



Bushfire Assessment

Planning Proposal

**Pleasure Point Road,
Pleasure Point**

Liverpool City Council

20 December 2021

(Ref: 21061)

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Executive summary

Objective

This Bushfire Assessment Report was commissioned by Liverpool City Council (LCC) to inform a Planning Proposal to amend planning controls relating to dwelling density for a site on Pleasure Point Road, Pleasure Point. The Planning Proposal seeks to increase the lot restriction as stipulated within Clause 7.12 of the *Liverpool Local Environmental Plan (LLEP)* 2008 for each site from four lots to five.

The objective was to assess the bushfire hazard and recommend bushfire protection measures to achieve compliance with the relevant requirements for protection against bushfires.

Compliance with legislation and policy

A Planning Proposal on bushfire prone land must have regard to the *Environmental Planning and Assessment Act 1979* Section 9.1 Ministerial Direction No. 4.4 – ‘Planning for Bush Fire Protection’, referring to the document *Planning for Bush Fire Protection 2019*.

Bushfire hazard

The hazard consists of extensive areas of forest situated within the Liverpool Military Area to the west and south of Heathcote Road and adjoining to the east. The forest extends into the Planning Proposal area within an E2 Environmental Conservation zone. Grassland also exists in the west direction beyond Pleasure Point Road.

Findings

The APZ constraint measured from the forest hazard (E2 zone) leaves two of the four sites (Site 1 and 3) with potential developable area. Site 2 already has the proposed limit of five dwellings and the APZ constraint on Site 4 prevents further development.

The physical separation between Site 1 and Site 3 prevents a through road around the eastern side of the development to act as a continuous perimeter road. Therefore, Sites 1 and 3 would require its own individual access road and turning facility. Private property access roads can link up with the existing fire trail requirement to ensure through access to the rear of all four sites is maintained. Hydrants would also need to be installed along the roads to ensure new dwellings have a compliant water supply for fire-fighters.

Conclusion

The proposal is not considered incompatible with the surrounding environment and bushfire risk. With sound bushfire management, the proposal can exist within the bushland setting.

The report concludes that the Planning Proposal together with the recommended bushfire protection measures satisfies the specifications and requirements of Ministerial Direction No. 4.4 and *Planning for Bush Fire Protection 2019*.

1 Introduction

1.1 Background

Liverpool City Council (LCC) commissioned Peterson Bushfire to prepare a Bushfire Assessment Report to inform and support a Planning Proposal to amend planning controls relating to dwelling density for a site on Pleasure Point Road, Pleasure Point. This report addresses the requirements for assessment of Planning Proposals involving 'bushfire prone land', namely the *Environmental Planning and Assessment Act 1979* Section 9.1 Ministerial Direction 4.4 – 'Planning for Bush Fire Protection'.

