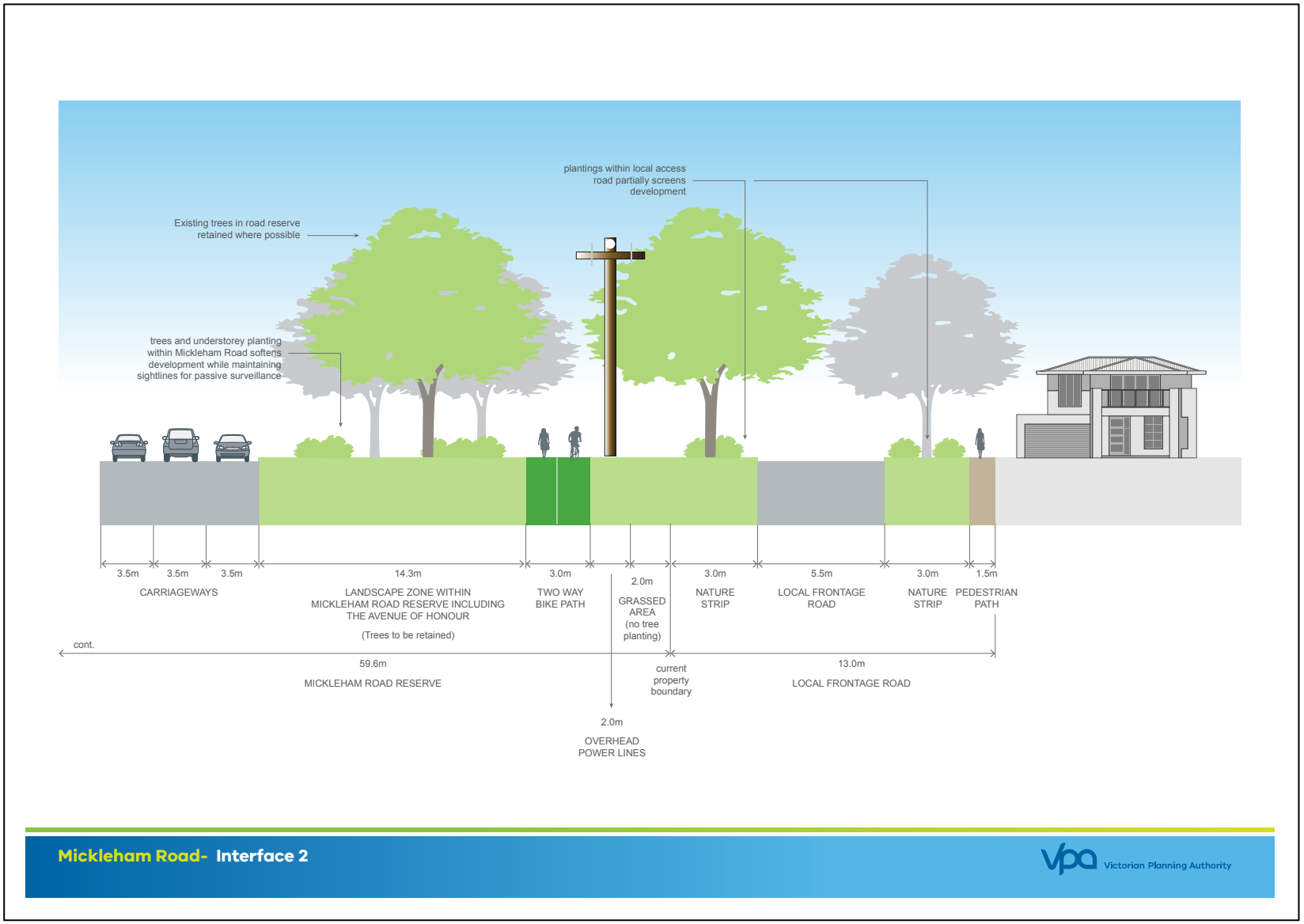
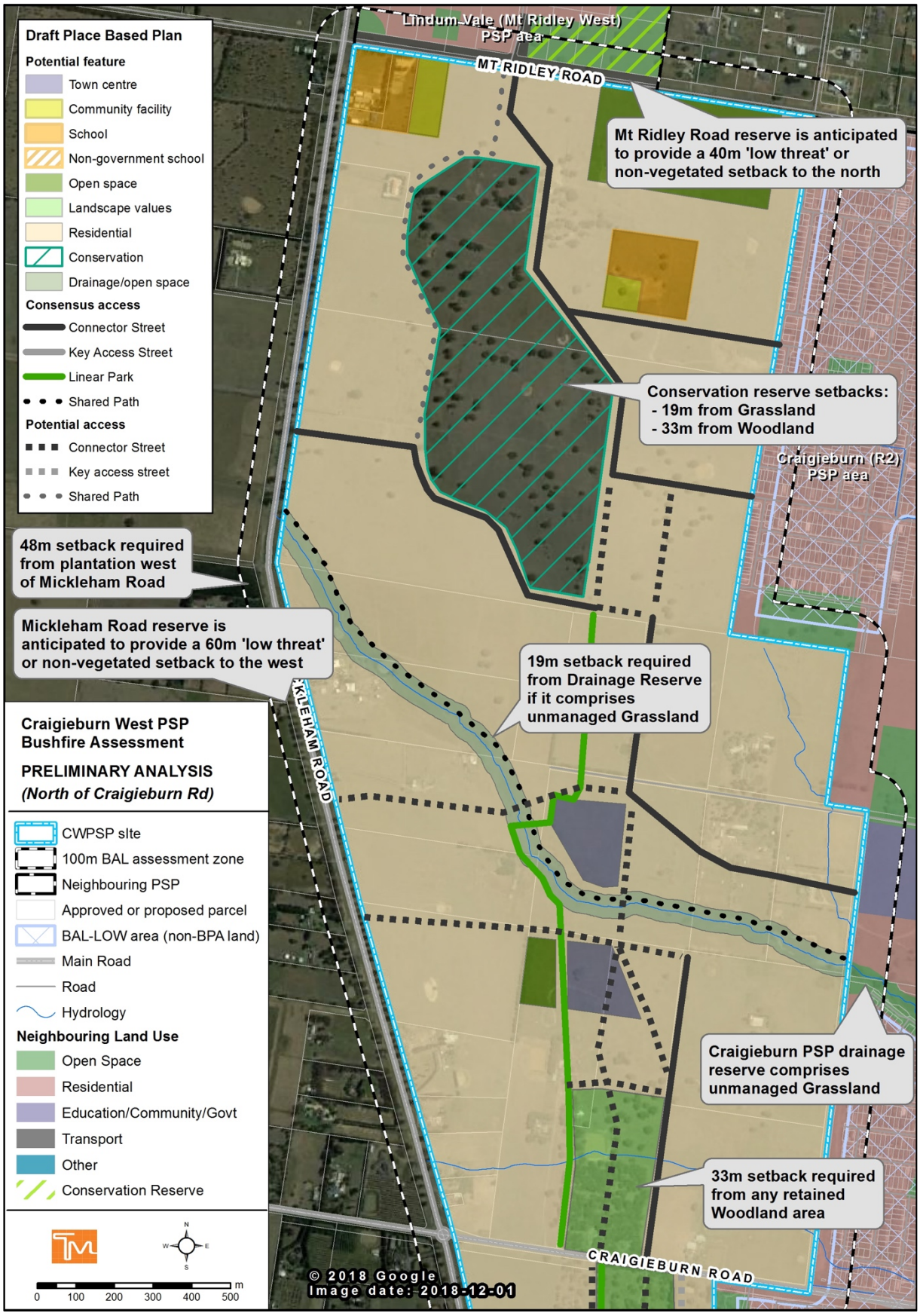
