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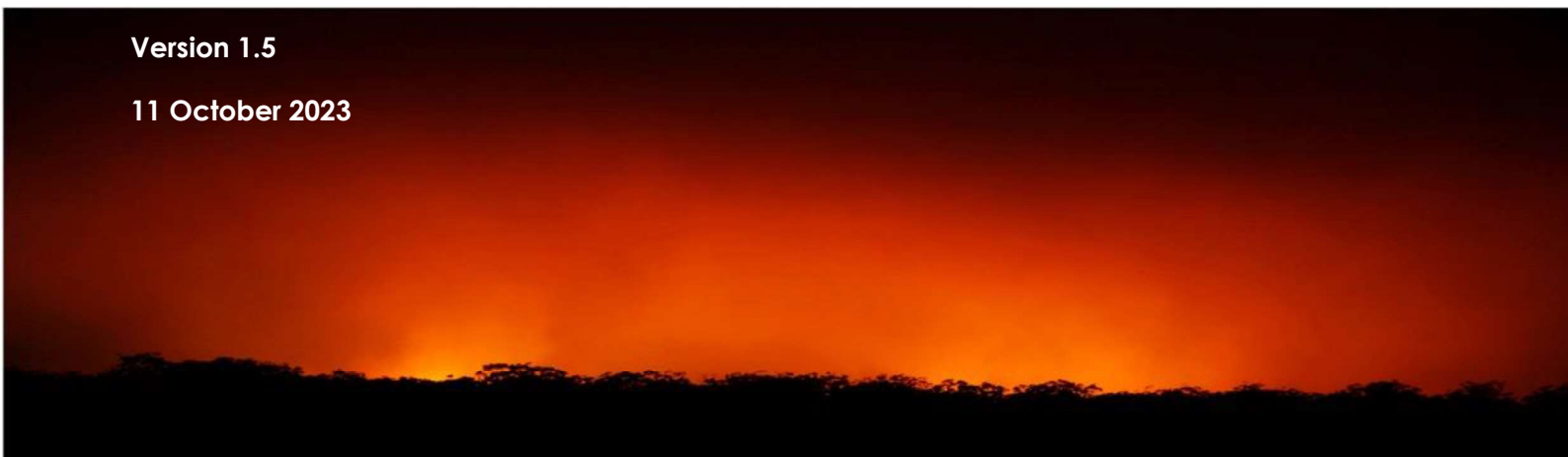
Stage 2 Report - High Level Strategic Bushfire Risk Assessment

Western Edge Strategic Bushfire Risk Assessment

Prepared for

EPSDD – ACT Government

BPAD Bushfire Planning & Design Accredited Practitioner Level 3



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Project Name:	Western Edge Strategic Bushfire Assessment
Prepared by:	
Client Details:	Syed Ali Project Manager ACT Environment, Planning and Sustainable Development Directorate
Project Address	Western Edge Study Area ACT

Name	Position	Contact No	Email
	Senior Planner & Bushfire Specialist		

Version	Primary Author(s)	Description	Date Completed
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| Senior Planner & Bushfire Specialist
Blackash Bushfire Consulting
B.A., Grad. Dip. Urban & Regional Planning; Master of Environmental Planning;
Adv. Dip. Of Public Safety (Emergency Management); Dip. Management

| Principal
Blackash Bushfire Consulting
B.A., Grad. Dip. (Design for Bushfires); Grad. Cert. of Management (Macq);
Grad. Cert. (Applied Management); Fire Protection Association of Australia BPAD Level 3 BPD-PA 16373

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Contents

1. Glossary

This section defines those core terms and concepts which are adopted throughout the body of this report.

Term	Definition
ACT Bushfire Management Standards (BMS)	The BMS provide development standards for designing and building on bush fire prone land in the ACT. The BMS also provides detailed fuel management, roads, and access standards for Land Management coordinated by various Government organisations and private land managers. These standards have been prepared under the ACT Strategic Bushfire Management Plan, and detail the measurable outcomes required for better bushfire outcomes.
ACT Strategic Bushfire Management Plan 2019-2024 (SBMP)	The SBMP is the overarching document that directs all levels of bushfire planning in the ACT. Its purpose is to provide a strategic framework to protect the ACT community from bushfires and reduce resulting harm to the physical, social, cultural and economic environment of the Territory. This refers to SBMP Version 4.
Asset Protection Zone (APZ)	A fuel-reduced area surrounding a built asset or structure which provides a buffer zone between a bushfire hazard and an asset. The APZ includes a defendable space within which firefighting operations can be carried out. The size of the required APZ varies with slope, vegetation and Forest Fire Danger Index.
Bushfire	A general term used to describe fire in vegetation, includes grass fire.
Bushfire abatement zone (BAZ)	This is a subset of the bushfire prone area map surrounding Canberra and depicts locations subject to more intensive planning and management to minimise the risk of bushfire.
Bushfire attack mechanisms	The various ways in which a bushfire can impact upon people and property and cause loss or damage. These mechanisms include flame contact, radiant heat exposure, ember attack, fire wind and smoke.

Bushfire Attack Level (BAL)	A means of measuring the severity of a building's potential exposure to ember attack, radiant heat, and direct flame contact. The BAL is used as the basis for establishing the requirements for construction to improve protection of building elements and to articulate bushfire risk.
Bushfire prone land (BPL)	An area of land that can support a bushfire or is likely to be subject to bushfire attack, as designated on a bushfire prone land map.
Bushfire prone area (BPA)	The area of land mapped by the ESA to assist resident bushfire risk awareness and trigger development control provisions in ACT planning. This is periodically updated and generally extends 100m past the urban-bushland interface.
Bushfire Hazard	Any vegetation that has the potential to threaten lives, property, or the environment.
Bushfire Threat	Potential bushfire exposure of an asset due to the proximity and type of a hazard and the slope on which the hazard is situated.
Forest Fire Danger Index (FFDI)	The Mark 5 forest fire danger index (FFDI) was developed by McArthur (1967) in order to assess fire danger and behaviour in eucalypt forest fuel types and has been widely used in Eastern Australia (Noble et al. 1980, Sharples et al. 2009a). The FFDI requires temperature, relative humidity, wind speed and a fuel availability index (i.e. a drought factor) measured at 15:00 as input variables (Matthews 2009).
Hazard	A hazard is any source of potential harm or a situation with a potential to cause loss. A hazard is therefore the source of risk.
Likelihood	The chance of an event occurring. Likelihood may be represented as a statistical probability (such as an annual exceedance probability), or where

	this is not possible, it can be represented qualitatively using measures such as 'likely', 'possible' and 'rare'.
Managed land	Land that has vegetation removed or maintained to a level that limits the spread and impact of bushfire. This may include developed land (residential, commercial, or industrial), roads, golf course fairways, playgrounds, sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries. Most common will be gardens and lawns within curtilage of buildings. These areas are managed to meet the requirements of an APZ.
Mitigation	The lessening or minimizing of the adverse impacts of a bushfire event. The adverse impacts of bushfire cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques, retrofitting and hazard-resistant construction as well as on ground works to manage fuel and separate assets from bushland.
Planning for Bushfire Protection 2019 (PBP)	NSW Rural Fire Service publication effective from 1 March 2020 which is applicable to all new development on bushfire prone land in NSW and is used with respect to a consistent approach between ACT and NSW planning for bushfires and the link to surrounding areas in NSW.
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. [1]

[1] UNDRR 2015 https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030

Risk	The degree of risk presented by that interaction will depend on the likelihood and consequence of the bushfire occurring. Risk may be defined as the chance of something happening, in a specified period of time that will have an impact on objectives. It is measured in terms of consequences and likelihood.
Risk assessment	A systematic process of evaluating the potential risks that may be involved in a projected activity or undertaking, having regard to factors of likelihood, consequence, vulnerability, and tolerability.
Risk-based land use planning	The strategic consideration of natural hazard risk and mitigation in informing strategic land use planning activities.
Strategic Bushfire Study (SBS)	Provides the opportunity to assess whether new development is appropriate in the bushfire hazard context.

2. Executive summary

This Strategic Bushfire Risk Assessment has been provided to further refine the process and geographical focus of the Western Edge Investigation Area project with respect to bushfire risk management. This is a large scale consideration of the study area identified by EPSDD and will need to be considered and further refined after integration with other studies. This has been prepared in alignment with the ACT Government framework for managing bushfire and planning with respect to bushfire and is consistent with the ACT Bushfire Management Standards (2023).

In the authors' professional opinion, the Western Edge Investigation Area (WEIA) has substantial scope for development that will be able to meet current and future standards for bushfire protection, and the next stage will be to integrate with other detailed studies to further refine the most suitable locations for future rezonings for urban uses. Bushfire protection of older development areas adjacent to the WEIA such as Hawker, Chapman, and Kambah may be substantially improved through new development towards the hazard vegetation.

The recommendations of this Strategic Bushfire Risk Assessment are as follows:

1. Consolidated guidance as to the relative suitability of the revised five investigation areas based on the areas identified in the *Western Edge Investigation Area Capability and Suitability Assessment* undertaken by SMEC Australia Pty. Ltd. (WEIACSA) and is summarised at Table 3 (p. 73).

2. This Strategic Bushfire Risk Assessment must be integrated with related investigations prior to the next steps in the planning process.

3. Site specific Strategic Bushfire Studies in accordance with the Bushfire Management Standards 2023 must form part of the next stage of the planning process as future investigation areas are refined, particularly with relation to the establishment of environmental corridors.

4. Priority should be given to investigation areas adjoining or adjacent to older development areas to provide additional bushfire mitigation of modern land use planning and building outcomes.

5. Future strategic planning processes related to the Western Edge Investigation Area should consider the site suitability criteria presented in Section 9.2 (p. 75).

6. To enhance bushfire safety into the future and improve practice, additional planning methods and requirements including, but not limited to, those presented in Section 8.3 should be explored by EPSDD and partners.

7. Part of the ongoing planning process must develop a staging strategy based on ensuring planning, operational delivery and bushfire management are coordinated.

3. Western Edge Strategic Bushfire Risk Assessment

3.1. Project overview and context

The ACT Planning Strategy 2018 (the Strategy) is the key planning document developed to guide the continuing sustainable development of Canberra, as both the nation's capital and a thriving city in its own right. This was developed as a refresh and update of the 2012 strategy and reflects significant community engagement reflecting the values of Canberrans and the importance of incorporating these into future growth. The key defining characters of the city include the value of green space, diversity of lifestyle options and the bushland setting. The vision for the Strategy therefore recognises the importance of celebrating the unique bushland setting while being responsive to future growth and resilient in the face of change (including climate change). The Strategy has 5 related themes to guide delivery of the vision through land-use planning:

1. *Compact and efficient*
2. *Diverse*
3. *Sustainable and resilient*
4. *Liveable*
5. *Accessible*

The Strategy is a long term policy designed to guide the strategic management of land for the next 30 years and provide a balanced range of outcomes derived from the broad themes. The Compact and Efficient theme seeks planning outcomes that:

- *grow mostly within our urban footprint or in areas close to our footprint*
- *maintain environmental values*
- *use infrastructure effectively to support an efficient, sustainable and liveable city*

Each of the themes results in a number of strategic directions and then actions to deliver on those directions. Under the Compact and Efficient theme, strategic direction 1.2 is to:

- *Investigate the potential for new residential areas to the west of the city to meet future housing need.*

The Strategy provides significant rationale for the strategic directions and actions, and these clearly are interrelated across the themes. Direction 1.2 recognises that whilst much of the city growth is being achieved on infill sites, there is always a need for new greenfield development areas with a growing population and an expressed preference for housing choices. It is also recognised that the existing areas

are developing quickly and are likely to be fully developed by around 2030. At the broadest level, significant limitations were identified to the north, south and east, and the Western Edge Investigation Area was identified for potential future urban expansion.

Action 1.2.1 sets up the next level of investigation towards ultimately determining the mixture of sustainable land uses:

- *Undertake environmental, infrastructure and planning studies for the western edge of the city to identify suitable areas for:*
    - *potential urban areas (excluding Central Molonglo)*
    - *nature reserves*
    - *environmental offset and potential environmental offset areas*
    - *the consideration of cultural and heritage values*
    - *other uses, for example rural, broad acre, major infrastructure, transport and services.*

A preliminary Bushfire Risk Assessment was completed in December 2020 and contributed to the *Western Edge Investigation Area Capability and Suitability Assessment* undertaken by SMEC Australia Pty. Ltd. (WEIACSA) in early 2023 that has defined the investigation areas for more detailed study. The Western Edge Strategic Bushfire Risk Assessment (SBRA) (this report) uses, in part, the findings of the WEIACSA as the basis for bushfire analysis to further refine the areas for further investigation.

The purpose of Stage 2 of the SBRA is to further drill down at a geographic scale to identify which areas are more or less suitable for development with respect to bushfire risk.

It builds on the concepts and practices introduced in the Stage 1 Report to provide guidance for decision making for bushfire risk management in the strategic planning context. This report will be consistent with the principles of the strategic planning approach laid out in the *ACT Emergencies Bushfire Management Standards 2023* (BMS), adopted as a Notified Instrument in July 2023. The BMS wholly adopts the principles and practice of Chapter 4 Strategic Planning in the NSW RFS document *Planning for Bushfire Protection 2019* (PBP) for consistency across borders. Both documents use the current standard design bushfire as being based on Forest Fire Danger Index (FFDI) 100. The current standards do not attempt to consider the future impacts of climate change and whether higher FFDI bushfires will need to be considered. The SBS will make some further suggestions as to possible additional methods for reducing impacts on the community overall.

3.2. Site context

The Western Edge Investigation Area (WEIA) was originally defined by the Planning Strategy as the area shown hatched orange to the west of the map in Figure 1. Greenfield sites currently under development are shown in solid orange.

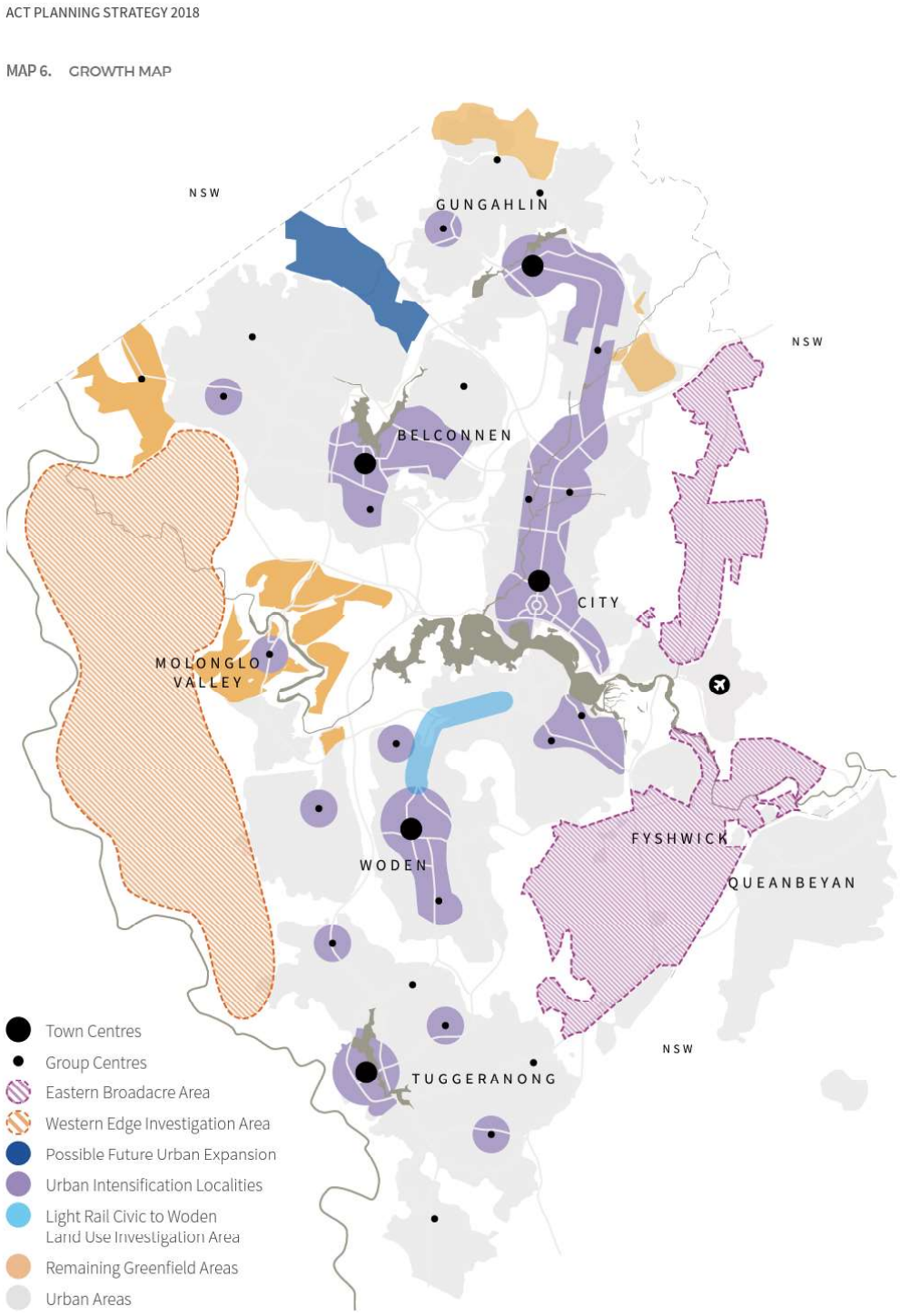

Figure 1: ACT Planning Strategy 2018 - Growth Map

3.3. Existing Development and land uses

The site extends approximately 20km from Holt & Strathnairn in the north to Kambah in the south and covers the majority of the area between the city and the Murrumbidgee River to the west. The WEIA is approximately 9,800ha and includes significant rural and agricultural uses, nature reserves, forest parks, infrastructure including major water and electricity transmission, and the Mount Stromlo Observatory complex. The general location of the WEIA in relation to the existing Canberra urban development area and the current zoning context are shown at Figure 2, and the WEIA in context with aerial photography is shown as Figure 3.

The consideration of suitability for future development areas and staging will be informed, in part, by the WEIACSA, and by the areas shown within the ACTmapi system as being retained as vegetation for the foreseeable future (e.g. Nature Reserves, riparian corridors, Stromlo Forest Park), and further ecological surveys. This includes the areas shown on Figure 2 as DES or 'designated areas' which it is expected will be retained for their environmental and/or recreational values.

It is clear that parts of the WEIA are immediately adjacent to existing urban development, which provides a number of advantages. In the bushfire context this assists by providing:

- significant developed areas which are unlikely to be the source of significant bushfire risk, and which provide places of refuge to retreat to from a major bushfire;
- road infrastructure for access and egress during a bushfire;
- reticulated water for firefighting;
- supporting physical, social, and economic infrastructure; and
- existing emergency services capability within a short distance.

There are significant differences between those areas developed prior to contemporary bushfire planning and those developed more recently, and this is most apparent at the urban-bushland interface.

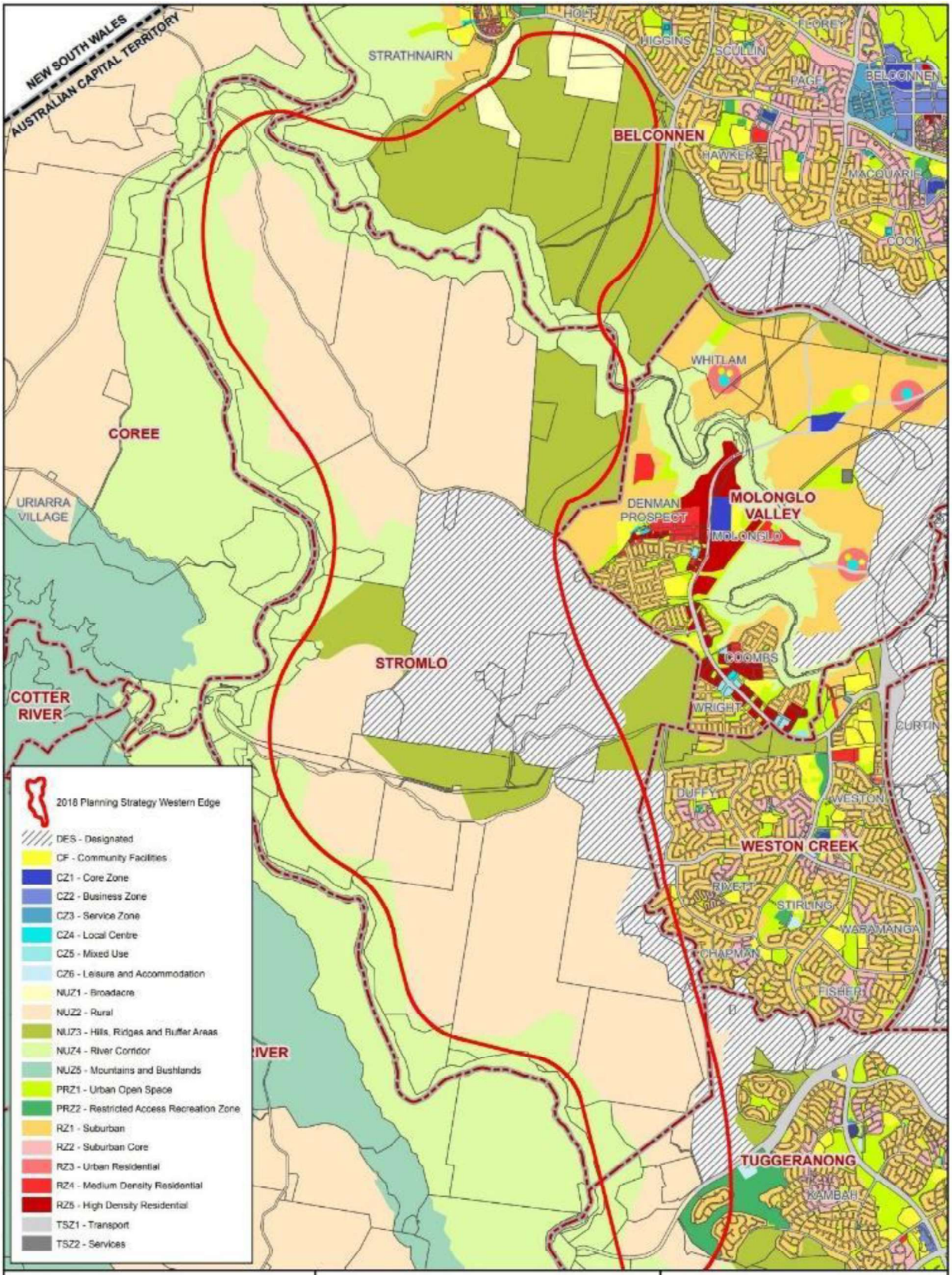

Figure 2: WEIA and current zoning (EPSDD)

Figure 3: WEIA and aerial photo (EPSDD)

3.4. Comparison of recent and older urban development at the WEIA interface

Ongoing new and recent development in areas adjacent to the WEIA such as Denman Prospect and Whitlam are proceeding in accordance with the principles and requirements laid out in the previous version of the BMS (Version 3, 2014). This section provides a snapshot to assist understanding of the supportive nature of existing development adjacent, and the potential positive impact of new urban development with respect to bushfire risk mitigation.

Under the *Strategic Bushfire Management Plan* (SBMP), the Commissioner of the ACT Emergency Services Agency (ESA) designates what constitutes the Bushfire Prone Area (BPA) which is the trigger to apply the relevant bushfire planning and building standards under the ACT regulatory framework. In these locations contemporary building construction standards should be applied to all new development. The Bushfire Abatement Zone (BAZ) is part of the BPA surrounding the Canberra urban area and depicts the locations subject to more intensive planning and management to minimise the risk of bushfires.

Figures 4-6 show a new and recently developed area in Denman Prospect that demonstrates how the ACT Government managed the bushfire risk and new urban release areas under the previous BMS Version 3. Figures 4 and 5 show the typical outcome at the urban interface with respect to bushfire management, resulting in a large separation between the bushfire hazard vegetation and any buildings. This separation typically consists of perimeter roads, managed parkland, drainage infrastructure etc. Figure 6 shows the arrangement of the Strategic Bushfire Management Zones, consisting of an Inner Asset Protection Zone (IAPZ) and an Outer Asset Protection Zone (OAPZ).

The BMS outlines the standards for maintenance for the overall Asset Protection Zones (APZ) in the *Regional Fire Management Plan* (RFMP) and *Bushfire Operational Plans* (BOP) which are the sub-plans developed by the various land management agencies. The majority of the required APZ are maintained by various parts of the ACT government, being the road reserves and managed parklands. This provides for consistent APZ treatment and minimises the number of houses impacted by bushfire construction standard requirements. However, this also imposes ongoing management responsibility, costs and legal exposure. APZ in residential zones built prior to 2022 may use the IAPZ as mapped and determined by ESA to facilitate development. A fundamental premise of new development after 2022 is that the APZ footprint for new development will require the APZ to be provided within the development footprint (BMS p. 22). Distances of 200m and 700m are depicted for comparison with the (generally) 100m buffer applied at the interface and their rationale explored below. These are shown on Figures 4-6 to provide perspective for the analysis to be developed further below. Denman Prospect is used as an example of new development and Hawker of older style development.

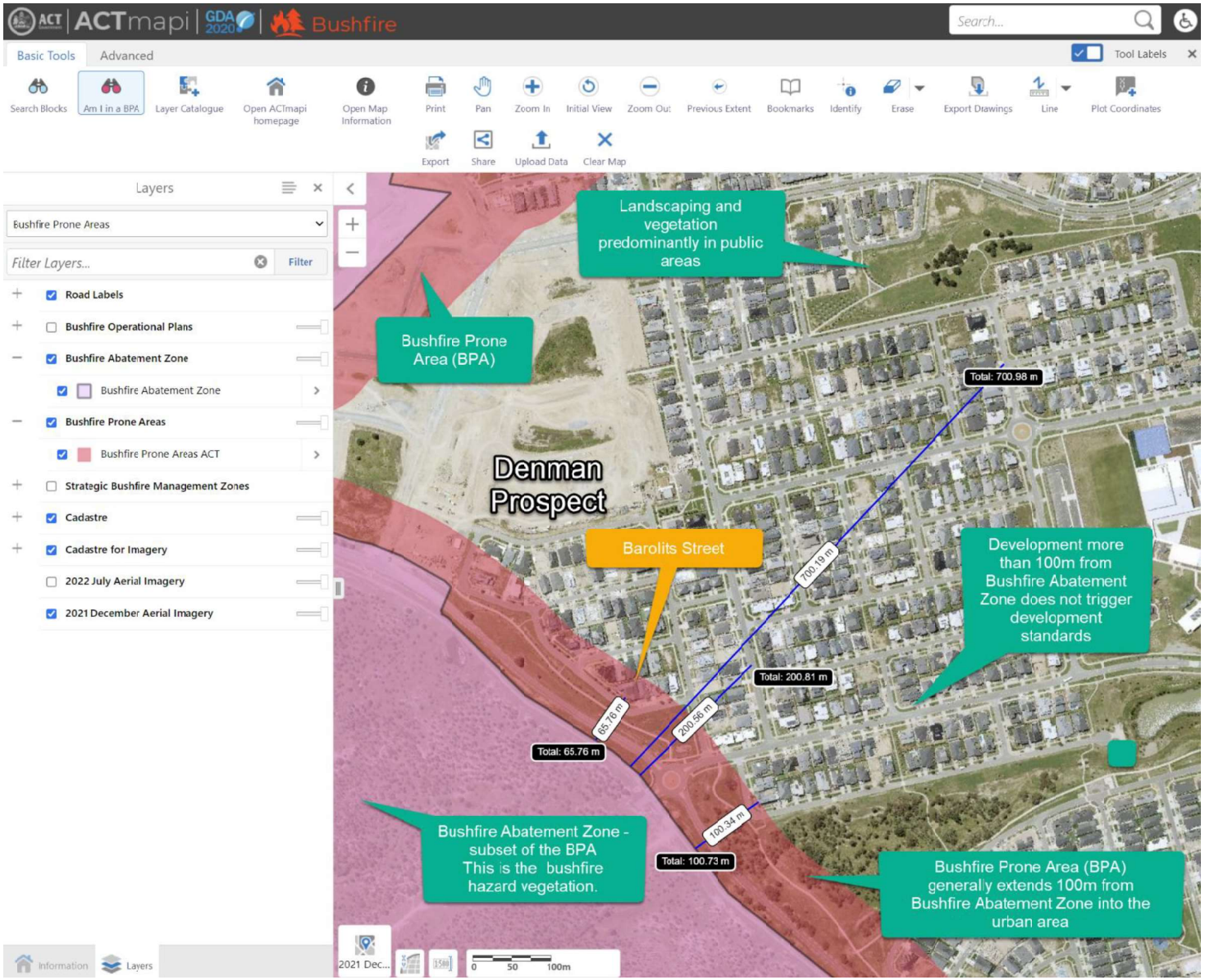

Figure 4: Extract from ACTmapi at Barolitis St, Denman Prospect showing development layout with relation to bushfire planning

Figure 5: Extract from Google streetview showing same location and view of bushfire management measures

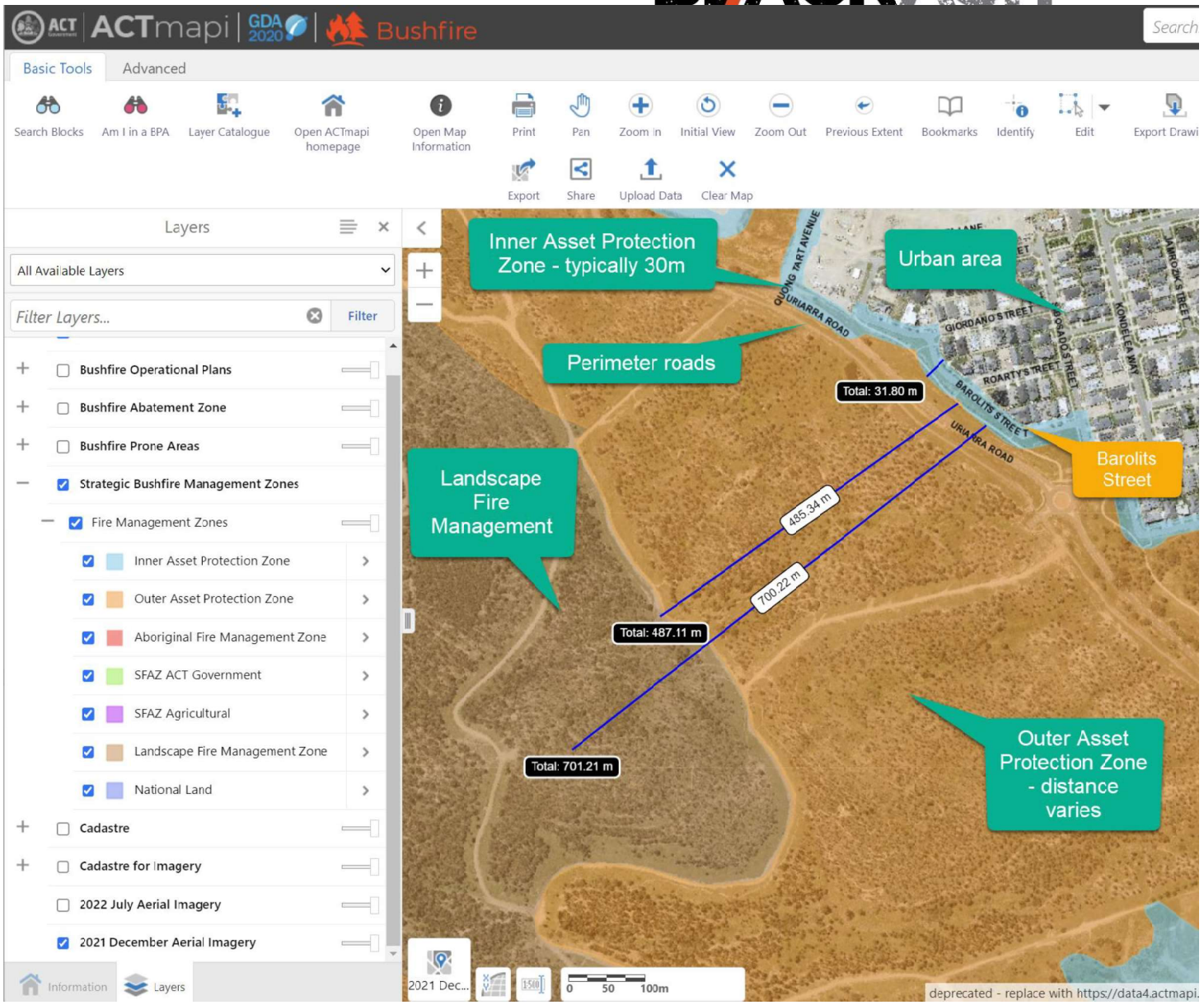

Figure 6: Strategic Bushfire Management Zones in context with urban development

Figures 7-9 provide an equivalent consideration of older development at Hawker. Older development areas adjacent to the WEIA such as Hawker, Chapman, and Kambah were developed prior to 2003 and the introduction of contemporary bushfire management methods. General observations of these older areas show that:

- subdivision design is generally not consistent with contemporary planning standards,
- no bushfire construction standards were applied to buildings,
- setbacks to the urban-bushland interface are often only several metres,
- lots are generally larger, and consequently there is significantly more bushfire vegetation contained within private lots as landscaping. This extends hazard vegetation around buildings and further into the urban area that potentially increases the risk of bushfire spread through house-to-house transmission,
- there are very often no perimeter roads, with development lots extending from cul-de-sacs,
- key infrastructure such as electricity transmission is often located at the urban-bushland interface and is also reliant on APZ maintenance.

Older development areas may also have sensitive use development (occupants are higher risk members of the community) located adjacent to significant bushfire hazard.

For these reasons, large IAPZ and OAPZ have been established in the past two decades for bushfire protection and are maintained by various ACT government units to standards detailed in the BMS and sub-plans. These larger APZ (in comparison to recently developed areas) are required as the full suite of Bushfire Protection Measures (BPM) used in contemporary planning and building have not been applied during the development stage. Therefore, greater separation via APZ is the primary method to mitigate bushfire risk through preventing flame contact, reducing radiant heat loads to development, and reducing the impact of ember attack. Other measures in combination also provide a balanced approach to new development including appropriate zoning and uses of land, access, services and construction standards.

Any future development for urban purposes adjoining this older style of development will significantly improve the bushfire protection to these existing suburbs by creating a greater separation between the older non-contemporary development and the bushfire hazard vegetation. However, development should not be contemplated as a vehicle to compensate for past planning decisions. New development must be designed in consideration of modern requirements that will also provide resilience benefits to legacy development.

