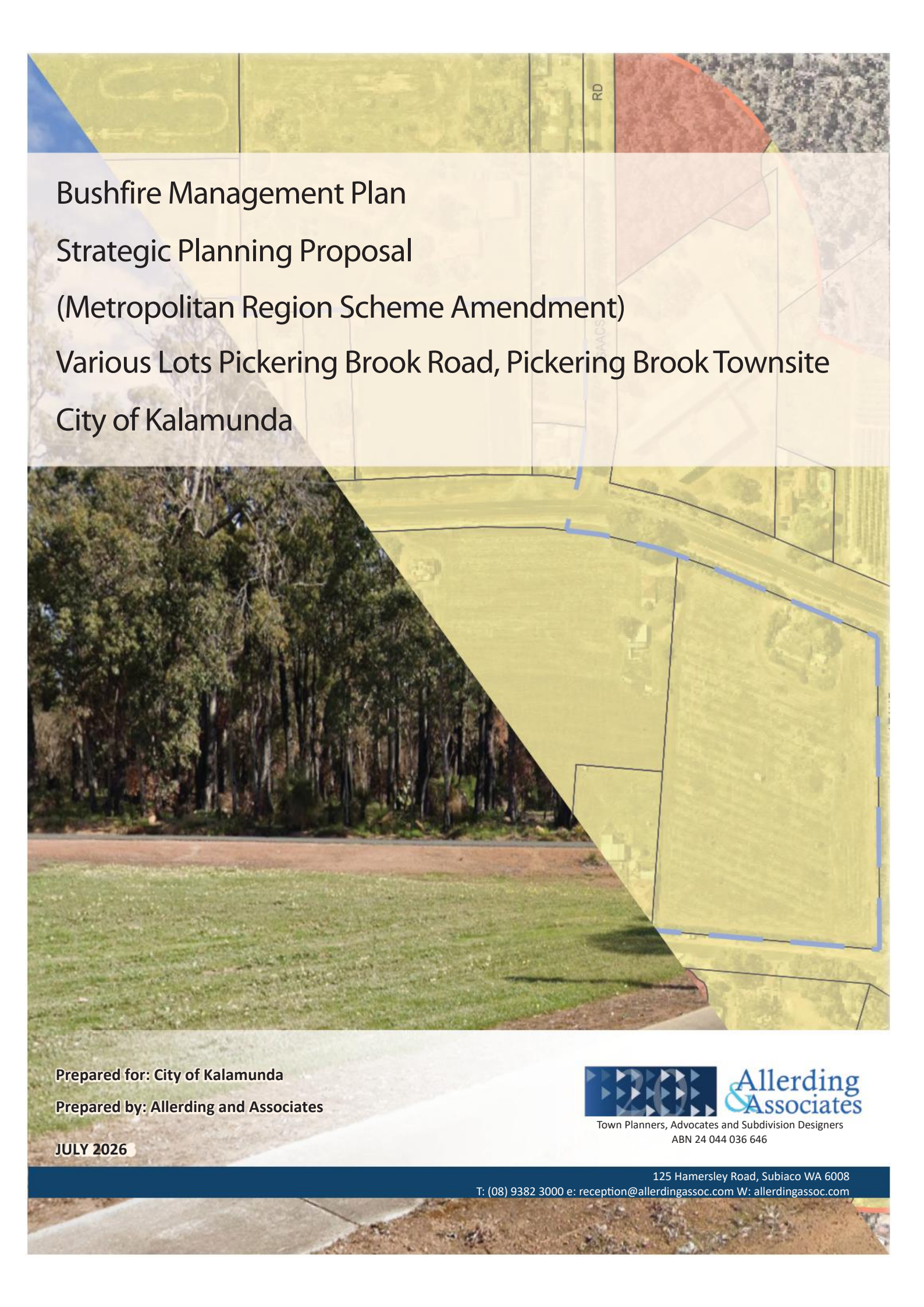




Bushfire Management Plan

Strategic Planning Proposal

(Metropolitan Region Scheme Amendment)

Various Lots Pickering Brook Road, Pickering Brook Townsite

City of Kalamunda

Prepared for: City of Kalamunda

Prepared by: Allering and Associates

JULY 2026



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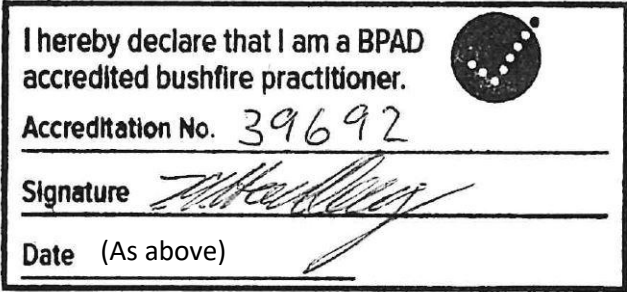
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1.0 EXECUTIVE SUMMARY

This Bushfire Management Plan (BMP) has been prepared to support the City of Kalamunda's request to initiate an amendment to the Metropolitan Region Scheme (MRS) to rezone thirteen lots (approximately 14 hectares) in the Pickering Brook townsite from Rural to Urban. The proposal would facilitate future residential subdivision of approximately 44 unsewered lots of around 2,000m² each, adjoining the existing townsite. The subject land is within a Priority 2 Public Drinking Water Source Area (Middle Helena Catchment) and is mapped as Bushfire Prone Area (Area 2) under State Planning Policy 3.7: Bushfire (SPP 3.7).

The proposal sits within an area previously considered for townsite expansion, which was refused in 2017 largely due to extreme bushfire risk, strategic planning considerations and water management constraints. Following subsequent State Government work (including the Pickering Brook and Surrounds Sustainability and Tourism Strategy and identification of the area as "Urban Investigation" in the Perth and Peel@3.5 Million/North-East Sub-regional Planning Framework), the Western Australian Planning Commission (WAPC) considered a request to initiate the amendment on 28 January 2026 and deferred its determination for six months pending additional information. In particular, the Department of Fire and Emergency Services (DFES) objected on the basis that the townsite is isolated, that evacuation options have not been demonstrated, and that risk to life and property is unacceptably high and cannot be adequately managed or mitigated.

This BMP responds directly to the WAPC's deferral requirements and addresses matters raised by DFES and the independent peer review (Meridian Urban).

The Broader Landscape Assessment determines the surrounding area to be Broader Landscape Type B, reflecting extreme landscape-scale bushfire potential. While this outcome triggers a presumption against further intensification unless an outcomes-based case can be demonstrated, it is not an automatic refusal under SPP 3.7. Accordingly, this BMP provides an outcomes-based approach to demonstrate how the risk to life, property and infrastructure can be reduced to the lowest practicable level, including through coordinated townsite and precinct-scale mitigation measures, demonstrated efficient and effective access and egress, targeted vegetation management to achieve bushfire attack level (BAL) outcomes at the lot and interface scale, and enhanced water supply arrangements for firefighting (including consideration of strategic water storage). The intent is to show that the expansion of the townsite will deliver improved bushfire resilience for the existing Pickering Brook community.

2.0 PROPOSAL DETAILS

2.1 Background

In 2017, the Western Australian Planning Commission (WAPC) refused a larger proposal to rezone approximately 90 hectares of land to expand the Pickering Brook townsite. The current proposal is located within part of this previously refused area.

Reasons for refusal included:

- The area not being supported for urban expansion.
- Extreme bushfire risk.
- Non-compliance with State Planning Policy 3.7: Bushfire (SPP 3.7).
- Lack of an approved District Water Management Strategy.

Following this refusal, a State Government Taskforce was established to consider six scenarios for expansion of the Pickering Brook townsite and options for economic diversification of the Pickering Brook precinct. The subject site was selected as the most suitable for residential development with the townsite. As a result of this work, the WAPC produced the Pickering Brook and Surrounds Sustainability and Tourism Strategy.

As part of this Strategy, a bushfire management plan (BMP) and risk assessment were prepared by Emerge Associates for the Department of Planning, Lands and Heritage (DPLH), in 2020. This BMP was prepared under SPP 3.7 (2015). The Department of Fire and Emergency Services (DFES) raised concerns with the BMP and risk assessment and in summary did not support the conclusions that the bushfire risk could be mitigated to an acceptable level.

Consequently, DPLH commissioned an independent peer review by Laura Gannon, Director at Meridian Urban, an interstate consultancy specialising in urban policy and planning, resilience and adaptation. Laura Gannon is an accredited level 3 Bushfire Practitioner with 20 years of experience in strategic and risk-based land use planning, climate adaptation, bushfire risk and community resilience. Laura specialises in management consulting approaches to the integration of natural hazard risk management into land use planning policy, strategy, and governance processes. She has extensive experience in the areas of risk assessment, climate resilience and disaster risk reduction.

Meridian Urban provided recommendations on additional work, including a traffic management and evacuation plan, which were included as recommendations within the that Pickering Brook and Surrounds Sustainability and Tourism Strategy, that should be undertaken. Both previous reporting prepared by both Emerge Associates and Meridian Urban has been referred to and referenced throughout this BMP.

The Government supported the Taskforce's recommendation that the site be considered for urbanisation, and the Perth and Peel@3.5Million/North-East Sub Regional Planning Framework identified the site as "Urban Investigation", with bushfire risk and protection of the Middle Helena Catchment Drinking Water Resource to be addressed.

Following the adoption of the Strategy, the City of Kalamunda prepared an amendment to the Metropolitan Region Scheme (MRS) to rezone 13 lots (approximately 14 hectares of land) in the Pickering Brook townsite from Rural to Urban to enable future residential development, consisting of about 44 unsewered residential lots of approximately 2,000 m² each. A request to initiate the amendment was considered by the WAPC on the 28 January 2026.

DFES objected to the proposal on the basis that the area is subject to an extreme bushfire hazard, that the Pickering Brook townsite is isolated, surrounded by unmanaged forest vegetation and steep terrain, and has limited evacuation options. DFES concluded that the proposal does not comply with SPP 3.7, and that the risk to life and property is unacceptably high and cannot be adequately mitigated.

The report to WAPC recommended that the MRS amendment not be initiated on the grounds that:

1. It does not satisfactorily address the "Urban Investigation" criteria in the Perth and Peel@3.5Million/North-East Sub Regional Planning Framework;
2. It does not comply with the requirements of SPP 3.7, as an extreme bushfire hazard exists making the location unsuitable and inappropriate for urban intensification; and
3. It does not comply with the requirements of State Planning Policy 2.9 – Water as unsewered residential development is proposed over a Priority 2 Public Drinking Water Source Area.

However, WAPC members outlined the following reasons for deferring consideration of the MRS Amendment:

- The City of Kalamunda indicated a willingness to undertake further investigations and provide additional reporting, particularly in response to concerns raised by DFES and the revised planning framework.
- The BMP needs to be updated by the City to address the findings of the independent peer review and the latest advice from DFES.
- The zoning requirements and permissible land uses relating to the BMP need to be reassessed. This includes ensuring that any proposed changes are consistent with the revised planning framework and address the bushfire issues raised by DFES and the requirements of SPP 3.7, including location and the need for a Broader Landscape Assessment, vehicle access and evacuation and water supply matters.
- There is also a need for the City to address the on-site effluent disposal concerns raised by the Department of Water and Environmental Regulation (DWER), DPLH, and the Department of Health, particularly regarding development within a Priority 2 Public Drinking Water Source Area and the ground water table levels.
- The City is required to address the broader landscape aspects of the proposal, ensuring that location within the broader landscape and environmental factors are adequately considered.
- DFES has raised the extreme risk represented by the proposal, with their current advice outlining that the risk cannot be mitigated, presenting a significant challenge for the City to address in their further investigations.

Subsequently, the WAPC resolved to defer the item, as detailed in the report dated 28 January 2026 for six months, pending:

1. Additional information being submitted by the City of Kalamunda in response to bushfire concerns which have been raised by DFES and the updated SPP 3.7.
2. Additional information being submitted by the City of Kalamunda in response to on-site effluent disposal concerns raised by the DWER, Department of Health and Water Corporation.

2.2 Purpose of the BMP

This BMP has been prepared in response to the WAPC determination.

The BMP has been prepared in accordance with SPP 3.7 and the Planning for Bushfire Guidelines (Guidelines), which require assessment against Section 4 (Strategic Planning) of the Guidelines, including consideration of Element 1: Location through an assessment of the broader landscape.

In accordance with SPP 3.7, the BMP also considers opportunities to minimise unnecessary clearing of native vegetation within the site. The BMP identifies bushfire hazard issues arising from the Bushfire Hazard Level (BHL) assessment and the surrounding broader landscape and assesses the proposal against the bushfire protection criteria requirements contained within the Guidelines, demonstrating compliance.

This BMP does not duplicate previous work that has been undertaken within the BMP and Risk Assessment that were prepared by Emerge Associates to support the Pickering Brook and Surrounds Sustainability and Tourism Strategy. This BMP considers the comments that were made by DEFS on the Emerge BMP, and the recommendations for additional work. Particular weight have been given to the independent comments provided by Meridian Urban in the peer review and the recommendations for additional work contained within the Pickering Brook and Surrounds Sustainability and Tourism Strategy. These concerns are detailed below and where relevant, addressed within the BMP.

2.2.1 DEFS Comments

DEFS comments dated 30 June 2025, in response to the MRS amendment included:

Bushfire Risk and Landscape Context

- Extreme Risk Landscape: The area is surrounded by unmanaged forest vegetation on steep slopes, creating a high bushfire risk that cannot be adequately mitigated.
- Broader Landscape Type: DEFS categorizes the area as Broader Landscape Type 'B' or 'C', which represents an extreme bushfire risk. This classification presumes against development or intensification of land use.
- Catastrophic Potential: The topography and vegetation present a risk of catastrophic-scale destruction from bushfires, making the location unsuitable for urban intensification.

Bushfire Management Plan Concerns

- Risk Assessment: DEFS disagrees with the BMP's conclusion that the overall bushfire risk is 'medium.' The reduction of the consequence level from 'catastrophic' to 'minor' is deemed unsupported by evidence.
- Evacuation Challenges: The BMP does not adequately address evacuation planning, including simultaneous evacuation of residents and visitors alongside emergency service access.
- Traffic Studies: The traffic impact assessment used in the BMP is a general study and not fit-for-purpose for emergency evacuation scenarios.
- Place of Last Resort: The use of the Pickering Brook Primary School as a community safer place is not supported due to its small size, hazardous surroundings, and lack of compliance with bushfire standards.

Compliance with SPP 3.7 Bushfire

- DEFS states that the proposal does not comply with SPP 3.7, which requires strategic planning proposals to avoid increasing bushfire threats to people, property, and infrastructure.
- Bushfire Protection Criteria: Compliance with the bushfire protection criteria, including location, siting and design, vehicular access, and water supply, has not been demonstrated.

Element 1: Location

- The area is isolated, with indirect road networks and continuous tracts of vegetation, making it unsuitable for intensification.
- Clearing vegetation to achieve a BAL-29 rating is insufficient to mitigate the broader landscape risks.

Element 2: Siting and Design

- Proposed lot layouts do not ensure that all lots achieve a BAL-29 rating or lower.
- Vegetation exclusions (e.g. orchards) is not supported unless evidence confirms they are managed to low threat levels.

Element 3: Vehicular Access

- Existing road networks do not meet standards for safe evacuation and emergency service access.
- Reliance on indirect routes and vegetation along evacuation paths exacerbates risks.

- The BMP's reliance on a shelter-in-place strategy (e.g., the school) is not supported as a substitute for compliant access and egress.

Element 4: Water Supply

- Concerns about the adequacy of water supply for firefighting during emergencies.
- Risks associated with the townsite's primary water source being located in a high-risk area.

Vulnerable Land Uses

- DFES opposes the inclusion of vulnerable land uses (e.g., aged care, short-stay accommodation) in the area due to increased risks and reliance on emergency services.

DFES Recommendations for Additional Work

- Outcomes-Based Approach: DFES recommends an Outcome-Based Approach to justify the proposal and demonstrate mitigation measures.
- Evacuation Traffic Modelling: A fit-for-purpose traffic study is required to assess evacuation scenarios and road network performance during emergencies.
- Policy Alignment: Future planning must align with updated SPP 3.7 (2024) and address all bushfire protection criteria.

2.2.2 Meridian Urban Comments

Meridian Urban provided the following comments in the peer review of the Emerge BMP:

- Without further evidence or traffic modelling from an emergency evacuation perspective, the evacuation context of the existing community of Pickering Brook Townsite (and surrounds) against an expanded townsite cannot be determined.
- Bushfire behaviour, smoke and ember density modelling has not been undertaken and thus, has not informed consideration of potential bushfire attack on the townsite, or the ability to evacuate.
- With regard to the nomination of a place of last resort within the townsite, further investigation at a policy level may be required. Whilst these options can be beneficial, they are routinely misunderstood by the community. Survival at a place of last resort cannot be guaranteed.
- It is the view of this peer review that the identification of a place of last resort is not of a sufficient magnitude to warrant a residual risk level of 'minor' for evacuation risks.
- The potential for vulnerable activities including aged care, child care centres and some forms of community facilities may also need to be contemplated for avoidance in Pickering Brook.

Roads and evacuation

Several matters are unclear in relation to the road access and evacuation considerations of the report. These include:

- the speed of vehicles in an emergency is reduced;
- assumptions of how many persons may be present (both in in town and in the surrounding area), and how many may have left early, and how many vehicles may be evacuating in emergency conditions. Research suggests families evacuating will take all or as many vehicles as they can to evacuate, rather than travel together;

- intersection flows can change in an emergency (i.e. a higher percentage of vehicles turning left instead of right, etc.) at key locations, either as a result of decision making to evacuate or upon direction by emergency services;
- the traffic of the broader catchment and how it has been specifically considered, particularly whether increased traffic from the townsite could prevent left turns from Canning Road from the south and the potential for bottlenecking in this location as well as others throughout the area;
- the potential for bottlenecks to remain, with vehicles queued on the road network as radiant heat increases due to spot fires and/or as the fire front arrives;
- the potential for spot fires and smoke in the area to confuse drivers as to the location or direction of the fire front;
- the points at which, under modelled events, certain evacuation routes would be closed by emergency services, or become un-trafficable; and
- the potential for evacuating traffic from Pickering Brook to inadvertently impact the ability for evacuation from other nearby locations.

Overall, the peer review found that the evacuation considerations of the BMP should be continued to be built upon. Evacuation is a growing consideration for strategic land use planning, as it is directly associated with the analysis of potential risk to life.

In research undertaken in 2017, the New South Wales Rural Fire Service found:

- most people do not intend to leave before there is a fire on days of Catastrophic fire danger. Those who intend to leave will wait until there is a fire, and others intend to stay and defend, notwithstanding emergency services advice to leave early;
- 12 per cent of those interviewed left for a place of safety when they received a catastrophic fire danger warning (this almost matches the proportion of evacuees who left more than 8 hours in advance of fire arrival during the 2009 Victoria bushfires);
- only 12 per cent of interviewees stated they would leave early upon receiving a catastrophic fire danger warning next season. 24 per cent said they would wait and see if a fire started before leaving, 27 per cent said they would prepare to stay and defend and the final 24 per cent said they would wait for a fire to decide what action to take; and
- the analysis of interviewees determined that some people underestimate the risks to life and property if fire danger is not catastrophic.

Data such as this presents a conundrum of sorts from a planning perspective, on whether strategic planning decisions should be made based on emergency management policy, or the reality of human behaviour derived from research.

The peer review could not verify the accuracy of the assessment made in relation to evacuation without a fit-for-purpose bushfire evacuation traffic study. Such a study will need to be informed by technical bushfire planning input to guide the nature of inputs and assumptions used to perform evacuation traffic modelling.

Water and electricity

Water supply infrastructure and distribution are located west of the townsite (408 metres west of Weston Road at 310 m AHD). Two 225 KL cement tanks are located within a 1,800 sqm fenced compound set within forest vegetation.

In addition to risk of ignition, loss of electricity can create cascading risks for the community with the loss of reticulated water supplies if pump stations (which may not be relevant here as the system is gravity fed) also lose power, and impacts on the ability to receive emergency warnings. Depending upon the duration of power loss, battery back ups for mobile phone towers can expire.

The NBN, which relies on power at both ends of the network, will cease to operate upon battery back-up expiration. Battery back-up at the building end of the network is designed to last for a period of approximately four (4) hours. The risks and resilience of the electricity network should be contemplated as part of continued studies relating to Pickering Brook Townsite.

2.3 Location

The subject site is situated in the Pickering Brook townsite, approximately 19km east of the townsite of Kalamunda, 5.6 km and approximately 30 km east of the Perth central business district.

The site is located within the City of Kalamunda, approximately 26 kilometres east of the Perth CBD, and directly adjacent to the existing Pickering Brook townsite. Surrounding land uses include:

- The existing townsite to the east;
- Pickering Brook Golf Course to the south-west;
- Rural agricultural land to the north; and
- A-Class Crown reserves and Korung National Park, designated as Regional Open Space.

The land comprises approximately 14 mostly cleared rural lots and is located within a Priority 2 Public Drinking Water Source Area (Middle Helena Catchment).

A location plan is included at **Figure 1**.

2.4 Zoning and Land Use

The subject site is zoned 'Rural' under the MRS and 'Rural Residential' under the City of Kalamunda Local Planning Scheme No. 4 (LPS4).

As outlined on the DFES Western Australian Map of Bush Fire Prone Areas, the subject site is designated as Bushfire Prone Area 2 (refer **Figure 2**).

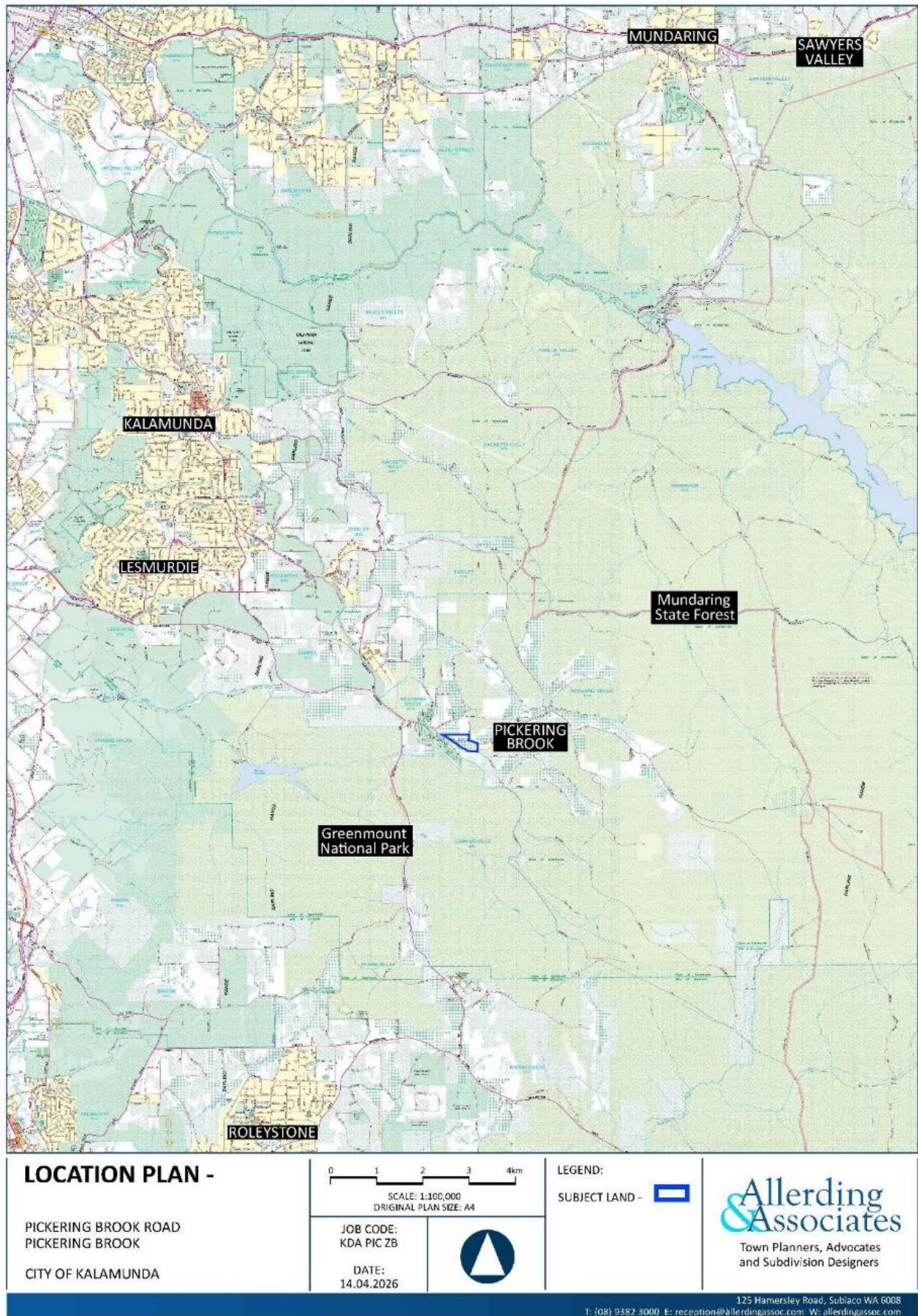


Figure 1 – Location Plan

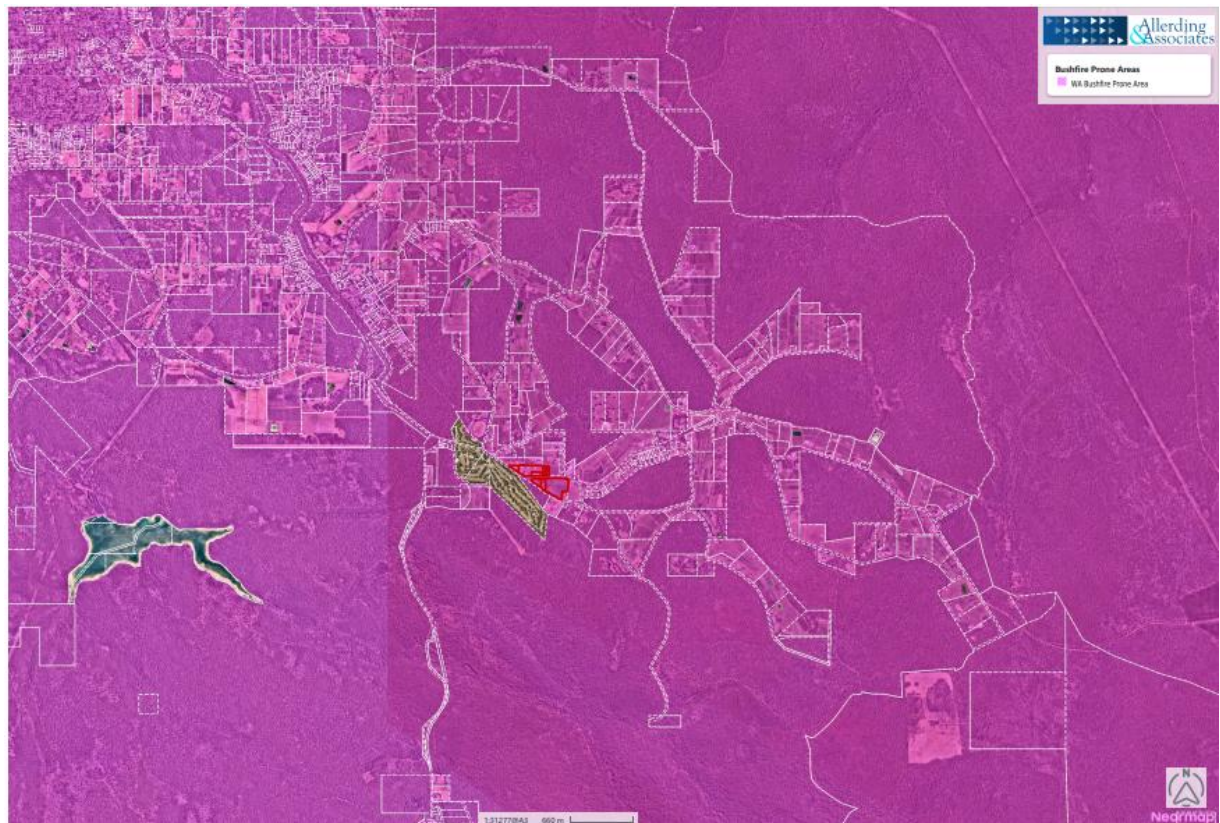


Figure 2 – Map of Bushfire Prone Areas (Source: MNG Maps 2025)

2.5 Overview of Proposal

The proposed MRS amendment seeks to rezone approximately 14ha in Pickering Brook from the Rural zone to the Urban zone. The amendment will facilitate the development of approximately 44 unsewered residential lots of approximately 2,000 m² each.

The Pickering Brook locality has a population of 570 people (2016 Census) and is comprised of primary production lots and rural lifestyle lots. The townsite comprises a cluster of 53 residential lots, mostly 2000 m² each ('R5') in a double block located along Pickering Brook Road. The townsite includes the Pickering Brook Primary School.

2.6 Access

Vehicular access is via Canning Road from the south (via Stoneville) and Canning Road from the west (via Kalamunda), and also via Kalamunda to the west via Walnut Road, and then south on Patterson Road (refer **Figure 3**).

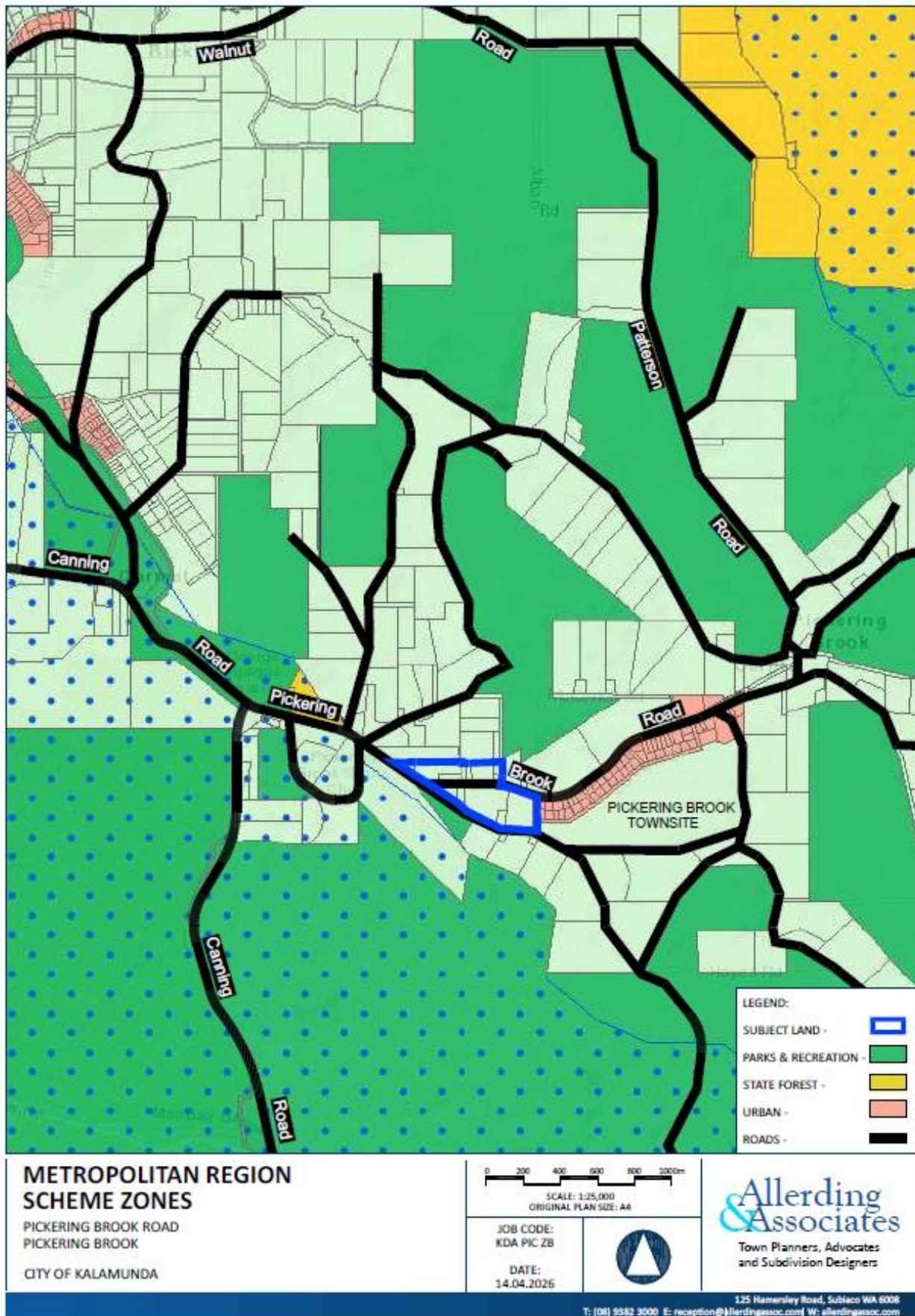


Figure 3: MRS and Road network

2.7 Water and Power Supply

The water supply infrastructure and distribution are located west of the townsite (408m west of Weston Road), within two concrete tanks. Fire hydrants exist within road reserves of the Pickering Brook townsite and the City's Emergency Services team advise that there is sufficient capacity and pressure for firefighting purposes (refer to **Figure 4**).

The Water Corporation advised that the future subdivision of land can be provided with water services by the subdivider's undertaking extensions of water mains at their cost; and that depending on the proposed lots sizes and ultimate lot yield, the Water Corporation will need to revisit its water planning for Pickering Brook to determine what headwork upgrades will be required to the water storage tank, water transfer pumping, and the tank outlet mains serving the local Pickering Brook network.

