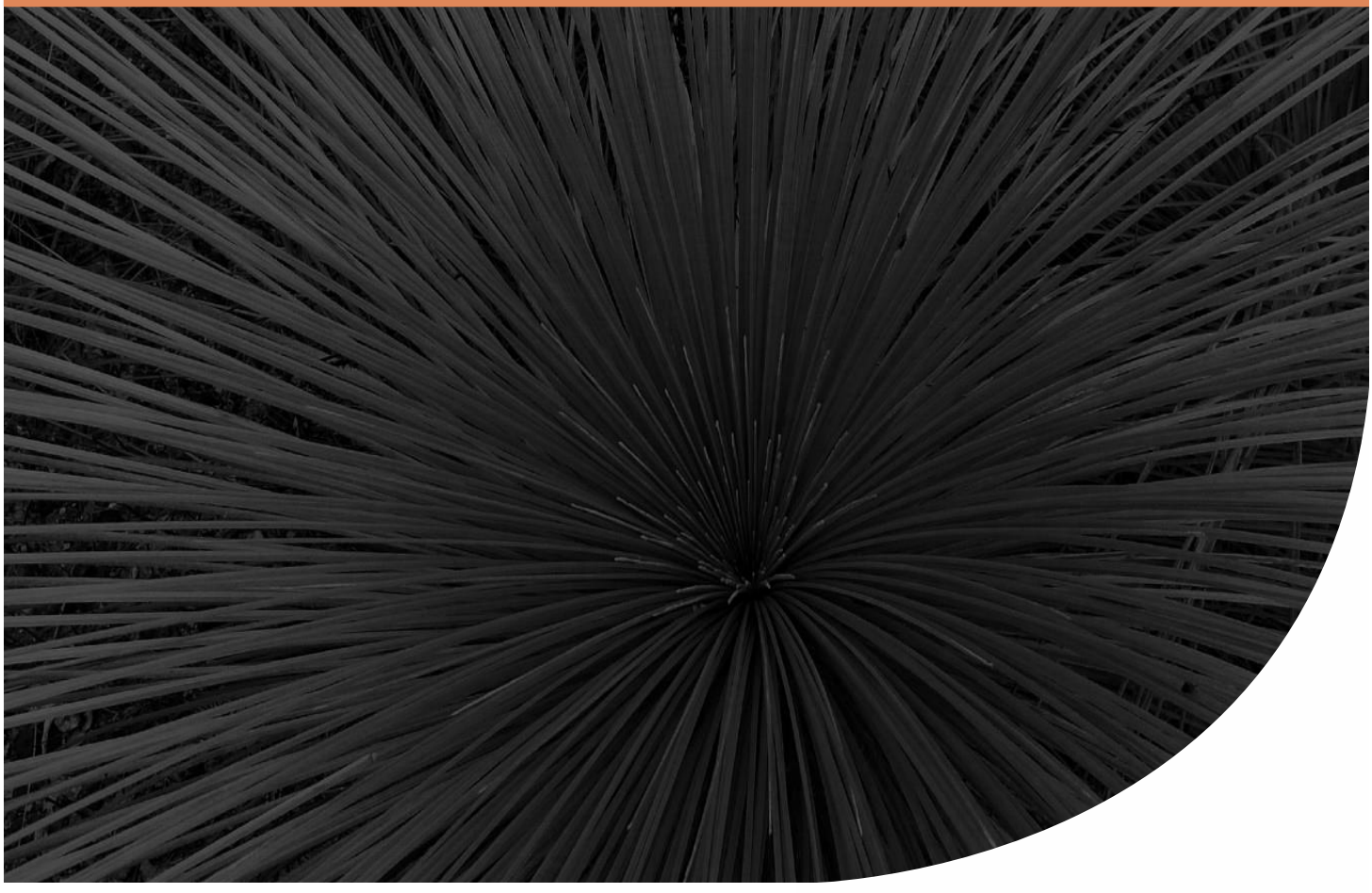
Bushfire Management Plan

Lots 3, 805 and 806 Mandurah Road Karnup

Project No: EP14-047(05)

Prepared for Gold Right Pty Ltd
October 2017



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The content of this document has been prepared primarily to consider the layout of the development or the appropriate building construction standard, where relevant. The measures outlined are considered to be prudent minimum standards only based on the relevant experience of the author and the standards prescribed by the relevant authorities. The level of implementation of the fire precautions achieved will depend upon the actions of the landowner or occupiers of the land and is not the responsibility of the author. Your local government and relevant fire authority (i.e. Department of Fire and Emergency Services or local bushfire brigade) should be approached for guidance on preparing for and responding to a bushfire.

Notwithstanding the precautions adopted in this report, it should always be remembered that bushfires burn under a wide range of conditions. An element of risk, no matter how small always remains. The objective of the Australian Standard AS 3959-2009 is to "prescribe particular construction details for buildings to reduce the risk of ignition from a bushfire while the front passes" (Standards Australia 2009). Building to the standards outlined in AS 3959 does not guarantee a building will survive a bushfire or that lives will not be lost.

Executive Summary

This Bushfire Management Plan (BMP) has been prepared on behalf of Gold Right Pty Ltd (the developer) to support the preparation of a revised Local Structure Plan (LSP) for Lots 3, 805 and 806 Mandurah Road, Karnup. This area is herein referred to as "the site" and its location is shown in **Figure 1**. The site is situated within the City of Rockingham (CoR) and is approximately 113.8 hectares in size. Lots 805 and 806 are owned by Gold Right Pty Ltd, whilst Lot 3 is owned by the CoR.

Portions of the site have been identified as bushfire prone under the state-wide *Map of Bush Fire Prone Areas*, prepared by the Office of Bushfire Risk Management (OBRM 2017), as shown in **Plate 1**. The identification of Bushfire Prone Areas within any portion of the site requires a further assessment of the bushfire hazard implications on development proposed within the site, in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.1* (the Guidelines) (WAPC and DFES 2017).

A *Fire Management Plan* (FMP) (Bushfire Safety Consulting 2013) for the entire site was prepared to support the West Karnup LSP in 2013. This LSP was endorsed by the WAPC in February 2013 and formally adopted by the CoR in May 2013, however excluded Lot 805 due to strategic planning issues. The associated FMP was approved by the CoR during the LSP endorsement process. Residential subdivision and development within part of Lot 806 has since progressed in accordance with the West Karnup LSP and the approved FMP, with other areas of the site remaining undeveloped. The revised LSP has been prepared to include a new residential development design across Lot 805 whilst retaining the original design and layout over Lots 3 and 806. This BMP has been prepared to support the lodgement of the revised LSP and will supersede the existing FMP.

Existing bushfire hazards identified within 100 m of the site include areas of Forest (Class A), Woodland (Class B), Shrubland (Class C), Scrub (Class D) and Grassland (G). This vegetation occurs in a number of areas within the site, in addition to various areas adjacent to the site, including within the Rockingham Lakes Regional Park and Perth-Mandurah railway reserve to the east, vacant state-owned land to the north, Mandurah Road reserve to the west and conservation areas to the south.

In the assumed post development scenario, all vegetation will be removed from the site to support residential development in accordance with the revised LSP. The majority of vegetation outside of the site is assumed to be retained in its current state, and will therefore pose a long term bushfire risk to the site. However, vegetation within the eastern side of the Mandurah Road reserve (abutting the western boundary of the site) has been assumed to represent low threat vegetation in the post-development scenario, in accordance with Section 2.2.3.2 of AS 3959, consistent with comments provided by the Department of Fire and Emergency Services dated 4 October 2017.

An indicative Method 1 Bushfire Attack Level (BAL) assessment has been undertaken as part of the BMP. An indicative BAL Contour Plan has been prepared based on the outcomes of the BAL assessment and is shown in **Figure 6**. The results of the indicative BAL assessment demonstrate that future residential development of the site can be progressed in accordance with the revised LSP such that no future dwellings will be exposed to a BAL rating greater than BAL-29, and demonstrates that the revised LSP meets the required bushfire management framework. The results of the indicative BAL assessment will be confirmed to support future stages of residential subdivision within the site,

most likely at the subdivision and condition clearance stages of development. BAL ratings for dwellings can be certified to support future building licence processes, where required.

Overall this BMP has been prepared in line with Appendix Four of the Guidelines and demonstrates that as development progresses in accordance with the revised LSP, an acceptable solution can be adopted for each bushfire hazard management issue, as summarised below:

- **Location:** the indicative BAL assessment indicates that the development (i.e. construction of future residential dwellings in accordance with the revised LSP) is located in an area that is or will, on completion, be subject to BAL–29 or below.
- **Siting and Design:** future residential dwellings will not be exposed to an unacceptable level of radiant flux, without appropriate mitigation measures, such as increased construction standards in accordance with AS 3959. Separation will be provided between future dwellings and post-development classified vegetation through Asset Protection Zones, which will be primarily be accommodated by public roads and areas of public open space.
- **Vehicular Access:** the internal layout, design and construction of public vehicular access and egress in the development, as set out in the revised LSP design, will be in accordance with the Guidelines. It will allow vehicles to move through the site easily and safely at all times. The development will have a number of direct access points to the adjacent public road network, including to Mandurah Road to the west and Paganoni Road to the north.
- **Water:** the development will be provided with a permanent and secure reticulated water supply and will be installed in accordance with the specifications of the Water Corporation, including the installation of fire hydrants. This is a typical requirement of urban development.

This BMP sets out the roles and responsibilities of the developer, future residents and the CoR to ensure the bushfire risk to the site is appropriately managed. It is important that the measures outlined in this BMP are adopted across the subdivision and dwelling construction processes.

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1 Introduction

1.1 Background

This Bushfire Management Plan (BMP) has been prepared on behalf of Gold Right Pty Ltd (the developer) to support the preparation of the revised Local Structure Plan (LSP) for Lots 3, 805 and 806 Mandurah Road, Karnup (provided in **Appendix A**). This area is herein referred to as 'the site' and its location is shown in **Figure 1**. The site is approximately 113.8 hectares in size, and is situated within the City of Rockingham (CoR) approximately 54 km south-west of the Perth Central Business District.

