



Bushfire Assessment and Development Report

for the Marshall
Precinct Structure Plan

Report prepared for the
City of Greater Geelong

May 2022

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Cover image: Looking along The Village Walk in the centre of the Marshall PSP.

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Glossary

ACUGA	<i>Armstrong Creek Urban Growth Area</i>
PSP	<i>Precinct Structure Plan.</i> PSPs are strategic masterplans for local areas that usually cater for between 5,000 and 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.
BAL	<i>Bushfire Attack Level</i> - A means of measuring the severity of a building’s potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire e.g. a building constructed to a BAL-12.5 standard is designed to be exposed to radiant heat not exceeding 12.5 kW/m ² .
BMO	<i>Bushfire Management Overlay</i> - 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	<i>Bushfire Prone Area</i> - 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 <i>Construction of buildings in bushfire prone areas</i> .
CoGG	<i>City of Greater Geelong.</i>
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	<i>Department of Environment, Land Water and Planning.</i>
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	<i>Ecological Vegetation Class</i> - 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	<i>Forest Fire Danger Index</i> – A numerical index representing the chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long- and short-term drought effects.
FUS	<i>Future Urban Structure.</i>
MPSP	<i>Marshall Precinct Structure Plan</i>
RHF	<i>Radiant heat flux</i> - The heat transfer rate per unit area from thermal (electromagnetic) radiation, expressed as kilowatts per metre squared. Calculated or measured for a specific surface to determine the radiant heat received by that surface from flames associated with a bushfire.

1 Introduction

This Bushfire Development Report has been prepared for the City of Greater Geelong (CoGG) as an assessment of the bushfire hazard for the Marshall Precinct Structure Plan (MPSP). The report identifies how the Future Urban Structure (FUS) responds to the bushfire risk, including the applicable Victorian planning and building controls that relate to bushfire. In particular, DELWP guidance for settlement planning at the bushfire interface (DELWP, 2020) and the objective and applicable strategies of Clause 13.02-1S *Bushfire planning* in the Planning Policy Framework (PPF) (Greater Geelong Planning Scheme, 2018a).

The precinct comprises 123 hectares of land located just to the east of the Grovedale township area and approximately 7km south of the Geelong CBD (see Figure 1). The precinct is the northernmost part of the wider Armstrong Creek Urban Growth Area (ACUGA), bounded by the Geelong-Waurn Ponds passenger rail line to the west and bounded/intersected by Reserve Road to the south and Barwon Heads Road to the north-east. Parts of the Marshall PSP include land over Barwon Heads Road to the north-east and over Reserve Road to the south-west but are not bound by existing landmarks (see Map 1). The proposed Bellarine Link Road will form the future southern boundary of the precinct.

The City of Greater Geelong, in conjunction with Government agencies, service authorities, major stakeholders and the community, has prepared a draft PSP for the land. The vision for the precinct is *'an attractive, liveable and connected neighbourhood that links the Armstrong Creek urban development to the south seamlessly with the existing Greater Geelong urban area. The precinct maximises and strengthens transport connections to key destinations in the region, via Marshall train station along the commuter rail line, the proposed Armstrong Creek transit corridor, a comprehensive shared path network, and major arterial roads. Strong pedestrian, cycling, rail and road connections will create an integrated precinct, showcasing high quality urban design, resulting in a safe, pedestrian friendly, convenient and accessible neighbourhood.'* (CoGG, 2019) (see Figure 2).

This report assesses the bushfire hazard in and around the precinct and identifies how planning for the design and layout of the precinct, and future development that will occur within it, can appropriately mitigate any bushfire risk, including responding to and complying 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:

- *Design Guidelines Settlement Planning at the Bushfire Interface* (DELWP, 2020);
- *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, 2020);
- and
- In relation to the classification of landscape risk, *Planning Permit Applications Bushfire Management Overlay Technical Guide* (DELWP, 2017).

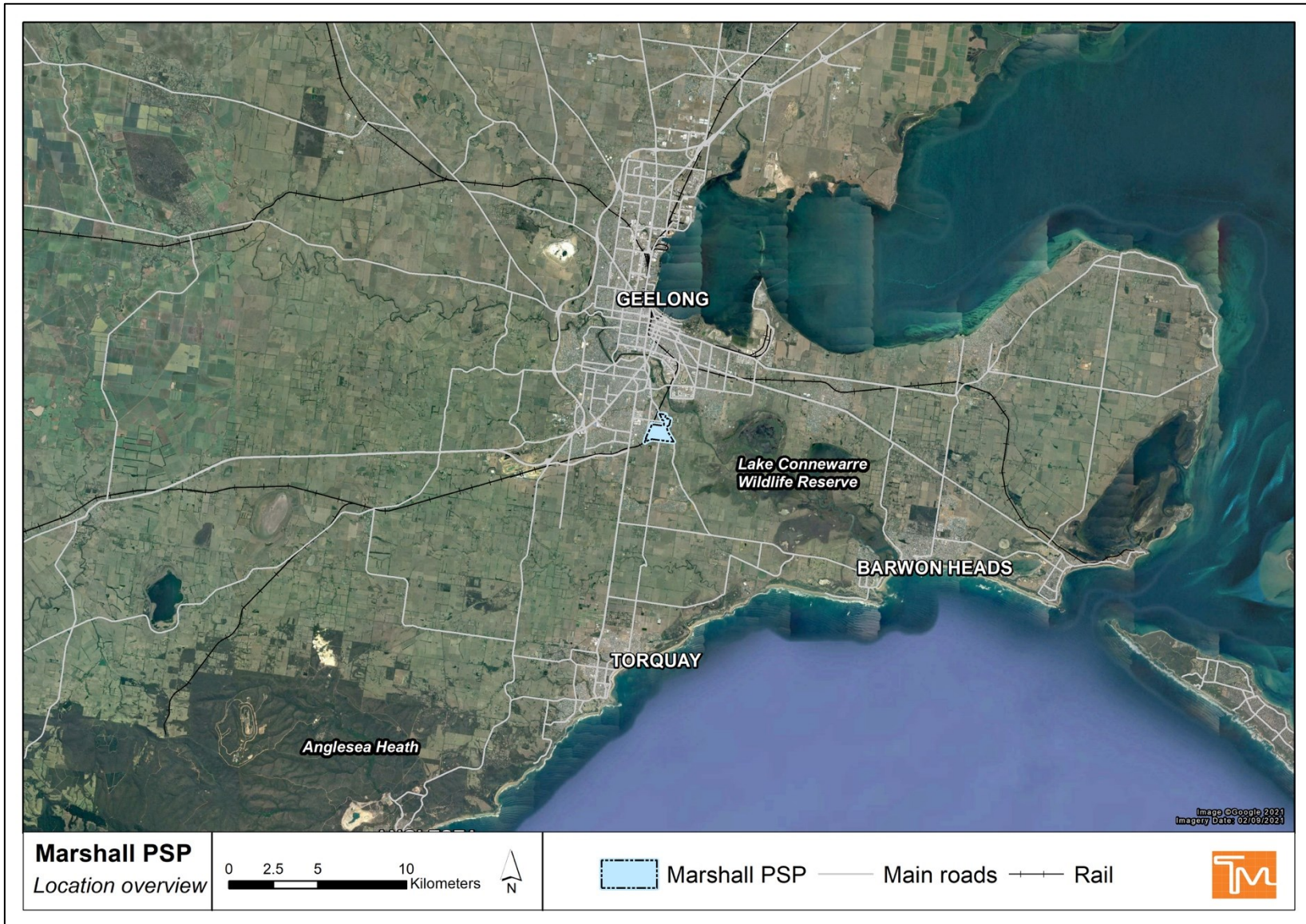


Figure 1 - Marshall PSP landscape location.

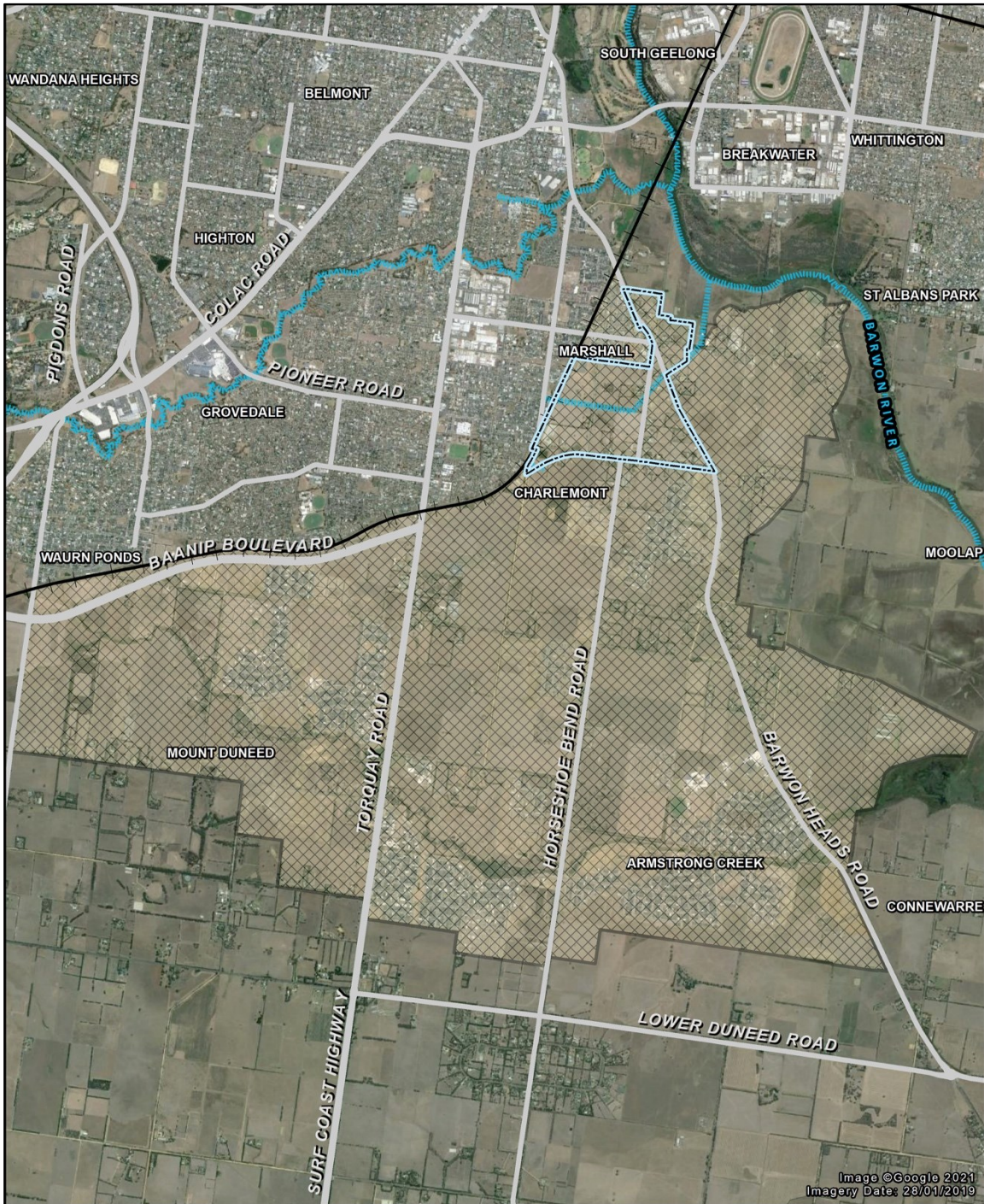


Image ©Google 2021
Imagery Date: 23/01/2019

<p>Marshall PSP Bushfire assessment study area</p> <p>Date: 13/11/2021</p> <p>TM terramatrix</p> <p>0 0.5 1 2 Kilometers</p> <p>Digital data Copyright ©The State of Victoria, Department of Environment, Land, Water and Planning 2017 Projection: VicGrid - GDA2020</p>		<p> Marshall PSP boundary</p> <p> Watercourse</p> <p> Main roads</p> <p> Rail</p> <p> Armstrong Creek Urban Growth Area</p>	
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Map 1 - Study area.