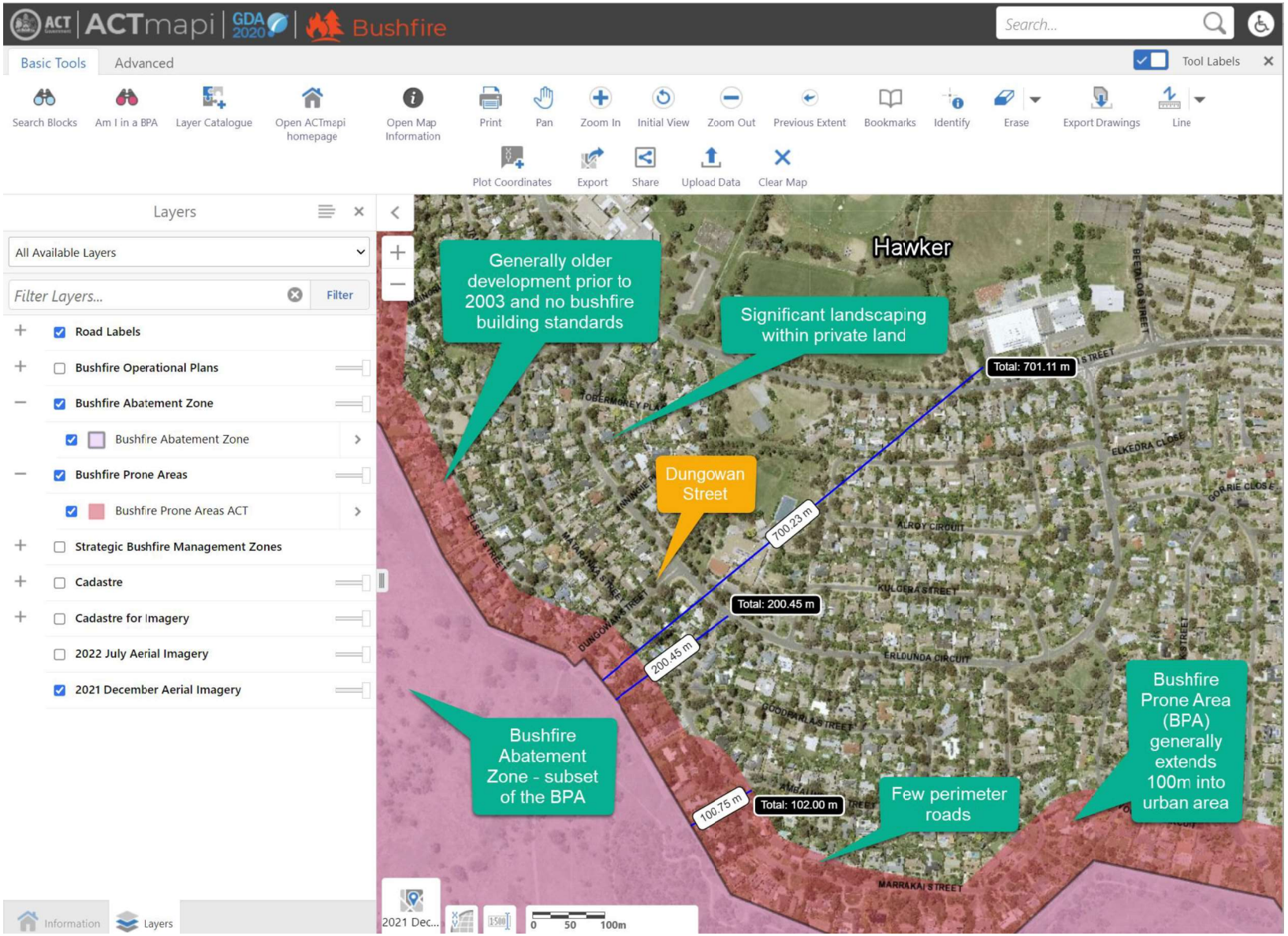

Figure 7: Extract from ACTmapi at Dungowan St, Hawker showing development layout with relation to bushfire planning

Figure 8: Extract from Google streetview showing same location and view of bushfire management measures

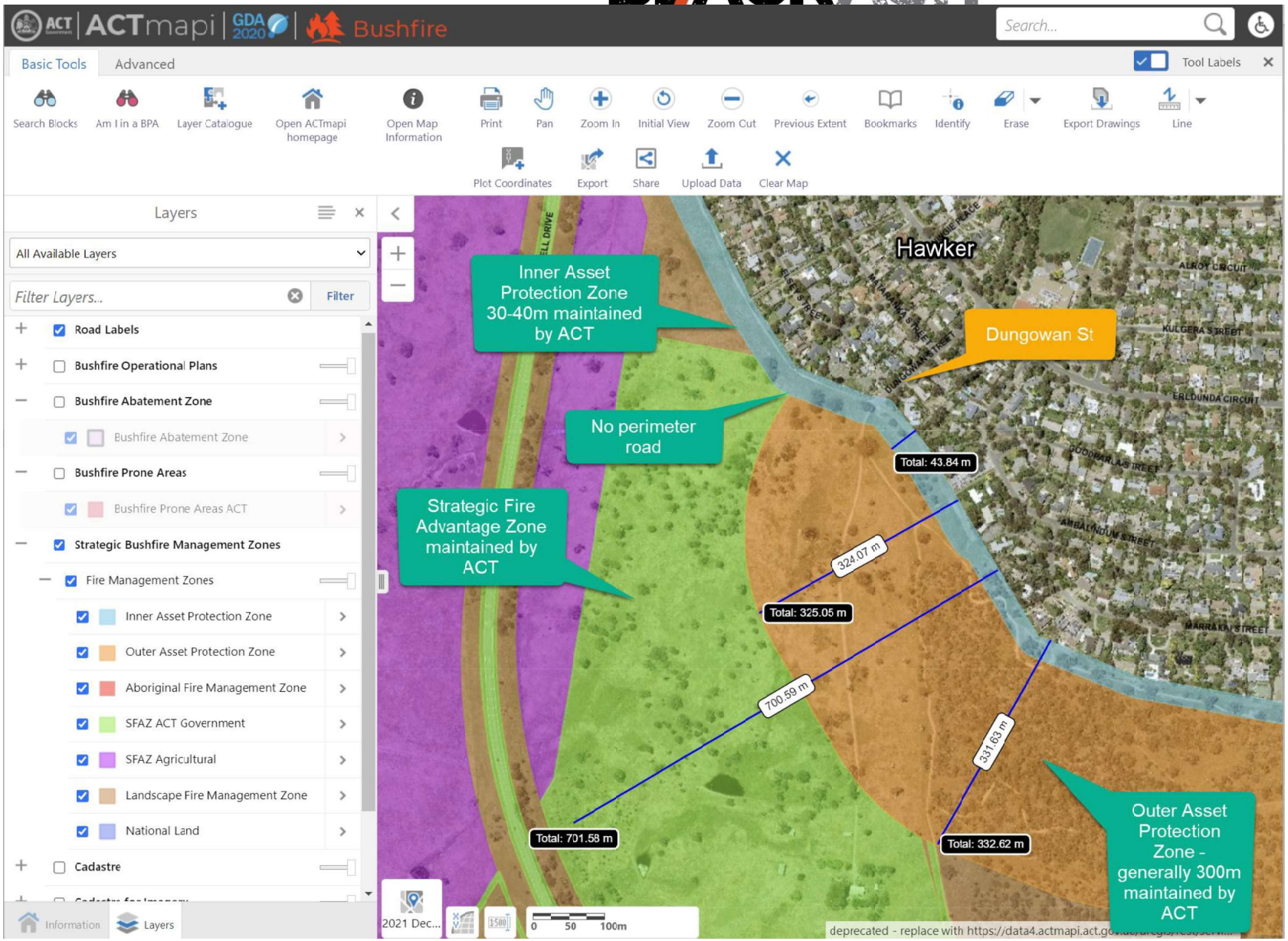

Figure 9: Strategic Bushfire Management Zones in context with urban development

3.5. Identified investigation areas and WEIACSA indicative development scenarios

The WEIACSA has used a three-stage approach using Geographic Information System (GIS) analysis to draw together information from a range of disparate sources building on previous work, public databases, and the initial preliminary WEIA studies.

The first stage, land capability assessment, looked at whether there were known constraints to developing the land for urban purposes and rating it accordingly, and this included high level bushfire risk.

The second stage, the land suitability assessment, clustered and compared areas of land and developed the five investigation areas shown in Figure 10. Three indicative development scenarios were then considered:

1. a 'low impact' footprint;
2. a focus on maintaining and enhancing habitat connectivity; and
3. a focus on building on infrastructure, land use and road efficiency.

The third stage was a multi-criteria analysis (Strategic Merit Test) that was performed using a scoring system developed in workshop with the Western Edge project control group who also undertook the analysis. The outcome of the WEIACSA assessment is qualified by various factors, notably the scale and accuracy of information available during this stage. The WEIACSA also regards the Preliminary Bushfire Assessment as of limited value with a conclusion that up to 95% of the WEIA may be suitable for development from a bushfire perspective and advises that bushfire factors played only a minor part in the assessment.

Whilst the WEIACSA has been used to provide background to this SBRA, this has primarily been through identifying the five broad investigation areas. These investigation areas generally removed areas of significant slope, most protected area reserves, and the areas adjacent to significant watercourses. For the purposes of this report, areas identified as nature reserves and other special use areas including Mount Stromlo Forest Park, as well as the steep areas to the south of Mount Stromlo Forest Park have also been excluded. These areas and those already excluded from the five investigation areas will be considered as bushfire hazard vegetation for the purposes of the report. Whilst some of these areas currently have relatively low threat grassland vegetation it is considered they are likely to be subject to future revegetation.

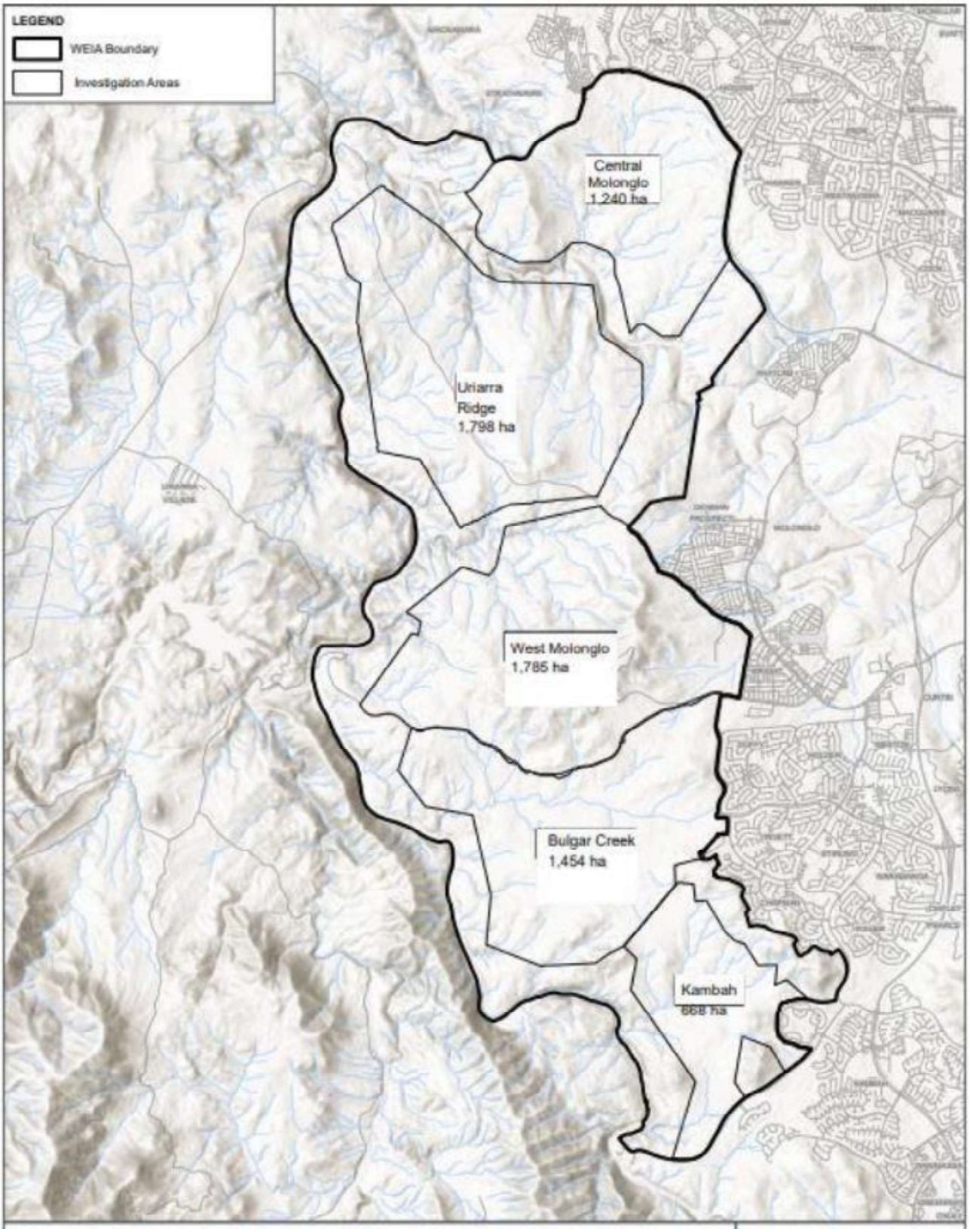

Figure 10: WEIA further investigation precincts (developed from WEIACSA 2023)

The scale of the bushfire hazard vegetation being considered is critical to the development of decision making about the suitability of land for potential urban development. This SBRA is designed to drill down further from the broad findings in the preliminary Bushfire Risk Assessment (EcoLogical Australia 2020). However, the bushfire considerations cannot be contemplated in isolation and are reliant on further detailed studies into biodiversity, water management, transport etc. which will ultimately constrain or facilitate the development pattern at a scale to develop zoning plans or Estate Development Plans. The SBRA will form another of the multiple layers of information that will need further consideration, integration and investigation before zoning plans can be developed.

Decision making regarding other constraints has not yet been finalised, therefore with respect to bushfire risk this SBRA is operating at the scale of kilometres, hundreds of metres, and hundreds of hectares. This will consider the impact of broad landscape scale fires on the five investigation areas identified on the assumption of this concept of scale. More detailed bushfire risk management planning will be required further along the process to accommodate final vegetation patterns determined by riparian or biodiversity requirements that will be internal to the current investigation areas. This is depicted in Figure 11.

Consideration of the impact on bushfire management of individual scenarios will need to be completed with other site constraints and considerations . Figure 12 provides an idea of overall scale consideration.

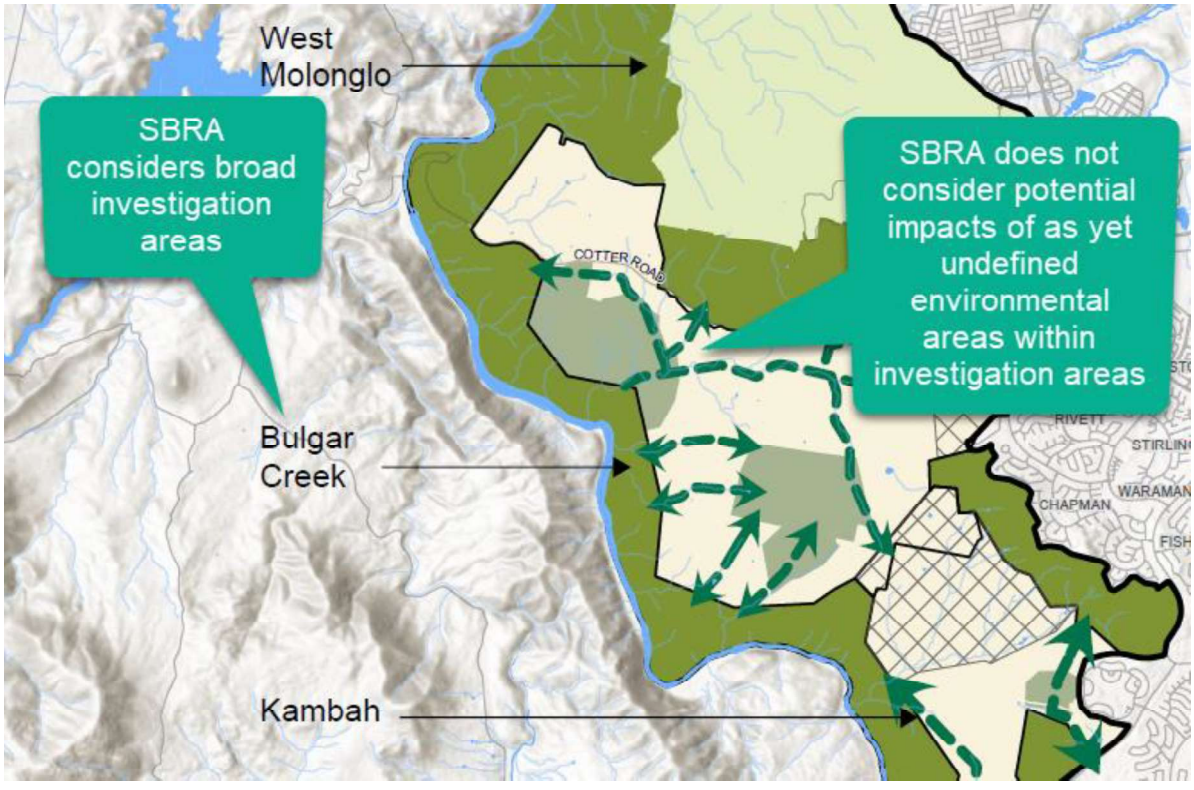

Figure 11: Scale considerations (adapted from an extract from Figure 8-2 "Scenario 2" in WEIACSA)

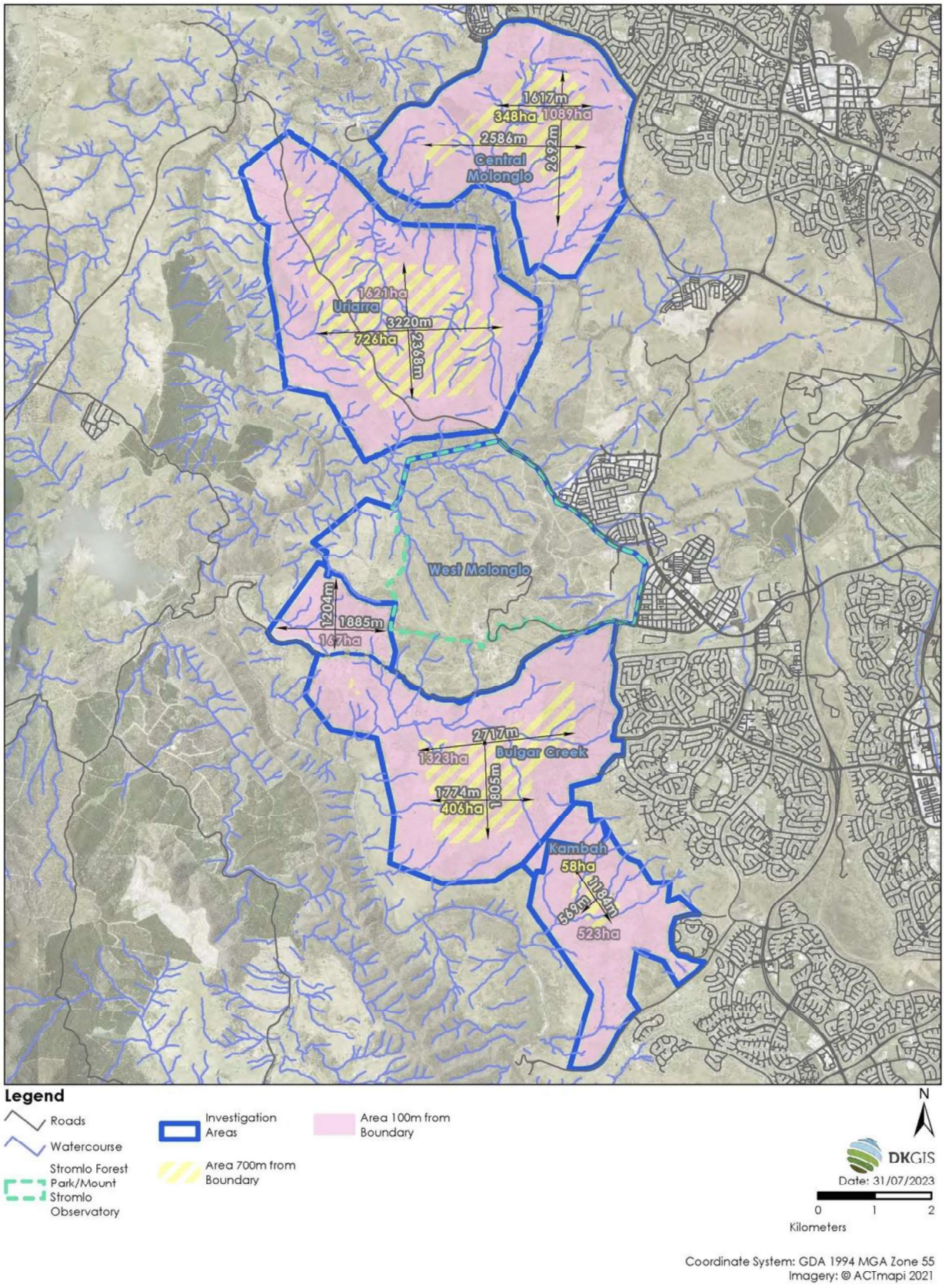

Figure 12: Scale of SBRA assessment showing investigation areas in context

4. Approach to the Strategic Bushfire Risk Assessment

The strategic planning process provides the opportunity to determine if the site complies with the legislative requirements pertaining to safety and potential risk to life and the capability of the site to comply with various bushfire objectives. This report uses a conservative approach suitable to the scale of investigation that demonstrates there are significant areas of land that can reasonably be developed once suitable detailed planning in accordance with BMS standards is applied.

The fundamental issue being tested is the determination of the suitability of the site for rezoning, and to identify those areas that may be more suitable, with respect to bushfire management considering bushfire safety and for the ability of future development to comply with BMS.

In a bushfire context, strategic land use planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bushfire attack. The broad principles which apply to the analysis, and which are demonstrated in this report are consistent with the BMS and PBP:

- identifying land suitable for development in the context of bushfire risk and assuming broader environmental impacts can be managed internally to the investigation areas;
- identifying land suitable for development that will provide flexibility to comply with the minimum requirements of BMS;
- highlighting the need to provide adequate infrastructure associated with emergency evacuation and firefighting operations; and
- highlighting the need to accommodate appropriate ongoing land management practices.

This report will demonstrate that with respect to bushfire risk management there are multiple options for further urban development in the WEIA. The report is based on understanding this SBRA is the second stage in the planning process and further investigations and integration with other data will be required prior to undertaking any formal rezoning. The formal rezoning/s and EDP processes will provide the opportunities for greater consideration of detailed constraints and opportunities at the local scale, and the final development application for individual lots will provide another opportunity to ensure compliance with all contemporary standards.

It is further noted that the planning instrument and planning policy stages may be used to provide additional detail to improve outcomes such as setting additional locational requirements for sensitive use development, or requiring additional risk mitigation measures for those areas nearest the hazard.

5. Strategic Planning for Bushfires

Land use planning is widely recognised as an important measure for limiting future vulnerabilities and losses in areas of new development and a critical element for building disaster resilient communities.

The physical design and layout of communities and settlements are central to the many functions that sustain the social, economic and environmental support systems for the community. Land use planning provides the opportunity to manage new growth and residual risk resulting from new development by complying with legislation and standards, limiting or modifying the location of new development and influencing its layout. This can limit both the impacts of new development on natural systems, ecosystem services and hazards and the flow on impacts on the existing community, as well as limiting the impacts that natural hazards can have on new development and its users.

The strategic planning system is particularly important in contributing to the creation of resilient, safe and sustainable communities that are in keeping with the policy and intent of government.

The *National Strategy for Disaster Resilience* (2011)[2] recognises that strategic planning is essential in creating safer and sustainable communities. In keeping with the policy and intent of government at all levels. Priority outcomes of Section 3.6 include:

- *All levels of decision making in land use planning and building control systems take into account information on risks to the social, built, economic and natural environments.*

This SBS has been completed having regard to the following Commonwealth documents:

- *National Strategy for Disaster Resilience* (2011)
- *National Disaster Risk Reduction Framework* (2018)
- *Land Use Planning for Disaster Resilient Communities* (2020)

Comprehensive consideration of bushfires and risks in the planning system needs sound understanding of the landscape context and risks, as well as clarity on risk management principles and on the approach to strategic planning and development controls that will adequately mitigate identified risks. Where there are competing policy objectives, such as biodiversity conservation and fuel reduction, an

[2] NSDR https://www.homeaffairs.gov.au/emergency/files/national-strategy-disaster-resilience.pdf

agreed methodology or guidance is critical. As such, planning decisions must be based on the best available evidence and rigorous merits-based assessment to ensure that new development - people, homes and businesses are not exposed to unacceptable risk from bushfire. The framework provided within PBP provides the minimum requirements for new development within bushfire prone areas.

The importance of sound land use planning has been recognised in most significant bushfire inquiries, including Natural Disasters in Australia which noted that land use planning that considers natural hazard risks is the single most important mitigation measure in preventing future disaster losses in areas of new development, and that planning, and development controls must be effective, to ensure that inappropriate developments do not occur[3]. The application of legislation, policy, and guidelines provides one of the most effective means of bushfire planning to ensure future developments are resilient and capable of protecting life.

This report focuses on disaster resilience which means planners, hazard leaders, emergency managers and other built environment professionals can contribute to:

- understanding and anticipating bushfire risks before they happen and developing more resilient land use and built form tailored to address bushfire risks
- minimising the increase in risks to people and disruptions to social and economic functions when a disaster strikes by ensuring compliance with territory requirements for new development in Bushfire Prone Areas.

This report is consistent with the balanced approach provided within the ACT regulatory framework including the SBMP and BMS for new development in bushfire prone areas. This recognises the need to protect human life and provide safe operating environments for fire and emergency services, while having due regard to the environmental impacts, development potential of land and the need to cater for growing populations.

It is key to understand this planning approach also provides for substantial risk reduction to existing older development where new urban development improves or supports bushfire risk mitigation through removal of hazards or improvements to access and infrastructure. In some cases this may be a significant enough improvement that changes to the Bushfire Prone Area and/or Bushfire Abatement Zone maps may be required. Chapter 19 of the Royal Commission into National Natural Disaster

[3] Ellis, S et al (2004) National Inquiry on Bushfire Mitigation and Management (p.92)

Arrangements Report 2020 (Royal Commission Report)[4] considers land-use planning and building regulation, and makes some clear observations and provides relevant recommendations. Figure 13 provides a summary of the Royal Commission Report findings (p. 399) and suggests using the planning system to potentially address legacy risk. The strategic planning process may provide a method to address legacy risk in older development areas by removing bushfire vegetation and/or reducing the size of the vegetation being retained and/or fragmenting the vegetation that will remain. This is not the only method to manage legacy risk, however it has the advantage of being a one-off significant improvement undertaken by government, as opposed to developing various incentive, compliance, and insurance related measures all of which may have limited take up and or need to be provided on an ongoing basis.

Summary

19.1 Land-use planning regimes and building regulations govern how and where homes, businesses and infrastructure are built. They influence the exposure and vulnerability of structures and communities to natural hazards. They can also be used to mitigate risk and improve resilience.

19.2 Land-use planning decisions and exposure to risk are inextricably linked. Existing, or 'legacy', risk needs to be identified and communicated, and proportionate action taken to reduce risk. Clear risk information supports individuals, communities, and governments to take informed action to manage those risks. Governments should work together to address legacy risk.

19.3 The likelihood of increases in the severity and frequency of natural hazards should be taken into account in land-use planning and building decisions. These decisions should be informed by the best available data on current and future risk.

19.4 The effectiveness of some standards intended to mitigate natural hazard risk is currently unclear and should be assessed to ensure that resources spent on mitigation efforts are effective and proportionate. Consideration should be given to the costs and benefits of amending the National Construction Code to add the resilience of buildings to natural hazards as an objective, in addition to the protection of life.

Figure 13: Summary of Royal Commission Report findings for land-use planning and building standards (p. 399)

[4] Royal Commission Report https://naturaldisaster.royalcommission.gov.au/system/files/2020-11/Royal%20Commission%20into%20National%20Natural%20Disaster%20Arrangements%20-%20Report%20%20%5Baccessible%5D.pdf

6. House loss and distance from bushfire vegetation

It has been long understood that there is a relationship between providing separation from bushfire hazard vegetation and the survivability of life and property during a bushfire. This is built into all current Australian planning and building approaches to mitigating bushfire risk for new development including the BMS, PBP, the National Construction Code (NCC) and *AS 3959:2018 Construction of buildings in bushfire-prone areas* (AS3959). These systems use an approach that the impact of radiant heat and other forms of bushfire attack (flame contact, embers, fire generated wind, smoke) are reduced by providing separation of the development from the bushfire front and the use of materials that reduces ignition potential and ember penetration.

The methodology calculates the range of radiant heat flux generated by the relevant combination of vegetation, slope and weather for a given design bushfire (FFDI 100 in the ACT) and determines an appropriate level of construction to meet the minimum standards required. The heat flux is measured in kW/m^2 and is generally referred to as the Bushfire Attack Level (BAL). Various building elements and systems are then specified for construction to meet the standard, for instance steel framed windows and toughened glass instead of wooden frames and float glass. Figure 14 is a pictorial representation of the forms of bushfire attack and relation to contemporary bushfire construction standards in AS3959, and Figure 15 (BMS Table 17, p. 78) provides additional descriptive details on the relationship to calculated BAL used for new development.

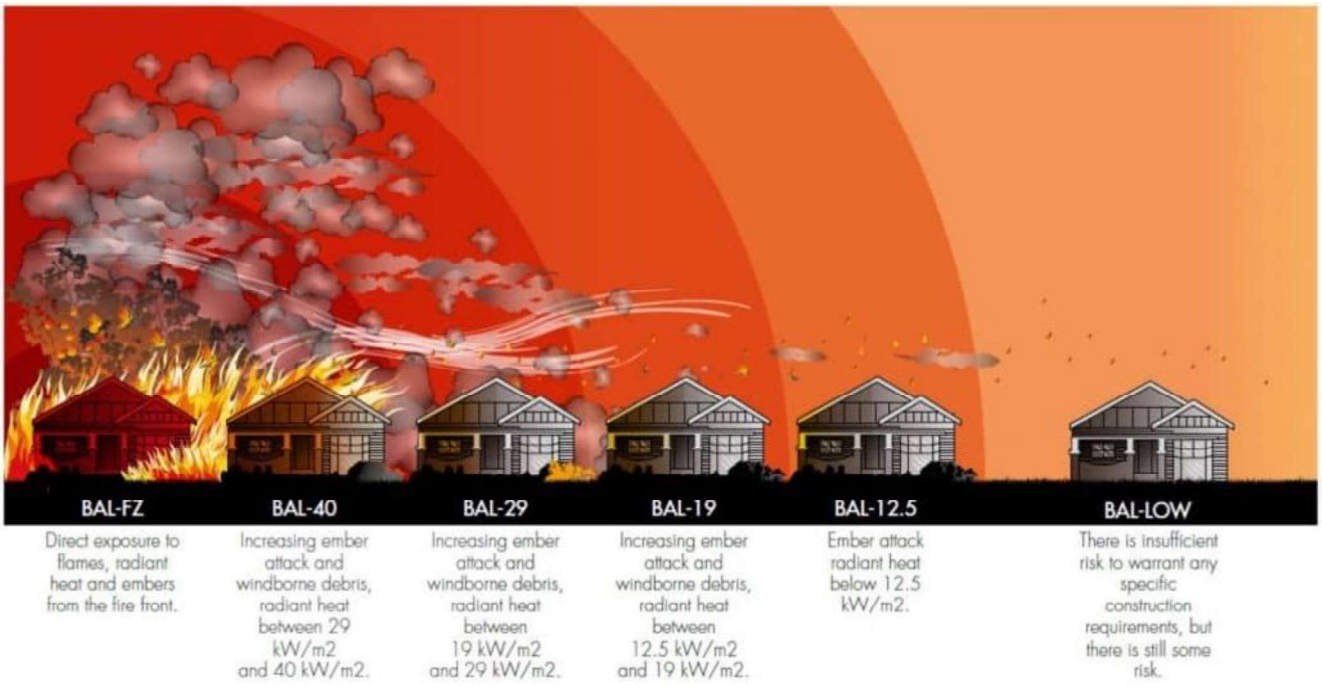

Figure 14: Forms of bushfire attack with relation to BAL construction standards (CFA 2012; AS3959:2018)

HEAT FLUX EXPOSURE	DESCRIPTION	AS 3959 CONSTRUCTION LEVEL
N/A	Minimal attack from radiant heat and flame due to the distance of the building from the vegetation, although some attack by burning debris is possible. There is insufficient threat to warrant specific construction requirements.	BAL-LOW
≤12.5	Attack by burning debris is significant with radiant heat (not greater than 12.5kW/m²). Radiant heat is unlikely to threaten building elements (such as unscreened glass). Specific construction requirements for ember protection and accumulation of debris are warranted.	BAL-12.5
>12.5 ≤19	Attack by burning debris is significant with radiant heat flux (not greater than 19kW/m²) threatening some building elements (such as screened glass). Specific construction requirements for embers and radiant heat are warranted.	BAL-19
>19 ≤29	Attack by burning debris is significant and radiant heat flux (not greater than 29kW/m²) threatens building integrity. Specific construction requirements for ember and higher levels of radiant heat are warranted. Some flame contact is possible.	BAL-29
>29 ≤40	Radiant heat flux and potential flame contact could threaten building integrity.	BAL-40
>40	Significant radiant heat and significantly higher likelihood of flame contact from the fire front will threaten building integrity and result in significant risk to residents.	BAL-FZ

Note: Attack from burning debris increases with the Bush Fire Attack Level. Source AS 3959.

Figure 15: Table 17 of BMS – Radiant heat flux exposure and appropriate Bushfire Attack Level (p. 77)

Figure 16 is taken from the BMS (Table 20, p. 83) and details the acceptable solution for minimum separation between development and the bushfire vegetation, which is the overall APZ, to meet the residential subdivision standard of BAL-29 or less than 29kW/m^2 of radiant heat based on a design fire of 1090K using the commonly adopted methodology. Sensitive use developments have significantly larger required separation. The purpose of setting a minimum standard is to ensure any new development lots created will be able to provide a practical building envelope where the building will have to be built to a maximum building standard of BAL-29. This is a recognition of the costs, limitations, and practicalities of building to higher standards (BAL-40 & BAL-FZ). As this methodology has been in use in various forms for over 20 years, the building industry has developed a range of designs, construction materials and elements, and systems that can provide relatively cost effective housing to this standard. Effectively the lower the BAL the lower the cost impact on building. This retains some flexibility that allows a developer to choose to build to a higher standard if they choose, and potentially reduce the required APZ separation.

KEITH VEGETATION FORMATION	EFFECTIVE SLOPE				
	Up slopes and flat	>0°-5°	>5°-10°	>10°-15°	>15°-20°
	Distance (m) from the asset to the predominant vegetation formation				
Rainforest	11	14	18	23	30
Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	24	29	36	45	56
Grassy and Semi-Arid Woodland (including Mallee)	12	16	20	25	32
Forested Wetland (excluding Coastal Swamp Forest)	10	12	16	20	26
Freshwater Wetlands	5	6	6	7	8
Grassland	10	12	13	15	17

Figure 16: BMS Table 20 – Minimum distances for APZ – residential development, FFDI 100 areas (<29kW/m2, 1090K)

There is a long-established and sophisticated understanding of the benefits of providing significant separation between development and a bushfire. The methodology adopted by Australian authorities via the National Construction Code 2022 (NCC) and the various regulatory frameworks allow for a BAL-Low rating, and this is the distance beyond which it is considered there is insufficient risk of bushfire attack to warrant requiring specific bushfire construction standards. This distance is measured as 100m for all vegetation formations except for grassland which is measured as 50m, which is recognition of the reduced risk from grassland wildfires. This pertains to the very different fuel type and in particular the significantly lower danger of ember attack as a greater quantity of fuel is consumed and the type of fuel is much less likely to generate burning embers. Figure 17 is an extract from BMS Table 21 (p. 84) demonstrating this.

KEITH VEGETATION FORMATION	EFFECTIVE SLOPE				
	BAL-FZ	BAL-40	BAL-29	BAL-19	BAL-12.5
	Distance (m) asset to predominant vegetatio class				
ALL UPSLOPE AND FLATLAND					
Rainforest	< 8	8 -< 11	11 -< 16	16 -< 23	23 -< 100
Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 18	18 -< 24	24 -< 33	33 -< 45	45 -< 100
Grassy and Semi-Arid Woodland (including Mallee)	< 9	9 -< 12	12 -< 18	18 -< 26	26 -< 100
Forested Wetland (excluding Coastal Swamp Forest)	< 7	7 -< 10	10 -< 14	14 -< 21	21 -< 100
Freshwater Wetlands	< 4	4 -< 5	5 -< 7	7 -< 11	11 -< 100
Grassland	< 8	8 -< 10	10 -< 15	15 -< 22	22 -< 50

Figure 17: Extract from BMS Table 21 (p.84) highlighting BAL-12.5 cutoff distances

Notwithstanding this, it is recognised that burning debris may be carried much greater distances, potentially over several kilometres in the worst conditions with landscape scale fires in forests with heavy bark fuel loads. Embers are capable of starting spot fires significantly ahead of the fire and are capable of starting fires more than 100m ahead of the urban-bushland interface. Not every ember will start a fire and many small fires away from the fire front may be easily extinguished or self-extinguish if there is insufficient fine fuel (<6mm) to ignite another fire.

It is important to be aware that the methodology used, and the standards derived from it are based on delivering a significant risk reduction, however this does not mean risk is eliminated. It is also important to understand that the methodology used is currently limited to an upper limit of FFDI of 100 as the maximum design fire, and that there is evidence of fires burning under more extreme weather conditions (Catastrophic) and awareness that the impacts of climate change will result in greater FFDI being observed on the worst fire weather days.

Following the Canberra 2003 fires, Chen and McAneney[5] produced a seminal research paper using data from Duffy ACT and several other major fires to establish the extent of bushfire penetration into Australian urban areas. The conclusion was that whilst there is a wide variety of impacts within urban areas, and variables such as action by fire agencies and homeowners as well as consideration of different building types, however there is a clear inverse relationship between distance from the urban-bushland interface and the probability of home destruction. It is important to note that at the time of the study the percentage of development built to any bushfire construction standard was significantly lower than in 2023.

They concluded that:

- '*the maximum distance at which homes are destroyed is typically less than 700m*.'

Figure 18 shows the curves establishing the cumulative distribution of homes destroyed in relation to distance from nearby bushland. Figure 19 shows the percentage of homes destroyed at different distance ranges, with the Victorian 'Ash Wednesday' (1983) figures complicated by the high proportion of houses located within the bushland and 'intermix' area (houses located within a mixed bushland and developed landscape). These demonstrate a clear relationship and support the conclusion that no houses in the fires studied were destroyed beyond the 700m distance.

[5] Chen, K and McAneney, J. 2004 Quantifying bushfire penetration into urban areas in Australia, Geophysical Research Letters Vol. 31

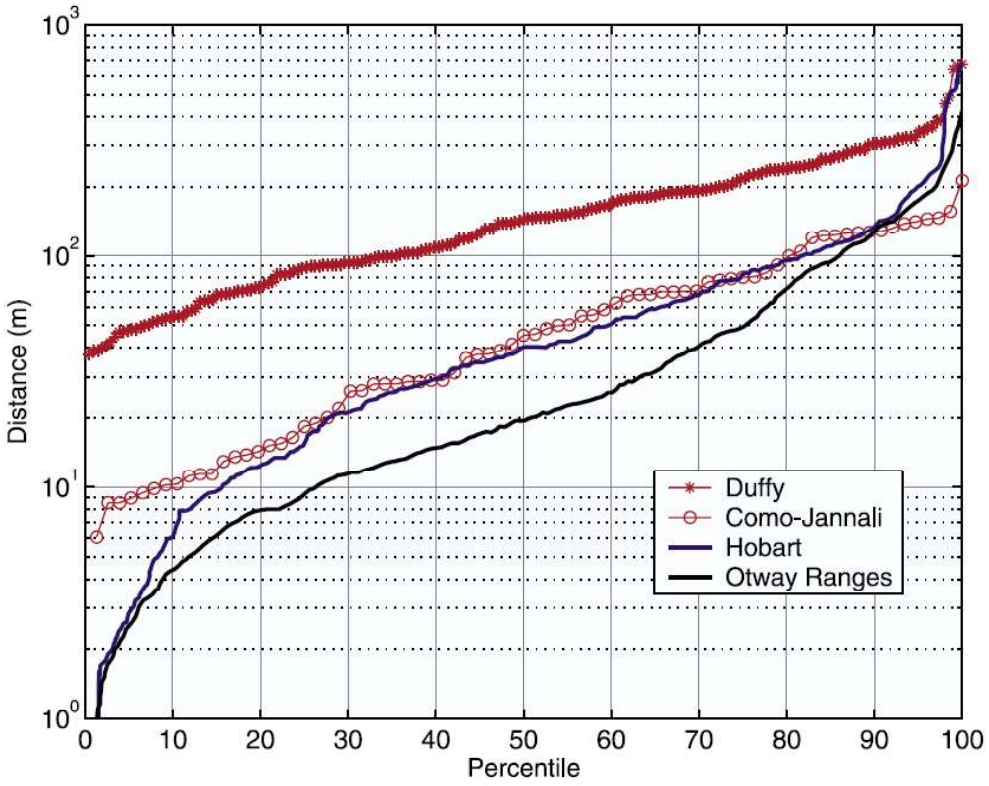

Figure 18: Chen & McAneney 2004 (Figure 1) houses destroyed and distance from bushland.