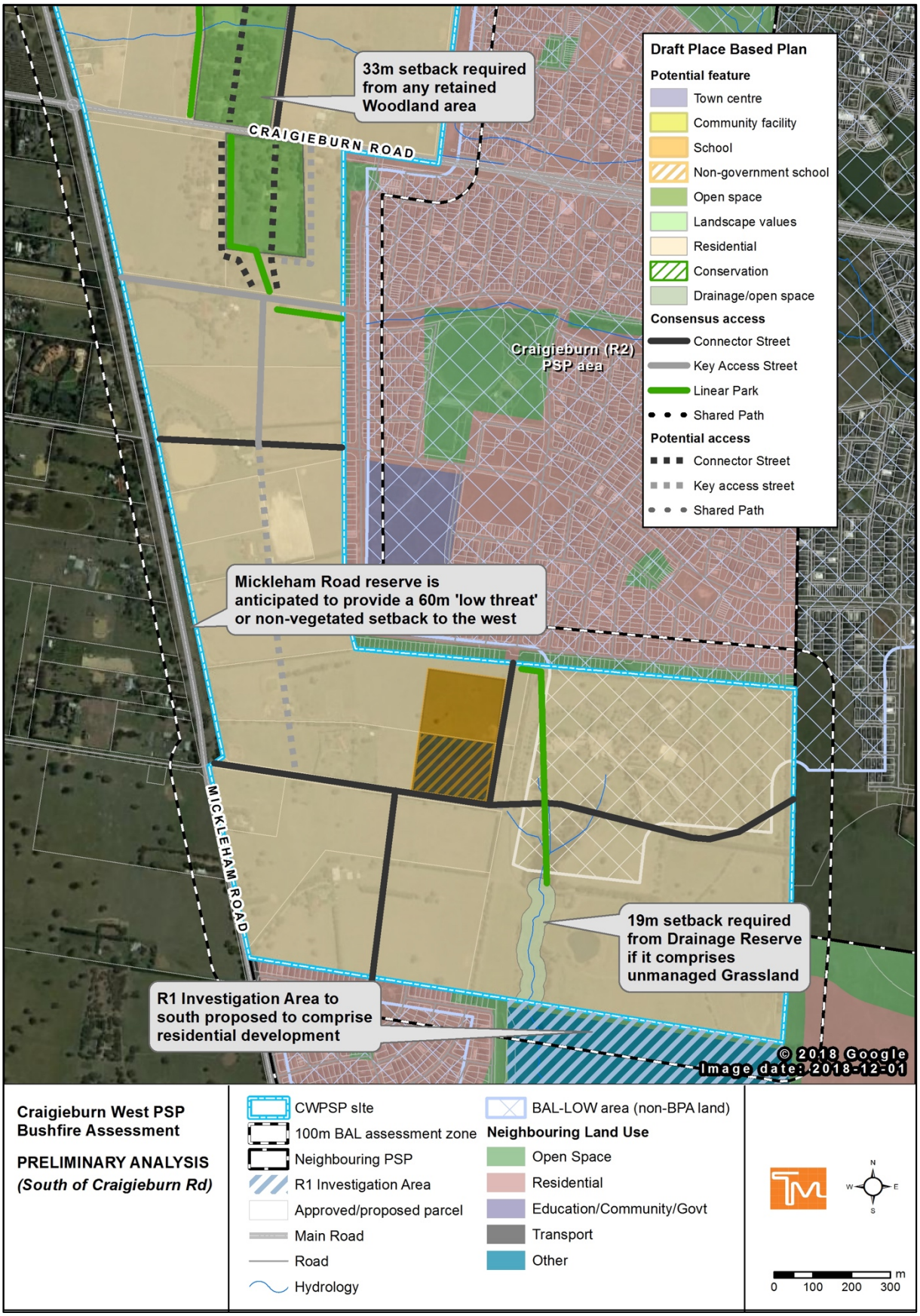