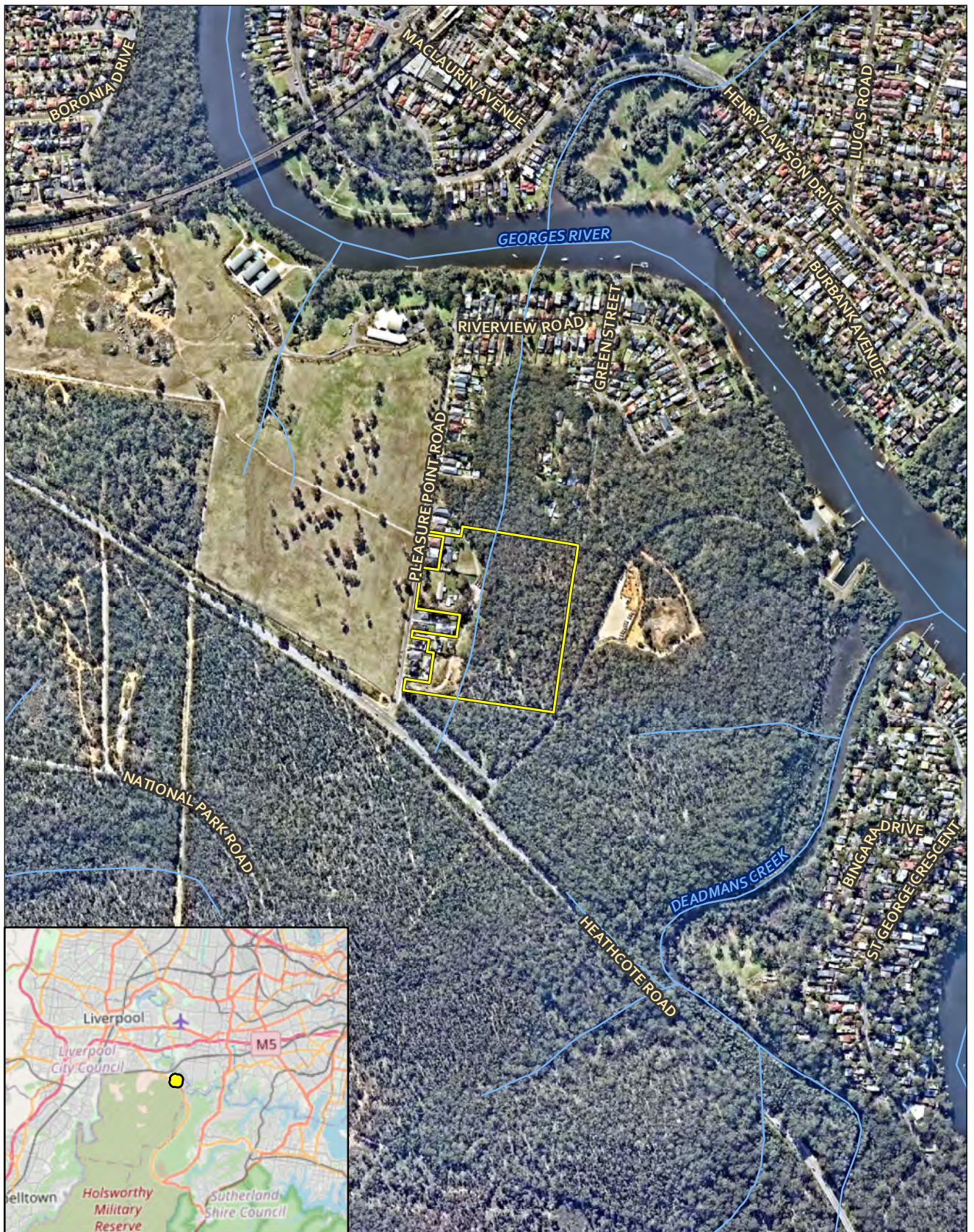
1.2 Location of subject land

The land subject to the Planning Proposal consists of 14 lots divided into four sites located near the intersection of Pleasure Point Road and Heathcote Road, Pleasure Point. The location of the subject land is shown on Figure 1.



The four sites and their respective lots are listed in Table 1 below.

Table 1: Lots that comprise the four Sites subject to the Planning Proposal

| Site 1: | Site 2: |
|--|--|
| Lot 71 within DP 1134477 Lot 72 within DP 1134477 Lot 73 within DP 1134477 Lot 74 within DP 1134477 | Lot 75 within DP 1134478 Lot 77 within DP 1134478 Lot 78 within DP 1134478 Lot 761 within DP 1217961 Lot 762 within DP 1217961 |
| Site 3: | Site 4: |
| Lot 5 within DP 239468 | Lot 83 within DP 1134481 Lot 84 within DP 1134481 Lot 85 within DP 1134481 Lot 86 within DP 1134481 |



Legend

-  Watercourse
-  Subject Land



Date: 27/05/2021

0 125 250 500
Metres

Figure 1: The Location of the Subject Land

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

1.3 The proposal

The Planning Proposal seeks to increase the existing four lot restriction for each site stipulated within Clause 7.12 of the *Liverpool Local Environmental Plan* (LLEP) 2008 to a maximum of five lots. The purpose for the Planning Proposal is to increase the yield potential of the four sites, and to formalise the existence of a five lot subdivision that has been approved previously for Site 2.

The proposal will be achieved through an amendment to the Dwelling Density Map DWD-0015 (4900_COM_DWD_015_020_20091013) of the LLEP 2008 to restrict the lot yield at five.

The potential for additional lots will only be considered within the existing R5 Large Lot Residential Zone as shown on the zoning plan on Figure 2. The R5 zone covers approximately the western third of the sites, fronting Pleasure Point Road. The remainder of the sites (approximately western two-thirds) are zoned E2 Environmental Conservation which does not permit the construction of a dwelling or the establishment and maintenance of any associated Asset Protection Zones (APZ). It is not an objective of this Planning Proposal to rezone the land to extend the residential zoning.