As part of their current works program, the Water Corporation are investigating the reticulated water capacity within Pickering Brook. The City of Kalamunda anticipate the findings to be released imminently. The findings will guide Water Corporation's future works program.

The townsite is supplied by overhead power lines, 33 KV, that connect the town from Canning Road through to Pickering Brook Road or by Patterson Road.

Meridian Urban note the specific risk of ignition posed by above ground power lines, and in addition to the risk of ignition, loss of electricity can create cascading risks for the community.

The Emerge Associates BMP states that the main threat to the function of the road network is from trees and powerlines falling into the roadway and recommends that the power poles and overhead wires be reviewed for clearance from falling trees and branches to minimise the disruption of power to the townsite (Emerge Associates: 2020). This recommendation is supported, and although the replacement of overhead powerlines, with underground power lines is supported, it is unlikely this work will occur in the near future, due primarily to the extent of the network in the area and the cost.

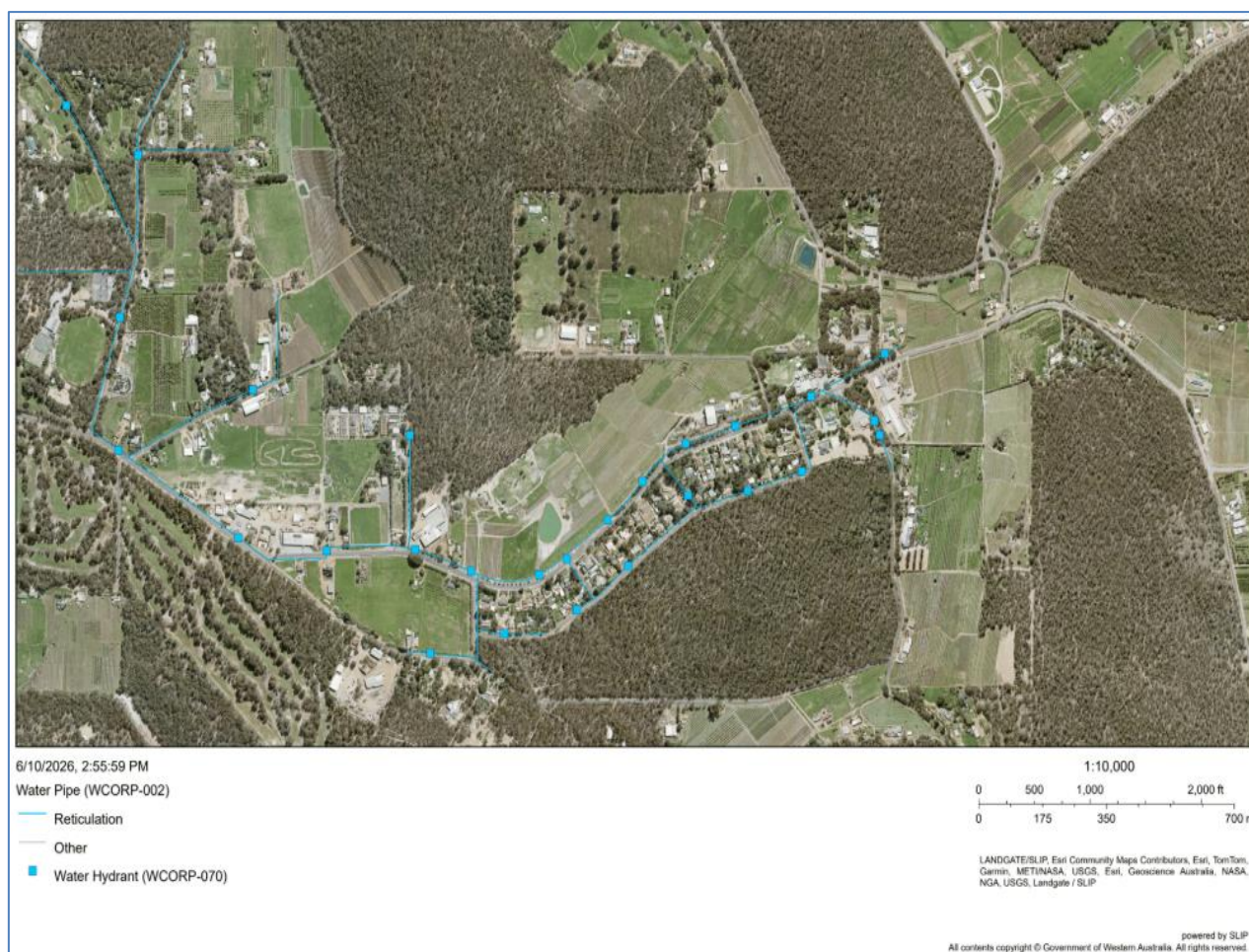


Figure 4: Water Hydrant Location

3.0 ENVIRONMENTAL CONSIDERATIONS

The subject site is mostly cleared, with only a limited number of mature trees remaining.

3.1 Native Vegetation – Modification and Clearing

A review of the publicly available databases has been undertaken. The review below does not include a detailed environmental assessment of any vegetation clearing and/or modification which may be required in road reservations for the purposes of upgrades to access routes to achieve compliance with the Guidelines.

Environmental feature	Occurrence within or in proximity to the subject site
BUSHFOREVER – DPLH-019	No Bush Forever sites are located within or adjacent to the site.
Conservation category wetland - Geomorphic Wetlands Swan Coastal Plain – DBCA -019	No wetlands have been identified within the site.
DBCA controlled lands or	No DBCA managed lands occur within the site.

waters - DBCA-011	
Environmentally Sensitive Areas (ESAs) – DWER-046	There are no ESAs identified within the site.
RASAR wetlands – DBCA- 010	No wetlands have been identified within the site.
Threatened and priority flora – DBCA-036	Potentially (subject to site specific assessment).
Swan Bioplan Regionally Significant Natural Areas 2010 - DWER-070	No Swan Bioplan Regionally Significant Natural Areas have been identified within the site.
Threatened and priority flora – DBCA-037	Potentially (subject to site specific assessment).
Threatened Ecological Communities (TECs) – DBCA-038	There are no threatened ecological communities identified within or adjacent to the site.
Waterways – DWER-031	There are no natural watercourses identified within the site. Piesse Gully is located to the north-east of the site.

3.2 Revegetation and Landscape Plans

No revegetation or landscaping is currently contemplated as part of the future redevelopment of the site.

4.0 BUSHFIRE ASSESSMENT RESULTS

4.1 Broader Landscape Assessment

As the subject site is designated as Bushfire Prone Area 2, an assessment of the broader landscape has been undertaken in accordance with Element 1: Location of the Guidelines to determine the broader landscape type. The broader landscape assessment has been undertaken in accordance with Appendix A.1 of the Guidelines with the results mapped in **Figures 5, 6 and 7** and the broader landscape type determined in **Table 1** based on the points-based system. The areas surrounding the subject site have been assessed as a Broader Landscape Type B. An outcomes-based approach is provided at **Section 8** of this BMP.

Table 1: Points Based System for Determining Broader Landscape Type

CRITERIA	5 POINTS	2 POINTS	1 POINT	POINTS
Proximity of the planning proposal to a suitable destination is:	>10km	1-10km	<1km	5
The road pattern from the planning proposal to a suitable destination is:	Complex and indirect (cul-de-sacs, and/or multiple intersections)	Mixed road patterns	Simple and/or direct (limited intersections)	1
The predominant vegetation pattern is:	large tracts of vegetation (contiguous vegetation)	A mosaic pattern of vegetation (e.g. vegetation within rural living precincts)	Cleared vegetation (e.g. clearing for residential zoned urban lots)	5
Exposure of the planning proposal to an identified external bushfire hazard (excluding Class G Grassland) is from:	Three or four aspects	Two aspects	From nil or one aspect only	5
TOTAL POINTS				
Total points	Broader landscape type			16
0 – 11 points	Broader landscape type A (BLT A)			☐
12 – 20 points	Broader landscape type B (BLT B)			☒
BROADER LANDSCAPE TYPE DETERMINED				

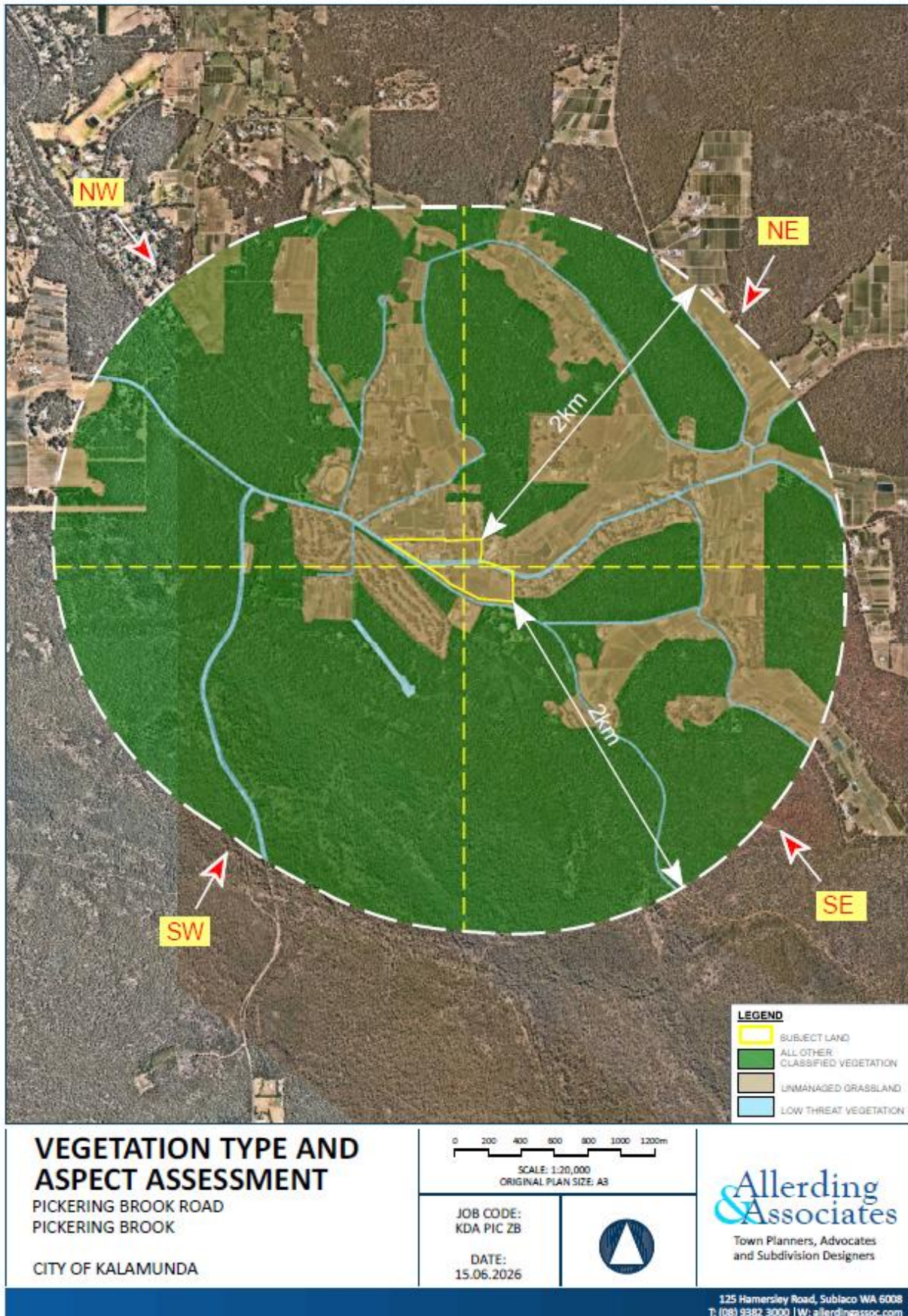


Figure 5 – Vegetation Type and Aspect

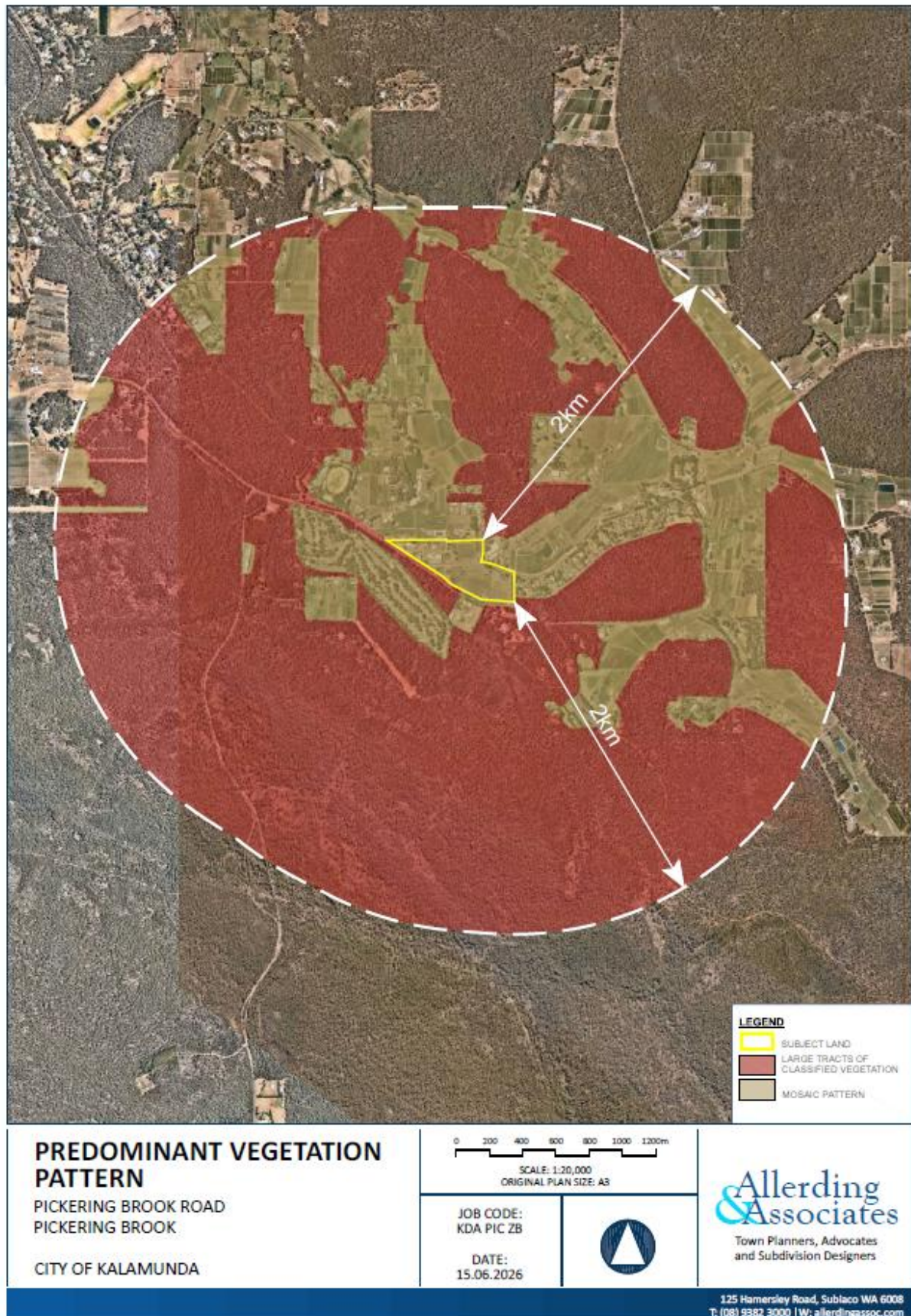


Figure 6 – Predominant Vegetation Pattern

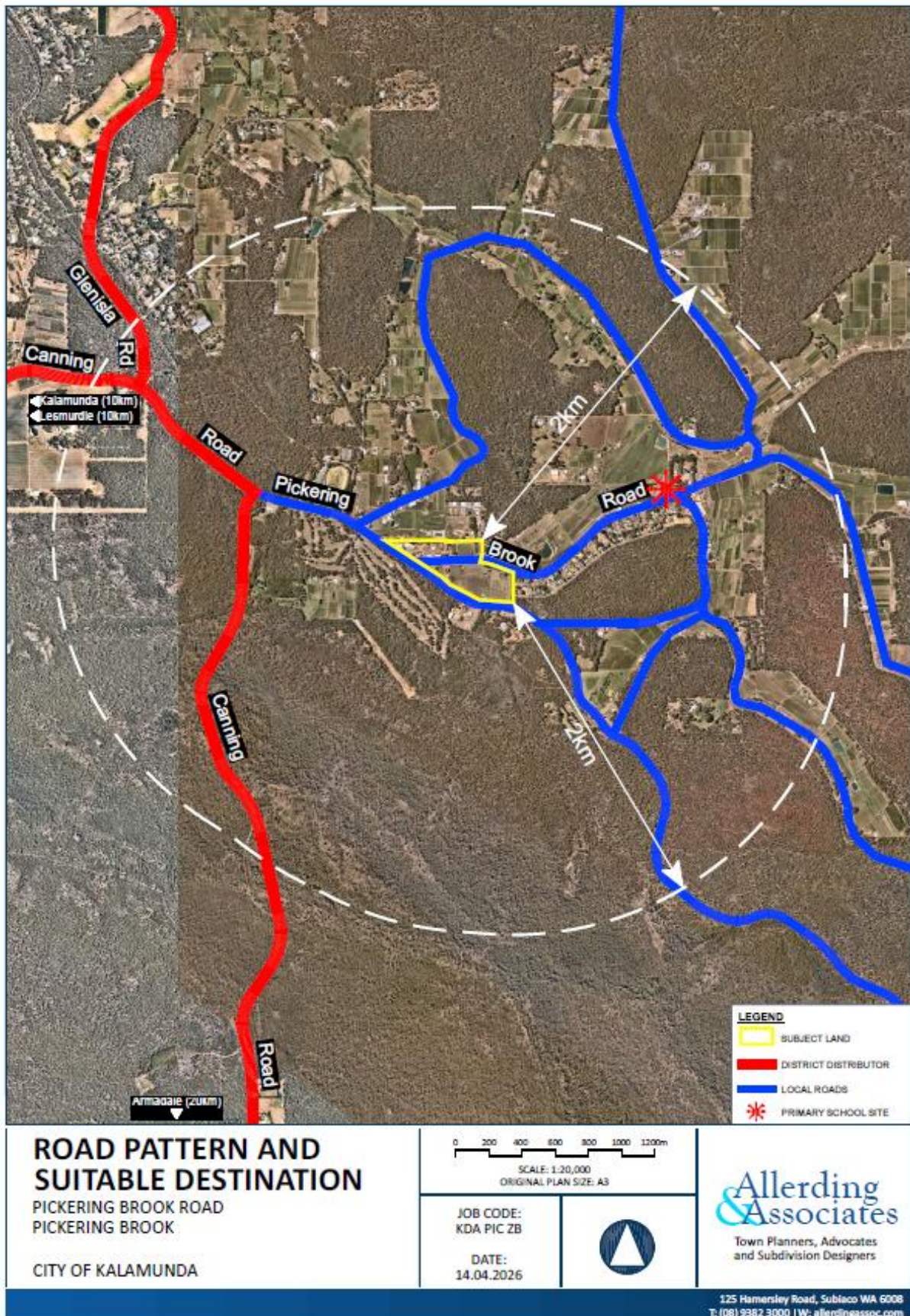


Figure 7 – Road Pattern and Suitable Destinations

4.2 Landscape Scale Bushfire Hazard Level Assessment

A Bushfire Hazard Level (BHL) assessment for the wider Pickering Brook precinct was undertaken by Emerge (**Figure 8**). The BHL has been conducted for a 5 km radius around the original townsite planning investigation area (PIA), rather than the 150m required by the Bushfire Guidelines and has sub-categorised 'extreme' values into three separate classes, using a fireline intensity assessment approach. These classes separate the 'extreme' rating into values of fireline intensity:

1. Up to 44, 000 kW/m;
2. 44, 000 kW/m – 62, 000kW/m; and
3. >62, 000 kW/m.

Emerge conclude that the townsite and the townsite expansion would likely experience a reduced fireline intensity exposure than the mapping might suggest. Fireline intensity is a measure of how powerful or severe a bushfire is at the fire edge. This is considered by Meridian Urban in their peer review, undertaken for the DPLH in 2021, to "be possible and perhaps likely, but irrespective of this, the lower fireline intensity exposure, one of the prevailing issues for the location, is increased ember attack and smoke within valley locations".

The BHL undertaken by Emerge is consistent with the findings contained within Figure 5 – Vegetation Type and Aspect of this BMP, where the subject site and much of the immediate surroundings, including the agricultural areas are classified as 'unmanaged grassland', generating a moderate BHL. The developed areas including the townsite, cleared and managed gardens associated with dwellings and other structures and roads are all considered to have a low BHL.

Once the subject site is developed, the BHL will be reduced to low, providing additional hazard separation to the townsite, from embers and radiant heat. The Pickering Brook Golf Course to the south of the subject site is not identified as Bushfire Prone on the DFES Map of Bushfire Prone Areas and serves as hazard separation to slow the impact of any bushfire travelling from the south-west.

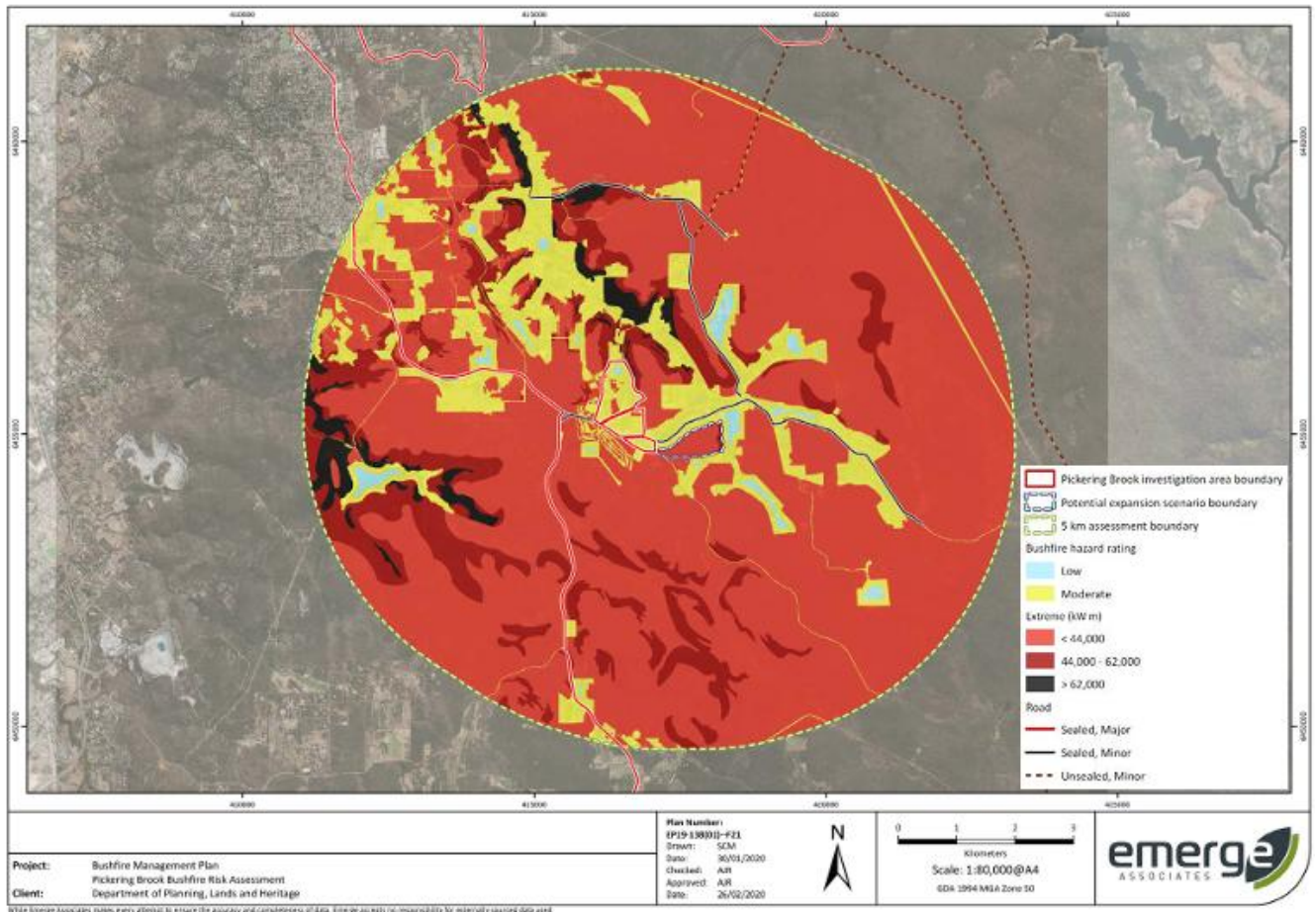


Figure 8: Landscape BHL

(Source: Pickering Brook Townsite Bushfire Risk Assessment – Bushfire Management Plan (Emerge 2020))

4.2.1 DFES and Meridian Urban comments

DFES considers the proposal non-compliant with SPP 3.7, which requires strategic planning proposals to avoid increasing bushfire threats to people, property, and infrastructure. The site is surrounded by unmanaged forest on steep slopes, with indirect road connections, creating a risk of catastrophic bushfire impacts that cannot be adequately mitigated. As a result, DFES deems the location unsuitable for urban intensification.

Concerns are also raised regarding vehicular access and evacuation, with the Emerge BMP not demonstrating that the existing road network meets standards for safe evacuation or emergency service access.

DFES recommends that, if the proposal is to proceed, it must be supported by an outcomes-based approach that clearly demonstrates how bushfire risks can be effectively mitigated. This includes undertaking a fit-for-purpose evacuation traffic study to assess evacuation scenarios and broader road network performance during emergencies. Future planning must also align with the updated SPP 3.7 and fully address all bushfire protection criteria.

Both DFES and Meridian Urban note that in the absence of detailed emergency evacuation modelling, the evacuation capacity of both the existing and expanded Pickering Brook townsite cannot be reliably determined.

The 2024 version of SPP 3.7, acknowledges the challenges of accommodating housing demand while supporting the long-term viability of established townsites, particularly where bushfire risk is present. This is reflected in the revised Policy Objective to “avoid the bushfire risk in the first instance, but where unavoidable, manage and/or mitigate the risk to people, property and infrastructure to ensure the risks are acceptable and appropriate to the land use and the location” (WAPC: 2024).

The outcomes-based approach at **Section 8** of this BMP has been developed in direct response to this objective. It seeks to demonstrate that, while the broader landscape presents an extreme bushfire risk, this risk to people, property and infrastructure, can be appropriately managed and mitigated, and that efficient and effective evacuation routes are available to support life safety in the event of a bushfire.

A Bushfire Shelter was proposed as part of the Emerge BMP and did not receive support from DFES. In the absence of a State endorsed legislative framework for public on-site bushfire shelters, further consideration of this mitigation strategy has not been progressed.

The outcomes-based approach includes bushfire evacuation scenarios, with supporting traffic modelling undertaken by Donald Veal Consultants. A copy of the Pickering Brook Evacuation Technical Note is included at **Appendix 1**.

4.3 BHL Map Inputs

4.3.1 Vegetation Classification

The vegetation classification has been determined within and surrounding the subject site in accordance with Clause 2.2.3 of AS3959, with the current pre-development (existing) condition mapped in **Figure 9**. This information has been used to develop the BHL Map at **Figure 11**. A copy of the bushfire mapping is also included at **Appendix 2**.

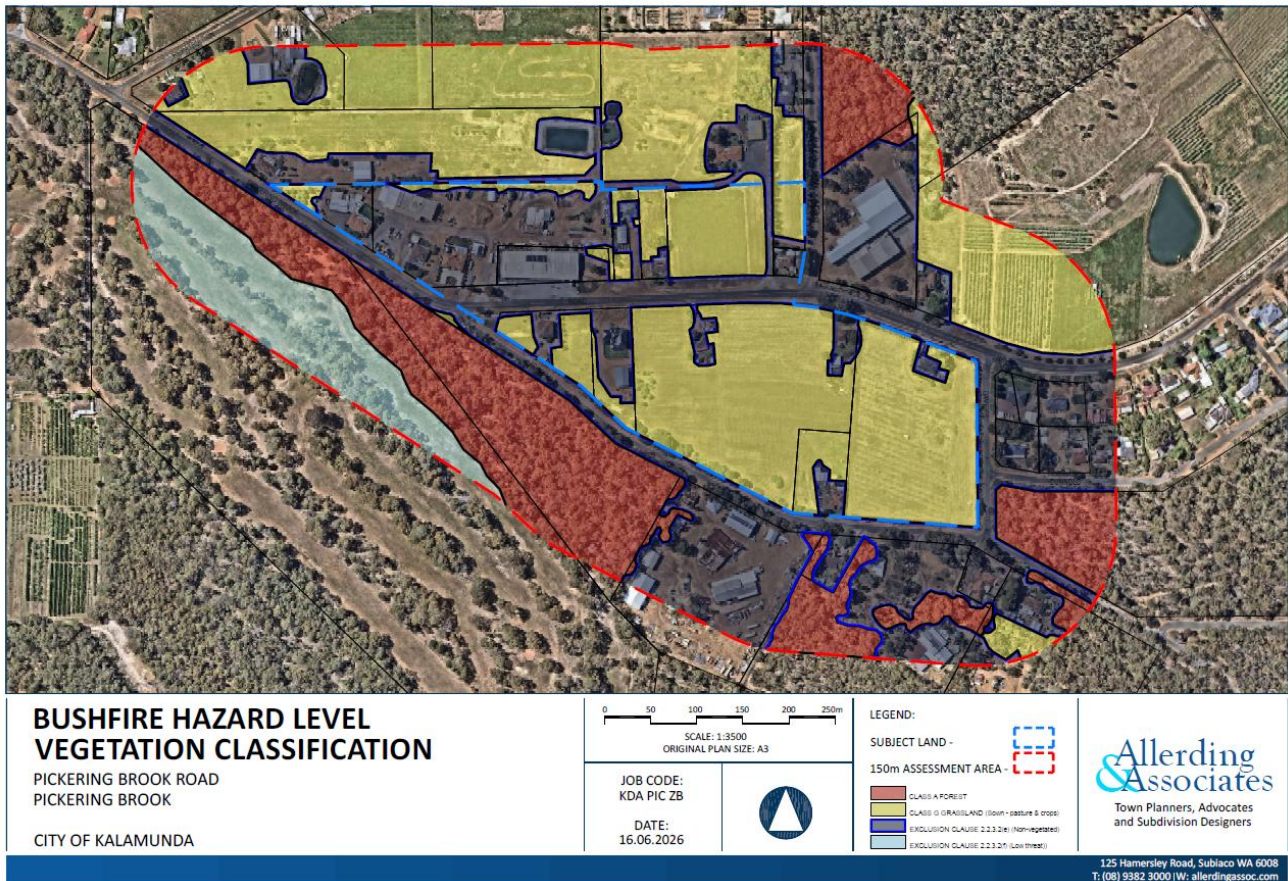


Figure 9 – Vegetation Classification (Existing Condition)

4.3.2 Site Topography and Slope

Based on available topographical mapping and previous work undertaken by Emerge, the subject land contains a slight valley in the centre (2.5 degrees). There is a 5.5 degree rise across the north of the site, from west to east. A topographical plan is included at **Figure 10**.

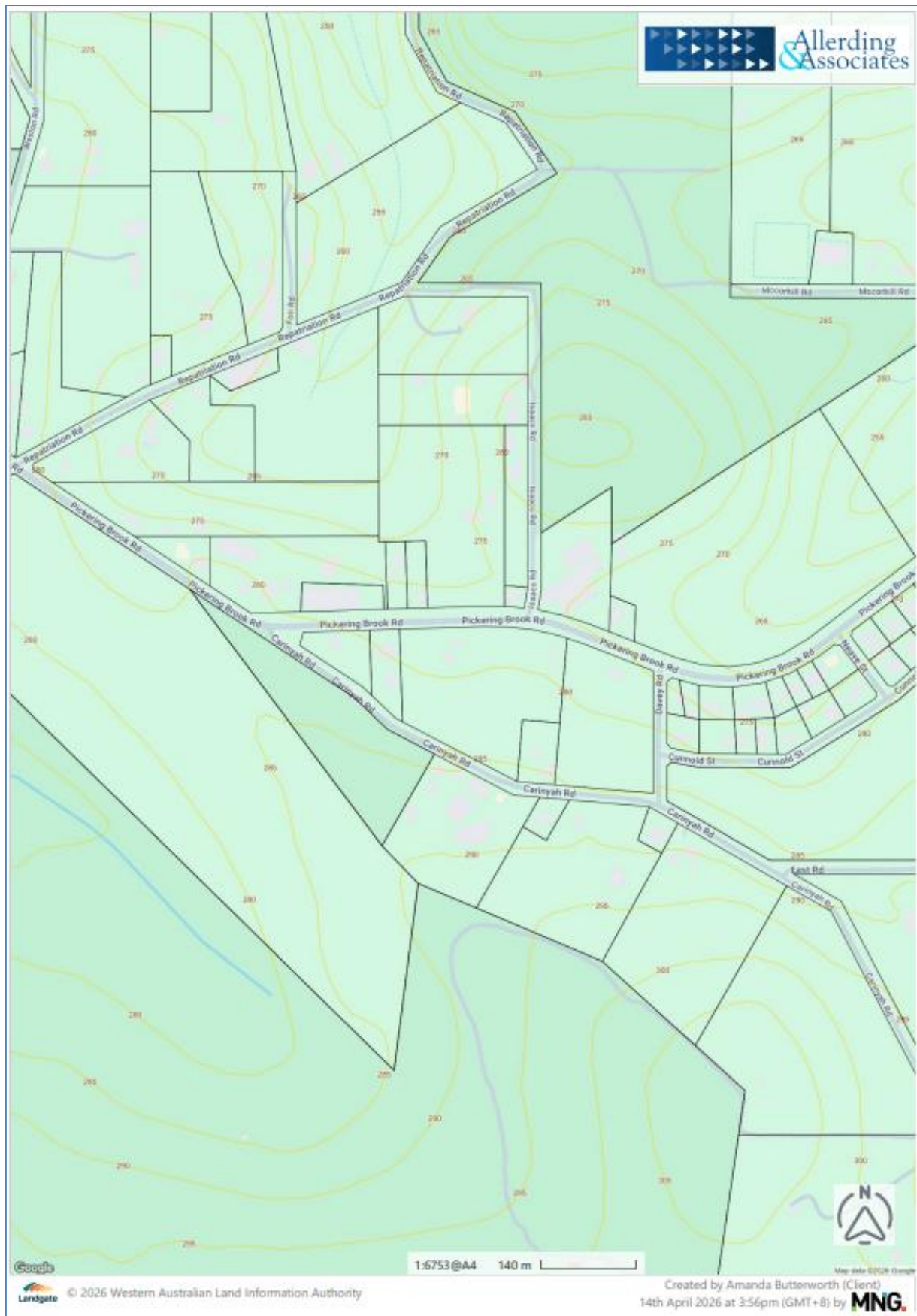


Figure 10 – Topographical Plan

4.4 BHL Map Outputs

4.4.1 BHL Mapping

The BHL Assessment was undertaken using the vegetation classification information contained within **Figure 9**, and the slope assessment shown at **Figure 10**. The BHL assessment methodology was applied based on Appendix A.2 of the Guidelines and has considered the classified vegetation and slope within 150m of the subject site. The results of the BHL are mapped in **Figure 11** in the current pre-development (existing) condition.