Portions of the site are identified as bushfire-prone under the state-wide *Map of Bush Fire Prone Areas* (OBRM 2017), as shown in **Plate 1** below. The identification of bushfire prone areas within any portion of the site requires further assessment of the bushfire hazard implications on proposed development to be undertaken in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.1* (the Guidelines)[1] (WAPC and DFES 2017).

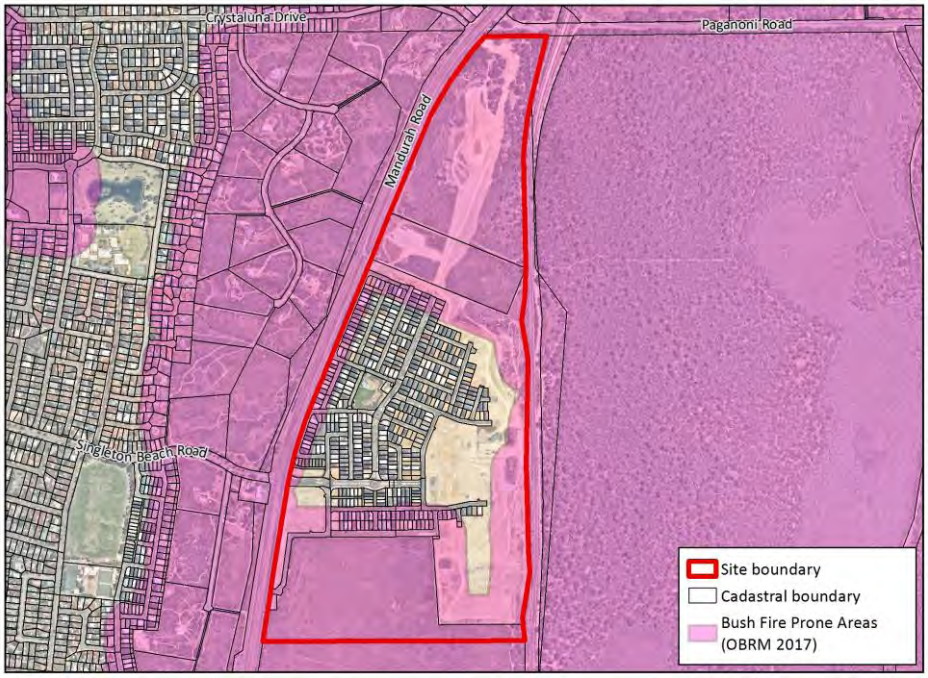

Plate 1: Areas within and surrounding the site identified as a "Bushfire Prone Area" (OBRM 2017).

A *Fire Management Plan* (FMP) (Bushfire Safety Consulting 2013) for the entire site was prepared to support the West Karnup LSP in 2013. This LSP was endorsed by the WAPC in February 2013 and formally adopted by the CoR in May 2013, however excluded Lot 805 due to strategic planning issues. The associated FMP was approved by the CoR during the LSP endorsement process. Residential subdivision and development within part of Lot 806 has since progressed in accordance

[1] This document and the associated site visit was completed prior to the release of Version 1.2 of the Guidelines in August 2017. As such, only bushfire hazards within 100 m of the site have been assessed.

with the West Karnup LSP and the approved FMP, with other areas of the site remaining undeveloped.

The strategic planning issues affecting Lot 805 have subsequently been resolved and as a result a revised LSP has been prepared to include a new residential development design across Lot 805, whilst retaining the original design and layout over Lots 3 and 806. This BMP has been prepared to support the lodgement of the revised LSP over the site and will supersede the existing FMP.

1.2 Aim of this document

The aim of this BMP is to support the lodgement of the revised LSP and outline how bushfire management considerations have been addressed through the revised LSP design, in addition to the specification of any future bushfire risk mitigation requirements to be implemented as part of subsequent stages of development.

This BMP addresses the requirements of SPP 3.7, the Guidelines and AS 3959, and includes:

- An assessment of the existing classified vegetation and associated bushfire hazard levels in the vicinity of the site (within 100 m) and consideration of hazards that will exist in the post development scenario.
- Identification of how the development will achieve the performance principles of the Guidelines by ensuring:
  - Development can be located, sited and designed in to ensure that any bushfire hazard does not present an unreasonable level of risk to life and property (i.e. BAL-29 is not exceeded), supported by an indicative Bushfire Attack Level (BAL) assessment. Where applicable, this includes consideration of Asset Protection Zone (APZ) requirements.
  - Vehicular access to and egress from the development is safe if a bushfire occurs.
  - Water is available to the development, so that life and property can be protected from bushfire.
- An outline of the roles and responsibilities associated with implementing this BMP.

The existing approved FMP for the site has been incorporated into this BMP, specifically those parts relating to Lots 806 and 3, which were approved by the CoR during the consideration of the West Karnup LSP in 2013. Bushfire planning considerations specific to Lot 805 have been updated in this BMP to respond to the amended LSP design over this portion of the site.

1.3 Accreditation

This BMP has been prepared jointly by Emerge Associates and Bushfire Safety Consulting.

Bushfire Safety Consulting is owned and operated by Rohan Carboon, an experienced bushfire consultant to the urban planning industry. Rohan has an undergraduate degree in Environmental Management and postgraduate qualifications in Bushfire Protection and has been providing bushfire risk and hazard assessment and mitigation advice to the urban planning and development industry for more than six years. He first worked professionally in community bushfire safety education in 1999 and has been involved in land management including bushfire suppression since 1993.

Bushfire Safety Consulting is a Corporate Bronze Member of the Fire Protection Association of Australia. Rohan has successfully completed the Graduate Diploma in Bushfire Protection at the University of Western Sydney and is in the process of finalising Bushfire Planning and Design (BPAD) Level 3 accreditation under the Fire Protection Association of Australia's new Western Australian accreditation scheme.

Emerge Associates has been working jointly with Bushfire Safety Consulting for more than four years to undertake detailed bushfire assessments to support the land use development industry. Emerge Associates' personnel have undertaken BPAD Level 2 training and are in the processes of seeking accreditation.

1.4 Statutory policy and framework

The following key legislation, policies and guidelines are relevant to the preparation of a bushfire management plan:

- *Fire and Emergency Services Act 1998*
- *Bush Fires Act 1954*
- Planning and Development (Local Planning Scheme Amendment) Regulations 2015
- Building Regulations 2012
- *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015)
- *Guidelines for Planning in Bushfire Prone Areas version 1.1* (WAPC and DFES 2017)
- *Australian Standard AS 3959 – 2009 Construction of buildings in bushfire prone areas* (Standards Australia 2009)

1.5 Description of site and adjacent land uses

The original West Karnup LSP comprised three landholdings, Lots 805 and 806 (owned by Gold Right Pty Ltd) and Lot 3 (owned by the by the CoR). Since the approval of the West Karnup LSP in 2013, Lot 806 has been subdivided on a staged basis to enable residential development. For the purpose of this BMP, these parcels are referred to by their original lot numbers prior to subdivision, as shown in **Figure 1**.

The site is bound by Mandurah Road to the west, the Perth - Mandurah railway and the Rockingham Lakes Regional Park to the east, remnant native vegetation to the south contained within Bush Forever Site 395 (BF 395), and undeveloped landholdings zoned “Parks and Recreation” to the north.

Portions of the site have historically been used for limestone extraction operations, which have since ceased. In addition to ongoing subdivision and residential development of Lot 806, a ‘reserve for conservation’ has been established within the southern portion of this lot. This area will be retained as remnant bushland as part of the future residential development of the site. Some portions of Lot 3 and 805 have been recently cleared to enable the installation of a pressure sewer main to support residential development within Lot 806.

The site is characterised by diverse topographical features due to the historic limestone quarrying activities and associated impacts to the natural landform, with elevations ranging from 5 m Australian Height Datum (mADH) to 28 mAHD. The higher elevations largely occur in the eastern portions of the site, meaning the site has a generally westward aspect. The elevation characteristics of the site are shown in **Figure 1**.

2 Bushfire Context

2.1 Bushfire risk

The risk management process described in AS/NZS ISO 31000:2009 *Risk management – Principles and guidelines* is a systematic method for identifying, analysing, evaluating and treating emergency risks.

Bushfire risk is determined by assessing:

- Bushfire hazard (i.e. bushfire prone vegetation)
- Threat level (i.e. proximity of the hazard to assets and people)
- Vulnerability of the asset
- Consequence rating (i.e. a rating for the potential outcome once the 'incident' has occurred)
- Likelihood rating (i.e. the chance of an event).

It is not necessary to undertake a standalone site specific bushfire risk assessment in accordance with AS/NZS ISO 31000:2009 as part of this BMP, as risk has been appropriately considered in the specific context of the Guidelines and AS 3959.

AS 3959 specifies requirements for the construction of buildings in bushfire prone areas in order to improve their resistance to bushfire attack from embers, radiant heat, flame contact, and combinations of these attack forms.

The objective of AS 3959 is to provide detailed methods for assessing bushfire attack and to prescribe specific construction details for buildings to reduce the risk of ignition from a bushfire, appropriate to the:

- Potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire.
- Intensity of the bushfire attack on the building.

Two separate methods are outlined in AS 3959 for determining the impact of bushfire on dwellings and have been outlined below:

- **Method 1**, outlined in Section 2 and Appendix A of AS 3959, provides a basic assessment of radiant heat flux levels at various distances from classified vegetation (up to 100 m). This method assumes standard fuel loads for classified vegetation as outlined in AS 3959 and considers the effective slope beneath vegetation. This method can be used to determine appropriate setbacks to dwellings to achieve different levels of radiant heat exposure (i.e. BAL-12.5 to BAL-FZ).
- **Method 2**, outlined in Appendix B of AS 3959, provides a framework for a more rigorous and site specific assessment of radiant heat flux exposure for a site, involving bushfire engineering analysis and modelling using site specific data (e.g. climate/weather conditions during fire season, actual onsite fuel loads associated with classified vegetation etc.).