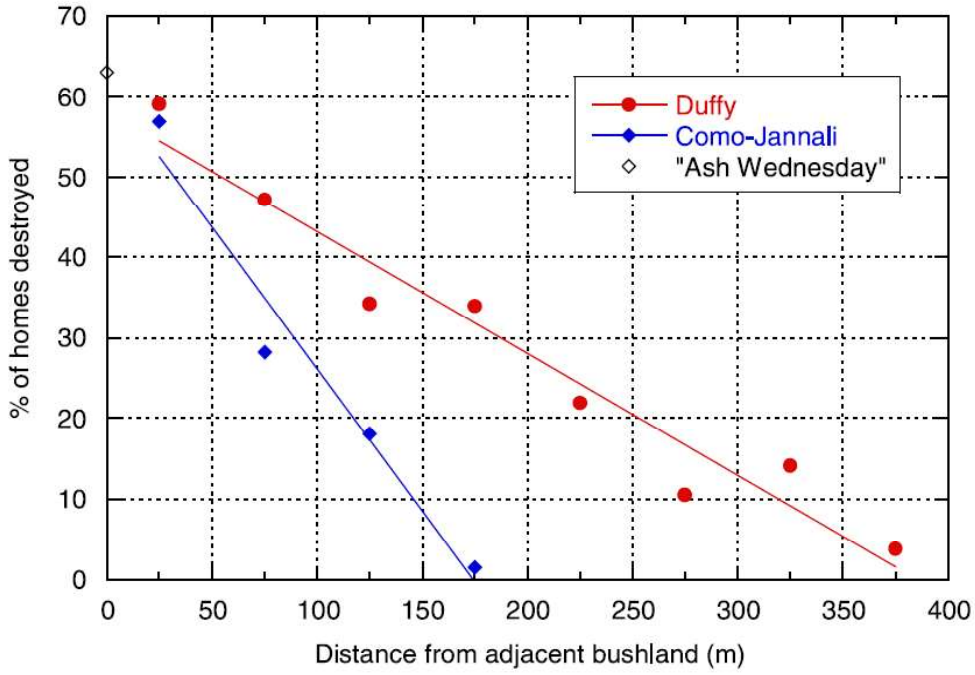

Figure 19: Chen & McAneney 2004 (Figure 2) percentage of homes destroyed at different distance ranges

In 2010, following the Victorian 'Black Saturday' bushfires Crompton et al [6] prepared a paper reevaluating the history of building damage and loss of life since 1925, that both referenced and supported the conclusions of the earlier 2004 work. The conclusions regarding an analysis of the Kinglake and Marysville fires supports the position that the vast majority of homes lost are within 200m from the bushland. Figure 20 is the Figure 4 referred to in the analysis.

> *"Destroyed buildings in Kinglake and Marysville were categorized as a function of distance from bushland boundaries, and these data are presented in Fig. 4. A key feature is that about 25% of destroyed buildings were located physically within the bushland boundary, and 60% and 90% were within 10 and 100 m of bushland (Fig. 4). Most buildings in Marysville lay within 200 m of the bushland boundary and, given the wind change that occurred early in the evening on 7 February 2009, would have been subject to ember attack from multiple directions (Victorian Bushfires Royal Commission 2009)."*

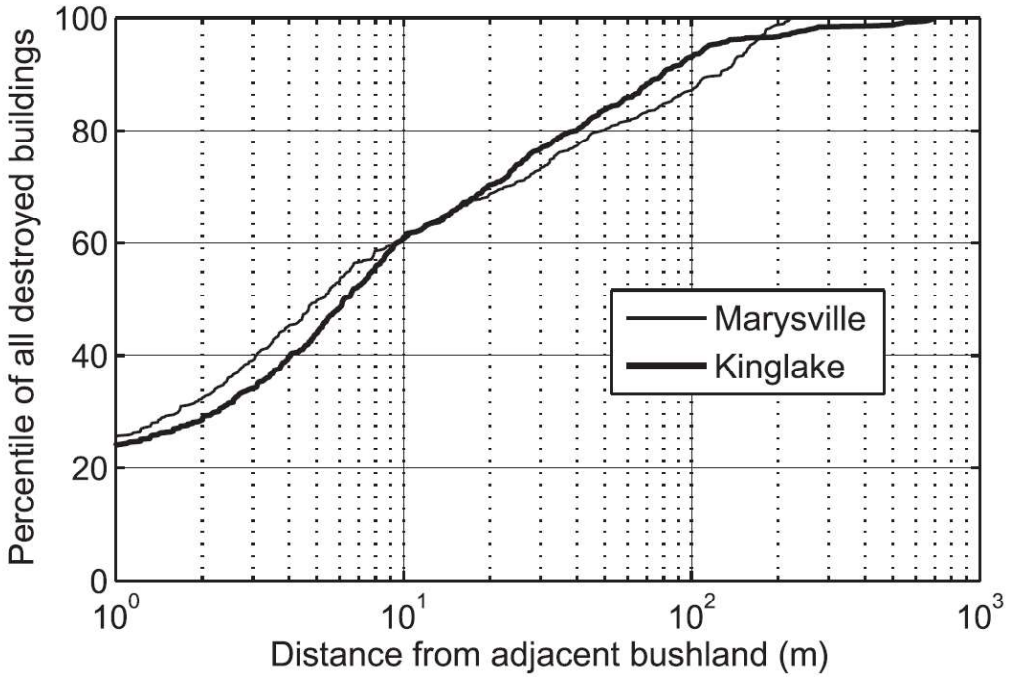

Figure 20: Extract from Crompton et al paper 2010

The reasonable conclusion from this research is that at 700m distance from the interface there is a very high likelihood of significantly limiting damage from bushfires and preventing house loss.

[6] Crompton, RP, McAneney, J, Chen, K, Pielke, RA and Haynes, K 2010 Influence of location, population and climate on building damage and fatalities due to Australian bushfire: 1925-2009. Weather, Climate and Society 2010 Vol. 2

7. Legislative Framework

In the ACT, a dual planning regime has been established with the Australian Government and ACT Government sharing statutory and strategic planning responsibility, with ACT Government responsible for most day-to-day planning matters (BMS, p. 17). The land use planning framework as it relates to land use planning and bushfire in ACT is embedded in the *Planning Act 2023*, *Planning (General) Regulation 2023, Emergencies Act 2004* and the *Emergencies Regulation 2004* and these are enacted through the SBMP and BMS (2023). The SBMP complements the Territory Plan and informs the development of future zoning. The *Planning Act 2023* was passed by the Assembly on 6 June 2023 and while some provisions have commenced, it will not commence in full until later in 2023. Section 4 of BMS deals with strategic planning. The BMS details the requirements for strategic planning as it pertains to bushfire risk management and sets the relevant aim, objectives and standards to be followed.

The BMS articulates the regulatory framework for ACT strategic planning processes and refers specifically to the Planning Strategy and the linkages to the ACT Wellbeing Framework and district and zone policies. The BMS outlines the process to be undertaken during the strategic planning phase and to be applied during the future development of District and Zone Policies that set the future zoning. Figure 21 is an amended extract from BMS Figure 3 showing where this SBRA fits into the strategic planning process.

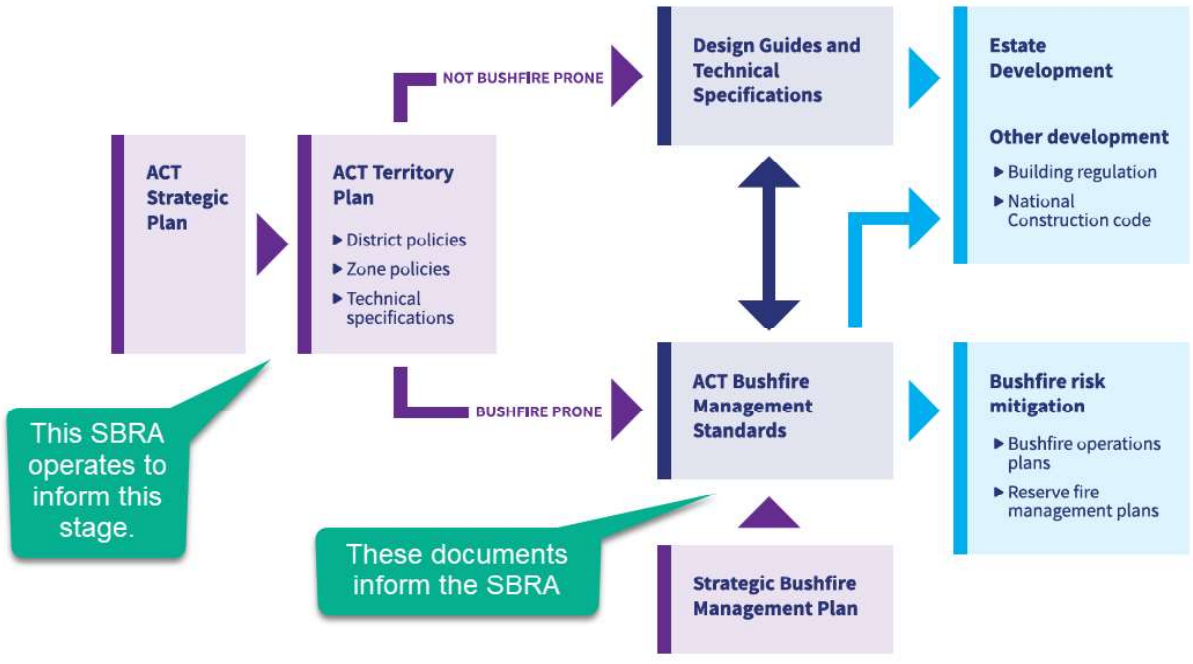

Figure 21: Amended extract from BMS 2023 Figure 3 (p. 28) showing where this SBRA operates.

It is suggested that a formal Strategic Bushfire Study (SBS) should be prepared when developing the relevant District and Zone Policies for any WEIA investigation area that ultimately is proposed for

rezoning. It is critical the SBS principles are followed at the rezoning stage to provide adequate consideration of the site specific characteristics and nature of the proposed rezoning. This is consistent with the first statement of BMS Section 4 (p. 28):

> *Strategic planning is the first stage in the planning process. It is needed to ensure that businesses and future development are not exposed to an unacceptable risk of bush fire. Unacceptable risk is a situation where bushfire protection measures have not been considered or addressed in accordance with AS3959 Construction of buildings in bushfire prone areas, NCC, and the BMS, where development occurs within the bushfire prone area.*

At the subdivision design stage, a formal SBS may be required. It is suggested that should an SBS have not been prepared at rezoning stage, it must be required for any Estate Development Plan.

The BMS requires detailed analysis to support development. The broad principles which apply to this analysis are:

- *ensuring land is suitable for development in the context of bushfire risk*
- *ensuring new development on BPL will comply with PBP*
- *minimising reliance on performance-based solutions*
- *providing adequate infrastructure associated with emergency evacuation and firefighting operations*
- *facilitating appropriate ongoing land management practices*.

BMS also outlines exclusion of inappropriate development in bushfire prone areas which includes:

- *the development area is exposed to a high bushfire risk and should be avoided*
- *the development is likely to be difficult to evacuate during a bushfire due to its siting in the landscape, access limitations, fire history and/or size and scale*
- *the development will adversely affect other bushfire protection strategies or place existing development at increased risk*
- *the development is within an area of high bushfire risk where density of existing development may cause evacuation issues for both existing and new occupants*
- *the development has environmental constraints to the area which cannot be overcome.*

The SBS considers the issues in Figure 22, which have been used to inform this SBRA. The BMS requires that any SBS developed to support a district policy or specification must be endorsed by EPSDD, the ESA and any other relevant agency. The BMS also explicitly recognises that regardless of the combination of bushfire protection measures or fuel mitigation measures, there will always be an element of residual risk and that it is not possible to eliminate all risk (p. 31).

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.	> The bush fire hazard in the surrounding area, including: • Vegetation • Topography • Weather > The potential fire behaviour that might be generated based on the above. > Any history of bush fire in the area. > Potential fire runs into the site and the intensity of such fire runs; and > The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.	> The risk profile of different areas of the development layout based on the above landscape study. > The proposed land use zones and permitted uses. > The most appropriate siting of different land uses based on risk profiles within the site (i.e., not locating development on ridge tops, SFPP development to be in lower risk areas of the site); and > The impact of the siting of these uses on APZ provision.
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout.	> The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile. > The location of key access routes and direction of travel; and > The potential for development to be isolated in the event of a bush fire.
Emergency services	An assessment of the future impact of new development on emergency services.	> Consideration of the increase in demand for emergency services responding to a bush fire emergency including the need for new stations/ brigades; and > Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency.
Infrastructure	An assessment of the issues associated with infrastructure and utilities.	> The ability of the reticulated water system to deal with a major bush fire event in terms of pressures, flows, and spacing of hydrants; and > Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc.
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.	> Consideration of the implications of a change in land use on adjoining land including increased pressure on BPMs through the implementation of Bush Fire Management Plans.

Figure 22: Requirements of a Strategic Bushfire Study (BMS Table 1 p. 31-32)

8. Bushfire Landscape Assessment

8.1. Bushfire Prone Area

Under the Strategic Bushfire Management Plan (SBMP), the Commissioner of the ACT Emergency Services Agency (ESA) designates what constitutes the Bushfire Prone Area (BPA) which is the trigger to apply the relevant bushfire planning and building standards under the ACT regulatory framework. The entire WEIA is identified as being within the BPA as shown in Figure 23.

8.2. Vegetation assessment

Vegetation is the fundamental physical component of determining the bushfire behaviour. Vegetation, in broad terms provides the available fuel to be consumed by a bushfire. Fuel load and arrangement represents a considerable component in dictating to a large degree the behaviour of fire in terms of intensity, rate of spread and flame height, and typically relates to dead plant material less than 6mm thick, and live plant material thinner than 3mm. Vegetation type, density and arrangement can further influence fire behaviour and intensity. Vertical and horizontal continuity is also a significant element. Thus, vegetation forms a key consideration within this report. The vegetation provides a basis for the determination for bushfire intensity mapping.

The vegetation assessment has been completed in accordance with BMS. The predominant vegetation is classified by structure or formation using the system adopted by David Keith (2004) and by the general description using BMS. The predominant vegetation types across the five investigation areas are grassland with smaller areas of grassy woodland. Forest fuels are generally restricted to the reserve system that follows the major riparian corridors. The vegetation mapping used for the basis of the fire intensity mapping is shown as Figure 24.

8.3. Slopes influencing bushfire behaviour

The slope of the land under the classified vegetation has a direct influence on the rate of fire spread, the intensity of the fire and the ultimate level of radiant heat flux. The effective slope is the slope of the ground under the hazard (vegetation). There are a wide range of slopes across the WEIA, however as the investigation areas were defined to remove the steep areas for a variety of reasons the majority of the slopes within the five investigation areas are moderate and in the 0-5 degrees range.

The slope mapping used for the basis of the fire intensity mapping is shown as Figure 25.

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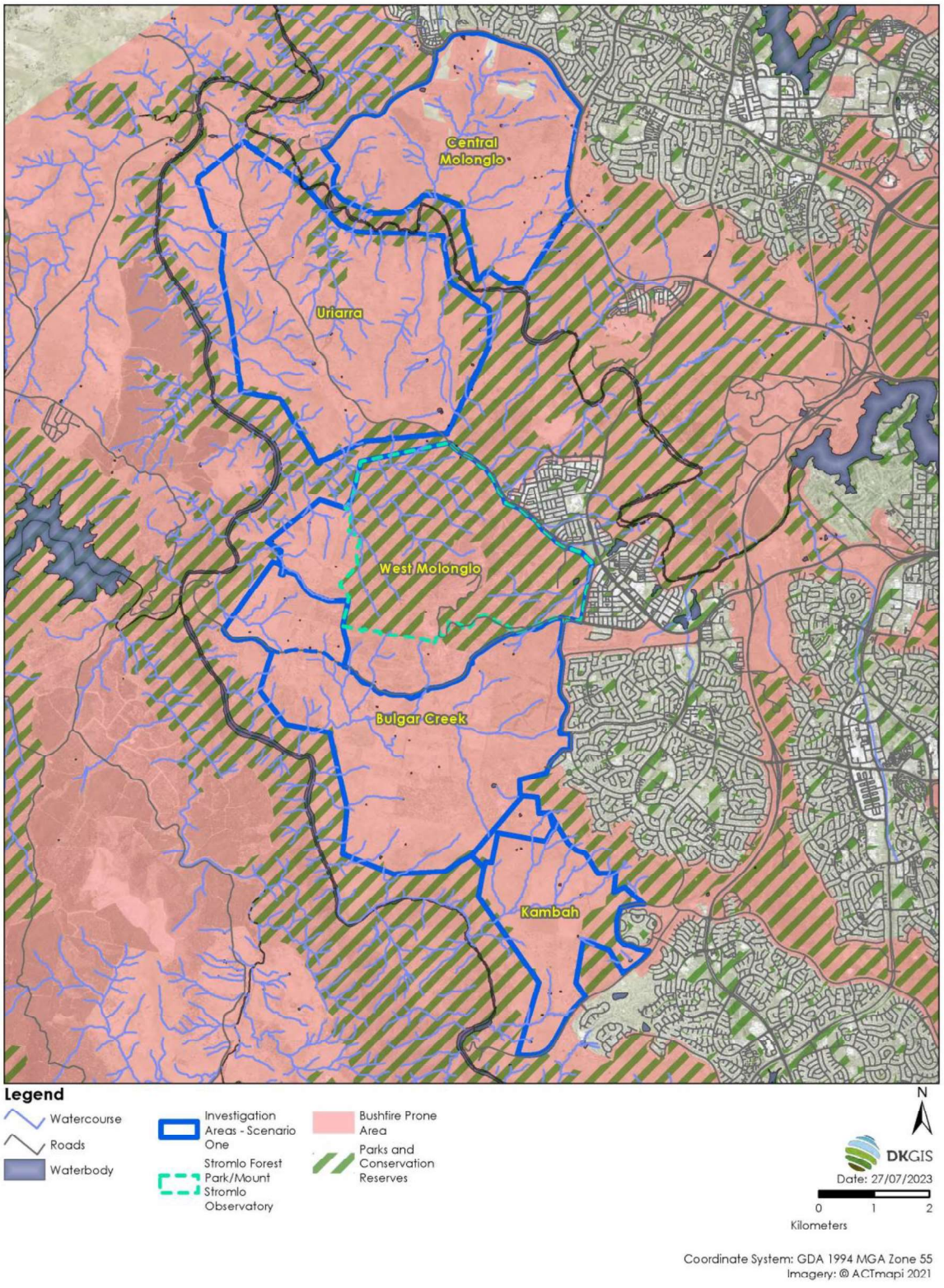

Figure 23: Bushfire Prone Area map

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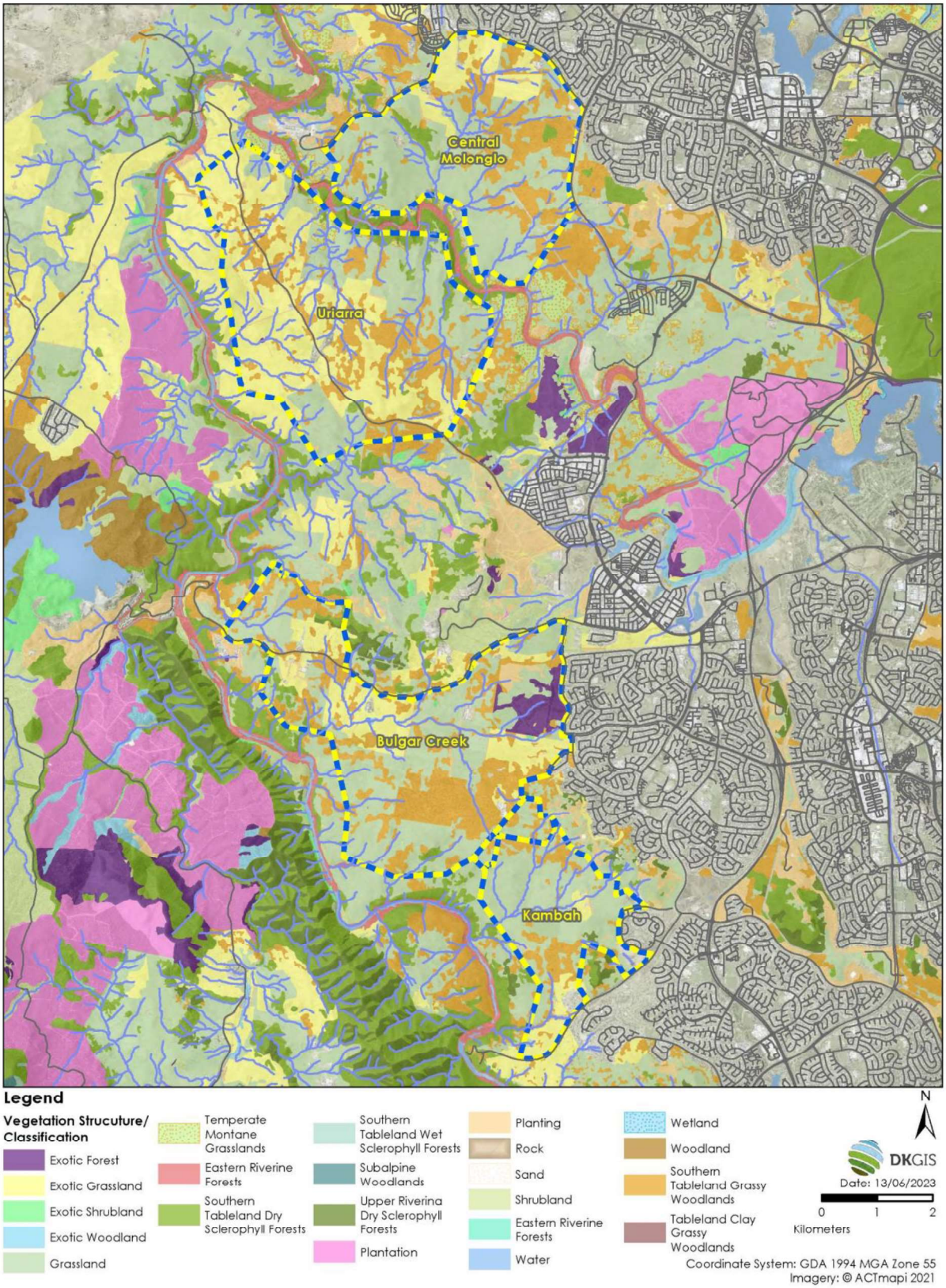

Figure 24: Vegetation map

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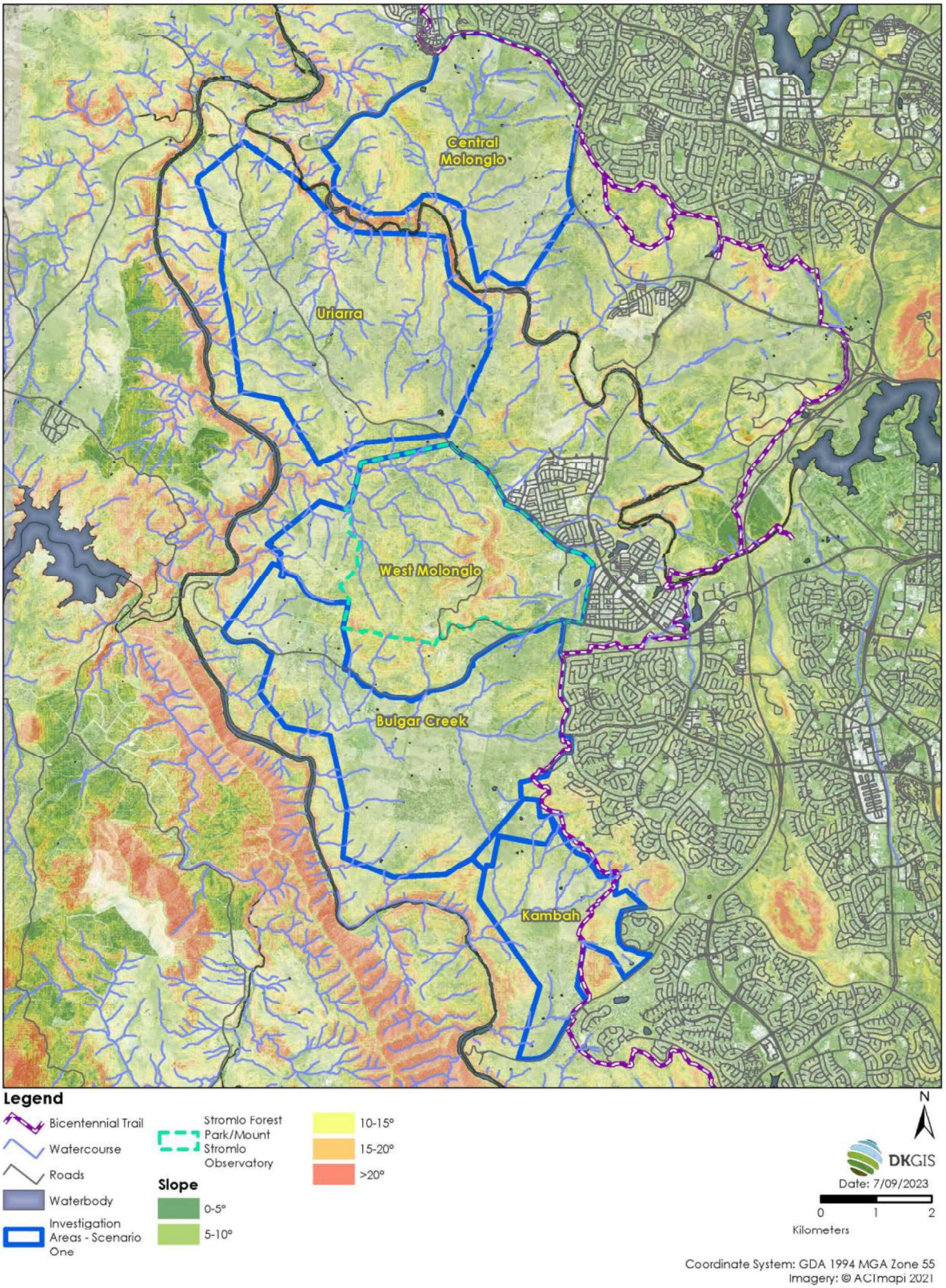

Figure 25: Slope map

8.4. Site suitability

Fire intensity:

The overall purpose of this SBRA is to guide decision making for future rezoning potential considering the bushfire risk at a large scale, using the 5 investigation areas provided. The analysis has been completed using fire intensity modelling based on the current mapped vegetation and slope within the five investigation areas. The modelling used a design bushfire of FFDI 100 and combines a range of fire scenarios with winds ranging from the north through the west to the southwest as these are the conditions likely to occur on bad fire weather days. The modelled intensity is then separated into three categories, Low, Moderate and High to improve legibility on the mapping. The fire intensity mapping is represented by the colours on the mapping. The modelling maps are presented as Figures 26-37.

House loss and distance to interface:

The majority of house loss occurs within the first 100m of the urban-bushland interface, with a high likelihood of 90% of losses occurring within 200m and an upper limit of house loss at 700m. The investigation area boundaries are used as the urban-bushland interface, and consider that the primary bushfire threat will come from outside the investigation areas. The 100m, 200m and 700m distances are shown on the fire intensity mapping as perimeters from the interface to the higher threat vegetation outside, on the assumption that the majority of the investigation areas will be developed as urban land. The relation of the areas inside the perimeters, to the perimeter, provides scale to the potential urban areas available within the relative distances from the interface. Where there is existing urban development adjoining the investigation area (e.g. eastern side of Central Molonglo) that has been considered as managed land not capable of sustaining a significant bushfire and the perimeter distances are affected accordingly.

Scale of consideration:

The five investigation areas have largely excluded the steepest land, and the majority of parks and conservation reserves. The Mount Stromlo Forest Park and the steep area south of the park (north side of Cotter Rd) has also been excluded. There is some intrusion of reserves into the mapped investigation areas of Uriarra and Kambah, however it was considered that for this large scale exercise this was appropriate. The mapping is done at a large scale and provides analysis without considering the impact that other constraints such as future internal green corridors will have on ultimate development areas. These vegetated corridors will ultimately be assessed using the standard methodology to determine bushfire risk and suitable BAL, as will those along the investigation area interface.

Amendment of investigation areas to aid analysis:

Notwithstanding the basic premise of using the investigation areas as provided, the West Molonglo and Bulgar Creek areas have been amended. The West Molonglo investigation area consists largely of area

that is to be excluded by the Mount Stromlo Forest Park, and much of the remaining area to the south bounded by Cotter Road is relatively steep and likely to be unsuitable with respect to bushfire management as it has the potential for increased fire behaviour, and has therefore been excised from the amended investigation area. Additionally, the western part of the Bulgar Creek investigation area has characteristics that are similar to that amended area. Therefore, the western area of Bulgar Creek and the remainder of West Molonglo have been combined at the point in the Bulgar Creek investigation area which is narrowest. The revised investigation area of Bulgar Creek is shown as Figures 30 & 31, and the revised investigation area to be as the West Molonglo area is shown as Figures 32 & 33. This revised West Molonglo investigation area has been created as the characteristics of the new combined area have a different risk profile to the Bulgar Creek area. With respect to the revised West Molonglo investigation area the risk profile differs as:

- it has the potential to be impacted by fire from three aspects, with the northwest and western aspects likely to be subject to significant landscape scale fire impact,
- it has a much larger perimeter to volume ratio,
- it is significantly narrower and provides only limited areas greater than 700m from the interface,
- it is significantly more likely to be isolated during a bushfire,
- it is significantly further away from an established urban area providing safe refuge until such time as the Bulgar Creek investigation area is potentially full developed.

Finally, consideration of the revised Bulgar Creek investigation area and the Kambah investigation area show there may be an advantage in combining these areas, so the respective southern and northern area boundaries are removed, and the two areas considered as a whole (Figures 36 & 37). This provides an additional option for consideration however will not be scored. This is suggested because:

- the potentially developable areas are slightly increased,
- both areas have connection to existing developed areas including alternate road access,
- There may be synergies in coordinating those stages,
- The Cooleman Ridge Nature Reserve would become a lesser bushfire threat to older development in Rivett, Chapman and Kambah if separated by development from the landscape scale threat posed by the Murrumbidgee River corridor and lands to the west.

Each intensity map is followed by a map showing the buffer distances with the current reserve system for additional context (Source: ACTGOV TP Overlay Zone).

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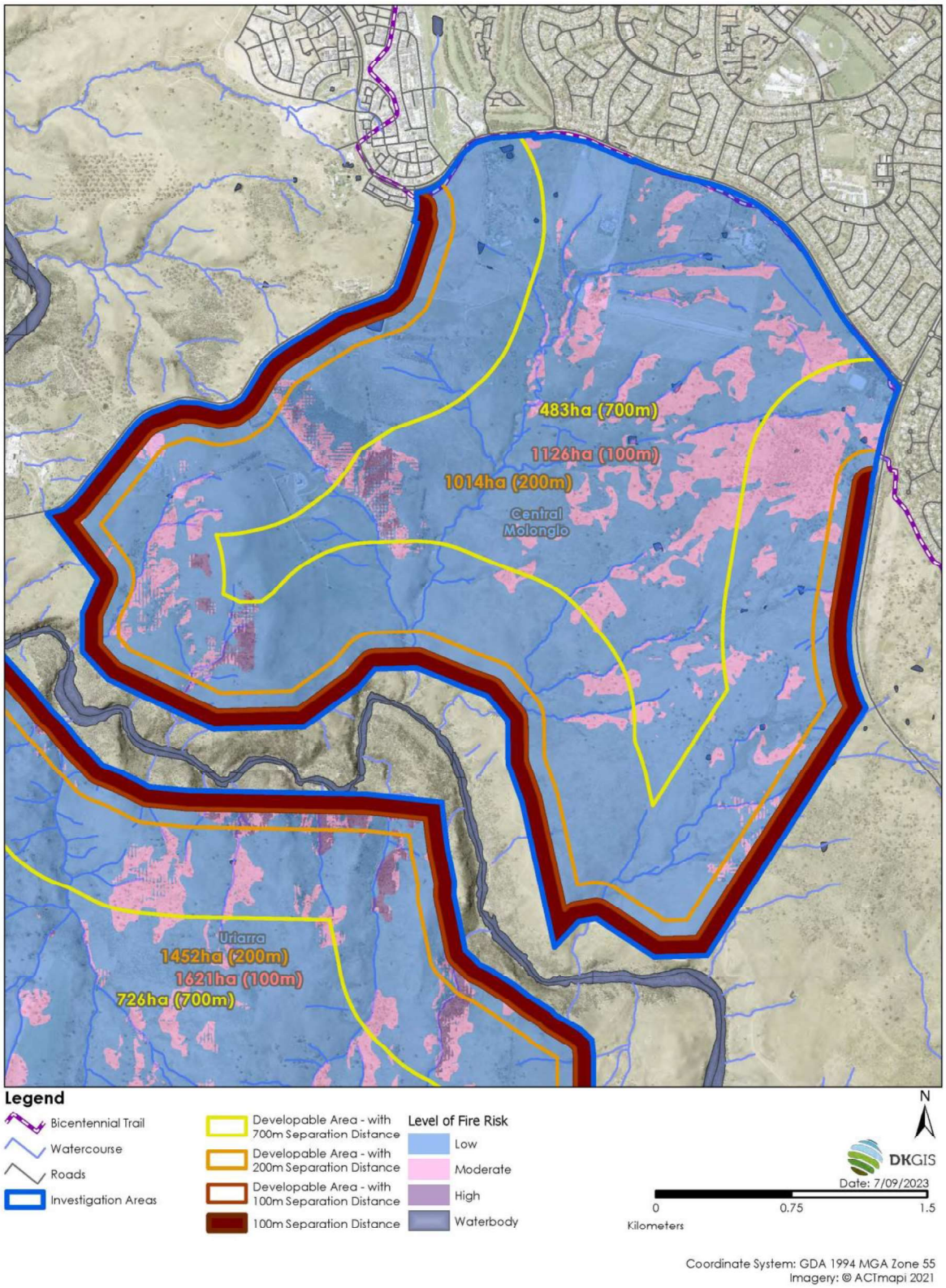

Figure 26: Fire intensity mapping Central Molonglo

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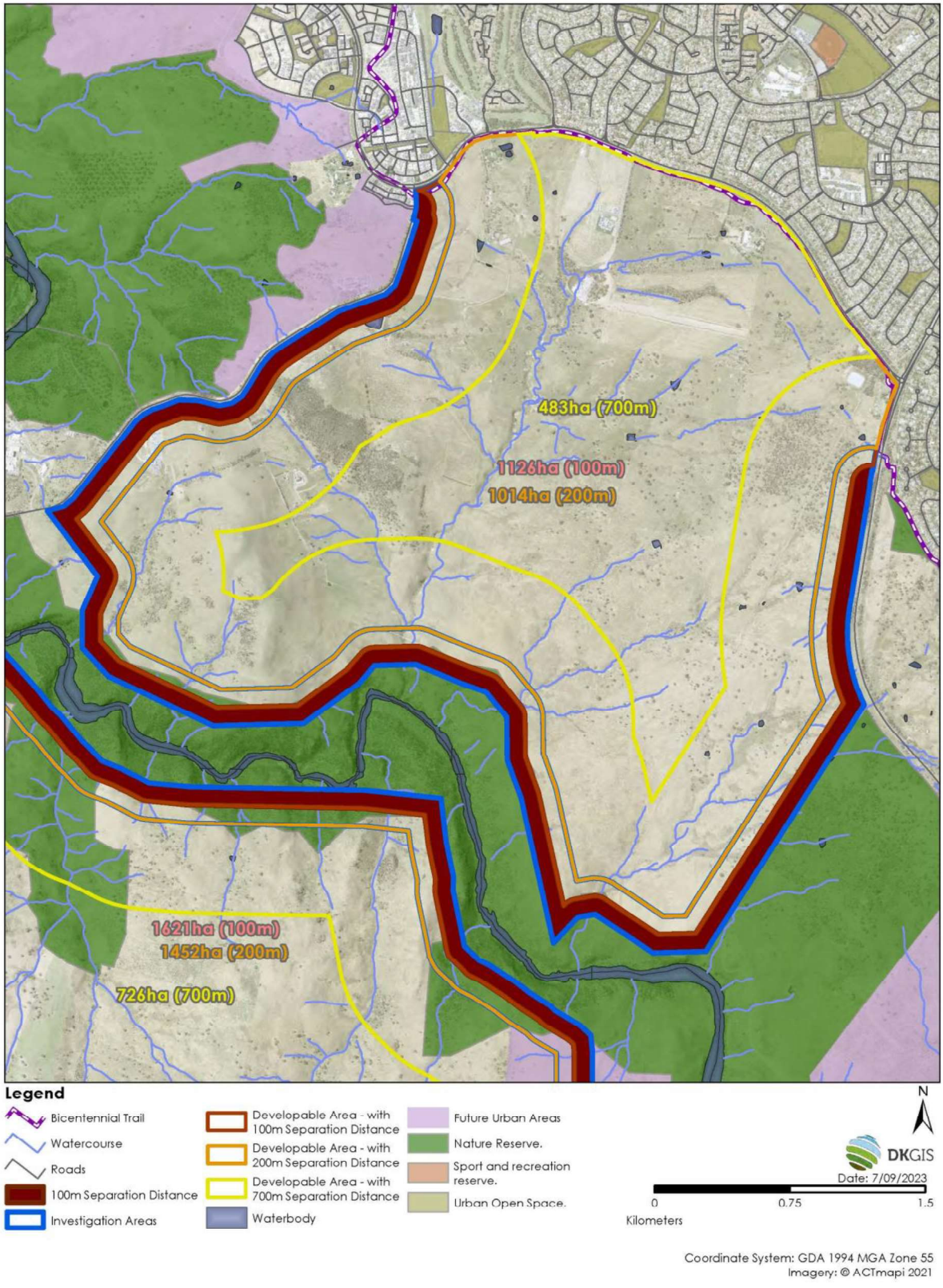