Legend

| | | | | |
|--|--------------|------------------|-------------------------------|--------------------------|
| | Contour - 2m | Land Zone | | R5 Large Lot Residential |
| | Watercourse | | E2 Environmental Conservation | |
| | Subject Land | | E3 Environmental Management | |
| | Cadastral | | R2 Low Density Residential | |
| | | | SP2 Infrastructure | |



Date: 27/05/2021

0 25 50 100
Metres

Figure 2: Land Zoning

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

2 Assessment requirements

The subject land is identified as 'bush fire prone land' as shown on Figure 3. Planning Proposal submissions involving bush fire prone land must have regard to Section 9.1 Direction 4.4 – 'Planning for Bush Fire Protection' of the *Environmental Planning and Assessment Act 1979* as well as the NSW Rural Fire Service document 'Planning for Bush Fire Protection 2019' (referred to as 'PBP' throughout this report).

2.1 Direction 4.4 requirements

The objectives of Direction 4.4 are:

- *To protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bushfire prone areas; and*
- *To encourage sound management of bushfire prone areas.*

Direction 4.4 instructs councils on the bushfire matters which need to be addressed when drafting and amending Local Environmental Plans (LEP). They are as follows:

- *A draft LEP shall:*
 - *have regard to the document Planning for Bush Fire Protection 2006;*
 - *introduce controls that avoid placing inappropriate developments in hazardous areas; and*
 - *ensure that bushfire hazard reduction is not prohibited within the asset protection zone.*
- *A draft LEP shall, where development is proposed, comply with the following provisions, as appropriate:*
 - *provide an asset protection zone incorporating at a minimum:*
 - *an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and,*
 - *an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road.*
 - *for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the draft LEP permit Special Fire Protection Purposes (as defined*

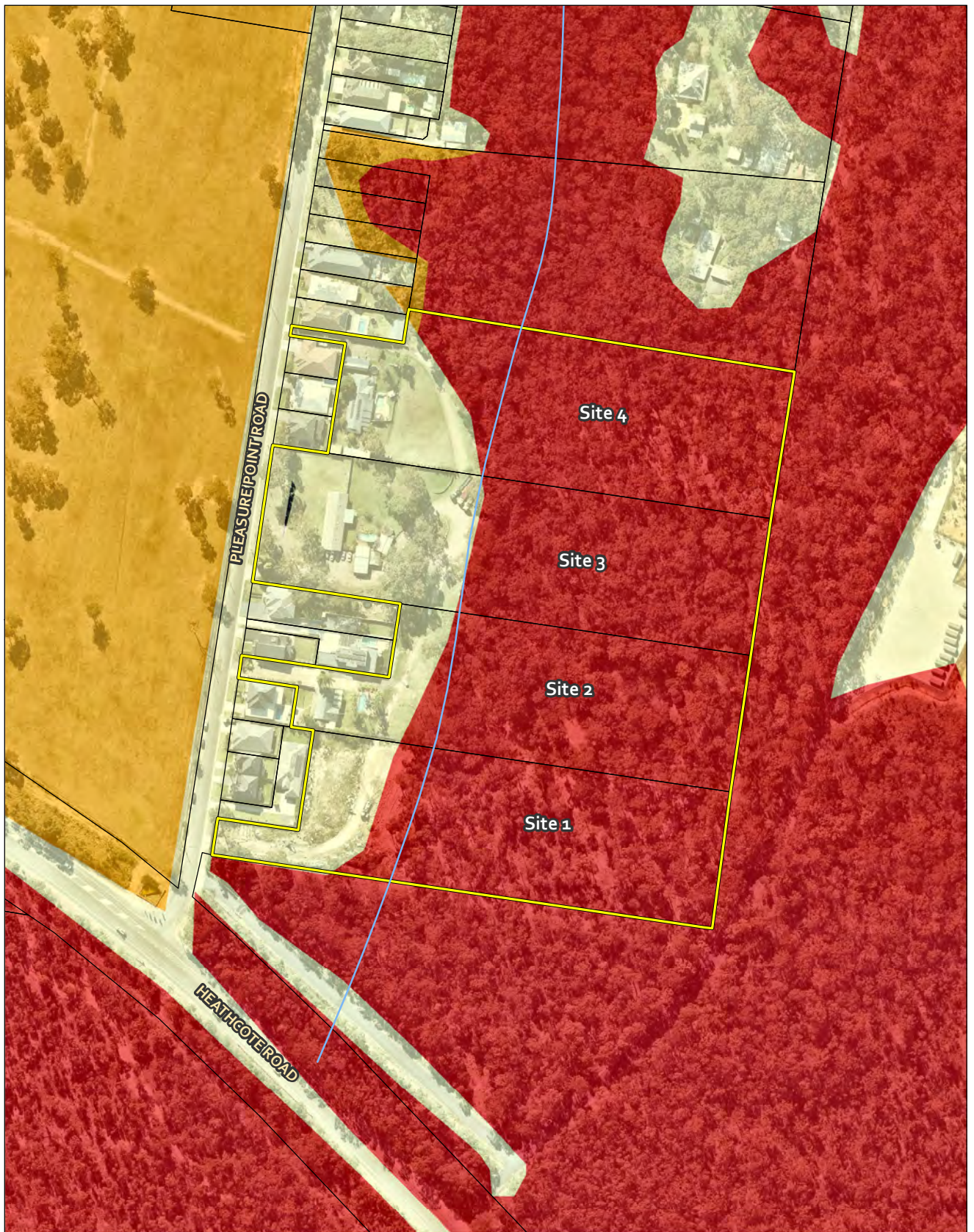
under Section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with,