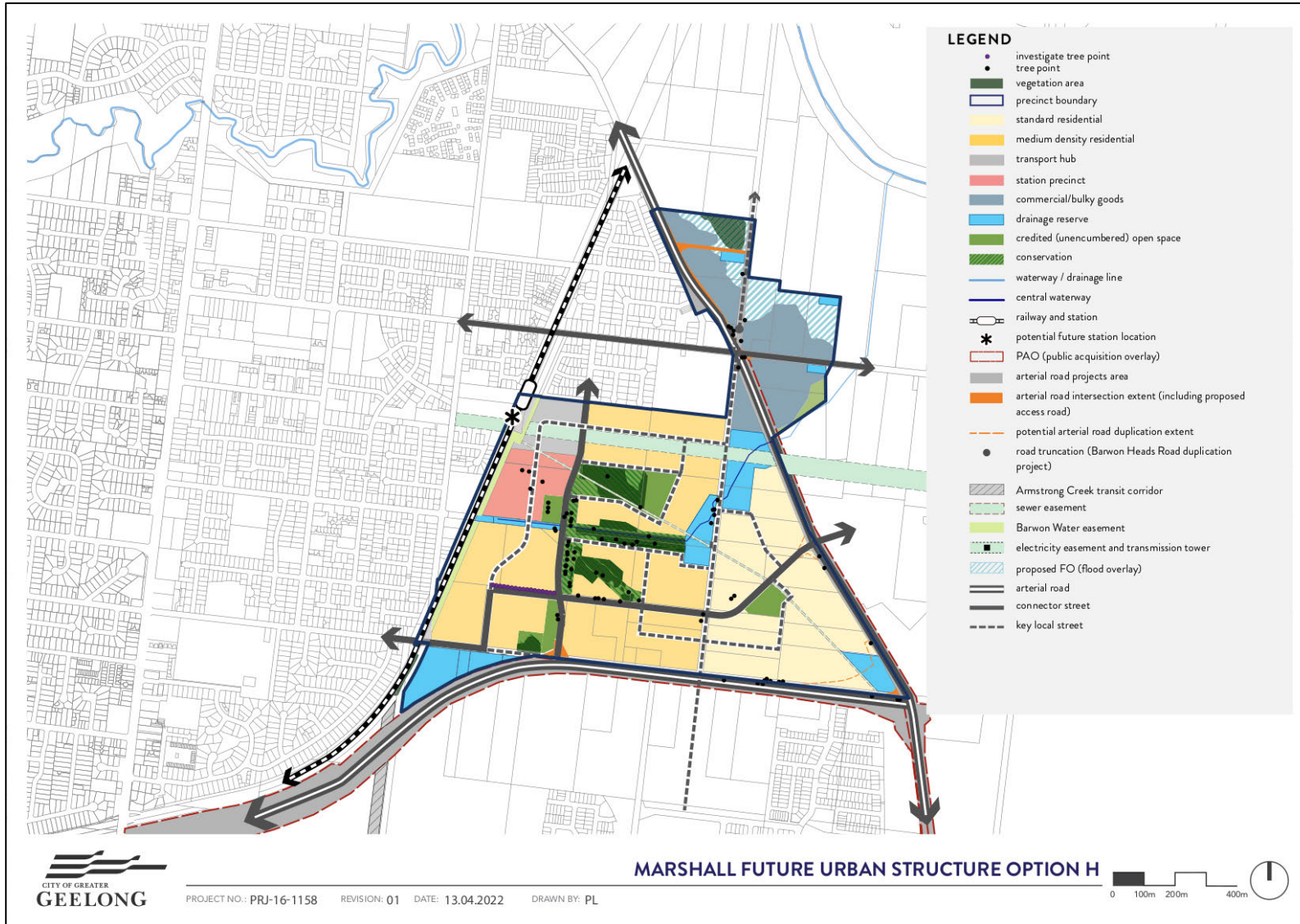


Figure 2 - Future Urban Structure (CoGG, 2019a). Note this design is also integrated into Map 7.

1.1 Executive summary

This study assesses the hazard in accordance with the hazard identification strategies of Clause 13.02-1S and the DELWP settlement guidelines and identifies the bushfire protection measures that will be required for future development in the MPSP area. It is considered that development can appropriately prioritise the protection of human life, and meet the objectives of Clause 13.02-1S, by an appropriate design and layout that amongst other things, ensures future dwellings will not be exposed to RHF above 12.5kW/m^2 , which is commensurate with a BAL-12.5 construction standard.

The MPSP is exposed to a Grassland hazard within and around the precinct and a potential Woodland hazard within the precinct, in the proposed conservation reserves. The topographic influence on fire is likely to be minimal, with the relevant applicable slope class being 'All upslopes and flat land'. The landscape scale risk to the site is considered relatively low, due to the precinct's position as a semi-infill development, however, consideration of the ongoing bushfire hazards within and around the precinct is required.

The FUS has been designed to be sensitive to the threat posed by ongoing bushfire risk. This mainly involves ensuring there are low threat setbacks between hazardous vegetation and buildings that require a BAL in residential areas, commensurate with a BAL-12.5 standard, as outlined in AS 3959-2018.

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’* (Greater Geelong 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 an increase in extreme fire weather (CSIRO/BOM, 2020). The trend of a longer fire season and increased number of dangerous fire weather days is projected to continue. Climate change is contributing to these changes in fire weather including by affecting temperature, relative humidity and associated changes to the fuel moisture content (CSIRO/BOM, 2020). 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).

The Greater Geelong Municipal Fire Management Plan also notes the contribution of climate change to an increase in risk during the fire season including *‘drought and unnaturally high fuel loads’* (City of Greater Geelong, 2019c).

Climate change trends associated with the risk of bushfire, support the adoption of a precautionary and conservative approach in identifying and responding to the risk. Climate change in relation to fire weather is discussed further in the hazard assessment in Section 3.4 of this report.

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*' (Greater Geelong Planning Scheme, 2018a). 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 (BPA);
- Subject to a Bushfire Management Overlay (BMO); 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*' (Greater Geelong Planning Scheme, 2018a).

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. In a BPA this also applies to planning applications for uses and developments that are:

- 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'* (Greater Geelong Planning Scheme, 2018a).

This study assesses the hazard in accordance with the hazard identification strategies of Clause 13.02-1S and identifies the bushfire protection measures that will be required for future development in the MPSP area. It is considered that development can appropriately prioritise the protection of human life, and meet the objectives of Clause 13.02-1S, by an appropriate design and layout that amongst other things, ensures 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 (Greater Geelong Planning Scheme, 2018a).

The PSP responds to the strategies in Clause 13.02-1S (detailed in Section 4.4) by an appropriate response to the DELWP guidelines for settlement planning as detailed in Section 4.

2.2 Clause 21.05-8 Wildfire

The Municipal Strategic Statement (MSS) at Clause 21.05-8 Wildfire, states an objective to minimise the impacts of wildfire by adopting the following strategies:

- *'Identify areas at risk of wildfire.*
- *Ensure that development in identified areas considers the impacts of wildfire'* (Greater Geelong Planning Scheme, 2010).

The bushfire hazard to the MPSP is largely limited to Grassland and, potentially, some relatively small areas of Woodland (see Section 3). It is considered that the existing planning and building controls that relate to bushfire will be able to facilitate an appropriate design response that adequately mitigates the risk in accordance with the objective and strategies of Clause 21.05-8.

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

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.

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

2.4 Bushfire Prone Area (BPA)

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, however no part of the precinct is affected by the BMO. The nearest area of BMO coverage is 10km to the south, associated with coastal vegetation between Torquay and Barwon Heads (see Map 5).

The precinct, and several large areas within 5km to the south and east, are in a designated BPA, however much of the land is also not, as illustrated in Map 4 and Map 5. The majority of land within 5km in the directions of highest bushfire risk (north and west) is not in a BPA (Non-BPA land) where the risk is lower and the same level of bushfire planning is not required (eg. where BAL-LOW is applicable).

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 3² buildings, 'Specific Use Bushfire Protected Buildings'³ and associated class 10A buildings⁴ 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, 2020).

Compliance with AS 3959-2018 *Construction of buildings in bushfire prone areas* (Standards Australia, 2020) is 'deemed-to-satisfy' the performance requirement⁵. Applicable buildings in a BPA must be constructed to a minimum Bushfire Attack Level (BAL)-12.5, or higher, as determined by a site assessment or planning scheme requirement.

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.

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).

Future development in the MPSP will comply with the applicable building regulations invoked by the BPA coverage. Further, as development progresses, reliably low threat or non-vegetated areas will be created, which will result in large parts of the precinct being able to be excised 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.

Land becomes eligible for excision from the BPA 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).

2.5 Other controls

2.5.1 Zoning

Except for the railway corridor along the west boundary of the precinct and the associated Station precinct, all of the precinct is currently zoned Urban Growth Zone (UGZ). The MPSP will be integrated into the UGZ framework, potentially as a schedule. Whilst the UGZ, or other urban residential zones, facilitate more intensive development in a BPA, good precinct design and layout and the existing building and planning controls will be able to appropriately mitigate the bushfire risk. Further, as identified above, as development progresses, some areas within the precinct will become eligible for excision from the BPA.

It is noted that in many PSP growth areas, UGZ schedules often 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 MPSP as it will help to ensure that bushfire risk is managed during the pre-development and construction phases, when areas of interim hazard may be retained in proximity to new or existing development. It also supports subdivision applications to demonstrate how bushfire risk will be mitigated in a Clause 13.02-1S response/application.

2.5.2 Overlays

The overlays that currently apply to parts of the precinct are:

- Environmental Significance Overlay (ESO) – central section of the precinct; and
- Flood Overlay (FO) – part of the northern arm of the precinct, north of Tannery Road; and
- Public Acquisition Overlay (PAO) – part of the Barwon Heads Road Duplication and Bellarine Link Proposal along the eastern and southern boundaries respectively; and
- Land Subject to Inundation Overlay (LSIO) – small portion in the south-east corner of the precinct

The ESO has some implications for bushfire risk, as it encourages the vegetation of high biodiversity or other environmental value being retained in a potentially hazardous state at the applicable EVC standard. Retained vegetation in managed parklands are likely to be low threat, or non-hazardous. Areas of existing vegetation that are proposed to be retained that may be hazardous have been identified and appropriately classified (see Map 2 and Map 6). Development of buildings requiring a BAL will be adequately setback from this hazardous vegetation in accordance with the appropriate BAL standard (BAL-12.5). This is discussed further in Section 4.1.4.

None of the remaining overlays have any implications for bushfire safety. It is not known if new overlay controls are proposed, however it is unlikely that any new overlays would have appreciable bushfire risk implications.

It is noted that there is no BMO coverage of the precinct, and that the nearest areas of BMO coverage are 10km away (see Map 5).

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’* (Greater Geelong Planning Scheme, 2018a).

This section includes an assessment of vegetation, topography and climate/weather considerations including, as applicable, at:

- The site scale, for 100m around the precinct to determine areas of likely future classified vegetation, effective slopes and hence, likely future BALs (see Map 2);
- The local landscape (1km) and neighbourhood (400m) scales (see Map 4); and
- The broader landscape scale, for up to 5km and at least 20km around the site (see Figure 1 and Map 5).

The BPA coverage invokes AS 3959-2018, which requires a site assessment of the vegetation and topography up to 100m around a site or building, for the purposes of determining the applicable BAL construction standard for that building (Standards Australia, 2020). Clause 13.02-1S also requires application of the AS 3959-2018 assessment method to ensure Radiant Heat Flux (RHF) will not exceed 12.5kW/m^2 in accordance with two key settlement planning strategies:

- *‘Directing population growth and development to low risk locations, being those locations assessed as having a radiant heat flux of less than 12.5 kilowatts/square metre under AS 3959-2009 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)’* (Greater Geelong Planning Scheme, 2018a).

3.1 Site based assessment

3.1.1 *Vegetation around the Precinct*

Vegetation within a 100m assessment zone around the precinct has been classified in accordance with the AS 3959-2018 methodology to identify likely BALs and RHF exposure for future buildings in the precinct.

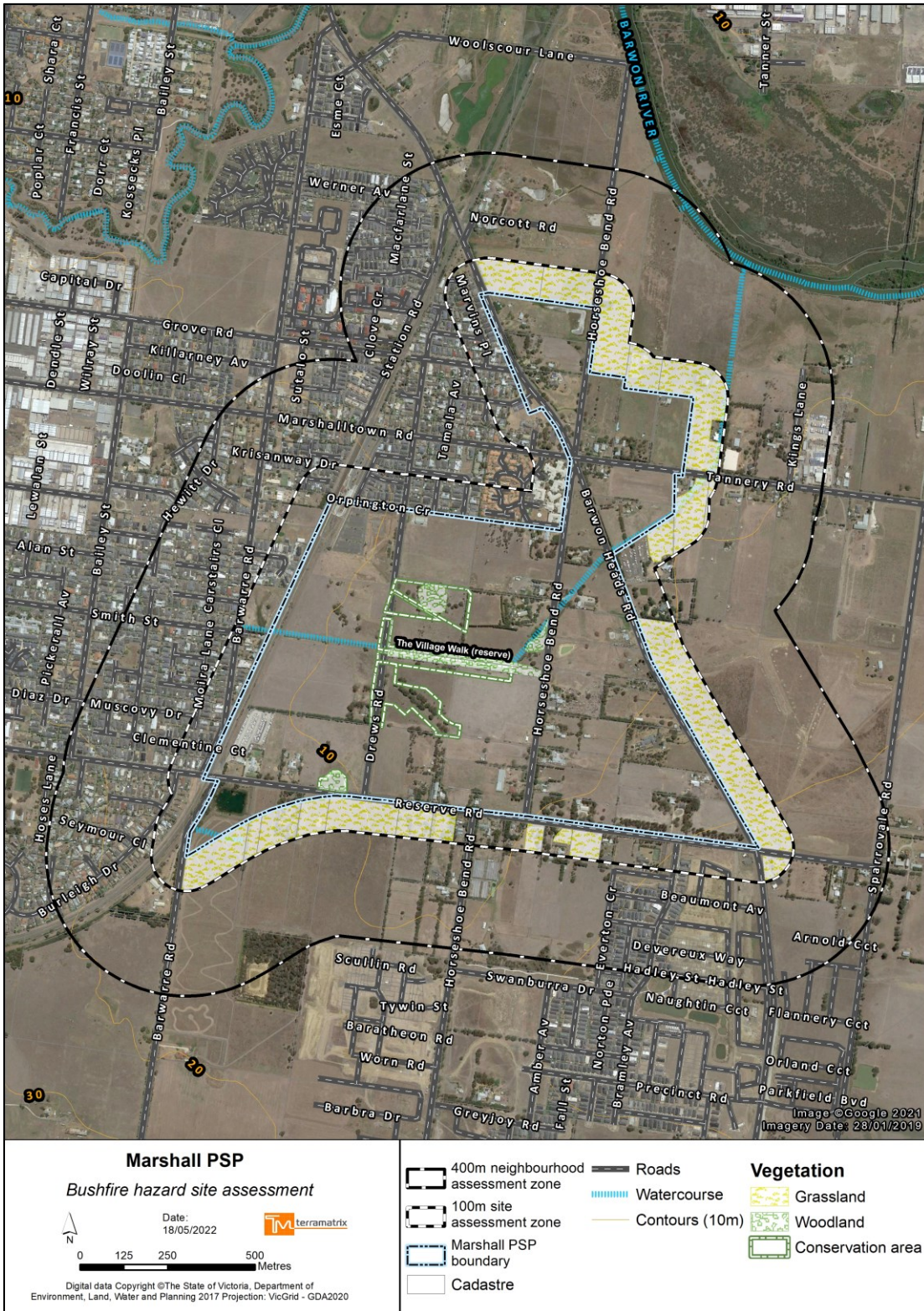
Classified vegetation is vegetation that is deemed hazardous from a bushfire perspective. The vegetation classification system is not directly analogous to Ecological Vegetation Classes (EVCs) but uses a generalised description of vegetation based on the AUSLIG (Australian Natural Resources Atlas: No. 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.