Figure 27: Risk buffers and reserves - Central Molonglo (Source: ACTGOV TP Overlay Zone)

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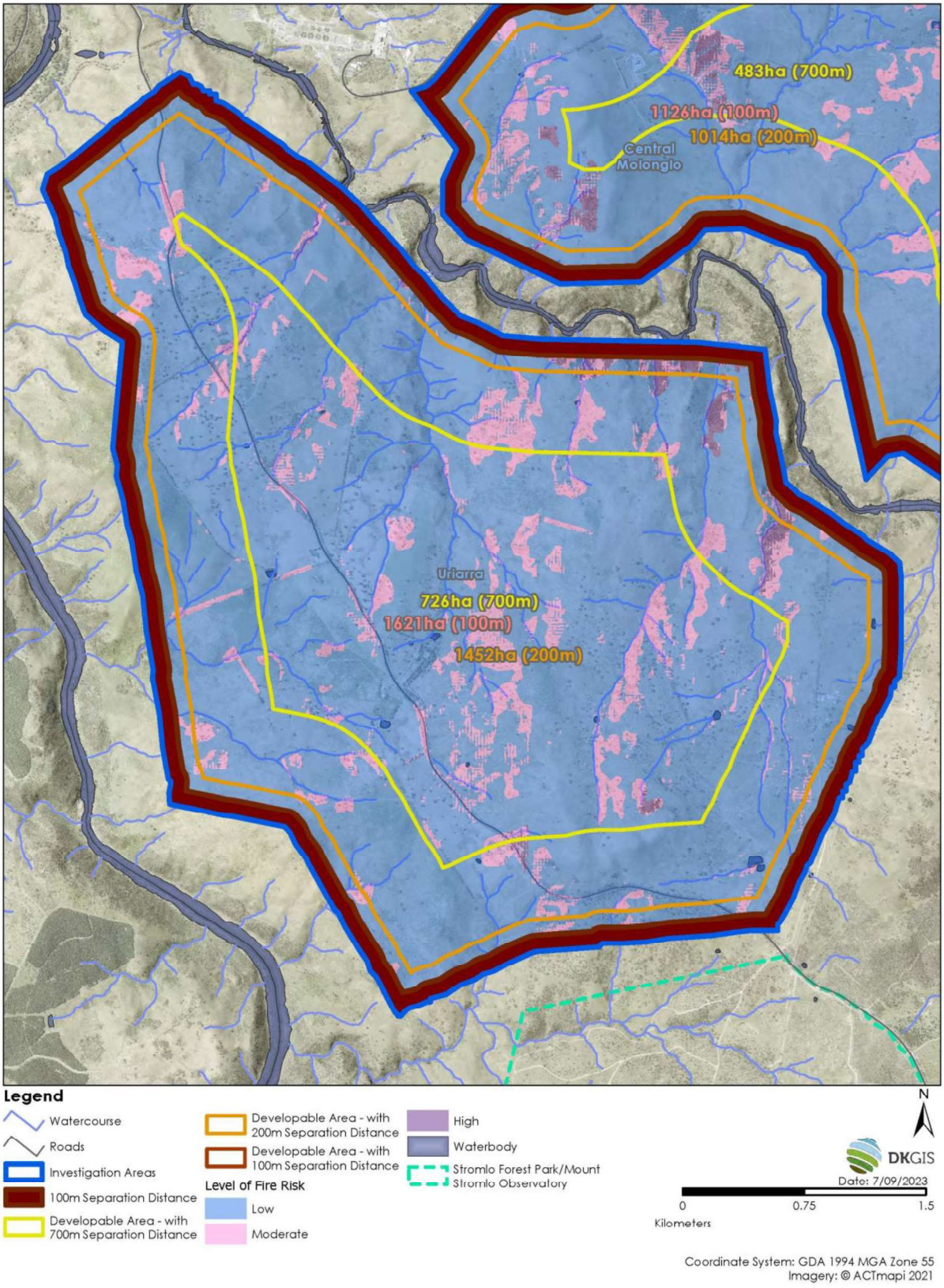

Figure 28: Fire intensity mapping Uriarra

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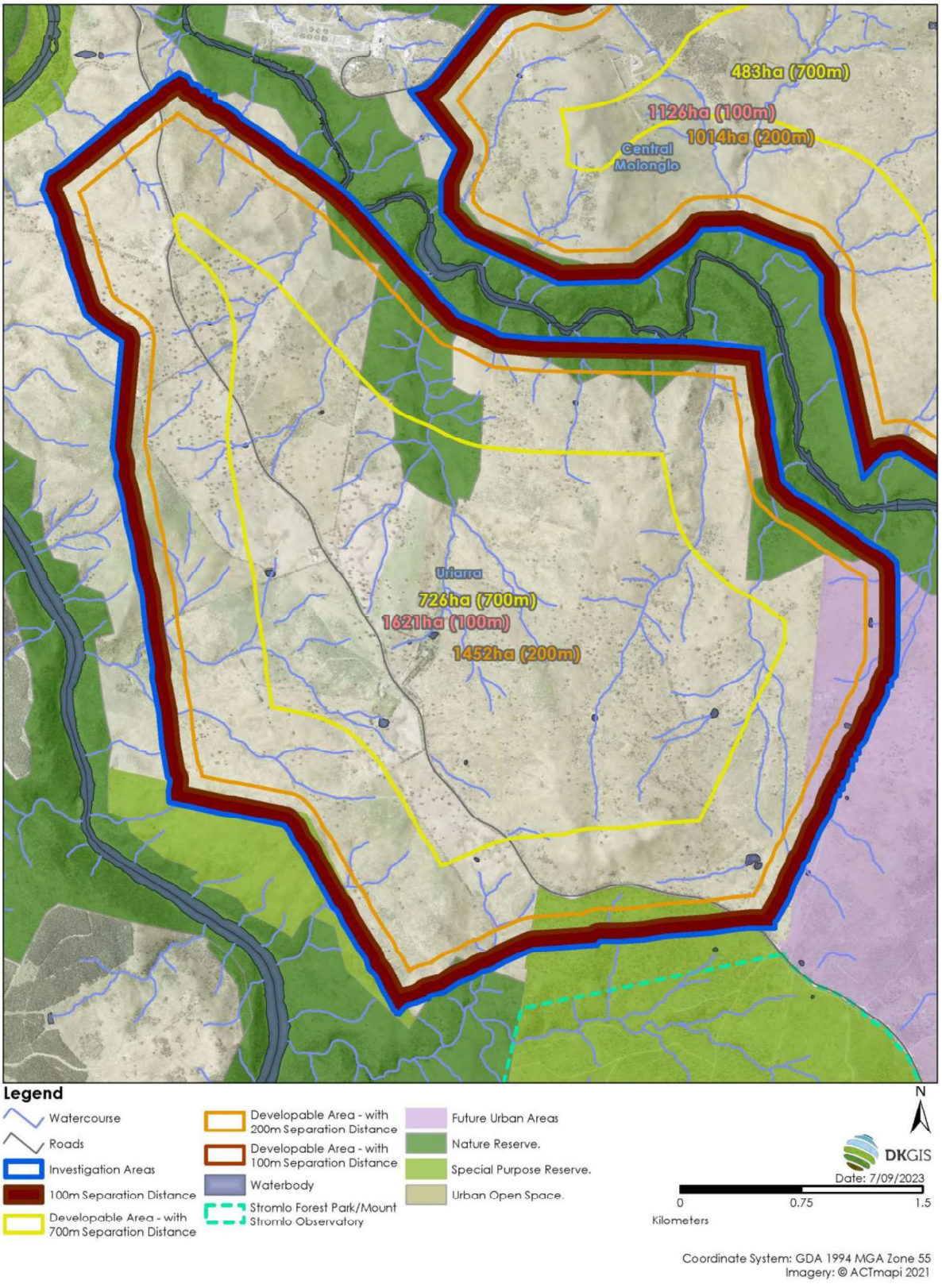

Figure 29: Risk buffers and reserves Uriarra (Source: ACTGOV TP Overlay Zone)

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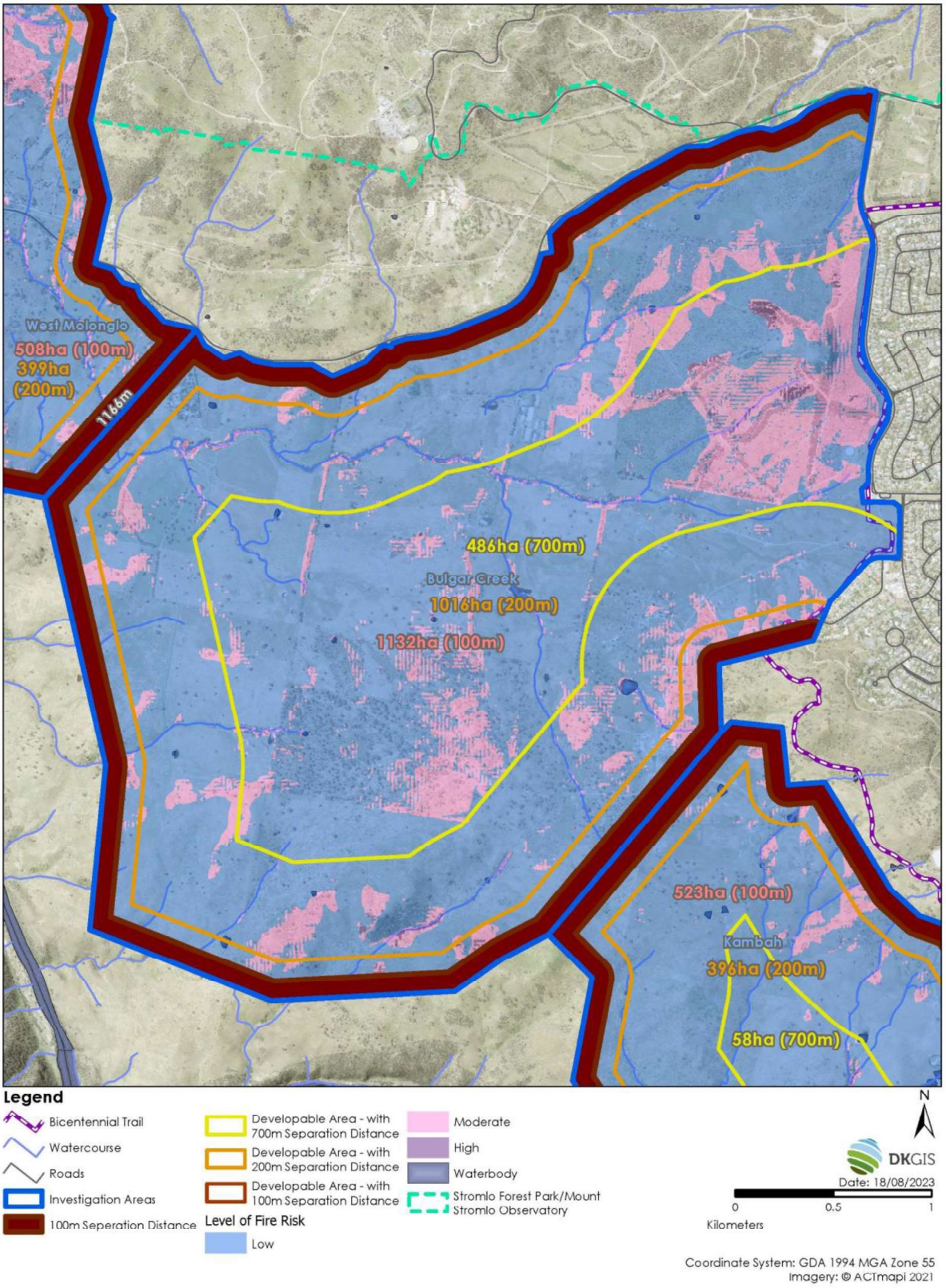

Figure 30: Intensity risk map Bulgar Creek (revised area)

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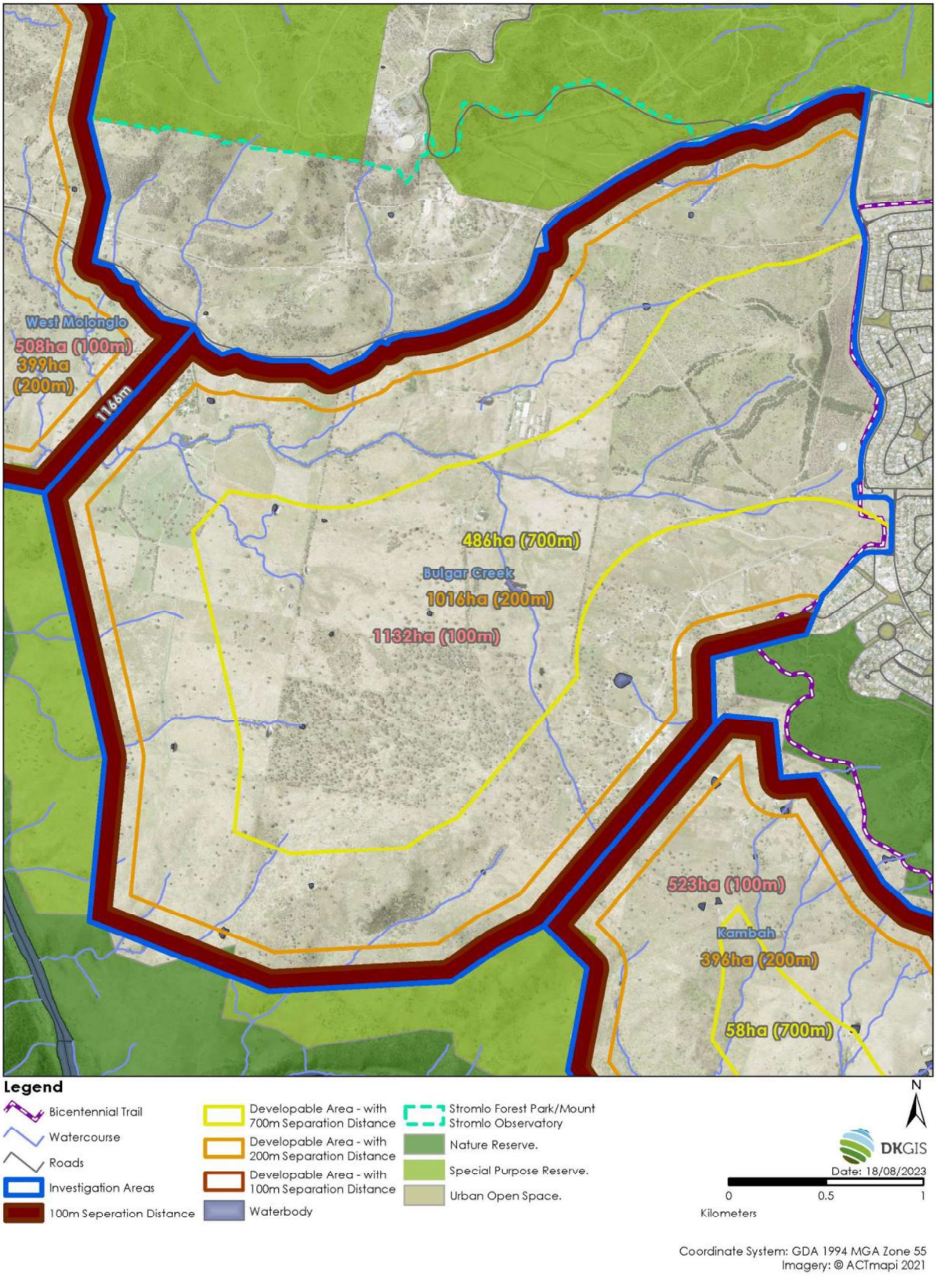

Figure 31: Risk buffers and reserves Bulgar Creek (revised area) (Source: ACTGOV TP Overlay Zone)

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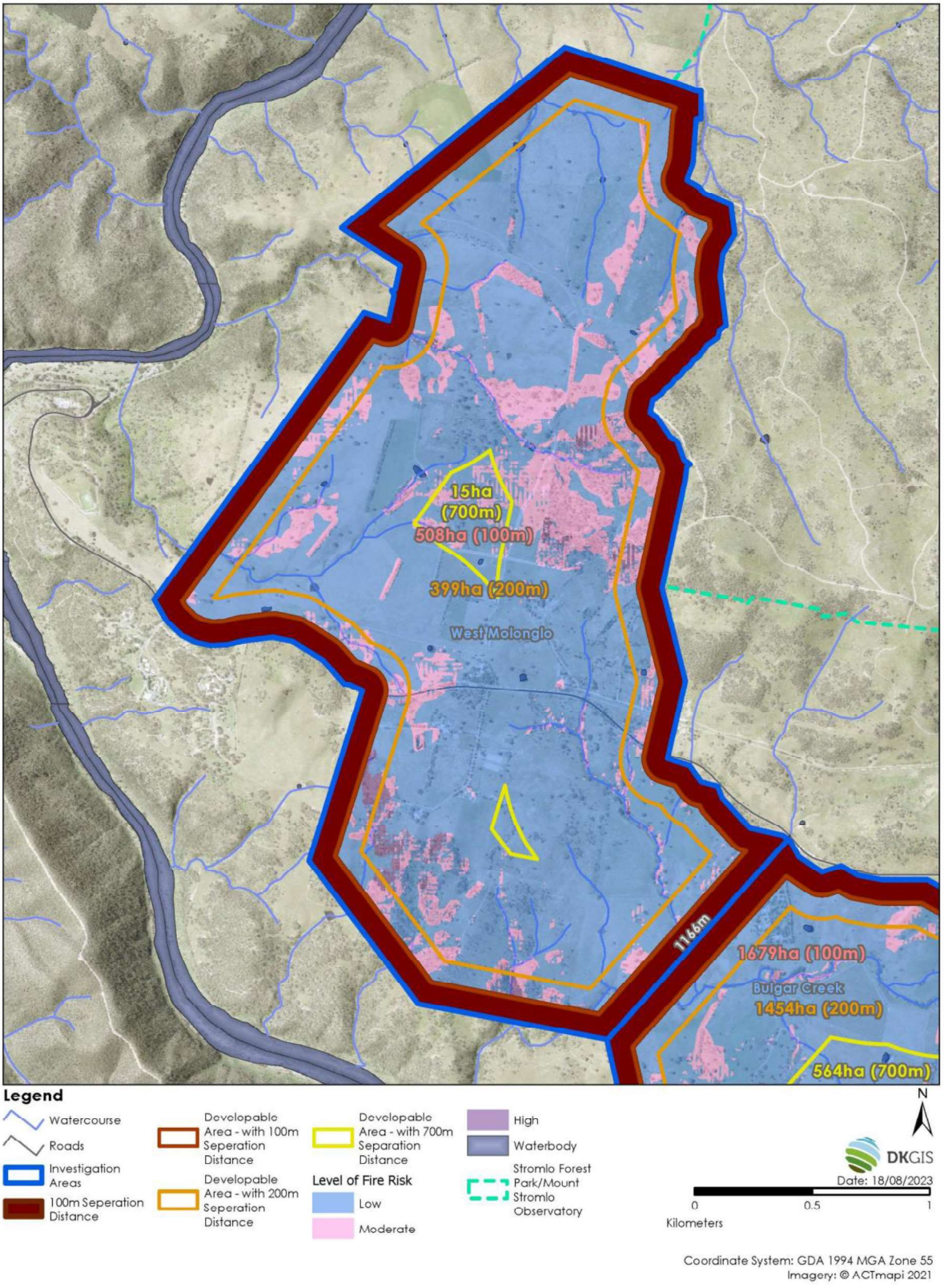

Figure 32: Intensity risk map West Molonglo (revised area)

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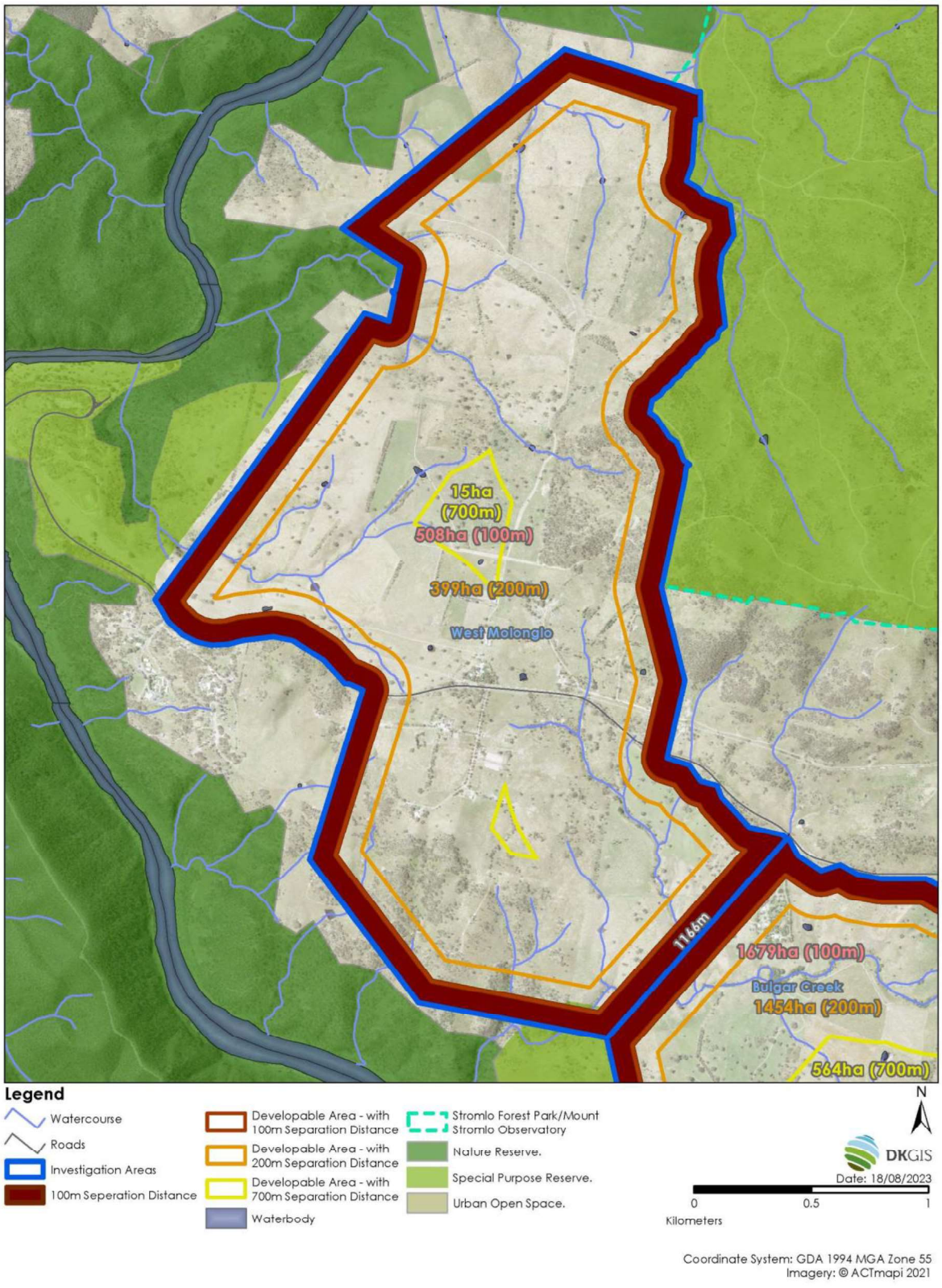

Figure 33: Risk buffers and reserves West Molonglo (revised area) (Source: ACTGOV TP Overlay Zone)

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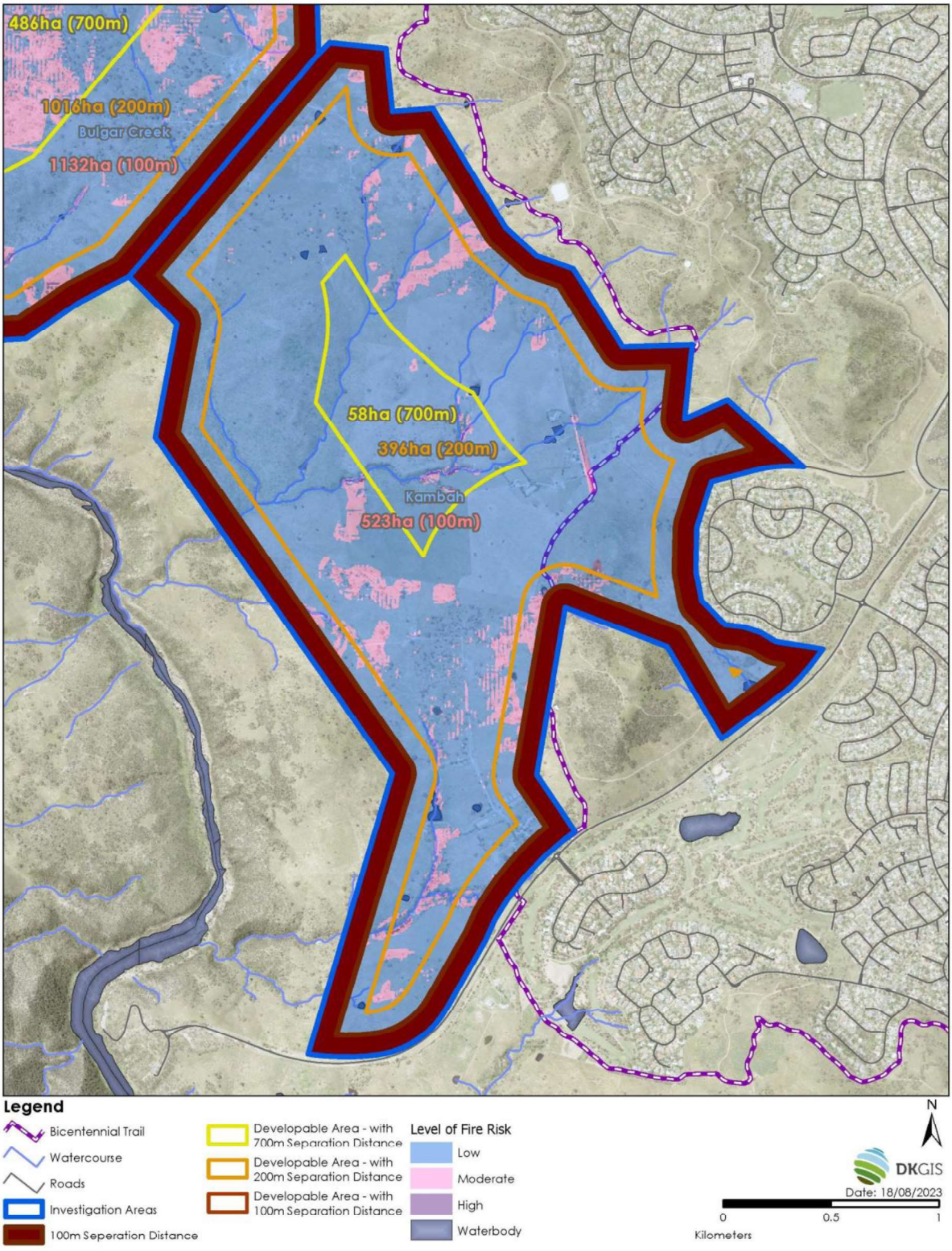

Figure 34: Intensity risk map Kambah

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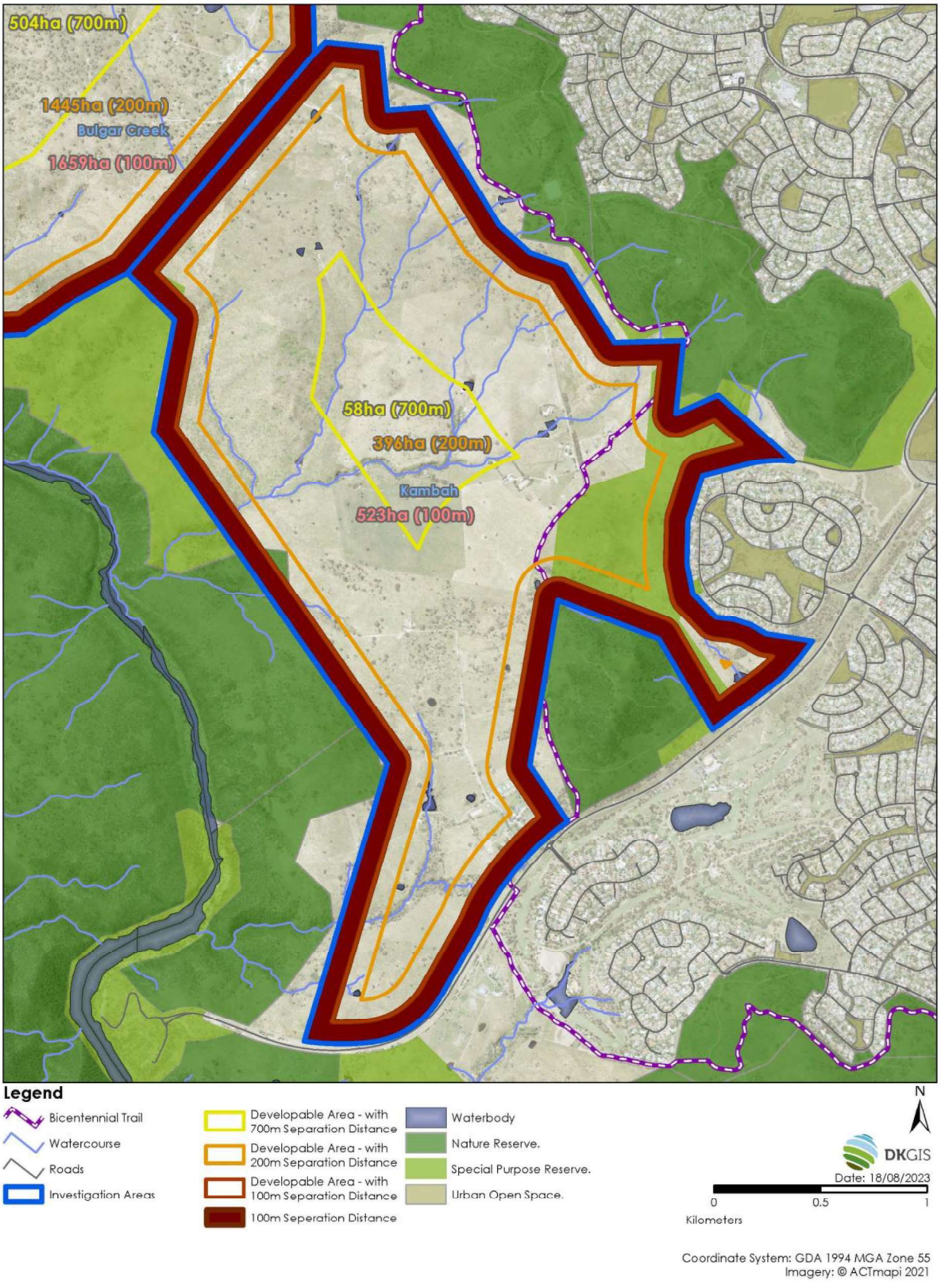

Figure 35: Risk buffers and reserves Kambah (Source: ACTGOV TP Overlay Zone)

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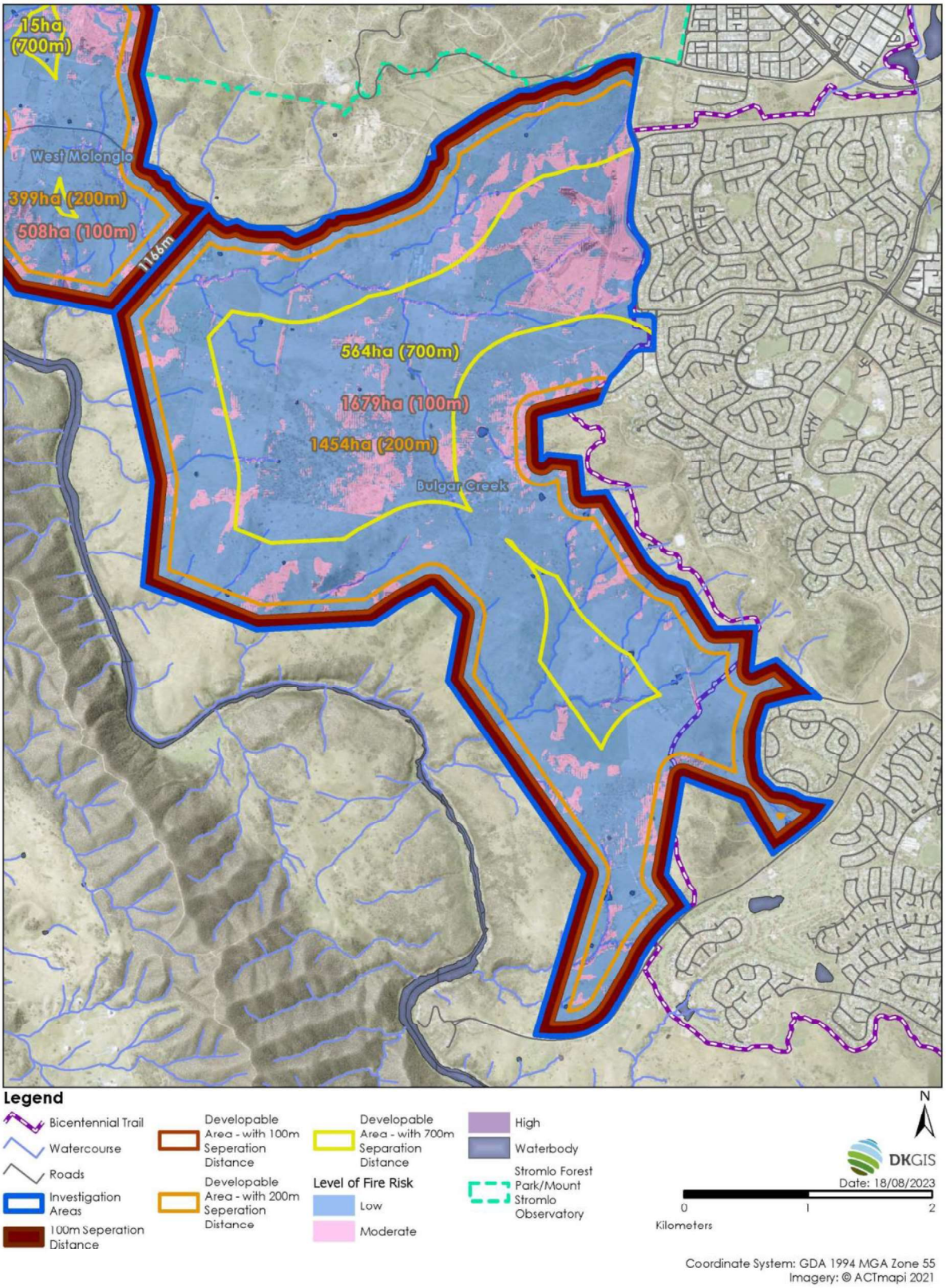

Figure 36: Intensity risk map combined Bulgar Creek-Kambah Investigation area

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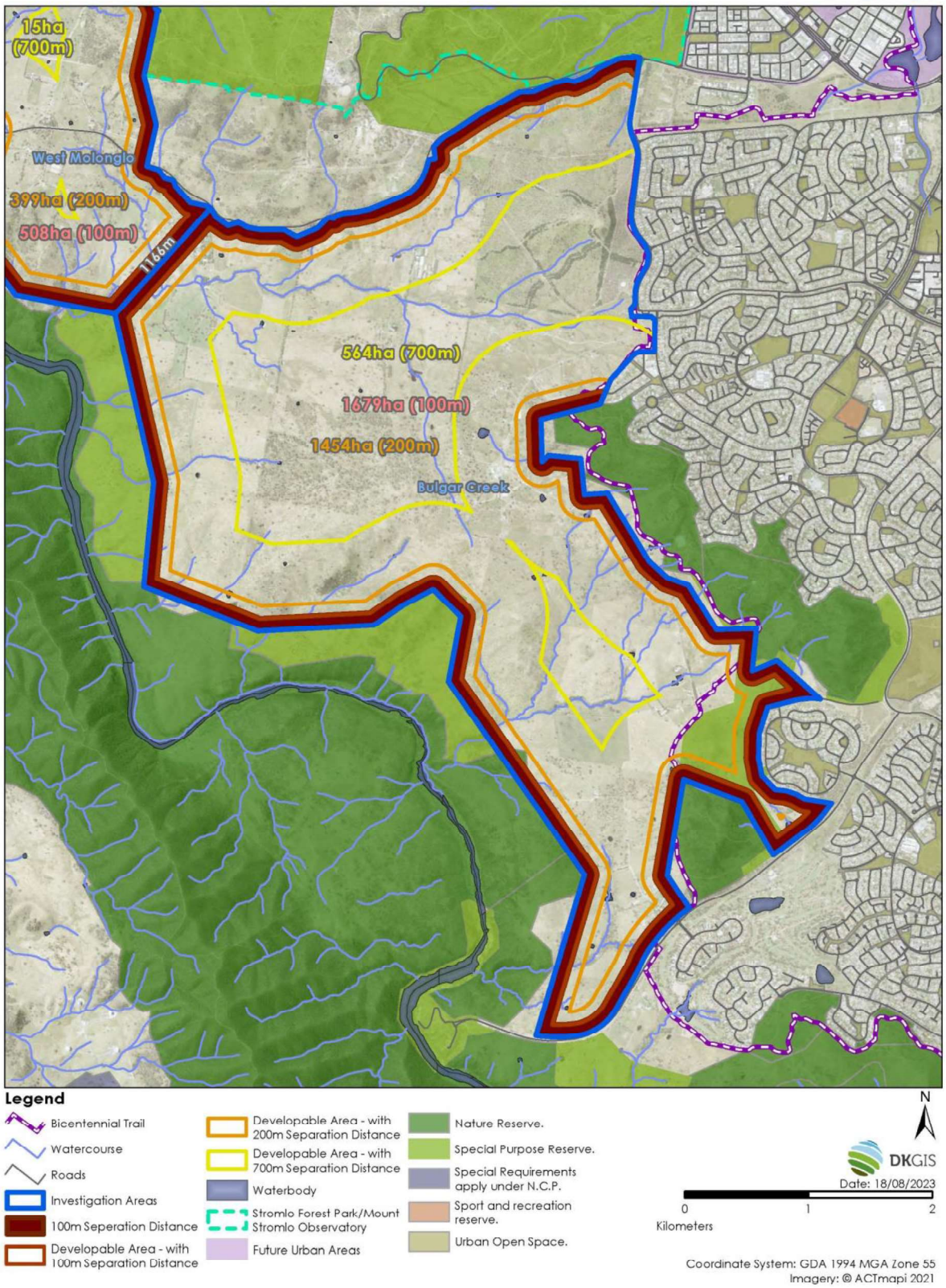

Figure 37: Risk buffers and reserves combined Bulgar Creek-Kambah Investigation area (Source: ACTGOV TP Overlay Zone)

8.5. Mapping discussion

From the analysis shown above, the majority of the internal investigation areas do not exhibit high fire intensity due to modest slopes and predominantly grassland vegetation. Further, due to the size of the revised areas, each is capable of providing substantial areas of potentially suitable urban development land that are more than 100m from the urban-bushland interface. Equally, it is apparent that final decisions cannot be made until significant further analysis is undertaken to integrate the wide range of land characteristics, key biodiversity constraints and other relevant issues. The quantum of developable land will be available only after further design work and decision making regarding other constraints, however each of the areas could reasonably be rezoned to allow for development, with all the caveats around design and compliance with BMS strategic principles.