Vegetation that does not trigger a BAL assessment (i.e. low threat) according to Section 2.2.3.2 of AS 3959 includes the following exclusions:

a) Vegetation of any type more than 100 m from the site.
b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified.
c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site or each other.
d) Strips of vegetation less than 20 m wide (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified.
e) Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops.
f) Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parkland, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and wind breaks.

The vulnerability of assets such as dwellings is impacted by several factors. Some relate to the way a bushfire behaves at a site, others to the design and construction materials in the building and siting of surrounding elements. Infrastructure, utilities and human behaviour are also factors. Leonard (2009) identified the following factors as relevant considerations:

- Terrain (slope)
- Vegetation (overall fuel load, steady state litter load, bark fuels, etc.)
- Weather (temperature, relative humidity and wind speed)
- Distance of building from unmanaged vegetation
- Individual elements surrounding the building that are either a shield or an additional fuel source
- Proximity to surrounding infrastructure
- Building design and maintenance
- Human behaviour (ability to be present and capacity to fight the fire)
- Access to the building and how that influences human behaviour
- Water supply for active and/or passive defence
- Power supply.

The bushfire threat for the site has been determined by undertaking an indicative Method 1 BAL assessment, to ensure no areas of the revised LSP identified for future residential dwellings are exposed to an unacceptable level of bushfire risk (i.e. greater than BAL-29), further discussed in **Section 3.2.2.**

Where buildings are lost, this is likely to occur as a result of their vulnerability to the mechanisms of bushfire attack. Buildings constructed to increased standards under AS 3959 are more likely to survive a bushfire than buildings that do not conform to these construction standards, although building survival is not guaranteed.

2.2 Vegetation classification and bushfire hazard assessment

Assessing bushfire hazards takes into account the classes of vegetation within the site and surrounding 100 m area, in accordance with AS 3959. The assignment of vegetation classifications is based on an assessment of vegetation structure, which includes consideration of the various fuel layers of different vegetation types. For example, fuel layers in a typical forest environment can be broken-down into five segments as illustrated in **Plate 2** below. These defined fuel layers are considered when determining the classification of vegetation and associated bushfire hazard levels.

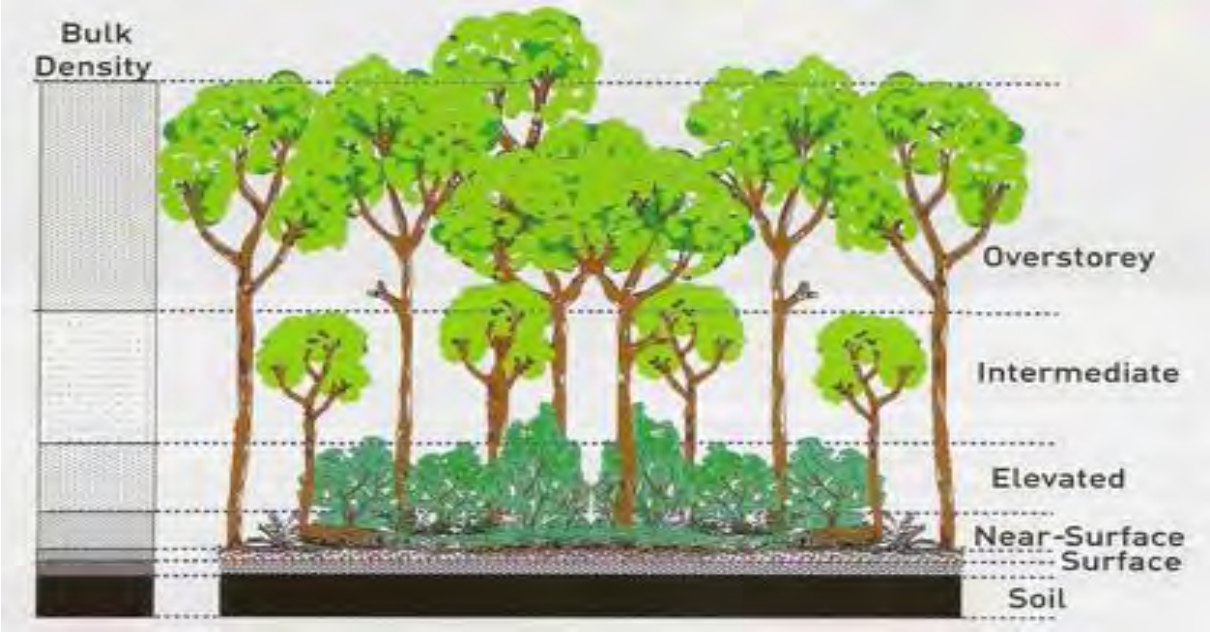

Plate 2: The five fuel layers in forest vegetation that could be associated with fire behaviour (Gould et al. 2007)

2.2.1 Existing conditions

An assessment of existing vegetation within and surrounding the site in accordance with AS 3959 was completed by Emerge Associates and Bushfire Safety Consulting on 24 January 2017. The results of this assessment are discussed below, with identified areas of classified vegetation shown in **Figure 2**. The photo locations for the identified vegetation referred to below are shown in **Figure 2**, while the photos have been provided in **Appendix B**. Based on the site assigned vegetation classifications, bushfire hazard levels have been determined in accordance with Appendix Two of the Guidelines and are shown in **Figure 3**.

Forest (Class A) vegetation occurs in the north of the site and adjacent area, as shown in **Figure 2**. This vegetation is characterised by an overstorey of tuart and banksia trees, over established intermediate and understorey layers (photo locations 1, 2 and 3). Forest (Class A) vegetation also occurs to the east of the site (photo location 4), on the eastern side of the Perth – Mandurah railway, within Rockingham Lakes Regional Park (BF 395). Forest (Class A) vegetation identified within the Rockingham Lakes Regional Park was observed to be more representative of an intact native vegetation structure compared to Forest (Class A) vegetation identified within the northern portion of the site and adjacent area. This vegetation represents an Extreme bushfire hazard in accordance with the Guidelines.

Woodland (Class B) vegetation occurs in the north of the site and adjacent area, as shown in **Figure 2**. This vegetation is characterised by an overstorey of tuart trees over a heavily disturbed and partially cleared understorey (photo locations 5 and 6). Areas of Woodland (Class B) also occur on the western side of Mandurah Road (photo location 7). This vegetation represents an Extreme bushfire hazard in accordance with the Guidelines.

Shrubland (Class C) vegetation is the dominant within the northern and southern portions of the site, as shown in **Figure 2**. This vegetation is typically characterised by an open heath of native coastal species intermixed with grass species (photo locations 8 and 9) and includes the area of retained remnant bushland in the south (photo location 10). Intermittent patches of Shrubland (Class C) vegetation also occur along the Mandurah Road reserve (photo location 11). This vegetation represents a Moderate bushfire hazard in accordance with the Guidelines.

Scrub (Class D) vegetation is also prevalent across the northern and southern portions of site, as shown in **Figure 2**. This vegetation is characterised by dense and tall areas of coastal scrub species, often abutting areas of Shrubland (photo locations 12 and 13). Intermittent patches of Scrub (Class D) vegetation also occur along the Mandurah Road reserve (photo location 14). This vegetation represents an Extreme bushfire hazard in accordance with the Guidelines.

Grassland (Class G) vegetation occurs in a number of isolated areas across the site, as shown in **Figure 2**. This vegetation is characterised by weed species in heavily disturbed areas (photo locations 15 and 16). Grassland (Class G) vegetation also occurs in unmanaged areas of the Mandurah Road reserve (photo location 17) and the Perth - Mandurah railway reserve (photo location 18). This vegetation represents a Moderate bushfire hazard in accordance with the Guidelines.

Low threat vegetation (AS 3959 Exclusion 2.2.3.2(f)) areas occur within areas of maintained public open space within existing residential areas of Lot 806, in addition to portions of the Mandurah Road reserve which are routinely managed through slashing by Main Roads of Western Australia (MRWA) (photo locations 19 and 20). This represents a low bushfire hazard in accordance with the Guidelines.

Non-vegetated areas (AS 3959 Exclusion 2.2.3.2(e)) occur throughout the site and surrounding area, associated with the historical quarrying footprint, existing residential areas and roads (photo location 21). A portion of the Mandurah Road reserve adjacent to Lot 805 comprises exposed rock and is identified as a non-vegetated area (photo location 22). These areas represent a low bushfire hazard in accordance with the Guidelines.

2.2.2 Post development conditions

The post-development scenario considers the extent and structure of potential bushfire fuels following implementation of the revised LSP. The post-development vegetation classifications are shown in **Figure 4**. The indicative BAL assessment completed as part of this BMP is based on these post-development vegetation classifications.

The retention of existing vegetation within the site through the implementation of the revised LSP is limited to the 'reserve for conservation' area in the southern portion of Lot 806. This vegetation will be retained in its existing structure and as such existing Shrubland (Class C) and Scrub (Class D) vegetation within this area will remain in the post-development scenario. All other areas of existing vegetation within the site will be cleared to facilitate future residential development, and will

therefore comprise non-vegetated areas (AS 3959 Exclusion 2.2.3.2(e)) in the post-development scenario.

In addition, areas of landscaped public open space (POS) will be developed across the site, in accordance with the revised LSP design. These POS areas will be subject to landscaping and ongoing management and will comprise areas of managed turf and parkland, which will comprise low threat vegetation (AS 3959 Exclusion 2.2.3.2(f)). The management of vegetation within POS areas is discussed further in **Section 2.3**.

Existing vegetation within Lot 3 has been assumed to be removed in the post-development scenario. Given potential uncertainty surrounding implementation timeframes for residential development of this land, this vegetation may represent a temporary hazard and is discussed further in **Section 3.2**.