Figure 16 – Example of potential Mickleham Road interface (*from Lindum Vale PSP to the north*).



Map 6 – Preliminary CWPSP analysis map - north of Craigieburn Road.



Map 7 - Preliminary CWPSP analysis map - south of Craigieburn Road.

4.5 Response to Clause 13.02-1S Bushfire planning

The applicable strategies stipulated in Clause 13.02-1S are detailed in the following sub-sections, and a summary is provided about how the proposed development responds to the strategies.

4.5.1 Protection of human life strategies

Priority must be given to the protection of human life.

Prioritising the protection of human life over all other policy considerations

The precinct is in a relatively low bushfire risk location. The risk will lessen as development in and around the precinct occurs. Accordingly, the protection of human life can be prioritised by adopting the measures recommended in this report and through application of the existing planning and building regulations for construction in a BPA, including ensuring future dwellings and other buildings are located where a BAL-12.5 construction standard can be achieved (i.e. achieving setbacks for future buildings from unmanaged vegetation, such that radiant heat can be expected to be below 12.5kW/m^2).

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.

As identified in Section 3.6, the site is in a relatively low risk landscape.

The nearest *lowest* risk locations are considered to be the urban-residential and township areas of Craigieburn to the east, that are not in the BPA (see Map 5).

Once development has occurred, reliably low threat urban areas within the precinct will become eligible for excision from the BPA if they satisfy the exclusion criteria (see Section 2.4). An area within the southern part of the precinct has already been excised from the BPA (see Map 7).

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 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'* (CFA, 2015).

It is considered that development of the precinct can appropriately implement the strategies in Clause 13.02-1S that aim to prioritise protection of human life and will, therefore, meet the CFA strategic planning principles for bushfire.

4.5.2 Bushfire hazard identification and assessment strategies

The bushfire hazard must be identified, and an 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* (DEWLP, 2015a) and *Planning Advisory Note 68 Bushfire State Planning Policy Amendment VC140* (DEWLP, 2018).