Table 1 summarises the extent of area potentially available for development internally within the three buffer distances. The percentage of size of the 700m buffer in comparison to the 100m buffer provides an indication of the relative levels of urban development safety and the relationship between perimeter length and internal area. Both metrics are used to rank the investigation areas.

Table 1: Summary of areas contained within buffers - revised investigation areas

	700m buffer zone internal area in ha	**Rank - Area internal to 700m buffer Use in Table 3**	**200m buffer zone internal area in ha**	**100m buffer zone internal area in ha**	**Urban safety - ratio of 700m buffer area to 100m buffer area as percentage**	**Rank - Urban safety 1-5 with 1 the highest for this metric Use in Table 3**
Central Molonglo	483	**3**	1014	1126	42.9%	**2**
Uriarra	726	**1**	1452	1621	44.8%	**1**
West Molonglo (revised)	15	**5**	399	508	2.9%	**5**
Bulgar Creek (revised)	486	**2**	1016	1132	42.9%	**2**
Kambah	58	**4**	396	523	11.1%	**4**

8.6. Landscape Assessment – Scale Context

The bushfire landscape assessment considers the likelihood of a bushfire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape. The WEIA is located within a landscape with significant areas of existing bushland and rural uses development on all aspects except to the east. The Preliminary Bushfire Risk Assessment (PBRA) has undertaken substantial assessment of the landscape at a large scale, however with limited consideration of the suitability of specific areas for future development.

As explored in the PBRA, the significant fire weather threat is very clearly from the north through the west to the southwest. Landscape scale fires cannot approach from the east due to the predominance of developed urban areas. The threat from the west of the site under bad fire weather conditions is significant, however consideration of the highly fragmented landscape also needs to consider the role of the river corridor and individual landscape features such as the impact of Mount Stromlo or McQuoid Hill. The ultimate Estate Development Plans will be following the patterns laid down at these earlier planning stages so the strategic stage is where landscape scale bushfires and impacts must be considered.

Over time as development proceeds much of the bushfire vegetation will become urban development with the retained vegetation of perhaps limited width or aligned specifically to consider the bushfire weather on the worst FFDI days. Perimeter roads can provide both a buffer to development and access for firefighting. Riparian corridors may be convoluted and have multiple changes of direction making it difficult for a fire to spread and develop as it would in more open conditions. Whilst conservation corridors will be able to sustain fire they may not have sufficient vegetation for large fully developed fires to be carried into the urban area. As all development will be staged over years, both temporary and permanent mitigation measures in the landscape will also need to be staged to complement known planning and building rules in the urban areas.

Two types of considerations are relevant in terms of assessing the bushfire hazard including:

- landscape scale hazard – where large expanses of bushland over tens to hundreds of hectares are located in immediate proximity to, and may traverse, urban periphery suburbs/townships; or
- localised hazard – which is most commonly presented by fragmented areas of vegetation larger than 1 hectare in size and vegetated corridors.

These two types of hazard present different types of fire behaviour, fire intensity and potential rate of spread characteristics. The site is currently exposed to both landscape scale risk and localised bushfire risk. Consideration of Landscape Scale risk will be used to drill down further into which areas are more

or less suitable with respect to potential future urban development. Local scale fires, whilst not insignificant, are considered to be managed through good integrated planning at the more granular scale in the future.

8.7. Landscape Scale Assessment Tool (LSAT)

The *Victorian Planning Permit Applications Bushfire Management Overlay – Landscape Scale Threat Assessment* has been used as the framework to assess the broader landscape scale potential of bushfire affecting the site. This document is the only Australian contemporary Landscape Scale methodology with legislative weight. Blackash has expanded and modified the criteria to emphasise the priority of life safety, and the criticality of bushfire Emergency Management and Evacuation Planning as part of the risk assessment process.

The Blackash Landscape Scale Assessment Tool (LSAT) combines quantitative and qualitative techniques which are scaffolded by the *Landscape Scale Threat Assessment* and associated documentation. The approach is shown in Table 1 and uses elements of the Bayesian decision making model and Expert Judgment techniques backed by data. Bayesian decision making has been used where there is both objective and subjective data to analyse, and decisions need to be made on the probability of successful outcomes where there are high levels of uncertainty. Expert Judgement has been used in the assessment and determination of the landscape scale risk.

Blackash Expert Judgement (as outlined in Appendix 2) is applied consistent with the criteria used in the *National Construction Code* (NCC)[7] Assessment Methods and NSW Land & Environment Court practice that calls up *Schedule 7 – Expert Witness Code of Conduct* in the *Uniform Civil Procedure Rules 2005*.[8]

The LSAT provides information on the bushfire hazard more than 150 metres away from the site at a landscape scale. The broader landscape and the potential size or scale of a bushfire is an important driver of the design response to determine the most suitable areas for development. The likelihood of a bushfire, its severity and intensity, and the potential impact on life and property varies depending on where a site is in the broader landscape. Landscape scale fires will place greater pressure on emergency response capability and will have a wider impact on roads and the length of time roads cannot be safely used. This will affect the likelihood of successful evacuations taking place across larger areas and may affect the ability of firefighting resources to be deployed. Multiple factors are considered

[7] https://www.abcb.gov.au/sites/default/files/resources/2021/UTNCC_Using_assessment_methods%20%281%29.pdf

[8] https://legislation.nsw.gov.au/view/html/inforce/current/sl-2005-0418#sch.7

for the landscape scale assessment. Key considerations in our assessment tool include:

- extent and continuity of vegetation
- topography
- prevailing winds
- the potential fire runs and area that is likely to be impacted by the fire
- the impact on evacuation routes to safer places considering road networks, distances, and landscape factors
- the location and exposure of the development to bushfire
- the ability to seek bushfire shelter on site or at alternative locations
- the extent of neighbourhood-scale damage the bushfire may produce.

As noted above the appropriate maximum Forest Fire Danger Index (FFDI) to be applied is FFDI 100.

Landscape scale fires are those that can span many kilometres or tens of kilometres, and that burn for days or weeks at a time. Typically, these fires can be many thousands of hectares in size with fire fronts many kilometres in length. On the east coast of Australia this scale of fire is only possible where there are very large areas of forested vegetation, typically National Parks and State Forests that also adjoin substantial areas of private bushland. Canberra 2003 is an example of this scale of fire.

As the WEIA develops, the areas of retained bushland will continue to change as some areas are cleared and others regenerated for conservation corridors. The fragmentation of the remaining bushland by roads and other infrastructure will continue and this needs to be considered over both contemporary and future timescales, noting that the planning process will also continue across decades. As much of the vegetation from these aspects is grassland, breaks in the landscape play a very significant role in fragmenting vegetation and providing containment lines or slowing the advance of a bushfire.

Fires that start in the riparian corridors may have higher fuel load runs (i.e. forest or woodland) that are only measured in a few hundred metres or less, may be impacted by the convoluted (meandering) alignments of the creeks, and under many conditions will present flank fires to the future development rather than a more intense head fire. Fires starting in the very large, forested areas west of the Murrumbidgee River may be very intense, however a combination of grassland areas and fire breaks through infrastructure, roads, water bodies etc. may have a significant impact on the grass fires when they emerge from the riparian corridors.

Not all bushfires are able to develop the size and intensity of a landscape scale fire that can cause neighbourhood scale destruction. These local scale fires may still be significant and can cause local damage. Wherever bushland is retained there will always be some residual risk to manage, however local scale bushfires are less likely to result in widespread property destruction and more likely to be

managed through well planned SFAZ and APZ combinations. Local scale fires also tend to be noticed immediately by the public, are called in to emergency services soon after ignition, and if there is good access via perimeter roads and fire trail networks may be extinguished early before they develop into large fires.

Due to the application of BMS requirements throughout the development process there will be good access for firefighting at the interface; and adequate firefighting resources, well located stations and water supplies can be planned to match the expansion of the urban areas.

Modern firefighting arrangements are also better coordinated than in previous decades, and have the use of more resources such as bulk water tankers, heavy plant (e.g. bulldozers and graders), helicopters and Large Air Tankers that are much more readily available. Combined with much improved command, control and communications, these resources enable a major addition to firefighting capabilities, especially on bad fire weather days.

All these characteristics mean that when such local fires are ignited there is a relatively quick and effective response meaning that the fire is unlikely to grow to a significant scale. Difficult fire weather days or use of resources elsewhere may have an impact on fire response, however, there is a lower likelihood of any significant fire starting within the WEIA that will impact on a poorly prepared community. Such local fires are likely to be managed with local resources as part of normal emergency operations. This is a very different situation to an isolated rural community, or traditional intermix community. Figures 4-9 and discussion of the existing development in Section 2.4 of this report demonstrate the benefit of having a defined interface to manage, and evacuation into an urban area that will be some hundreds of metres from the fire front.

Taking the conservative approach required by BMS, all new development lots ultimately established must be capable of providing practical building envelopes so that future dwellings are built to withstand radiant heat levels of 29kW/m^2 or less and be separated physically from bushland by perimeter roads and an APZ.

Using the WEIA Landscape Assessment Tool

The Blackash LSAT has been recalibrated to better suit the very large scale of the WEIA, and to be more appropriate for considering the relative merits of the five investigation areas. This version is referred to as the WEIA LSAT. The WEIA LSAT is heavily weighted to life safety and places significant emphasis on the ability for the future community to be able to shelter in place or evacuate safely, whilst emergency services can access the site at the same time. Life safety is a key consideration when considering planning proposals and the concept of whether the site is suitable for development. All future development will be subject to additional detailed bushfire assessment during the development process, from subdivision stage and continuing to individual developments. This will ensure that the

requirements of BMS can be met at each stage and will result in built form that meets the appropriate standards for each individual location.

The discussion below expands on the parameters of the WEIA LSAT, and it is critical to understand that whilst the parameters work together to provide analysis to support the SBRA conclusions, the exercise is dependent on reaching agreement between multiple stakeholders and agencies before final scoring can be done in later stages.

The basis for the evaluation relates to the distance from vegetation, therefore in this exercise the consideration will be focused on whether the investigation areas can provide significant areas away from the interface. This also relates to the location and whether or not vegetation allows the approach from one or more aspects; if the vegetation is subject to the impact of landscape scale fires or only local fires; and the relationship of the perimeter to area ratio is likely to allow fire to approach or impact on a neighbourhood scale, rather than simple along a defined interface. The ultimate rezoning of a large area such as one of the investigation areas should be designed to provide a very significant urban area of 'managed land' that will not be capable of carrying a bushfire. All future residents will be capable of quickly moving to an area more than 100m from bushland using local streets, and this puts them outside the range of fire impacts that currently require a planning and building response. As shown in the research there is then a higher margin of safety for locations 200-700m from the interface, and where there are significant areas of urban development more than 700m from the urban-bushland interface the bushfire impacts are equivalent to the indirect impacts (e.g. smoke, disruption) that exist within the large urban areas.

Vegetated corridors are not considered a significant landscape scale threat given they are relatively narrow and often convoluted riparian corridors. Such a fragmented landscape pattern does not provide an opportunity for extreme bushfire behaviour associated with landscape scale fires to develop and combined with contemporary BMS standards, is highly unlikely to result in neighbourhood scale destruction. These vegetated corridors may extend a major fire into the urban area and may also be the source of local scale fires due to the proximity of human activity. It is critical that clearly defined and committed arrangements are permanently in place to manage interfaces and vegetated corridors and this requires agreement of all agencies

Access and egress routes that allow firefighters to respond and residents to evacuate are of critical importance. A shelter in place strategy is often the optimum method of emergency management for ensuring the life safety of the community where good planning has been undertaken. There is considerable risk involved with mass evacuations, particularly those undertaken as the fire approaches and last minute decisions are made. Part of the focus of the WEIA LSAT is to show how good planning is able to reduce the need for any mass evacuation other than local scale to move beyond 100m distance from the fire front. Where evacuation is required, or more commonly, where some people may wish to self-evacuate to larger urban areas the distances of travel and routes giving safe passage are

important. This makes development adjacent to existing developed areas with multiple routes generally a preferred option.

The ultimate incorporation of internal vegetation and riparian corridors needs to be carefully considered before rezoning, and clear agreement between agencies as to the future form of vegetation and management methods is essential. If one agency supports revegetation of forests the outcomes for interface management will be significantly different than if grasslands or stormwater infrastructure is supported by other agencies. Similarly, the use of managed public lands such as sports fields can assist in providing the initial separation distances so that careful consideration of the location of such facilities may assist in the overall development outcomes.

Significant areas of retained bushland may be fragmented against long fire runs, and will be ringed by suitable combinations of perimeter roads, stormwater infrastructure, sports fields, parks and formal APZ. As these fragmented areas of bushland will not be able to develop or maintain landscape scale fires the ultimate built form will be more than 100 metres from areas of extreme bushfire threat, as opposed to local scale bushfire threat. Once developed all lots in the future subdivisions will be serviced with reticulated water and as per Australian Standards the perimeter roads will have multiple hydrant points for firefighting access. There may be a number of significant water detention basins across the site to manage stormwater and these will also be constructed to provide additional firefighting water supplies. Planning for space for emergency services infrastructure and for clear management arrangements at the interface is key. It is also key to remember that unless the entire interface consists of public facilities, which is very unlikely, there will always be residential development within 100m of the interface, and the risk will continue to be managed via the existing standards in the BMS.

The concepts discussed above are distilled into a series of factors with a weighted numerical scoring system focusing on life safety. As the WEIA revised investigation areas are a large scale examination of these issues, and there will be significant variations to scoring within the individual investigation areas the scoring is weighted using expert judgement by considering the percentage size of safer urban areas (>700m from interface), and the relative remoteness from established urban areas. Due to the assumptions made above including good design and planning incorporated from the earliest stage, and the size of the areas, the numerical scores are relatively close, however do provide another method of comparing and ranking the suitability of the five investigation areas. The lower the score means the lower the relative risk (more suitable).

The tool will provide greater clarity between individual sites as the planning process continues to drill down to geographically smaller areas for potential rezoning, particularly when vegetated corridors have been decided.

The score summaries extracted from the LSAT for the five investigation areas are shown as Figures 38-42.

Landscape Scale Assessment Tool (ACT WEIA version)

Central Molonglo

Landscape scale bushfire risk factors

Parameter	Low landscape scale threat	Moderate landscape scale threat	High landscape scale threat	Extreme landscape scale threat	
1. Distance to vegetation mapped as bushfire prone land or capable of sustaining a wildfire	Bushfire prone vegetation is more than 700m from the proposed development area.	Bushfire prone vegetation is between 200-700m from the proposed development area.	Bushfire prone vegetation is between 100-200m from the proposed development area.	Bushfire prone vegetation is less than 100m from the proposed development area.	Low
2. Surrounding Vegetation	Bushfire cannot directly approach the proposed development area as it is surrounded by more than 700m of urban development, non-mapped vegetation and managed land.	Bushfire can only approach the proposed urban area from one aspect. Typically an island of bushfire vegetation within a wider urban development area, or a linear vegetation corridor of less than 100m width.	Bushfire can approach from one or more aspect and site is on the bushland-urban interface. Contiguous bushfire vegetation with a fire run in any direction of 0.1-2.0 km distance.	Bushfire can approach from more than one aspect and site is on bushland-urban interface. Contiguous bushfire vegetation with a fire run of more than 2 km.	High
3. Bushfire Behaviour	Extreme bushfire behaviour at the site is not possible given the broader landscape.	Extreme bushfire behaviour at the site is unlikely in this broader landscape.	Extreme bushfire behaviour at the site is likely due to the broader landscape.	Extreme bushfire behaviour at the site is very likely due to the broader landscape.	Moderate
4. Impact of Catastrophic fire behaviour (FFDI 100)	There is little vegetation beyond 700 metres of the site (except grasslands and low-threat vegetation) which will not result in neighbourhood scale destruction.	The type and extent of vegetation within 100-700m of the site is unlikely to result in neighbourhood-scale destruction.	The type and extent of vegetation less than 100m of the site and the layout of urban development makes possible neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	The type and extent of vegetation less than 100m of the site and the layout of urban development is likely to result in neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	Moderate
5. Separation and bushfire management arrangements	Future development is separated from bushfire vegetation by more than 700m.	Future development is separated from bushfire vegetation by 100-700m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are NOT maintained outside the urban area.	Low
6. Vegetation corridors within development area	Vegetation within the site cannot enable fire to enter and move through the site OR the site is more than 700m from bushfire vegetation.	Vegetation within the site is of less than 1 ha size; or highly fragmented; or a linear configuration unlikely to enable fire to enter and move through the site.	Bushfire vegetation within the site is larger than 1ha; or of a linear configuration more than 100m wide and may provide a passage for fire to enter and move though the site.	Bushfire vegetation corridors within the site link directly to large areas of bushland and are likely to provide a passage for fire to enter and move through the site.	Moderate
7. Evacuation routes	Site is adjoining existing urban area. Good, multiple route evacuation is possible and the site is more than 700m from bushfire vegetation.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and less than 1km and can be completed by foot or vehicle.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and is within 1km-3km.	Evacuation to alternate location that provides life safety refuge is via single route only; and/or is more than 3km; and/or is through significant areas of bushfire prone vegetation.	Low
8. Isolation and emergency services access to development area	Seamless integration with existing settlement and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and limited emergency services infrastructure for local response.	Large areas of bushland or multiple pinch points along access routes that could block emergency access for extended time; and/or no emergency services infrastructure for local response.	Low
9. Firefighting infrastructure	Site is within urban area more than 700m from bushfire prone vegetation.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed and firefighting infrastructure such as fire trails, water supplies and helipads areas have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed however no firefighting resources have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is NOT permanently managed, and no firefighting infrastructure has been established in accordance with BMS.	Low
		Overall Threat Rating	**Moderate Risk**	**Total**	**140**

Assessed at Forest Fire Danger Index of 100 as the design fire, using Method 1 in accordance with BMS

The scoring system uses a multiplier for each Threat level based on a conservative life safety approach.

The scaled scores for each Threat assessment are totalled and final scores are placed within a range to produce the final Risk Rating

Figure 38: LSAT summary score - Central Molonglo

Landscape Scale Assessment Tool (ACT WEIA version)

Uriarra

Landscape scale bushfire risk factors

Parameter	Low landscape scale threat	Moderate landscape scale threat	High landscape scale threat	Extreme landscape scale threat	
1. Distance to vegetation mapped as bushfire prone land or capable of sustaining a wildfire	Bushfire prone vegetation is more than 700m from the proposed development area.	Bushfire prone vegetation is between 200-700m from the proposed development area.	Bushfire prone vegetation is between 100-200m from the proposed development area.	Bushfire prone vegetation is less than 100m from the proposed development area.	Low
2. Surrounding Vegetation	Bushfire cannot directly approach the proposed development area as it is surrounded by more than 700m of urban development, non-mapped vegetation and managed land.	Bushfire can only approach the proposed urban area from one aspect. Typically an island of bushfire vegetation within a wider urban development area, or a linear vegetation corridor of less than 100m width.	Bushfire can approach from one or more aspect and site is on the bushland-urban interface. Contiguous bushfire vegetation with a fire run in any direction of 0.1-2.0 km distance.	Bushfire can approach from more than one aspect and site is on bushland-urban interface. Contiguous bushfire vegetation with a fire run of more than 2 km.	Extreme
3. Bushfire Behaviour	Extreme bushfire behaviour at the site is not possible given the broader landscape.	Extreme bushfire behaviour at the site is unlikely in this broader landscape.	Extreme bushfire behaviour at the site is likely due to the broader landscape.	Extreme bushfire behaviour at the site is very likely due to the broader landscape.	Moderate
4. Impact of Catastrophic fire behaviour (FFDI 100)	There is little vegetation beyond 700 metres of the site (except grasslands and low-threat vegetation) which will not result in neighbourhood scale destruction.	The type and extent of vegetation within 100-700m of the site is unlikely to result in neighbourhood-scale destruction.	The type and extent of vegetation less than 100m of the site and the layout of urban development makes possible neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	The type and extent of vegetation less than 100m of the site and the layout of urban development is likely to result in neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	Moderate
5. Separation and bushfire management arrangements	Future development is separated from bushfire vegetation by more than 700m.	Future development is separated from bushfire vegetation by 100-700m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are NOT maintained outside the urban area.	Low
6. Vegetation corridors within development area	Vegetation within the site cannot enable fire to enter and move through the site OR the site is more than 700m from bushfire vegetation.	Vegetation within the site is of less than 1 ha size; or highly fragmented; or a linear configuration unlikely to enable fire to enter and move through the site.	Bushfire vegetation within the site is larger than 1ha; or of a linear configuration more than 100m wide and may provide a passage for fire to enter and move though the site.	Bushfire vegetation corridors within the site link directly to large areas of bushland and are likely to provide a passage for fire to enter and move through the site.	Moderate
7. Evacuation routes	Site is adjoining existing urban area. Good, multiple route evacuation is possible and the site is more than 700m from bushfire vegetation.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and less than 1km and can be completed by foot or vehicle.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and is within 1km-3km.	Evacuation to alternate location that provides life safety refuge is via single route only; and/or is more than 3km; and/or is through significant areas of bushfire prone vegetation.	Low
8. Isolation and emergency services access to development area	Seamless integration with existing settlement and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and limited emergency services infrastructure for local response.	Large areas of bushland or multiple pinch points along access routes that could block emergency access for extended time; and/or no emergency services infrastructure for local response.	Extreme
9. Firefighting infrastructure	Site is within urban area more than 700m from bushfire prone vegetation.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed and firefighting infrastructure such as fire trails, water supplies and helipads areas have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed however no firefighting resources have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is NOT permanently managed, and no firefighting infrastructure has been established in accordance with BMS.	Low
		Overall Threat Rating	**Moderate Risk**	**Total**	**180**

Assessed at Forest Fire Danger Index of 100 as the design fire, using Method 1 in accordance with BMS

The scoring system uses a multiplier for each Threat level based on a conservative life safety approach.
The scaled scores for each Threat assessment are totalled and final scores are placed within a range to produce the final Risk Rating

Figure 39: LSAT summary score - Uriarra

Landscape Scale Assessment Tool (ACT WEIA version)

Bulgar Creek

Landscape scale bushfire risk factors

Parameter	Low landscape scale threat	Moderate landscape scale threat	High landscape scale threat	Extreme landscape scale threat	
1. Distance to vegetation mapped as bushfire prone land or capable of sustaining a wildfire	Bushfire prone vegetation is more than 700m from the proposed development area.	Bushfire prone vegetation is between 200-700m from the proposed development area.	Bushfire prone vegetation is between 100-200m from the proposed development area.	Bushfire prone vegetation is less than 100m from the proposed development area.	Low
2. Surrounding Vegetation	Bushfire cannot directly approach the proposed development area as it is surrounded by more than 700m of urban development, non-mapped vegetation and managed land.	Bushfire can only approach the proposed urban area from one aspect. Typically an island of bushfire vegetation within a wider urban development area, or a linear vegetation corridor of less than 100m width.	Bushfire can approach from one or more aspect and site is on the bushland-urban interface. Contiguous bushfire vegetation with a fire run in any direction of 0.1-2.0 km distance.	Bushfire can approach from more than one aspect and site is on bushland-urban interface. Contiguous bushfire vegetation with a fire run of more than 2 km.	High
3. Bushfire Behaviour	Extreme bushfire behaviour at the site is not possible given the broader landscape.	Extreme bushfire behaviour at the site is unlikely in this broader landscape.	Extreme bushfire behaviour at the site is likely due to the broader landscape.	Extreme bushfire behaviour at the site is very likely due to the broader landscape.	High
4. Impact of Catastrophic fire behaviour (FFDI 100)	There is little vegetation beyond 700 metres of the site (except grasslands and low-threat vegetation) which will not result in neighbourhood scale destruction.	The type and extent of vegetation within 100-700m of the site is unlikely to result in neighbourhood-scale destruction.	The type and extent of vegetation less than 100m of the site and the layout of urban development makes possible neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	The type and extent of vegetation less than 100m of the site and the layout of urban development is likely to result in neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	Moderate
5. Separation and bushfire management arrangements	Future development is separated from bushfire vegetation by more than 700m.	Future development is separated from bushfire vegetation by 100-700m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are NOT maintained outside the urban area.	Low
6. Vegetation corridors within development area	Vegetation within the site cannot enable fire to enter and move through the site OR the site is more than 700m from bushfire vegetation.	Vegetation within the site is of less than 1 ha size; or highly fragmented; or a linear configuration unlikely to enable fire to enter and move through the site.	Bushfire vegetation within the site is larger than 1ha; or of a linear configuration more than 100m wide and may provide a passage for fire to enter and move though the site.	Bushfire vegetation corridors within the site link directly to large areas of bushland and are likely to provide a passage for fire to enter and move through the site.	Moderate
7. Evacuation routes	Site is adjoining existing urban area. Good, multiple route evacuation is possible and the site is more than 700m from bushfire vegetation.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and less than 1km and can be completed by foot or vehicle.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and is within 1km-3km.	Evacuation to alternate location that provides life safety refuge is via single route only; and/or is more than 3km; and/or is through significant areas of bushfire prone vegetation.	Low
8. Isolation and emergency services access to development area	Seamless integration with existing settlement and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and limited emergency services infrastructure for local response.	Large areas of bushland or multiple pinch points along access routes that could block emergency access for extended time; and/or no emergency services infrastructure for local response.	Low
9. Firefighting infrastructure	Site is within urban area more than 700m from bushfire prone vegetation.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed and firefighting infrastructure such as fire trails, water supplies and helipads areas have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed however no firefighting resources have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is NOT permanently managed, and no firefighting infrastructure has been established in accordance with BMS.	Low
		Overall Threat Rating	**Moderate Risk**	**Total**	**150**

Assessed at Forest Fire Danger Index of 100 as the design fire, using Method 1 in accordance with BMS

The scoring system uses a multiplier for each Threat level based on a conservative life safety approach.
The scaled scores for each Threat assessment are totalled and final scores are placed within a range to produce the final Risk Rating

Figure 40: LSAT summary score – Bulgar Creek

Landscape Scale Assessment Tool (ACT WEIA version)

West Molonglo

Landscape scale bushfire risk factors

Parameter	Low landscape scale threat	Moderate landscape scale threat	High landscape scale threat	Extreme landscape scale threat	
1. Distance to vegetation mapped as bushfire prone land or capable of sustaining a wildfire	Bushfire prone vegetation is more than 700m from the proposed development area.	Bushfire prone vegetation is between 200-700m from the proposed development area.	Bushfire prone vegetation is between 100-200m from the proposed development area.	Bushfire prone vegetation is less than 100m from the proposed development area.	Low
2. Surrounding Vegetation	Bushfire cannot directly approach the proposed development area as it is surrounded by more than 700m of urban development, non-mapped vegetation and managed land.	Bushfire can only approach the proposed urban area from one aspect. Typically an island of bushfire vegetation within a wider urban development area, or a linear vegetation corridor of less than 100m width.	Bushfire can approach from one or more aspect and site is on the bushland-urban interface. Contiguous bushfire vegetation with a fire run in any direction of 0.1-2.0 km distance.	Bushfire can approach from more than one aspect and site is on bushland-urban interface. Contiguous bushfire vegetation with a fire run of more than 2 km.	Extreme
3. Bushfire Behaviour	Extreme bushfire behaviour at the site is not possible given the broader landscape.	Extreme bushfire behaviour at the site is unlikely in this broader landscape.	Extreme bushfire behaviour at the site is likely due to the broader landscape.	Extreme bushfire behaviour at the site is very likely due to the broader landscape.	Extreme
4. Impact of Catastrophic fire behaviour (FFDI 100)	There is little vegetation beyond 700 metres of the site (except grasslands and low-threat vegetation) which will not result in neighbourhood scale destruction.	The type and extent of vegetation within 100-700m of the site is unlikely to result in neighbourhood-scale destruction.	The type and extent of vegetation less than 100m of the site and the layout of urban development makes possible neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	The type and extent of vegetation less than 100m of the site and the layout of urban development is likely to result in neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	Moderate
5. Separation and bushfire management arrangements	Future development is separated from bushfire vegetation by more than 700m.	Future development is separated from bushfire vegetation by 100-700m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are NOT maintained outside the urban area.	Low
6. Vegetation corridors within development area	Vegetation within the site cannot enable fire to enter and move through the site OR the site is more than 700m from bushfire vegetation.	Vegetation within the site is of less than 1 ha size; or highly fragmented; or a linear configuration unlikely to enable fire to enter and move through the site.	Bushfire vegetation within the site is larger than 1ha; or of a linear configuration more than 100m wide and may provide a passage for fire to enter and move though the site.	Bushfire vegetation corridors within the site link directly to large areas of bushland and are likely to provide a passage for fire to enter and move through the site.	Moderate
7. Evacuation routes	Site is adjoining existing urban area. Good, multiple route evacuation is possible and the site is more than 700m from bushfire vegetation.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and less than 1km and can be completed by foot or vehicle.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and is within 1km-3km.	Evacuation to alternate location that provides life safety refuge is via single route only; and/or is more than 3km; and/or is through significant areas of bushfire prone vegetation.	High
8. Isolation and emergency services access to development area	Seamless integration with existing settlement and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and limited emergency services infrastructure for local response.	Large areas of bushland or multiple pinch points along access routes that could block emergency access for extended time; and/or no emergency services infrastructure for local response.	Extreme
9. Firefighting infrastructure	Site is within urban area more than 700m from bushfire prone vegetation.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed and firefighting infrastructure such as fire trails, water supplies and helipads areas have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed however no firefighting resources have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is NOT permanently managed, and no firefighting infrastructure has been established in accordance with BMS.	Low
		Overall Threat Rating	**High Risk**	**Total**	**220**

Assessed at Forest Fire Danger Index of 100 as the design fire, using Method 1 in accordance with BMS

The scoring system uses a multiplier for each Threat level based on a conservative life safety approach.

The scaled scores for each Threat assessment are totalled and final scores are placed within a range to produce the final Risk Rating

Figure 41: LSAT summary score – West Molonglo

Landscape Scale Assessment Tool (ACT WEIA version)

Kambah

Landscape scale bushfire risk factors

Parameter	Low landscape scale threat	Moderate landscape scale threat	High landscape scale threat	Extreme landscape scale threat	
1. Distance to vegetation mapped as bushfire prone land or capable of sustaining a wildfire	Bushfire prone vegetation is more than 700m from the proposed development area.	Bushfire prone vegetation is between 200-700m from the proposed development area.	Bushfire prone vegetation is between 100-200m from the proposed development area.	Bushfire prone vegetation is less than 100m from the proposed development area.	Low
2. Surrounding Vegetation	Bushfire cannot directly approach the proposed development area as it is surrounded by more than 700m of urban development, non-mapped vegetation and managed land.	Bushfire can only approach the proposed urban area from one aspect. Typically an island of bushfire vegetation within a wider urban development area, or a linear vegetation corridor of less than 100m width.	Bushfire can approach from one or more aspect and site is on the bushland-urban interface. Contiguous bushfire vegetation with a fire run in any direction of 0.1-2.0 km distance.	Bushfire can approach from more than one aspect and site is on bushland-urban interface. Contiguous bushfire vegetation with a fire run of more than 2 km.	High
3. Bushfire Behaviour	Extreme bushfire behaviour at the site is not possible given the broader landscape.	Extreme bushfire behaviour at the site is unlikely in this broader landscape.	Extreme bushfire behaviour at the site is likely due to the broader landscape.	Extreme bushfire behaviour at the site is very likely due to the broader landscape.	High
4. Impact of Catastrophic fire behaviour (FFDI 100)	There is little vegetation beyond 700 metres of the site (except grasslands and low-threat vegetation) which will not result in neighbourhood scale destruction.	The type and extent of vegetation within 100-700m of the site is unlikely to result in neighbourhood-scale destruction.	The type and extent of vegetation less than 100m of the site and the layout of urban development makes possible neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	The type and extent of vegetation less than 100m of the site and the layout of urban development is likely to result in neighbourhood-scale destruction through house to house transmission and interaction with retained vegetation.	Moderate
5. Separation and bushfire management arrangements	Future development is separated from bushfire vegetation by more than 700m.	Future development is separated from bushfire vegetation by 100-700m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are maintained outside the urban area.	Future development is separated from bushfire vegetation by less than 100m and permanent bushfire vegetation management areas are NOT maintained outside the urban area.	Low
6. Vegetation corridors within development area	Vegetation within the site cannot enable fire to enter and move through the site OR the site is more than 700m from bushfire vegetation.	Vegetation within the site is of less than 1 ha size; or highly fragmented; or a linear configuration unlikely to enable fire to enter and move through the site.	Bushfire vegetation within the site is larger than 1ha; or of a linear configuration more than 100m wide and may provide a passage for fire to enter and move though the site.	Bushfire vegetation corridors within the site link directly to large areas of bushland and are likely to provide a passage for fire to enter and move through the site.	Moderate
7. Evacuation routes	Site is adjoining existing urban area. Good, multiple route evacuation is possible and the site is more than 700m from bushfire vegetation.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and less than 1km and can be completed by foot or vehicle.	Evacuation to alternate location that provides life safety refuge is possible by multiple routes and is within 1km-3km.	Evacuation to alternate location that provides life safety refuge is via single route only; and/or is more than 3km; and/or is through significant areas of bushfire prone vegetation.	Low
8. Isolation and emergency services access to development area	Seamless integration with existing settlement and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and adequate emergency services infrastructure for local response.	Short bushland pinch points that may restrict access temporarily or carry fire across roads; and limited emergency services infrastructure for local response.	Large areas of bushland or multiple pinch points along access routes that could block emergency access for extended time; and/or no emergency services infrastructure for local response.	Low
9. Firefighting infrastructure	Site is within urban area more than 700m from bushfire prone vegetation.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed and firefighting infrastructure such as fire trails, water supplies and helipads areas have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is permanently managed however no firefighting resources have been established in accordance with BMS.	Site is within 100m of bushfire prone vegetation where vegetation is NOT permanently managed, and no firefighting infrastructure has been established in accordance with BMS.	Low
		Overall Threat Rating	**Moderate Risk**	**Total**	**150**

Assessed at Forest Fire Danger Index of 100 as the design fire, using Method 1 in accordance with BMS

The scoring system uses a multiplier for each Threat level based on a conservative life safety approach.