Once the subject site is developed, the BHL will be reduced to low.

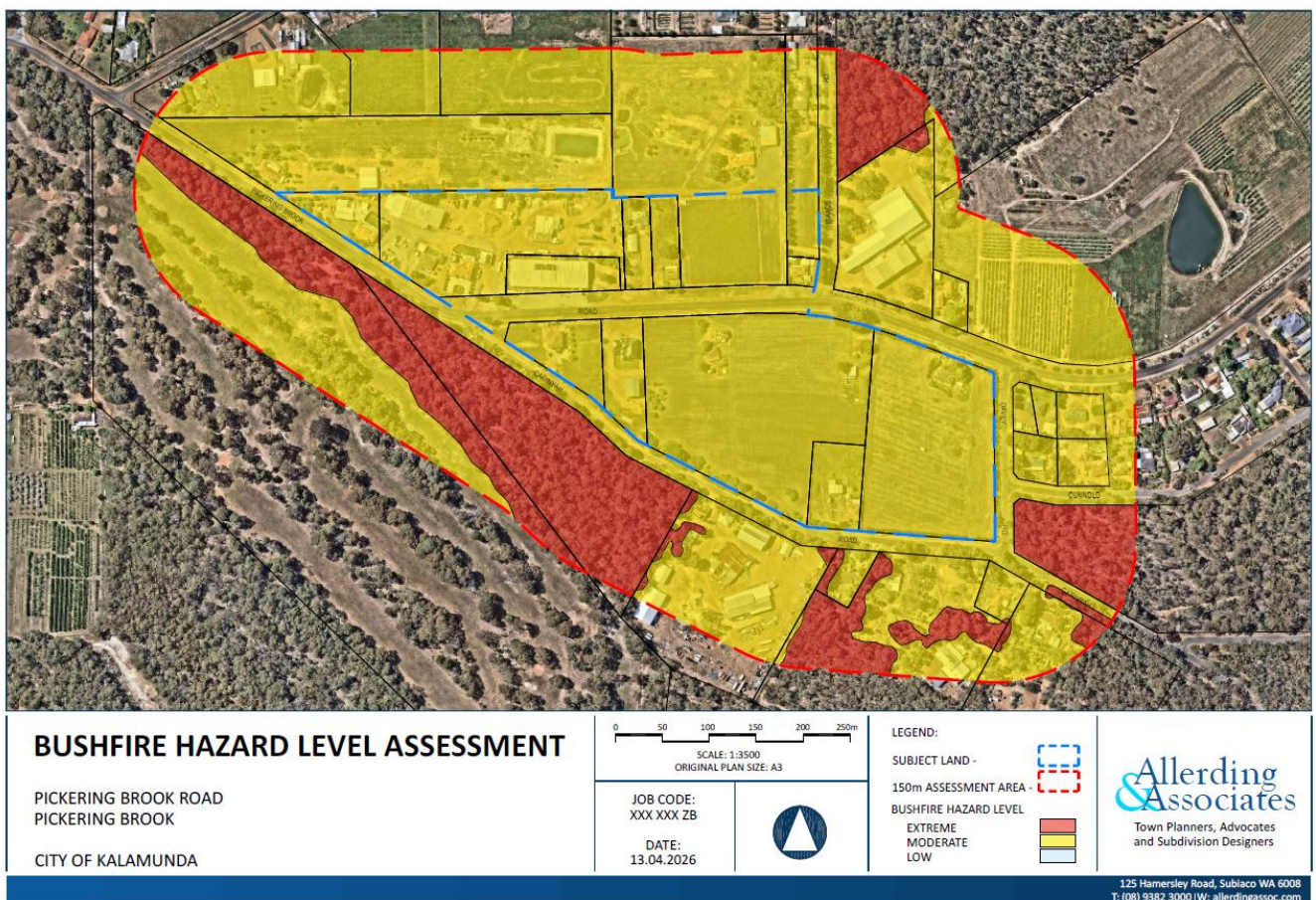


Figure 11 – BHL Map (Existing Condition)

5.0 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

The subject site is set in a valley surrounded by National Parks with slopes between 5° and 10°. The Emerge Associates BMP estimated that Pickering Brook will experience a significant bushfire within 5 km of the townsite occurring at least once every five years, however that despite the rate of occurrence of bushfires in the area, there has yet to be a penetration of a bushfire within the townsite. The Emerge Associates BMP attributes this to present bushfire mitigation measures, the fuel reduction activity taken in the adjacent National Parks and Lot 81, and brigade suppression activity.

Pursuant to Clause 7.1ii.e. of SPP 3.7, the proposal has been assessed against the bushfire protection criteria requirements contained within the Guidelines. **Sections 6.0 and 7.0** of this report demonstrate that the proposal complies with the bushfire protection criteria of the Guidelines, for Elements 2, 3 and 4.

The townsite expansion area is within a Broader Landscape Type B, representing an extreme risk. Although the risk is extreme, the subject site is surrounded by areas of moderate and low BHL, providing areas of hazard separation from embers and radiant heat. The extent of these low and moderate BHL areas is best demonstrated in **Figure 8**, including the Pickering Brook Golf Course to the south, which is not identified as Bushfire Prone on the DFES Map of Bush Fire Prone Areas. These areas serve to fragment the vegetation and slow the impact of any bushfire impacting the subject site.

Figure 8 also spatially identifies those aspects that include large areas of contiguous vegetation, presenting opportunity for landscape scale bushfires.

An outcomes-based approach has been prepared, to provide more detail on the likelihood of a bushfire impacting the subject site, and in the event of a bushfire, the risk to life, property and infrastructure, can be mitigated and managed to an acceptable level.

Importantly a detailed traffic analysis has been undertaken to detail how the additional 131 residents associated with the proposed townsite expansion, and the existing residents of the Pickering Brook precinct as a whole, are able to evacuate.

6.0 PROPOSAL COMPLIANCE AND JUSTIFICATION

Strategic planning proposals in bushfire prone areas are required to comply with SPP3.7 and **Section 4** of the Guidelines, as required under the following policy measures.

6.1 SPP 3.7 Policy Measures

6.1.1 Relevant provisions

The development has been assessed against the policy measures of Clause 7.1 for information to accompany planning proposals:

Policy Measure:	Response:
a. <i>an assessment of the broader landscape (where required);</i>	A broader landscape assessment has been undertaken and is included in Section 4.0 of this report, noting the area surrounding the subject site has been assessed as Broader Landscape Type B. An outcomes-based assessment is included at Section 8.0 .
b. <i>the identification of any environmental, biodiversity or conservation values on the subject site, including vegetation that may be impacted by any proposed clearing or modification, necessary to mitigate bushfire risk;</i>	Consideration has been given to environmental, biodiversity and conservation values on the subject site in Section 3.0 of this report.
c. <i>a Bushfire Hazard Level, Bushfire Attack Level (BAL), Contour Map or BAL assessment;</i>	A BHL Map has been prepared as part of this BMP as provided in Figure 11 .
d. <i>the identification of any bushfire hazard issues arising from the assessment; and</i>	The identification and assessment of bushfire hazards relevant to the proposal are contained in Section 5.0 of this report.
e. <i>assessment against the bushfire protection criteria contained within the Guidelines, demonstrating compliance via either the acceptable solutions, or through an outcomes based approach.</i>	An assessment of the proposal against the bushfire protection criteria of the Guidelines is provided in Section 7.0 of this report.

7.0 ASSESSMENT AGAINST THE BUSHFIRE PROTECTION CRITERIA

An assessment of the proposal against the bushfire protection criteria under Section 4 of the Guidelines is contained in **Table 2** which demonstrates how the proposal meets the outcomes and acceptable solutions. Further guidance on road and water requirements, for subsequent stages of the planning process, is provided at Appendix 3.

7.1.1 Compliance table

Table 2: Assessment Against the Bushfire Protection Criteria

Bushfire Protection Criteria	Outcomes	Method of Compliance	Proposed Bushfire Management Strategies	Response
		Acceptable Solutions		
Element 1: Location	Avoid broader landscapes that present an unacceptable bushfire risk to life, property and infrastructure.	Area 1 (Urban): Does not require assessment of Element 1: Location.	The subject site is located in a Bushfire Prone Area 2.	
		Area 2: Determine the Broader Landscape Type in accordance with Appendix A.1 and proceed with the following acceptable solutions.		
		A1.1 Location		
		A1.1a Broader Landscape Type A The subject site is located in an area that is a Broader Landscape Type A. This location satisfies the policy outcome for Element 1: Location and no additional consideration is required.	NA	NA
		A1.1b Broader Landscape Type B The subject site is located in an area that is a Broader Landscape Type B which presents an unacceptable bushfire risk of a landscape-scale bushfire resulting in impacts to people, property and infrastructure. This location does not satisfy the acceptable solution for Element 1: Location.	As outlined in Section 4.1 of this report, the subject site is located in an area that is Broader Landscape Type B.	The proposal does NOT achieve acceptable solution A1.1a. An outcomes-based approach is provided at Section 8.0

Bushfire Protection Criteria	Outcomes	Method of Compliance	Proposed Bushfire Management Strategies	Response
		Acceptable Solutions		
Element 2: Siting and Design	Ensure siting and design solutions: - manage or mitigate the bushfire risk to people, property and infrastructure; and - Avoid, or where unavoidable, minimises the clearing of native vegetation.	Area 1 (Urban): Does not require assessment of Element 2: Siting and design.	The subject site is located in a Bushfire Prone Area 2.	NA
		Area 2: Proceed with the following acceptable solutions.		
		A2.1 Siting and design The areas of the subject site(s) identified for intensification and/or the future development site(s) achieve a pre- or post-development bushfire hazard level of moderate or low.	The proposed development site is within a BHL of moderate and low. Future development will be capable of being appropriately sited in a BAL-29 or below through targeted vegetation management and clearing, predominantly focussed to the south-western portions of the subject site. As outlined in Section 3.0 of this BMP, the degraded environmental condition and ecological values of existing vegetation within the subject site do not constrain future development and should therefore not prevent clearing to facilitate those works.	The proposal achieves acceptable solution A2.1.
		A2.2 Clearing of native vegetation The strategic planning proposal avoids, or where unavoidable, minimises the clearing of native vegetation.		

Bushfire Protection Criteria	Outcomes	Method of Compliance	Proposed Bushfire Management Strategies	Response
		Acceptable Solutions		
Element 3: Vehicular Access	Ensure the design and capacity of vehicular access and egress provide: - for efficient and effective evacuation to a suitable destination(s) and/or - as a contingency measure for vulnerable land uses, an on-site shelter, where demonstrated appropriate, as a last resort option.	Area 1 (Urban): Does not require assessment of Element 3: Vehicular access. Area 2: Proceed with the following acceptable solutions.	The subject site is located in a Bushfire Prone Area 2.	NA
		A3.1 Public roads Public roads, including perimeter roads should meet the technical requirements in Appendix B.3, Table 10.		
		A3.2 Access routes Public road access should be provided in two different directions, to two different suitable destinations, with an all-weather surface.	The future internal public road network will address the applicable design standards and/or local government requirements. <u>Additional mitigation measure</u> The public road network beyond the subject site, serving the wider Pickering Brook precinct is considered as part of the outcomes-based approach in Section 8.0	The proposal achieves acceptable solution A3.1.
			The public road network provides access to the west via Canning Road to Lesmurdie, Kalamunda and High Wycombe Evacuation Centre (suitable destination), and to the south via Canning Road to Roleystone and Armadale (suitable destination)*¹. <u>Additional mitigation measure</u>	The proposal achieves acceptable solution A3.2.

Bushfire Protection Criteria	Outcomes	Method of Compliance	Proposed Bushfire Management Strategies	Response
		Acceptable Solutions		
			Public road upgrades form part of the outcomes-based approach in Section 8 and in the Pickering Brook Bushfire Evacuation Technical Note included in Appendix 1 .	
		A3.3a No-through roads If the public road access to the subject site is via a no-through road which cannot be avoided due to demonstrated site constraints, the public road access is to be a maximum of 200 metres from the subject site boundary to an intersection where two-way access is provided.	NA	NA
		A3.3b No-through road requirements A no-through road is to meet all the following requirements: • requirements of a public road (Appendix B.3, Table 10, Column 2); and • turn-around area/head (Figure 30).	NA	NA

Bushfire Protection Criteria	Outcomes	Method of Compliance	Proposed Bushfire Management Strategies	Response
		Acceptable Solutions		
Element 4: Water Supply	Ensure that sufficient water is available and accessible for emergency services, to enable people, property and infrastructure to be defended from bushfire.	Area 1 (Urban): Does not require assessment of Element 4: Water supply. Area 2: Proceed with the following acceptable solutions.	The subject site is located in a Bushfire Prone Area 2.	NA
		A4.1 Water supply Evidence that a sufficient and accessible reticulated or non-reticulated water supply for bushfire firefighting can be provided at the subdivision and/or development application stage, in accordance with the specifications of the relevant water supply authority or the requirements in Appendix B.4: Water Supply dedicated for bushfire firefighting.	The subject site is serviced by a reticulated water supply <u>Additional mitigation measure</u> It is recommended that a 50, 000 litre strategic water tank be provided to support bushfire fighting in Pickering Brook.	The proposal achieves acceptable solution A4.1.

*Note¹. A suitable destination is an area that is not designated as bushfire prone on the Map of Bush Fire Prone Areas or is greater than 100 metres from classified vegetation, or 50 metres from Class G Grassland, as per AS 3959 and can provide protection during and after a bushfire event. A suitable destination is located within an urban area, townsite or similar. This also includes any evacuation centre, dedicated by the local government, for use during a bushfire event (WAPC: 2024).

The nominated suitable destinations are south to Armadale and west to Kalamunda. Although the majority of Kalamunda is identified as bushfire prone, there is a nominated evacuation centre at 200 Newburn Road, High Wycombe, which is not designated as bushfire prone and is approximately 16km from Pickering brook townsite. The nominated evacuation centre in Armadale is the Armadale Recreation Centre at 4 Mach Court.

8.0 OUTCOMES-BASED APPROACH FOR BROADER LANDSCAPE TYPE B

The Planning for Bushfire Guidelines (2024) state that strategic planning provides the best stage of the planning process to ensure future land use and development are not located in areas where the bushfire risk is extreme and/or where the bushfire risk cannot be satisfactorily managed or mitigated through the use of the bushfire protection criteria.

The subject site is located in an area that is a Broader Landscape Type B which presents an unacceptable bushfire risk of a landscape scale bushfire resulting in impacts to people, property and infrastructure. However the WAPC Bushfire Explanatory Note (2025), states that a Broader Landscape Type B is not an automatic refusal. The Guidelines provide that where the practitioner considers that further analysis could demonstrate to the decision-maker that the risks can be appropriately managed and/or mitigated, an outcomes-based approach should be prepared in accordance with policy measures 7.2 and 7.5 of SPP 3.7.

Policy measure 7.2 of SPP 3.7 states that *proposals located within Broader Landscape Type B will not be supported unless the proposal has demonstrated through an outcomes-based approach that the broader landscape risk to people, property and infrastructure is acceptable.*

The Bushfire Guidelines state that *it has become evident that risk assessments in accordance with methodologies including ISO 3100 and the National Emergency Risk Assessment Guidelines (NERAG) are complex, difficult for decision-makers to interpret and may not be suitable for land use planning decision making.*

The methodology for the following outcomes-based approach is consistent with the recommended methodology within the Bushfire Guidelines. The principles of risk assessment, including the likelihood of a bushfire impacting the area, the potential consequences to life, property and infrastructure and the mitigation measures that could be introduced to reduce the risks, form the underlying basis for the methodology.

Four different bushfire scenarios have been analysed to examine the potential impact (consequence) a bushfire will have on the proposed development site and although additional to the requirement of SPP 3.7 and the Guidelines, also considers the impacts on the whole of the Pickering Brook precinct. These scenarios demonstrate that although the broader landscape presents an extreme broader landscape risk, the risks to people, property and infrastructure from a bushfire, can be managed to an acceptable level, through evacuation to suitable destinations on existing roads, and through the implementation of various mitigation measures.

8.1 SPP 3.7 Policy Measures for an Outcomes-based Approach

8.1.1 Address the acceptable solutions to the greatest extent possible

The Working Group considered six different parcels of land for residential development, within and adjoining the Pickering Brook townsite. In their 2020 BMP, Emerge Associates undertook a detailed risk assessment for each of the sites considering the bushfire (fuel) hazards within and adjoining each site, access to the public road network and ability for each site to achieve BAL-29 or below. Emerge Associates and subsequently the Working Group determined that the subject site satisfies all of the requirements of SPP 3.7 (2015), including Element 1: Location as the subject site contains and is directly surrounded by predominantly BHL – low or moderate.

The subject site has now been assessed against SPP 3.7 (2024) and the Bushfire Protection Criteria within the Bushfire Guidelines (2024). **Table 4** demonstrates how the proposal complies with the acceptable solutions for Element 2 – siting and design, Element 3 – vehicular access and Element 4 – water supply.

The 2024 version of SPP 3.7 and the Bushfire Guidelines include a broader landscape assessment to demonstrate compliance with Element 1: Location.

8.1.2 Identify the non-compliance with the acceptable solutions and why these cannot be achieved

The subject site is within an area which is Broader Landscape Type B. The Broader Landscape Type B has been triggered due to the vegetation type within the broader landscape, and to a lesser extent, proximity to a suitable destination being more than 10km.

Kalamunda and Lesmurdie, both suitable destinations, are 10km west of the subject site, and Armadale, also a suitable destination, is approximately 20km south of the subject site. It is therefore important that the road network provides for efficient evacuation of the existing and proposed community, whilst providing for access for emergency services vehicles to utilise the road network for bushfire response.

Improvements to the road network will not change the distance to suitable destinations, but will improve the capability of the road network to provide for efficient evacuation of the area to these suitable destinations.

Vegetation beyond the subject site, within the broader landscape is within private properties and Crown land reserves, including Mundaring State Forest and Greenmount Nature Reserve. Most of the Crown land in the area is identified as 'Priority management area' and actively managed by the Department of Biodiversity, Conservation and Attraction (DBCA). Further information is provided below.

Land under private ownership surrounding the subject site consists of the Pickering Brook townsite and rural zoned lots, many of which contain operating and non-operating orchards. The orchards in Pickering Brook and surrounds have been in operation since the arrival of the European settlers. Clause 2.2.3.2 Australian Standard 3959 allows for the exclusion of orchards and vineyards, as low threat vegetation, due to factors such as flammability, moisture content and fuel load.

It is noted that DFES did not support these orchards as an exclusion without evidence they were being managed in a low threat state. As such these lots have been mapped as 'mosaic', which within the broader landscape assessment methodology, includes rural living lots, and 'unmanaged grassland', which could represent an orchard once the trees are removed and the ground is bare. Either way, this BMP is not disputing the extreme risk presented by the broader landscape.

Improved management on private land can be achieved by community education programs, and enforcement of the fire break notice and improved management of Crown reserves, will reduce the impact of a bushfire on the town and precinct, however it is unlikely to change the vegetation classifications within the broader landscape assessment.

8.1.3 Detail how the design addresses bushfire risk and where additional bushfire risk management measures have been deemed necessary and included to minimise risk

The Pickering Brook Townsite Bushfire Risk Assessment (Emerge 2020) considered the likelihood and consequential impact of a bushfire that may threaten the townsite, and drew upon historical bushfire information for the area. The Emerge Assessment identified that a bushfire was likely to occur on average every five years and that the consequence could be catastrophic with fatalities and loss of buildings to be expected unless exposure is managed successfully. This conclusion is supported.

Exposure is considered in two parts within this outcomes-based approach – reducing exposure of future and existing residents and visitors to the area to a bushfire, by demonstrating efficient evacuation is available; and secondly, reducing exposure of the proposed development, and in part, the townsite, to a bushfire.

DFES contend that the proposal should not be supported as it does not satisfy SPP3.7 and “avoid broader landscapes that present an unacceptable bushfire risk”. The SPP3.7 Policy Objective provides further guidance on risk and states “Avoid the bushfire risk in the first instance, but where unavoidable, manage and/or mitigate the risk to people, property and infrastructure, to ensure the risks are acceptable and appropriate to the land use and the location”.

Acceptable risk is the level of potential harm or financial loss that an individual, organisation or society is willing to tolerate. Determining this level is difficult to quantify and involves value judgement that often varies between decision-makers and affected parties. For instance, Emergency Services typically demand a low threshold for bushfire risk, aiming to avoid it entirely. Land-use planning considers competing factors, including land release, environmental protection, social and economic development. As discussed in State Planning Policy 2.5 Rural Planning and advocated within the Bushfire Guidelines, consolidation and expansion of existing settlements can facilitate additional funding to better foster robust bushfire resilient communities.

Consequently, when evaluating acceptable risk, decision-makers should also consider benefits of the proposed townsite expansion to the existing and future residents. Benefits to the existing townsite and the Pickering Brook precinct are discussed further in **Section 8.1.4**.

The bushfire risk is existing and the proposed townsite expansion aims to reduce this risk to the existing community through various mitigation measures. Risks to the proposed development and new residents will be mitigated through compliance with the acceptable solutions, including the provision of reticulated water, legible internal road network and importantly the new homes will be constructed to the appropriate bushfire construction standard.

The following mitigation measures, in addition to those measures required by SPP 3.7, have been identified to manage and mitigate the bushfire risk to people, property and infrastructure:

- Installation of a 50, 000 litre strategic bushfire water tank on the subject site, to supplement the reticulated fire hydrants within the road reserves;
- The following targeted road upgrades, identified within the Pickering Brook Bushfire Evacuation Technical Note included in **Appendix 1**, to improve evacuation efficiency and emergency vehicle access within the wider Pickering Brook precinct:
 - Two culverts on the bend just north of Pickering Brook Road on Bracken/Patterson Road may constrain evacuation and emergency vehicle access. These culverts should be

extended and the carriageway widened to at least 7.0m, and potentially wider, having regard to the horizontal geometry of the road at this location.

- The sealed carriageway width of the eastern section of Walnut Road, west of its intersection with Patterson Road, is approximately 5.5 m. While this may be adequate for one-way evacuation, it may limit the ease and safety of concurrent use as an emergency vehicle access route. The sealed carriageway should be widened to at least 6.0m.
- The sealed carriageway width of the northern section of Patterson Road, south of its intersection with Walnut Road, is approximately 5.5m. While this may be adequate for one-way evacuation, it may limit the ease and safety of concurrent use as an emergency vehicle access route. The sealed carriageway should be widened to at least 6.0m.
- Glenisla Road generally meets or exceeds the sealed width of 6.0m, recommended by the Bushfire Guidelines. However, roadside hazards were noted towards its northern end, including trees, power poles and unrecoverable batters, with no formal protection. To improve road-user safety and emergency access, edge lines, additional signage, and vegetation management, pruning and, where necessary, removal is recommended.
- Signage plays an important role in bushfire risk mitigation. In the event of a bushfire, people can become disorientated and legible directional signage is necessary to ensure people are directed to the safest destination. The following signage improvements are recommended to improve clarity during evacuation:
 - The initial southern section of the Patterson Road evacuation route is currently signposted as Bracken Road, before Bracken Road branches east. This may cause confusion, particularly for drivers unfamiliar with the local road network or under emergency conditions. It is recommended that this section be reviewed and, where appropriate, renamed and signposted as part of the Patterson Road route.
 - Directional signage at the Patterson Road turn-off to Canning Road south is not sufficiently clear. It is recommended that signage at this location be reviewed, relocated where necessary, and upgraded to clearly identify Canning Road south as a southern evacuation route.
 - A number of no-through roads occur within the Pickering Brook area. Although several are signposted, it is recommended that no-through road signage be audited and upgraded where required, including through additional signs to reduce the risk of drivers entering unsuitable routes during an emergency.
- Preparation of a Bushfire Risk Management (BRM) Plan for Pickering Brook. A BRM Plan assists a local government to identify, assess, prioritise, treat and monitor bushfire risk throughout its local government area. A BRM Plan has been developed for Kalamunda; however this does not include Pickering Brook townsite or precinct. DFES Rural Fire Division and regional offices, offer support to local governments to identify and assess bushfire risks and treat risks through the development of BRM Plans. DFES recommend that local governments with significant bushfire risk develop and implement a BRM Plan.
- Maintaining hazard separation around the subject site and the Pickering Brook townsite. There are existing significant areas of Crown land in the area, which are identified as a Priority Management Area by DBCA. These areas are managed by DBCA and form part of

the annual works program. The existing urban and rural land forming the Pickering Brook townsite and surrounds are mapped as low and moderate BHL. The land parcels highlighted in red in **Figure 12** are both Crown land, with the eastern site (Lot 81 Cunnold Street), identified as Rural under the MRS and Rural Conservation under the City's Local Planning Scheme No. 3. It is understood that this parcel is not part of the DBCA burn program and instead, managed by DFES through mosaic burning. The smaller parcel adjoining the subject site to the south (Reserve 47881), is managed by DBCA as part of their burn program.

- Community engagement and training. Residents within Pickering Brook are aware of the bushfire risks, however new residents to the area, should be provided with adequate information about what to do in the event of a bushfire. Work could also be undertaken to identify cost effective retrofitting measures that could be implemented for existing houses, to reduce the risk of ember attack and radiant heat.
- Construction of new homes to the appropriate assessed BAL, under AS3959. In instances where the assessed BAL is BAL-low, a condition of development approval is for the building to be constructed to a minimum standard of BAL-12.5, which primarily addresses ember attack.

The mitigation measures required at the different stages of the planning process are set out in **Section 9.0**, including timing and responsibilities for implementation.

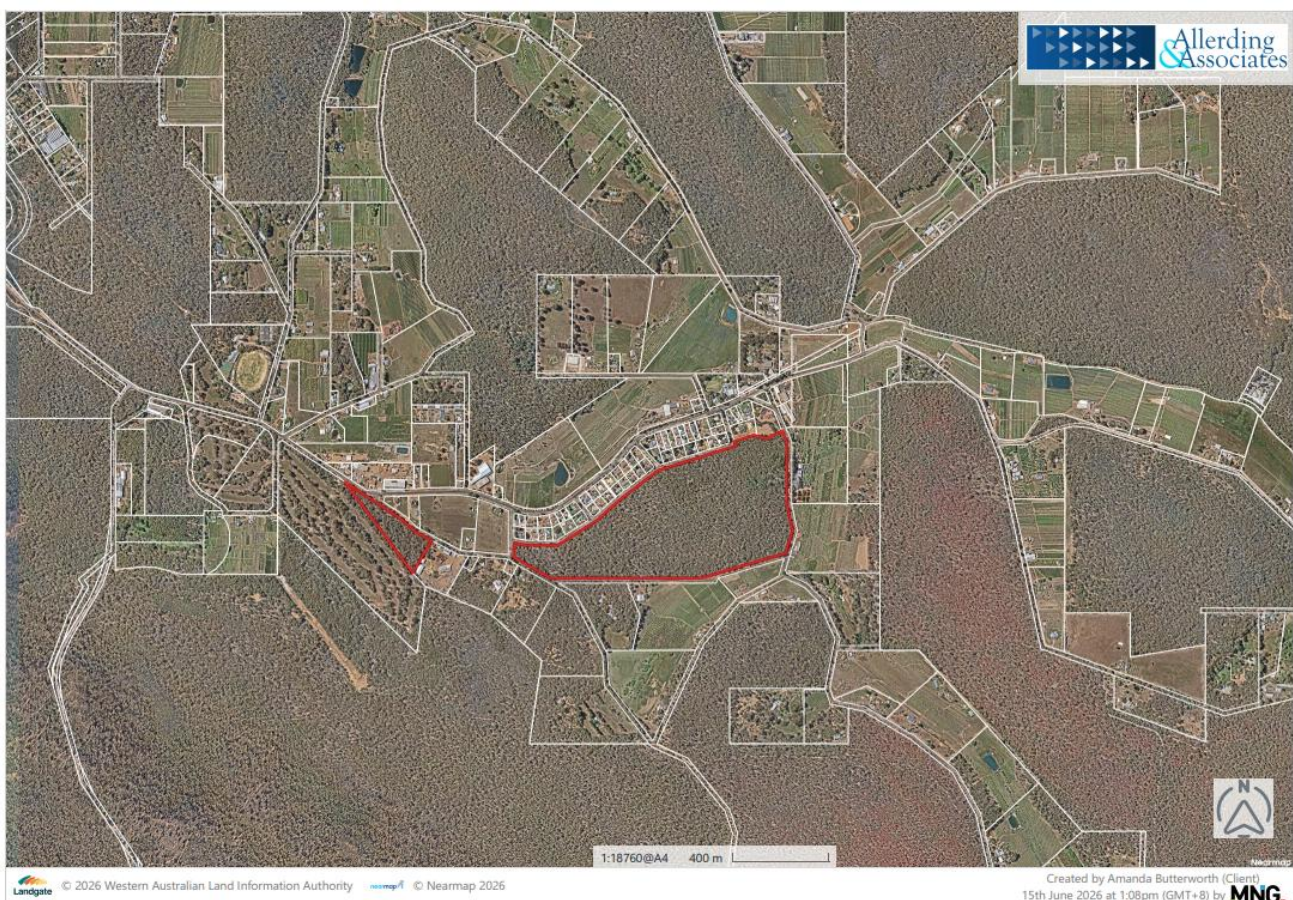


Figure 12: Hazard separation

8.1.4 Detail community net benefits such as improvements to the public road network

In recognition of the extreme bushfire risk presented by the broader landscape, any expansion of the Pickering Brook townsite will need to reduce this risk, to the lowest possible level, through the implementation of the measures identified above. The additional bushfire risk mitigation measures will not only enhance bushfire resilience for the future development area associated with the MRS amendment but will also deliver wider community benefits that provide for a more sustainable townsite and wider area, in general.

The sustainability of the townsite and the precinct as a whole, has been previously considered in reports, including the Pickering Brook Townsite Sustainability Assessment (Macroplan, April 2020), prepared for the DPLH on behalf of the Pickering Brook and Surrounds Working Group. The report estimated townsite expansion within the subject site, would yield a population of 131, resulting in approximately 14 primary school aged children.

Community consultation to support the development of the Sustainability Assessment, identified that economic development and (bushfire) security are identified by residents, as the most important categories for the on-going sustainability of the town.

Community bushfire security (resilience)

SPP 3.7 will require mitigation measures at the structure plan and/or the subdivision stage of the process. These measures will be specific to the development site and include internal roads, provision of reticulated water to the new dwellings and dwellings constructed to the appropriate bushfire construction standard. The clearing of unmanaged grassland and any other vegetation within the subject site, and the construction of bushfire resilient dwellings, built to the appropriate BAL level (and above), will provide a built form interface that improves the bushfire resilience of the existing townsite. If a bushfire were to impact the subject site, the likelihood of house to house transfer of fire is reduced, which in turn will reduce the penetration of the fire into the townsite.

This BMP includes bushfire mitigation measures that are over and above the requirements of SPP 3.7. These are discussed in **section 8.1.3**. The community benefits are discussed below.

- The road upgrades, including signage and verge vegetation management, identified within the Pickering Brook Bushfire Evacuation Technical Note (2026), will improve evacuation efficiency for the townsite and the wider Pickering Brook precinct. Road upgrades will also provide increased confidence for tourists and tourism operators within the area and improve the reliability of the road network for emergency services, to fight the fire.
- A Bushfire Risk Management Plan will provide a framework that identifies risks facing the townsite and the potentially the precinct, and prioritise mitigation and management measures, such as fuel load management within Crown reserves that could reduce the risks of a bushfire impacting the town or the wider precinct.
- The provision of a 50, 000L strategic water tank within the subject site, will ensure there is a back-up water supply for firefighting purposes, to service the wider precinct. A strategic water tank will be a condition of subdivision approval, paid for by the developer and ceded to the local government, for on-going care and control.