- *contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,*
- *contain provisions for adequate water supply for fire-fighting purposes,*
- *minimise the perimeter of the area of land interfacing the hazard which may be developed,*
- *introduce controls on the placement of combustible materials in the Inner Protection Area.*








2.2 Planning for Bush Fire Protection 2019 (PBP) requirements

Most of the Direction 4.4 provisions regarding Asset Protection Zones (APZ) and access are specified within PBP. This report addresses both Direction 4.4 and PBP, combining responses to requirements where there is overlap.

PBP also specifies the type of bushfire assessment and level of information and detail required for Planning Proposal submissions. PBP Section 4 'Strategic Planning' outlines the submission requirements. The Planning Proposal is to be assessed in accordance with PBP Section 4.4.1 whereby the nature, scale and risk of the proposal and its potential impact on the wider infrastructure network is such that a Strategic Bush Fire Study (SBFS) is not required in accordance with PBP Section 4.2. A SBFS is required for strategic development proposals whereby new uses are proposed or new areas are to be rezoned and developed. The Planning Proposal does not seek to introduce new zoning, uses or development with a higher risk profile than the existing residential area. The Planning Proposal seeks to increase the density of development within the existing zone (R5 Large Lot Residential).



Legend

- | | | |
|--|---|---|
|  Watercourse | Bushfire Prone Land |  Vegetation Category 3 |
|  Subject Land |  Vegetation Buffer | |
|  Cadastre |  Vegetation Category 1 | |
| |  Vegetation Category 2 | |



Date: 27/05/2021

0 25 50 100
Metres

Figure 3: Bushfire Prone Land

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

3 Bushfire hazard assessment

An analysis of the bushfire environment, or parameters that give rise to the bushfire hazard, threat and risk, provides the foundation for determining compliance with Direction 4.4 and the relevant specifications and requirements of PBP. Parameters to be analysed are discussed in the following subsections and consist of bushfire hazard (comprising vegetation and topography) and the risk of fire impacting on the Planning Proposal area.

Figure 1 shows the wider landscape influencing a bushfire approaching the Planning Proposal area. The bushfire hazard consists of the extensive area of forest within the Liverpool Military Area (LMA) generally to the west and south of Heathcote Road, and to the east leading down to the Georges River. The hazard within the LMA is contiguous with the vegetation within the Planning Proposal area.

3.1 Vegetation communities

Bushfire fuel is the vegetative material in the landscape that burns during a bushfire. Bushfire behaviour is significantly influenced by fuel load, driving the intensity of a bushfire.

The predominant vegetation communities within and adjoining the Planning Proposal area have been assessed in accordance with PBP. The hazard was assessed on site on 17th May 2021 (photographs are included in Appendix A).

There are three vegetation communities present within the 140 m assessment area measured from the R5 zone where potential for further density has been assessed. All communities are within the structural formation class of 'forest' as according to Keith (2004) and PBP. The communities are listed in Table 2 on the following page.

As evident from Figure 4, the forest communities border the northern, eastern and southern boundaries of the Planning Proposal area, and extend through the area predominantly within the E2 zone. The forest communities within and immediately adjacent the Planning Proposal area, and their connectivity to the forests within the LMA present the greatest hazard to any future development.

A secondary hazard exists to the the west of Pleasure Point Road, being a large undeveloped property that presents a grassland hazard.