Areas of the Mandurah Road reserve which are routinely slashed by MRWA are assumed to remain as low threat vegetation in the post-development scenario. Areas of Shrubland (Class C), Scrub (Class D) and Grassland (Class G) within the eastern side of the Mandurah Road reserve, directly abutting the site, are identified as low threat vegetation in accordance with advice provided by DFES (on the previous version of this document) dated 4 October 2017, which stated:

> *'DFES advises that consistent with NSW and Tasmania's interpretation of AS-3959 clause 2.2.3.2 Exclusions (pg.15) states:*
>
> *Strips of vegetation less than 20 metres in width, regardless of length and not within 20 metres of other areas of classifiable vegetation are deemed as "Low threat" and therefore do not contribute to the BAL calculation.*
>
> *On this basis, please advise the proponent that the strip of vegetation on the east side of Mandurah Rd which abuts the subject lot can be deemed "Low threat" for the BAL Assessment, where it meets the above conditions, post development.'*

As such, vegetation within the eastern side of the Mandurah Road reserve has been identified as low threat vegetation (generally in accordance with Section 2.2.3.2(d) of AS 3959) in the post-development scenario, as shown in **Figure 4**.

Existing vegetation classifications for all other areas surrounding the site have been assumed to remain in the post-development scenario, as the revised LSP does not provide for future development in these areas, nor will it change the assumptions regarding vegetation width or management.

2.3 Vegetation within public open space

As discussed above, a number of POS areas are proposed across the site in the revised LSP, as shown in **Appendix A**. Detailed landscape designs will be prepared for these areas as part of development, which will outline the treatment and management of these areas. These areas will be designed, landscaped and maintained to a low threat standard in accordance with Exclusion 2.2.3.2(f) of AS 3959 and will therefore pose no bushfire risk to development within the site.

Low threat bushfire standards under AS 3959 can be achieved through the design and landscaping of POS areas to include the following:

- No areas of retained intact remnant vegetation that are greater than 1 ha in size and within 100 m of other classified vegetation.
- No areas of retained intact remnant vegetation that are greater than 0.25 ha in size and within 20 m of future dwellings.
- No revegetation works that would create high fuel areas – some revegetation may be accommodated where species are chosen for characteristics such as: low ground cover, low fuel loads, single strips of vegetation no less than 20 m apart, etc.
- Planted or retained mature trees with a managed understorey which may include turfed, mulched or woodchipped areas, irrigated/maintained garden beds etc.
- Reticulated and/or maintained planted garden beds and other similar areas.
- Reticulated turf areas or constructed play areas.
- Drainage basins.

The mitigation of hazards within areas proposed as POS within the site will be largely addressed through the detailed design of the landscape treatments. The City of Rockingham will manage the long term maintenance of the parkland and reserves that fall within POS and drainage areas following handover of these areas from the developer.

2.4 Effective slope

The effective slope under areas of classified vegetation surrounding the site ranges from effectively flat or upslope, to five to ten degrees downslope, as shown in **Figure 5**. Areas of downslope are associated with Forest (Class A) vegetation within the Rockingham Lakes Regional Park to the east of the site, in addition to vegetation occurring on dunal landforms to the south and west of the site.

3 Bushfire mitigation strategy

This BMP provides an outline of the mitigation strategies that will ensure that as development progresses, an acceptable solution is adopted for each bushfire hazard management issue. This approach is consistent with Appendix Four of the Guidelines and the compliance checklist is provided in **Appendix C**. The management issues addressed as part of this BMP are:

- Location of the development
- Siting and design of the development
- Vehicular access
- Water supply.

For the proposed residential development of the site, acceptable solutions are proposed for all of the bushfire hazard management issues. In addition to the management measures listed below, proponents of future subdivision and development will be required to comply with the CoR Fire Control Notice until such a time as development is completed. Future lot owners and residents will also be required to comply with the CoR Fire Control Notice as published.

3.1 Element 1: Location

3.1.1 Intent

To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.

3.1.2 Acceptable Solution A1.1 Development location

While development within the site will be progressed within 100 m of areas of Moderate or Extreme bushfire hazards (as shown in **Figure 3**), the proposed future development layout has been sited and designed to manage or mitigate the associated bushfire risk by addressing:

- Vehicular access within, to and from the site.
- Adequate water supply to enable life and property to be defended against bushfire.
- Siting and design of development within the site, including provision of Asset Protection Zones (APZ) and increased building construction standards where required to ensure that no future dwellings will be exposed to an unacceptable level of radiant heat flux (i.e. BAL-29 is not exceeded).

These mitigation options are outlined further in the sections below.

3.2 Element 2: Siting and design of development

3.2.1 Intent

To ensure the siting and design of development minimises the level of bushfire impact.

3.2.2 Background

AS 3959 provides six BAL ratings: BAL-LOW, BAL-12.5, BAL19, BAL-29, BAL-40 and BAL-FZ. These categories are based on heat flux exposure thresholds and are summarised in **Table 1**. The method for determining the BAL rating for any given site involves a specific assessment of vegetation and of topographic slopes. Each BAL rating is associated with appropriate construction standards that apply as a minimum for buildings in bushfire-prone areas (as per AS 3959).

Table 1 : Summary of BAL ratings, heat flux thresholds and associated construction standards, as outlined within AS 3959

Bushfire Attack Level (BAL)	Classified vegetation within 100 m of the subject building and heat flux exposure thresholds	Description of the predicted bushfire attack and levels of exposure	Construction section (within AS 3959)
BAL-LOW	See Section 2.2.3.2 of AS 3959	There is insufficient risk to warrant specific construction requirements	4
BAL-12.5	≤ 12.5 kW/m^2	Ember attack	3 & 5
BAL-19	> 12.5 kW/m^2 to ≤ 19 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers blown together with increasing heat flux	3 & 6
BAL-29	> 19 kW/m^2 to ≤ 29 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers blown together with increasing heat flux	3 & 7
BAL-40	> 29 kW/m^2 to ≤ 40 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers blown together with the increased likelihood of exposure to flame	3 & 8
BAL-FZ	≤ 40 kW/m^2	Direct exposure to flames from fire front in addition to heat flux and ember attack	3 & 9

The revised LSP (**Appendix A**) sets out the spatial layout of future residential development across the site, which will involve the future subdivision of the site into residential lots, public roads and areas of public open space. Future residential dwellings exposed to any bushfire hazard will be those located within 100 m of permanently retained classified vegetation in areas surrounding the site.

The extent of classified vegetation posing a bushfire risk to the site (within 100 m) in the post-development scenario is described in **Section 2.2.2** and shown in **Figure 4**.

An indicative BAL assessment has been undertaken as part of this BMP in order to demonstrate that no future residential dwellings within the site will be exposed to an unacceptable level of bushfire risk (i.e. will be exposed to a BAL rating of greater than BAL-29). This is outlined further below.

3.2.3 Indicative BAL assessment methodology and assumptions

The indicative BAL assessment for the site has been based on a Method 1 BAL assessment (as per AS 3959 and outlined in **Section 2.1**). The criteria used in the indicative Method 1 BAL assessment is outlined as follows:

- Designated FDI: 80
- Flame Temperature: 1090
- Slope: flat/upslope, downslope 0-5^{o}, downslope 5-10^{o}
- Vegetation Class: Forest (Class A), Woodland (Class B), Shrubland (Class B) and Grassland (Class G), as shown in **Figure 4**.
- Distances from classified vegetation: as per **Table 2** below.

In addition to the above, the following key assumptions have informed this assessment:

- The site will be completely cleared of vegetation to support residential development in accordance with future subdivision approvals. The developer will undertake active fuel load management within any undeveloped portions of the site (within their landholding) that are within 100 m of titled residential lots, to maintain a low threat standard in accordance with Section 2.2.3.2 of AS 3959. This will be undertaken by the developer prior to and during bushfire season (November to May each year) as required, to ensure the site remains low threat until such a time as the hazard is permanently removed or managed as part of residential development. Management includes slashing of grasses to 100 mm in height and removal of fallen branches and leaf litter and low pruning where required.
- Areas of public open space established within the site as part of future residential development will be managed to a low threat standard in accordance with Section 2.2.3.2 of AS 3959.
- Areas of classified vegetation (or excluded vegetation) outside the site will remain in their existing condition and the current management regimes will continue to be implemented.
- The strip of vegetation on the east side of Mandurah Road (within the road reserve and abutting the western boundary of the site) represents low threat vegetation in the post-development scenario, in accordance with Section 2.2.3.2 of AS 3959 and as per advice provided by DFES (dated 4 October 2017).

3.2.4 Indicative BAL assessment outcome

Based on the outcomes of the indicative Method 1 BAL assessment undertaken for the site, future development can be progressed in accordance with the revised LSP such that no future dwellings will be exposed to a BAL rating greater than BAL-29. The results of the indicative BAL assessment is outlined below in **Table 2** and the associated BAL contour map is shown in **Figure 7**.

Table 2 details the setbacks required between future dwellings and classified vegetation within 100 m of the site, to achieve the various BAL ratings. These setbacks are based on the distances specified within Table 2.4.3 of AS 3959.

Table 2: Indicative Method 1 BAL Assessment

Vegetation classification	Effective slope	Setback	BAL rating
Class A Forest	Flat/upslope	21 - < 31 m	BAL-29
		31 - < 42 m	BAL-19
		42 - < 100 m	BAL-12.5
	Downslope 0 - 5°	27 - < 37 m	BAL-29
		37 - < 50 m	BAL-19
		50 - < 100 m	BAL-12.5
Class B Woodland	Flat/upslope	14 - < 20 m	BAL-29
		20 - < 29 m	BAL-19
		29 - < 100 m	BAL-12.5
Class C Shrubland	Flat/upslope	9 - < 13 m	BAL-29
		13 - < 19 m	BAL-19
		19 - < 100 m	BAL-12.5
	Downslope 0 - 5°	10 - < 15 m	BAL-29
		15 - < 22 m	BAL-19
		22 - < 100 m	BAL-12.5
	Downslope 5 - 10°	11 - < 17 m	BAL-29
		17 - < 25 m	BAL-19
		25 - < 100 m	BAL-12.5
Class D Scrub	Flat/upslope	13 - < 19 m	BAL-29
		19 - < 27 m	BAL-19
		27 - < 100 m	BAL-12.5
	Downslope 0 - 5°	15 - < 22 m	BAL-29
		22 - < 31 m	BAL-19
		31 - < 100 m	BAL-12.5
	Downslope 5 - 10°	17 - < 24 m	BAL-29
		24 - < 35 m	BAL-19
		35 - < 100 m	BAL-12.5
Class G Grassland	Flat/upslope	8 - < 12 m	BAL-29
		12 - < 17 m	BAL-19
		17 - < 50 m	BAL-12.5
	Downslope 0 - 5°	9 - < 14 m	BAL-29
		14 - < 20 m	BAL-19
		20 - < 50 m	BAL-12.5

The results of the indicative BAL assessment, as shown in **Figure 6**, show that future residential development of the site can be progressed such that no future dwellings will be exposed to a BAL rating greater than BAL-29, and as such demonstrates that the revised LSP satisfies the bushfire management framework set out in SPP 3.7 and the Guidelines.