Grassland

The predominant hazard within the 100m BAL assessment area, and up to and beyond the 400m neighbourhood area around the precinct, is Grassland (see Map 1 and Map 2). 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, 2020).

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, 2020). 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.

Grassland, comprising mainly pastures around the site to the north, will remain the dominant hazard to the precinct, as land in this direction is beyond the boundary of the Urban Growth Area (see Map 4 and Map 5). It additionally abuts low riparian vegetation along the Barwon River. It is therefore reasonable to assume it will remain as and continue to pose no more than a Grassland hazard. Except in areas when development has already occurred, to the east and south, the land is also dominated by Grassland. The Grassland to the east and south are considered however, to be a lesser hazard than that to the north, as when land is subsequently developed as part of the Armstrong Creek UGA, the Grassland hazard will likely be removed, or at least significantly reduced in these directions.



Map 2. - Bushfire Hazard Site Assessment. Note that conservation areas may comprise Woodland. For detail on proposed vegetation retention/removal within the precinct see Map 6.

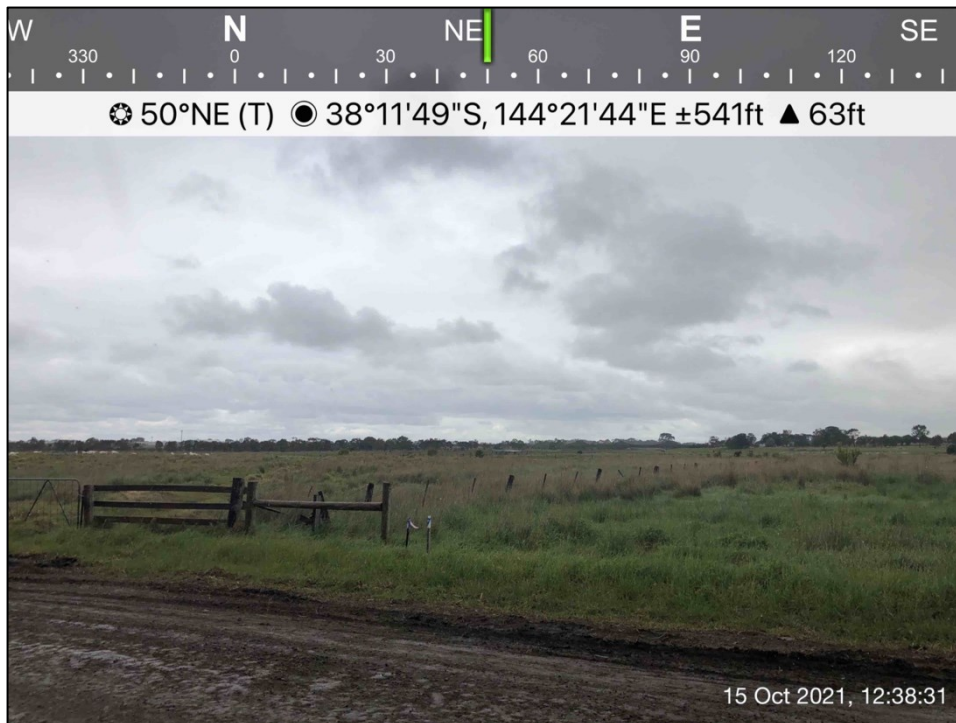


Figure 3 - Looking north-east from Horseshoe Bend Road at Grassland north of the precinct.

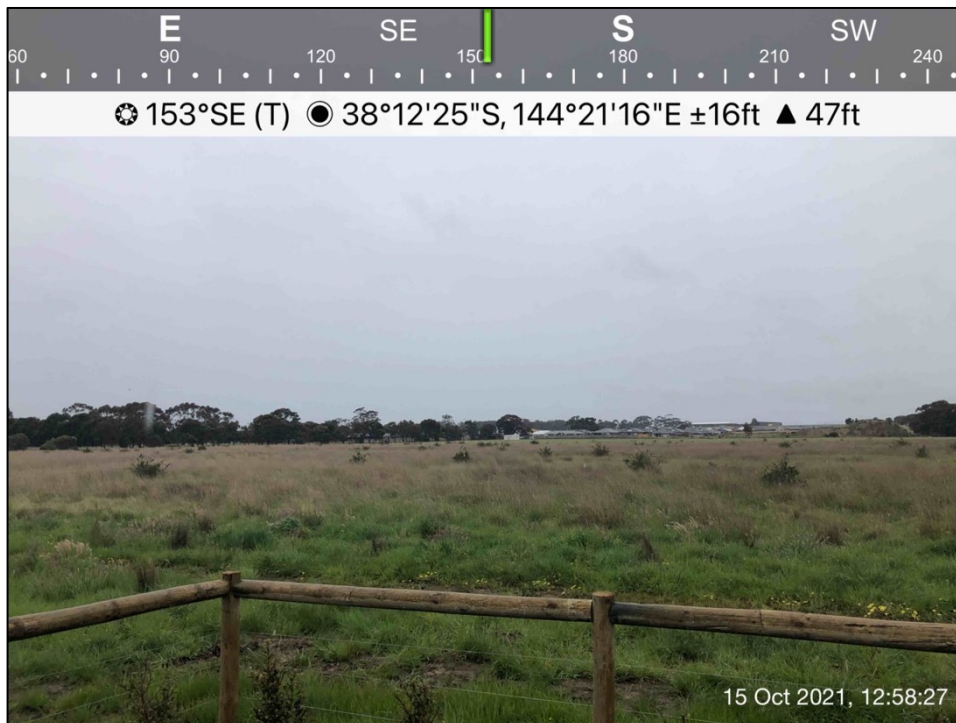


Figure 4 – Grassland to the south of Reserve Road, south of the MPSP. Note this land is likely to be developed in the future within the Armstrong Creek Urban Growth Area.



Figure 5 – Looking east from Barwon Heads Road at Grassland east of the precinct.



Figure 6 – Looking at Grassland to the south from the south-west corner of the precinct.



Figure 7 – Looking at Grassland along the precinct boundary along Orphington Crescent. Grassland on yet to be developed areas of the precinct will pose an interim hazard to new development.

3.1.2 Vegetation within the precinct

Vegetation classification is based on the current and anticipated likely future long-term state of the vegetation as anticipated by the proposed draft Future Urban Structure (FUS) for the MPSP (see Figure 2, Map 2 and Map 6). It must be noted that this necessarily involves making assumptions about the future state and extent of vegetation within the precinct, in particular in the proposed reserves (see Section 4.1.4). These assumptions are specified in this report and should be reviewed and confirmed as far as is practicable by stakeholders, for finalisation of the FUS prior to the amendment process. Areas where vegetation will, or may, be retained as a potential bushfire hazard should be identified in the FUS and appropriate development setbacks adopted.

Grassland

The extensive areas of Grassland that currently occur within the precinct are likely to be a short to medium-term hazard, as it is anticipated that they will be transformed into low threat vegetation (i.e. domestic lawns, gardens, local parks and streetscapes) or will become non-vegetated land as the precinct is developed. Any areas of unmanaged Grassland within 100m of buildings will be 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 3.2). For Grassland hazard around the precinct, see Section 3.1.1.

Woodland

Several relatively small patches of treed vegetation with a predominantly grassy understory occur within the precinct, currently in the proposed longitudinal reserve 'The Village Walk' and as distinct patches on private properties (see Map 2). These areas of treed vegetation match the AS 3959-2018 classification of Woodland. Some of these areas may be retained in their natural state and managed to the applicable EVC benchmark and may, therefore, be an ongoing fire hazard within the precinct. This is discussed further in Section 4.1.4. Revegetation may also occur in the conservation areas identified in the FUS, which could comprise Woodland.

Woodland vegetation typically comprises areas with trees up to 30m tall, 10–30% foliage cover dominated by eucalypts (and/or *Callitris*) with a prominent grassy understory, may contain isolated shrubs (Standards Australia, 2020).

Whilst some of the tree canopy in these Woodland patches exceeds 30%, the generally sparse grassy understory and the hazard it poses is considered more commensurate with a Woodland classification rather than Forest.



Figure 8 – Woodland along The Village Walk at the centre of the precinct, identified for retention. See Map 6 for a detailed view of vegetation retention/removal.

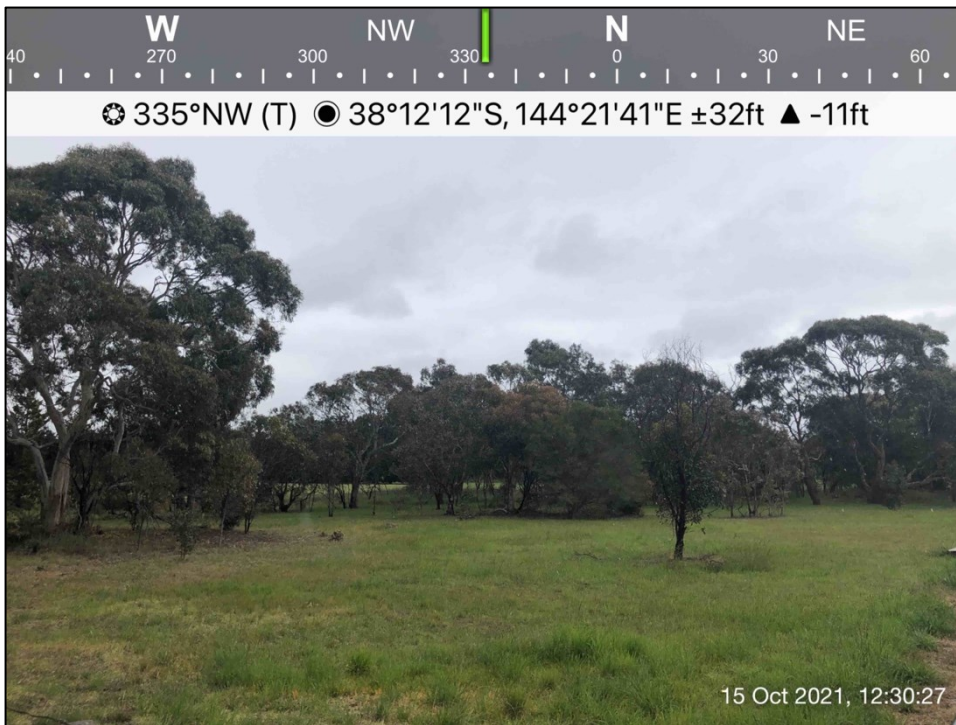


Figure 9 – Woodland north of The Village Walk abutting Horseshoe Bend Road.



Figure 10 – A small patch of Woodland along Reserve Road, marked for retention (left of image).

Roadside Vegetation

Note that vegetation along roadsides or property boundaries, may be able to be deemed 'low threat' as per one of the criteria for excluded vegetation in Section 2.2.3.2 of AS 3959-2018, which allows narrow strips of vegetation along waterways or drainage lines (or roadsides) to 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. The applicable exclusion is:

'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' (Standards Australia, 2020).

This exclusion applies to vegetation along roadsides and property boundaries within and around the precinct (see Figure 14).

Drainage Reserves and Easements

The future vegetated state of the proposed Drainage Reserves and Easements and/or wetlands associated with the Flood Overlay (see Figure 2 and Map 7), may comprise hazardous Grassland (or higher hazard vegetation) if they are not managed in a minimal fuel condition. In this case, these areas will need to be sufficiently separated (setback) from future dwellings or other buildings requiring a BAL to enable a BAL-12.5 standard (e.g. for BAL-12.5 in response to flat or upslope Grassland, a 19m setback is required). The land within the setback must be low threat vegetation or a non-vegetated area. If natural recruitment over time, and/or active revegetation, occurs within reserves, they may comprise higher hazard Woodland vegetation for which a greater setback of development would be required (e.g. 33m for BAL-12.5 in response to flat or upslope Woodland). The future vegetated state of all the drainage reserves and easements will need to be confirmed to identify the hazard they may pose to future development, and the setbacks that may be required. Setbacks can also be managed by mowing areas of grass for the required setback distance to achieve a BAL-12.5 standard or to make that vegetation excludable.

It is reasonable to assume that all other open space reserves, local parks and roadsides within the precinct, will comprise low threat vegetation that can be excluded from classification (see Section 4).

Transport Corridor & Road Reserves

Currently the rail corridor along the south-west boundary of the Marshall PSP poses a Grassland hazard, with only relatively small areas of trees and shrubs that could generate a localised increase in ember attack if a fire occurred along the corridor. The rail corridor is abutted by a narrow (15m wide) area designated as 'Barwon Water Easement' (see Figure 2).