Table 2: Vegetation communities and corresponding class and formation

| Vegetation community | Class | Formation |
|--|--|------------------------|
| 'Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion' (PCT 883) | Sydney Sand Flats Dry Sclerophyll Forest | Dry Sclerophyll Forest |
| 'Red Bloodwood – Scribbly Gum – Stringybark open forest on sandstone ridges along the western side of the Woronora and Hornsby plateaus' (PCT 1787) | Sydney Coastal Dry Sclerophyll Forest | Dry Sclerophyll Forest |
| 'Broad-leaved Ironbark - Grey Box – Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion (PCT 724) | Cumberland Dry Sclerophyll Forest | Dry Sclerophyll Forest |

3.2 Topography

Steeper slopes can significantly increase the rate of spread of fires, and it has been shown that with each 10 degree increase or decrease in slope a corresponding doubling or halving, respectively, in the rate of spread can be expected (McArthur 1962). Therefore slope is a major factor determining the direction and rate of fire spread.

Figure 4 shows the pattern of the terrain across the immediate landscape. The predominant feature are the downslopes in the east direction from the R5 zone into the E2 zone influenced by a creekline that runs south to north draining to the Georges River.

The slope classes were measured from a contour layer with 2 m intervals as shown on Figure 4. The slope classes according to PBP are also identified on Figure 4.

The slope most significantly influencing the fire behaviour (i.e. 'effective slope') approaching the R5 zone within the Planning Proposal area fell into four of the five possible slope classes as listed in Table 3 below.

Table 3: Effective slope classes affecting the Planning Proposal area

| Site | Direction | Slope classes |
|------|-----------|------------------|
| 1 | South | Upslope/Flat |
| | East | Downslope 0-5° |
| 2 | East | Downslope 0-5° |
| 3 | East | Downslope 5-10° |
| 4 | East | Downslope 10-15° |
| | North | Downslope 0-5° |



Legend

- Zone Boundary
- Contour - 2m
- Watercourse
- Subject Land
- Cadastre
- Asset Protection Zone**
- Asset Protection Zone - 24m
- Asset Protection Zone - 29m

- Asset Protection Zone - 36m
- Asset Protection Zone - 45m



Date: 27/05/2021

0 12.5 25 50
Metres

Figure 4: Bushfire Hazard Analysis and Asset Protection Zone

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

4 Addressing compliance

This section details how compliance with the assessment requirements listed in Section 2 are addressed. The response to requirements is set out following the structure of Direction 4.4, followed by PBP. There is duplication of requirements between Direction 4.4 and PBP; in these cases, the relevant report subsection is referred to for the appropriate response.

4.1 Direction 4.4

The objectives of Direction 4.4 can only be satisfied once the provisions are achieved. Demonstration of achieving the provisions is provided below (Section 4.1.2). Statements of how the objectives are achieved are as follows:

4.1.1 Objectives

Objective 1

“To protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bushfire prone areas”

The intention of the objective is to avoid a development outcome that is faced by or poses a risk that cannot be managed to an acceptable level. The assessment of ‘incompatible’, ‘inappropriate’ and ‘acceptable’ is a subjective one, and one that is not defined within PBP, legislation or related policy. To guide an assessment, reference should be made to the measures specified by *Planning for Bush Fire Protection 2019* (see Section 4.2 of this report), such as the ability to establish and maintain an adequate APZ, and the assurance of acceptable access and evacuation.

The land use is already zoned residential and the proposed amendment to the LLEP 2008 is not introducing any new land uses or land zoning. Increasing the yield potential from four to five lots across each of the four sites will result in a possible maximum additional four lots across the Planning Proposal area. The risk to a potential additional four lots can be adequately managed by implementing the requirements of PBP (refer to Section 4.2 of this report) therefore making it compatible with the surrounding bushfire prone area.

The proposed use is not considered incompatible with the surrounding bushfire prone area. Compliant APZs coupled with adequate access designed to address the bushfire risk produces a use not incompatible with the surrounding environment.

Objective 2

“To encourage sound management of bushfire prone areas”

The recommended bushfire protection measures demonstrate sound management of the sites for the zoned land use. The provisions and how they are to be addressed are listed in Section 4.1.2.

4.1.2 Provisions

Provision 1

“have regard to Planning for Bush Fire Protection”

Addressing this provision is detailed in Section 4.2 of this report. The Planning Proposal complies with PBP.

Provision 2

“introduce controls that avoid placing inappropriate developments in hazardous areas”

The proposal is within the restrictions of the existing R5 zone and an additional four lots across the Planning Proposal area is not dissimilar to the current use. The proposal is therefore not considered inappropriate. Controls (bushfire protection measures) will be set in place to ensure compliance with PBP. The controls are set out in Section 4.2 of this report.