The scaled scores for each Threat assessment are totalled and final scores are placed within a range to produce the final Risk Rating

Figure 42: LSAT summary score - Kambah

Table 2: Comparison of summary LSAT scores – lower score means more suitable

	Score Ranges	Score	Risk Rating	Rank – use in Table 3
Central Molonglo	Low risk < 130	140	Moderate	**1**
Uriarra	Moderate risk 130-180	180	Moderate	**4**
West Molonglo	High risk >180-230	220	High	**5**
Bulgar Creek	Extreme risk >230	150	Moderate	**2**
Kambah		150	Moderate	**2**

8.8. Contribution to improvement of bushfire safety for existing development

The assessment of the five revised investigation areas has concentrated on the ability of the areas to provide potential safer urban development opportunities, and the spatial relationship to existing established urban areas of Canberra has been limited to the influence this may have on the future bushfire management of the investigation areas. However, Section 2.4 - Comparison of recent and older urban development at the WEIA interface; Section 4 - Strategic planning for bushfires; and Section 5 - House loss and distance from bushfire vegetation; highlights the relationship of potential new development to assist in making the overall Canberra community safer from bushfire threat.

The strategic planning process provides an opportunity to provide for the expansion of Canberra and significantly improve the bushfire risk management of older development areas that have not been planned and built to contemporary standards. In finalising the relative rankings, the revised investigative areas will be scored as a binary 'yes' or 'no' as to whether they are likely to provide a material improvement to the bushfire safety of existing areas. This means the likely result of future urban development through a combination of:

- directly removing a bushfire threat through creating a significant buffer to the bushfire hazard through new development; or
- reducing the size of bushfire prone vegetation adjoining so it no longer can support landscape scale fires; or
- significantly fragmenting the retained vegetation adjoining the older development area.

Given the potential positive impact a significant score of 5 points will be applied.

8.9. Bushfire landscape assessment conclusion

Quantitative and qualitative methods have been used to consider both the overall bushfire risk of the five revised investigation areas, and the relative suitability of each for the next stages of investigation in the strategic planning process. The final relative rankings are presented in Table 3.

- Each of the rankings summarised in Tables 1 (area and area/perimeter ratio) & 2 (LSAT score) score points in inverse of the ranking. That is, rank 1 scores 5 points and rank 5 scores 1, with any tied rankings sharing the points for the next two positions.
- Given the significant improvement provided to bushfire safety for existing older development, by locating new development towards the threat, the areas scored as 'yes' will receive an additional 5 points.

The final scores are totaled, and these scores indicate the relative suitability of each of the revised investigation areas for further study and rezoning potential. This must assume the caveats discussed at length above regarding the need for integration with other key issues, notably biodiversity and green corridors, and the assumption that all future rezoning proposals will undergo a complete Strategic Bushfire Study during the early stages of that next process. Further, the scores may also provide guidance in the staging of future rezoning proposals.

Table 3: Final scores WEIA Strategic Bushfire Risk Assessment – higher overall is more suitable[9]

	Area within 700m buffer rank Table 1	Points	Urban safety score rank Table 1	Points	LSAT rank Table 2	Points	Support older areas Yes = 5 No = 0	Total point score (max. 20)	Overall suitability ranking
Central Molonglo	3	**3**	2	**3.5**	1	**5**	**Yes - 5**	**16.5**	**1**
Uriarra	1	**5**	1	**5**	4	**2**	**No - 0**	**12**	**4**
West Molonglo	5	**1**	5	**1**	5	**1**	**No - 0**	**3**	**5**
Bulgar Creek	2	**4**	2	**3.5**	2	**3.5**	**Yes - 5**	**16**	**2**
Kambah	4	**2**	4	**2**	2	**3.5**	**Yes - 5**	**12.5**	**3**

[9] Study areas identified by EPSDD following recommendations of WEIACSA report (2023)

9. Next steps

The ACT Government is in a unique position to ensure strategic planning plays a critical role in the future bushfire safety for new urban areas, and that this is supported by direct involvement and coordinated commitments by various land management arms of government. Further, the functioning of the planning system as shown in the BMS (Figure 3 p. 28) provides opportunities to introduce place specific controls and technical specifications, if desired, that can assist in improving the long-term bushfire safety of both new development and adjacent older development. This provides opportunities to consider the likely impacts of climate change by providing requirements that extend beyond contemporary practice (Figure 43). The potential scale of the WEIA provides opportunities to spread any additional costs across a large development area and minimise the development costs on individual developers and future residents. These opportunities focus on the strategic planning principles and requirements outlined in Section 4 of the BMS.

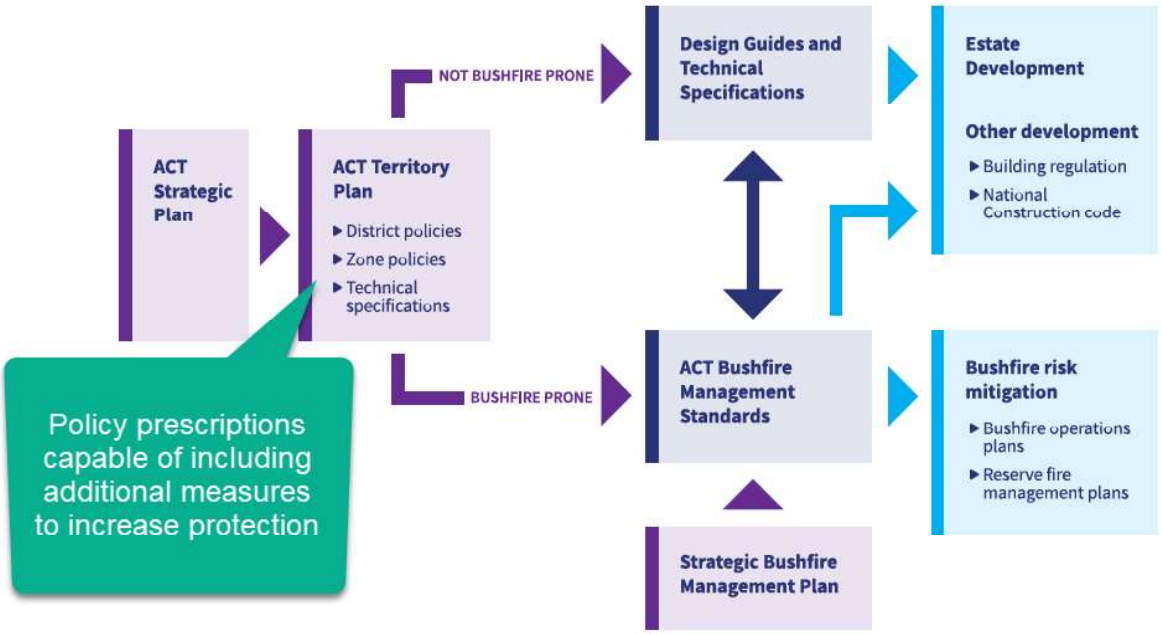

Figure 43: Opportunity to introduce place specific controls (BMS, p. 28)

9.1. Integrate SBRA findings with latest studies

As discussed previously, this large scale SBRA needs to be integrated into the ongoing studies being undertaken as part of the WEIA process, with a particular focus on ecological constraints/opportunities, stormwater management and infrastructure provision. The future spatial location and form of these elements is critical to inform the next stage of bushfire risk management.

It is understood that it is neither sustainable or desirable to remove all bushfire prone vegetation from the Canberra landscape, and that there are multiple competing demands and community desires for land use. This is particularly critical for those areas such as green corridors and nature reserves that may be located within the investigation areas after further decisions have been made. By using the suite of bushfire protection measures identified in the BMS, new development areas can achieve compliance whilst retaining the unique bushland setting. It is critical to undertake a formal SBS at the rezoning stage to ensure sufficient focus is on the integration of all elements and future compliance with the BMS can be assured.

9.2. Suggested site suitability criteria for Policies and Technical Specifications

As shown above there is a very clear inverse relationship between distance from the urban-bushland interface and the resilience of development. It is strongly suggested that a set of site suitability criteria is considered in the strategic planning process (such as in the preparation of a Planning and Response Report in accordance with the *Planning Act 2023*. This will have the advantage of considering requirements at the early planning stage to determine whether specific requirements are needed in the Territory Plan, providing clarity for government development agencies and the private sector alike. It may be practical to directly relate site suitability and development types to the buffer zones discussed in this report. This explicitly recognises (consistent with the BMS) that there will be uses such as ecotourism that may still be located in higher bushfire risk areas and will rely on other bushfire protection measures such as early evacuation. The BMS (p. 22 & 101) also recognises that new development post 2022 can no longer rely on mapped IAPZ determined by ESA and maintained by the ACT, and instead must contain IAPZ to the development site and ongoing maintenance by the resident.

The following site suitability criteria are strongly recommended for further discussion for the next stage of the process following the integration of the SBRA with the related studies. These suggested criteria are based in the BMS bushfire protection principles (p. 12) and the requirements of the SBS p. 31-32) shown as Figure 22 in this report:

1. **Low suitability** – Exclusion of development and zoned for conservation, infrastructure & recreation etc. These areas should not be zoned for urban development and land uses should be compatible with providing support for bushfire management. This area will contain permanently managed OAPZ, SFAZ and LMZ. Typically, the boundary between Low suitability and Moderate suitability areas will be a zone boundary and considered the urban-bushland interface.
    a. Steep land

b. Environmentally constrained lands which cannot be overcome
c. Other areas that may exhibit high bushfire intensity and extreme bushfire behaviour within the retained vegetation e.g. pine plantations
d. Large areas of retained native vegetation e.g. Nature Reserves and water catchment areas
e. Natural setting recreation reserves e.g. equestrian, mountain biking
f. Potential for the area to be isolated in the event of a bushfire and the development is likely to be difficult to evacuate during a bush fire due to its siting in the landscape
g. The development is within an area of high bush fire risk where density of existing development may cause evacuation issues for both existing and new occupants

2. **Moderate Suitability** – Areas 0-200m from the urban-bushland interface. Zoned primarily for suburban residential development and supporting uses. Subdivision design should be compatible with providing support for bushfire management. This area will contain perimeter roads and IAPZ.
    a. Accessible land and access routes not compromised by bushfire
    b. Not environmentally constrained lands
    c. Vegetated corridors and riparian areas assessed as capable of sustaining local scale fires only and are accessible for firefighting operations
    d. Where retained vegetation is likely to generate moderate to high bushfire intensity and extreme bushfire behaviour is possible, assets are protected by perimeter roads, acceptable solution APZ and construction standards.
    e. Provision of hardened infrastructure that will not be degraded by bushfire (services are underground). Suitable water pressure is available to all developed areas for firefighting purposes.
    f. Development types
        i. Residential subdivision - Meet the acceptable solutions and are within 100m of interface including high risk including forest, woodland and plantation and 50m of grassland (including grazing, cropping, exotic and native).
        ii. Sensitive uses
            a. Highly vulnerable sensitive uses not within moderate suitability area
            b. Lower vulnerability sensitive uses located more than 100m from unmanaged Bushfire Prone Areas
        iii. No hazardous industry

iv. Only small scale local commercial uses to prevent social and economic impacts affecting the wider community
v. Managed land including recreation areas, infrastructure etc. that are incorporated into permanent APZ after consultation with all relevant agencies.

3. **High suitability** - Greater than 200m from the urban-bushland interface. Zoned for a range of uses. Subdivision design should be compatible with providing support for bushfire management, offer multiple access away from the interface, and offer opportunities for public space suitable for use as informal safer places during large scale bushfires.
    a. Multiple access routes not compromised by bushfire
    b. Not environmentally constrained lands
    c. Vegetated corridors and riparian areas assessed as capable of sustaining local scale fires only and are accessible for firefighting operations
    d. Where retained vegetation is likely to generate moderate to high bushfire intensity and extreme bushfire behaviour is possible, assets are protected by perimeter roads, acceptable solution APZ and construction standards.
    e. Provision of hardened infrastructure that will not be degraded by bushfire (services are underground). Suitable water pressure is available to all developed areas for firefighting purposes.
    f. Development types
        i. Multiple residential types and densities permitted, with high density residential preferably located more than 700m from the interface.
        ii. Sensitive uses
            a. Highly vulnerable sensitive uses preferably located more than 700m from interface
            b. Lower vulnerability sensitive uses permitted
        iii. Hazardous industry acceptable in accordance with BMS and any specific requirements
        iv. All commercial and industrial uses permitted, with town centres and major commercial areas preferably located more than 700m from interface

9.3. Additional planning and building controls for consideration

The contemporary Australian bushfire risk management standards work from the basis of a design bushfire based on FFDI 100. The current SBMP (p. 11-13; 56-58) recognises the importance of taking an adaptive management approach to considering climate change. This relates to both the increasing risk related to more high fire weather days and potentially longer dry periods and likely increases in FFDI readings in excess of 100.

The impacts of climate change of the increase in fire severity should be considered in relation to the design fire. The western edge is on the leading edge of fires running into Canberra from the west, northwest and north, and susceptible to the "probable worst case" fire weather, and bushfire should be considered as part of the planning timeframe and perspective.

Incorporating climate considerations and projections in line with the lifecycle of the developments and into land use planning is crucial for creating sustainable and resilient communities. The event horizon should be considered for climate change design fires and the FDI and associated APZs adjusted accordingly. Redundancy should be built into the planning system to provide a layered approach to defence and harm minimisation for people, recognising that pyro convective fires will burn beyond what can be reasonably planned for.

Climate change will also likely affect the ability to undertake hazard reduction works and increase the costs of managing bushfire mitigation and operational response capability.

The contemporary framework focusses on managing development within 100m of the urban-bushland interface due to the relationship between historic house losses and distance to bushland. This is out of step with the consequences of large scale fires in 2009 and 2019 – 2020. Lastly, the contemporary framework does not specifically manage the impact of house-to-house transmission of fire, nor does it seek to eliminate building loss from bushfire attack.

There is an opportunity to partially address these issues through the planning process that go beyond the contemporary Australian bushfire development standards, and the controls strongly recommended for incorporation into future Policies and Technical Specifications discussed in section 8.2 above. The following measures are suggested for discussion as either single innovations or combinations as the planning and regulatory framework for the WEIA is developed:

- Requirement for key road crossings through vegetated areas (typically riparian or green corridors) to meet suitable standards (to be developed) to facilitate safe access and egress during a bushfire. This may include mechanisms to prohibit access, asset protection zones adjacent to the roads, design guidelines for the location of stormwater retention ponds, use of large non-flammable batters or radiant heat shields;

- Requirement for detailed guidelines to incorporate suitable future public facilities and infrastructure (e.g. sports fields, roads, car parking, managed playgrounds, stormwater ponds, shared paths) into APZ areas on the development site. This may minimise the impact on retained vegetation, provide a permanent defined urban-bushland interface, reduce maintenance costs on public land, and result in fewer houses within 100m of the interface;
- Requirement for compulsory sprinkler systems to be installed for all new development within 100m of bushland deemed to be capable of being impacted by a landscape scale fire;
- Requirement for BAL-12.5 construction standards to apply for all new development between 101-200m from the interface;
- Requirement for early consultation with the ESA, Parks and Conservation, and combat firefighting agencies prior to rezoning proposals or Estate Development Plans being exhibited. This should include the location and form of all strategic fire management zones and firefighting infrastructure (including potential static water supplies within 100m of the interface) affecting the development;
- Requirement for protection of critical infrastructure guidelines to be improved and updated based on detailed vulnerability assessments specific to the type and criticality of the infrastructure, and detailed site assessments consistent with contemporary bushfire attack methodology.

9.4. Staging

There are significant advantages in finalising the ultimate urban-bushland interface early in the process, and this is generally the future zone boundary. Given the scale of the WEIA investigation areas, the size of rezoned areas potentially to result, and the decades long process to ultimately fully develop the final urban areas, there is a need to develop a clear planning strategy. This needs to be endorsed by all agencies and funded in a clear long term manner to ensure that good strategic planning is not let down with respect to bushfires in the coming decades due to a lack of clarity or resources.

This will have the advantage of setting requirements prior to the Estate Development stage and providing clarity for government development agencies and the private sector alike.

10. Recommendations

The final recommendations of this Strategic Bushfire Risk Assessment are as follows:

1. Consolidated guidance as to the relative suitability of the revised five investigation areas is provided in Table 3 (p. 73).
2. This Strategic Bushfire Risk Assessment must be integrated with related investigations prior to the next steps in the planning process.
3. Site specific Strategic Bushfire Studies in accordance with the Bushfire Management Standards must form part of the next stage of the planning process as future investigation areas are refined, particularly with relation to the establishment of environmental corridors.
4. Priority should be given to investigation areas adjoining or adjacent to older development areas to provide additional bushfire protection.
5. Future strategic planning processes related to the Western Edge Investigation Area should consider the site suitability criteria presented in Section 9.2 (p. 75).
6. To enhance bushfire safety into the future and improve practice, additional planning methods and requirements including, but not limited to, those presented in Section 8.3 should be explored by Environment Planning & Sustainable Development Directorate and partners.
7. Part of the ongoing planning process should develop a staging strategy based on ensuring planning, operational delivery and bushfire management are coordinated.

11. Conclusion

This Strategic Bushfire Risk Assessment has been provided to further refine the process and geographical focus of the Western Edge Investigation Area project with respect to bushfire risk management. This is a large scale consideration of the area identified and will need to be further refined after integration with other studies. This has been prepared in alignment with the ACT Government framework for managing bushfire and planning with respect to bushfire and is consistent with the ACT Bushfire Management Standards (2023).

In the authors' professional opinion, the Western Edge Investigation Area has substantial scope for development that will be able to meet current and future standards for bushfire protection, and the next stage will be to integrate with other detailed studies to further refine the most suitable locations for future rezonings for urban uses.

| Senior Planner & Bushfire Specialist

Blackash Bushfire Consulting

B.A., Grad. Dip. Urban & Regional Planning; Master of Environmental Planning; Adv. Dip. Of Public Safety (Emergency Management); Dip. Management

| Principal

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Blackash Bushfire Consulting

B.A., Grad. Dip. (Design for Bushfires); Grad. Cert. of Management (Macq); Grad. Cert. (Applied Management); Fire Protection Association of Australia BPAD Level 3 BPD-PA 16373

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13. Appendix 1 – Stage 1 Report – Context and Concepts

PO BOX 715 WAHROONGA NSW 2076 AUSTRALIA
M 0419 203 853 | E lew.short@blackash.com.au
W blackash.com.au

BLACKASH
BUSHFIRE CONSULTING

Appendix 1
Stage 1 Report – Context and Concepts

Western Edge Strategic Bushfire Risk Assessment

Prepared for
EPSDD – ACT Government

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Version 1.0

20 September 2023

Project Name:	Western Edge Strategic Bushfire Assessment – Constraints and Opportunities
Prepared by:	
Client Details:	Syed Ali Project Manager ACT Environment, Planning and Sustainable Development Directorate
Project Address	Western Edge Study Area ACT

Name	Position	Contact No	Email
	Senior Planner & Bushfire Specialist		

Version	Primary Author(s)	Description	Date Completed
0.2		Draft	27 July 2023
1.0		Final incorporating comments	20 September 2023

| Senior Planner & Bushfire Specialist

Blackash Bushfire Consulting

B.A., Grad. Dip. Urban & Regional Planning; Master of Environmental Planning; Adv. Dip. Of Public Safety (Emergency Management); Dip. Management

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Contents

1. Credentials

This Constraints and Opportunities Report has been prepared by David Lemcke and Lew Short from Blackash Bushfire Consulting. Current Curriculum Vitae are at Appendix 2.

David Lemcke is a Senior Planner & Bushfire Specialist who is an active senior RFS volunteer, with over 20 years in the service, having been a field officer for 14 years, with incident management experience at local level and he has held multiple brigade Executive roles. Dave is an experienced town planner with over 20 years experience in local government holding numerous qualifications including a Master of Environmental Planning and Advanced Diploma of Public Safety (Emergency Management).

Lew Short is the Principal at Blackash Bushfire Consulting (FPAA BPAD-A Certified Practitioner No. BPD-PA-16373) who is recognised by the RFS as qualified in bushfire risk assessment and has been accredited by the Fire Protection Association of Australia as a Level 3 BPAD qualified consultant.

Lew established and led the Community Resilience Group for the RFS. His areas of responsibility included land use planning, community engagement, education, vulnerable communities, bunkers, Neighbourhood Safer Places, business systems and projects, social media, integrated risk management and environmental management. He was responsible for the establishment, management and leadership of the development assessment function for the RFS at a State level where he was responsible for the assessment of over 80,000 development applications in Bush Fire Prone Areas.

Lew holds several qualifications including undergraduate and post graduate level in environmental management and specialising in bushfire management. Lew is an active Crew Leader with Ku-ring-gai Rural Fire Brigade and has significant operational experience.

Both Lew and David are experts in the bushfire field and can interpret and apply legislation, policy and bushfire requirements while drawing on extensive professional expertise and operational experience.

2. Western Edge Strategic Bushfire Risk Assessment

2.1. Project Overview

The ACT Planning Strategy 2018 (the Strategy) is the key planning document developed to guide the continuing sustainable development of Canberra, as both the nation's capital and a thriving city in its own right. This was developed as a refresh and update of the 2012 strategy and reflects significant community engagement reflecting the values of Canberrans and the importance of incorporating these into future growth. The key defining characters of the city include the value of green space, diversity of lifestyle options and the bushland setting. The vision for the Strategy therefore recognises the importance of celebrating the unique bushland setting while being responsive to future growth and resilient in the face of change (including climate change). The Strategy has 5 related themes to guide delivery of the vision through land-use planning:

1. *Compact and efficient*
2. *Diverse*
3. *Sustainable and resilient*
4. *Liveable*
5. *Accessible*

The Strategy is a long term policy designed to guide the strategic management of land for the next 30 years and provide a balanced range of outcomes derived from the broad themes. The Compact and Efficient theme focuses on planning outcomes that:

- *grow mostly within our urban footprint or in areas close to our footprint*
- *maintain environmental values*
- *use infrastructure effectively to support an efficient, sustainable and liveable city*

Each of the themes results in a number of strategic directions and then actions to deliver on those directions. Under the Compact and Efficient theme, strategic direction 1.2 is to:

- *Investigate the potential for new residential areas to the west of the city to meet future housing need.*

The Strategy provides significant rationale for the strategic directions and actions, and these clearly are interrelated across the themes. Direction 1.2 recognises that whilst much of the city growth is being achieved on infill sites, there is always a need for new greenfield development areas with a growing population and an expressed preference for housing choices. It is also recognised that the existing areas

are developing quickly and are likely to be fully developed by around 2030. At the broadest level, significant limitations were identified to the north, south and east, and the Western Edge Investigation Area was identified for potential future urban expansion.

Action 1.2.1 sets up the next level of investigation towards ultimately determining the mixture of sustainable landuses:

- *Undertake environmental, infrastructure and planning studies for the western edge of the city to identify suitable areas for:*
    - *potential urban areas (excluding Central Molonglo)*
    - *nature reserves*
    - *environmental offset and potential environmental offset areas*
    - *the consideration of cultural and heritage values*
    - *other uses, for example rural, broad acre, major infrastructure, transport and services.*

A preliminary Bushfire Risk Assessment was completed in December 2020 and contributed, along with other preliminary studies, to the *Western Edge Investigation Area Capability and Suitability Assessment* (WEIACSA) undertaken by SMEC in early 2023 that has further defined the investigation areas for more detailed study. The Western Edge Strategic Bushfire Risk Assessment (SBRA) uses the findings of WEIACSA as the basis for bushfire analysis to further refine the areas for further investigation.

This Constraints and Opportunities Report is Stage 1 of the SBRA and will introduce the concepts and practices that are used to underpin decision making for bushfire risk management in the strategic planning context. This is provided to assist decision makers to understand the rationale applied in the Stage 2 Report without having to contain all the theoretical and practice background. This Stage 1 Report is presented as an Appendix to the overall report. The Stage 2 Strategic Bushfire Study implements the concepts and strategies introduced and focuses on drilling down further to prioritise which areas are most suitable for future urban development and why. The Stage 2 Report follows the strategic planning approach laid out in the ACT Bushfire Management Standards (BMS). The BMS wholly adopts the principles and practice of Chapter 4 Strategic Planning in PBP for consistency across borders and a reference to either BMS or PBP in this context is considered to be the standard required for the ACT.

2.2. Site Description

The Western Edge Investigation Area (WEIA) was originally defined by the Strategy as the area shown hatched orange to the west of the map in Figure 1.

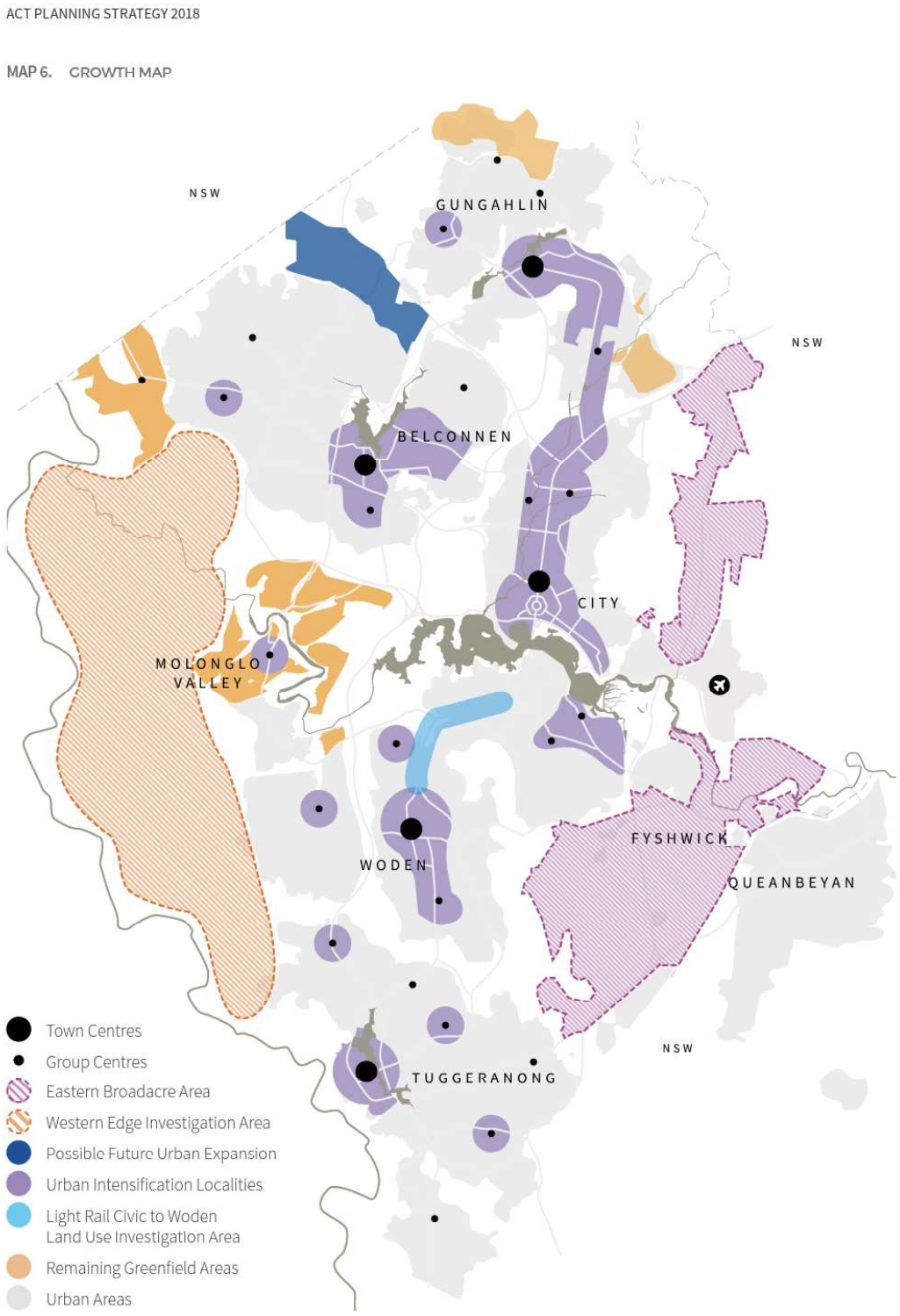


Figure 1: ACT Planning Strategy 2018 - Growth Map

2.3. Existing Development and landuses

The WEIACSA report details the wide range of non-urban uses and management tenures that cover the areas. The report pulls together the results of a wide range of preliminary studies highlighting the diverse range of heritage, environmental, natural resource management considerations. The site extends approximately 20km from Holt & Strathnairn in the north to Kambah in the south and covers the majority of the area between the city and the Murrumbidgee River to the west. The WEIA is approximately 9800ha and includes significant rural and agricultural uses, nature reserves, forest parks, infrastructure including major water and electricity transmission, and the Mount Stromlo Observatory complex.

2.4. Indicative development scenarios

The WEIACSA report has used a three-stage approach using Geographic Information System (GIS) analysis to draw together information from a range of disparate sources building on previous work, public databases and the initial preliminary WEIA studies. The first stage, land capability assessment, looked at whether there were known constraints to developing the land for urban purposes and rating it accordingly, and this included bushfire risk. The second stage, the land suitability assessment, clustered and compared parcels of land and developed the five investigation areas shown in Figure 2. Three indicative development scenarios were then developed for consideration being a 'low impact' footprint; one focused on maintaining and enhancing habitat connectivity; and one focused on infrastructure, land use and road efficiency. The third stage was a multi-criteria analysis (Strategic Merit Test) that was performed using a scoring system developed in workshop with the Western Edge project control group who also undertook the analysis.

The outcome of the WEIACSA is qualified by various factors, notably the scale and accuracy of information available during this stage. The WEIACSA report also regards the Preliminary Bushfire Assessment as of limited value with a conclusion that up to 95% of the WEIA may be suitable for development from a bushfire perspective and advises that bushfire factors played only a minor part in the assessment. Given scale of the project, this requires a continual drilling down in scale and focus of investigation.

For the purposes of this Stage 1 report, the WEIACSA report clearly identifies that most of the Mount Stromlo area is of low suitability as it is predominantly reserved for a Forest Park and recreational uses. The remainder of that investigation area is considered with the Bulgar Creek area. The overall scoring of the investigation areas is noted, however the SBRA will assess all areas for bushfire risk alone.

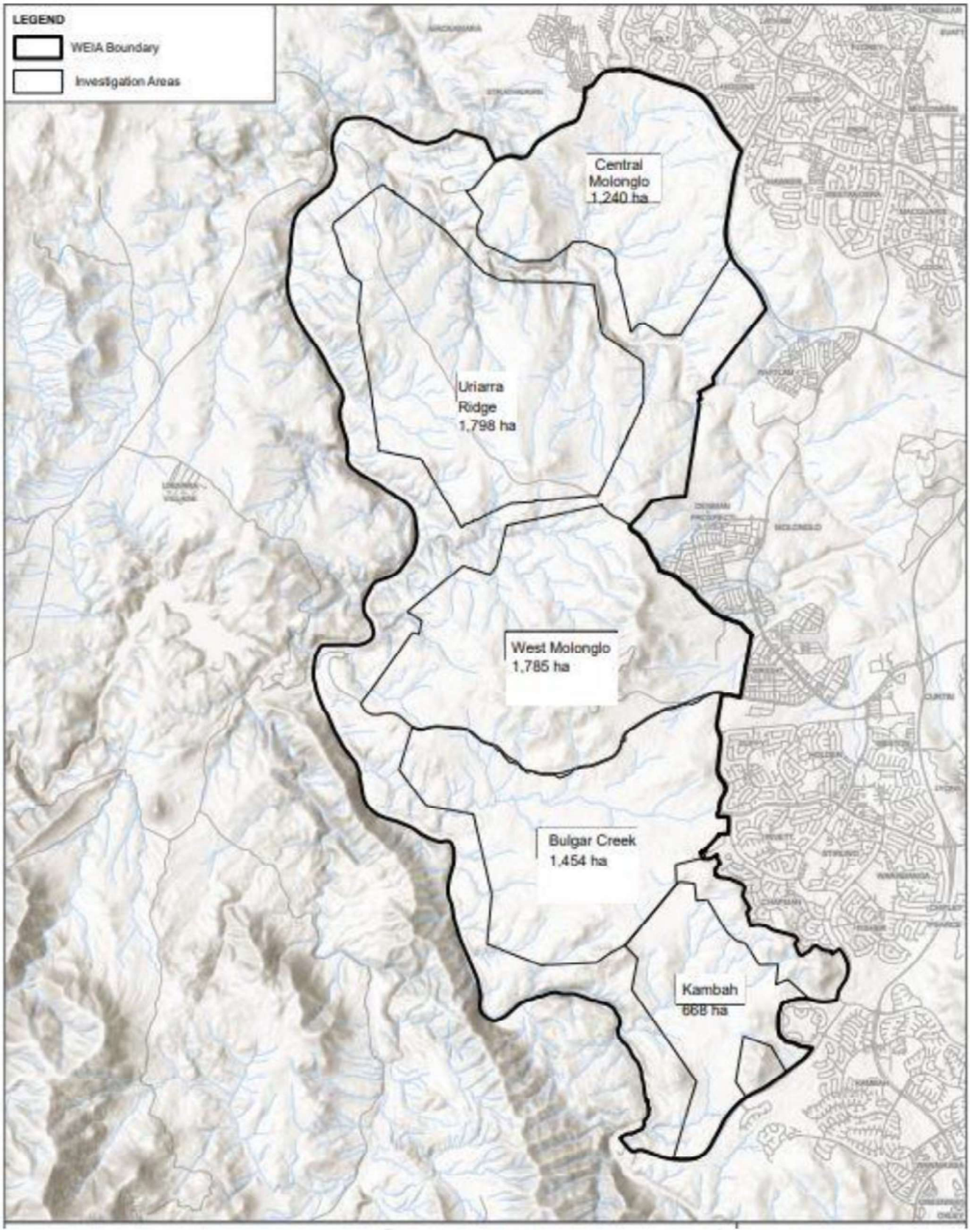


Figure 2: WEIACSA Report investigation areas.

3. The site in bushfire risk management context – historical perspective

The ACT Multi Hazard Advisory Council *Report on ACT Bushfire Management since 2003* (2023), provides a good summary of bushfire risk and preparedness provides a good summary of bushfire risk and preparedness as it is currently and provide background to the major 2003 fire and the 2020 Orroral Valley fire in their *Report on ACT Bushfire Management since 2003* (2023). In 2003, the entirety of the WEIA was burnt by the bushfire that severely impacted the city (Figure 3), and in 2020 the Orroral Valley fire that burnt in Namadji National Park and Tidbinbilla Nature Reserve to the south of the site also had the potential to burn across the WEIA and impact the city. Both this report and the ACT Bushfire Council *Bushfire Preparedness 2021-22 Report* raise the importance of managing bushfire risks, improving bushfire planning and building controls generally in the ACT, and the significance of suitably planning for bushfires in the WEIA and taking into account effects of climate change.

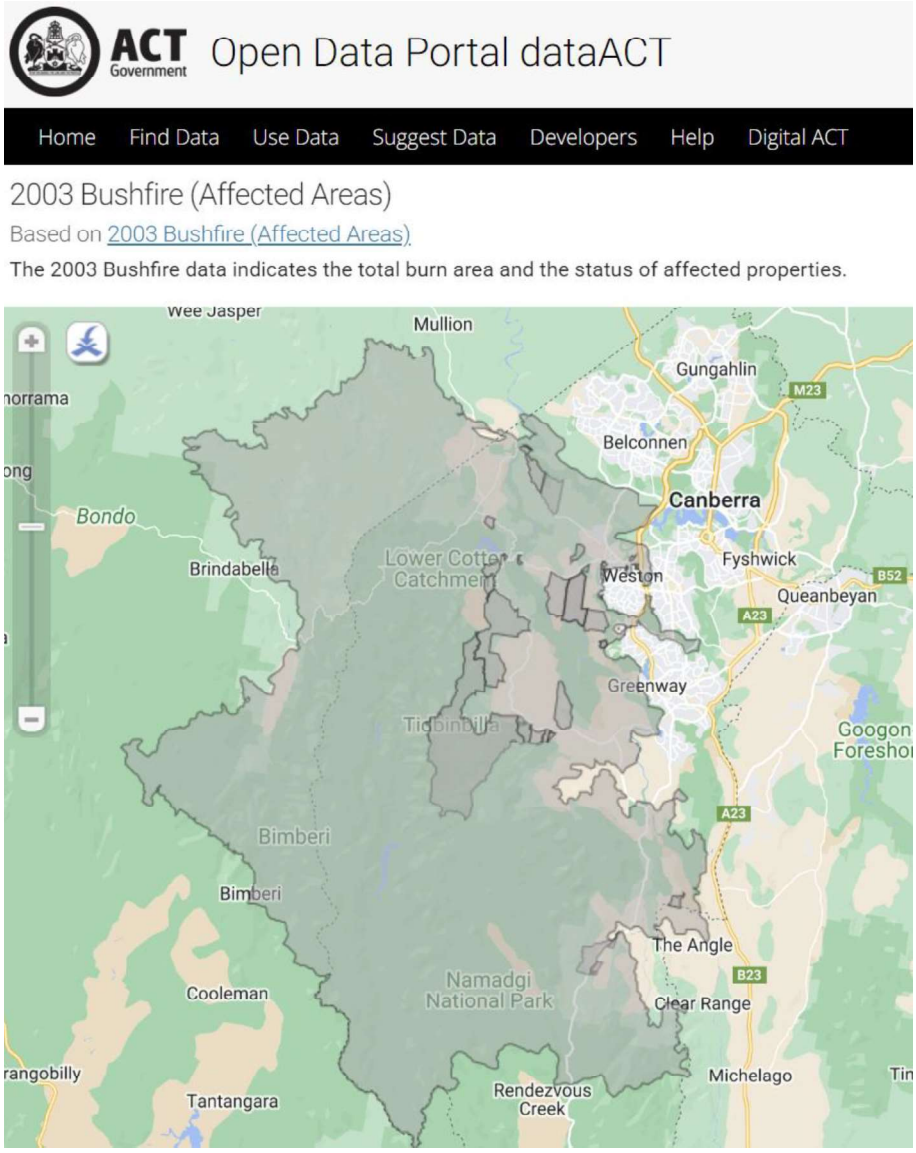


Figure 3: Extent of Canberra 2003 bushfire (ACT Open Data Portal)

4. Strategic Planning for Bushfires

Land use planning is widely recognised as an important measure for limiting future vulnerabilities and losses in areas of new development and a critical element for building disaster resilient communities.