Grassland on the road reserves is likely to be slashed or mown, at least during the fire danger period and may, therefore, be deemed low threat (see Figure 13). Alternatively, some road reserves satisfy the ‘narrow strips’ criterion for non-hazardous vegetation if they are less than 20m wide, not connected with any other area of classifiable vegetation, and are at least 20m from future dwellings (see exclusion criteria in Section 3.2).



Figure 11 - Looking south-west along the rail corridor, from the south-west corner of the precinct.





Figure 14 - Looking south along Barwarre Road, at the south-west boundary of the precinct.

3.2 Excluded vegetation and non-vegetated areas

Areas of low threat vegetation and non-vegetated areas can be excluded from classification and deemed non-hazardous 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, 2020).

Residential and other developed 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.

Areas where vegetation may be retained that could be a potential bushfire hazard (i.e. that will not meet one or more of the exclusion criteria above) should be identified in the FUS and appropriate development setbacks adopted.

3.3 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 vegetation⁶ that will most significantly influence the bushfire attack on a building. Two broad types apply:

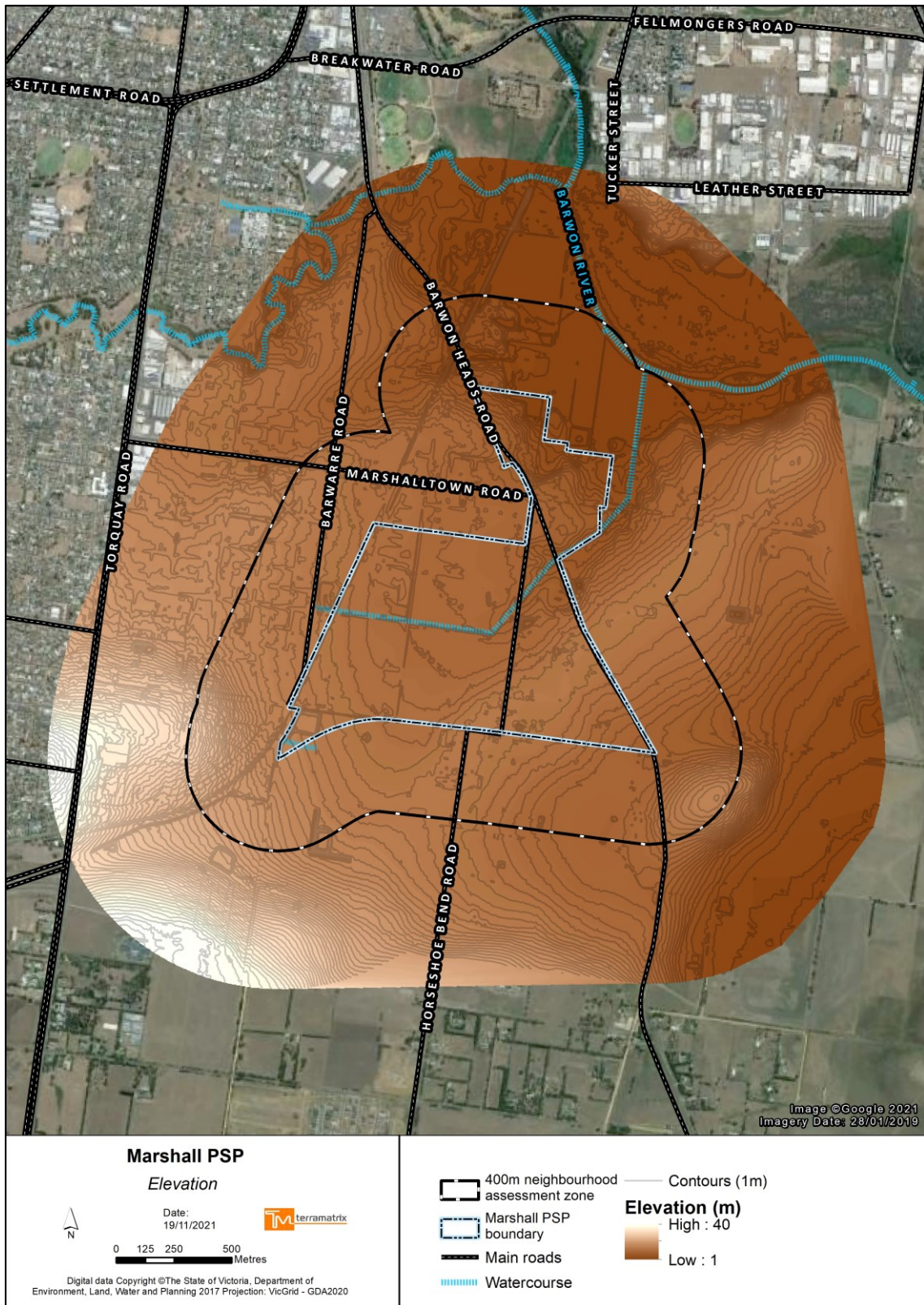
- Flat and/or Upslope - land that is flat or on which a bushfire will be burning downhill in relation to the development. Fires burning downhill (i.e. on an upslope) will generally be moving more slowly with a reduced intensity.
- Downslope - land under the classified vegetation on which a bushfire will 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, publicly available 10m contour data, and by creating an elevation model for the site and surrounding land using an interpolated TIN (Triangulated Irregular Network) digital elevation model generated from 1m contour data supplied by CoGG (see Map 3).

The terrain in the precinct and in the surrounding landscape for at least 400m is relatively benign from a bushfire perspective, being predominantly flat, very gently sloping or upslope in relation to the precinct. Overall, the land generally rises from the north to the south of the precinct. For the purposes of determining future BALs and vegetation setback distances for buildings, the applicable slope class is 'All upslopes and flat land'.

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

⁶ 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.



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

3.4 Fire weather

The Forest Fire Danger Index (FFDI) and the Grassland Fire Danger Index (GFDI) represent the level of bushfire threat based on weather (and fuel) conditions. An FFDI 100/GFDI 130 is applied in non-alpine areas of Victoria by the building system, to establish 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 range⁷ 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 MPSP area.

As noted in Section 2.1.1, especially in southern Australia, since the 1950s there has been an increase in the length of the fire weather season and an increase in extreme fire weather. It is projected that there will be further increase in the number of dangerous fire weather days and a longer fire season for southern and eastern Australia (CSIRO/BOM, 2020).

There is a 'high confidence' that climate change will result in a harsher fire weather climate for the Southern Slopes (Victoria West) sub-cluster region that the precinct is in; with a 'very high confidence' that average temperatures will continue to increase in all seasons. Generally, less rainfall in the cool season (winter and spring) is projected with 'high confidence'. Changes to summer and autumn rainfall are possible but less certain. The magnitude of the change depends on the rainfall projection and its seasonal variation. Enhanced summer rainfall projected in some scenarios could moderate the number of severe fire weather days (CSIRO/BOM, 2021).

Currently neither the CFA or DELWP have a published policy or guidance 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 system⁸.

⁷ The GFDI ranges for each FDR in Table 1 may vary in some jurisdictions.

⁸ 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	
12-24		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.
0-11		Low – Moderate	

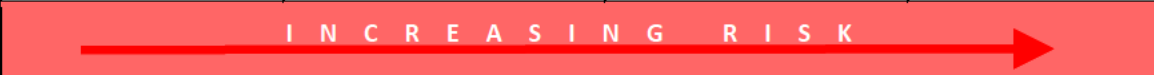
3.5 Landscape risk

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 MPSP area is not affected by the BMO, with the nearest areas of BMO coverage being 10km south of the precinct near Torquay. 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).

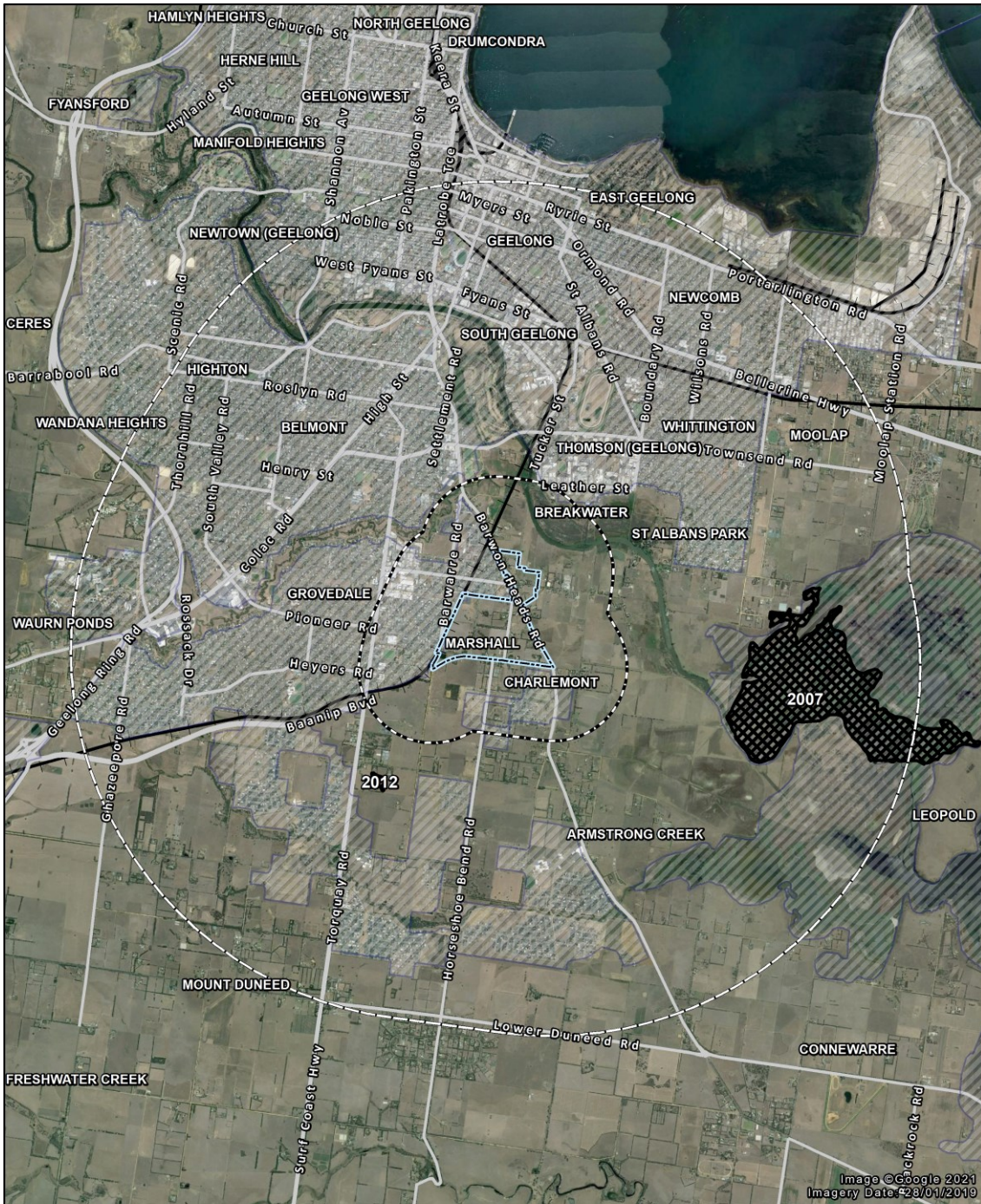
Broader Landscape Type 1	Broader Landscape Type 2	Broader Landscape Type 3	Broader Landscape Type 4
<ul style="list-style-type: none"> • There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation). • Extreme bushfire behaviour is not possible. • The type and 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. 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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.
			

It is considered that the landscape within 1km of the precinct best matches the attributes of Landscape Type 1. The topography is relatively benign and the predominant hazard is Grassland. Fire runs from the north can reach 1km in length, beyond which there are developed residential areas of Greater Geelong and Port Phillip Bay. Similarly, the length of a fire run from the south is somewhat curtailed by developed areas further south in the Armstrong Creek UGA and are through a landscape that comprises Grassland. The longest grassfire run that can approach the site is from the east, through Lake Connewarre Wildlife Reserve. It is noted that the Lake is marked as Non-BPA Land in Map 4, however there is a risk of fire occurring as the lake may become seasonally dry and vegetated, providing grassland fuel for a fire to propagate, as occurred in 2007. Grassfires can ignite, spread and impact rapidly under severe fire conditions when driven by strong winds, however they generally have a lesser intensity and/or likelihood of occurring under the scenario of a fire approaching from the east and as such the threat of fire approaching the site from this direction is somewhat moderated (Long, 2006).

In the directions of highest risk, to the northwest, west, and southwest⁹, the precinct is somewhat 'buffered' by the residential allotments and non-BPA land in these directions (see Map 4 and Map 5).

Good precinct design that responds to the bushfire risk, including the provision of BAL-12.5 setbacks, the application of the building controls for development in a BPA, and an urban residential road network and reticulated water supply appropriately mitigate the risk.

⁹ The northwest, west and southwest are directions typically associated with severe or higher fire weather in Victoria (Long, 2006).



Marshall PSP
Local and landscape assessment

Date: 19/11/2021

TM terramatrix

0 1 2 4 Kilometers

Digital data Copyright ©The State of Victoria, Department of Environment, Land, Water and Planning 2017 Projection: VicGrid - GDA2020

5km from Marshall PSP	Bushfire history
1km local landscape assessment zone	Non-BPA land
Marshall PSP boundary	Main roads
	Rail

Map 4 - Bushfire Hazard Local and Landscape Assessment Map.