The type and extent of (hazardous) vegetation within, and up to 150m around, the precinct has been identified and classified into AS 3959-2018 vegetation groups. Classification was 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.

GIS analysis of publicly available 1m contour data for the area was undertaken, including creating a Digital Elevation Model (DEM) of the topography (see Map 3) and determining slopes.

In relation to climatic conditions and fire weather, the AS 3959 default FFDI 100/GFDI 130 benchmark used in the Victorian planning and building system, has been applied as discussed in Section 3.5.

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 2.4) and is shown in Map 4 and Map 5. This is based on the most recent BPA mapping for the precinct, which was published 11th September 2019.

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

As identified in Section 2.5.2, no part of the CWPSP area is covered by the BMO. The nearest area of BMO occurs approximately 1.2km to the west of the precinct (see Map 4 and Map 5). This is considered appropriate and reflects statewide BMO mapping introduced into the Hume Planning Scheme on 3rd October 2017.

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 site, neighbourhood and local scale (see Section 3, Map 2, Map 4 and Map 5).

At the site scale, the assessment follows the AS 3959-2018 methodology applied in a BPA, of classifying vegetation and topography within 100m of a building, and for this study, extending 150m around the precinct.

At the broader landscape scale a 20km, 10km and 5km radius of the site has been applied (see Section 3.6, Figure 1 and Map 4) in accordance with guidance about assessing risk for planning scheme amendments in the Planning Advisory Note 68 (DEWLP, 2018) and Planning Practice Note 64 (DELWP, 2015a).

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

It is anticipated the CFA will be consulted by reviewing and commenting on this Bushfire Development Report.

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.

DELWP 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.

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.

If the objectives and strategies of Clause 13.02-1S are successfully implemented, as discussed in this report, and the building regulations for construction in a BPA are complied with, then the risk can be deemed to be acceptably mitigated such that development can proceed.

The CFA specify that areas where development should not proceed could include:

- *'Isolated settlements where the size and/or configuration of the settlements will be insufficient to modify fire behaviour and provide protection from a bushfire.*
- *Where bushfire protection measures will not reduce the risk to an acceptable level.*
- *Where evacuation (access) is severely restricted.*
- *Where the extent and potential impact of required bushfire protection measures may be incompatible with other environmental objectives or issues, e.g. vegetation protection, land subject to erosion or landslip'* (CFA, 2015).

None of these criteria or characteristics are applicable to the CWPSP area.

It is recommended that the proposed planning scheme amendment giving effect to the PSP, include a requirement that applications for subdivision/development permits include a Site Management Plan that addresses bushfire risk during, and where necessary, after construction (see Section 2.5.1).

4.5.3 Settlement planning strategies

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 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).

The applicable distances for dwellings or other buildings to be setback from classifiable vegetation, such that RHF is calculated to not exceed 12.5kW/m^2 and BAL 12.5 dwellings could potentially be sited, have been determined. Taking into consideration the assessment of landscape risk, implementation of these setbacks and a BAL-12.5 construction standard for applicable buildings in the BPA, 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 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009) where human life can be better protected from the effects of bushfire.

The nearest *lowest* risk locations are considered to be those areas in the surrounding landscape which are not in a designated Bushfire Prone Area (BPA). These comprise the urban-residential and township areas of Craigieburn to the east and other urban areas to the north and south of the precinct (see Map 4 and Map 5).

As identified in Section 2.4, once development has occurred, reliably low threat urban areas within the precinct will become eligible for excision from the BPA if they satisfy the exclusion criteria.

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:

- Development achieves vegetation setbacks from hazardous vegetation to enable BAL-12.5 construction, provides an appropriate water supply for fire fighting via a conventional reticulated hydrant system, and appropriate access/egress for emergency vehicles and residents via a conventional residential road network.
- It is ensured that any hazardous vegetation retained or re-established, does not create an increase in the hazard exposure for existing residents.

The risk to existing residents will be reduced by the development of additional urban residential areas and associated low threat or non-vegetated land. As identified above,

this will eventually create BAL-LOW areas with the potential to be excised from the BPA, if they are sufficiently distant from any hazardous vegetation.

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.

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 3959-2009'.

If the setback distances from any hazardous vegetation, as identified in this report are implemented, then construction can achieve a BAL not exceeding BAL-12.5. Future development and excision from the BPA of some parts of the precinct, would enable BAL-LOW.

4.5.4 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.

Biodiversity impacts associated with the growth areas were identified in the Biodiversity Conservation Strategy for Melbourne's Growth Corridors (DEPI, 2013). A reserve is proposed in the central northern part of the CW precinct to protect an identified area of Grassy Eucalypt Woodland.