- The prioritisation of fuel management within Lot 81 Cunnold Street and Reserve 47881, in the Pickering brook townsite could result in improved bushfire resilience of the townsite, by slowing and reducing the impact of a bushfire of the townsite.

The Macroplan Sustainability Assessment identified that an additional 131 residents would have the following economic and social benefits on the Pickering Brook townsite and wider precinct.

Economic benefits

- Increased residents in Pickering Brook should encourage local spending to increase.
- The increased availability of land for residential holdings will reduce housing availability pressures for people who want to move into the area.
- An additional local labour force may also assist businesses in the area needing employees.

Social infrastructure benefits

- Some form of development in the area should encourage the revitalisation of Pickering Brook through greater participation in local activities/facilities.
- There is potential for new development to attract families and increase enrolments at the Pickering Brook Primary School.
- With more people in the area, some income from the additional residents will then be injected into local business.

8.1.5 *Include fire engineering solutions or written evidence such as publications and State Administrative Tribunal decisions to support the proposal (where appropriate)*

In their Peer Review, Meridian Urban stated that bushfire scenario modelling is an emerging field. Methodologies including the SPARK modelling utilised for North Stoneville Structure Plan, were not supported by DFES or the WAPC. A decision by the State Administrative Tribunal (SAT) of the North Stoneville Structure Plan, has not yet been made.

In the absence of any agreed or established methodology, this BMP has utilised the methodology recommended by the Bushfire Guidelines – assessment of the potential bushfire scenarios.

The purpose of the analysis is to model the evacuation of residents to a suitable destination, if a bushfire were to arrive from different directions and block road access.

This type of bushfire scenario modelling provides a clear representation of the different bushfire scenarios, whether deemed likely (from the South) or unlikely (from the North); and the available evacuation routes. Through this modelling the BMP has identified the necessary road and/or verge upgrades or modifications necessary, to ensure the existing road network can provide for efficient and effective evacuation, while providing for access by Emergency Services vehicles, in the event of various bushfire scenarios.

8.1.6 *Outline how the policy outcomes have been achieved*

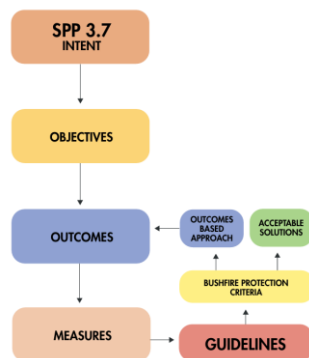
The Planning for Bushfire Guidelines (2025), state that the bushfire protection criteria are an outcomes-based system of assessing bushfire risk management, divided across four Elements – location, siting and design, vehicular access and water supply. Each Element is achieved by demonstrating compliance with one of the following:

- a) Acceptable solution(s)
- b) Outcomes-based approach

c) A combination of (a) and (b).

The Guidelines state that an outcomes-based approach can be used where compliance with the acceptable solutions cannot be achieved due to demonstrated site constraints or environmental values (including where existing native vegetation cannot be cleared), and where the bushfire planning practitioner is of the expert opinion that the SPP 3.7 outcomes can still be demonstrated.

The diagram below is from the Guidelines and shows the inter-relationship between the intent, objectives, outcomes and measures.



The overarching intent of SPP3.7 is to *implement effective, risk-based land use planning and development which in the first instance avoids the bushfire risk, but where unavoidable, manages and/or mitigates the risk to people, property and infrastructure to an acceptable level. The preservation of life and the management of bushfire impact are paramount.*

In relation to this strategic planning proposal, the relevant objectives of SPP3.7 include:

- 5.1 *Avoid the bushfire risk in the first instance, but where unavoidable, manage and/or mitigate the risk to people, property and infrastructure, to ensure the risks are acceptable and appropriate to the land use and the location.*

The relevant policy outcome which contributes to the above policy objective includes:

- 6.1 *Avoid broader landscapes that present an unacceptable bushfire risk to people, property and infrastructure.*

In relation to the broader landscape considerations, the following policy measure addresses the above policy objective and outcome:

- 7.2 i *Proposals located within a Broader Landscape Type B in accordance with the methodology within the Guidelines, will not be supported unless the proposal has demonstrated through an outcomes-based approach that the broader landscape risk to people, property and infrastructure is acceptable.*

The policy outcome and objective require demonstration that the bushfire risk is acceptable. The concept of acceptable risk has been explored in the previous sections of this BMP. In summary, while the proposal does place people, property and infrastructure at risk, the bushfire risk will be reduced to the lowest practicable level, which is acceptable to the current and future residents of the townsite and the broader precinct. This is due to the improved bushfire resilience, through additional management and mitigation measures; and sustainability benefits for the existing Pickering Brook townsite and wider precinct.

8.1.7 Outline why approval is warranted by the decision-maker in this instance

The Pickering Brook and Surrounds Sustainability and Tourism Strategy – Part 1 – Pickering Brook Townsite (WAPC, November 2020) (Sustainability and Tourism Strategy) and the City of Kalamunda Local Planning Strategy identify a *“potential opportunity to increase the size of the existing townsite and subsequent additional population to support and grow existing services and facilities, provide a wider variety of housing options and generally revitalise the townsite that is in decline”*.

The Pickering Brook Working Group consisted of representatives from City of Kalamunda, DPLH and various State government agencies. The Working Group resolved to support the townsite expansion and that the concerns raised by DFES could be addressed through the preparation of a traffic and evacuation plan. This BMP supports the recommendations of the Working Group and has provided the traffic and evacuation plan.

This BMP also supports the findings of the Macroplan Sustainability Assessment, which concludes that the recommendations developed by the Working Group are a balanced consideration of the strategic local need for a relatively small but worthwhile townsite expansion.

This BMP addresses the issues raised by the WAPC in its consideration of the MRS Amendment on 28 January 2026, including addressing the revised 2024 SPP 3.7, which incorporates a broader landscape assessment and outcomes-based approach.

The proposal does not represent isolated greenfield development, rather, it constitutes the logical expansion of an established townsite, where existing and proposed development, supporting infrastructure, and management regimes can be integrated to improve bushfire resilience at both the site and townsite scale.

The proposed townsite expansion allows for the coordinated implementation of bushfire mitigation measures that provide broader community-wide bushfire resilience, social and economic benefits not only for the proposed development area, but for the existing Pickering Brook townsite and wider precinct. Collectively, these measures are intended to reduce exposure to bushfire attack, improve emergency access and evacuation capacity, and strengthen the ability of emergency services to defend the townsite and precinct, during bushfire events.

Accordingly, while the site is located within a Broader Landscape Type B, the outcomes-based approach demonstrates that the risk of a bushfire impacting on life, property or infrastructure, can be reduced to the lowest practicable level, consistent with the intent of SPP 3.7, and that the proposal represents a net improvement in bushfire resilience and economic and social benefits for the Pickering Brook community.

8.2 Bushfire scenarios

8.2.1 DFES and Meridian Urban comments

DFES and Meridian Urban recommended that any intensification of the townsite area should ensure that the capacity of the broader road network is sufficient to enable effective evacuation and access by emergency services in the event of a bushfire. Meridian Urban commented that evacuation considerations of the Emerge BMP should be continued to be built upon. Evacuation is a growing consideration for strategic land use planning, as it is directly associated with the analysis of potential risk to life.

Meridian Urban also noted that the accuracy of the assessment made in relation to evacuation will be dependent on a fit-for-purpose bushfire evacuation traffic study. Such a study will need to be informed by technical bushfire planning input to guide the nature of inputs and assumptions used to perform evacuation traffic modelling.

8.2.2 *Bushfire scenario modelling*

Bushfire scenario modelling has been undertaken to demonstrate that in the event of a bushfire, the road network has sufficient capacity to provide for the evacuation of the 1,020 existing vehicles within the Pickering Brook townsite and precinct, which includes approximately 570 residents, 250 external workers and 200 tourists or other visitors. The modelling also demonstrates that the additional 110 vehicle movements associated with the 44 residential lots anticipated as part of the proposed MRS amendment, totalling 1,130 vehicles, can be evacuated from the Pickering Brook townsite within a reasonable period of time. Consideration has also been given to future growth within the area of permanent residents and tourists. The calculations have been based on 2,000 vehicles within the townsite and the precinct.

Previous studies, including the Emerge BMP found that bushfires predominantly arrive from the south, west and east, and are rare from the north and north-east. Irrespective of likelihood, four scenarios have been undertaken that consider bushfire behaviour, and likely impact on the road network and options for evacuation.

Anticipated bushfire behaviour considers vegetation type, contiguity, potential for ember attack and the BHL mapping undertaken by Emerge, which considers slope under vegetation. These are presented diagrammatically at **Figures 13, 14, 15 and 16** and **Appendix 4** and discussed below.

The Pickering Brook Bushfire Evacuation Technical Note prepared by Donald Veal Consultants (2026) provides detailed analysis of the road capacity and evacuation potential (refer **Appendix 1**). The Technical Note has used the figures provided by Meridian Urban in their Peer Review as follows:

- 12% stated that they would leave early;
- 24% intended to wait to see whether a fire started, and then leave if it did;
- 27% stated they would prepare to stay and defend their properties; and
- 24% were uncertain as to their likely course of action.

It is noted that this does not add up to 100%.

The Technical Note assumes, as a worst-case scenario, that the vast majority of the residents, the visitors, the workers and the tourists, will all leave together, within a short window of time.

Whilst it is expected that the majority of vehicles being used to evacuate will be standard sedans, 4WDs and SUVs, the Technical Note has provided for a proportion of vehicles towing trailers, caravans and horseboxes.

The majority of the vehicles leaving the area will need to use Pickering Brook Road in order to access evacuation routes. The road is designated as a Local Distributor that is constructed as a two-lane undivided highway, partly kerbed, with one lane in each direction. The sealed road pavement width is generally 7.0m and complies with the 6.0m horizontal clearance requirements of the Guidelines.

The Technical Note has also considered the possibility that residents (and others) will be evacuating the area whilst emergency services vehicles are heading into the area. Given the road network around Pickering Brook, and the lack of access from the east, the nearest fire stations to the area are generally to the north and west, noting that in a significant bushfire event, DFES resources may come from further afield.

Generally, however, the most likely access route into the area would be via Canning Road, either from the west or the south. Both roads are of a suitable width and geometry to allow simultaneous access and egress by emergency vehicles and those evacuating the area.

Should a section of Canning Road become inaccessible, alternative routes would include Carmel Road, Lawnbrook Road, Glenisla Road, Walnut Road and Patterson Road.

As detailed below, the Technical Note has identified some 'pinch points' along some of these roads that may make simultaneous use more difficult. Upgrades to these sections of road are included within the implementation section of this BMP.

Bushfire scenario 1 (Fire activity advance from north-east):

A bushfire advancing from the north or north-east (refer **Figure 13**) is considered less likely than scenarios associated with prevailing summer conditions. However, under severe fire weather, including trough-driven conditions that may generate hot, dry and gusty winds from the north or north-east, a fire in this sector could develop into a landscape-scale event within Mundaring State Forest. This risk is influenced by the extent of contiguous Class A Forest vegetation and the extreme BHL values identified within the broader landscape.

As a fire front advances towards the Pickering Brook townsite and the proposed expansion area, areas of low and moderate BHL associated with existing development, orchards and managed land along parts of the road network may assist in moderating fire behaviour. These areas may provide opportunities for suppression activities and may reduce the continuity of fuel between the broader forested landscape and the townsite interface.

Ember attack remains likely under this scenario. Future dwellings within the expansion area will therefore need to be constructed in accordance with AS 3959 bushfire construction requirements applicable to their assessed BAL rating. The presence of lower and moderate BHL corridors along parts of the road network also provides a degree of hazard separation between the broader bushfire hazard and the townsite.

In the event of a landscape-scale bushfire approaching from the north or north-west, the principal evacuation options from the existing and proposed townsite expansion would be to the west via Canning Road (identified as Route 1 in the Technical Note, and in **Table 3** of this BMP), towards Lesmurdie and Kalamunda, and to the south via Canning Road (Route 2), towards Roleystone and Armadale, subject to prevailing fire behaviour, road conditions and emergency services direction.

Canning Road being a Regional Distributor, is constructed to a two-lane undivided highway, with one lane in each direction. The road pavement width is 7.0m wide and generally carries around 3,000 to 6,000 vehicles per day. The Technical Note concludes that Canning Road (west and south) has the capacity to handle the evacuation volumes in addition to typical volumes on the route, noting the need for improved directional signage to Canning Road south.

Bushfire scenario 2 (Fire activity advance from north-west):

A bushfire advancing from the north-west or west (refer **Figure 14**) is considered less likely than scenarios associated with prevailing summer conditions. However, under severe fire weather, including conditions that may generate hot, dry and gusty winds from the north-west or west, a fire in this sector could still develop and advance towards the Pickering Brook townsite and the proposed expansion area.

The north-western and western approach to the townsite contains patches of Class A Forest vegetation classified as extreme BHL, interspersed with and fragmented by significant areas of low and moderate BHL associated with the outer suburbs of Mundaring, rural land, orchards along Glenisla Road and managed land extending east towards the Pickering Brook townsite. The band of low and moderate BHL between Western Road and Repatriation Road provides a degree of hazard separation between the townsite, the proposed expansion area and a potential bushfire approaching from the north-west or west. This separation is approximately 600 metres wide on average.

As a fire front advances through this fragmented landscape, areas of low and moderate BHL, existing development, orchards and managed land may assist in moderating fire behaviour. These areas may also provide opportunities for suppression activities and may reduce the continuity of fuel between the broader forested landscape and the townsite interface.

Ember attack remains likely under this scenario. Future dwellings within the expansion area will be constructed in accordance with AS 3959 bushfire construction requirements applicable to their assessed BAL rating, which will mitigate this risk. The presence of low and moderate BHL areas along parts of the western and north-western interface, including the hazard separation described above, may also reduce ember exposure and provide a degree of separation between the broader bushfire hazard and the townsite.

In the event of a bushfire approaching from the north-west or west, the principal evacuation options from the existing and proposed townsite expansion would be to the south via Canning Road (Route 2 in the Technical Note and **Table 3** of this BMP) towards Roleystone and Armadale, and to the north via Pickering Brook Road and Patterson Road (Route 4) towards Mundaring Weir or along Walnut Road to Kalamunda, subject to prevailing fire behaviour, road conditions and emergency services direction.

As detailed above, Canning Road (south) is a Regional Distributor, and is constructed as a two-lane undivided highway, with one lane in each direction. The road pavement width is 7.0m wide and generally carries around 3, 000 to 6, 000 vehicles per day. In the event that Canning Road is no longer available for evacuation, the alternative is Patterson Road.

The Technical Note states that Patterson Road, is constructed as a two-lane undivided highway, with one lane in each direction. The southern section achieves 6m sealed pavement width, with sealed shoulders, but further north is reduced to a pavement width of 5.5m.

Patterson Road is designated as an Access Road, under care and control of the Local Government. The Technical Note concludes that the sections of the road that are 5.5m wide are likely to restrict traffic flow. Walnut Road, west of Patterson Road intersection, is also designated as an Access Road, with a 5.5m pavement seal, which some large trees along the northern edge and an open drain along the south.

The Implementation section of this BMP and the Technical Note require the widening of these roads to a minimum 6m seal.

Bushfire scenario 3 (Fire activity advance from south-east):

A bushfire advancing from the east or south-east (refer **Figure 15**) is considered a credible scenario under typical summer prevailing wind conditions. Under severe fire weather, a fire in this sector could develop into a landscape-scale event within the surrounding Mundaring State Forest and adjoining forested reserves. This risk is influenced by the extent of contiguous Class A Forest vegetation and the extreme BHL values identified within the broader landscape.

As a fire front advances towards the south-eastern interface of the Pickering Brook townsite and the proposed expansion area, areas of low and moderate BHL associated with existing development, orchards and managed land may assist in moderating fire behaviour. These areas may provide opportunities for suppression activities and may reduce the continuity of fuel between the broader forested landscape and the townsite interface.

Ember attack remains likely under this scenario. Future dwellings within the expansion area will be constructed in accordance with AS 3959 bushfire construction requirements applicable to their assessed BAL rating, which will mitigate this risk. The presence of low and moderate BHL areas along parts of the south-eastern interface and road network may also provide a degree of hazard separation between the broader bushfire hazard and the townsite.

In the event of a bushfire approaching from the east or south-east, the principal evacuation options from the existing and proposed townsite expansion would be to the west via Canning Road (Route 1 in the Technical note and **Table 3** of this BMP) towards Lesmurdie and Kalamunda, and to the north via Pickering Brook Road and Patterson Road (Route 4) towards Mundaring Weir or along Walnut Road to Kalamunda, subject to prevailing fire behaviour, road conditions and emergency services direction.

As detailed above, Canning Road has sufficient carrying capacity to provide for evacuation. Glenisla Road provides an additional evacuation route north of Canning Road (west). Glenisla Road is a Regional Distributor Road and has sufficient capacity to cater for the required traffic volumes.

As stated above, Patterson Road is constructed as a two-lane undivided highway, with one lane in each direction. Upgrades to widen the northern routes is identified within the implementation table of this BMP and the Technical Note.

Bushfire scenario 4 (Fire activity advance from south-west):

A bushfire advancing from the south or south-west (refer **Figure 16**) is considered likely under typical summer prevailing wind conditions. Under severe fire weather, a fire in this sector could develop into a landscape-scale event within the surrounding Greenmount National Park, Korung National Park, Mundaring State Forest and adjoining forested reserves. This risk is influenced by the extent of contiguous Class A Forest vegetation and the extreme BHL values identified within the broader landscape.

As a fire front advances towards the south-western interface of the Pickering Brook townsite and the proposed expansion area, areas of low and moderate BHL associated with existing development, orchards, managed land and the Pickering Brook Golf Course may assist in moderating fire behaviour. These areas may provide opportunities for suppression activities and may reduce the continuity of fuel between the broader forested landscape and the townsite interface. The Pickering Brook Golf Course and Pickering Brook Road also provide a degree of hazard separation between the broader bushfire hazard and the proposed townsite expansion.

Ember attack remains likely under this scenario. Future dwellings within the expansion area will be constructed in accordance with AS 3959 bushfire construction requirements applicable to their assessed BAL rating, which will mitigate this risk. The presence of low and moderate BHL areas along parts of the south-western interface, together with the Pickering Brook Golf Course, Pickering Brook Road and adjoining managed land, may also provide a degree of hazard separation between the broader bushfire hazard and the townsite.

In the event of a landscape-scale bushfire approaching from the south or south-west, the principal evacuation options from the existing and proposed townsite expansion would be to the west via Canning Road (identified as Route 1 in the Technical Note and **Table 3** of this BMP) towards Lesmurdie and Kalamunda, and to the north via Glenisla Road. A third option is east along Pickering Brook Road, north onto Patterson Road and west onto Walnut Road towards Kalamunda (Route 4). An additional option may be available via Patterson Road and Lockwood Road towards Mundaring Weir.

As detailed above, the Technical Note found that Canning Road (west) has sufficient carrying capacity to provide for evacuation, and Glenisla Road provides an additional evacuation route north of Canning Road (west). Glenisla Road is a Regional Distributor road and has sufficient capacity to cater for the required traffic volumes.

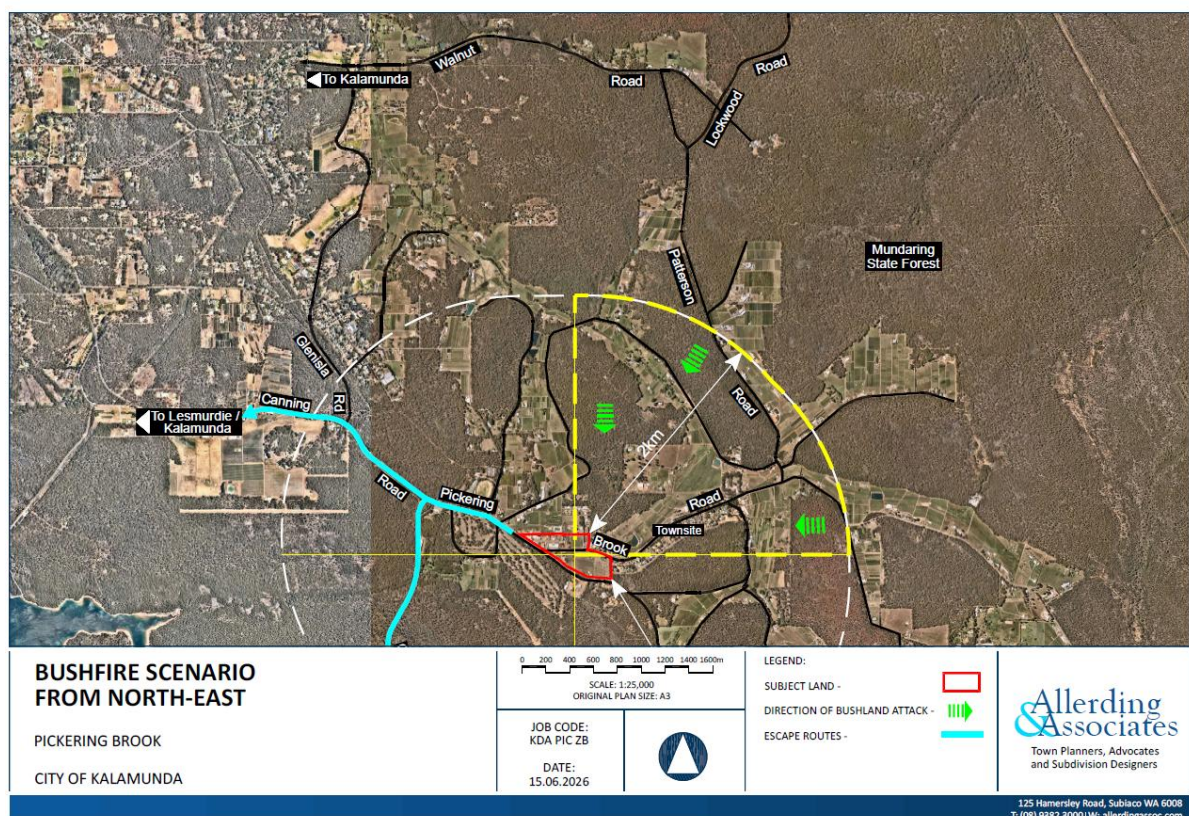


Figure 13: Bushfire scenario 1 (North-east)

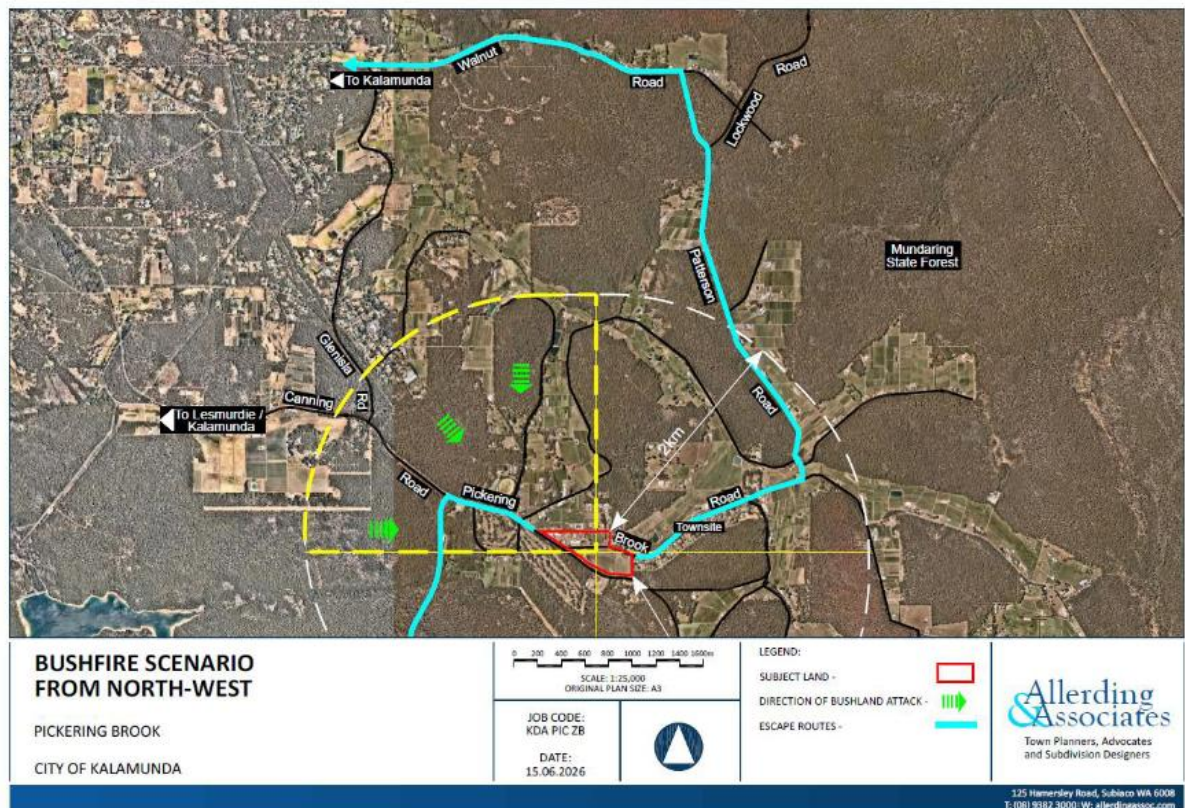


Figure 14: Bushfire scenario 2 (North-west)

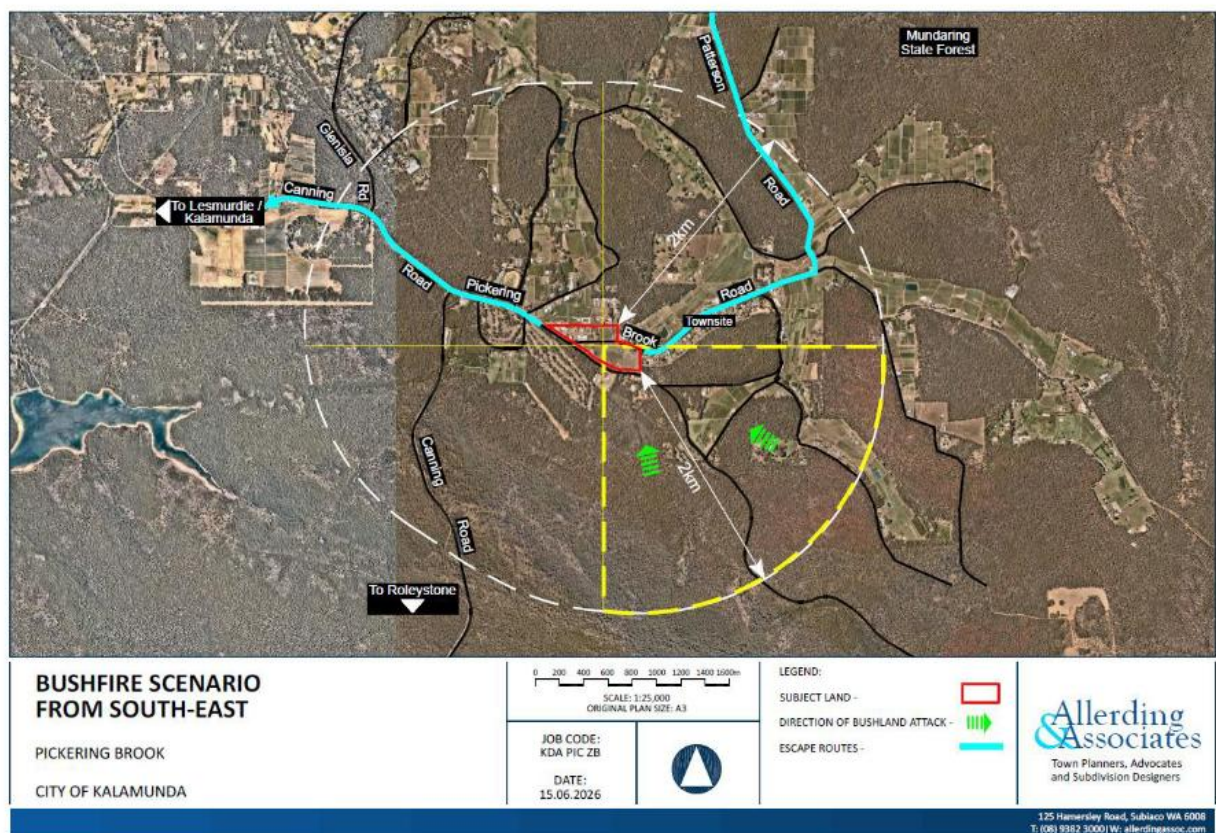


Figure 15: Bushfire scenario 3 (South-east)

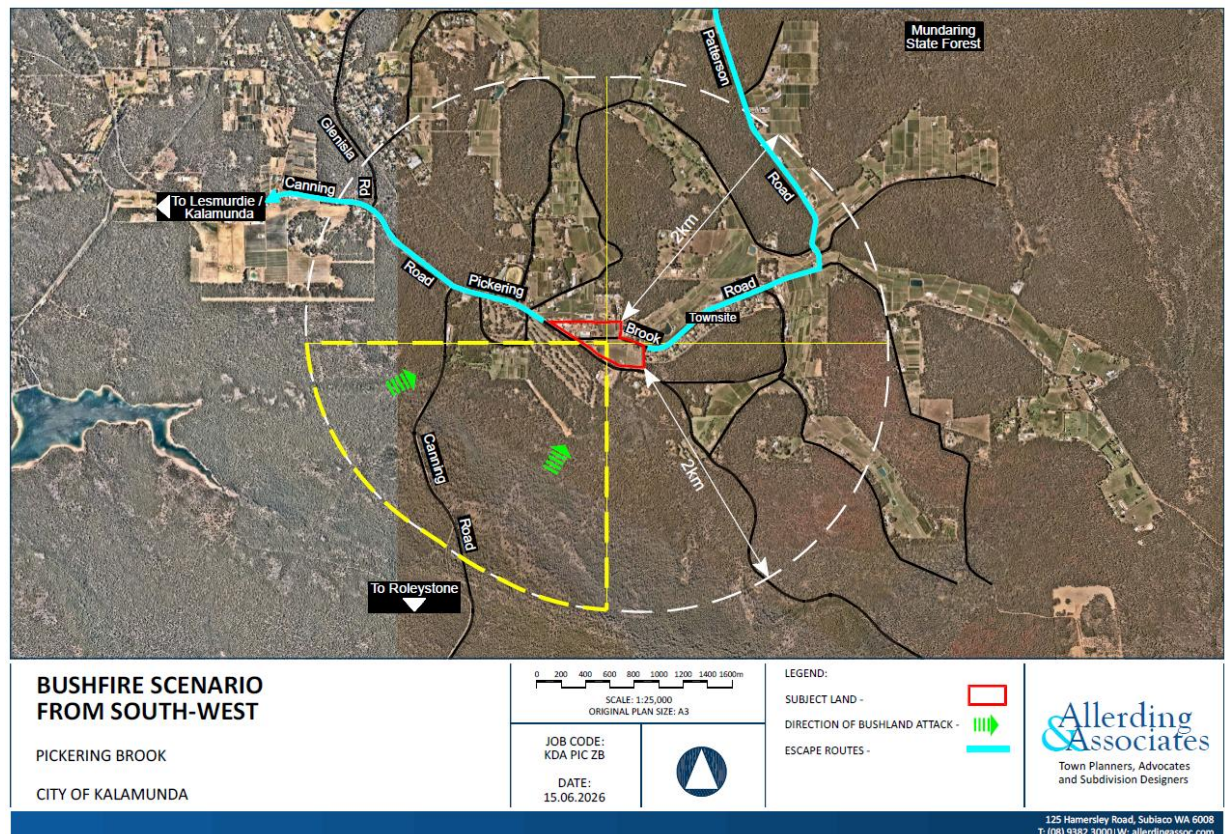


Figure 16: Bushfire scenario 4 (South-west)

Table 3: Evacuation Options

Evacuation scenario	Current level of development (1,020 vehicles)	Post – MRS Amendment development (1,130 vehicles)	Future Scenario: Current x2 (2,000 vehicles)
Initial exit from the Townsite – all vehicles (20 km/h)	Maximum of 1 hour	Maximum of 1 hour	Potentially over 1 hour
Initial exit from the Townsite – staged (30 km/h)	Up to 40 minutes	Up to 45 minutes	Potentially within 1 hour
Bushfire scenario 1 - bushfire from the north-east			
Route 1	15 minutes (40 km/h)	15 minutes (40 km/h)	20 minutes (30 km/h)
Route 2	12 minutes	12 minutes	16 minutes

	(40 km/h)	(40 km/h)	(30 km/h)
Bushfire scenario 2 – from the north-west			
Route 2	12 minutes (40 km/h)	12 minutes (40 km/h)	16 minutes (30 km/h)
Route 4	26 minutes (30 km/h)	26 minutes (30 km/h)	39 minutes (20 km/h)
Bushfire scenario 3 from the South-east			
Route 1	15 minutes (40 km/h)	15 minutes (40 km/h)	20 minutes (30 km/h)
Route 4	26 minutes (30 km/h)	26 minutes (30 km/h)	39 minutes (20 km/h)
Bushfire scenario 4 – from the south-west			
Route 1	15 minutes (40 km/h)	15 minutes (40 km/h)	20 minutes (30 km/h)
Route 4	26 minutes (30 km/h)	26 minutes (30 km/h)	39 minutes (20 km/h)

Table 3 has been adapted from Table 7.1 of the Pickering Brook Bushfire Evacuation Technical Note, Page 30 (refer **Appendix 1). The route characteristics and capacity are detailed in Sections 6.1 and 6.2 of the Technical Note, respectively.*

Table 3 (Table 7.1 of the Technical Note) has been prepared in two parts including firstly the initial exit timeframe to evacuate everyone from the townsite assuming all vehicles leave at the same time and secondly the time taken for individual vehicles to travel one of the four routes to a suitable destination.