The results of the indicative BAL assessment will be confirmed to support future stages of residential subdivision within the site, most likely at the subdivision and condition clearance stages of development.

All future subdivided lots within the site which are identified as being exposed to a BAL rating greater than BAL-LOW, will be subject to a notification pursuant to Section 165 of the *Planning and Development Act 2005* to be placed on the certificate(s) of title indicating that the lot is subject to the requirements of a Bushfire Management Plan (i.e. increased construction standards to meet increased BAL ratings).

Future subdivision stages will also consider the impacts of temporary bushfire hazards (i.e. classified vegetation) within Lot 3. Lot 3 is currently owned by the CoR and timeframes for future residential development of this lot (in accordance with the revised LSP) are uncertain. Removal or management of fuels within Lot 3 by the developer prior to subdivision approval may not be feasible. To date, subdivision applications within Lot 806 have been designed to accommodate the temporary hazards within Lot 3, primarily through the provision of suitable separation distances between classified vegetation and subdivided lots to ensure BAL-29 is not exceeded. This approach will continue to be applied until such a time as the vegetation within Lot 3 is removed to facilitate residential development.

3.2.5 Acceptable solution A2.1: Asset Protection Zone

One of the most important bushfire protection measures influencing the safety of people and property is to create an Asset Protection Zone (APZ) around buildings. The APZ is a low fuel area immediately surrounding a building. Non-flammable features such as irrigated landscapes, gardens, driveways and roads can form parts of an APZ. As outlined in the Guidelines, an APZ must be wide enough to ensure that the maximum BAL rating for residential dwellings adjacent to classified vegetation will not exceed BAL-29.

Research into land management and house losses during the 'Black Saturday' Victorian bushfires concluded that the action of private landholders who managed fuel loads close to their houses was the single most important factor in determining house survival when compared with other land management practices, such as broad scale fuel reduction burning remote from residential areas (Gibbons *et al.* 2012).

Managing vegetation in the APZ has two main purposes:

- To reduce direct flame contact and radiant heat from igniting the building during the passage of a fire front.
- To reduce ember attack and provide a safer space for people to defend (if required) before, during and after a fire front passes.

An APZ is defined within the Guidelines as '*an area surrounding a building that is managed to reduce the bushfire hazard to an acceptable level*'. Within the Guidelines, an 'acceptable level' is where the potential radiant heat impact of a fire does not exceed 29 kW/m^2 (BAL-29). APZs can include public roads, waterways, footpaths, buildings, rocky outcrops, golf courses and maintained POS areas, as well as fuel-managed areas within individual lots. For the site, APZ requirements have been primarily addressed through the location of public roads and POS within the revised LSP, which will be maintained to achieve a low threat in accordance with Section 2.2.3.2 of AS 3959. Public roads and POS are typical requirements of urban development, and the standards for these land uses are well known and would generally meet the APZ standard outlined within the Guidelines. On this basis, appropriate separation has been accommodated within the revised LSP and no future residential dwellings will be subject to a BAL rating exceeding BAL-29.

The required width of the APZ is dependent on the characteristics of the adjacent classified vegetation and align with the minimum setback required to achieve a BAL rating of BAL-29, as specified in **Table 2**, and shown in **Figure 7**. Future detailed BAL assessment/s to support the subdivision and condition clearance stages of development will provide further detail on APZs that may need to be accommodated within future residential lots (where applicable), or will be addressed through the location of public roads and POS.

3.3 Element 3: Vehicular access

3.3.1 Intent

To ensure vehicular access serving a subdivision is available and safe during a bushfire event.

3.3.2 Acceptable solution A3.1: Two access routes

The proposed internal road network set out in the revised LSP (as shown in **Appendix A**) will be implemented as part of future residential development across the site. An interconnected loop road system provides all residents and fire fighters with two road access options at all times. In addition, the proposed network provides a number of connections to external public roads, including:

- Mandurah Road and Singleton Beach Road intersection
- Mandurah Road and Crystaluna Drive intersection
- Paganoni Road, through a northern extension of the primary internal Neighbourhood Connector A road (Aquamarine Parade).

This provides a minimum of two access points via public roads to the site. Furthermore, each stage of development will require at least two access routes to and from the stage in order to allow egress for residents and emergency vehicles in the event of a bushfire. Staged access arrangements will be outlined as part of future BAL assessment/s and/or BMPs (where required) undertaken to support the subdivision approval process.

To facilitate road access between Lot 805 and 806 (given the unknown development timeframe associated with Lot 3), subdivision approval was issued by the Western Australian Planning Commission in July 2015 to create a 22 m wide road reserve the centre of Lot 3. This will provide public road access connectivity between Lot 805 and Lot 806.

3.3.3 Acceptable solution A3.2: Public roads

Surrounding public roads and all new public roads within the site will comply with the minimum standards outlined in Appendix Four of the Guidelines. All public roads achieve a minimum 6 m width, as per the Guidelines.

3.4 Element 4: Water

3.4.1 Intent

To ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.

3.4.2 Acceptable Solution A4.1: Reticulated water

The site is located within an Emergency Services Levy (ESL) category 2 area, which indicates that emergency bushfire response is provided by a career fire station, a volunteer fire and rescue services brigade, and the State Emergency Service. Fire response services require ready access to an adequate water supply during bushfire emergencies.

The development will be provided with a reticulated water supply, together with fire hydrants that will be installed by the developer/s to meet the standard specifications of Water Corporation (Design Standard DS 63) and DFES. Fire hydrants on land zoned for residential purposes are required to be sited at or within 200 m of residential dwellings (Class 1a).

The Water Corporation will be responsible for all hydrant maintenance and repairs.

3.5 Public education

Community bushfire safety is a shared responsibility between individuals, the community, government and fire agencies. DFES has an extensive Community Bushfire Education Program including a range of publications, a website and Bushfire Ready Groups. The publication *Prepare. Act. Survive.* (DFES 2014) provides excellent advice on preparing for and surviving the bushfire season. Other downloadable brochures are available from http://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/pages/publications.aspx.

The CoR provides bushfire safety advice to residents available from their website http://rockingham.wa.gov.au/. Professional, qualified consultants also offer bushfire safety advice and relevant services to residents and businesses in high risk areas.

Future residents of the site are able to access additional bushfire information via the above sources, or through contacting the CoR or DFES directly. In the case of a bushfire in the area, advice would be provided to residents by DFES, Department of Parks and Wildlife (DPaW) and/or the CoR on any specific recommendations to responding to the bushfire, including evacuation if required. It is recommended that future residents should make themselves aware of their responsibilities with regard to responding to a potential bushfire.

4 Implementing the Bushfire Management Plan

Table 3 outlines the future responsibilities of the developer, future lot owners or residents, and the CoR associated with implementing this BMP. Some of these responsibilities may be enforceable through the CoR Fire Control Notice.

The future owners/occupiers of lots within the site, as created through future subdivision in accordance with the revised LSP, are responsible for maintaining a reduced level of risk from bushfire within their properties (where applicable), and will be responsible for undertaking, complying and implementing measures to protect their own assets (and people under their care) from the threat and risk of bushfire.

Table 3: Responsibilities for the implementation of the BMP

Management action	Timing
Developer	
Confirm the results of the indicative BAL assessment (completed as part of this BMP) through the completion of BAL assessment/s to support subdivision application/s and or condition clearances, where required.	Subdivision and condition clearance stages
Lodge a Section 165 Notification on the Certificate of Title for each new future lot created within areas exposed to a BAL rating exceeding BAL-LOW, in order to alert purchasers and successors in title of the existence of the overarching BMP and specifically the requirements associated with meeting AS 3959 construction standards.	To support the creation of lot titles
Install the public roads to standards outlined in **Section 3.3.3** and ensure two access ways are provided at all times for each subdivision stage.	To support the creation of lot titles[1]
Design and landscape POS areas as low threat vegetation in accordance with Section 2.2.32(f) of AS 3959.	As part of subdivision and development
Install a reticulated water supply and hydrants as per standard Water Corporation requirements, unless otherwise agreed.	As part of subdivision and development
Make a copy of the BMP and subsequent BAL assessment/s available to each lot owner subject to AS 3959 construction standards.	During the lot sale process, and ongoing as required
Clear or manage vegetation to a low threat standard (in accordance with Section 2.2.3.2 of AS 3959) in areas within 100 m of titled residential lots (within the developer's landholding) unless assumed otherwise (ensuring that BAL-29 is not exceeded). This includes slashing of grasses, and removal of surface and near surface fuels (such as leaf litter and dead branches), where required immediately prior to and during the bushfire season (November to May annually).	Ongoing, where applicable
Comply with the CoR Fire Control Notice as published on all vacant balance land	Ongoing, where applicable
Property owner/occupier	
Ensure construction of dwelling/s complies with AS 3959 where a BAL rating greater than BAL-LOW is applicable, as detailed within the certified BAL assessment that will be completed prior to the creation of lot titles. The certified BAL ratings can be used to determine the appropriate building construction standard.	As part of building design and construction
Comply with AS 3959 if dwellings are subject to additional construction in the future, such as renovations, if applicable (i.e. where located within a designated bushfire prone area).	As part of building design and construction