The physical design and layout of communities and settlements are central to the many functions that sustain the social, economic and environmental support systems for the community. Land use planning provides the opportunity to manage new growth and residual risk resulting from new development by complying with legislation and standards, limiting or modifying the location of new development and influencing its layout. This can limit both the impacts of new development on natural systems, ecosystem services and hazards and the flow on impacts on the existing community, as well as limiting the impacts that natural hazards can have on new development and its users.

In keeping with the policy and intent of government, the strategic planning system is particularly important in contributing to the creation of resilient, safe and sustainable communities.

The *National Strategy for Disaster Resilience* (2011)[1] recognises that strategic planning is essential in creating safer and sustainable communities and should be incorporated in policy and intent of government at all levels. Priority outcomes of Section 3.6 include:

- *All levels of decision making in land use planning and building control systems take into account information on risks to the social, built, economic and natural environments.*

This SBRA has been completed having regard to the following Commonwealth documents:

- *National Strategy for Disaster Resilience* (2011)
- *Land Use Planning for Disaster Resilient Communities* (2020)
- *National Disaster Risk Reduction Framework* (2018)

Comprehensive consideration of bushfires and risks in the planning system needs sound understanding of the landscape context and risks, as well as clarity on risk management principles and on the approach to strategic planning and development controls that will adequately mitigate identified risks.

[1] NSDR https://www.homeaffairs.gov.au/emergency/files/national-strategy-disaster-resilience.pdf

Where there are competing policy objectives, such as biodiversity conservation and fuel reduction, an agreed methodology or guidance is critical. As such, planning decisions must be based on the best available evidence and rigorous merits-based assessment to ensure that people, homes and businesses in new development are not exposed to unacceptable risk from bushfire. The framework provided within PBP provides the minimum requirements for new development within bushfire prone areas.

The importance of sound land use planning has been recognised in all recent bushfire inquiries, including Natural Disasters in Australia which noted that land use planning that considers natural hazard risks is the single most important mitigation measure in preventing future disaster losses in areas of new development, and that planning and development controls must be effective, to ensure that inappropriate developments do not occur[2]. The application of legislation, policy, and guidelines provides one of the most effective means of bushfire planning to ensure future developments are resilient and capable of protecting life.

This report focuses on disaster resilience which means planners, hazard leaders, emergency managers and other built environment professionals can contribute to:

- understanding and anticipating bushfire risks before they happen and developing more resilient land use and built form tailored to address bushfire risks; and
- minimising the increase in risks to people and disruptions to social and economic functions when a disaster strikes by ensuring compliance with state requirements for new development in Bushfire Prone Areas.

This report uses the balanced approach provided within PBP for new development in Bushfire Prone Areas (BPA) that recognises the critical need to protect human life and provide safe operating environments for fire and emergency services, protect property, whilst having due regard to the environmental impacts, development potential of land and the need to cater for growing populations.

[2] Ellis, S et al (2004) National Inquiry on Bushfire Mitigation and Management (p.92)

5. Preliminary Bushfire Risk Assessment – Western Edge Investigation Area (Eco Logical Australia 2020)

5.1. PBRA 2020– Introduction

The *Western Edge Investigation Area Preliminary Bushfire Risk Assessment* is referred to as "PBRA 2020". In this section of this report all figures and page references refer to the PBRA 2020 document unless otherwise stated. The PBRA 2020 was produced for the ACT EPSDD to inform the Western Edge Investigation Area studies to support the implementation of the Strategy and the selection of areas suitable for future urban development. It does not consider the impact of other factors such as biodiversity or hydrology, changes to vegetation that may occur because of developing new conservation reserves, or the impact of bushfire protection measures or mitigation activities (p. 5) and is a high level document covering the WEIA as a whole, rather than the individual areas identified in the later WEIACSA document. With respect to climate change impacts, it recognises there is likely to be an increase in the number of days of high Forest Fire Danger Index (FFDI), however does not consider the potential increases in FFDI resulting from climate change. The bushfire risk assessment approach is essentially sound, however the focus on the area as a whole does not assist in making intra area comparisons, with the conclusion therefore less useful than may originally have been sought by EPSDD.

5.2. PBRA 2020 – Bushfire Landscape Risk Assessment

The summary of the landscape bushfire risk assessment concludes "*the study shows no evidence the entire WEIA is in an inappropriate bushfire landscape given the landscape fire advantages identified above and the site capacity to implement appropriate bushfire protection measures fully within the WEIA without the need for reliance on any fire management activities outside of the WEIA*" (p. 22).

The PBRA 2020 explicitly recognises that the potential for large bushfires exists in most years due to weather and fuel continuity, both inside and outside the WEIA. Essentially, the PBRA 2020 is correct under the terms of the various qualifying factors that are provided:

However, the likelihood of these fires impacting the WEIA will be determined by:

- *the likelihood and location of ignitions within the landscape coinciding with adverse fire weather conditions that move a fire toward the WEIA;*
    - *this may include an increased risk of ignitions from within the Murrumbidgee River Corridor as a result of increased access and usage resulting from potential development*
- *factors related to wildfire mitigation and suppression such as timing of fire runs, reduced fuel areas, quality wildfire detection from ACT fire towers, suppression deployment and capability,*

and the coincidence of these with landscape fire advantages (such as the Murrumbidgee River under mild fire conditions), areas of modified fuels (noting limitations as discussed in Section 2.4) and existing road and trail networks.

- *the future arrangement, extent and management of any natural vegetation areas or revegetated areas that do not meet managed open space specifications.*

The PBRA 2020 provides useful information on general bushfire risk and the need to manage interfaces and planning design suitably, and states "*over 95% of future development can be located within BAL-LOW i.e. large internal areas no longer classified as bushfire prone land*" (p. 23).

The PBRA 2020 does not however provide guidance of a more specific nature as to which areas are more suitable for development, and the statement above is made with reference to the definition of bushfire prone land only being within 100m of bushland. Whilst technically correct, this does not assist in "drilling down" to finer grained planning investigations. The PBRA 2020 makes assumptions that all areas other than riparian corridors and some woodland will be developed, and bases APZ planning on that assumption which is not realistic as significant areas will be identified for various reasons as not suitable for urban purposes. The PBRA 2020 concludes that the majority of the WEIA could theoretically be considered suitable for development.

5.3. The PBRA 2020 – Comment

The PBRA 2020 provides useful general information, advises further studies will be required, and provides general advice regarding access and egress issues. The PBRA 2020 recognises the need to ensure resources are provided for emergency services appropriate to the final development, and the need for collaborative discussions with all relevant agencies throughout the process.

The PBRA 2020 makes wide ranging assumptions about future development patterns and the application of treatments of the interface, assuming the development of the WEIA. The PBRA 2020 therefore does not provide specific information or analysis with respect to areas of the WEIA that may be more or less suitable for urban development.

6. ACT Bushfire Management Standards 2023

6.1. Introduction

The ACT Emergencies Bushfire Management Standards (BMS) is a notifiable instrument (NI2023-427) that has been updated using previous ACT standards in combination with the more contemporary NSW Planning for Bushfire Protection 2019 (PBP). Much of the document including the aim and objectives are entirely consistent with PBP which is useful given the close relationship between agencies, similarity of issues and adjoining geography. There is a greater focus on consideration of fire trails and helicopters built into the BMS, whereas the NSW RFS manages policy for these areas through other documents.

The application of the BMS and PBP are also linked through higher level national strategic policy positions, including the operation of the National Construction Code 2022 (NCC) and Australian Standard AS 3959:2018 Construction of buildings in bushfire-prone areas (AS3959).

The **aim** of BMS (p. 10) is:

- *to provide for the protection of human life and minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment*.

The **objectives** of BMS (p. 10-11) are to:

- *Afford buildings and their occupants protection from exposure to a bushfire*
- *Provide for a defendable space to be located around buildings*
- *Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings*
- *Ensure that appropriate operational access and egress for emergency service personnel and occupants is available*
- *Provide for ongoing management and maintenance of Bushfire Protection Measures; and*
- *Ensure that utility services are adequate to meet the* needs of firefighters

The legislative framework of the ACT is similar, however not the same, as NSW and therefore the overall planning system differences and legislative requirements are different in detail. The significant difference is that without individual Local Government Areas to manage, ESA and EPSDD are able to directly manage matters such as the determination of the Bushfire Prone Area, and to maintain a single consistent point of truth for this critical information.

6.2. Strategic Planning

Section 4 of BMS and Section 4 of PBP both deal with strategic planning. The BMS articulates the regulatory framework for ACT strategic planning processes and refers specifically to the Strategy and the linkages to the ACT Wellbeing Framework and district and zone policies. The BMS and PBP are the same with regard to strategic planning principles and the process to be undertaken during the strategic planning phase at master plan or spot rezoning level. In both cases, a formal Strategic Bushfire Study (SBS) is required. The principles of the SBS will inform the Stage 2 report of this SBRA.

In the Bushfire Prone Area, detailed analysis is required to support development. The broad principles which apply to this analysis are:

- *ensuring land is suitable for development in the context of bushfire risk*
- *ensuring new development on BPL will comply with PBP*
- *minimising reliance on performance-based solutions*
- *providing adequate infrastructure associated with emergency evacuation and firefighting operations*
- *facilitating appropriate ongoing land management practices.*

BMS also outlines exclusion of inappropriate development in bushfire prone areas which includes:

- *the development area is exposed to a high bushfire risk and should be avoided*
- *the development is likely to be difficult to evacuate during a bushfire due to its siting in the landscape, access limitations, fire history and/or size and scale*
- *the development will adversely effect other bushfire protection strategies or place existing development at increased risk*
- *the development is within an area of high bushfire risk where density of existing development may cause evacuation issues for both existing and new occupants*
- *the development has environmental constraints to the area which cannot be overcome.*

A further Bushfire Risk Assessment (Strategic Bush Fire Study) may also be required at the subdivision design application (detail subdivision) stage to further refine and confirm any site-specific requirements identified in the relevant district policy or district specification to be imposed on development. As seen in the extract below (Figure 4) the SBS specifically considers the following matters, which will also be used to inform Stage 2 of this SBRA:

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.	> The bush fire hazard in the surrounding area, including: • Vegetation • Topography • Weather > The potential fire behaviour that might be generated based on the above. > Any history of bush fire in the area. > Potential fire runs into the site and the intensity of such fire runs; and > The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.	> The risk profile of different areas of the development layout based on the above landscape study. > The proposed land use zones and permitted uses. > The most appropriate siting of different land uses based on risk profiles within the site (i.e., not locating development on ridge tops, SFPP development to be in lower risk areas of the site); and > The impact of the siting of these uses on APZ provision.
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout.	> The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile. > The location of key access routes and direction of travel; and > The potential for development to be isolated in the event of a bush fire.
Emergency services	An assessment of the future impact of new development on emergency services.	> Consideration of the increase in demand for emergency services responding to a bush fire emergency including the need for new stations/ brigades; and > Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency.
Infrastructure	An assessment of the issues associated with infrastructure and utilities.	> The ability of the reticulated water system to deal with a major bush fire event in terms of pressures, flows, and spacing of hydrants; and > Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc.
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.	> Consideration of the implications of a change in land use on adjoining land including increased pressure on BPMs through the implementation of Bush Fire Management Plans.

Figure 4: Requirements of a Strategic Bushfire Study (BMS Table 1 p. 29-30)

The BMS requires that any SBS developed to support a district policy or specification must be endorsed by EPSDD, the ESA and any other relevant agency.

The BMS also explicitly recognises that regardless of the combination of bushfire protection measures or fuel mitigation measures, there will always be an element of residual risk and that it is not possible to eliminate all risk (p. 31).

6.3. Development assessment

The BMS uses the same concepts as both NCC and PBP in providing a structure that provides specific objectives for different development types at development stage. There is a clear intent stated for each of the bushfire protection measures (BPM) and then performance criteria to be met and a set of acceptable solutions that satisfy the performance criteria. The system allows flexibility by permitting a combination of performance solutions and/or acceptable solutions. The BPM are the suite of measures used in combination to manage the impacts of bushfire behaviour.

Section 5 provides the requirements for Estate Development Plans required for subdivisions.

Section 6 provides the requirements for sensitive use developments with more vulnerable occupants (e.g. schools, hospitals, aged care facilities, tourism facilities etc).

Section 7 provides the requirements for residential infill development and home occupations, including some departures from PBP that appear to be practical, and designed to simplify development for residents.

Section 8 provides requirements and objectives for other types of development.

6.4. ACT Strategic Bushfire Management Plan (SBMP)

The SBMP is the overarching document that directs all levels of bushfire planning in the ACT and the current version is SBMP4 2019-2024. Part A provides details on context and risk management. The regulatory framework is shown in Figure 5.

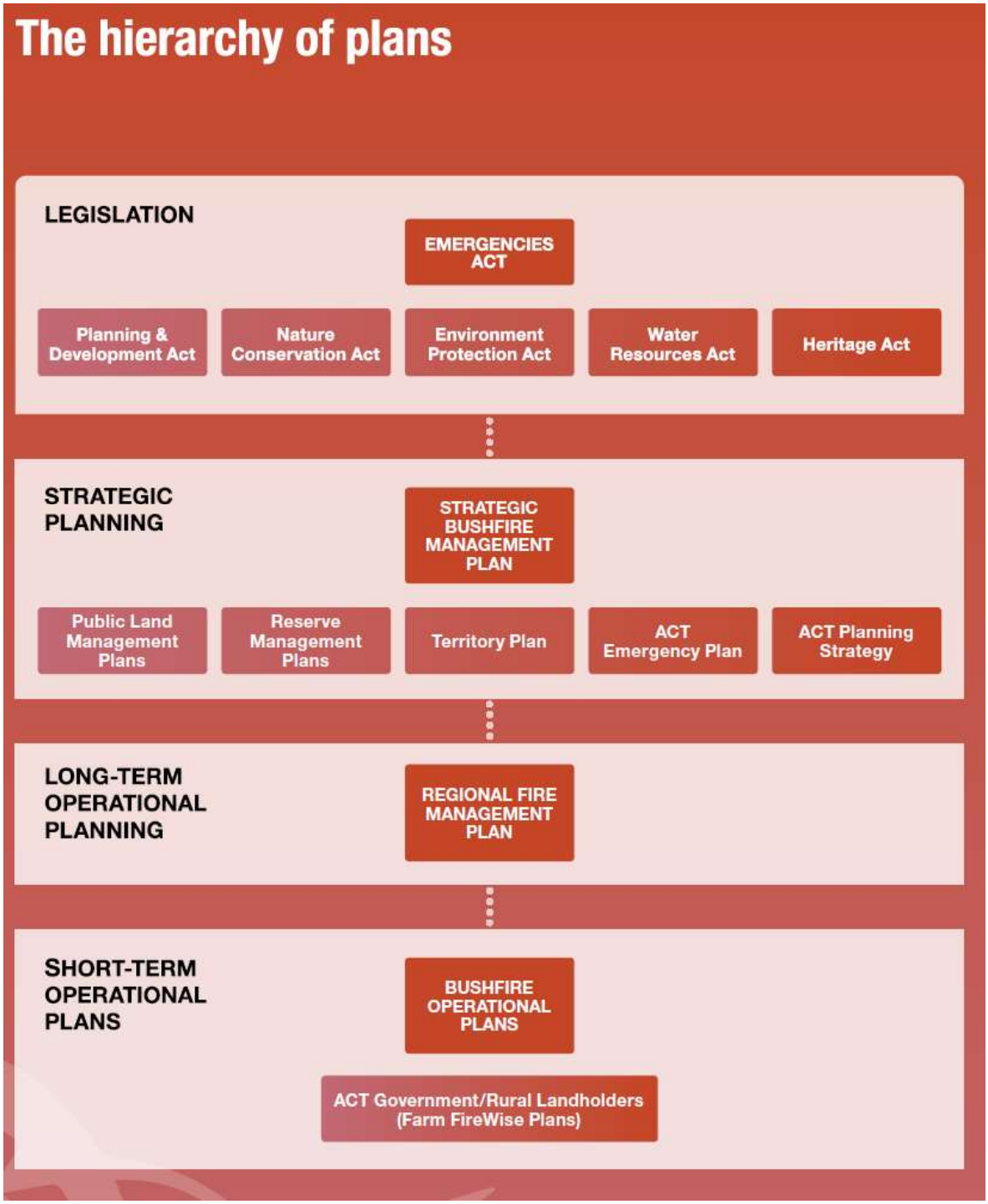


Figure 5: Hierarchy of plans in ACT (SBMP p. 19)

The Bushfire Prone Area (BPA) is enacted by the ESA and drives residents' personal risk assessment and triggers the development control provisions in the BMS. The BPA extends 100m past the bushland urban interface to take into account the impact of bushfire spread into the urban area via house-to-house transmission and ember attack. The BPA is periodically updated to take into account new urban development, improved mapping and site specific issues as required. The entire WEIA is shown as BPA currently. Figure 6 is an extract from ACTmapi showing the BPA covering the WEIA.

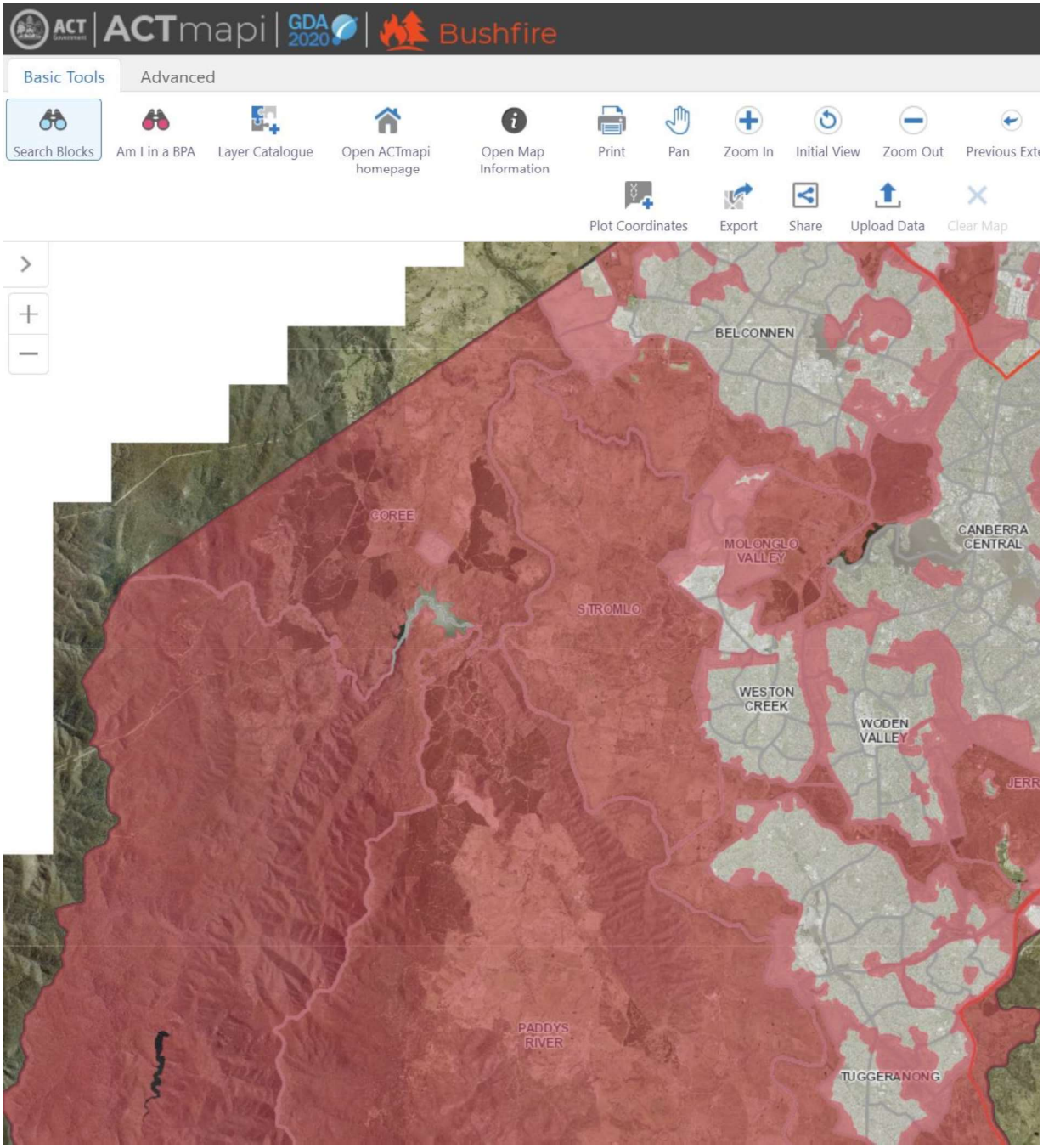


Figure 6: Bushfire Prone Area (ACTmapi)

Fire management zones are areas within the BPA identified as needing priority fuel management actions and access requirements and are linked to widths and maintenance standards for each type of zone in the BMS.

The zones are:

- Inner Asset Protection Zone
- Outer Asset Protection Zone
- Strategic Fire Advantage Zone
- Agricultural Fire Protection Zone
- Landscape Fire Management Zone
- Aboriginal Fire Management Zone

Figure 7 depicts how some of the zones work together in practice to manage risk and these are determined by various factors such as vegetation, aspect, and length of fire run.

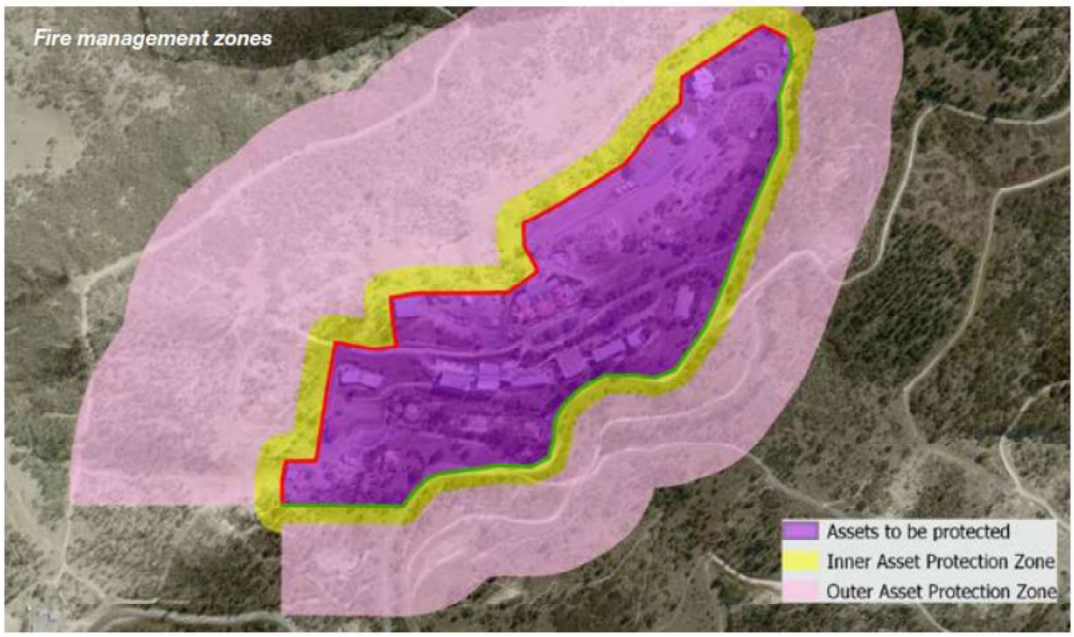


Figure 7: Example of fire management zone configuration (SBMP p. 17)

Figure 8 is an extract showing the type of management zones in part of the WEIA. Land management plans are prepared by public land managers incorporating relevant bushfire management measures.

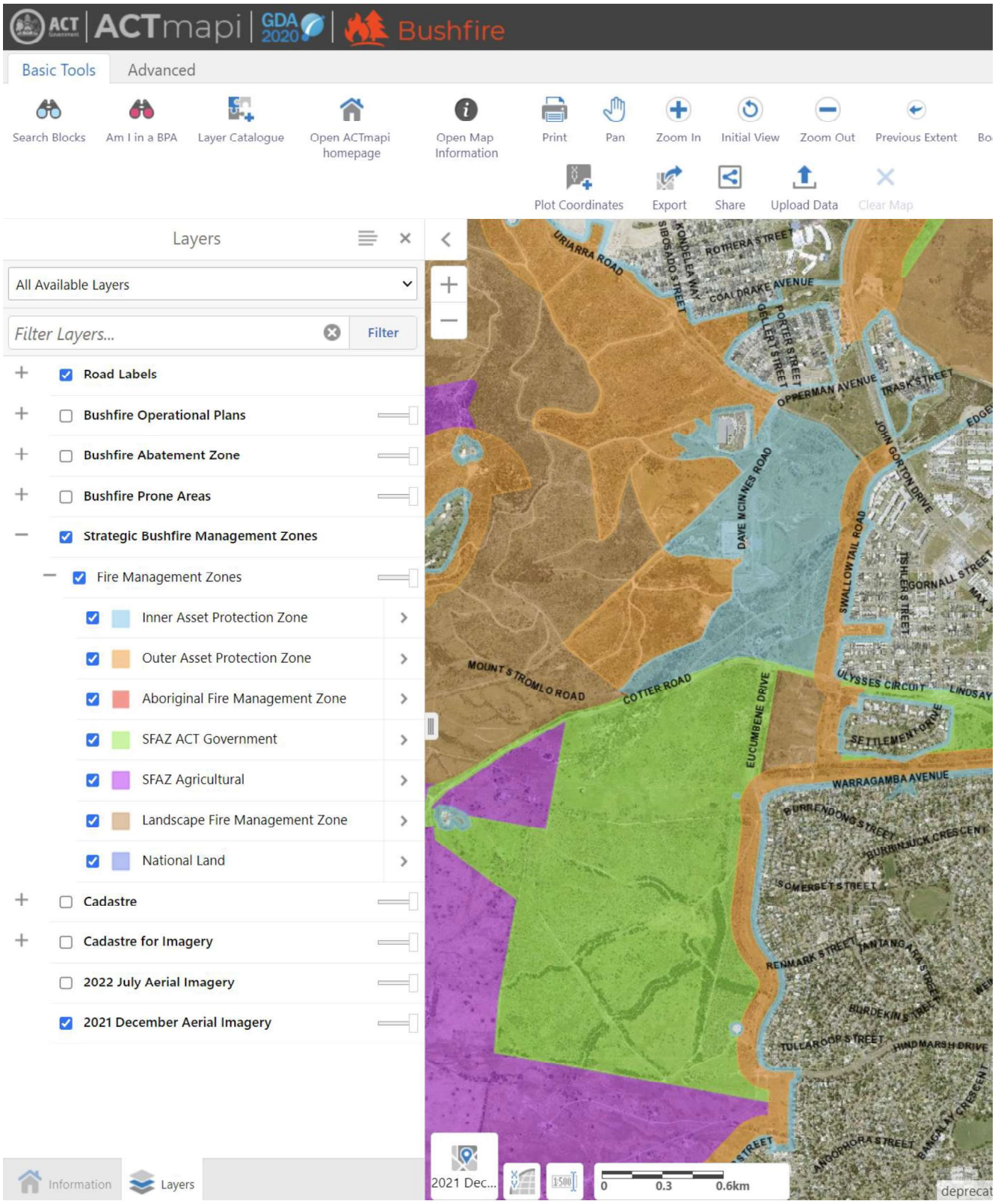


Figure 8: Fire management zone extract - Mount Stromlo to west of picture (ACTmapi)

The Bushfire Abatement Zone (BAZ) is part of the BPA surrounding the Canberra urban area and depicts the locations subject to more intensive planning and management to minimise the risk of bushfires. Figure 9 depicts the BAZ overlaid over the BPA in the area of the WEIA.

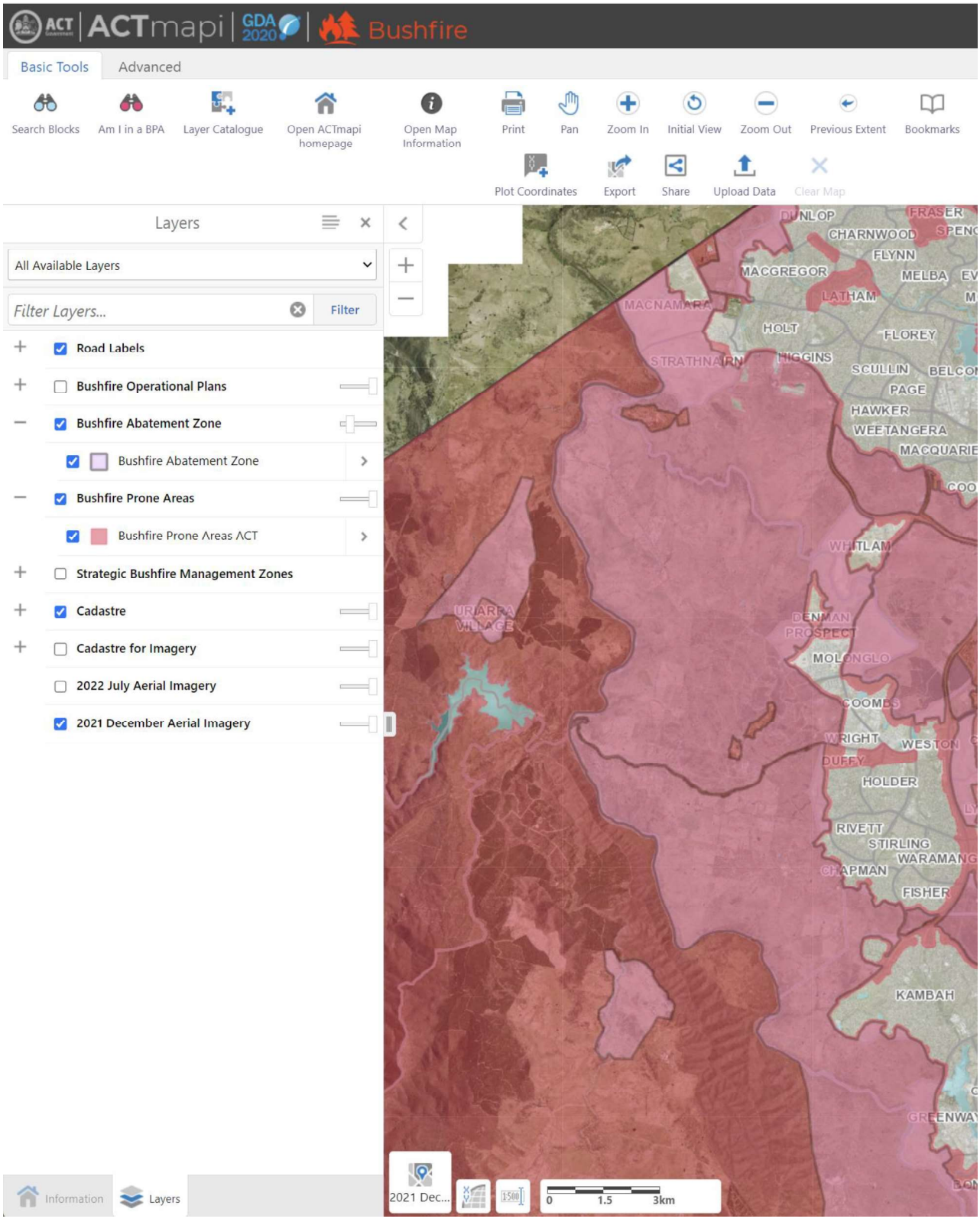


Figure 9: Bushfire Abatement Zone overlaid over the BPA in WEIA area (ACTmapi)

The Regional Fire Management Plan (RFMP) is the link between this plan and more detailed Bushfire Operational Plans (BOP). It is developed in close consultation with community members, key stakeholders and community groups.

The RFMP covers the majority of land managed by EPSDD and Transport Canberra and City Services Directorate (TCCS). It details the major fire fuel management, fire access management and fire infrastructure management strategies that Territory land managers will implement over a 5–10-year period. It also details indicative timings for that work.

The BOP detail the specific type, location and timing of fuel reduction, access and infrastructure activities proposed to be undertaken by the landholder. The Emergencies Act mandates that BOP are required for all unleased territory land or land occupied by the Territory. It also states that BOP may be required for other land in the BAZ if this plan mandates that a BOP be prepared. Under this plan, all landholders within the BAZ must prepare a BOP for that land. Utility providers managing land or assets located within the bushfire abatement zone must also prepare a BOP.

Figure 10 is an extract showing the impact of various BOP in the area east of Mount Stromlo.

Response and coordination plans for firefighting agencies, response capability responsibilities and the approach to community engagement are discussed.

As shown above there is a strong framework of planning and implementation to undertake works and actions to protect life, property and the environment for ACT residents. It is clear that there are direct links between these actions, the management of bushfire at the interface, and ultimately the impact on the built form and future layout and management of new urban areas.

Figures 8 & 10 in particular demonstrates how works programs are focused immediately at the interface, and that moving the interface away from existing communities will take the bushfire development trigger away from those properties (Figure 9). Secondly it is clear that good planning of new urban development at the urban edge will not only improve the bushfire safety for older suburbs but may also be coordinated to reallocate mitigation resources rather than simply increasing the workload. Lastly, it demonstrates the importance of planning with final built and managed impacts at the interface in mind, and the importance of collaborating with relevant agencies. The interface is typically the location for many fire trail heads, helicopter staging areas and water supply points so operational firefighting concerns should also be considered during the planning phase (Figure 11).