Provision 3

“ensure that bushfire hazard reduction is not prohibited within the asset protection zone”

Any required APZs are to be contained wholly within the R5 zone and within the routinely managed portion of each of the sites. Management of the R5 zone for the purpose of an APZ would not require the removal of any trees or vegetation. Importantly, any APZ is to be measured from the E2 zone boundary and will not extend into the E2 zone.

Provision 4

“provide an asset protection zone incorporating at a minimum:

- an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and,
- an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road”

An APZ has been designed for each of the four sites to ensure compliance with the minimum APZ distances prescribed by PBP. The minimum APZ is detailed in Section 4.2 of this report. A perimeter road strategy is also proposed.

Provision 5

“for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the draft LEP permit Special Fire Protection Purposes (as defined under Section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with”

Section 4.2 details how a compliant APZ can be accommodated across the sites.

Provision 6

“contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks”

Future development is to feature access roads that will also act as perimeter roads. More detail on the proposed access is detailed in Section 4.2 of this report.

Provision 7

“contain provisions for adequate water supply for fire-fighting purposes”

All aspects of future development are to have a hydrant supply that complies with PBP. More details are provided at Section 4.2 of this report.

Provision 8

“minimise the perimeter of the area of land interfacing the hazard which may be developed”

The hazard interface is uniform and is fixed in the landscape set by the E2 zone. The hazard interface will remain unchanged with additional lots being within the R5 zone. The interface is not excessive and does not create ‘pinch-points’ or ‘bottle-necks’ amongst the hazard.

Provision 9

“introduce controls on the placement of combustible materials in the Inner Protection Area”

Section 4.2 details the how the site and any APZs are to be maintained.

4.2 Planning for Bush Fire Protection 2019 (PBP)

Compliance with *Planning for Bush Fire Protection 2019* (PBP) is achieved by addressing the standards for bushfire protection. The standards consist of ‘Acceptable Solutions’ and corresponding ‘Performance Criteria’ for the provision of APZs, access and services (e.g. water supply). Discussion on the standards and statements on how each protection measure can be complied with are listed in the subsections below.

4.2.1 Asset Protection Zones (APZ)

Using the hazard parameters of vegetation and slope discussed in Section 3, APZ distances have been determined in accordance with the Acceptable Solution APZ distances specified by Table A1.12.2 of PBP. The APZs are mapped on Figure 4.

The required APZ is a significant constraint to further development within the R5 zone across all sites. Developable area remains within Site 1 and Site 3, however the APZ precludes additional lots within Site 2 and Site 4. Site 2 is already at the limit of five dwellings.

The APZ has been measured from the E2 zone and has not taken into consideration any riparian corridor or buffer requirements that may exist along the drainage line that runs almost parallel to the E2 boundary. Measuring the APZ from any riparian corridor constraint may further restrict the potential developable area within the sites.

4.2.2 Vegetation management

Maintenance of any new lots, including the APZ, is to achieve the standard of an Inner Protection Area (IPA) as described within Appendix A4.1.1 of PBP. The following specifications have been designed to achieve the IPA at this site:

Trees

- Trees at maturity should not touch or overhang the dwelling; and
- Tree canopies should not be connected when at maturity. Gaps between crowns or groups of crowns are to be maintained at distances of 2 to 5m.

Shrubs

- Ensure gaps in the vegetation, such as between garden beds, to prevent the spread of fire towards the dwelling;
- Clumps of shrubs should be separated from glazing and doors by a distance of at least twice the height of the vegetation.

Groundcovers

- Grass should be kept mown (as a guide grass should be kept to no more than 100 mm in height);
- Leaves and vegetation debris should be regularly removed;
- Organic mulch is not to be used within 2 m of a building.

4.2.3 Bushfire Attack Level (BAL) for construction of dwellings

Dwellings are required to be designed and constructed in accordance with the relevant Bushfire Attack Level (BAL) determined in accordance with Table A1.12.5 of PBP. The BAL relates to a suite of construction specifications listed within Australian Standard *AS 3959-2018 Construction of buildings in bushfire prone areas* (SAI Global 2018).

A new dwelling with the minimum required APZ will have a maximum BAL rating of BAL-29.

4.2.4 Access

As established in Section 4.2.1 'Asset Protection Zones (APZ)', possible further residential development can only occur in Site 1 and 3. New dwellings within these sites would be accessed directly from Pleasure Point Road or in a battle-axe arrangement.