Management action	Timing
Where required, APZs are maintained in good order in accordance with this BMP and/or Appendix Four of the Guidelines.	Ongoing, where applicable
Ensure that their property complies with the CoR Fire Control Notice as published.	Ongoing, where applicable
Ensure that where hydrants are located, they are not obstructed and remain visible at all times.	Ongoing, where applicable
City of Rockingham	
Provide fire prevention and preparedness advice to landowners upon request, including the *Homeowners Bush Fire Survival Manual: Prepare, Act, Survive* (or similar suitable documentation) and the CoR Fire Control Notice.	Ongoing, as required
Monitor vegetation fuel loads in public road reserves under CoR control and liaise with relevant stakeholders to maintain fuel loads at minimal fuel levels and comply with the CoR firebreak notice.	Ongoing, as required
Maintain POS area to appropriate low threat vegetation standards in accordance with Section 2.2.3.2 of AS 3959 following handover by the developer.	Ongoing, as required
Main Roads Western Australia	
Monitor vegetation fuel loads in public road reserves under MRWA control and liaise with relevant stakeholders to maintain fuel loads at minimal fuel levels.	Ongoing, as required
Department of Fire and Emergency Services	
DFES emergency fire personnel are responsible for responding to emergency situations relating to bushfire within the CoR. Where bushfire threatens the site, the local brigade will utilise the internal road network of the site to protect life and property, where appropriate.	Ongoing, as required.
Water Corporation	
The Water Corporation is responsible for the ongoing maintenance and repair of water hydrants.	Ongoing, as required

5 Summary of bushfire management

The site is located within an area identified as bushfire prone within the state *Map of Bush Fire Prone Areas* (OBRM 2017). This BMP has been prepared consistent with Appendix Four of the Guidelines (WAPC and DFES 2017) and demonstrates that as development progresses in accordance with the revised LSP, an acceptable solution can be adopted for each bushfire hazard management issue, as summarised below:

- **Location:** as outlined in **Section 3.2.4** the indicative BAL assessment indicates that the development (i.e. future residential subdivision in accordance with the revised LSP) is located in an area that is or will, on completion, be subject to BAL–29 or below, as shown in the indicative BAL contour map (**Figure 6**).
- **Siting and Design:** future residential dwellings will not be exposed to an unacceptable level of radiant flux, without appropriate mitigation measures, such as increased construction standards in accordance with AS 3959. Separation will be provided between future dwellings and post-development classified vegetation primarily through the provision of public roads and areas of public open space, as indicated in **Figure 7**. The results of the indicative BAL assessment will be confirmed to support future stages of residential subdivision within the site, most likely at the subdivision and condition clearance stages of development. BAL ratings for dwellings can be certified to support future building licence processes, where required.
- **Vehicular Access:** the internal layout, design and construction of public vehicular access and egress in the development, as set out in the revised LSP design, will be in accordance with the Guidelines. It will allow vehicles to move through the site easily and safely at all times. The development will have a number of direct access points to the adjacent public road network, including Mandurah Road to the west (at a number of locations) and Paganoni Road to the north.
- **Water:** the development will be provided with a permanent and secure reticulated water supply and will be installed in accordance with the specifications of the Water Corporation, including the installation of fire hydrants. This is a typical requirement of urban development.

Table 3 of this BMP outlines the actions which should be implemented, and the parties responsible for their implementation, to reduce the bushfire risk to future residents and the community.

Community bushfire safety is a shared responsibility between state and local governments, fire agencies, communities and individuals. The future owners/occupiers of future lots within the site are responsible for maintaining a reduced level of risk from bushfire within their properties (where applicable), and will be responsible for undertaking, complying and implementing measures to protect their own assets (and people under their care) from the threat and risk of bushfire. Further information on bushfire preparedness is available directly from the CoR and DFES.

6 Applicant Declaration

I declare that the information provided is true and correct to the best of my knowledge.

Name: Kirsten Knox

Company: Emerge Associates

Date: 13 October 2017

Name: Rohan Carboon

Company: Bushfire Safety Consulting

Date: 13 October 2017

7 References

7.1 General references

Bushfire Safety Consulting 2013, Fire Management Plan - Lots 3, 805 and 806 Mandurah Road, Karnup, Unpublished report prepared for Golden Group.

Department of Fire and Emergency Services (DFES) 2014, Prepare. Act. Survive., Perth.

Gibbons, P., van Bommel, L., Gill, A., Cary, GJ, Driscoll, D., Bradstock, R., Knight, E., Moritz, M., Stephens, S. and Lindenmayer, D. 2012, Land Management Practices Associated with House Loss in Wildfires, PLoS One, 7(1).

Leonard, J. 2009, Report to the 2009 Victorian Royal Commission Building Performance in Bushfires.

Standards Australia 2009, AS 3959-2009 Construction of buildings in bushfire-prone areas, Sydney.

Western Australian Planning Commission (WAPC) 2015, State Planning Policy 3.7 Planning in Bushfire Prone Areas, Western Australian Planning Commission, Perth, Perth.

WAPC and DFES 2017, Guidelines for Planning in Bushfire Prone Areas version 1.1, Western Australian Planning Commission, Perth.

7.2 Online references

Department of Water 2008, *LIDAR derived 1 m elevation contours* dataset, Government of Western Australia.

Office of Bushfire Risk management (OBRM) 2017, Map of Bush Fire Prone Areas, viewed June 2017, <https://maps.slip.wa.gov.au/landgate/bushfireprone/>.

Figures

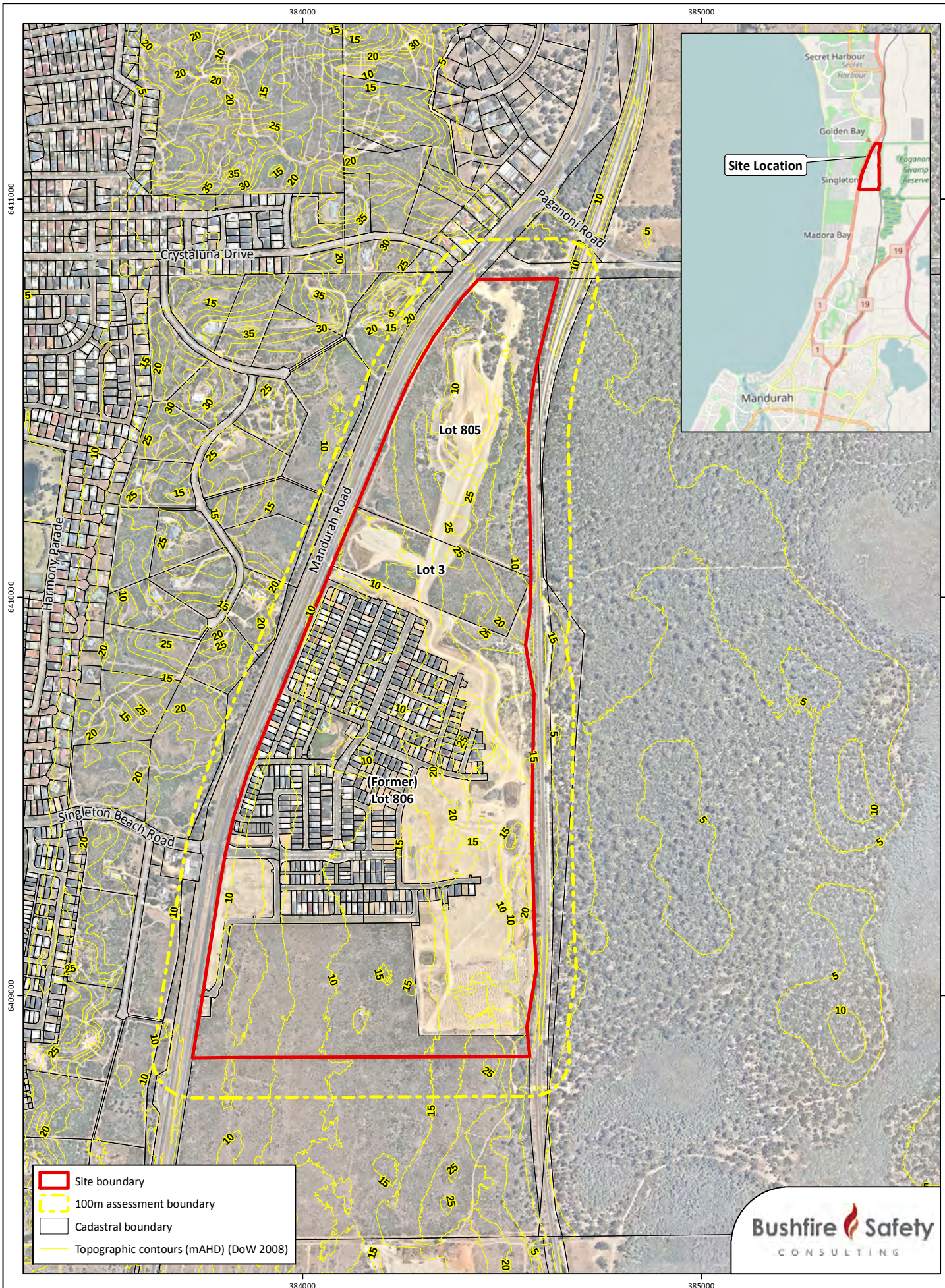

Figure 1: Site and Assessment Area

Project:	Bushfire Management Plan The Vista Karnup
Client:	Gold Right Pty Ltd

Plan Number:
EP14-047(05)--F77

Drawn:	KNM
Date:	12/06/2017
Checked:	ADB
Approved:	KK
Date:	22/06/2017

N

0 100 200 300
Metres
Scale: 1:12,500@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