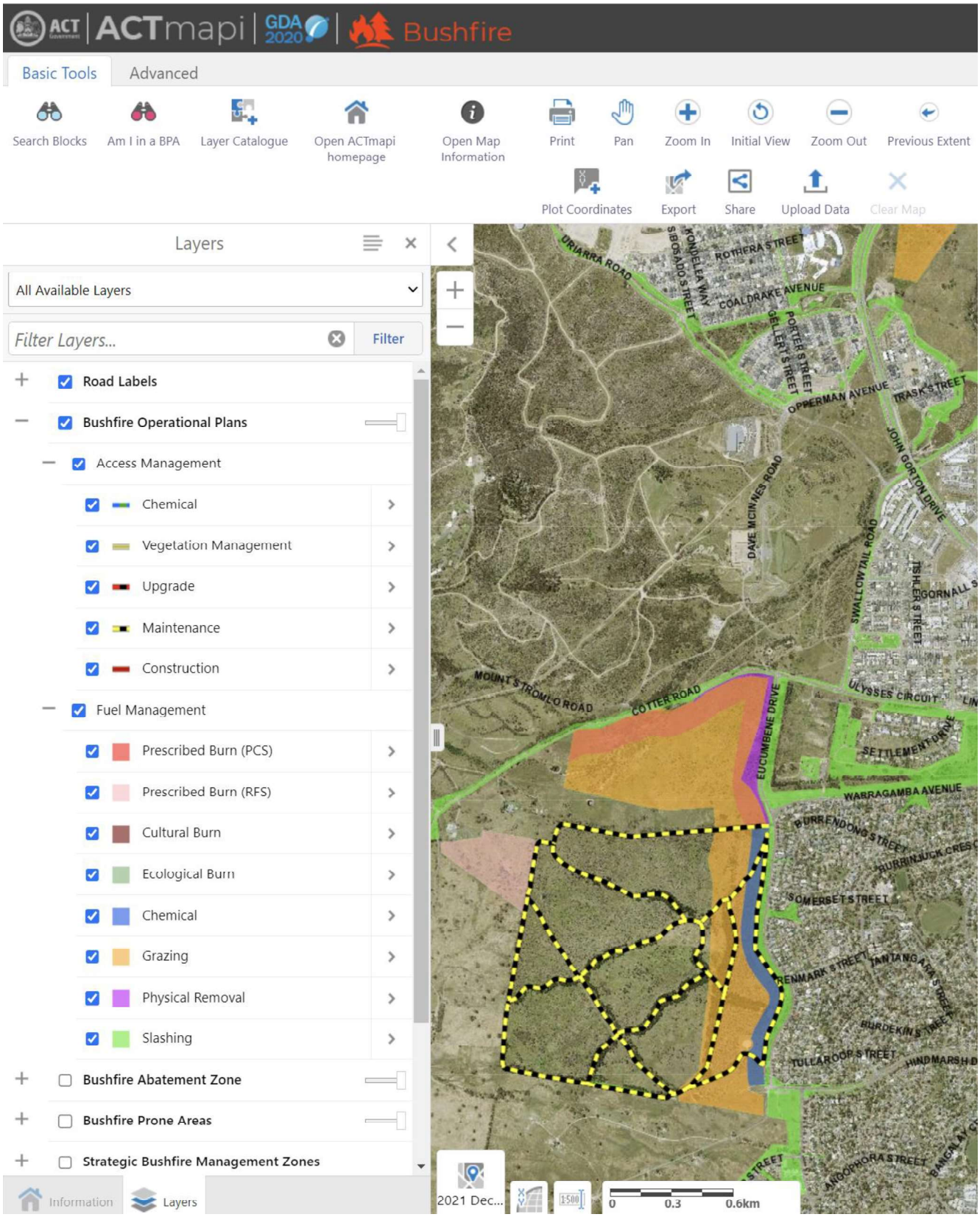


Figure 10: Bushfire Operational Plans in Mount Stromlo area (ACTmapi)

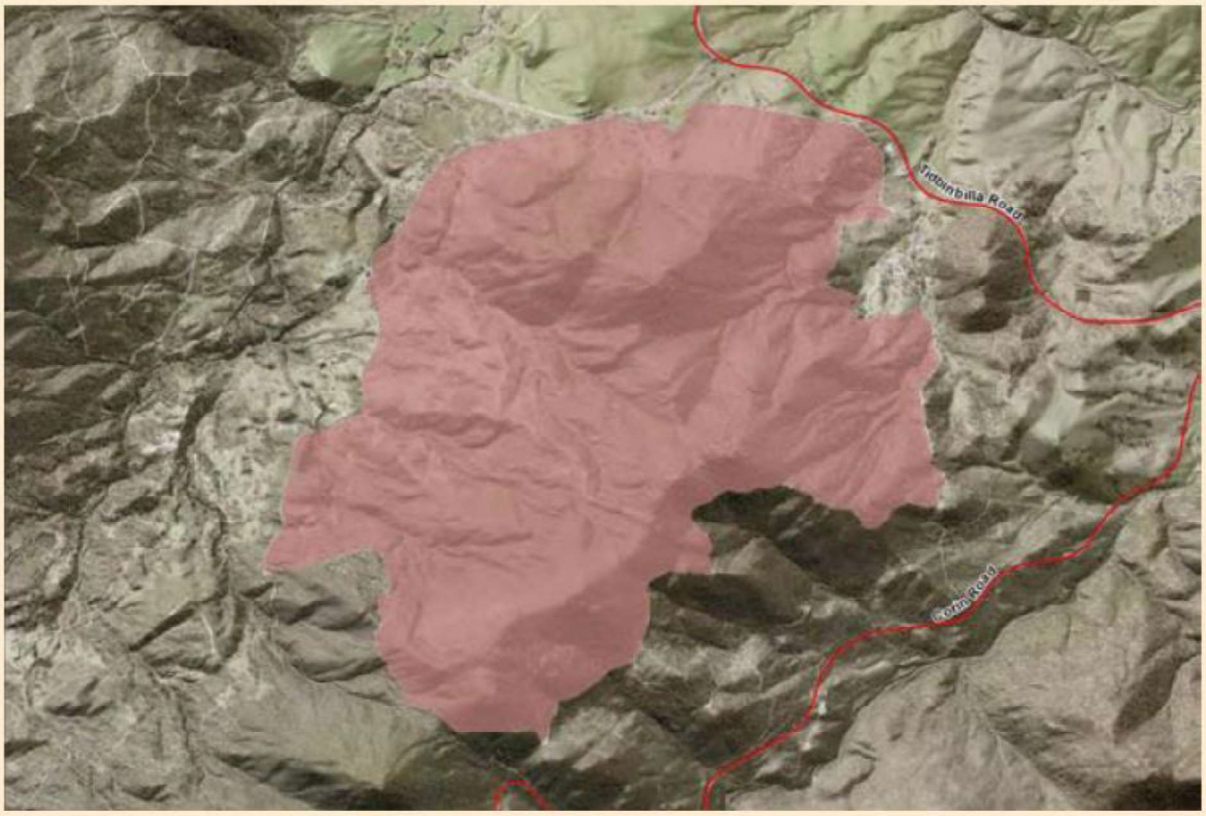
Part B of the SBMP deals with the themes, objectives, strategies and actions necessary to achieve the objectives. Figure 11 summarises the areas detailed in the latter half of the SBMP.

OBJECTIVES		
COMMUNITY		
1	A reduction in bushfire ignitions.	Programs will be implemented to reduce the number of ignitions, targeting systemic and human-caused factors of deliberately lit bushfires (arson) and the careless use of fire.
2	Planned fire management on all private rural lands.	With the support of the ACT Government, private rural land managers will develop a whole-of-property plan to reduce the risk of bushfire to their business and surrounding areas. This plan will be revised every five years or as required.
3	A community that is prepared for bushfires.	Having a community that is prepared for bushfires is a shared responsibility.
FIREFIGHTING OPERATIONS		
4	Effective firefighting operations by skilled and supported personnel.	The ACT Government will support a responsive bushfire fighting capability with sufficient numbers of skilled and motivated personnel to respond to bushfires.
5	The necessary equipment and resources to respond to and extinguish bushfires.	The ACT Government will ensure an adequate supply of equipment and resources, supported by clear principles and systems of work, to support operations, so firefighters can respond to bushfires safely and effectively.
6	Extinguish bushfires when they occur.	A rapid, decisive and coordinated response will provide the best opportunity to control bushfires in the shortest possible time and in a safe manner.
BROAD AREA FUEL REDUCTION AND FIRE ACCESS		
7	Broad area bushfire fuel reduction across the natural and rural landscape of the ACT.	Broad area fuel reduction practices will be used to establish and maintain a range of differing fuel loads across the broader natural and rural landscape of the ACT, to assist in suppressing bushfires and reducing the impact of bushfires on life, property and the environment.
8	Access for vehicles and firefighters to undertake bushfire fighting and fuel reduction.	Government and private land managers will work together to provide a network of fire trails and helipads that provide safe and effective access for firefighting and fuel reduction operations.
ADAPTIVE MANAGEMENT AND CLIMATE CHANGE		
9	Adaptive management of current and future bushfire risks.	The ACT Government will adopt an adaptive management process to address increasing bushfire risks, including climate change, and support continuous improvement based on sound research, modelling, monitoring, evaluation and lessons learned.
LAND-USE PLANNING		
10	Land-use policy and planning that reduces bushfire risk.	The assessment and mitigation of bushfire risk through effective land-use policy and planning will reduce the exposure of built and natural environments to bushfire.
11	Integrated bushfire protection at the urban edge.	A range of complementary measures will be used to achieve integrated bushfire risk reduction on the urban edge.
BUSHFIRE RECOVERY		
12	Supported communities for bushfire recovery.	Recovery from bushfire may start while bushfire response operations are underway and may need to continue for a long time afterwards. Recovery will encompass actions to address the social, economic and environmental impacts of bushfires, as they affect individuals, the broader community and environment.

Figure 11: SBMP themes, objectives and outcomes (p. 27).

Whilst broad acre hazard reduction (HR) burning is no substitute for suitable planning and building regulations, the use of fire is critical in maintaining the environment in good condition (SBMP Objective 7). Mosaic pattern burning to put varied fuel ages across the landscape reduces risk and helps maintain environmental health and protect waterways. Similarly, Aboriginal cultural burning has a role to play in maintaining connections to country and culture for people, and in maintaining and protecting Aboriginal cultural sites. In line with the ACT Aboriginal and Torres Strait Islander Agreement 2019-2028 community leadership and using the expertise of traditional custodians is helping drive greater collaboration in the cultural burning area. The Tidbinbilla Nature Reserve has established an Aboriginal Fire Management Zone in the reserve plan to support cultural activities (p. 53). Figure 12 shows the area mapped in the plan and activities being supported by the Parks & Conservation team.

THE ABORIGINAL FIRE MANAGEMENT ZONE



The Aboriginal Fire Management Zone encompasses areas and sites of cultural significance. Cultural burns are designed to be undertaken with and by local Indigenous community members, with the support of the Murumbung Ranger team from PCS and the Caring for Country team.

Figure 12: Aboriginal Fire Management Zone (p. 52)

Similarly, fire trails do not play a direct role in protecting new development where the key bushfire protection measures are providing Asset Protection Zones (APZ), building to relevant NCC and AS3959 standards and providing perimeter roads. Fire trail networks provide quick access to extinguish small fires before they grow, provide access to critical infrastructure, assist with HR burning and provide critical escape routes to urban areas for firefighters. They also provide a valuable recreation resource and when planned and maintained well provide significant opportunities to pursue healthy lifestyles in keeping with the ACT Wellbeing Framework. Figure 13 provides examples of fire trails being used to facilitate HR burning.

THE IMPORTANCE OF MAINTAINED FIRE TRAILS

Fire trails are maintained to allow safe access by firefighters and vehicles.

It is important that trails remain free from fuel hazards because firefighters need to gain access to fire as quickly as possible. Safe exits are also essential.

The fire trail in use during a prescribed burn at Aranda Nature Reserve.

FIRE TRAILS AS CONTROL LINES

Using the fire trail at Gossan Hill as a control line during a prescribed burn.

Figure 13: Fire trails (p. 55)

Adaptive management and climate change are both encouraged by the SBMP with potential long-term land management and bushfire protection benefits. The cycle of plan, implement, monitor evaluate – then continue the cycle, allows for better practice to occur and encourages a culture of resiliency particularly in the face of climate change.

Theme 10 involves land-use planning directly as a key prevention technique, and the linking of land-use planning with other planning and management objectives and actions allows for better design of urban interface areas and more effective use of scarce resources. Bushfire planning and building regulations

raise awareness in the community and promote the concept of shared responsibility. The ACT is unique in Australia in having clear fixed boundaries at the interface which provides opportunities for more integrated approaches and shared responsibility for preparation to protect life and property. The Estate Development Plans (subdivision plans) must reduce the vulnerability of dwellings and residents from the impact of a bushfire. New greenfield estates must provide that all blocks on which residential uses are permitted must not face a Bushfire Attack Level (BAL) greater than 29. As a standard approach, any intensively managed Inner Asset Protection Zones required to achieve that level must be located within the footprint of the area to be developed.

PO BOX 715 WAHROONGA NSW 2076 AUSTRALIA
M 0419 203 853 | E lew.short@blackash.com.au
W blackash.com.au

7. Bushfire Landscape Assessment

7.1. Landscape Assessment – Scale Context

The bushfire landscape assessment considers the likelihood of a bushfire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape. The broader landscape and the potential size or scale of a bushfire has been a key design response by the project team throughout the preparation of the Planning Proposal.

The likelihood of a bushfire, its severity and intensity, and the potential impact on life and property varies depending on where a site is located in the landscape. The site is subject to a range of environmental features and historical influences which provide the current urban form of the area, including bushfire, vegetation corridors, existing land uses, drainage, and ecology/biodiversity values. The WEIA is located within a landscape with significant areas of existing bushland and rural uses development on all aspects except to the east. The Preliminary Bushfire Risk Assessment (PBRA) has undertaken substantial assessment of the landscape at a large scale, however with limited consideration of the suitability of specific areas for future development. This two-Stage SBRA report provides greater detail and Stage 2 will drill down to a smaller scale consideration of the areas prioritised by the WEIACSA report.

As explored in the PBRA, the significant fire weather threat is very clearly from the north through the west to the southwest, with substantially lower FFDI associated with weather impacts from the southwest through the east and to the north. This means significant fires starting in the south / east are much less likely to significantly impact the site due to significantly lower FFDI. In addition, the spread through forest vegetation tends to be slower than the grassland wind driven spread.

The threat from the west of the site under bad fire weather conditions is significant, however consideration of the highly fragmented landscape also needs to consider the role of the river corridor and individual landscape features such as the impact of Mount Stromlo or McQuoid Hill. The ultimate Estate Development Plans will be following the patterns laid down at these earlier planning stages so the strategic stage is where landscape scale bushfires and impacts must be considered.

Over time as potential land use change occurs some of the bushfire vegetation will become urban development with the retained vegetation of perhaps limited width or aligned specifically to consider the bushfire weather on the worst FFDI days. Perimeter roads can provide both a buffer to development and access for firefighting. These riparian corridors may be convoluted and have multiple changes of direction making it difficult for a fire to spread and develop as it would in more open conditions. Whilst conservation corridors will be able to sustain fire they may not have sufficient vegetation for large fully developed fires to be carried into the urban area. As any future development will be staged over many

years, both temporary and permanent mitigation measure in the landscape will need to complement existing planning and building rules for urban areas.

Two types of considerations are relevant in terms of assessing the bushfire hazard including:

- landscape scale hazard – where large expanses of bushland over tens to hundreds of hectares are located in immediate proximity to, and may traverse, urban periphery suburbs/townships; or
- localised hazard – which is most commonly presented by fragmented areas of vegetation larger than 1 hectare in size.

These two types of hazard present different types of fire behaviour, fire intensity and potential rate of spread characteristics. The WEIA is currently exposed to both landscape scale risk and localised bushfire risk. Consideration of Landscape Scale risk will be used to drill down further into which areas are more or less suitable with respect to potential future urban development. Local scale fires, whilst not insignificant, are considered to be managed through good integrated planning at the more granular scale in the future.

7.2. Landscape Scale Assessment Tool (LSAT)

The *Victorian Planning Permit Applications Bushfire Management Overlay – Landscape Scale Threat Assessment* has been used as the framework to assess the broader landscape scale potential of bushfire affecting the site. This document is the only Australian contemporary Landscape Scale methodology with legislative weight. Blackash has expanded and modified the criteria to emphasise the priority of life safety, and the criticality of bushfire Emergency Management and Evacuation Planning as part of the risk assessment process.

The Blackash Landscape Scale Assessment Tool (LSAT) combines quantitative and qualitative techniques which are scaffolded by the *Landscape Scale Threat Assessment* and associated documentation. The approach is shown in Table 1 and uses elements of the Bayesian decision making model and Expert Judgment techniques backed by data. Bayesian decision making has been used where there is both objective and subjective data to analyse, and decisions need to be made on the probability of successful outcomes where there are high levels of uncertainty. Expert Judgement has been used in the assessment and determination of the landscape scale risk.

Blackash Expert Judgement (as outlined in Appendix 2) is applied consistent with the criteria used in the

National Construction Code (NCC)[3] Assessment Methods and NSW Land & Environment Court practice that calls up *Schedule 7 – Expert Witness Code of Conduct* in the *Uniform Civil Procedure Rules 2005*.[4]

The LSAT provides information on the bushfire hazard more than 150 metres away from the site at a landscape scale. The broader landscape and the potential size or scale of a bushfire is an important driver of the design response to determine the most suitable areas for development. The likelihood of a bushfire, its severity and intensity, and the potential impact on life and property varies depending on where a site is in the broader landscape. Landscape scale fires will place greater pressure on emergency response capability and will have a wider impact on roads and the length of time roads cannot be safely used. This will affect the likelihood of successful evacuations taking place across larger areas and may affect the ability of firefighting resources to be deployed. Multiple factors are considered for the landscape scale assessment. Key considerations in our assessment tool include:

- extent and continuity of vegetation
- topography
- prevailing winds
- the potential fire runs and area that is likely to be impacted by the fire
- the impact on evacuation routes to safer places considering road networks, distances, and landscape factors
- the location and exposure of the development to bushfire
- the ability to seek bushfire shelter on site or at alternative locations
- the extent of neighbourhood-scale damage the bushfire may produce.

As noted above the appropriate maximum Forest Fire Danger Index (FFDI) to be applied is FFDI 100.

Landscape scale fires are those that can span many kilometres or tens of kilometres, and that burn for days or weeks at a time. Typically, these fires can be many thousands of hectares in size with fire fronts many kilometres in length. On the east coast of Australia this scale of fire is only possible where there are very large areas of forested vegetation, typically National Parks and State Forests that also adjoin substantial areas of private bushland. Canberra 2003 is an example of this scale of fire.

As the WEIA develops the areas of retained bushland will continue to change as some areas are cleared and others regenerated for conservation corridors. The fragmentation of the remaining bushland by

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3 https://www.abcb.gov.au/sites/default/files/resources/2021/UTNCC_Using_assessment_methods%20%281%29.pdf

4 https://legislation.nsw.gov.au/view/html/inforce/current/sl-2005-0418#sch.7

roads and other infrastructure will continue and this needs to be considered over both contemporary and future timescales, noting that the planning process will also continue across decades. As much of the vegetation from these aspects is grassland, breaks in the landscape play a very significant role in fragmenting vegetation and providing containment lines or slowing the advance of a bushfire.

Fires that start in the riparian corridors may have higher fuel load runs (i.e. forest or woodland) that are only measured in a few hundred metres or less, may be impacted by the convoluted (meandering) alignments of the creeks, and under many conditions will present flank fires to the future development rather than a more intense head fire. Fires starting in the very large, forested areas west of the Murrumbidgee River may be very intense, however a combination of grassland areas and fire breaks through infrastructure, roads, water bodies etc may have a significant impact on the grass fires when they emerge from the riparian corridors.

Not all bushfires are able to develop the size and intensity of a landscape scale fire that can cause neighbourhood scale destruction. These local scale fires may still be significant and can cause local damage. Wherever bushland is retained there will always be some residual risk to manage, however local scale bushfires are less likely to result in widespread property destruction and more likely to be managed through well planned SFAZ and APZ combinations. Local scale fires also tend to be noticed immediately by the public, are called in to emergency services soon after ignition, and if there is good access via perimeter roads and fire trail networks may be extinguished early before they develop into large fires.

Due to the application of BMS requirements throughout the development process there will be good access for firefighting at the interface; and adequate firefighting resources, well located stations and water supplies can be planned to match the expansion of the urban areas.

Modern firefighting arrangements are also better coordinated than in previous decades, and have the use of more resources such as bulk water tankers, heavy plant (e.g. bulldozers and graders), helicopters and Large Air Tankers (LATS) much more readily available, and these enable a major addition to firefighting capabilities, especially on bad fire weather days.

All these characteristics mean that when such fires are ignited there is a relatively quick and effective response meaning that the fire is unlikely to grow to a significant scale. Difficult fire weather days or use of resources elsewhere may have an impact on fire response, however, there is a lower likelihood of any significant fire starting within the WEIA that will impact on a poorly prepared community. Such local fires are likely to be manage with local resources as part of normal emergency operations. This is a very different situation to an isolated rural community, or traditional intermix community. Figures 15 & 16 demonstrate the benefit of having a defined interface to manage, and evacuation into an urban area that will be some hundreds of metres from the fire front.

Figure 14: Dangerous intermix type development - rapid fire spread and large impact likely.

Figure 15: Planned interface with perimeter roads and access into large urban area - less chance of spread and lower impact likely.

Taking the conservative approach required by BMS, all new development lots ultimately established must be capable of providing practical building envelopes so that future dwellings are built to withstand radiant heat levels of 29kW/m^2 or less and be separated physically from bushland by perimeter roads and an APZ.

Overall Landscape Scale Assessment

The LSAT is heavily weighted to life safety and places significant emphasis on the ability for the future community to be able to shelter in place or evacuate safely, whilst emergency services can access the site at the same time. A shelter in place strategy is the primary method of emergency management for ensuring the life safety of the community.

Life safety is a key consideration when considering planning proposals and the concept of whether the site is suitable for development. All future development will be subject to additional detailed bushfire assessment during the development process, from subdivision stage and continuing to individual developments. This will ensure that the requirements of BMS can be met at each stage and will result in built form that meets the appropriate standards for each individual location.

Vegetated corridors are not considered a significant landscape scale threat given they are relatively narrow and often convoluted riparian corridors. Such a fragmented landscape pattern does not provide an opportunity for extreme bushfire behaviour associated with landscape scale fires to develop and combined with contemporary BMS standards, is highly unlikely to result in neighbourhood scale destruction.

The ultimate development of a typical large holding of 450ha may result in a large urban area of approximately 350 ha with a north to south distance of approximately 1800m and east-west distance of over 2400m. This will provide a very significant urban area of 'managed land' that will not be capable of carrying a bushfire. All future residents will be capable of quickly moving to an area more than 100m from bushland using local streets and will not have to evacuate the locality to find an immediate life safety refuge.

Significant areas of retained bushland may be fragmented against long fire runs, and will be ringed by suitable combinations of perimeter roads, stormwater infrastructure, sports fields, parks and formal APZ. As these fragmented areas of bushland will not be able to develop or maintain landscape scale fires the ultimate built form will be more than 100 metres from areas of extreme bushfire threat, as opposed to local scale bushfire threat. Once developed all lots in the future subdivisions will be serviced with reticulated water and as per Australian Standards the perimeter roads will have multiple hydrant points for firefighting access. There may be a number of significant water detention basins across the site to manage stormwater and these will also be constructed to provide additional firefighting water supplies.

The concepts discussed above are distilled into a series of factors with a numerical scoring system.

Table 1: Blackash Landscape Scale Assessment Tool – Example

Landscape Scale Assessment Tool

Landscape scale bushfire risk factors

Parameter	Low landscape scale threat	Moderate landscape scale threat	High landscape scale threat	Extreme landscape scape threat	
1. Surrounding Vegetation	Bushfire cannot directly approach the site as it is surrounded by urban development and non-mapped vegetation or managed land.	Bushfire can only approach from one aspect and the site is within a suburban, township or urban area considered managed land. Typically an island of bushfire vegetation within a wider urban development area or interface site impacted only by linear vegetation corridors of 100m width or less.	Bushfire can approach from more than one aspect and site is on the bushland-urban interface with the developed area considered as managed land. Typically contigous bushfire vegetation with a typical fire run in any direction of 0.1-2.0 km distance.	Bushfire can approach from more than one aspect and/or fires have many hours or days to grow and develop before impacting and/or site is surrounded by significant unmanaged vegetation. Typically large areas of contigous bushland with fire runs of more than 2 km possible.	**High**
2. Bushfire Behaviour	Extreme bushfire behaviour at the site is not possible given the broader landscape.	Extreme bushfire behaviour at the site is unlikely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	Extreme bushfire behaviour at the site is likely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	Extreme bushfire behaviour is very likely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	**Low**
3. Impact of severe fire behaviour (FFDI 80 or 100 as relevant) coming onto site from wider fire catchment	There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation) and will not result in neighbourhood scale destruction of the site.	The type and extent of vegetation beyond 150m from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	The type and extent of vegetation beyond 150m is likely to result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	The type and extent of vegetation beyond 150m will result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	**Moderate**
4. Vegetation Corridors	Vegetation within the site cannot enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation within the site is unlikely to enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation within the site may enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation corridors on site provide for passage of fire to enter and move through the site from the primary fire source.	**Low**
5. Separation	Hazard separation between extreme bushfire hazard and buildings of greater than 100m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of 50-100m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of 20-50m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of <20m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	**Moderate**
6. Shelter	Immediate access is available to a place that provides shelter from bushfire. This includes existing or proposed buildings on site constructed in accordance with PBP and urban areas more than 100m from bushland hazard.	Access is readily available to a place that provides shelter from bushfire. This will often be the surrounding developed area. In the case of an eco-tourist facility it will be the designated bushfire refuge built in accordance with PBP requirements.	Access to a place that provides shelter from bushfire is not certain during a wildfire and existing buildings are not built to PBP standards.	Access to a place that provides shelter from bushfire is not possible during a wildfire.	**Low**
7. Evacuation	Multiple evacuation routes are available and unlikely to be impacted by fire.	Evacuation to alternate location that provides life safety refuge is <1km and can be completed by foot or vehicle.	Evacuation to alternate location that provides life safety refuge is 1km-10km.	Evacuation to alternate location that provides life safety refuge is > 10km.	**Moderate**
8. Isolation and emergency services	Seamless integration with existing settlement - no impact on evacuation or access for emergency services.	Short bushland pinch points that may carry fire across roads and restrict access briefly during passage of fire. Unlikely impact on evacuation or access for emergency services.	Short bushland pinch points that are likely to carry fire across roads and restrict access temporarily. Likely impact on evacuation or access for emergency services.	Large areas of bushland or multiple pinch points that are likely to carry fire across roads in forest areas and will block evacuation or emergency service access routes for extended time.	**Moderate**
9. Firefighting water supplies	Site is within urban area and has access to reticulated water supply OR site has dedicated firefighting water supply in accordance with PBP requirements.	Site is on the periphery of urban area and has access to reticulated water supply that may be more susceptible to interuption.	Site is outside urban area and relies on an on site water supply not in accordance with PBP.	Site is in an isolated area and relies on an on site water supply not in accordance with PBP.	**Low**
		Overall Threat Rating	**Moderate Risk**	**Total**	150

Assessed at Forest Fire Danger Index of 100 as the design fire, using Method 1 in accordance with PBP 2019

The scoring system uses a multiplier for each Threat level based on a conservative life safety approach.

The scaled scores for each Threat assessment are totalled and final scores are placed within a range to produce the final Risk Rating

8. Conclusion

The purpose of this Stage 1 report for the Western Edge Strategic Bushfire Risk Assessment is to review previous studies and provide an overview of where the overall project is up to, and where the bushfire assessment fits in. It introduces the project and the site; considers the work done to date including the WEIACSA report; and looks at the historical bushfire context. The strategic planning context is introduced; and the Preliminary Bushfire Assessment is reviewed. The report then looks at the key ACT Bushfire framework and relevant documentation. The landscape scale assessment concept is introduced, and the Blackash Landscape Scale Assessment Tool is introduced.

The Stage 2 Report is based around producing detailed high level assessment and prioritisation of the Investigation areas using the tools and concepts introduced at Stage 1.

| Senior Planner & Bushfire Specialist

Blackash Bushfire Consulting
B.A., Grad. Dip. Urban & Regional Planning; Master of Environmental Planning;
Adv. Dip. Of Public Safety (Emergency Management); Dip. Management

| Principal

Blackash Bushfire Consulting

B.A., Grad. Dip. (Design for Bushfires); Grad. Cert. of Management (Macq); Grad. Cert. (Applied Management); Fire Protection Association of Australia BPAD Level 3 BPD-PA 16373

9. Bushfire Concepts

Relation - house loss and distance to bushfire vegetation

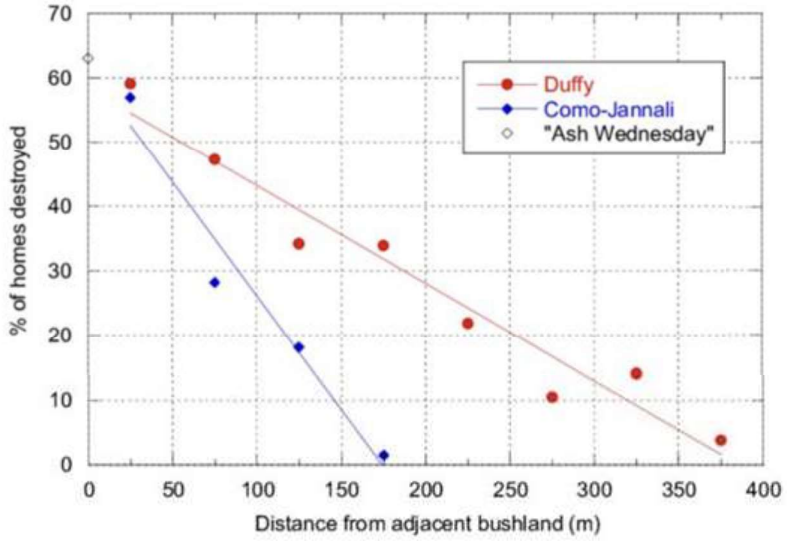
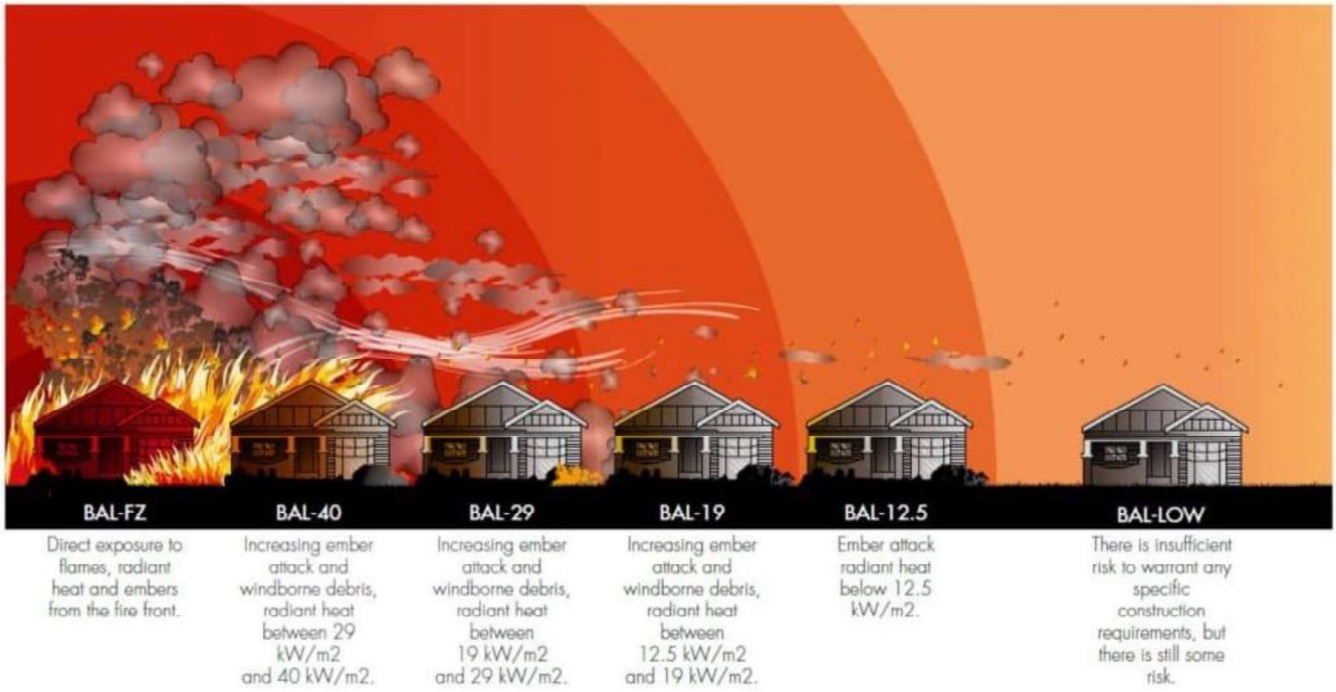


Figure 5: Percentage of homes destroyed at different distance ranges (interval=50 m) in the 2003 Canberra fires, the 1994 Como-Jannali fires in Sydney and the 1983 Ash Wednesday fires in Victoria and South Australia. In four different suburbs (Fairhaven, Airey's Inlet, Macedon and Mount Macedon, the delineation of bushland boundaries was difficult and so post-fire aerial photographs were used to estimate the percentages of homes destroyed for areas immediately adjacent to bushland. The figure plotted is an average of these. (Source: Chen and McAneney 2004.)

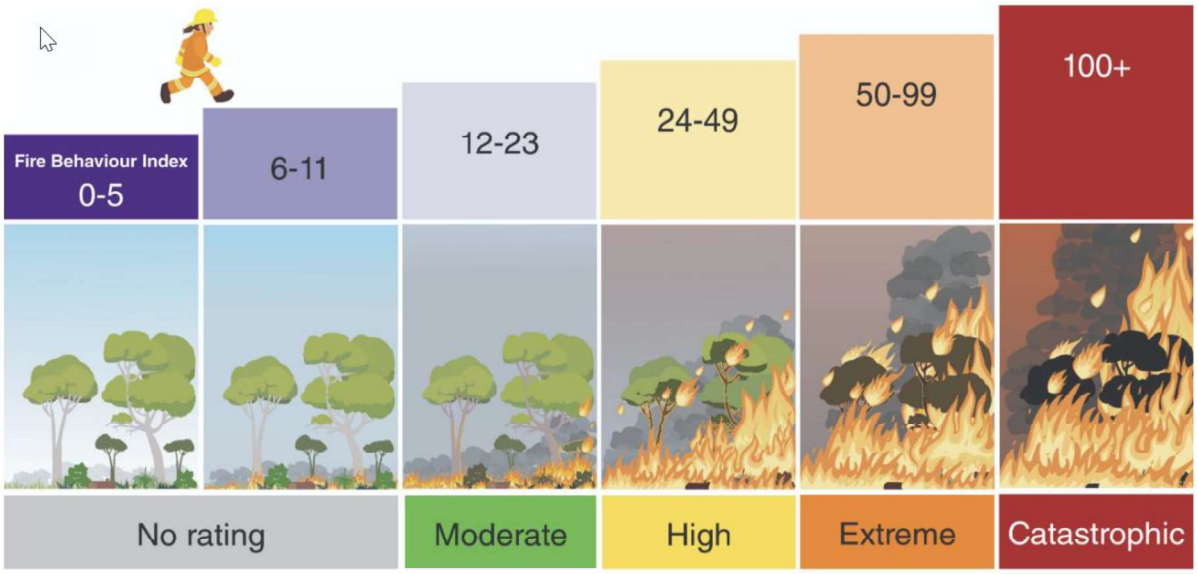
Effects of radiant heat flux (RFS, 2006)

Radiant heat flux kW/m²	Observed effect
1	Maximum for indefinite skin exposure
3	Hazardous conditions, firefighters expected to operate for a short period (10 minutes)
4.7	Extreme conditions, firefighters in protective clothing will feel pain after 60 seconds of exposure
6.4	Pain after 8 seconds of skin exposure
7	Likely to be fatal to unprotected person after exposure for several minutes
10	Critical conditions, firefighters not expected to operate in these conditions although they may be encountered. Considered to be life threatening in less than 60 seconds in protective equipment. Fabrics inside a building could ignite spontaneously with long exposure.
12.5 (BAL-12.5)	Volatiles from wood may be ignited by pilot after prolonged exposure. Standard float glass could fail during the passage of a bushfire.
16	Blistering of skin after 5 seconds
19 (BAL-19)	Screened float glass could fail during the passage of a bushfire.
29 (BAL-29)	Ignition of most timbers without piloted ignition (3 minutes of exposure) during the passage of a bushfire. Toughened glass could fail.
40+	Flame zone – exposure to direct flame contact from fire front.

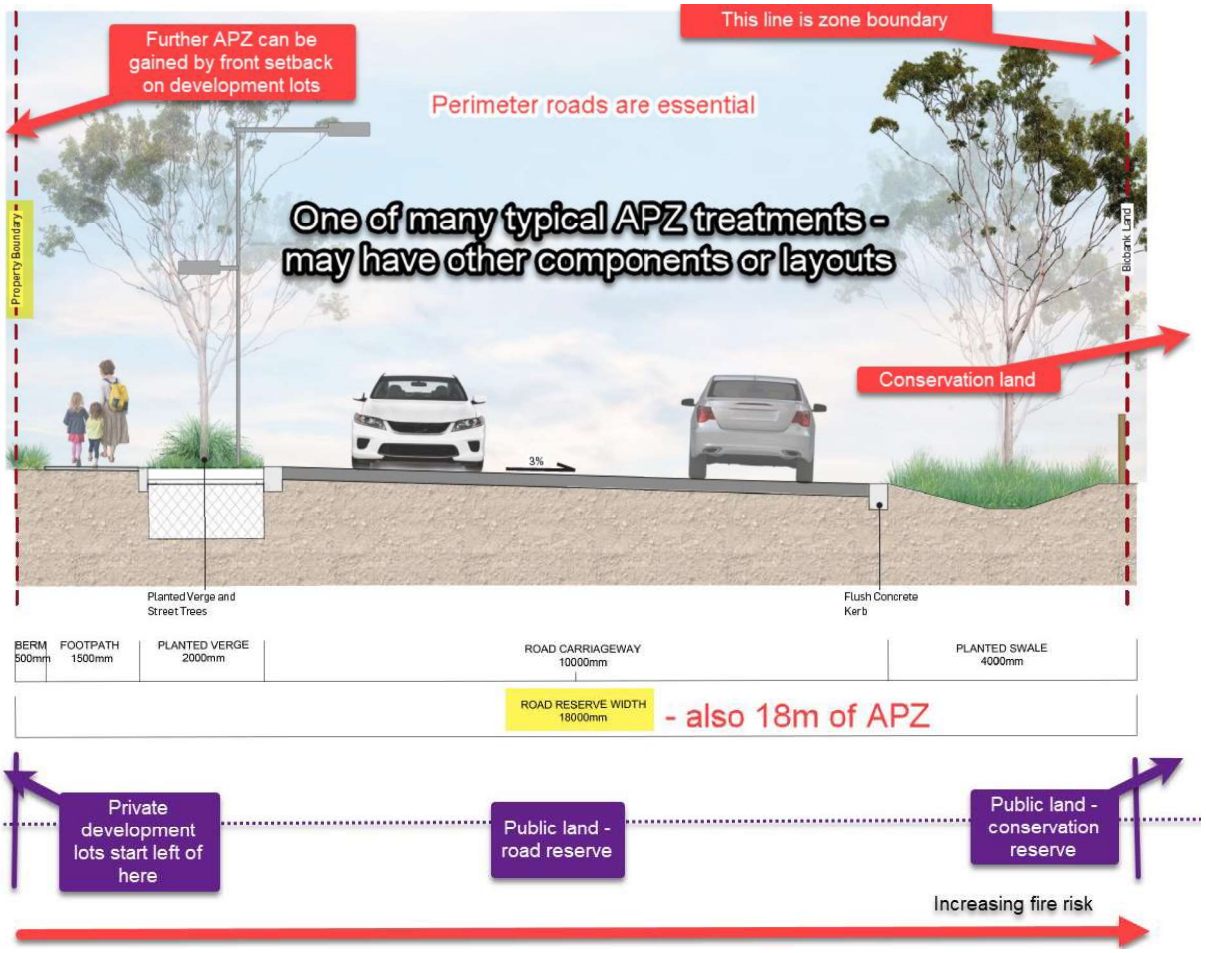
Bushfire Attack Level and forms of bushfire attack



Fire Behaviour Index (AFDRS, 2023)



Interface and Asset Protection Zone



Bushfire Protection Measures (BPM)