<p>Marshall PSP Broad landscape assessment</p> <p>Date: 27/10/2021</p> <p>TM terramatrix</p> <p>0 2.5 5 10 Kilometers</p> <p>Digital data Copyright ©The State of Victoria, Department of Environment, Land, Water and Planning 2017 Projection: VicGrid - GDA2020</p>		<p>20km from Marshall PSP</p> <p>Marshall PSP</p> <p>Public land</p> <p>BMO and Schedules</p> <p>Main roads</p> <p>Rail</p>	
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Map 5 - Bushfire Hazard Broad Landscape Assessment Map.

4 Planning and design response

This section identifies how the FUS and PSP responds appropriately 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 Settlement form and structure

4.1.1 *Considering the bushfire hazard in directing growth*

Situated as it is within the Armstrong Creek Urban Growth Area, the MPSP area is outlined in the Greater Geelong City Council's Municipal Strategic Statement (MSS), which identifies the Marshall precinct as an 'Increased Housing Diversity Area' and a primary town for urban growth and consolidation, noting that the Armstrong Creek UGA is anticipated to grow from 7,000 to 55,000-65,000 residents. The MPSP alone will be able to house approximately 4,300 residents (Greater Geelong Planning Scheme, 2019; CoGG, 2020).

Clause 13.02-1S stipulates that settlement planning must identify the bushfire hazard, assess the risk and direct growth to low-risk areas (Greater Geelong Planning Scheme, 2018a).

Due to the precinct's position as semi-infill in relation to surrounding development, the MPSP is exposed to less of a hazard than growth precincts located on the boundary of the associated UGA. Urban landscapes cover most of the land within 5km to the north and west. The precinct has some exposure to moderate (1km) fire runs from the north and south and longer (>5km) fire runs to the east (see Map 4). Severe fire weather conditions are also not typically associated with easterly or north-easterly winds (Long, 2006).

High hazard forested landscapes occur further to the south-west, including the Anglesea Heath and further to the Great Otway National Park, however it should be noted that these are over 15km away and are removed significantly enough from the site not to present an appreciable risk (see Map 5).

The precinct is somewhat protected or 'buffered' from a bushfire approach from the northwest and west by the Grovedale township area and other residential areas where the bushfire hazard has been removed or substantially modified by settlement. Furthermore, the grassland within 5km of the site is somewhat enclosed by the Thomson and South Geelong township areas to the north and Charlemont and Armstrong Creek township areas to the south. More land to the south will eventually be developed and consequently the risk of grassfire from the south will be removed. These are the directions typically associated with severe or higher fire weather conditions in

Victoria (Long, 2006). The reduced risk is reflected by the removal of significant areas of land in these directions from the BPA (see Map 4).

The higher risk parts of the precinct are those abutting and adjacent to the northern precinct boundary, and to a lesser extent, the southern and eastern boundaries.

Overall, the vegetation within 5km of the precinct to the north and west is limited to low threat roadside vegetation and curtilage associated with residential properties, with the exception of Grassland within 1km to the north, which is likely to remain in its current state buffering the Barwon River. Vegetation to the south and east comprises a mix of temporary Grassland and low threat gardens on developing residential curtilage, the latter of which will subsequently replace the former as the Armstrong Creek UGA is developed (see Map 1).

The main form of bushfire attack on future development is potentially low levels of ember attack from a large, 'landscape scale' bushfire burning near the precinct; and elevated levels of radiant heat and localised flaming that might be experienced if a fire front impacted.

However, the hazard and resultant bushfire risk is low and not significant enough to prevent development of the precinct; and the existing planning and building controls are appropriate to mitigate the risk. If the development layout responds to the bushfire risk and future buildings are setback sufficiently from hazardous vegetation such that they can achieve a BAL no higher than BAL-12.5, the risk can be deemed to be acceptable.

The precinct is located to the east of an established settlement, which accords with DELWP guidance about lower risk locations. Furthermore, as land is developed in and around the precinct it will result in areas of the precinct becoming eligible for exclusion from the BPA if they are sufficiently distant from hazardous vegetation around it (see the criteria for excision in Section 2.4).

4.1.2 The distribution of land uses in the settlement

Terramatrix is not aware if any specific vulnerable uses are proposed. A vulnerable use is typically a residential aged care facility, residential building, retirement village, child care centre, education centre, hospital, leisure and recreation facility or a place of assembly. The proposed higher density residential areas are located in the lower risk north-western part of the precinct, well away from the higher risk northern, eastern and southern boundaries of the precinct.

Some local parks and commercial land use areas of the FUS are located along the northern interface to provide a protective 'buffer' for residential development from a potential fire approaching from the north. Proposed roads, public parks and drainage reserves also provide

additional buffers from potential bushfire risks within conservation areas within the precinct and classified vegetation around the precinct. This also acts to achieve all or part of the BAL-12.5 setbacks from classified vegetation within and around the precinct.

4.1.3 Lot sizes in settlement layout

Most of the precinct is proposed to have standard or medium density housing, with an average density of 17 and 30 dwellings per hectare respectively. The high density residential areas in the Station Precinct are proposed to have an average of 50 dwellings per hectare (CoGG, 2019a). These residential densities are typically associated with low threat cultivated gardens that will assist to minimise hazardous vegetation within the residential area.

The average density of housing over the MPSP is:

- High density - 50 dwellings per hectare in the Station Precinct along the west boundary, comprising multi-unit apartments/terraces row houses and villas (approx. 5.5 ha in total);
- Medium density - 30 dwellings per hectare in the Walkable Catchment area, comprising small-lot housing (approx. 40 ha in total);
- Normal density - 20 dwellings per hectare in the Wider Precinct, comprising dual-occupancies, duplexes and detached houses (approx. 22 ha in total) (CoGG, 2019a).

Small lot sizes can offer bushfire safety advantages, if the lot size is small enough that it creates a 'dense' urban area that contains only low threat vegetation and non-vegetated areas with a resultant limited potential for bushfire to spread through it.

Conversely, studies have found a correlation between house loss in a bushfire and proximity to other houses, due to the potential for heavy 'urban' fuels to increase flame, radiant heat and ember attack on adjacent or nearby dwellings (Price and Bradstock, 2013; Bianchi and Leonard, 2005; Gill *et al.*, 2003).

DELWP guidelines consider lot sizes between 800m² and 1,200m² provide a good balance between the risk of larger lots retaining more vegetation within a residential area, and smaller lots providing an increased risk of house-to-house ignitions or increased house losses from ember attack due to the higher housing density (DELWP, 2020).

The Medium Density residential areas making up the bulk of housing in the precinct are proposed to comprise a total of 40 hectares with 1,248 dwellings, which equates to an average lot size of 320m². The Standard Density residential areas in the south-eastern part of the precinct are proposed to comprise a total of 22 hectares with 442 dwellings, which equates to an average lot size of just under 500m².

The residential lot sizes proposed in the MPSP do not trigger any particular design features outside those necessitated by those required by the BPA, namely that they are provided with the appropriate level of low threat and non-vegetated setback commensurate with a BAL-12.5 standard (see Section 4.2.1).

The area marked for Commercial use in the FUS is likely to provide a minimally vegetated or non-vegetated buffer between the Grassland to the north and residential areas. This is a desirable feature, as it provides an added degree of setback from the ongoing hazard in that direction.

Subject to the final proposed lot density in the residential parts of the precinct, it may be useful to also consider the need for vegetation controls or guidelines for areas with an interface with a bushfire hazard (e.g. the northern boundary or those near conservation reserves) to ensure vegetation on larger lots is maintained as low threat.

4.1.4 Vegetated areas within a settlement

Areas of vegetation within the MPSP that may comprise classified vegetation have been identified in the FUS as conservation areas. This will allow setbacks from them to be defined to achieve BAL-12.5 development. It is assumed that all other vegetation within the precinct will be excluded from classification by one or more of the AS 3959-2018 vegetation exclusion criteria see Section 3.2.

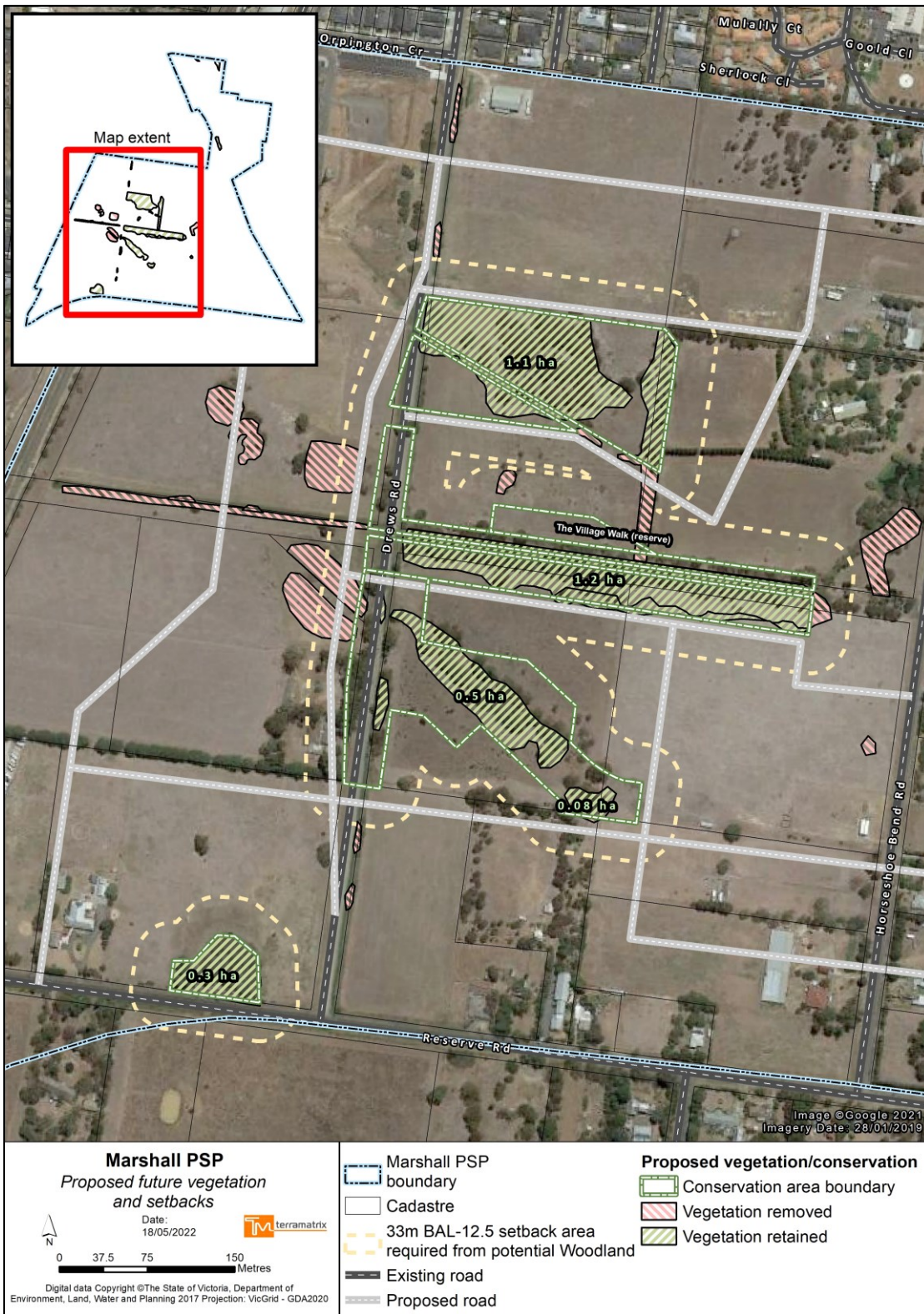
It is recognised, however, that at the strategic and settlement planning stage it may be difficult to define the exact future vegetated state of the precinct. In this case, statutory controls should be put in place to ensure, at the subdivision design and approval stage, that any areas of hazardous vegetation are identified, and commensurate development setbacks incorporated, with appropriate certainty about management of vegetation within a setback area.

City of Greater Geelong provided Terramatrix with geographic data outlining proposed conservation areas and the retention/removal of existing treed vegetation within the FUS on 26/10/2021, which has been adapted in accordance with the updated FUS provided on 20/04/2022 and is illustrated in Map 6). Residential development will need to be setback from classified vegetation in the conservation areas unless it qualifies for one or more of the exclusion criteria under Section 2.2.3.2 of AS 3959-2018 (see criteria in Section 3.2), in which case it can be considered low threat and non-hazardous. Exclusion often requires the dwelling (aka site) on a residential lot to be setback by a distance of 20m from the vegetation. If the vegetation is deemed hazardous according to the classification methodology, residential development must provide low threat setbacks from the vegetation for the distances required for BAL-12.5 construction designated by the applicable vegetation class (see Section 4.1.2).