Therefore, assuming it takes one hour in total for all vehicles to exit the Pickering Brook townsite from the commencement of the evacuation to the time the final vehicle leaves under the post MRS amendment development scenario, then it is possible to determine the total time it would take for the evacuation of all residents to a suitable destination. Assuming the final vehicle to leave the Pickering Brook townsite takes Route 4, then the total time to evacuate 1,130 vehicles would be one hour and 26 minutes.

It is possible to use this evacuation modelling to inform bushfire evacuation triggers and response actions as part of a future Bushfire Risk Management Plan for the townsite based on rate of spread calculations. As part of this BMP, rate of spread calculations have been compared to inform worst case bushfire attack scenarios for the Pickering Brook townsite.

Emerge (2020) reported on a study by Cheney dated 2010 into the January 2005 Pickering Brook fire which observed a peak rate of spread of 1.6km/hr with spotting occurring up to 2-3km.

Emerge (2020) separately calculated an average peak rate of spread from the Pickering Brook townsite over varying slopes (up to 10 degrees) at a rate of 3.3km/hr (with an FFDI of 100).

A study by Cheney, Gould and McCaw (2001) reported rates of spread for fires on level ground up to 10 degrees over a five minute period, which translated to a rate of between approximately 4km/hr to 8km/hr with an FFDI of 80.

The above rates of spread have been mapped at **Figure 17** (using an indicative 6km/hr to represent the Cheney, Gould and McCaw study) to demonstrate the varying trigger distances where a bushfire may be within one hour of direct attack on the Pickering Brook townsite. Further investigation at the future planning stages is required to confirm appropriate evacuation trigger distances based on road capacity and evacuation timeframes.

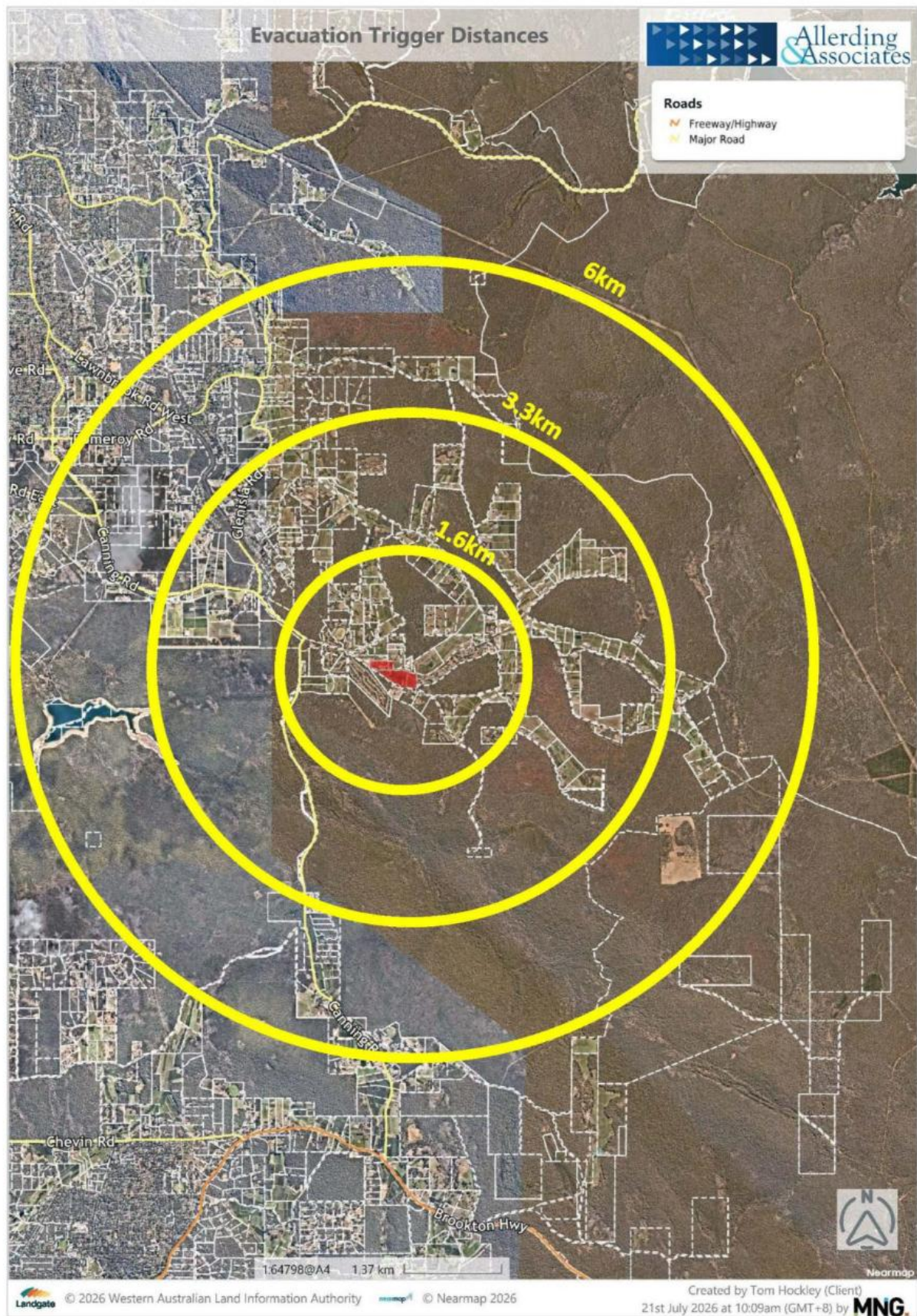


Figure 17: Indicative Bushfire Evacuation Trigger Distances

9.0 RESPONSIBILITIES FOR IMPLEMENTATION AND MANAGEMENT OF MEASURES

The relevant responsibilities for implementation and management of the required actions contained within this BMP are summarised below. A new BMP should be provided at each subsequent stage to address the measures identified. The **required measures** are those that are necessary to comply with SPP 3.7 and the Bushfire Guidelines, and the **additional measures** are those measures that have been identified through this BMP as additional measures to reduce the risk to life, property and infrastructure.

Measures to support the MRS Amendment		
Required Measures	Responsibility	Comment
Maintain and upgrade the existing reticulated water supply as required to for the proposed development.	Water Corporation	WC currently investigation capacity
Additional Measures		
Maintain and upgrade the existing reticulated water supply as required for the Pickering brook townsite.	Water Corporation	WC currently investigation capacity
Prioritise fuel management within Lot 81 Cunnold Street, and Reserve 47881 Pickering Brook Road.	DBCA/DFES	The City to advocate for the regular management of these parcels.

Measures to support the LPS rezoning		
Required Measures	Responsibility	Comment
Where the LPS rezoning includes a concept of structure plan, the design of the subdivision in accordance with SPP 3.7 to ensure compliant internal roads, reticulated water supply and that each dwelling achieves BAL-29 or below	Developer	A revised BMP will be required to support the amendment
Additional Measures		
Local Government to prepare a works program for road upgrades.	Local Government	The works are to include the recommendations of this BMP and the Pickering Brook Bushfire Evacuation Technical Note (Appendix 1)
Develop a Bushfire Risk Management Plan.	Local Government	The BRMP to be specific to the Pickering Brook townsite
Prepare community information on retrofitting existing homes to improve bushfire resilience and a Guide to Living in Bushfire Prone Areas (or similar).	Local Government	Note that any retrofitting is not a requirement for landowners, but is optional.
Improve coverage of the NBN services for Pickering Brook precinct.	NBN	Local Government to advocate for improved coverage.

Measures to support the subdivision and/or conditions of approval		
Required Measures	Responsibility	Comments
Design and construction of the subdivision in accordance with SPP 3.7 to ensure compliant internal roads, reticulated water supply and that each dwelling achieves BAL-29 or below	Developer	A new BMP to be provided to demonstrate compliance with SPP 3.7 and the Bushfire Guidelines.
Additional Measures		
Any new dwellings within an area of BAL-low, to be constructed in accordance with AS3959 to a minimum construction of BAL-12.5	Developer	Condition of approval
Identify a separate lot on the subject site for the provision of a 50, 000L strategic water tank	Developer / Local Government	The developer to construct the water tank, to the specifications of the Bushfire Guidelines. This lot and the tank to be ceded free of cost, to the LG, for their care and control.
Install signage in accordance with the recommendations of this BMP and detailed within the Pickering Brook Bushfire Evacuation Technical note	Local Government	Prior to subdivision
Undertake road upgrades in accordance with the recommendations of this BMP and detailed within the Pickering Brook Bushfire Evacuation Technical note	Local Government	Prior to subdivision
Manage roadside verge vegetation to ensure a minimum 6m horizontal clearance and 4.5m vertical clearance, at all times	Local Government	Prior to subdivision and on an on-going basis

Measures to support the development application		
Required Measures	Responsibility	Comments
Dwellings are to be within an area of BAL-29 or below and constructed to the appropriate standard	Developer/landowner	Condition of approval
Driveways to be to the standards contained within the Bushfire Guidelines	Developer/landowner	Condition of approval
Additional Measures		
New dwellings constructed in accordance with AS3959 with a minimum construction of BAL-12.5 for BAL-Low areas.	Developer landowner	Condition of approval

10.0 REFERENCES

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*Note this includes the Meridian Urban Peer Review

**APPENDIX 1 –
PICKERING BROOK BUSHFIRE EVACUATION TECHNICAL NOTE**

July 2026
Final

Pickering Brook Bushfire Evacuation

Prepared For:
City of Kalamunda



Technical Note



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1. INTRODUCTION

1.1 BACKGROUND

Donald Veal Consultants (DVC) has been commissioned to provide transport engineering input to a Strategic Bushfire Management Plan (BMP) for Pickering Brook in the City of Kalamunda.

1.2 SCOPE OF THIS REPORT

The focus of this report is to identify and evaluate suitable evacuation routes from the townsite of Pickering Brook in the event of a bushfire.

The Technical Note considers the types and volumes of traffic that will need to be accommodated on the evacuation routes, the likely staging of the decisions to leave and the expected time taken to evacuate people to a safer location.

Potential infrastructure upgrades are also touched upon which will improve the traffic flow and safety of evacuation from a traffic perspective.

2. PICKERING BROOK

2.1 LOCATION

Pickering Brook is a rural suburb in the Perth hills, lying some 30kms to the southeast of the Perth CBD, in the City of Kalamunda. Refer to **Figure 2.1** for its general locality. The area is characterised as a farming community, but has a significant element of tourist-based activities.

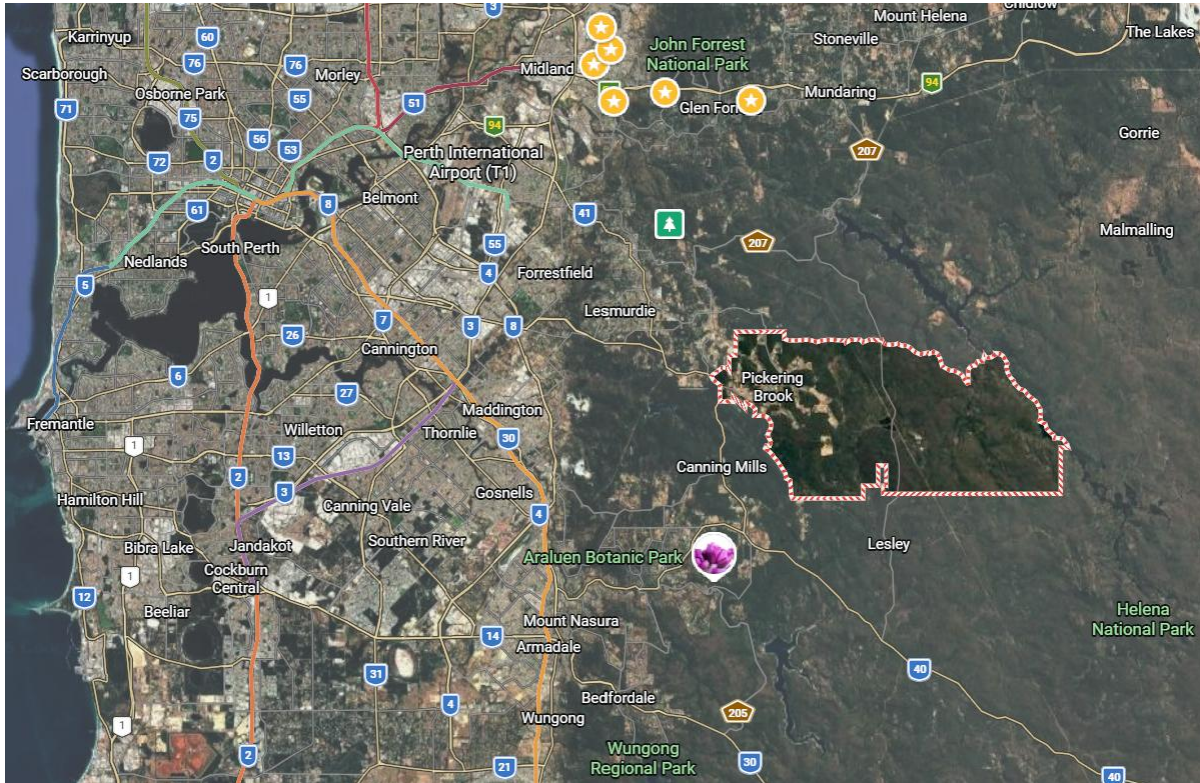


Figure 2.1: General location of Pickering Brook

Source: Google Maps

2.2 ROAD NETWORK

The main townsite area is located along Pickering Brook Road, which is classified in MRWA's Functional Road Hierarchy as a Local Distributor Road. The majority of the other roads within the suburb are classified as Access Roads, and are generally signed as being 'No Through Roads'.

As can be seen in **Figure 2.2**, the townsite of Pickering Brook is served by a number of Regional Distributor roads, providing direct links to the north, via Canning Road and Glenisla Road, to the west via Canning Road and to the south, again via Canning Road, but it cannot be directly accessed from the east.

Whilst there are a number of smaller roads, that can provide alternative links between these main route options, many of the roads within this area simply provide access to small numbers of rural properties, with no through access.

The posted speed limits along the various roads can be seen in **Figure 2.3**.

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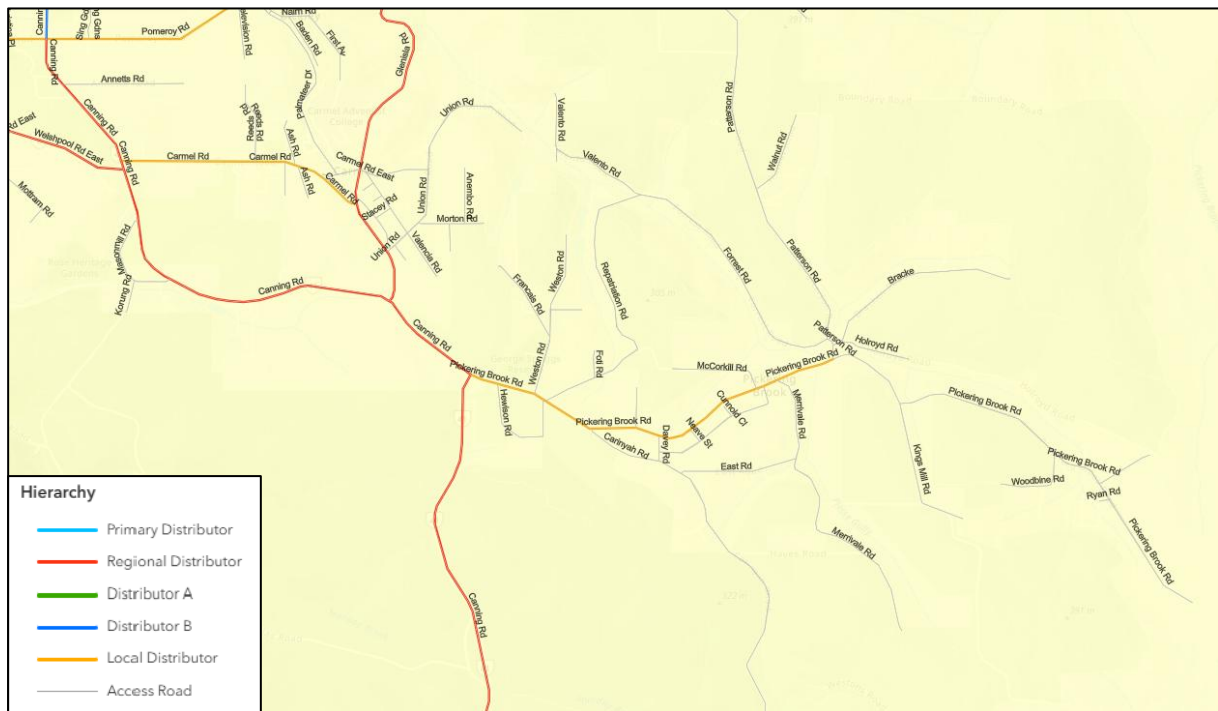


Figure 2.2: Road network hierarchy around Pickering Brook

Source: MRWA's Road Info Mapping

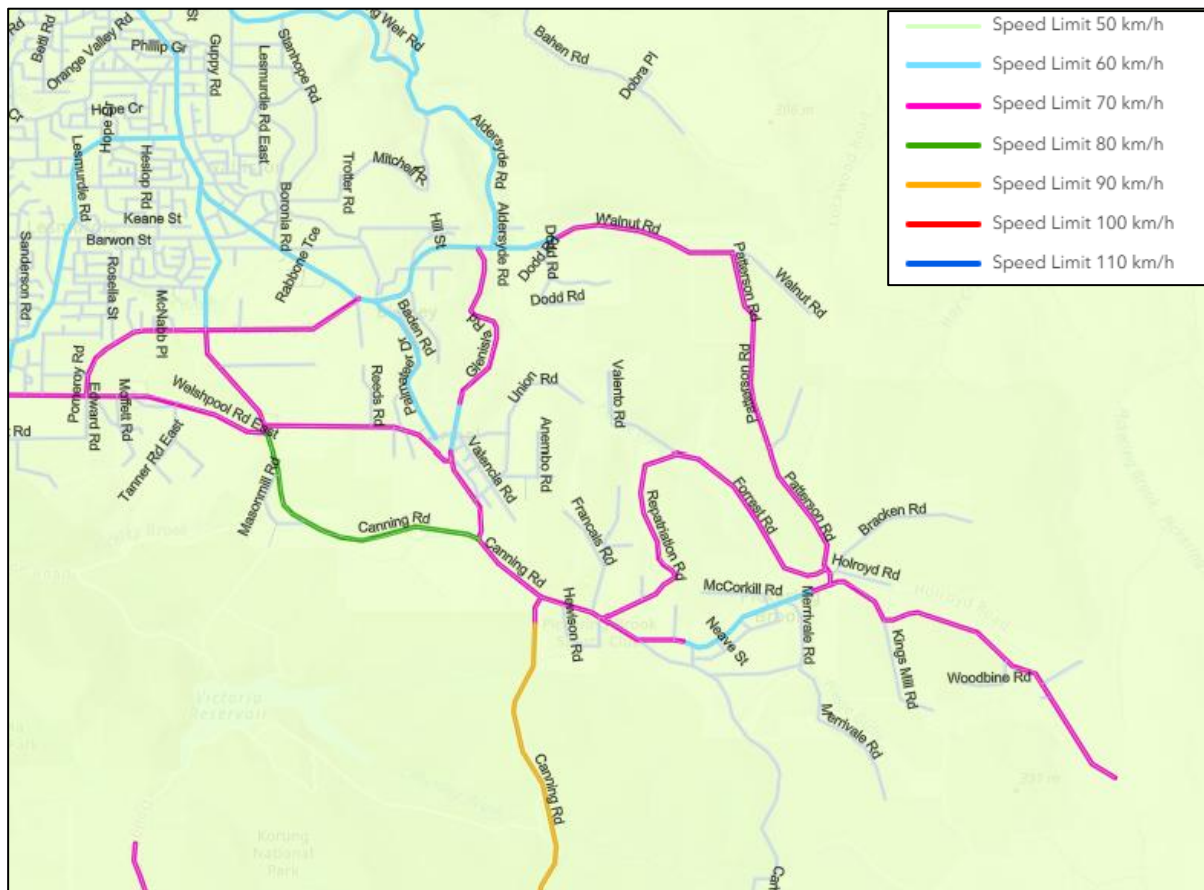


Figure 2.3: Speed limits around Pickering Brook

Source: MRWA's Road Info Mapping

3. BUSHFIRE SCENARIOS

3.1 DIRECTION OF APPROACH

Historically, it is understood that bushfires in this area are most likely to approach from the east, but potentially also from the south east or north east. However, depending upon prevailing conditions, other scenarios are certainly possible.

Clearly, the decision to recommend an evacuation from the area would depend upon a number of factors, including an assessment of the threat presented by a fire, given its location, intensity, predicted path and speed. These factors would also determine which potential evacuation route option would be the most appropriate.

Typical bushfire scenarios, showing potential bushfire approach paths and corresponding evacuation route options, can be seen in **Figures 3.1 to 3.4**. It should be noted that other possible evacuation routes are available, and may be preferred in a particular scenario. Some of these will be considered in subsequent sections of this report.

3.2 SPOT FIRES

It is understood that embers from a bushfire may travel up to 5 km ahead of the main fire front, starting new spot fires ahead of the main fire front. Whilst this may affect the safety of a particular route, or trigger the need to use alternative options, it is beyond the scope of this assessment to take such events into account. Generally, this assessment has been carried out on the basis that any evacuation would most likely be staged, and that the majority of evacuees will have left the immediate area prior to such events significantly impacting the evacuation routes.

Similarly, it is beyond the scope of this report to assess the need for vegetation management along the routes. This issue should be addressed by those more familiar with the likelihood, behaviour and effects of spot fires.

3.3 SMOKE

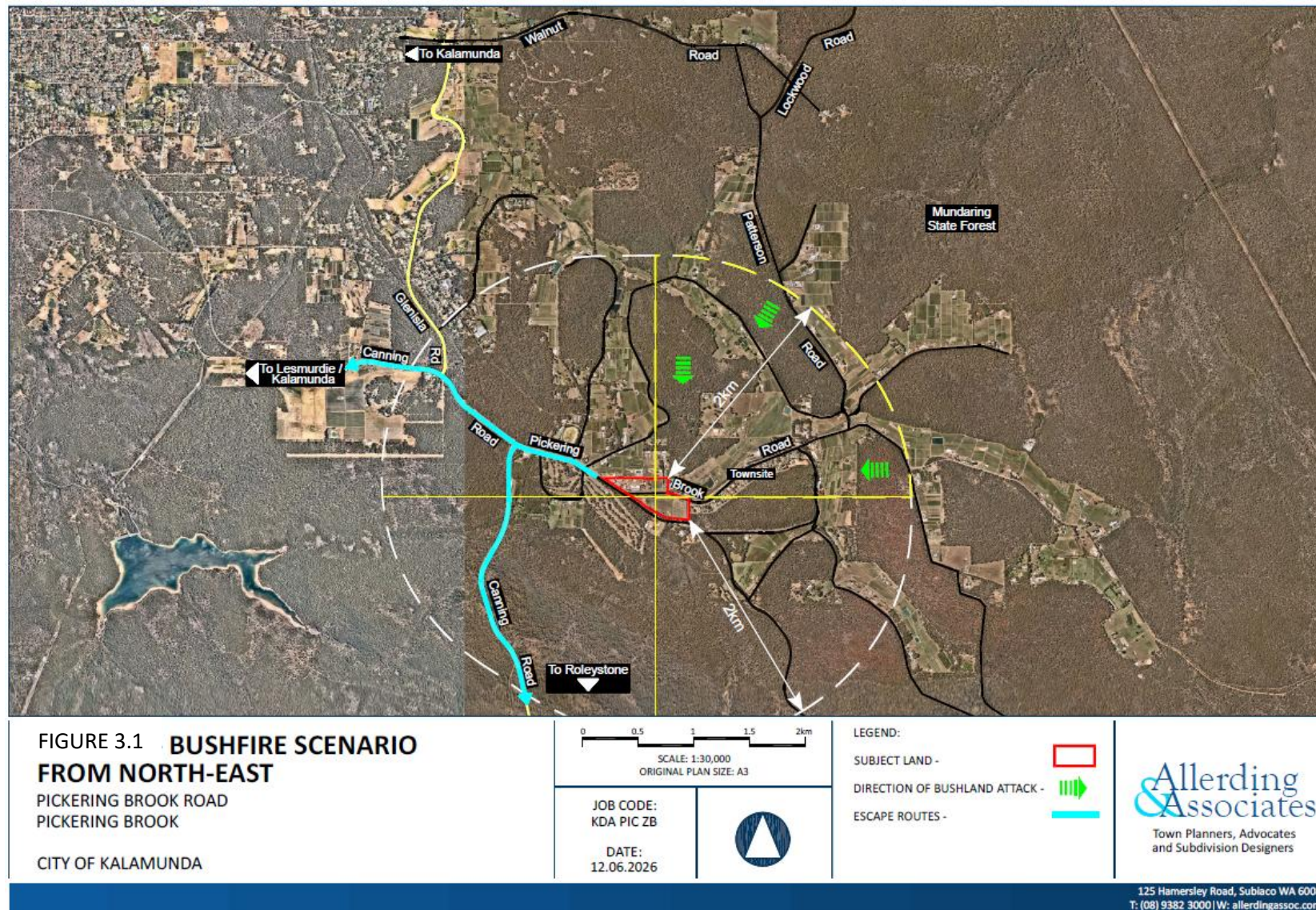
Whilst there is clearly a risk of smoke affecting visibility in the event of a significant bushfire incident, as indicated, the assessments within this report have focussed primarily on the staged evacuation of vehicles from the townsite, and it is generally expected that the majority of vehicles will have left prior to any significant smoke related issues occurring.

One of the potential dangers associated with smoke during the evacuation is reduced visibility. This may affect a driver's ability to identify road signs, and may also reduce travel speeds. Consideration could be given to the provision of illuminated signage at key intersections.

However, it is not expected that the presence of smoke would significantly impact the ability of drivers to join the main evacuation routes from side roads or driveways within the townsite itself.

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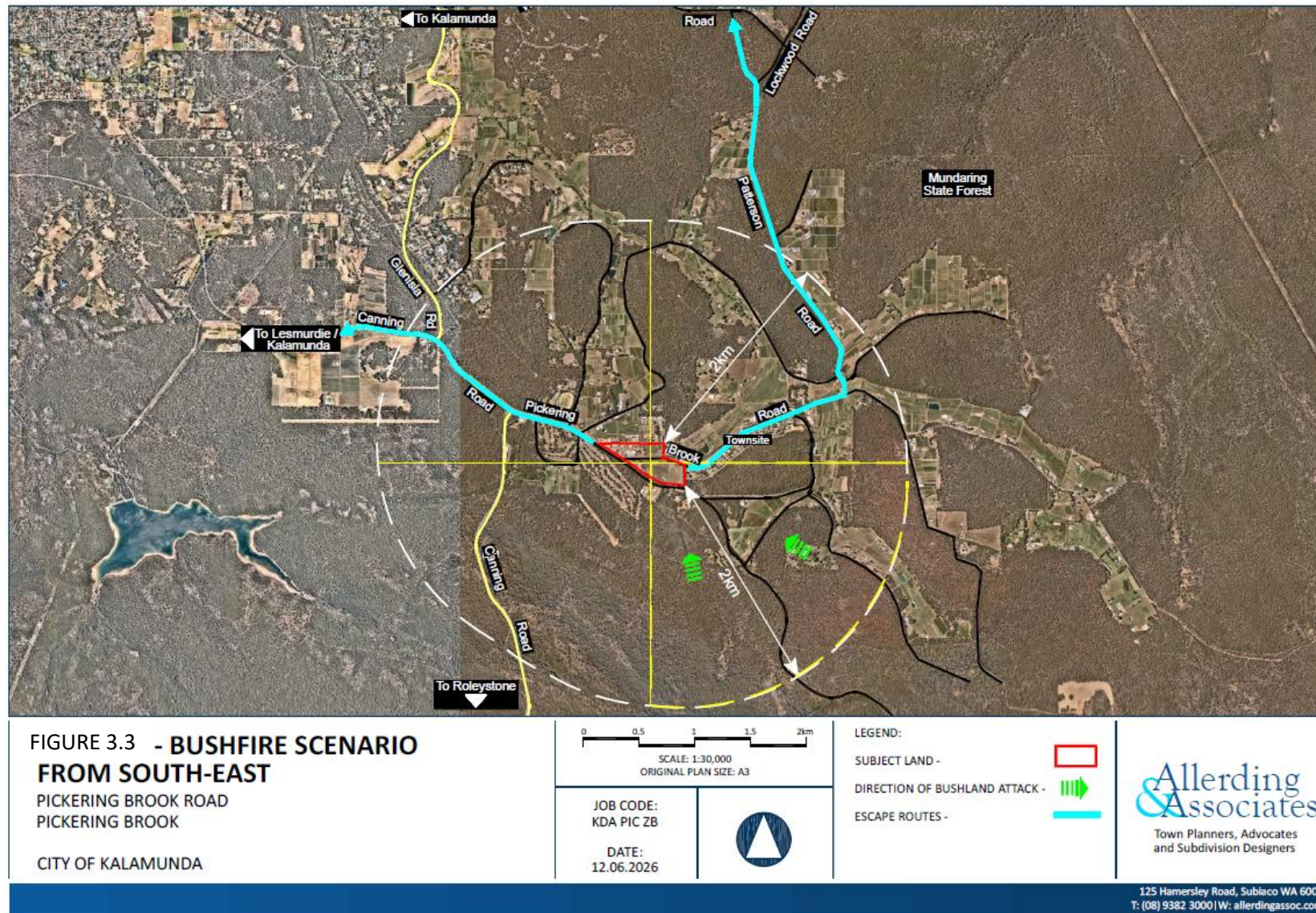
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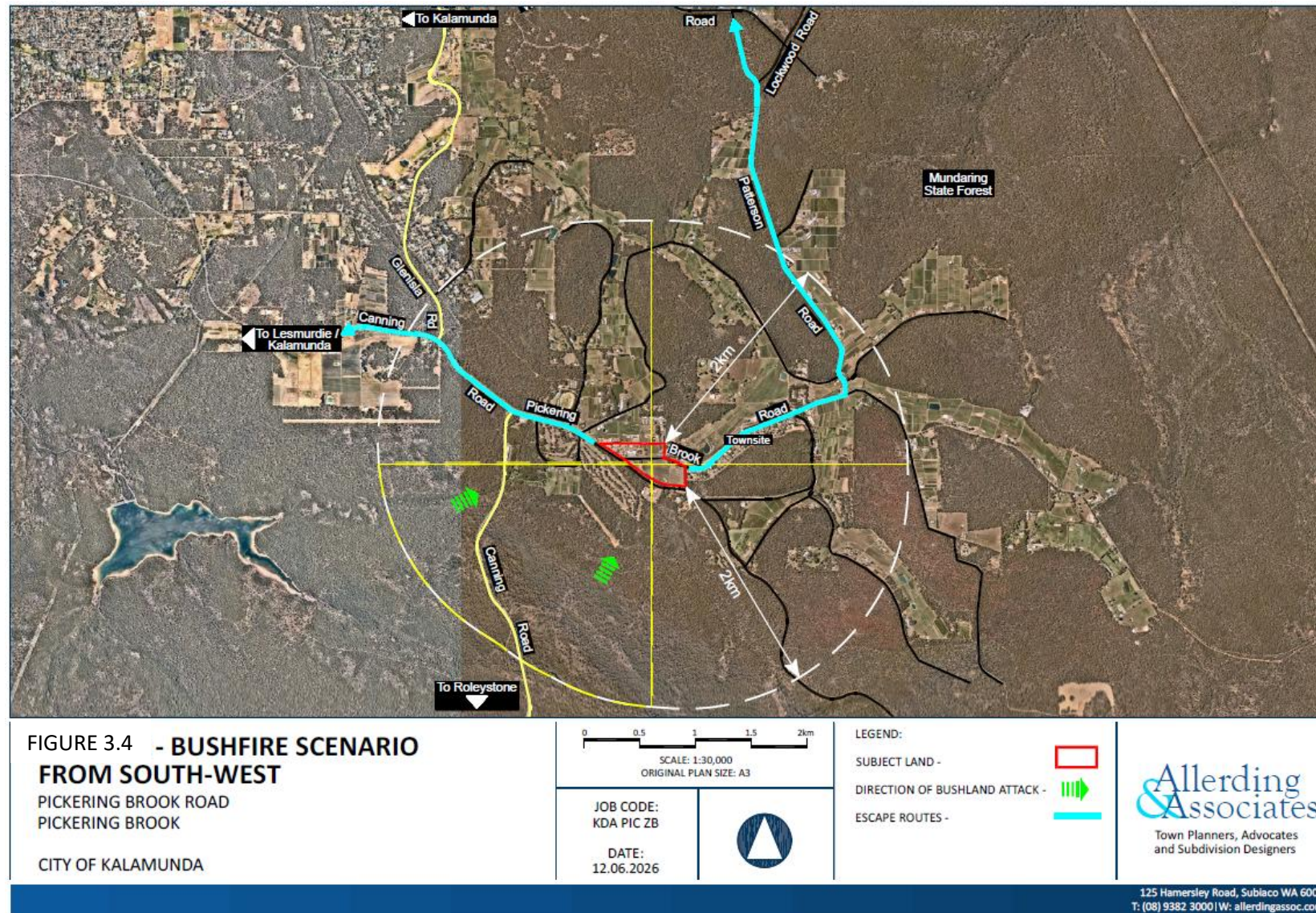
Client: City of Kalamunda

Project: Pickering Brook Bushfire Evacuation



Client: City of Kalamunda

Project: Pickering Brook Bushfire Evacuation



4. ASSESSMENT OF EVACUATION NUMBERS

4.1 GENERAL

Generally, different people behave in different ways.