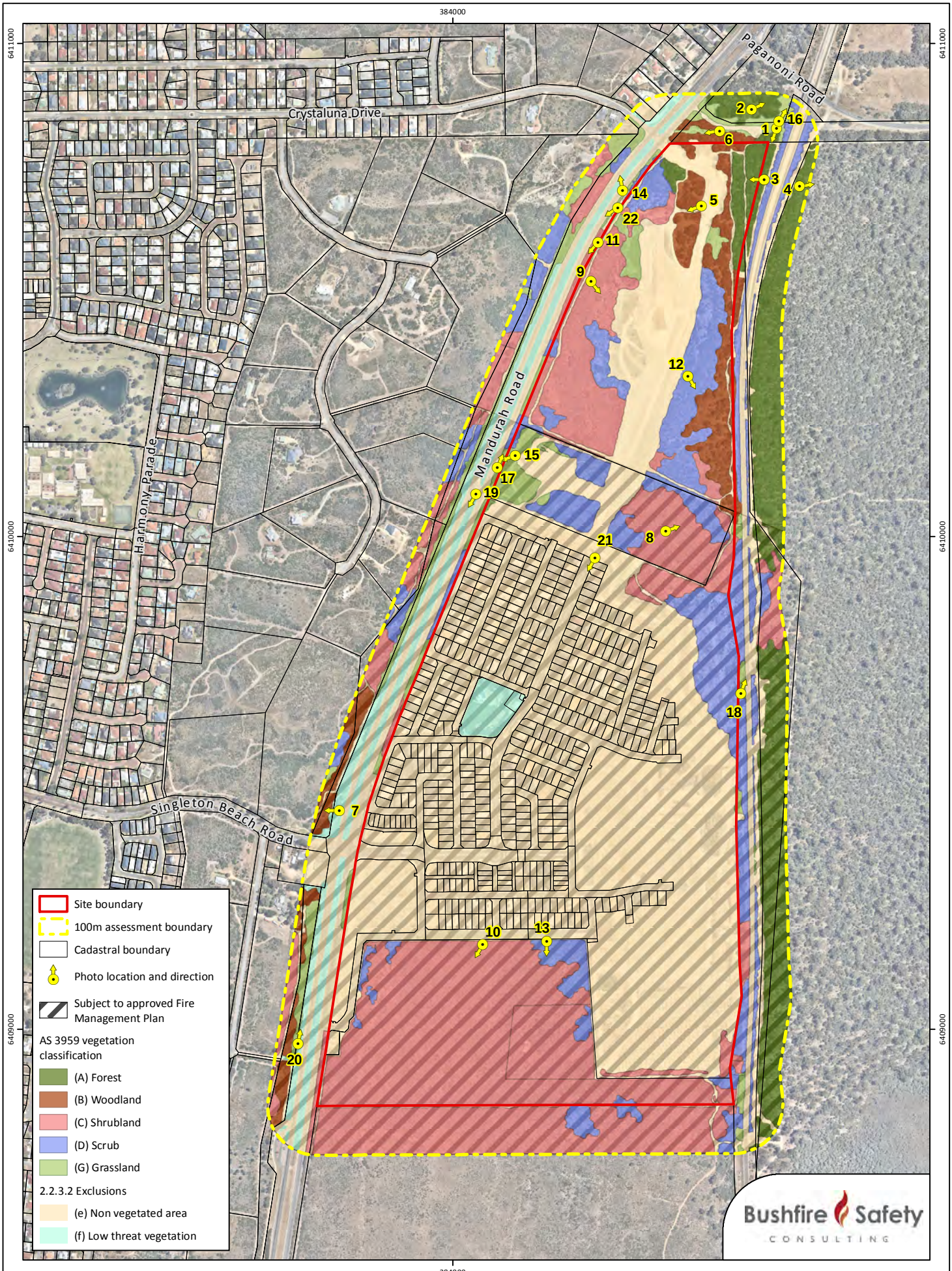

Figure 2: **Existing Site Conditions – AS 3959 Vegetation Classification**

Project: Bushfire Management Plan
The Vista Karnup
Client: Gold Right Pty Ltd

Plan Number:
EP14-047(05)--F78
Drawn: KNM
Date: 12/06/2017
Checked: ADB
Approved: KK
Date: 22/06/2017

N

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Metres
Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

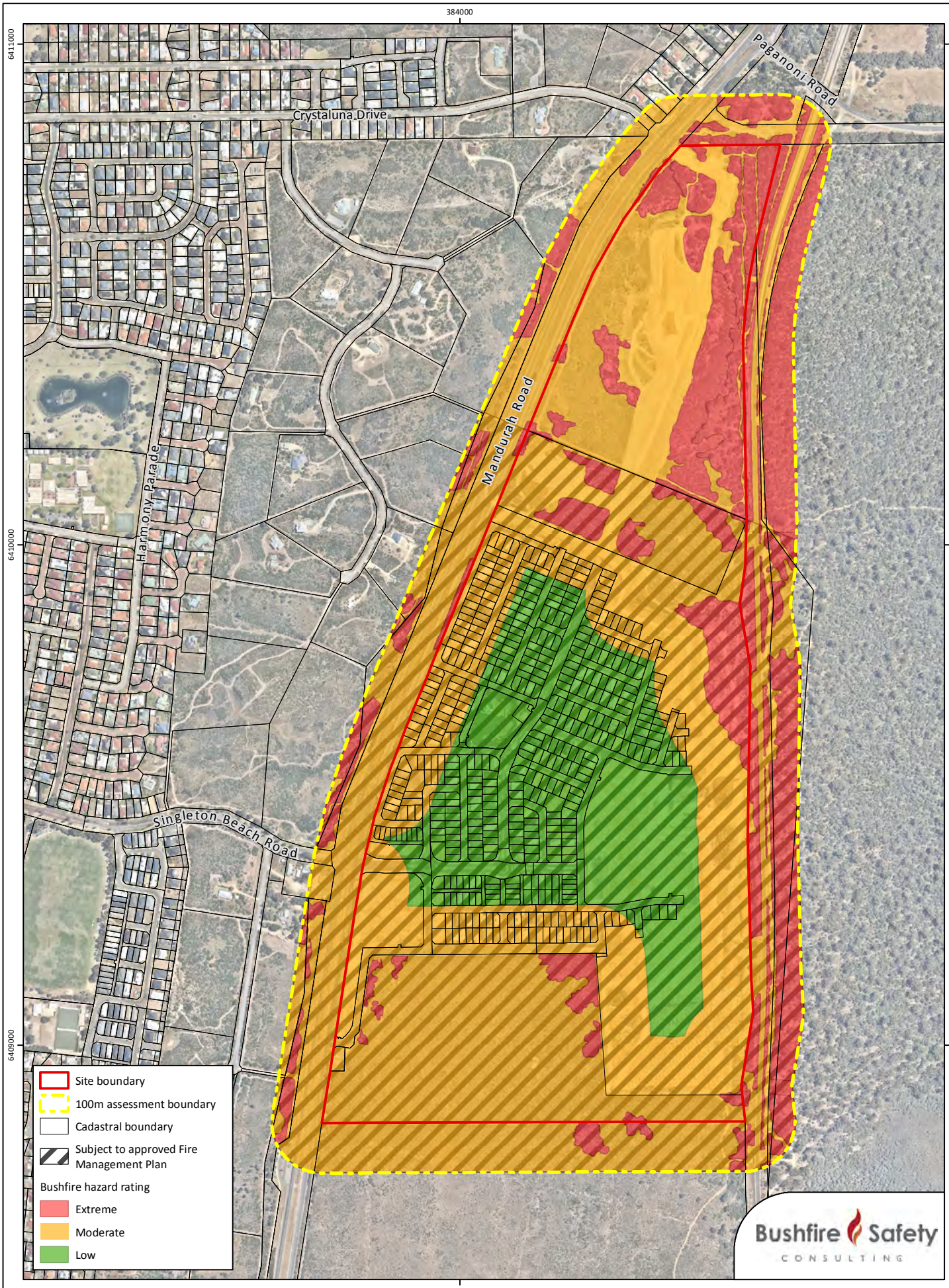

Figure 3: Existing Site Conditions – Bushfire Hazard Assessment

Project: Bushfire Management Plan
The Vista Karnup
Client: Gold Right Pty Ltd

Plan Number:
EP14-047(05)--F79
Drawn: KNM
Date: 12/06/2017
Checked: ADB
Approved: KK
Date: 22/06/2017

N

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Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

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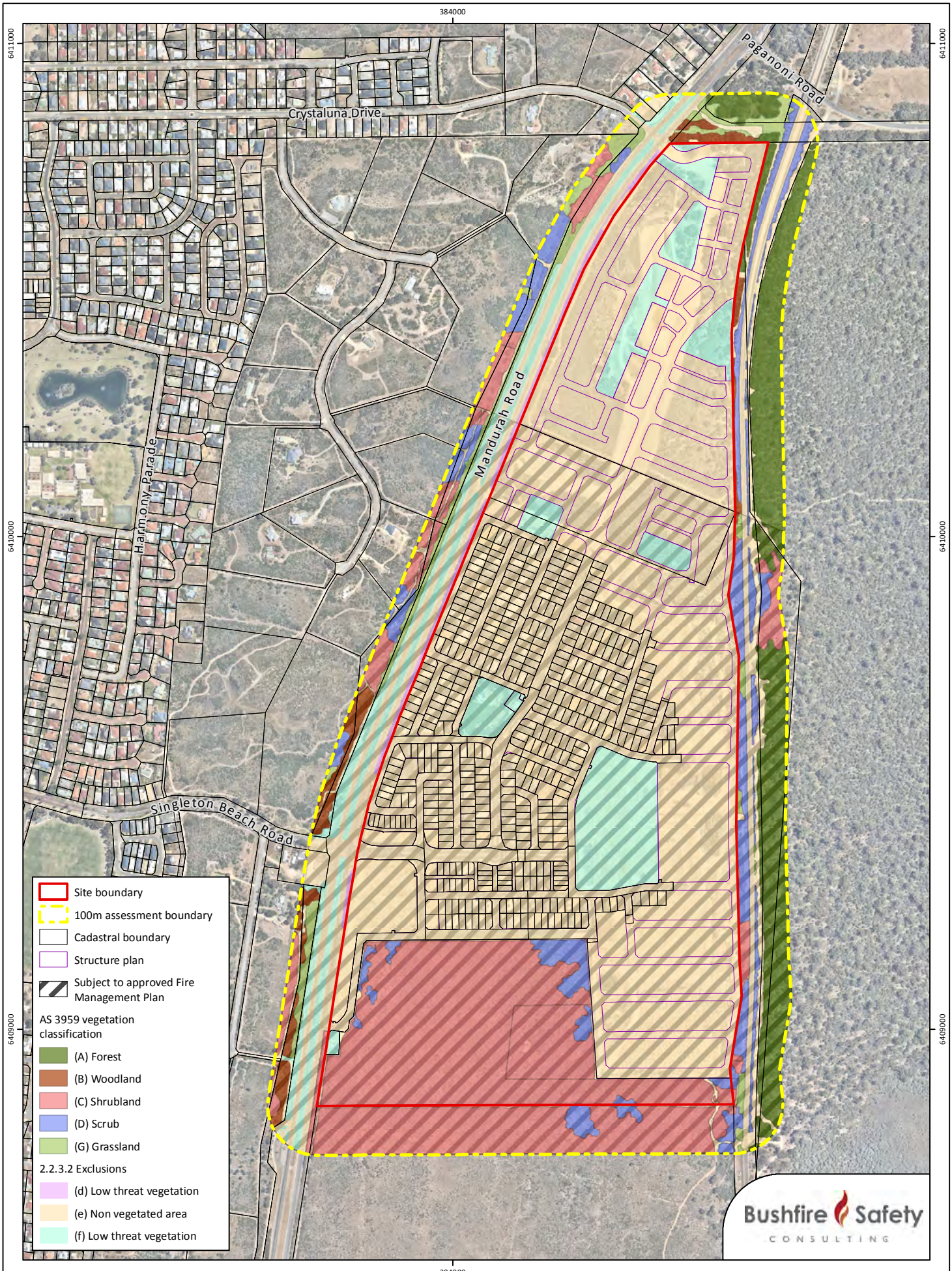