Unfortunately, without additional development possible within Site 2 (as this site has already reached the proposed limit of five dwellings) and Site 4 (due to APZ restrictions and existing development), a through perimeter road linking Site 1 to Site 3 / Site 4 will not be possible. New dwellings within Sites 1 and 3 will require their own individual road and turning facility.

Such an access design is permissible by PBP as individual roads accessing new dwellings to the rear of Sites 1 and 3 would be well under the 200 m threshold required by PBP for maximum length of no-through roads.

The access roads could also act as a perimeter road to any new dwellings within Sites 1 and 3 by extending around the eastern side of a new building envelope within the required APZ. Figure 5 demonstrates that there is ample space to construct a road within the APZ including turning facility.

The new roads would replace and link up to the existing requirement of a perimeter fire trail (as per Liverpool Development Control Plan 2008) to effectively complete perimeter access across Sites 2 and 4 as shown on Figure 5. Turning facility options are shown at Appendix B.

Access roads to the standard of 'property access' as listed within Table 5.3b of PBP (see Table 4 below) would achieve compliance for both Sites 1 and 3.

Table 4: PBP property access road requirements

| Performance Criteria | Acceptable Solutions |
|--|--|
| <i>Firefighting vehicles can access the dwelling and exit safely</i> | <i>Minimum 4 m carriageway. Some short constrictions in the access may be accepted where they are not less than 3.5 m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed.</i> |
| | <i>In forest, woodland and heath situations, rural property roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay</i> |
| | <i>A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches</i> |
| | <i>Property access must provide a suitable turning area (refer to Appendix B)</i> |
| | <i>Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress</i> |
| | <i>The minimum distance between inner and outer curves is 6m</i> |
| | <i>The crossfall is not more than 10°</i> |
| | <i>Maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads</i> |
| | <i>A development comprising more than three dwellings has access by dedication of a road and not by right of way</i> |

4.2.5 Water supply for fire-fighting

Given the request for dedicated public roads by RFS, it will be expected that the reticulated water supply along Pleasure Point Road would be extended along any new public road into a site to service hydrants installed to comply with *AS 2419.1 – 2005 Fire Hydrant Installations - System Design, Installation and Commissioning* (SAI Global 2005). Hydrants would need to be located so that all sides of a building envelope are within 70 m of a hydrant by lay of the hose (or 90 m with a tanker parked in-line maximum 20 m from the hydrant).



Legend

- Existing Fire Trail (Link)
- Indicative Access Road and Turning Head
- Zone Boundary
- Contour - 2m
- Watercourse

- Proposed Building Envelope
- Subject Land
- Cadastre

Asset Protection Zone

- Asset Protection Zone - 24m

- Asset Protection Zone - 29m
- Asset Protection Zone - 36m
- Asset Protection Zone - 45m



Date: 27/07/2021

0 12.5 25 50
Metres

Figure 5: Access

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

5 Conclusion and recommendations

The information presented in this Bushfire Assessment Report demonstrates that the proposal to amend Clause 7.12 of the *Liverpool Local Environmental Plan* (LLEP) 2008 to increase and formalise the lot restriction at the four sites from four lots to five can satisfy the Ministerial Direction No. 4.4 – ‘Planning for Bush Fire Protection’ and the requirements of *Planning for Bush Fire Protection 2019*. This is achieved by bushfire protection measures, such as APZs and access roads, that are compliant with the Acceptable Solutions of *Planning for Bush Fire Protection 2019*.

Additional lots may be possible at Sites 1 and 3 once the APZ requirement is accommodated to the E2 boundary and any riparian buffer requirement to the drainage line. Both sites will require property access roads that achieves compliance with *Planning for Bush Fire Protection 2019*.

The proposal is not considered incompatible with the surrounding environment and bushfire risk. The proposal does not involve the introduction of new uses or land zones. With sound bushfire management, the proposal can exist adjacent the bushland setting.



David Peterson



References

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McArthur, A.G., 1962. *Fire behaviour in Eucalypt Forests*. Commonwealth Department of National Development, Forestry and Timber Bureau. Leaflet 107. Paper submitted to the Ninth Commonwealth Forestry Conference. India. 1968.

NSW Rural Fire Service (RFS). 2019. *Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities and Developers*. State of New South Wales through the NSW Rural Fire Service.

SAI Global 2005. *Fire hydrant installations - System design, installation and commissioning*, AS2419.1, Fourth edition 2005, Standards Australia International Ltd, Sydney.