In a bushfire situation, this remains true. Some will refuse to leave their homes, and vow to defend their property, come what may. Others will leave as soon as they are advised that this is the safest option. A few will have already left. Yet others may delay their decision, until the last possible moment.

There will also be differences in the time taken for people to prepare to leave.

Thus, the timing of an evacuation, the vehicle types, numbers and their potential speeds are difficult to predict.

In their peer review comments*, Meridian Urban quoted data gathered during interviews with residents, regarding their intentions with respect to leaving the area in the event of a future fire warning.

*[28-jan-2026---western-australian-planning-commission---agenda](#)

The data identified the following proportions:

- 12% stated that they would leave early;
- 24% intended to wait to see whether a fire started, and then leave if it did;
- 27% stated they would prepare to stay and defend their properties; and
- 24% were uncertain as to their likely course of action.

It is noted that this does not add up to 100%.

From the above survey up to 73% of residents may well leave in the event of a fire warning. In this Technical Note, however, it has initially been assumed, as a worst-case scenario, that the vast majority of the residents, the visitors, the workers and the tourists, will all leave together, within a short window of time. Clearly, if this is possible, then other, perhaps more realistic, evacuation scenarios should also be achievable.

4.2 RESIDENTS

The latest population figures made available from the 2021 Census indicate that there are approximately 579 residents in the Pickering Brook area. With 228 private dwellings in the area, this gives an average of 2.7 residents per dwelling.

Given that the population figure includes children and others who may not be able to drive, a conservative estimate must be made for the number of evacuation vehicles that might be expected.

On average, the census shows that there are 2.7 vehicles per dwelling. Allowing for people to be keen to try to evacuate as many of their vehicles as possible, we would conservatively estimate that each dwelling may evacuate using up to 2.5 vehicles. This would generate around 570 vehicles for the residential element.

4.3 WORKERS, TOURISTS & OTHER VISITORS

Generally, particularly during the high season, it would be expected that a number of people would be working at the various businesses within the Pickering Brook area, not all of whom would be local residents. Although some may arrive by bus, most would likely do so in single occupant private vehicles.

These people might reasonably be expected to be able to leave quite quickly, given there would be no decision to be made regarding staying and defending.

The number of tourists and other visitors present in the area could be influenced by a number of factors, and as such, is difficult to predict.

A search of Australian Bureau of Statistics (ABS) data indicates that local businesses within Pickering Brook employ around 470 people. Whilst this number appears high, a proportion of these people will be residents, whilst others will commute from other areas. 2021 Census data from ABS also identifies that approximately 306 people living in Pickering Brook are employed. However, this did not indicate whether their places of employment were within the area or beyond.

Similarly, there is little information regarding tourist numbers, with most being casual visitors, rather than those seeking accommodation. These visitors come and go at random times throughout the day and week, although seasonal peaks do exist.

Short of carrying out detailed surveys, or collecting staffing and visitor data from all local businesses, there does not appear to be a simple way to get an accurate estimate of the numbers of these people. Even then, numbers may vary significantly from day to day and week to week.

In order to make a basic estimate of the potential number of workers, tourists and other visitors that may need to be evacuated in the event of a fire, DVC has made some assumptions, based on available data:

- A maximum of 250 external staff vehicles within the area at any one time;
- A maximum of 200 vehicles, driven by tourists and other visitors, within the area at any one time;
- The majority of tourists would leave early, or not visit, once aware of the fire danger*; and
- The majority of external, non-resident workers would also leave early*.

*The latter assumptions are made based on these persons not having to make a decision as to whether to stay and defend, and with little time required to prepare to leave.

4.4 TOTAL VEHICLES TO BE EVACUATED

Thus, the total number of vehicles estimated to require evacuation would be as follows:

Residents = 570

External workers = 250

Tourists and other visitors = 200

Total number of vehicles = 1,020.

4.5 VEHICLE TYPES

Whilst it is expected that the majority of vehicles being used to evacuate will be standard sedans, 4WDs and SUVs, there may be a proportion of vehicles towing trailers, caravans and horseboxes.

Such vehicles would generally be able to keep up with other traffic, although horse boxes may slow down progress, particularly if it is necessary to use the Patterson Road evacuation route.

There is also a haulage business located along Pickering Brook Road, with a number of Prime Movers parked in front. Although these are quite large, unless they have fully laden trailers attached, they are likely to be able to travel at the same speed as other traffic.

5. EVACUATION ROUTES

5.1 GENERAL

Fundamentally, there are three main evacuation directions available, depending upon the direction of an approaching bushfire: North, South or West. As previously identified, there is no feasible evacuation route from Pickering Brook towards the east.

5.2 WESTERN ROUTE (ROUTE 1)

The main Western evacuation route entails heading west from Pickering Brook along Pickering Brook Road, which becomes Canning Road, and is signposted for Kalamunda. This is shown in **Figures 3.1, 3.3 and 3.4**.

Further along to the west, drivers may choose to continue on to Kalamunda on Canning Road, or turn left onto Welshpool Road East.

5.3 SOUTHERN ROUTE (ROUTE 2)

The main Southern evacuation route consists of again heading west from Pickering Brook along Pickering Brook Road, before turning left onto Canning Road, signposted for Kelmscott and Brookton. This is shown in **Figures 3.1 and 3.2**.

This is the only real option for a southern evacuation.

5.4 NORTHERN ROUTE (ROUTE 3)

Depending upon the direction from which the fire is approaching, the best Northern evacuation route may consist of heading west from Pickering Brook along Pickering Brook Road, and continuing west along Canning Road, signposted for Kalamunda, and then taking a right turn onto Glenisla Road.

An alternative northern route (Route 4) may be used if Route 3 is inaccessible.

5.5 ALTERNATIVE ROUTES AND DETOURS

5.5.1 North / West (Route 4)

Should there be an unforeseen situation, whereby the primary exit route from Pickering Brook to either the north or west - i.e. Canning Road and/or Glenisla Road - is not available, then there is an alternative north/west option further to the east.

This would involve heading east along Pickering Brook Road through the townsite, before turning left onto Bracken Road, and then using Patterson Road, Walnut Road and Lawnbrook East Road. Following this route would allow one to rejoin Glenisla Road or Canning Road, further to the west. This is shown in **Figures 3.2, 3.3 and 3.4**.

5.5.2 West (Route 1a)

Should access to Canning Road west of the townsite be blocked, a potential detour via Glenisla Road and Carmel Road may also be considered.

5.5.3 South

It is noted that if the recommended evacuation direction is south, there is only one feasible road in that direction – i.e. Canning Road. No realistic alternative routes are available.

5.5.4 Unsealed routes

Whilst there are some alternative routes along unsealed roads, these would not be considered as viable options in most cases, especially for persons unfamiliar with the area. Driving on unsealed roads requires a skill set that not all drivers have and the roads may not be signed appropriately as not highly trafficked. Generally, these roads run through densely forested regions, where the risks of fire would be higher, the potential to get lost may rise, and road conditions cannot be guaranteed. Hence, use of such roads for evacuation should not be encouraged.

5.6 CRITICAL LINKS

As can be seen from the main and alternative route options, there are some key links within the area that need to be kept open in order to allow people to access the preferred or necessary alternative routes.

The main key links are:

- i. **Pickering Brook Road**, between Bracken Road and Canning Road;
This link allows access to both the southern and western Canning Road options, as well as the north / west Patterson Road option.
- ii. **Canning Road** between Pickering Brook Road and Glenisla Road.
This link allows access to both the northern Glenisla Road and western Canning Road options.
- iii. **Bracken Road** between Pickering Brook Road and Patterson Road.
This link allows access to the northern Patterson Road / Walnut Road route.

6. ASSESSMENT OF EVACUATION ROUTES

6.1 ROUTE CHARACTERISTICS AND ISSUES

DVC has driven along the majority of the links in each potential route and detour, in order to assess the suitability of each to provide both an evacuation route and an entry route for emergency services.

The following sections provide some notes regarding potential issues and characteristics of the various links.

6.1.1 Common Link – Pickering Brook Road

A majority of the vehicles leaving Pickering Brook will need to use Pickering Brook Road in order to access whichever evacuation route they are intending to use.

The road is constructed as a two-lane undivided highway, partly kerbed, with one lane in each direction. The sealed road width is generally over 7.0m, although this drops slightly further east. Nonetheless, it remains above the required minimum of 6.0m throughout. The road is designated as a Local Distributor, which can be defined as follows:

Urban - (Built Up Area)

Roads that carry traffic within a cell and link District Distributors or Regional Distributors at the boundary, to access roads. The route of Local Distributors should discourage through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to, or serving the area. These roads should accommodate buses, but discourage trucks.

Rural - (Non Built Up Area)

Connect to other Rural Distributors and to Rural Access Roads. Not Regional Distributors, but which are designed for efficient movement of people and goods within regional areas.

Urban and Rural Local Distributor roads are managed by local government.

6.1.2 Route 1: West along Canning Road

Canning Road, west of Pickering Brook, is constructed as a two-lane undivided highway, with one lane in each direction. The traffic lanes are generally 3.5m wide. The road is designated as a Regional Distributor, which can be defined as:

Roads that are not Primary Distributors but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by local government.

As such, these roads would generally carry around 3,000 to 6,000 vehicles per day.

The route is readily identifiable, as it is a direct continuation of Pickering Brook Road, as one exits the townsite to the west. However, it is noted that there are no easily visible direction signs confirming the road as leading to Kalamunda.

No issues were identified along the route in terms of cross section, throttle points, overhead or underground elements etc. No issues were identified in terms of visibility, gradients or intersections.

6.1.3 Route 2: South along Canning Road

Whilst the geometry and capacity of Canning Road heading south from Pickering Brook is much as per the western section, again with no issues identified regarding cross section, gradient or other restrictions, it was noted that the route is not as easy to identify on leaving the townsite.

The southern section of Canning Road is effectively a side road off the through east-west route, which consists of Pickering Brook Road and the western section of Canning Road.

This side road intersection is less obvious, and may be missed, due to the location and partial obstruction of the direction signs.

See **Photos 1 & 2**.



Photo 1: The intersection with the southern Canning Road route is not very visible from the Pickering Road approach.



Photo 2: The intersection is signposted for Kelmscott and Brookton, but this could easily be missed.

6.1.4 Route 3: North along Canning Road / Glenisla Road, then west on Lawnbrook Road

Glenisla Road, between Canning Road and Lawnbrook Road East, in Bickley, is constructed as a two-lane undivided highway, with one lane in each direction. The road seal is generally 6 to 6.2m wide, for the majority of its length. Whilst the seal widens to over 7.0m just south of Bickley, it is noted that there are some significant (unprotected) embankment drop offs to the eastern side of the road in this area.

Glenisla Road is designated as a Regional Distributor, which are defined as:

Roads that are not Primary Distributors but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by local government.

Again, this road would generally carry around 3,000 to 6,000 vehicles per day.

Lawnbrook Road is designated a Distributor B road in MRWA's functional road hierarchy. These roads are intended to carry an indicative volume of over 6,000 vpd, and are defined as follows:

District Distributor B: Urban area roads - (Built Up Area)

Perform a similar function to type A District Distributors but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with a traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and generally not through them, forming a grid which would ideally space them around 1.5 kilometres apart. They are managed by local government.

6.1.5 Route 4: North along Bracken Road / Patterson Road and then west on Walnut Road

Patterson Road, between Bracken Road and Walnut Road, is constructed as a two-lane undivided highway, with one lane in each direction. The southern section has been widened to provide two three metre lanes, with edge lines and sealed shoulders, but this drops back to a 5.5m seal, further north. See **Photo 3**.



Photo 3: Patterson Road transitions from over 6.0m between edge lines to the south, to a 5.5m seal in the north.

Both Bracken Road and Patterson Road are designated as Access Roads, which are defined as:

Access Roads: Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by local government.

In a Built-Up Area, the Maximum desirable volume of an Access Road is stated as 3 000 vpd. In non-Built-Up Areas this reduces to 'up to 75 vpd'.

Apart from the limited general width of the road, another issue identified along this evacuation route is the presence of two culverts beneath Bracken Road and Patterson Road, just north of Pickering Brook Road. These culverts are near intersections and horizontal curves, and are only around 5.5m wide. This is likely to restrict traffic flow.

See **Photos 4 & 5**.



Photo 4: Narrow culvert under Bracken Road, just north of Pickering Brook Road intersection.



Photo 5: Narrow culvert under Patterson Road, between Bracken Road and Forrest Road intersections.

Walnut Road, west of the Patterson Road intersection, is also relatively narrow, with a generally 5.5m seal, on a fairly steep downhill gradient. There are large trees along the northern edge, and an open drain along the south.

Again, this road is designated as an Access Road.

Whilst this route offers an acceptable alternative evacuation route from the Pickering Brook area, it is not currently suitable for emergency vehicle access to occur concurrently with the evacuation of residents.

6.2 EVACUATION ROUTE CAPACITY

6.2.1 General

The capacity of a route to accommodate the number of vehicles wishing to use it is generally limited primarily by the capacity of the intersections along it. This in turn is restricted by the number of vehicles wishing to turn, particularly right, and the number of vehicles on the intersecting road. Capacity is rarely limited purely by mid-block issues, except in very specific cases.

Generally, the capacity of a single lane of traffic, in free-flowing, uninterrupted conditions, is estimated to be in the region of 1,800 to 2,200 vehicles per hour. However, this can be affected significantly by a number of factors, including, as indicated above, intersections and other interruptions, such as pedestrian crossings, access points etc. The nature of the vehicles may also have an effect, with significant numbers of heavy vehicles, caravans and trailers etc reducing the overall capacity. Narrow lanes may also reduce capacity, as drivers tend to reduce speed if they are closer to oncoming traffic.

In the case of an evacuation scenario, it is expected that most of the vehicles will be travelling in one direction, and that the majority will be making the same turning movements at each intersection, except where alternative routes commence, and evacuees can choose to head south, say, instead of west. In these scenarios, there is not expected to be a significant amount of opposing traffic, and such movements should be reasonably free-flowing.

These factors mean that the usual effect of intersections on overall capacity and timing may be significantly reduced. Nonetheless, in an evacuation scenario, factors including the volume of traffic, the types of vehicles and the general atmosphere of a bushfire situation, may reduce speeds along the route. Other factors that may affect speeds generally, particularly in the later stages of evacuation, might include reduced visibility due to smoke, which may also affect the ability of drivers to read signs and therefore identify the appropriate evacuation route.

In this assessment we will look at the expected ability of various key links, generally those closer to the Pickering Brook area, to cater for the forecast numbers of evacuating vehicles. It should be noted that given the lack of connectivity to the east, there is unlikely to be any additional ‘through’ evacuation traffic, from other adjacent communities, using these roads.

Once drivers are clear of the immediate area, depending upon the initial route used, additional route options may open up, and they may choose to head in different directions, depending upon their particular circumstances. In this way, the load on subsequent links and routes will reduce as the evacuating vehicles spread across more of the road network.

As previously identified, there will be a small number of key critical links, along which - depending upon the directions of the fire and the evacuation - almost all vehicles will need to travel. Canning Road

being a Regional Distributor is taken to have the capacity to handle the evacuation volumes in addition to typical volumes on the route. Other critical routes are described below.

6.2.2 *Pickering Brook Road*

In the worst-case scenarios for this road, with a bushfire approaching from the east or northeast, virtually all evacuating vehicles will need to drive west along Pickering Brook Road.

There are no physical impediments or capacity issues to Pickering Brook Road being able to cater for the volume of traffic forecast, during a one-hour evacuation period of this type. However, as this road is the main artery through the townsite, it is clear that various smaller streams of traffic will be joining it at the various intersections, as well as individual vehicles from frontage properties.

This creates what is known as ‘side friction’ and can reduce the speed of vehicles significantly.

Nonetheless, with an absolute maximum of just over 1,000 vehicles heading west, this should remain well within the capacity of the road.

6.2.3 *Glenisla Road*

Should the section of Canning Road west of Glenisla Road be blocked, Glenisla Road would be the main northern escape route. Normally, a right turn into this road might present a delay, but in these circumstances, it is assumed that DFES would close off the through route, and there would be no opposing traffic.

Whilst it is perhaps unlikely that both Canning Road to the west and Patterson Road to the east would be blocked simultaneously, as a Regional Distributor road, Glenisla Road is considered to have sufficient capacity to cater for the required traffic volumes should this eventuate.

6.2.4 *Bracken Road / Patterson Road*

This route has perhaps the lowest potential capacity for carrying the entire evacuation traffic volume, given the steep nature of some sections and the limited width along others.

As Access Roads, the roads are generally not expected to cater for higher volumes of traffic on a regular basis, but with the vast majority of vehicles heading in one direction, this still offers an alternative option if required.

6.3 EVACUATION ROUTE TIMINGS

6.3.1 *General*

The time taken for vehicles to evacuate along any given route is primarily conditional upon speed and distance. Whilst speed will vary both along the route, depending upon factors associated with the road, such as gradient, alignment and visibility, as well as individual factors, such as driver confidence and vehicle type, distance will also vary, depending upon where evacuees begin their journey, and at what point they can be considered to have reached ‘a safer place’.

Generally, one might assume that vehicles would be considered to have completed their evacuation once they have reached the nearest major townsite, as these should be equipped with evacuation centres in the event of a large bushfire.

In a lot of cases, however, particularly when residents have decided to leave early, it is expected that people will be relocating to the houses of friends or relatives, rather than to a central 'safe place'. Visitors, tourists and external workers are also likely to head back to their own homes, if that is beyond the fire risk area. Clearly, different evacuees may be on the road for a longer or shorter time and distance, depending on their particular origins and destinations.

Timings indicated by Google Maps are shown for the main routes, as a base indicator. However, these are based on drivers generally travelling at or near to the speed limit. This may not be possible in an evacuation scenario, especially within the immediate townsite area. It is noted that the timings also allow for normal background traffic. Whilst the usual background traffic trips are likely to be significantly reduced in a bushfire situation, there may be other evacuating vehicles using some of these roads.

The key to evacuating the townsite will be the capacity of the critical road links nearest to the town. Once drivers have reached Canning Road, for example, traffic should flow more freely, and no further capacity issues would be expected.

For the purpose of this exercise, it has been assumed that the average speed of those leaving the townsite - once they have reached a larger road, such as Canning Road - will be 40km/h, but restricted to 20km/h within the townsite, where some queuing may be expected, as vehicles join the evacuation routes from various side roads and driveways. On Access Roads, such as the Patterson Road route, we have assumed average speeds would reach perhaps 30km/h.

6.3.2 Townsite evacuation speeds and vehicle spacing

For the timing estimate for people to exit the immediate townsite area, we will assume that all 1,020 vehicles are to be evacuated as quickly as possible following a final evacuation notice.

Again, using a worst-case scenario, if we assume that it takes one hour to get all vehicles out of the townsite, and use an average speed through Pickering Brook of 20 km/h, the vehicles would then be leaving the area spaced, on average, 20m apart. This would allow plenty of gaps for vehicles to join the main route from property accesses and side roads. Generally, vehicles moving along in a queue situation might be expected to travel somewhat closer.

Thus, even with the maximum total number of vehicles evacuating, using a single route, it should be possible for all vehicles to leave in a one-hour period.

However, it is far more likely that the evacuation will be carried out in stages, with the majority of the (200 of 250) external workers, (150 of 200) tourists and other visitors leaving gradually, over a longer period, well before any final instruction to evacuate. This would leave around 100 worker and tourist vehicles, along with perhaps 80% of the 570 predicted resident vehicles. It should also be noted that from their aforementioned interviews, Meridian Urban identified that 27% of residents indicated that

they intended to remain in place and defend. Should this scenario eventuate, and assuming that the interviews were undertaken with only one person per dwelling, this would reduce the number of exiting vehicles by a further 150.

This equates to a total of perhaps 400 vehicles leaving in the hour following the final instruction to evacuate. These vehicles would then need to leave the townsite at a rate of just one vehicle every 9 seconds. Again, based on an average speed of 20km/h, these vehicles could be spaced at around 50 metre intervals. This number of vehicles, even at 20 km/h, would therefore be able to clear the townsite in well under an hour. It is more likely that with less than half the number of vehicles, speeds through the townsite would increase to at least 30 km/h.

As previously identified, speeds would also increase once the vehicles are clear of the townsite, with significantly reduced side friction, particularly on the higher order roads. The estimated 'second stage' route timings are described below.

6.3.3 Route 1

Route 1 will involve vehicles travelling west along Canning Road. If we assume they would head to Kalamunda, rather than turning onto Welshpool Road, Google maps indicates a base time of around 10 minutes for this 9.6 km route, travelling with normal traffic. See **Figure 6.1**.

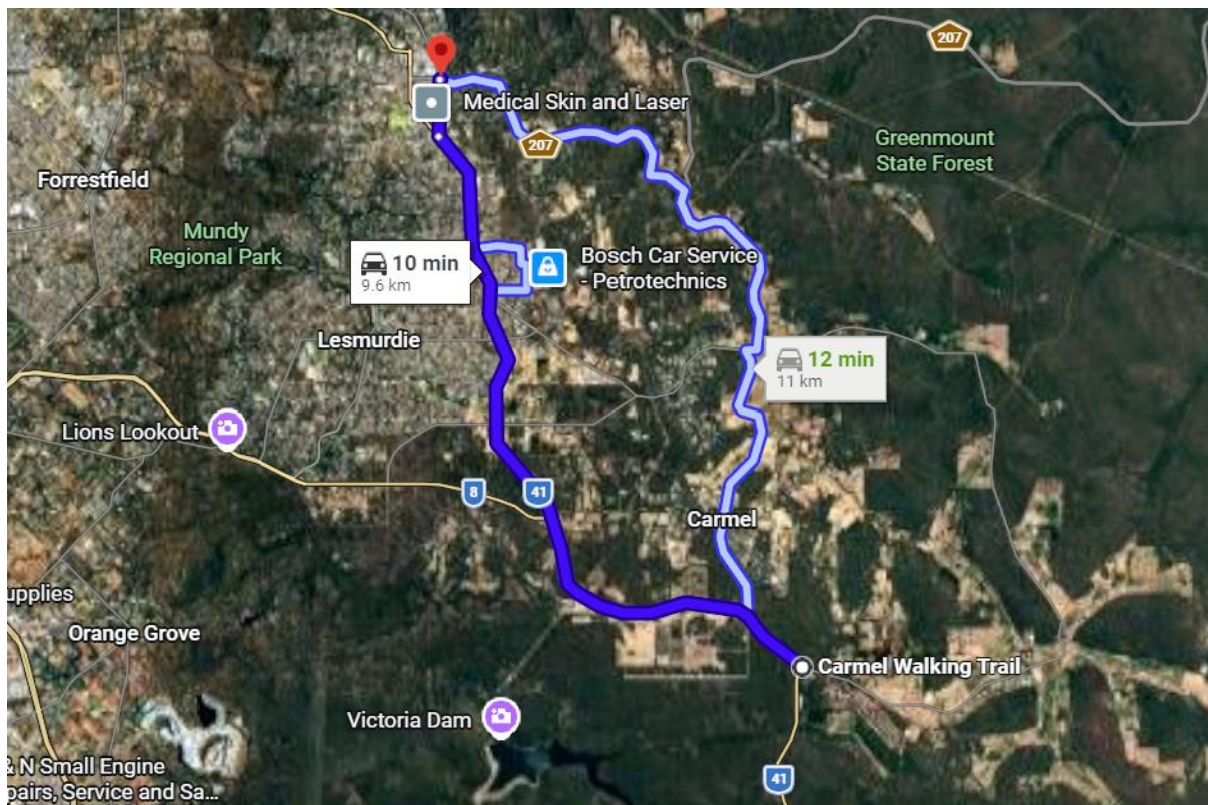


Figure 6.1: Google Maps timing for Route 1

This assumes an average speed of just under 60 km/h. If, due to the circumstances and the volume of traffic, this were to be reduced to, say 40km/h, the second stage of the evacuation journey should then take around 15 minutes.

6.3.4 Route 2

The southern evacuation route, along Pickering Brook Road and then south along Canning Road is a very straightforward route, if available. The only intersection along the route, between Pickering Brook and the Brookton Highway at Karragullen, is the left turn from Pickering Brook Road onto Canning Highway, at which vehicles would simply turn left, with no expected delays. At Brookton Highway, it is expected that most drivers would turn right towards Roleystone.

Google Maps shows that, with normal traffic, this journey of around 8km would take in the order of 7 minutes. This indicates an average speed of around 69 km/h. See **Figure 6.2**.

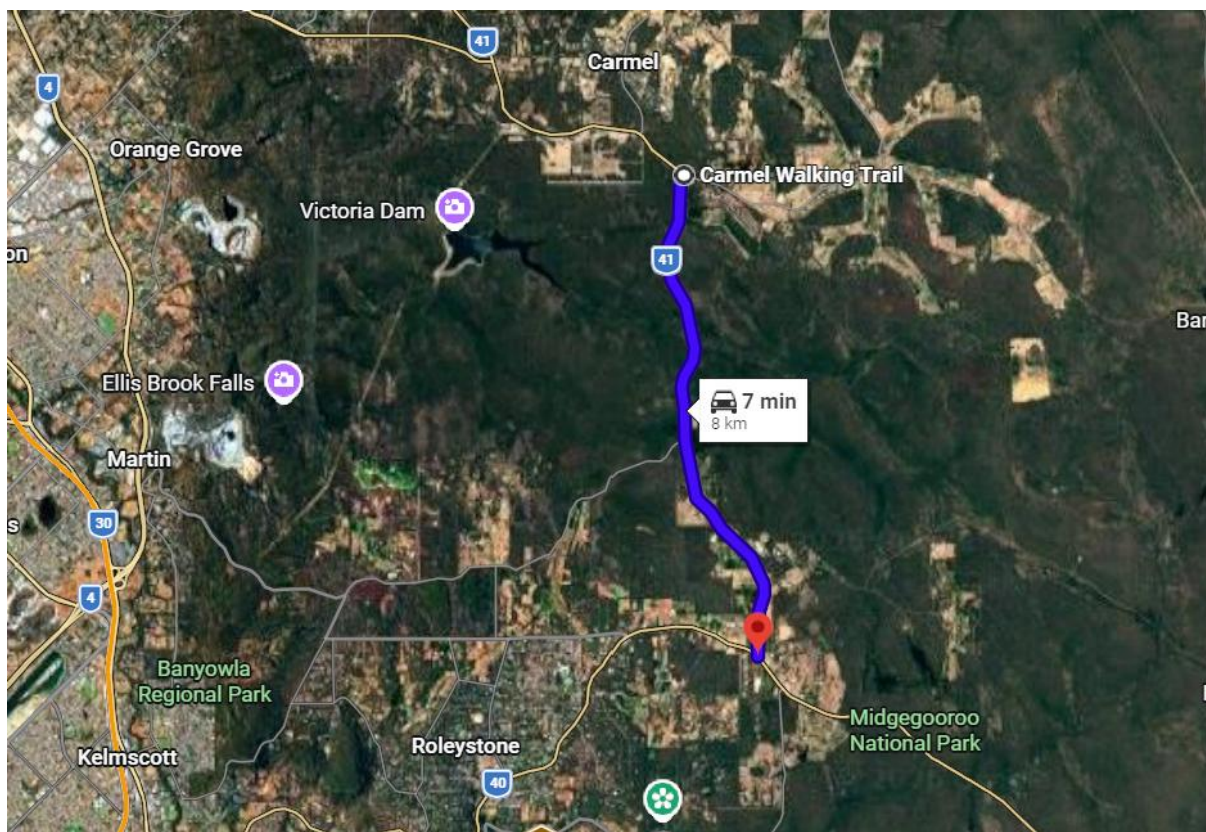


Figure 6.2: Google Maps timing for Route 2

Even if the average speed of vehicles evacuating the town site were to be reduced to 40 km/h, this route would only take around 12 minutes.

6.3.5 Route 3

The northern evacuation route, travelling along Pickering Brook Road, Canning Road, Glenisla Road and Lawnbrook Road is a more direct route through Walliston to Kalamunda.

Nonetheless, Google Maps shows that, with normal traffic, this journey of around 9 km would take in the region of 11 minutes. See **Figure 6.3**.

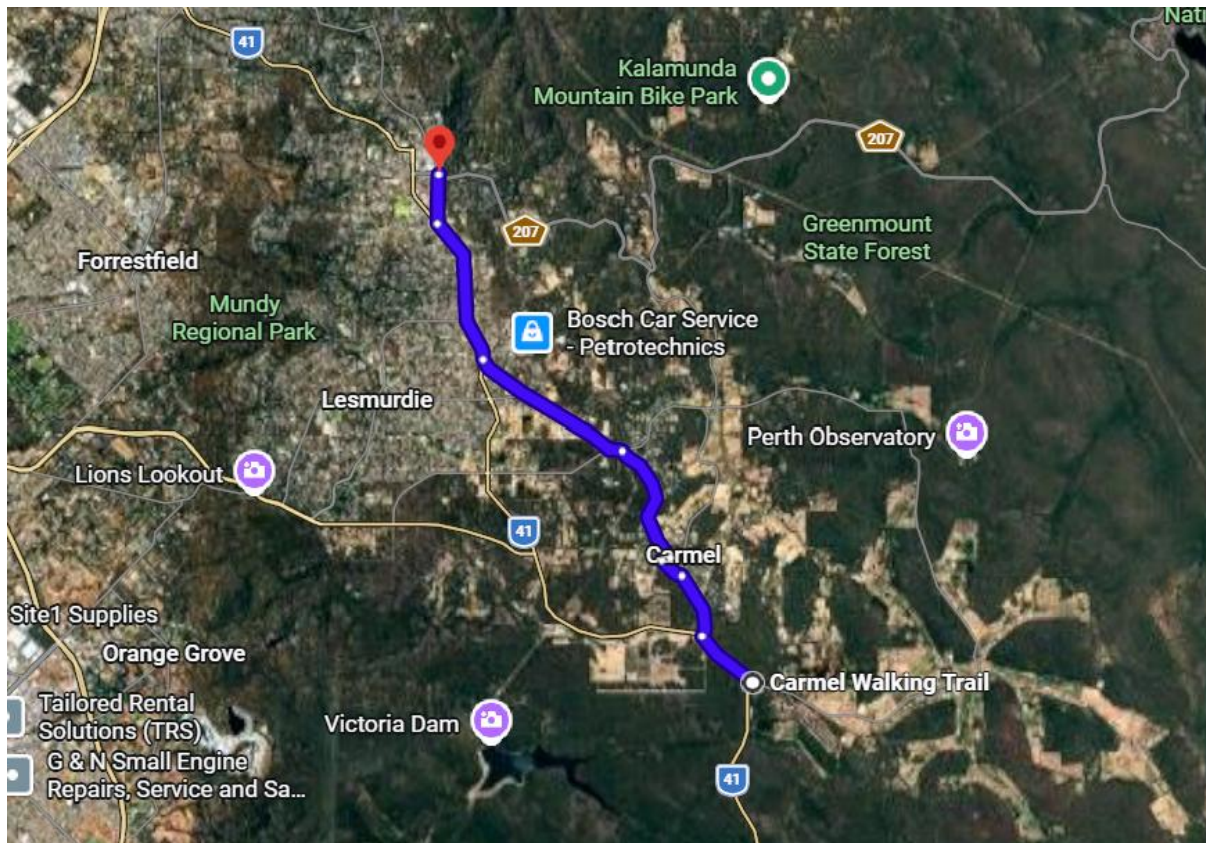


Figure 6.3: Google Maps timing for Route 3

This gives an average speed of around 49 km/h. Reducing the average speed to 30 km/h would result in a travel time of around 18 minutes.

6.3.6 Route 4

The alternative north / west evacuation route, travelling east along Pickering Brook Road, Bracken Road, Patterson Road, Walnut Road and Lawnbrook Road is a less direct route through Walliston to Kalamunda.

Google Maps shows that, with normal traffic, this journey of around 13 km would take in the region of 15 minutes. See **Figure 6.4**.

This indicates an average speed of just over 50km/h. However, it is expected that the geometry of these roads would be less amenable to carrying the potential maximum volume of traffic using this route, during an evacuation scenario, potentially resulting in lower average speeds. We have therefore assumed an average speed of 30km/h, giving a journey time of 26 minutes.