The MPSP is in the Volcanic Plains Bioregion, and whilst Ecological Vegetation Classes (EVCs) are not directly analogous to the AS 3959-2018 vegetation classifications, the EVC descriptors provide some information about the hazard the 'natural' state of vegetation in the precinct may pose. The following EVCs are identified as potentially occurring within the Armstrong Creek growth area according to a Detailed Flora and Fauna Assessment of a nearby precinct (CPG Australia, 2011) and publicly available EVC data:

- ***EVC 132: Plains Grassland*** - *Treeless vegetation mostly < 1 m tall dominated by largely graminoid and herb life forms. Occupies cracking basalt soils prone to seasonal waterlogging in areas receiving < 500 mm annual rainfall.*
- ***EVC 647: Plains Sedgy Wetland*** - *Occurs in seasonally wet depressions on volcanic and sedimentary plains, typically associated with fertile, silty, peaty or heavy clay paludal soils. Primarily sedgy-herbaceous vegetation, sometimes with scattered or fringing eucalypts or tea-tree/paperbark shrubs in higher rainfall areas. A range of aquatic herbs can be present, and species-richness is mostly relatively low to moderate, but higher towards drier margins.*
- ***EVC 56: Floodplain Riparian Woodland*** - *An open eucalypt woodland to 20 m tall over a medium to tall shrub layer with a ground layer consisting of amphibious and aquatic herbs and sedges. Occurs along the banks and floodplains of the larger meandering rivers and major creeks, often in conjunction with one or more floodplain wetland communities. Elevation and rainfall are relatively low and soils are fertile alluviums subject to periodic flooding and inundation.*
- ***EVC 175: Grassy Woodland*** - *A variable open eucalypt woodland to 15 m tall or occasionally Sheoak/Acacia woodland to 10 m tall over a diverse ground layer of grasses and herbs. The shrub component is usually sparse. It occurs on sites with moderate fertility on gentle slopes or undulating hills on a range of geologies." (DSE, 2004)*

If the future state of vegetation within the proposed conservation reserves is managed to these EVC benchmarks, the hazard posed by them is not likely to exceed that of a Woodland or Grassland classification under AS 3959-2018 standards.



Map 6 – Proposed future vegetation retention/removal, reserves and potential setbacks from classified vegetation.

The following vegetated areas marked for tree retention and illustrated in Map 7 are described below.

The Village Walk Reserve – 1.2 ha

Treed patches with a grassy understory within an existing longitudinal reserve and associated walking trail are proposed to be retained in the MPSP FUS. At the time of the site assessment the reserve was considered to comprise a Woodland hazard, although some patches were semi-managed as part of the walking trail (see Figure 8). 33m low threat setbacks will apply to achieve a BAL-12.5 standard for dwellings within a BPA.

Reserve Road Reserve – 0.3 ha

Trees with an unmanaged understory including scattered shrubs on a property on the north side of Reserve Road are proposed to be retained in the MPSP FUS. At the time of the site assessment the trees were considered to comprise a Woodland hazard. 33m low threat setbacks will apply to achieve a BAL-12.5 standard for dwellings in a BPA.

Drews Road Reserve (north) – 1.1 ha

Trees with a grassy understory on properties on the east side of Drews Road and north of The Village Walk are proposed to be retained in the MPSP FUS. At the time of the site assessment the trees were considered to comprise a Woodland hazard. 33m low threat setbacks will apply to achieve a BAL-12.5 standard for dwellings in a BPA.

Revegetation may occur within the conservation area identified in the FUS and as such, 33m setbacks have been applied from the conservation area boundary.

Drews Road Reserve (south) – 0.5 ha

Trees with a grassy understory on properties on the east side of Drews Road and south of The Village Walk are proposed to be retained in the MPSP FUS. At the time of the site assessment the trees were considered to comprise a Woodland hazard. 33m low threat setbacks will apply to achieve a BAL-12.5 standard for dwellings in a BPA.

Revegetation may occur within the conservation area identified in the FUS and as such, 33m setbacks have been applied from the conservation area boundary.

4.2 The hazard interface

4.2.1 Applying the required development setbacks

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 setback¹⁰ 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 metre¹¹ 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)’ (Greater Geelong Planning Scheme, 2018a).*

The BAL-12.5 setbacks potentially required in response to Grassland and Woodland, 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.

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

Vegetation	Slope class	Dwelling-Vegetation setback distance (defendable space)
Grassland	All upslopes and flat land	19m
Woodland		33m

¹⁰ 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:

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

¹¹ Note that the first strategy is to ensure RHF is less than 12.5kW/m² (author’s emphasis). The second strategy stipulates a maximum BAL-12.5 construction standard (which requires that RHF not exceed 12.5kW/m²). 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.

Map 7 shows the BAL-12.5 setbacks that will be required from the edge of classified vegetation within and around the precinct for future dwellings in the precinct (as per the site assessment in Section 3.1) if the vegetation does not meet one or more of the exclusion criteria (see Section 3.2 and 4.1.4).

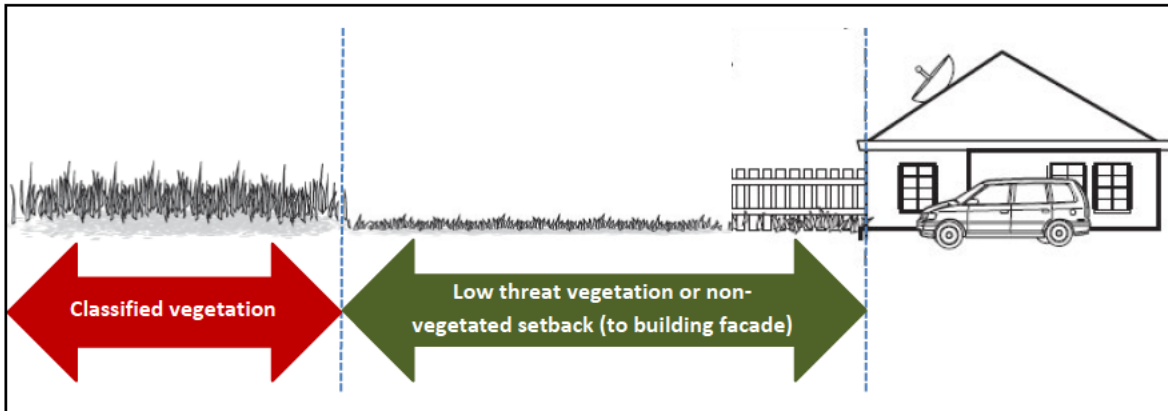


Figure 15 - Example of building-classified vegetation setback (adapted from CFA, 2013).

The setbacks in Map 6 and Map 7 are based on the conservation area boundaries provided in the FUS to Terramatrix on 20/04/2022. Care should be taken that the applicable setbacks are provided at the time the precinct is developed.

As identified previously, if this is not possible, statutory controls at the subdivision design and approval stage should ensure that any areas of hazardous vegetation are identified and commensurate development setbacks incorporated, with appropriate certainty about management of vegetation within any setback area.

4.2.2 *Designing the hazard-development interface*

Section 3.5 has identified that the landscape risk to the MPSP is relatively low. However, as identified in Section 4.1.2, lower threat areas such as local parks and roads are located along development interfaces, to provide a partial protective ‘buffer’ for residential development from areas of hazardous vegetation within and around the precinct. The siting of non-residential land uses along the northern boundary maximises residential setbacks from this more hazardous northern precinct interface, which will be an ongoing hazard. Local parks and/or drainage reserves, where vegetation is managed in a low threat state are sited near potentially hazardous conservation reserves and their layouts are designed to provide an added degree of safety for some of the adjacent development as a buffer. The road layout and design also provides a similar degree of safety, separating development from future potential bushfire hazard within and around the precinct.

Scaled, illustrative design cross sections for the following road-hazard interfaces have been prepared as part of the draft MPSP to show the interface layout with development setbacks and indicative landscaping (see Section 4.2.3). These cross-sections serve the dual purpose of providing low threat or non-vegetated setbacks and access for emergency vehicles, as exemplified in Figure 16 below.

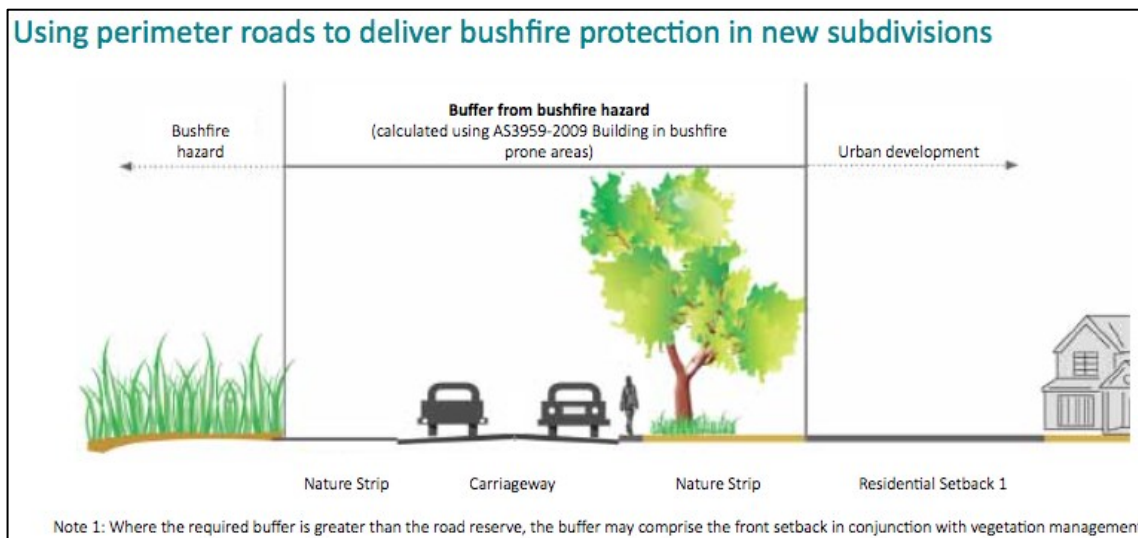


Figure 16 - Illustration of a perimeter road to provide required development setbacks (DELWP, 2015a).

The southern and eastern interfaces are lesser risk locations due to the Horseshoe Bend Road, which will form a useful ‘hard edge’ to the east boundary of the precinct, comprising a 20m low threat and non-vegetated buffers for adjacent development. It is also not an aspect typically associated with approach of bushfire on days of elevated fire danger.

Similarly, the proposed Bellarine Link Road along the southern boundary will be a 74m combined major road and service road, which more than achieves the minimum required 19m setback for BAL-12.5 development, from the Grassland hazard posed by the pastures further to the south.

Whilst the Grovedale township provides a large low threat area further to the west, the railway reserve within and along the western precinct boundary currently poses a Grassland hazard. The Barwon Water Easement abutting the rail corridor can provide the required 19m for development setbacks, however it would need to be managed ongoingly to achieve this.

The Grassland hazard along the north-western boundary of the precinct, on the land designated under the Flood Overlay will need to include a low threat or non-vegetated area of management to achieve BAL-12.5 setbacks for any buildings that require a BAL in the commercial land use area.

4.2.3 Designing access and egress

Perimeter roads are a desirable design feature; to achieve, or contribute to BAL setbacks, separate future development from hazardous vegetation with a ‘hard’ non-vegetated edge, and facilitate property protection and fire fighting (see Figure 16). Perimeter road design cross-sections have been drafted into the MPSP (CoGG, 2019a), as follows.

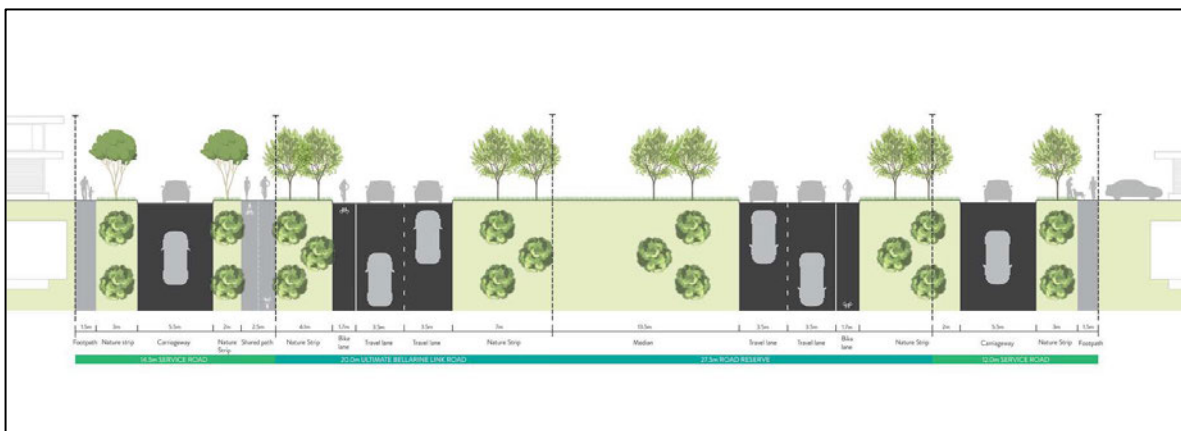


Figure 17 – Proposed Bellarine Link Road interface, providing 74m of low threat and non-vegetated setback for development on the southern boundary of the precinct.

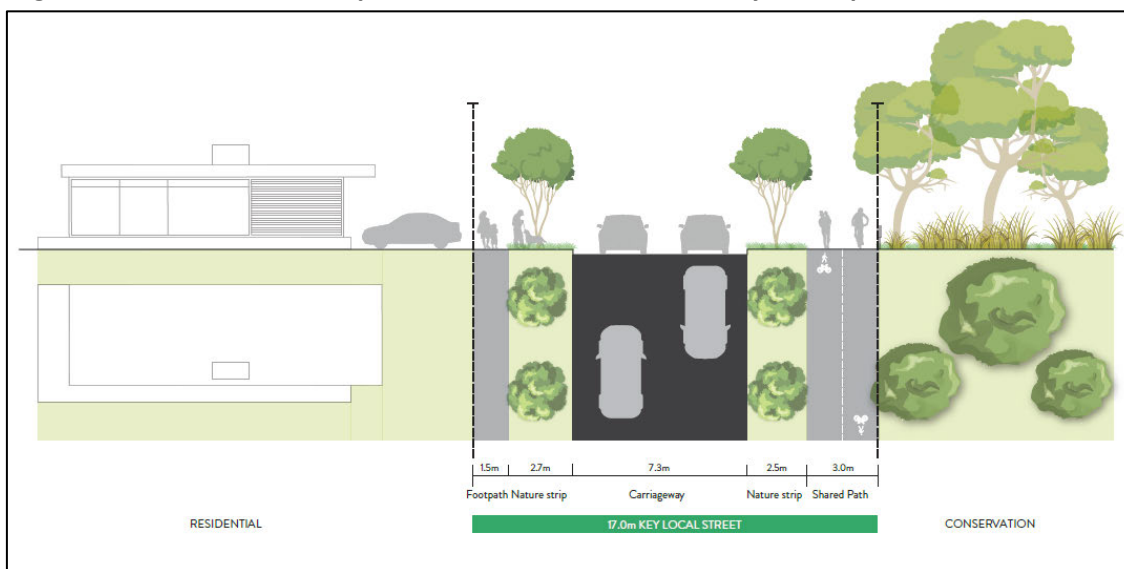


Figure 18 – Key local street-conservation reserve interface, providing 17m of low threat and non-vegetated setback for residential development. Note the balance of 3m could be provided as residential setback if the vegetation qualifies for one or more of the exclusion criteria (see Section 3.2).