4.5.5 Use and development control in a Bushfire Prone Area

Clause 13.02 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'* (Hume Planning Scheme, 2018b).

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'* (Hume Planning Scheme, 2018b).

Future development applications should be able to achieve acceptable safety if:

- Appropriate setbacks for future development from classified vegetation are achieved to enable BAL-12.5 construction in the BPA;
- Adequate access and egress for emergency management vehicles is provided by a residential road network, with a perimeter road adjacent to any hazardous vegetation within or external to the precinct to assist property defence and fire fighting; and
- A reliable water supply for fire fighting is provided, via a conventional reticulated hydrant system, in accordance with the hydrant objective for residential subdivision at Clause 56.09-3.

5 Conclusion

This report has assessed the bushfire hazard in and around the Craigieburn West Precinct Structure Plan area, in accordance with Clause 13.02-1S in the Hume Planning Scheme, the AS 3959-2018 methodology invoked by the Victorian building regulations, and additional guidance, as appropriate, provided in *Planning Practice Note 64 Local planning for bushfire protection* (DEWLP, 2015a), *Planning Advisory Note 68 Bushfire State Planning Policy Amendment VC140* (DEWLP, 2018) and, in relation to the landscape hazard assessment, the DELWP technical guide *Planning Permit Applications Bushfire Management Overlay* (DELWP, 2017).

It is considered that this assessment also fulfils the requirements of *Ministerial Direction 11 Strategic Assessment of Amendments,* which requires that an amendment addresses any relevant bushfire risk (Direction No. 11, 2013).

All of the precinct, except for an area in the south, is currently a designated BPA; however, no part is covered by the BMO.

The landscape is one of relatively low bushfire risk, which will lessen as development in and to the north, east and south of the precinct is completed. The hazard is largely restricted to Grassland, and bushfire behaviour can reasonably be expected to be within AS 3959-2018 presumptions and design parameters. Accordingly, it is considered that the risk can be mitigated to an acceptable level and that the proposed development is appropriate, if dwellings are separated from hazardous vegetation to allow BAL-12.5 construction, in accordance with the building regulations and Clause 13.02-1S. Most of the precinct will be able to be excised from the BPA, which, subject to timing of development and the excision, may allow construction to BAL-LOW.

The type and extent of (hazardous) vegetation within, and up to 150m around the precinct, has been identified and classified into AS 3959-2018 vegetation groups, based on DELWP extant EVC mapping, aerial imagery and site investigation. The classification is based on the current and likely future state of the vegetation and identifies that the hazard is primarily Grassland, which will eventually be confined to the west of the precinct (as land in other directions is developed), the proposed Conservation Reserve in the northern part of the precinct, and potentially drainage lines.

The terrain in the precinct and the surrounding landscape is relatively benign from a bushfire perspective, being predominantly flat or gently sloping. For the purpose of determining BALs and vegetation setback distances for future buildings, the applicable slope class is likely to be 'All upslopes and flat land', although relatively minor downslopes may occur to the southwest of the precinct and in Drainage Reserves within the precinct.

It is considered that development can appropriately prioritise the protection of human life and meet the objectives of Clause 13.02-1S, largely by ensuring future dwellings will not be exposed to RHF above 12.5kW/m^2, which is commensurate with a BAL-12.5 construction standard. In response to

Grassland in the 'All upslopes and flat land' slope class, this would require a minimum 19m setback of buildings from the classified Grassland.

Access and egress for emergency management vehicles and residents, in the event of a bushfire, can be achieved via a conventional urban-residential road network. A perimeter road should be provided between future development and the Conservation Reserve in the north. The road network should aim to provide at least two ways in and out in directions away from the hazard.

A reliable water supply for fire fighting can be provided via a conventional reticulated hydrant system in accordance with the hydrant objective for residential subdivision.

The risk to existing residents will be reduced by the development of additional urban residential areas and associated low threat or non-vegetated land. This will eventually create BAL-LOW areas with the potential to be excised from the BPA if they are sufficiently distant from hazardous vegetation.

Appendix A - BALs explained

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 4kW/m^2 pain to humans after 10 to 20 seconds exposure. Critical conditions at 10kW/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 12.5kW/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 19kW/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 29kW/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 42kW/m^2 ignition of cotton fabric after 5 seconds exposure (without piloted ignition).
BAL- FZ (i.e. 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 45kW/m^2 ignition of timber in 20 seconds (without piloted ignition).

Source: derived from AS 3959-2018 (Standards Australia, 2019).

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