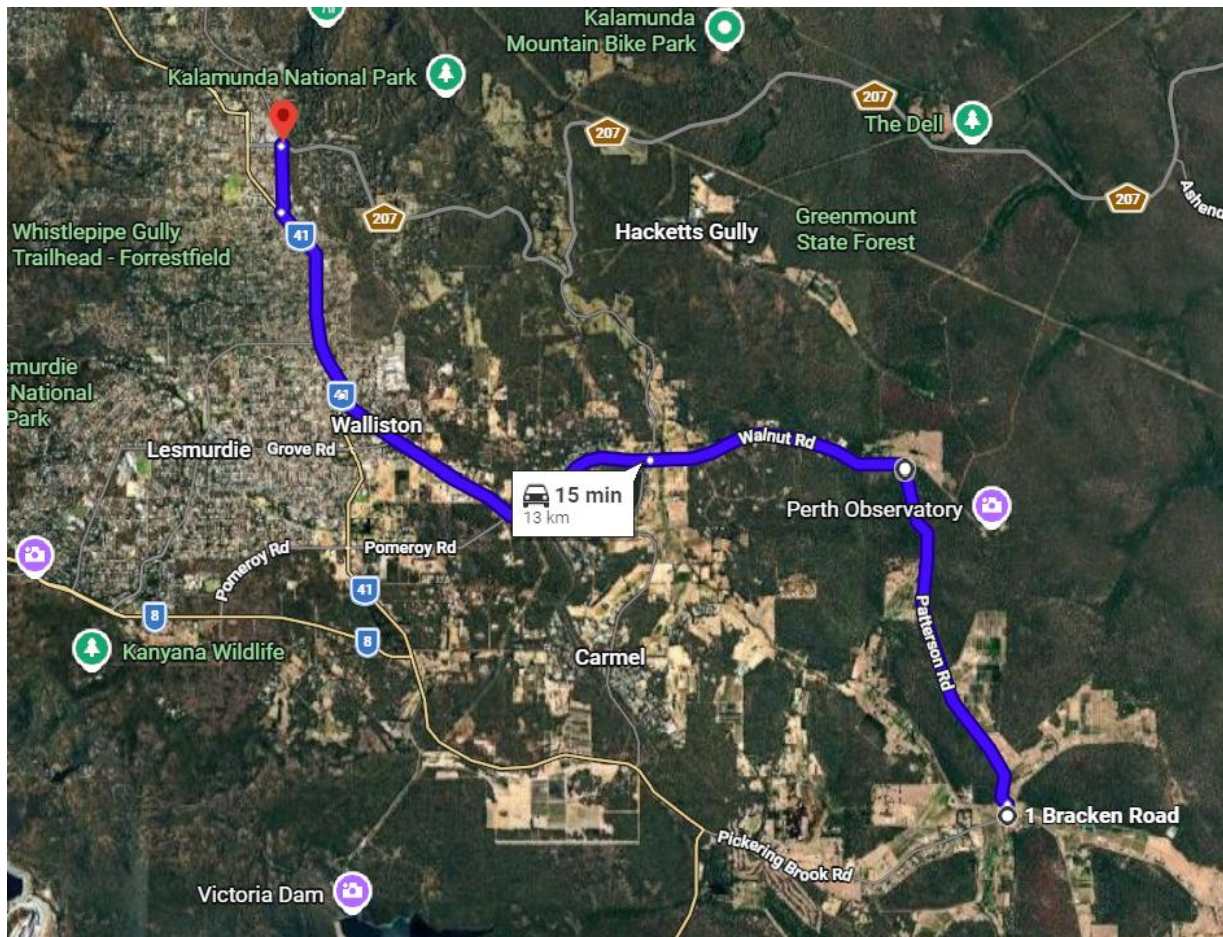


Figure 6.4: Google Maps timing for Route 4

7. IMPACT OF FUTURE DEVELOPMENT

The proposed amendment to the Metropolitan Regional Scheme (MRS) would result in the creation of an additional 44 residential blocks within Pickering Brook. This would increase the population of the townsite by around 131 residents.

Using the same methodology, the additional dwellings, once fully occupied, might produce a maximum of $2.5 \times 44 = 110$ more vehicles to be evacuated in the event of a bushfire event. Again, this is based on each family evacuating using an average of 2.5 vehicles. In reality, this may be on the high side.

As the new lots will be zoned residential, they would not be expected to generate any additional tourist or external worker trips.

As before, if we assume that perhaps 27% of the dwellings' residents would remain in place, the number of vehicles potentially evacuating then reduces to around 80. A proportion of these would be likely to leave early.

However, if we once again look at the worst-case scenario, with all residents, tourists and external workers leaving in a relatively short window, the additional vehicles generated by the new lots would represent a maximum increase of just over 10%.

In the more realistic scenario previously employed, with the final evacuation being undertaken by around 400 vehicles, the additional lots might contribute a further 58 vehicles, or an additional 15%.

Given the capacity and timings previously determined, this increase should not cause any issues with the ability of these vehicles to evacuate the townsite in a timely manner.

Table 7.1 provides a summary of the estimated worst case evacuation timings for each of the identified evacuation routes, under three different development scenarios: with the current level of development; post-the proposed MRS amendment; and a potential future scenario with the current figures being doubled.

As stated, these estimates represent the worst case scenario, whereby all visitors, workers and residents need to leave in the final period, following an order to evacuate.

The previous calculation for the initial complete clearance from the townsite itself of all 1,020 vehicles belonging to residents, workers and visitors examined the worst case speeds and spacings for this to be completed within a one hour period, and concluded that this could be achieved. However, it should be noted that although this was deemed the 'worst case' scenario, it is not a particularly realistic one.

The third development scenario to be considered here is one where the current level of development within Pickering Brook is doubled at some time in the future, with a similar increase in external workers and visitors. Under this scenario, a total of just over 2,000 vehicles might need to evacuate the townsite in a bushfire situation.

Table 7.1: Worst Case estimated evacuation timings for various development scenarios

Evacuation Scenario	Current level of development	Post-proposed MRS Amendment	Future Scenario: Current x 2
Initial exit from the Townsite – all vehicles (20 km/h)	Maximum of 1 hour	Maximum of 1 hour	Potentially over 1 hour
Initial exit from the Townsite – staged (30 km/h)	Up to 40 minutes	Up to 45 minutes	Potentially within 1 hour
Route 1	15 minutes (40 km/h)	15 minutes (40 km/h)	20 minutes (30 km/h)
Route 2	12 minutes (40 km/h)	12 minutes (40 km/h)	16 minutes (30 km/h)
Route 3	18 minutes (30 km/h)	18 minutes (30 km/h)	27 minutes (20 km/h)
Route 4	26 minutes (30 km/h)	26 minutes (30 km/h)	39 minutes (20 km/h)

Notes:

- The times shown for the ‘initial exit from the townsite’ are estimated times for all applicable vehicles to leave the town site and join one of the evacuation routes, following a final instruction to evacuate. In the staged scenario, many will have already left and some will choose to remain, resulting in a reduced number of vehicles leaving.
- The times indicated for the various routes are indicative only, based on estimated average speeds over the extent of the route, *after having left the townsite*. No allowance has been made for unusual events, such as crashes or unrelated traffic management or road closures etc.
- The times stated are for *each individual vehicle* to travel along the route from the point of exiting the townsite to the point of arriving at the nominated destination. It is not a cumulative time from the first vehicle leaving to the last vehicle arriving.
- The times indicated for the various routes assume a steady flow of vehicles travelling at an assumed reduced average speed, with all vehicles leaving the townsite in the immediate aftermath of an evacuation order. Staging of the evacuation may reduce these times.

- The critical part of the evacuation is that of leaving the townsite. This will be the period where progress may be slowed as vehicles from side roads and direct access driveways will need to join the exiting flow of vehicles. Thus, the average speeds through this area will be lower.
- Estimates for the post-MRS amendment scenario are based on the estimated increase in vehicles generated by the additional development.
- The estimates for the x2 scenario should be considered as ball park figures, given the lack of information regarding possible timeframes and the potential for traffic growth on other roads within the area. Again, the critical phase will be exiting the townsite. This is likely to take longer, whilst travel times on the evacuation routes may also be affected by higher overall traffic volumes. Congestion can lead to exponential delays under certain circumstances.

8. EMERGENCY VEHICLE ACCESS

The routes to be taken by emergency vehicles into the area will of course depend upon their initial location and the direction of the approaching fire.

Given the road network around Pickering Brook, and the lack of access from the east, the nearest fire stations to the area are generally to the north and west. See **Figure 8.1**.

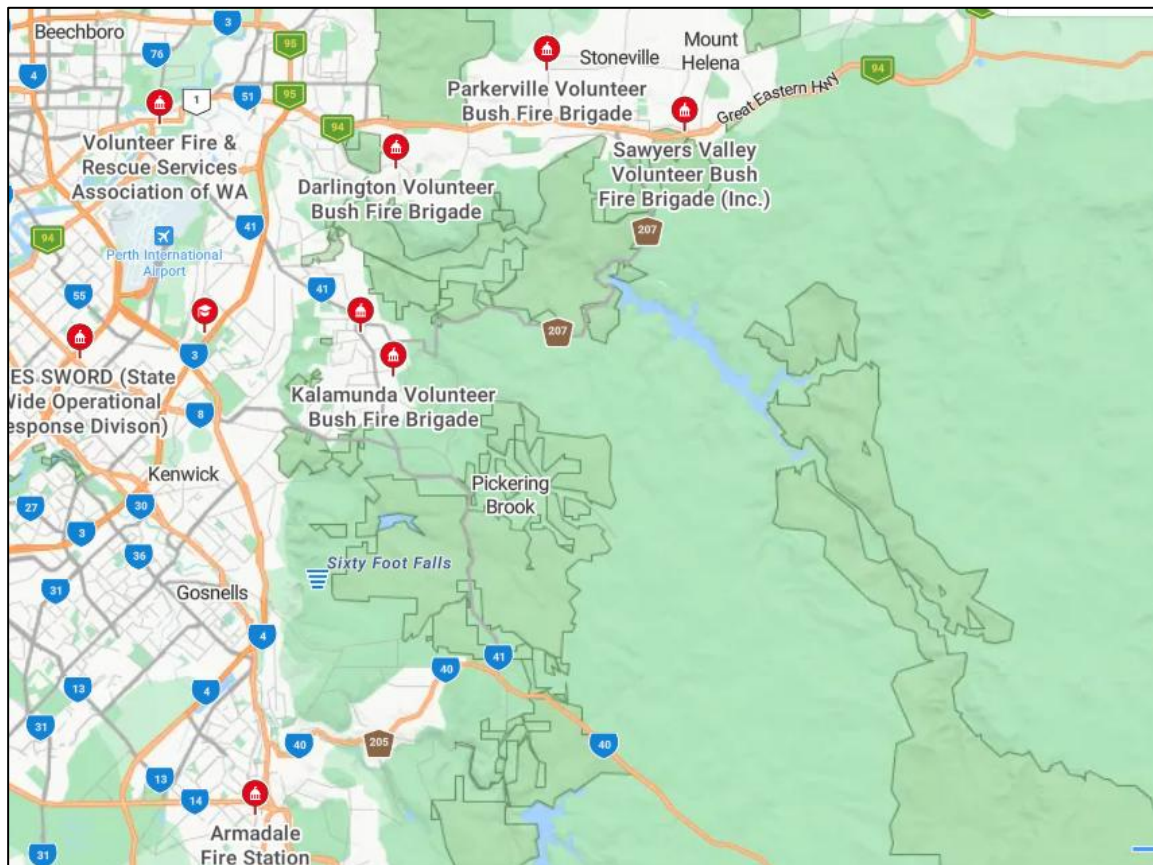


Figure 8.1: Fire stations in the vicinity of Pickering Brook

Source: Google Maps

However, in a significant bushfire event, DFES resources may come from further afield.

Generally, however, the most likely access route into the area would be via Canning Road, either from the west or the south. Both of these roads are of a suitable width and geometry to allow simultaneous access and egress by emergency vehicles and those evacuating the area.

Should a section of Canning Road become inaccessible, alternative routes would include Carmel Road, Lawnbrook Road, Glenisla Road, Walnut Road and Patterson Road.

As previously identified, some of these roads have limited width and other issues that may make simultaneous use more difficult, and certain upgrades should be considered.

9. POTENTIAL INFRASTRUCTURE UPGRADES

From the assessment of evacuation routes and their suitability above, the following are recommended infrastructure improvements to improve the traffic flow and safety of the evacuation from a traffic perspective.

9.1 BRACKEN ROAD / PATTERSON ROAD CULVERTS

Whilst only a short section of Bracken Road is likely to be used as part of an evacuation route, there are two culverts on the bends just north of Pickering Brook Road, which may present an issue in the event of this route being used. See **Figure 9.1**.

The culverts allow only a 5.5m carriageway, which is likely to restrict evacuation movements, especially if DFES vehicles also need to access the townsite via this road.

These culverts should be extended and the road widened to at least 7.0m, and possibly more, given the horizontal geometry of the road in this location. The widening here should be designed to take the swept path of opposing design vehicles.

9.2 PATTERSON ROAD

The sealed width of the eastern section of Walnut Road, west of its intersection with Patterson Road, is approximately 5.5m. Whilst this may be adequate for a one-way evacuation route, it would limit the ease and safety of concurrent use as an emergency vehicle access route. Ideally, the seal would be widened to at least 6.0m.

9.3 WALNUT ROAD

The sealed width of the northern section of Patterson Road, south of its intersection with Walnut Road, is approximately 5.5m. Whilst this may be adequate for a one-way evacuation route, it would limit the ease and safety of concurrent use as an emergency vehicle access route. Ideally, the seal would be widened to at least 6.0m.

However, it is noted that Walnut Road has significant gradients, which may not be suited to the passage of emergency vehicles. Liaison with DFES would be recommended before committing to any upgrades.

9.4 GLENISLA ROAD

Glenisla Road generally meets or exceeds the required sealed width of 6.0m. However, it was noted that there are some significant roadside hazards towards its northern end, including trees, power poles and unrecoverable batters, with no formal protection.

Improving this road's safety should be considered, particularly if it will be a recommended evacuation route – as not all evacuees will be familiar with the terrain and hazards. The improvements could be staged, with improved delineation (such as edge lines) and additional signage (if required) which may

assist drivers, particular in ‘darker’ road conditions. The more costly improvements, such as the treatment of hazards, would need to be assessed and programmed.

9.5 SIGNAGE

There are a number of areas where signage could be improved, to facilitate those unfamiliar with the area to find the appropriate evacuation route in the event of a bushfire.

9.5.1 Pickering Brook Road / Bracken Road Intersection

It was noted on site that the initial southern section of what becomes Patterson Road, and is generally referred to as the ‘Patterson Road route’ is actually sign posted as Bracken Road, which then branches off as a side road to the east. See **Figure 9.1**.

This may potentially confuse people, especially if they are unfamiliar with the roads, and particularly under the stress of finding an evacuation route.

Ideally, this short section of Bracken Road should be renamed and signposted as ‘Patterson Road’.



Figure 9.1: This road section is signposted Bracken Road (green). Note culverts restricting road width (magenta).

9.5.2 Pickering Brook Road / Canning Road Intersection

As detailed above, the priority movement at this intersection is given to the east-west movements between Pickering Brook Road and Canning Road, rather than following Canning Road. This is exacerbated by the poorly located directional signs, and may lead to evacuees from Pickering Brook missing the left turn onto Canning Road, when intending to follow the southern evacuation route.

Whilst DFES or Police staff may be located at the intersection to direct traffic in the event that use of the southern route were required, the signage in this location should still be reviewed and relocated to be more visible, clearly indicating that this is the southern evacuation route. The option to provide illuminated signage should also be considered, to increase visibility in the event of heavy smoke.

9.5.3 No Through Roads

There are a number of roads within the Pickering Brook area that do not link through to anywhere, and that would be unsuitable in the event of a bushfire. Whilst several of these are marked with 'No Through Road' signage, these should be reviewed, and improvements made where necessary. Additional signs may be deemed appropriate in some locations.

10. SUMMARY & CONCLUSIONS

10.1 SUMMARY

Donald Veal Consultants (DVC) has been commissioned to provide transport engineering input to a Strategic Bushfire Management Plan (BMP) for Pickering Brook.

The focus of this report is to identify and evaluate suitable evacuation routes from the townsite of Pickering Brook in the event of a bushfire.

Historically, it is understood that bushfires in this area are most likely to approach from the east, but potentially also from the south east or north east. However, depending upon prevailing conditions, other scenarios are certainly possible.

Clearly, the decision to recommend an evacuation from the area would depend upon a number of factors, including an assessment of the threat presented by a fire, given its location, intensity, predicted path and speed. These factors would also determine which potential evacuation route option would be the most appropriate.

In their peer review comments, Meridian Urban quoted data gathered during interviews with residents, regarding their intentions with respect to leaving the area in the event of a future fire warning.

The data showed that up to 73% of residents may well leave in the event of a fire warning. In this Technical Note, however, it has initially been assumed, as a worst-case scenario, that the vast majority of the residents, the visitors, the workers and the tourists, will all leave together, within a short window of time.

The latest population figures made available from the 2021 Census indicate that there are approximately 579 residents in the Pickering Brook area. With 228 private dwellings in the area, this gives an average of 2.7 residents per dwelling.

On average, the census shows that there are 2.7 vehicles per dwelling. Assuming that each dwelling may evacuate using up to 2.5 vehicles, this would generate around 570 vehicles for the residential element.

In order to make a basic estimate of the potential number of workers, tourists and other visitors that may need to be evacuated in the event of a bushfire, DVC has made some assumptions, based on available data. Thus, the total number of vehicles estimated to require evacuation would be as follows:

Residents = 570

External workers = 250

Tourists and other visitors = 200

Total number of vehicles = 1,020.

Whilst it is expected that the majority of vehicles being used to evacuate will be standard sedans, 4WDs and SUVs, there may be a proportion of vehicles towing trailers, caravans and horseboxes.

Such vehicles would generally be able to keep up with other traffic, although horse boxes may slow down progress, particularly if it is necessary to use the Patterson Road evacuation route.

Fundamentally, there are three main evacuation directions available, depending upon the direction of an approaching bushfire: North, South or West. As previously identified, there is no feasible evacuation route from Pickering Brook towards the east.

The main Western evacuation route entails heading west from Pickering Brook along Pickering Brook Road, which becomes Canning Road, and is signposted for Kalamunda.

The main Southern evacuation route consists of again heading west from Pickering Brook along Pickering Brook Road, before turning left onto Canning Road, signposted for Kelmscott and Brookton.

Depending upon the direction from which the fire is approaching, the best Northern evacuation route may consist of heading west from Pickering Brook along Pickering Brook Road, and continuing west along Canning Road, signposted for Kalamunda, and then taking a right turn onto Glenisla Road.

Should there be an unforeseen situation, whereby the primary exit route from Pickering Brook to either the north or west - i.e. Canning Road and/or Glenisla Road - is not available, then there is an alternative north/west option further to the east.

This would involve heading east along Pickering Brook Road through the townsite, before turning left onto Bracken Road, and then using Patterson Road, Walnut Road and Lawnbrook East Road. Following this route would allow one to rejoin Glenisla Road or Canning Road, further to the west.

Whilst there are some alternative routes along unsealed roads, these would not be considered as viable options in most cases, especially for persons unfamiliar with the area.

DVC has driven along the majority of the links in each potential route and detour, in order to assess the suitability of each to provide both an evacuation route and an entry route for emergency services.

A majority of the vehicles leaving Pickering Brook will need to use Pickering Brook Road in order to access whichever evacuation route they are intending to use.

In this assessment we have looked at the expected ability of various key links, generally those closer to the Pickering Brook area, to cater for the forecast numbers of evacuating vehicles. Once drivers are clear of the immediate area, depending upon the initial route used, additional route options may open up, and they may choose to head in different directions, depending upon their particular circumstances. In this way, the load on subsequent links and routes will reduce as the evacuating vehicles spread across more of the road network.

The time taken for vehicles to evacuate along any given route is primarily conditional upon speed and distance. Whilst speed will vary both along the route, depending upon factors associated with the road, such as gradient, alignment and visibility, as well as individual factors, such as driver confidence and vehicle type, distance will also vary, depending upon where evacuees begin their journey, and at what point they can be considered to have reached 'a safer place'.

Generally, one might assume that vehicles would be considered to have completed their evacuation once they have reached the nearest major townsite, as these should be equipped with evacuation centres in the event of a large bushfire.

Timings indicated by Google Maps have been shown for the main routes, as a base indicator. However, these are based on drivers generally travelling at or near to the speed limit. This may not be possible in an evacuation scenario, especially within the immediate townsite area.

The key to evacuating the townsite will be the capacity of the critical road links nearest to the town. Once drivers have reached Canning Road, for example, traffic should flow more freely, and no further capacity issues would be expected.

For the purpose of this exercise, it has been assumed that the average speed of those leaving the townsite - once they have reached a larger road, such as Canning Road - will be 40km/h, but restricted to 20km/h within the townsite, where some queuing may be expected, as vehicles join the evacuation routes from various side roads and driveways. On Access Roads, such as the Patterson Road route, we have assumed average speeds would reach perhaps 30km/h.

Our assessment indicates that, even with the maximum total number of vehicles evacuating, using a single route, it should be possible for all vehicles to leave in a one-hour period.

However, it is far more likely that the evacuation will be carried out in stages, with the majority of the external workers, tourists and other visitors leaving gradually, over a longer period, well before any final instruction to evacuate. Meridian Urban identified that 27% of residents indicated that they intended to remain in place and defend.

This then equates to a total of perhaps 400 vehicles leaving in the hour following the final instruction to evacuate. This number of vehicles would therefore be able to clear the townsite in well under an hour.

In terms of the proposed MRS amendment, which would see an additional 44 residential properties added to the townsite, this would represent an increase of around 10% on the number of vehicles potentially attempting to evacuate in the worst-case scenario. In the more likely scenario, the increase would be nearer to 15%. However, neither increase would significantly affect the ability of all vehicles to evacuate the townsite in a timely manner.

The routes to be taken by emergency vehicles into the area will of course depend upon their initial location and the direction of the approaching fire. Given the road network around Pickering Brook, and the lack of access from the east, the nearest fire stations to the area are generally to the north and west. However, in a significant bushfire event, DFES resources may come from further afield.

Generally, however, the most likely access route into the area would be via Canning Road, either from the west or the south. Both of these roads are of a suitable width and geometry to allow simultaneous access and egress by emergency vehicles and those evacuating the area.

Should a section of Canning Road become inaccessible, alternative routes would include Carmel Road, Lawnbrook Road, Glenisla Road, Walnut Road and Patterson Road. However, some of these roads have limited width and other issues that may make simultaneous use more difficult, and certain upgrades should be considered.

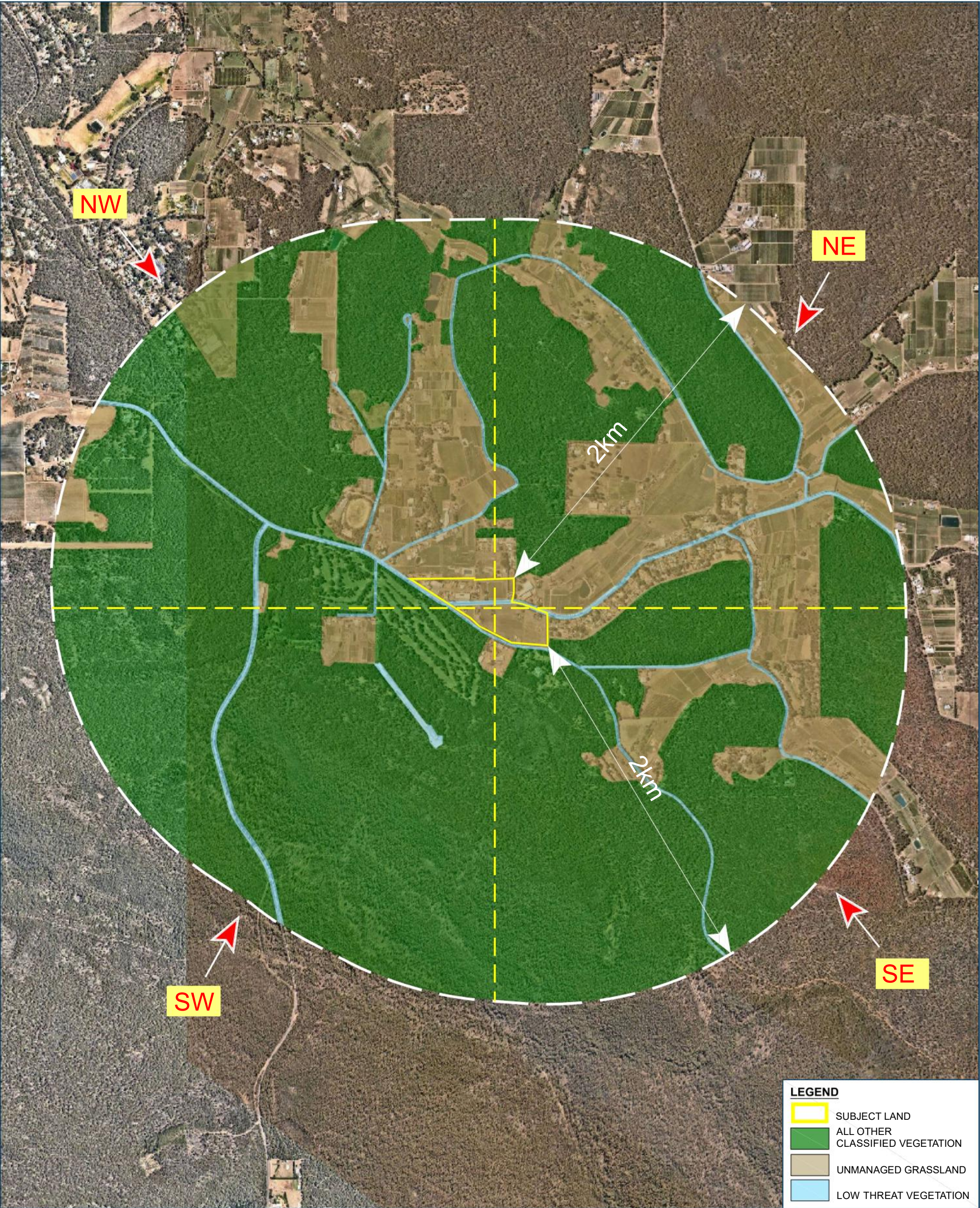
There are a number of areas where signage could be improved, to facilitate those unfamiliar with the area to find the appropriate evacuation route in the event of a bushfire.

10.2 CONCLUSIONS

Based on the available information and some reasonable assumptions, the analysis contained within this Technical Report indicates the following conclusions:-

- A maximum of 1,020 vehicles could be expected to leave the townsite in the event of a significant bushfire event, although with a number indicating an intention to remain in place and the likely early exit of a proportion, including workers, tourists and other visitors to the area, this could potentially be reduced to around 400.
- There are three main evacuation routes, which are generally considered suitable for both the evacuation of vehicles from the area and the simultaneous entry of DFES and other emergency vehicles. These routes include one to the west, one to the south and one to the north. There is no viable route to the east.
- Alternative routes and detours do exist that may be used in certain circumstances. Some of these may benefit from targeted upgrades. A review of the existing signage should also be undertaken.
- Based on estimated values for capacity, speed and timing, the required number of evacuation vehicles will be able to exit the townsite and reach the nearest major townsite within an acceptable timeframe.

It should be noted that this assessment is based on available data sources such as census data, resident surveys, and a number of assumptions that rely to some extent on factors such as human behaviour, which can be variable, and difficult to predict. These factors may also change as circumstances alter, particularly in the light of an imminent threat such as a bushfire event.



VEGETATION TYPE AND ASPECT ASSESSMENT

PICKERING BROOK ROAD
PICKERING BROOK

CITY OF KALAMUNDA

0 200 400 600 800 1000 1200m

SCALE: 1:20,000
ORIGINAL PLAN SIZE: A3

JOB CODE:
KDA PIC ZB

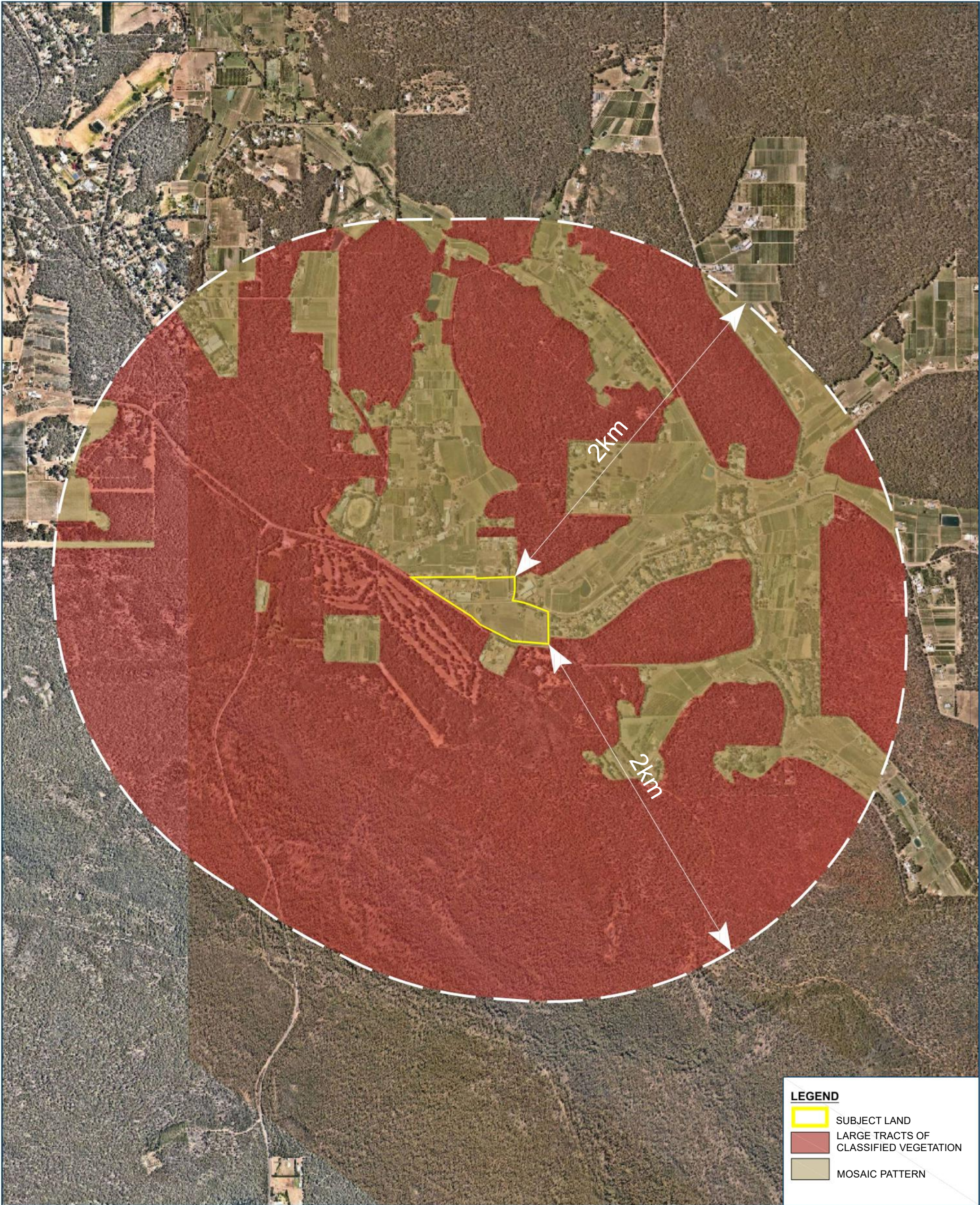
DATE:
14.04.2026



Allering & Associates

Town Planners, Advocates
and Subdivision Designers

125 Hamersley Road, Subiaco WA 6008
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LEGEND

-  SUBJECT LAND
-  LARGE TRACTS OF CLASSIFIED VEGETATION
-  MOSAIC PATTERN

PREDOMINANT VEGETATION PATTERN

PICKERING BROOK ROAD
PICKERING BROOK

CITY OF KALAMUNDA

0 200 400 600 800 1000 1200m
SCALE: 1:20,000
ORIGINAL PLAN SIZE: A3

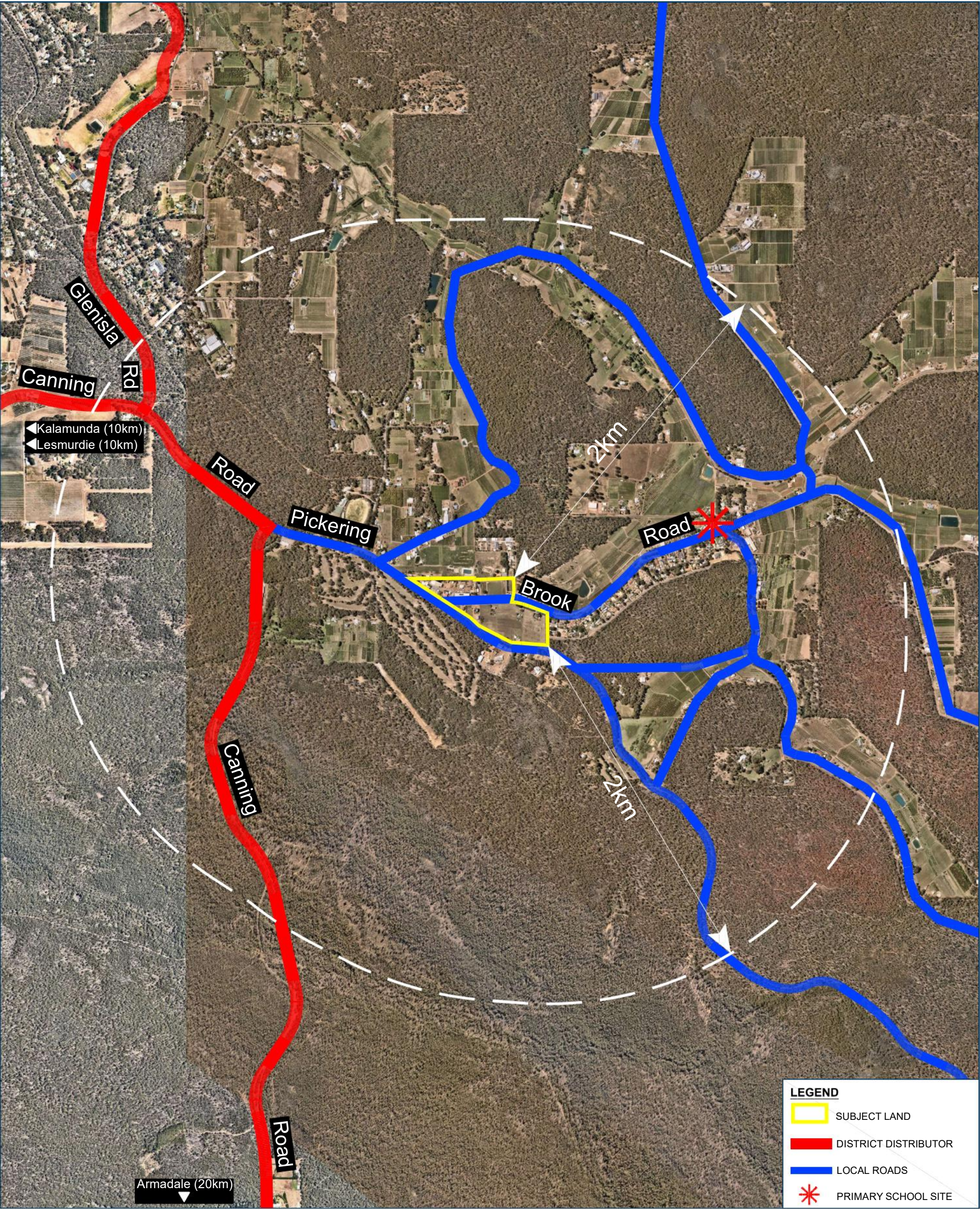
JOB CODE:
KDA PIC ZB

DATE:
13.04.2026



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ROAD PATTERN AND SUITABLE DESTINATION