SAI Global 2018. *Construction of buildings in bushfire-prone areas*, AS 3959, Standards Australia International Ltd, Sydney.

Appendix A - Photographs



Photograph 1: Site 1 - View through E2 to rear of existing dwellings



Photograph 2: Site 2 - View through E2 to rear of existing dwellings

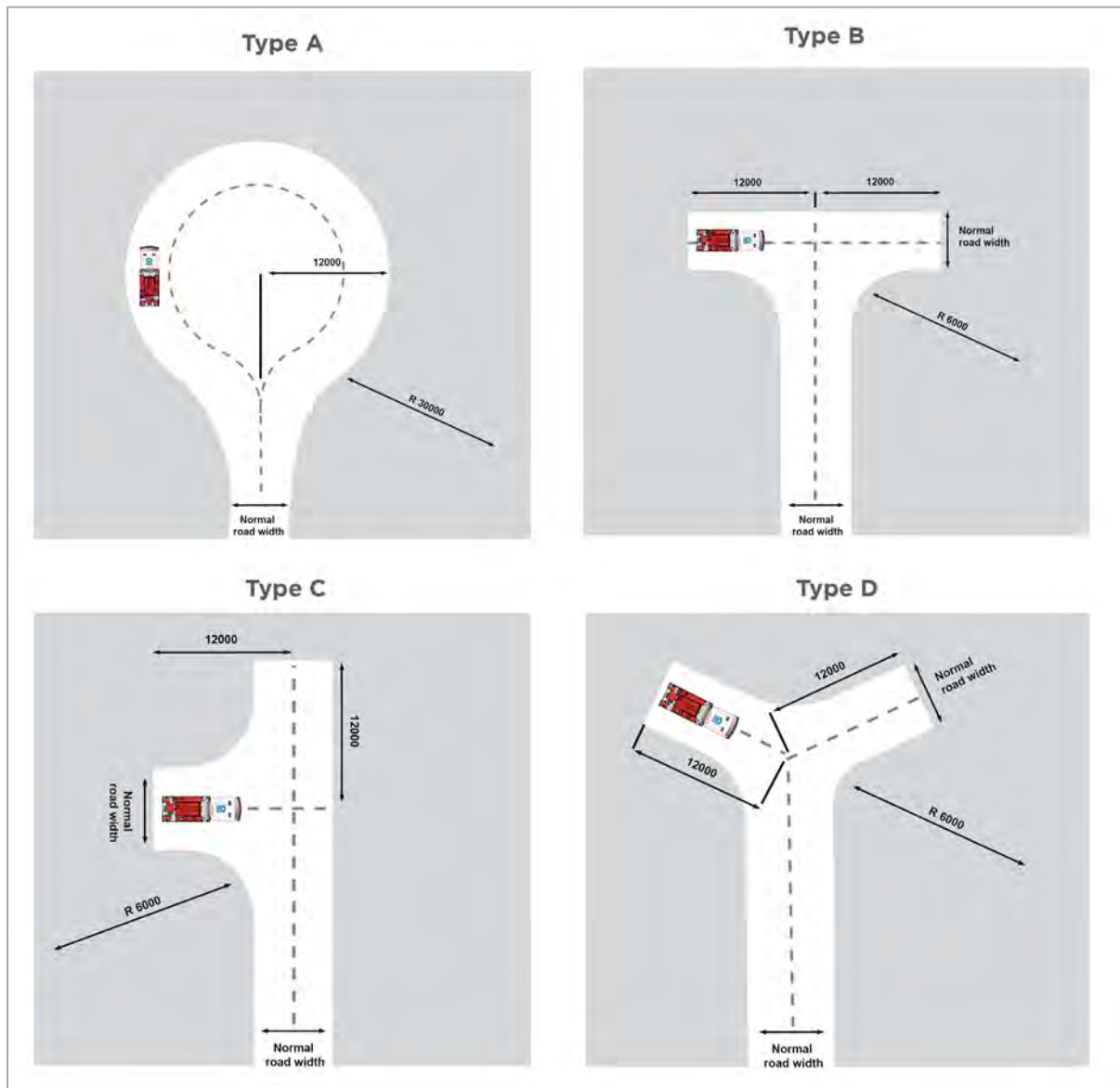


Photograph 3: Site 3 - View through E2 to rear of existing dwellings



Photograph 4: Site 4 - View through E2 to rear of existing dwellings

Appendix B – Turning facilities



(Source: Planning for Bush Fire Protection 2019; Figure A3.3)