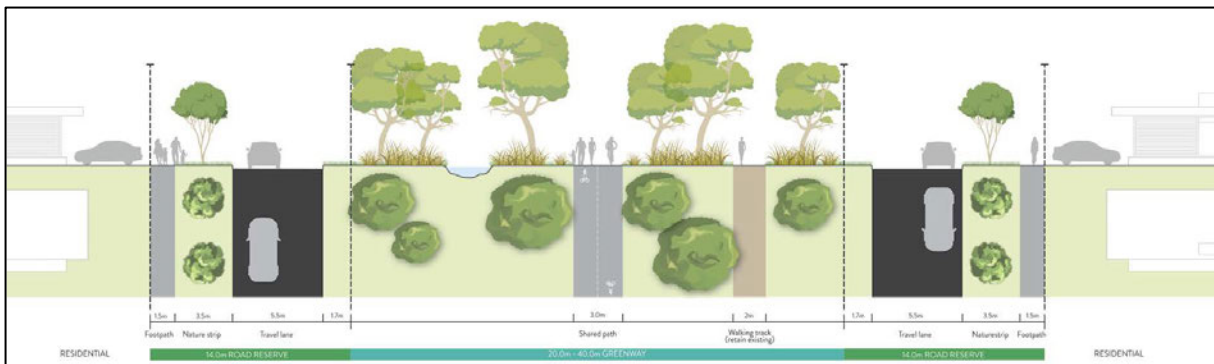


Figure 19 – The proposed Smith Street interface, providing 14m of low threat and non-vegetated setback for residential development from The Village Walk reserve. Note the balance of 6m could be provided as residential setback if the vegetation qualifies for one or more of the exclusion criteria (see Section 3.2).

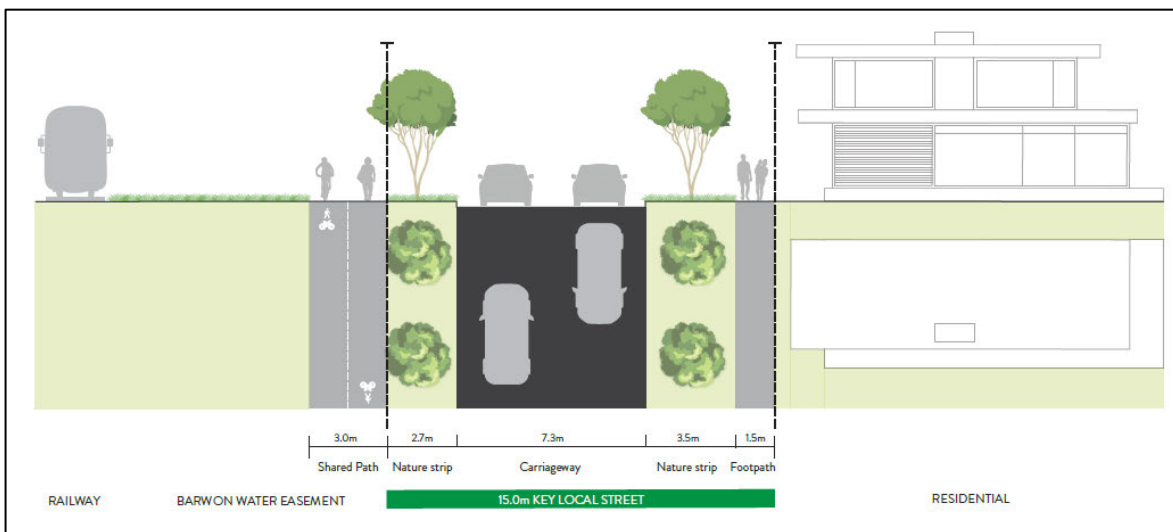


Figure 20 – The Station Precinct-rail corridor interface, providing 15m (+3m of shared path) of low threat and non-vegetated setback for residential development from potential Grassland in Barwon Water Easement if the vegetation does not qualify for one or more of the exclusion criteria (see Section 3.2).

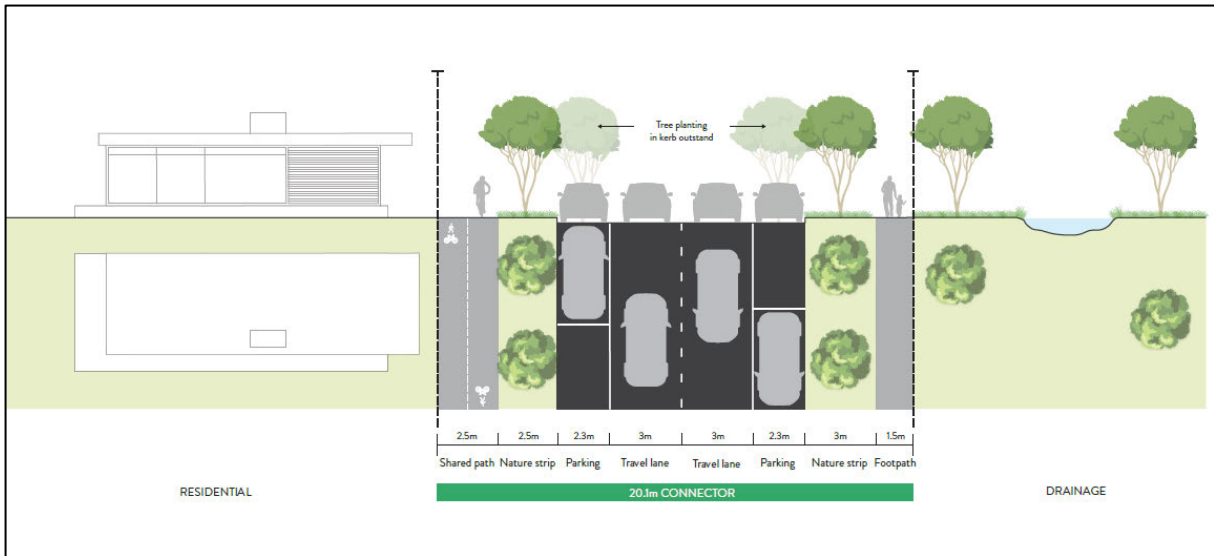


Figure 21 – The Horseshoe Bend Road interface, providing 20m of low threat and non-vegetated setback for residential development from a Drainage Reserve within the precinct.

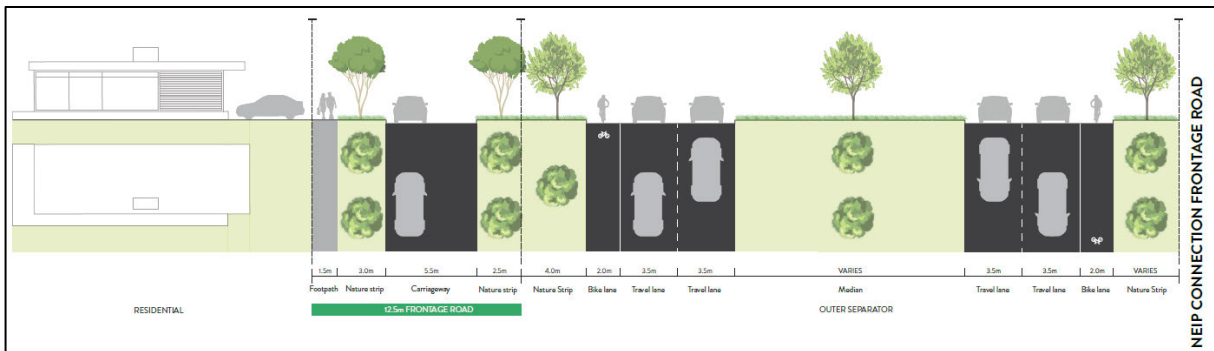


Figure 22 – The proposed Barwon Heads Road duplication interface, providing more than 20m of low threat and non-vegetated setback for residential development on the eastern border of the precinct.

To the south and east, the precinct boundaries have the advantage of roads that will provide a hard edge for development and separate it from hazardous vegetation beyond the precinct. Along the west boundary of the precinct, the railway reserve and/or ‘Barwon Water Easement’ may fulfil some of the functions of a perimeter road, although at the time of the site assessment the railway reserve contained hazardous vegetation (see Figure 12).

Achieving the appropriate setback distances provided by perimeter roads, local/linear parks and/or residential setbacks within lots (see Figure 16) must be considered along the boundary of any areas of hazardous vegetation within the precinct (e.g. The Village Walk) to provide separation for buildings that require a BAL.

All of the proposed road widths provide a minimum BAL-12.5 setback from Grassland on flat or upslope land, as shown in the draft FUS, which identifies:

- 74m major road design for Bellarine Link Road along the southern precinct boundary;
- >20m main road design for Barwon Heads Road duplication along the eastern precinct boundary;
- 14m-17m Smith Street and Key local street interfaces along a conservation reserve boundaries;
- 20m connector roads (including Horseshoe Ben Road along a part of the northern precinct boundary); and
- 15m connector roads alongside the rail corridor and Barwon Water Easement (CoGG, 2019a).

There should be no obstacles to future subdivision providing appropriate access/egress for emergency vehicles and residents via a conventional residential road network in accordance with the requirements for roads in a residential subdivision at Clause 56.06. Road layouts should enable good access to the lesser risk eastern and southern arterial roads and then to Grovedale to the west or Geelong to the north.

4.3 Bushfire protection measures across a settlement

4.3.1 *Vegetation management*

Roadsides, narrow waterway and drainage reserves or other parks that pose a Grassland hazard or contain potentially hazardous patches of remnant vegetation, or revegetation or plantings posing a hazard, may be excluded from classification as low threat, non-hazardous vegetation if they meet the AS 3959 exclusion criteria for small patches:

- 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 a 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 a site/building or each other, or other areas of classified vegetation.

For BAL compliance, no further development setbacks are needed from such 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 (see Section 3.2).

The Conservation Reserve areas proposed in the FUS are likely to contain vegetation that is unable to be excluded from classification. As such, the AS 3959-2018 setbacks between dwellings and the hazard for the relevant vegetation class apply from the reserve boundary. This necessitates minimum 19m setbacks from Grassland and 33m setbacks from Woodland (see Map 6 and Map 7).

Ideally, all landscaping of road and drainage reserves, easements, communal areas, and any other open space should be low threat and therefore excludable, however the minimum setbacks required for BAL-12.5 must be assured.

The Municipal Fire Management Plan (MFMP), or other appropriate plan, should specify ongoing management standards for any other areas, such as road reserves, that are required to be maintained in a low threat state. Any review and future version of the MFMP should note any other bushfire protection measures that are implemented for the study area if they require ongoing maintenance.

Land within the drainage reserves or elsewhere in the precinct, may be non-vegetated or low threat if they will be reliably open water or wet areas with little or no vegetation. However, larger, seasonally inundated wetlands or precinct features that may be dry and vegetated during the fire danger period, such as the area marked as Flood Overlay in the FUS, could comprise classifiable Grassland (or higher hazard vegetation if they have shrubs and/or trees).