PICKERING BROOK ROAD
PICKERING BROOK

CITY OF KALAMUNDA

0 200 400 600 800 1000 1200m

SCALE: 1:20,000
ORIGINAL PLAN SIZE: A3

JOB CODE:
KDA PIC ZB

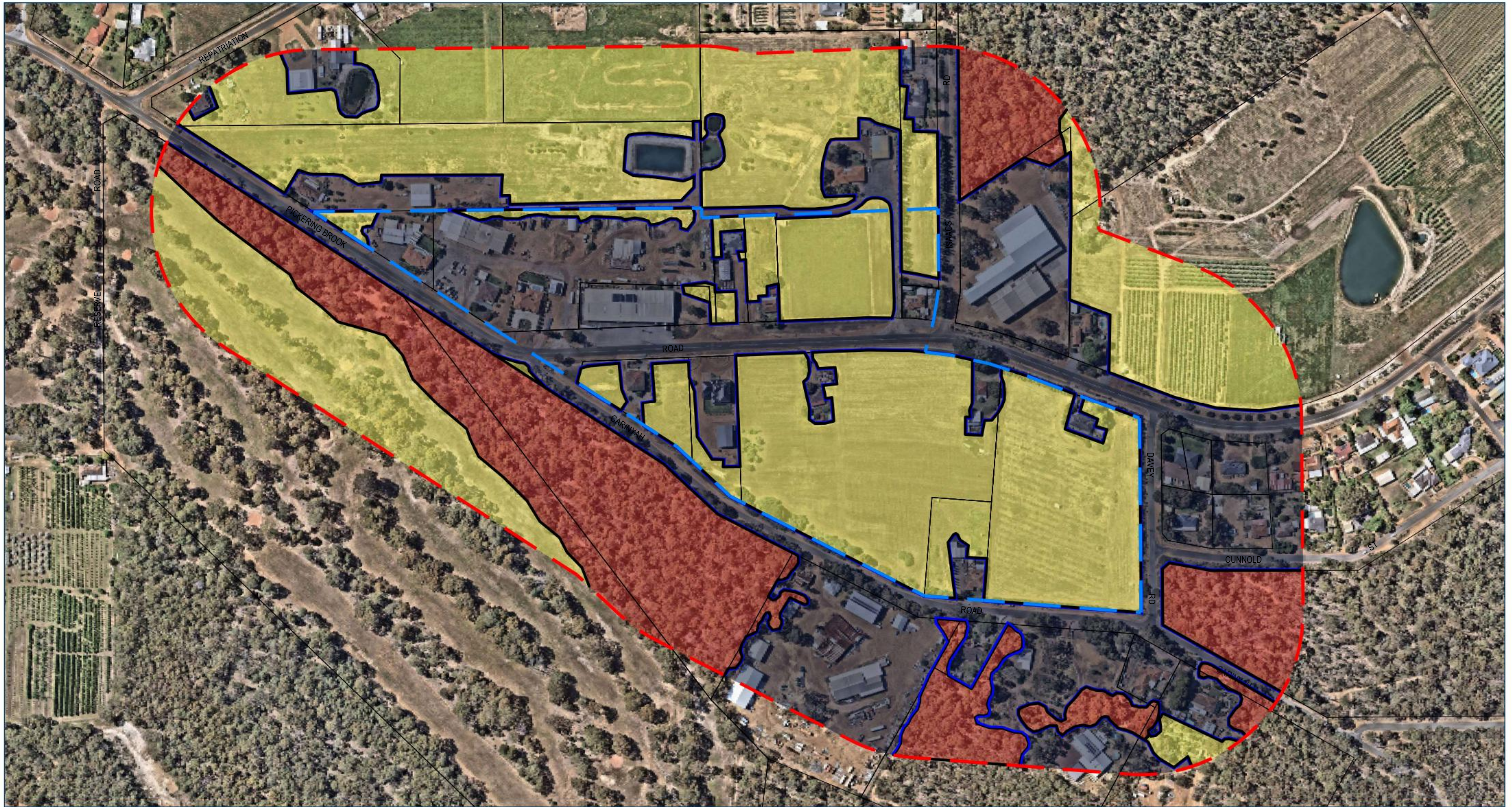
DATE:
14.04.2026



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BUSHFIRE HAZARD LEVEL VEGETATION CLASSIFICATION

PICKERING BROOK ROAD
PICKERING BROOK

CITY OF KALAMUNDA

0 50 100 150 200 250m

SCALE: 1:3500
ORIGINAL PLAN SIZE: A3

JOB CODE:
XXX XXX ZB

DATE:
13.04.2026



LEGEND:

SUBJECT LAND -

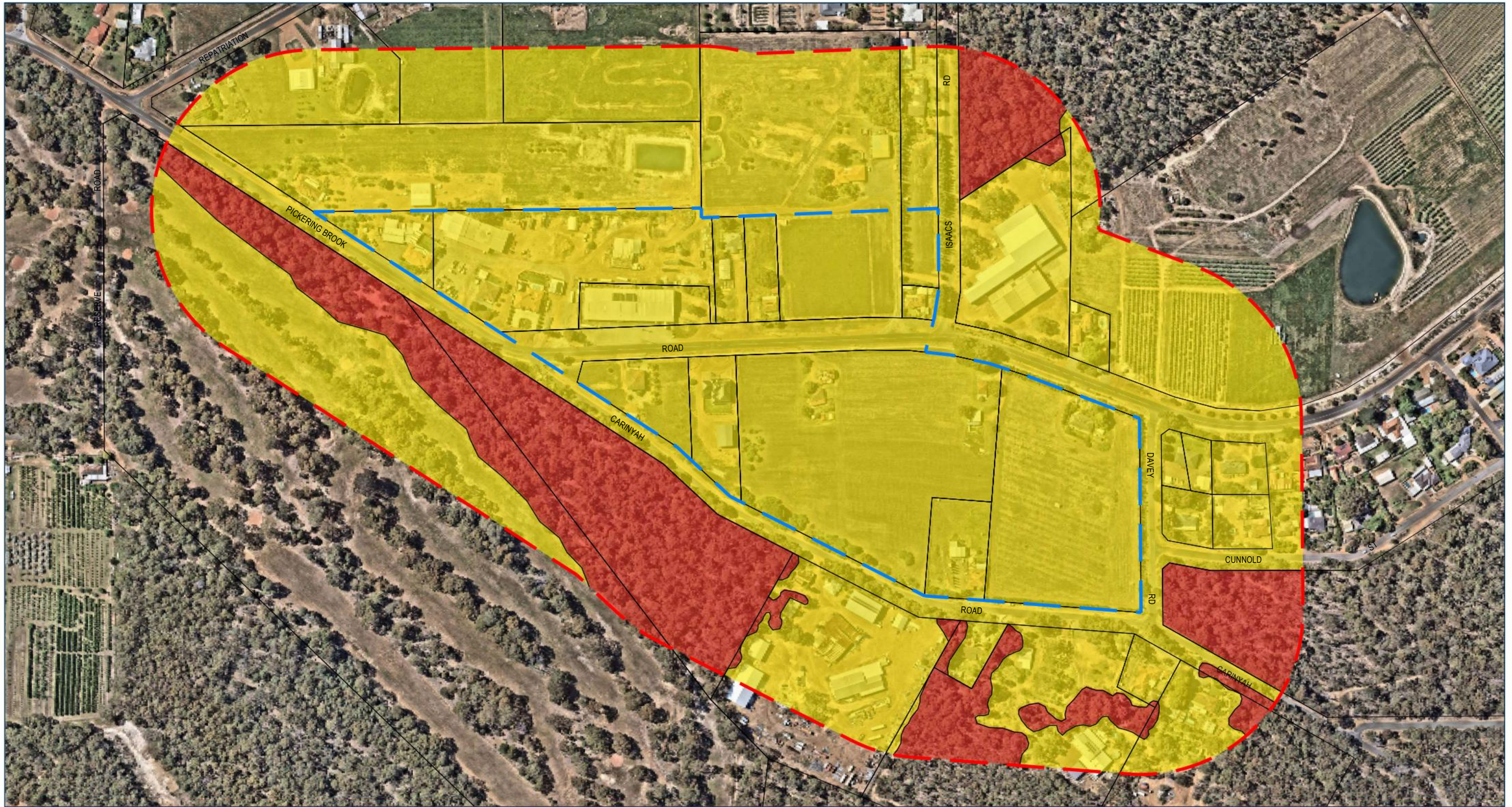
150m ASSESSMENT AREA -

- CLASS A FOREST
- CLASS G GRASSLAND (Sown - pasture & crops)
- EXCLUSION CLAUSE 2.2.3.2(e) (Non-vegetated)

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BUSHFIRE HAZARD LEVEL ASSESSMENT

PICKERING BROOK ROAD
PICKERING BROOK

CITY OF KALAMUNDA

0 50 100 150 200 250m

SCALE: 1:3500
ORIGINAL PLAN SIZE: A3

JOB CODE:
XXX XXX ZB

DATE:
13.04.2026



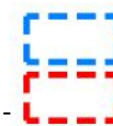
LEGEND:

SUBJECT LAND -

150m ASSESSMENT AREA -

BUSHFIRE HAZARD LEVEL

EXTREME
MODERATE
LOW



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**APPENDIX 3 –
VEHICULAR ACCESS AND WATER TECHNICAL REQUIREMENTS**
(Extracted from the *Planning for Bushfire Guidelines 2024*, Appendix B)

Element 3: Vehicular Access

The following requirements for vehicular access from the Guidelines is provided for the City of Kalamunda for ease of implementation.

Pickering Brook is within Area 2 and for public roads these should be to the standards as outlined by the Institute of Public Works Engineering Australasia (IPWEA), subdivision guidelines, Liveable Neighbourhoods, Austroads Standards, Main Roads standards, supplement, policy or guideline and/or any applicable or relevant local government standard or policy (refer to Note 5 in the table below).

The Guidelines suggest that a minimum of 6m horizontal clearance is sufficient for public roads to provide for efficient and effective evacuation during a bushfire emergency (refer to Figure A below).

Acceptable solution 3.1 Public roads: Public roads, including perimeter roads should meet the technical requirements in Appendix B.3, Table 10 of the Guidelines.

	1		2		3		4		5	
TECHNICAL REQUIREMENTS	PERIMETER ROADS		PUBLIC ROADS		EMERGENCY ACCESS WAY ³		FIRE SERVICE ACCESS ROUTE ³		BATTLE-AXE & PRIVATE DRIVEWAYS ¹	
MAP OF BUSH FIRE PRONE AREAS DESIGNATION	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1	Area 2	Area 1
Minimum horizontal clearance (metres)	12	8	See note 5		10	6	10	6	6	
Minimum vertical clearance (metres)	4.5									
Minimum weight capacity (tonnes)	15									
Maximum grade unsealed road ²	See note 5		See note 5		1:10 (10% or 6°)					
Maximum grade sealed road ^{2,4}					1:7 (14.3% or 8°)					
Maximum average grade sealed road					1:10 (10% or 6°)					
Minimum inner radius of road curves (metres)					8.5					

Notes:

¹ Driveways and battle-axe legs to comply with the Residential Design Codes and Development Control Policy 2.2 Residential Subdivision where not required to comply with the widths in this Appendix or the Guidelines.

² Dips must have no more than a 1 in 8 (12.5% - 7.1 degrees) entry and exit angle.

³ To have crossfalls between 3 per cent and 6 per cent.

⁴ For sealed roads only the maximum grade of no more than 1 in 5 (20 per cent) (11.3 degrees) for no more than 50 metres is permissible, except for short constrictions to 3.5 metres for no more than 30 metres in length where an obstruction cannot be reasonably avoided or removed.

⁵ As outlined in the Institute of [Public Works Engineering Australasia \(IPWEA\) subdivision guidelines](#), [Liveable Neighbourhoods](#), [Austroads Standards](#) Main Roads standard, supplement, policy or guideline and/or any applicable or relevant local government standard or policy.

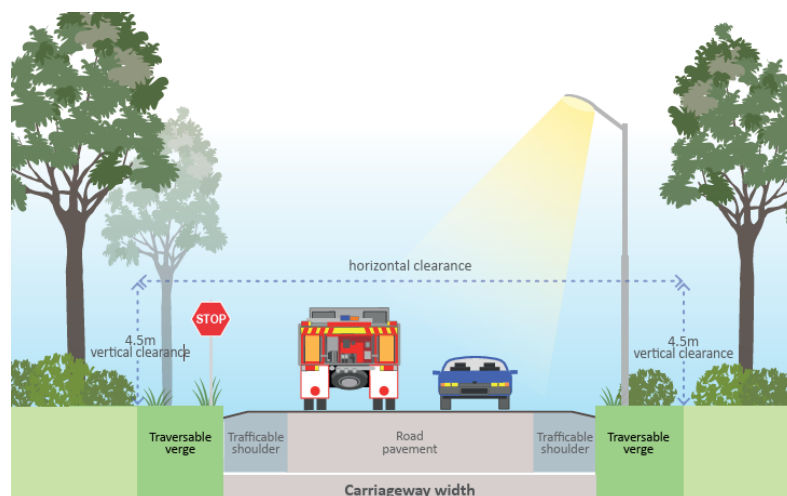


Figure A: Area encompassing horizontal clearance and vertical clearance (WAPC: 2024)

Horizontal clearance: the carriageway width (including the road pavement and trafficable shoulder) and traversable verge that provide for the movement and parking of vehicles and area required by emergency services to operate. Infrastructure and vegetation within the traversable verge should be frangible, however non-frangible items can occur providing they do not restrict vehicular movements in the event of an emergency (WAPC Guidelines: 2024).

Acceptable solution 3.2 Access routes: Public road access should be provided in two different directions, to two different suitable destinations; and with an all-weather surface. If the public road access to the subject site is via a no-through road which cannot be avoided due to demonstrated site constraints.

Acceptable solution 3.3a No-through roads: Public road access should be provided in two different directions, to two different suitable destinations; and with an all-weather surface.

If the public road access to the subject site is via a no-through road which cannot be avoided due to demonstrated site constraints, the public road access is to be a maximum of 200 metres from the subject site boundary to an intersection where two-way access is provided.

The no-through road may exceed 200 metres if it is demonstrated that an alternative access, including an emergency access way, cannot be provided due to site constraints, and the following requirements are met:

- the no-through road travels towards a suitable destination; and
- the balance of the no-through road that is greater than 200 metres from the subject site is wholly within BAL-LOW, or is within a residential built-out area or within Area 1.

Acceptable solution: 3.3b No-through roads requirements A no-through road is to meet all the following requirements:

- requirements of a public road (Table 10, Column 2); and
- turn-around area/head.

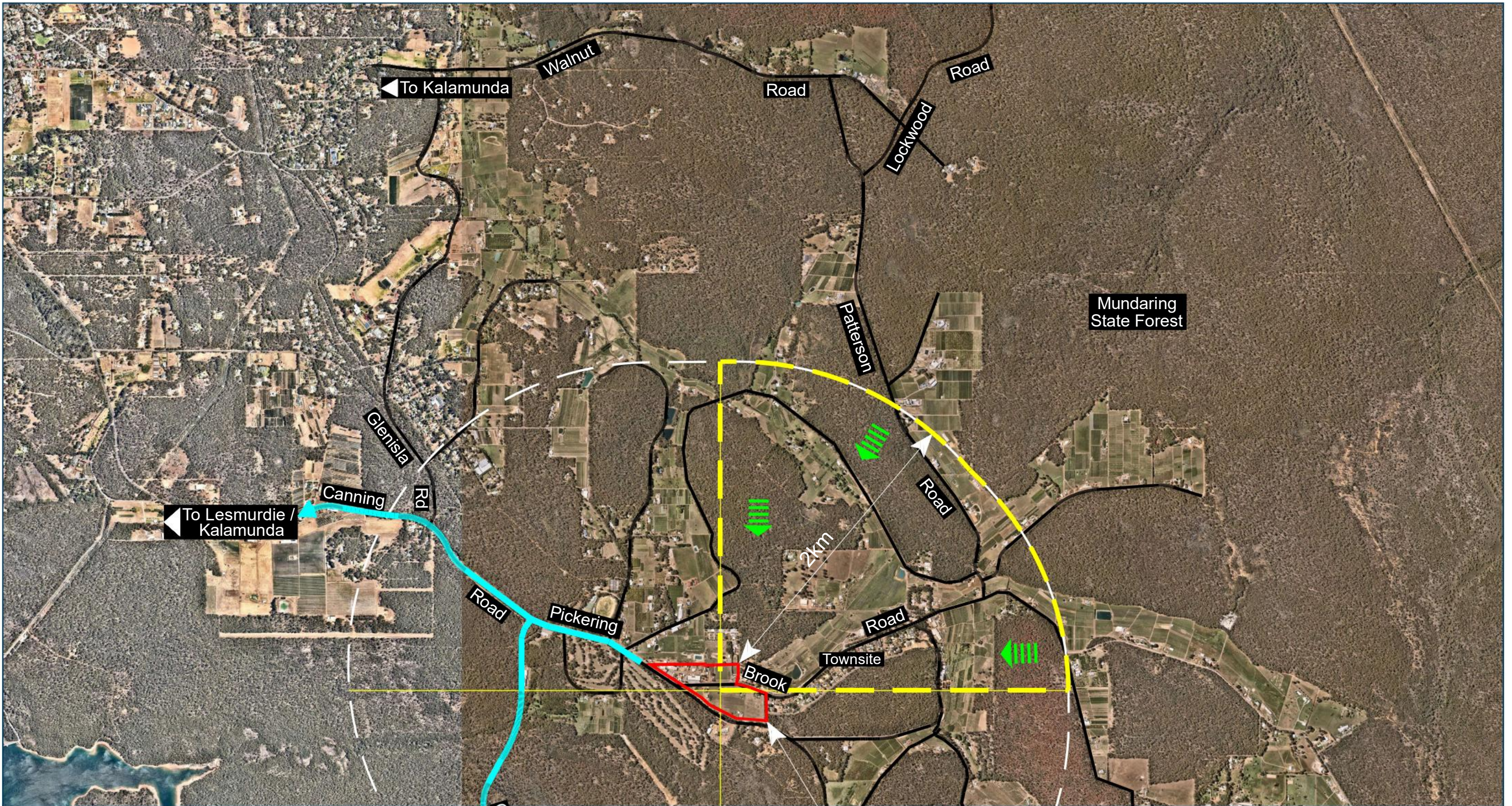
Element 4: Water

Acceptable solution: 4.1 Water supply Evidence that a sufficient and accessible reticulated or non-reticulated water supply for bushfire firefighting can be provided at the subdivision and/or development application stage, in accordance with the specifications of the relevant water supply authority or the requirements in Appendix B4: Water Supply dedicated for bushfire firefighting.

Where strategic water tank for bushfire fighting purposes is proposed, it should be located no more than 10 minutes from the farthest development site (20 minute turnaround time at a maximum). The turnaround time is the time it takes an emergency services vehicle to travel at legal road speeds from a lot to the water supply and back to the lot.

A 50, 0000 litre strategic water tank is recommended to supplement water for firefighting purposes. The tanks should be a condition of subdivision approval and provided by the developer. On-going management will be the responsibility of the Local Government.

**APPENDIX 4 –
BUSHFIRE SCENARIO MAPPING**



BUSHFIRE SCENARIO FROM NORTH-EAST

PICKERING BROOK

CITY OF KALAMUNDA

0 200 400 600 800 1000 1200 1400 1600m

SCALE: 1:25,000
ORIGINAL PLAN SIZE: A3

JOB CODE:
KDA PIC ZB

DATE:
15.06.2026



LEGEND:

SUBJECT LAND -

DIRECTION OF BUSHLAND ATTACK -

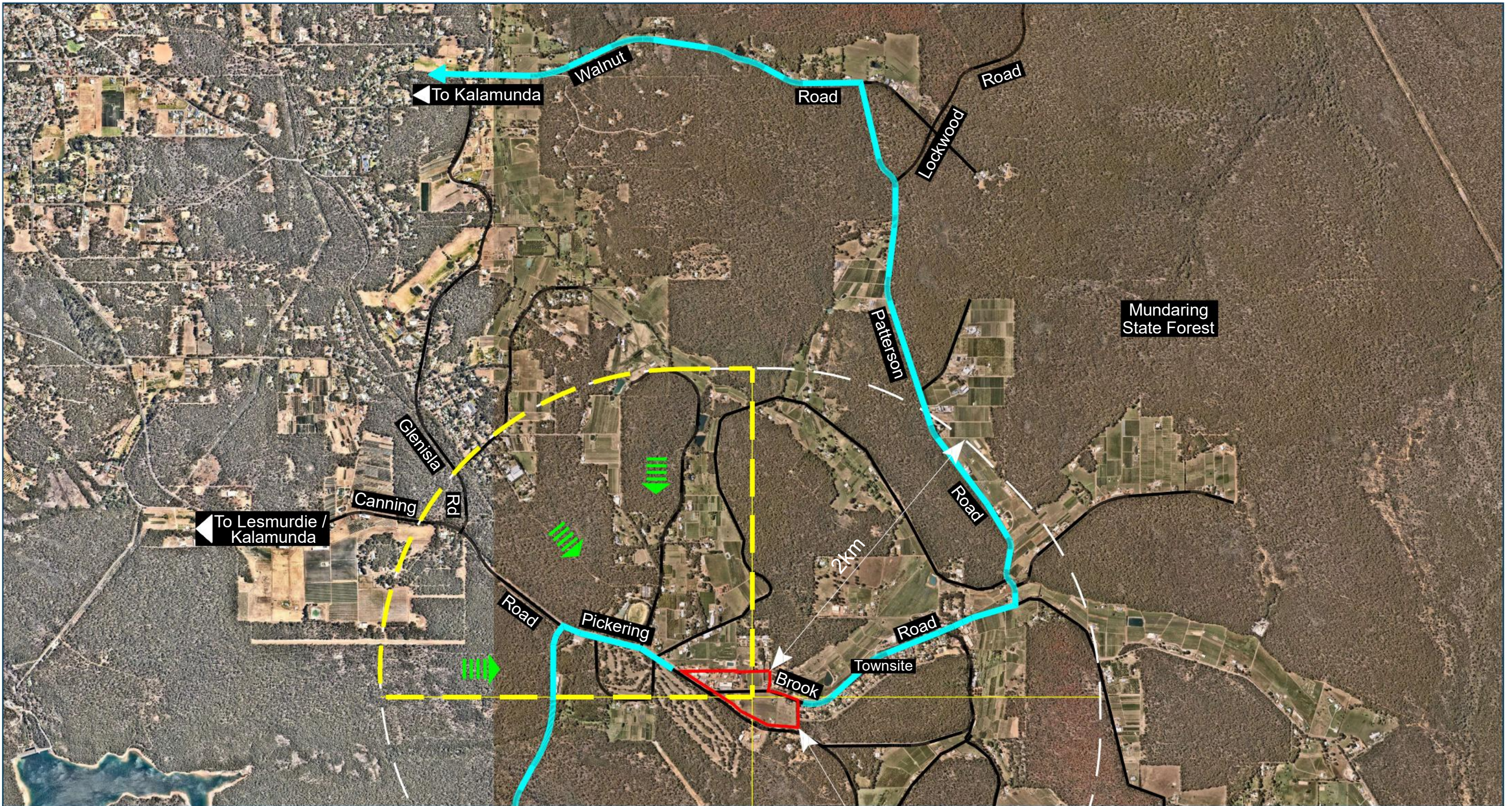
ESCAPE ROUTES -



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BUSHFIRE SCENARIO FROM NORTH-WEST

PICKERING BROOK

CITY OF KALAMUNDA



SCALE: 1:25,000
ORIGINAL PLAN SIZE: A3

JOB CODE:
KDA PIC ZB

DATE:
15.06.2026



LEGEND:

SUBJECT LAND -

DIRECTION OF BUSHLAND ATTACK -

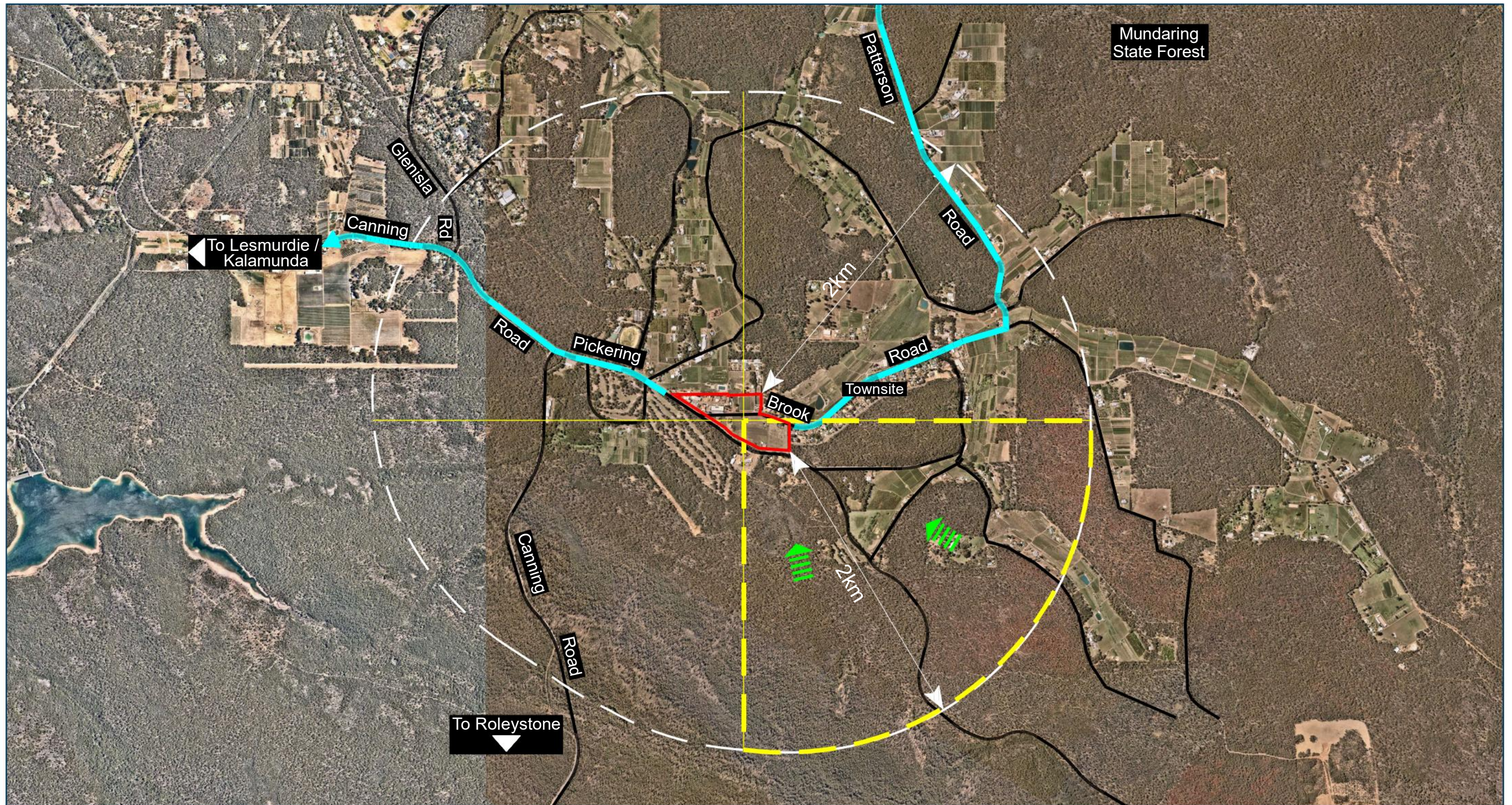
ESCAPE ROUTES -



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BUSHFIRE SCENARIO FROM SOUTH-EAST

PICKERING BROOK

CITY OF KALAMUNDA



SCALE: 1:25,000
ORIGINAL PLAN SIZE: A3

JOB CODE:
KDA PIC ZB

DATE:
15.06.2026



LEGEND:

SUBJECT LAND -

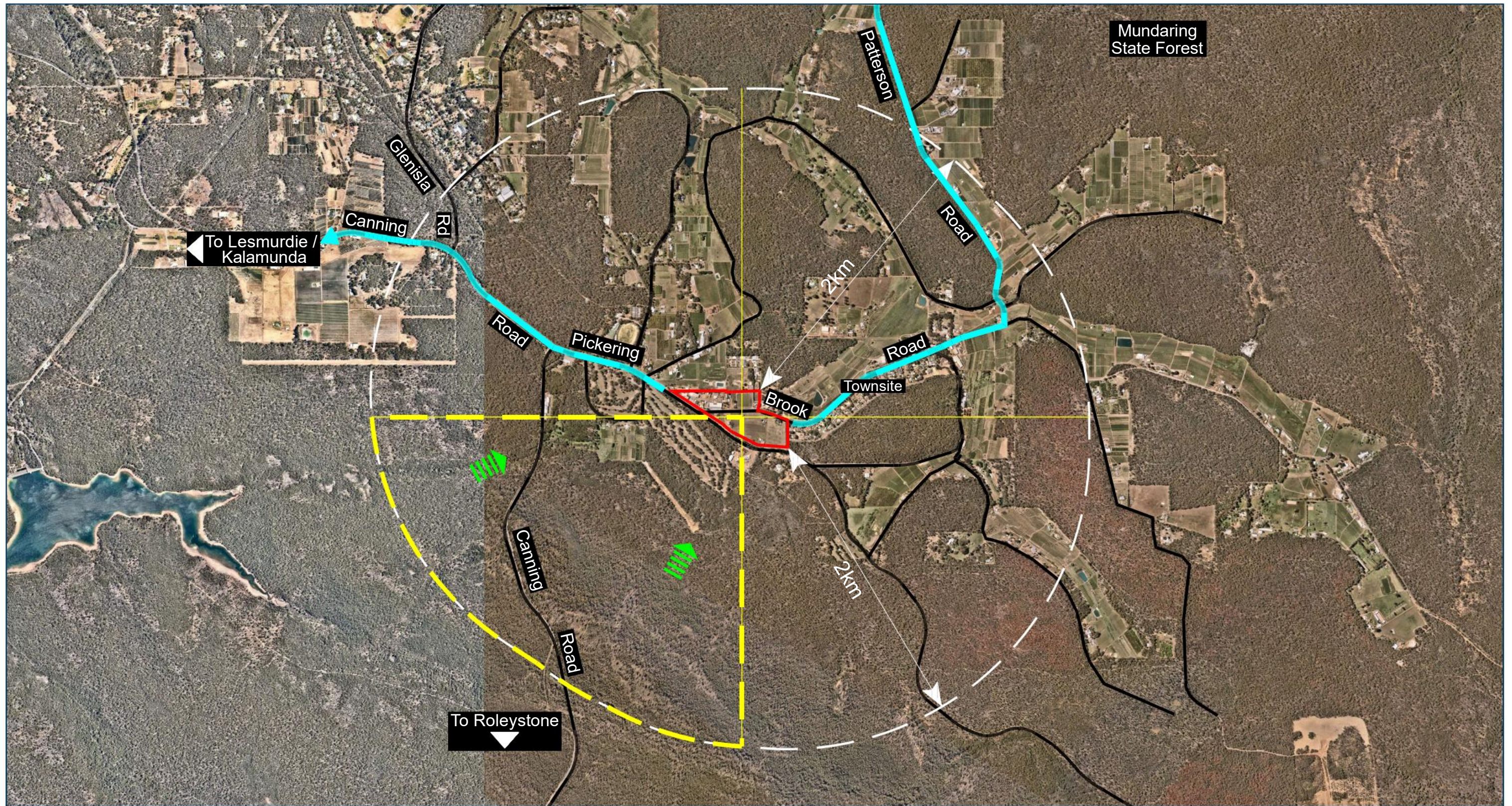
DIRECTION OF BUSHLAND ATTACK -

ESCAPE ROUTES -



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BUSHFIRE SCENARIO FROM SOUTH-WEST

PICKERING BROOK

CITY OF KALAMUNDA



SCALE: 1:25,000
ORIGINAL PLAN SIZE: A3

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