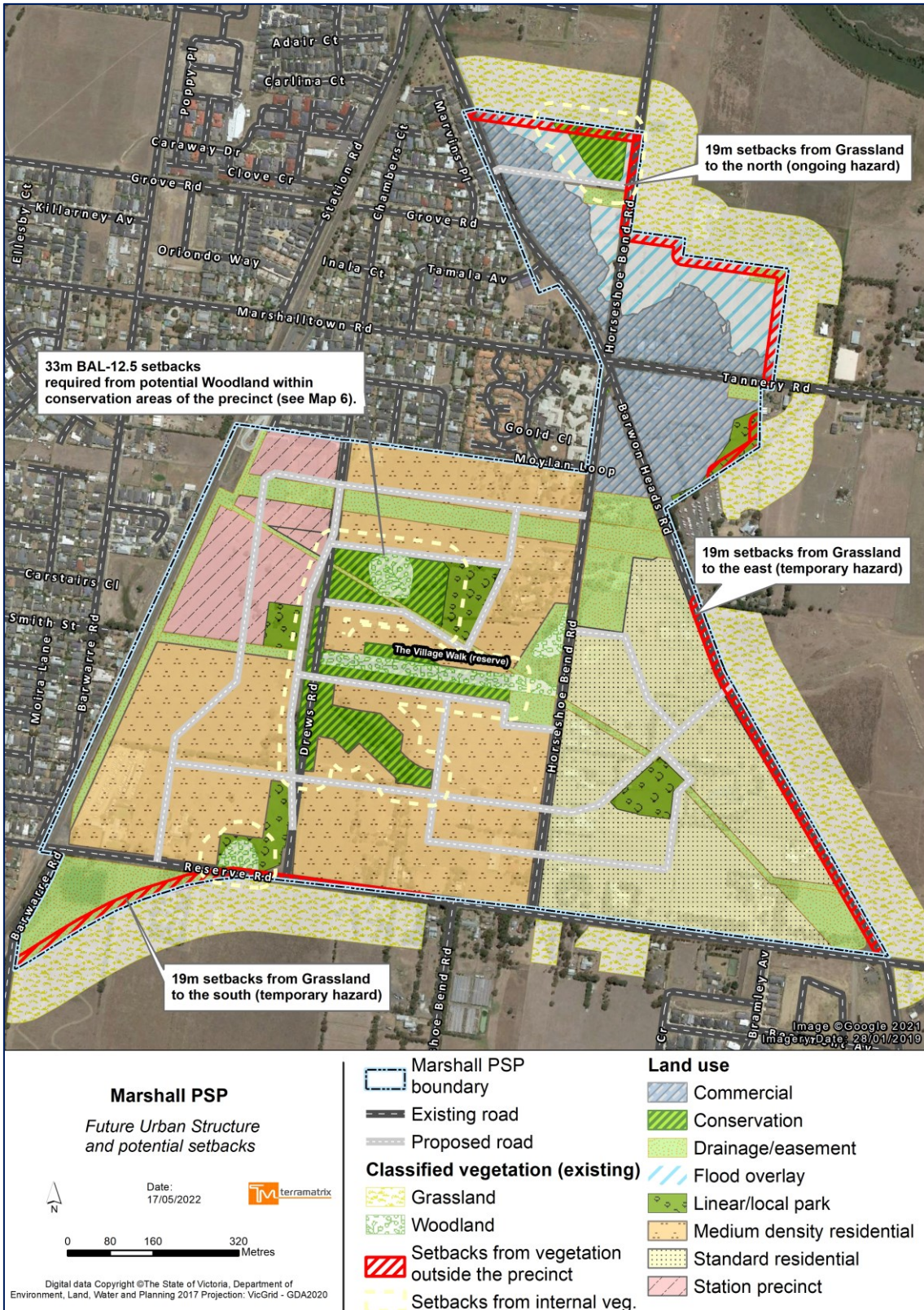
4.3.2 Building construction standards

The FUS has been designed to ensure that no BAL construction standard higher than the minimum BAL-12.5 that applies in a BPA, is required for any building that requires a BAL. The development setbacks required for BAL-12.5 in response to the Grassland and Woodland identified in the hazard assessment in Section 3, were determined using the simple Method 1 procedure of AS 3959-2018, and are provided in Table 3 above.

Note that as identified above, one of the key settlement planning strategies of Clause 13.02-1S is that strategic plans and policies, planning scheme amendments and settlement planning must not result in development exceeding a BAL-12.5 standard.

4.3.3 Fences and other localised fuel sources

An appropriate mechanism could be implemented to discourage, restrict or prohibit the use of combustible fences such as non-bushfire resistant timber fences and brush fences, especially in the northern interface parts of the precinct where there is closer proximity to an ongoing hazard.



Map 7 – Future Urban Structure and potential BAL-12.5 setback areas.

4.4 Clause 13.02-1S Bushfire planning

The applicable strategies stipulated in Clause 13.02-1S are identified below. A response to each of them will be provided in the final report, summarising how the MPSP implements the strategies.

4.4.1 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 site is in a low risk location. The protection of human life can be prioritised by application of the existing building and planning controls. This includes ensuring future buildings are located where a BAL-12.5 construction standard could be achieved (i.e. achieving setbacks for future buildings from unmanaged vegetation, such that radiant heat can be expected to be below 12.5kW/m²); managing vegetation within the site in a low threat state where appropriate, adequate water for fire fighting is maintained; appropriate access and egress is provided for site occupants and emergency responders; and a bushfire emergency management plan is prepared to the satisfaction of the relevant fire authority.

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 4.4, the site is in a low risk landscape.

The nearest lowest risk locations are the urban-residential and township areas of Grovedale immediately to the west or Charlemont to the south-east, that are not in the BPA and are developed urban neighbourhoods (see Map 4).

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 responding to the bushfire risk at all stages of the planning and building process, whereby the MPSP is designed to ensure compliance with a minimum BAL-12.5 standard for all future buildings requiring a BAL.

4.4.2 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 100m, and up to 400m 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, aerial imagery, site assessment and published guidance on vegetation assessment for bushfire purposes.

GIS analysis of contour data supplied by CoGG for the area was undertaken, including creating a Digital Elevation Model (DEM) of the topography, and determining slopes, extending to 1km around the precinct (see Section 3.3 and Map 3).

In relation to climatic conditions and fire weather, the AS 3959-2018 default FFDI 100/GFDI 130 benchmark used in the Victorian planning and building system, has been applied as discussed in Section 3.4.

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

The extent of BPA coverage has been considered (see Section 2.4) and is shown in Map 4 (inversely as 'non-BPA land'). This is based on the most recent BPA mapping for the precinct, which was published 7th July 2021.

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 3.5, no part of the site or surrounding land within 10km is covered by the BMO.

Considering and assessing the bushfire hazard on the basis of:

- ***Landscape conditions - meaning the conditions in the landscape within 20 kilometres and potentially up to 75 kilometres from a site;***
- ***Local conditions - meaning conditions in the area within approximately 1 kilometre from a site;***
- ***Neighbourhood conditions - meaning conditions in the area within 400 metres of a site; and***
- ***The site for the development.***

The hazard has been assessed and described at the regional, municipal and local (site and neighbourhood) scale (see Section 3).

At the local 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 out to 400m around the site (see Map 2).

At the landscape scale a 5km and 1km radius of the site has been applied (see Map 4) and a 20km radius of the site at the broad landscape scale (see Map 5) 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.

The author is not aware of any consultation with the fire authority to date.

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, and the building regulations invoked by the BPA coverage, including the bushfire hazard landscape assessment, specify the general requirements and standards for assessing the risk. These have been used in this report as appropriate.

Not approving development where a landowner or proponent has not satisfactorily demonstrated that the relevant policies have been addressed, performance measures satisfied or bushfire protection measures can be adequately implemented.

There are no identified obstacles to implementing any of the bushfire protection measures in this report. The relevant fire authority should be consulted to confirm what minimum fire safety measures are required.

4.4.3 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/m² and BAL 12.5 dwellings could potentially be sited, have been determined (see Section 4.2.1 and Map 6 and Map 7).

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 MPSP provides good access via a residential road network to the urban-residential and township areas of Grovedale and Charlemont that are not in the BPA (immediately to the west and south-east) and are therefore BAL-LOW areas (see Map 4).

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.
- Residential areas within the precinct are designed to provide setbacks between buildings and any potentially hazardous vegetation inside the MPSP that comprises classified vegetation by the appropriate BAL-12.5 distance (eg. 33m setbacks from Woodland, see Section 3.1.2).

- All other vegetation across the site is managed in a low threat state or qualifies for one or more of the vegetation exclusions (see Section 3.2).

The risk to existing residents in the surrounding suburbs will be reduced by the development of the site as a low threat urban residential area, and associated removal of an existing area of potentially 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 development locations have been assessed as part of this study. The site is identified as low risk and is largely infill development.

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’.

All future dwellings and associated buildings in the development that require a BAL, can achieve a BAL-12.5 construction standard.

4.4.4 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.

Terramatrix is not aware of any biodiversity impacts associated with the proposal.

4.4.5 Use and development control in a Bushfire Prone Area

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

- Subdivisions of more than 10 lots.

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

Identified bushfire protection measures include:

- ensuring future buildings are located where a BAL-12.5 construction standard could be achieved (i.e. achieving setbacks for future buildings from unmanaged vegetation, such that radiant heat can be expected to be below 12.5kW/m²)
- managing vegetation within the site in a low threat state where appropriate,
- adequate water for fire fighting is maintained;
- appropriate access and egress is provided for site occupants and emergency responders; and
- *a bushfire emergency management plan is prepared to the satisfaction of the relevant fire authority.*

There are no apparent obstacles to implementing any of the bushfire protection measures identified in this report. The relevant fire authority should be consulted to confirm what minimum fire safety measures are required.

5 Conclusion

This report has assessed the bushfire hazard in and around the Marshall precinct in accordance with the hazard identification strategies of Clause 13.02-1S Bushfire Planning and the BAL assessment methodology of AS 3959-2018 *Construction of buildings in bushfire prone areas*. The report identifies how the precinct and future development that will occur within it, can appropriately mitigate any bushfire risk, including responding to and complying with the applicable bushfire planning and building controls.

It is noted that since the 1950's there has been an increase in the length of the fire weather season and an increase in extreme fire weather, a trend which is projected to continue. Climate change trends associated with the risk of bushfire, support the adoption of a precautionary and conservative approach in identifying and responding to the risk.

All of the precinct, and much of the surrounding land within 5km, is a designated BPA. However, no part of the precinct is affected by the BMO and the nearest areas of BMO coverage is 10km to the south. As development progresses, reliably low threat or non-vegetated areas will be created, which will result in large parts of the precinct being able to be excised from the BPA.

Vegetation within a 100m assessment zone around the precinct was classified to identify likely BALs and RHF exposure for future buildings in the precinct. The vegetation classification is based on the current and anticipated likely future long-term state of the vegetation, according to the proposed FUS. This necessarily involves making assumptions about the future vegetated land within the precinct, in particular the proposed conservation reserves.

The dominant hazard outside the precinct, is Grassland. Pastures to the north will remain the dominant hazard to the precinct, as land in these directions is beyond the Urban Growth Boundary. To the south and east, the land is also dominated by Grassland. Over the long term, when land to the south is developed as part of the Armstrong Creek UGA, the Grassland hazard in this direction will likely be removed or at least significantly reduced.

Several areas of treed vegetation with an unmanaged grassy understory within the precinct are considered Woodland. Some of these areas of Woodland have been marked for retention in conservation reserves as part of the FUS. The future vegetated state of these conservation reserves is likely to comprise no more than a Grassland or Woodland hazard. 33m BAL-12.5 setbacks will be required to separate residential development from the hazard.

The future vegetated state of the other proposed Drainage Reserves and Easements may comprise Grassland (or a higher hazard) if they are not managed in a minimal fuel condition. If so a 19m by low threat or non-vegetated setback is applicable from future dwellings or other buildings

requiring a BAL, commensurate with a BAL-12.5 standard. Currently the rail corridor and Barwon Water Easement along the west boundary poses a potential Grassland hazard unless an exclusion is applicable.

Vegetation exclusion criteria that could be applied to ensure areas of classified vegetation within the precinct do 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.

The terrain in the precinct and in the surrounding landscape for at least to the 400m is relatively benign from a bushfire perspective. Overall, the land rises from the north to the south of the precinct. For the purposes of determining future BALs and vegetation setback distances for buildings, the applicable slope class is 'All upslopes and flat land'.

Due to the MPSP location amongst other developed and developing areas, the precinct is a semi-infill development, containing a lower landscape risk than other areas on the southern perimeter of the Armstrong Creek UGA. The Armstrong Creek UGA comprises land over the southern and eastern boundaries, moderating the temporary hazard from these directions, as neighbouring land will subsequently be developed over time.

The precinct is somewhat protected or 'buffered' from a bushfire approach from the hazardous northwest and west directions by the Grovedale township area and other residential areas where the bushfire hazard has been removed or substantially modified by settlement. The landscape risk from the north, south and east are also reduced by the mix of completed and ongoing development of neighbouring suburbs within 5km of the site. The reduced risk is reflected by the removal from the BPA of significant areas of land in these directions.

The main bushfire hazards are potentially ember attack from a large, 'landscape scale' grassfires burning near to or into the precinct, and smaller bushfire that may develop in the proposed conservation reserves within the precinct. The higher risk parts of the precinct from a landscape fire perspective are those adjacent to the northern boundary, and to a lesser extent those to the south and east.

Areas that may comprise classified vegetation are identified in the FUS as conservation reserves, from which buildings requiring a BAL will need to be setback by the appropriate distance as follows:

- 33m from Woodland, and
- 19m from Grassland.

Statutory controls should be in place to ensure that at the subdivision design and approval stage, any areas of hazardous vegetation are identified and commensurate development setbacks incorporated, with appropriate certainty about management of vegetation within a setback area.

It is desirable to prohibit the use of combustible fences, such as non-bushfire resistant timber fences and brush fences, especially in the northern interface parts of the precinct.

To the south and east, the precinct boundaries have the advantage of the proposed Barwon Heads Road duplication and the Bellarine Link Road projects that will provide a 'hard edge' for residential development and separate it from hazardous vegetation beyond the precinct. The proposed Commercial land use area in the FUS will buffer residential areas from Grassland to the north, which will remain an ongoing hazard.

Perimeter roads and/or local parks are located along the boundary of some areas of hazardous vegetation within the precinct (e.g. the Conservation reserves) to provide setbacks for adjacent residential areas.

Overall, the hazard and resultant bushfire risk is not considered significant enough to prevent development of the precinct. It is considered that development can appropriately prioritise the protection of human life, and meet the objectives of Clause 13.02-1S, by an appropriate design and layout that, amongst other things, ensures future dwellings will not be exposed to RHF above 12.5kW/m^2 , which is commensurate with a Bushfire Attack Level (BAL)-12.5 construction standard of any applicable building in a BPA. The maximum 12.5kW/m^2 safety threshold is required in settlement planning as the upper limit for acceptable risk.

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, 2020).

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