Figure 4: **Post Development Site Conditions – AS 3959 Vegetation Classification**

Project: Bushfire Management Plan
The Vista Karnup
Client: Gold Right Pty Ltd

Plan Number:
EP14-047(05)--F80a

Drawn:	ADB
Date:	13/10/2017
Checked:	ADB
Approved:	KK
Date:	13/10/2017

N

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Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used

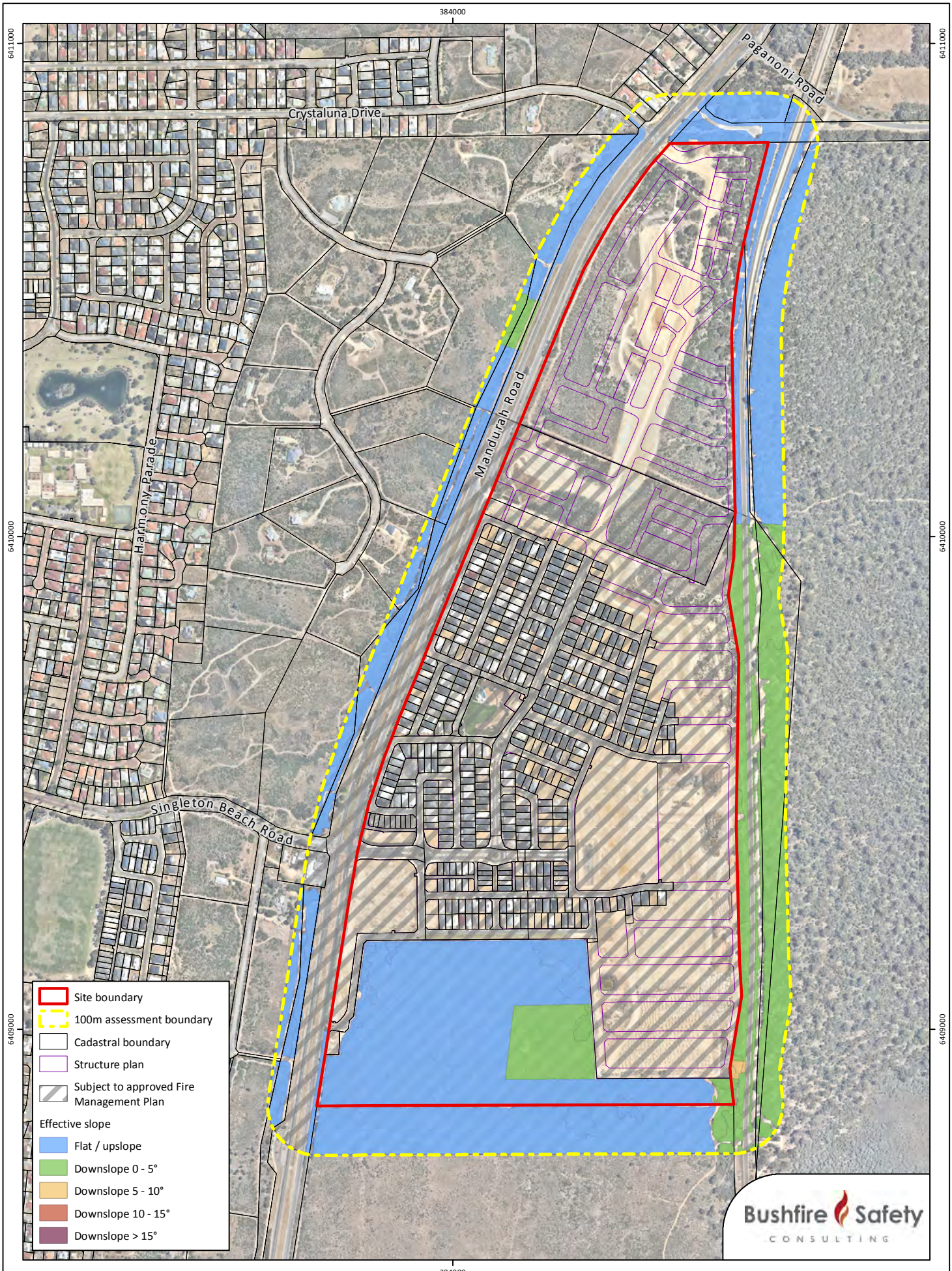

Figure 5: Effective Slope

Project:	Bushfire Management Plan The Vista Karnup
Client:	Gold Right Pty Ltd

Plan Number:
EP14-047(05)--F81a

Drawn:	ADB
Date:	13/10/2017
Checked:	ADB
Approved:	KK
Date:	13/10/2017

N

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Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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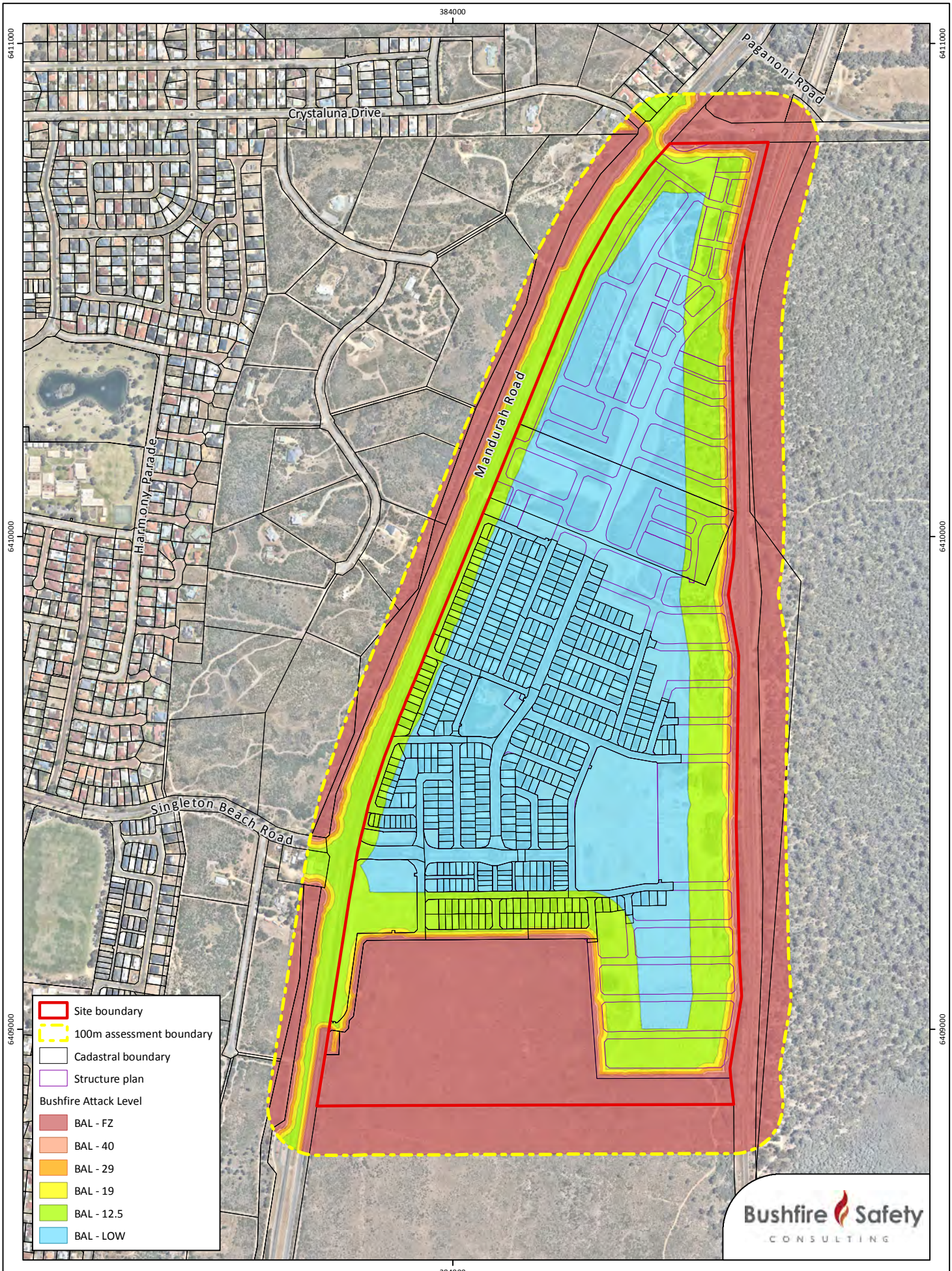

Figure 6: Indicative Bushfire Attack Level Contour Plan

Project: Bushfire Management Plan
The Vista Karnup
Client: Gold Right Pty Ltd

Plan Number:
EP14-047(05)--F84a
Drawn: ADB
Date: 13/10/2017
Checked: ADB
Approved: KK
Date: 13/10/2017

N

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Metres
Scale: 1:10,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

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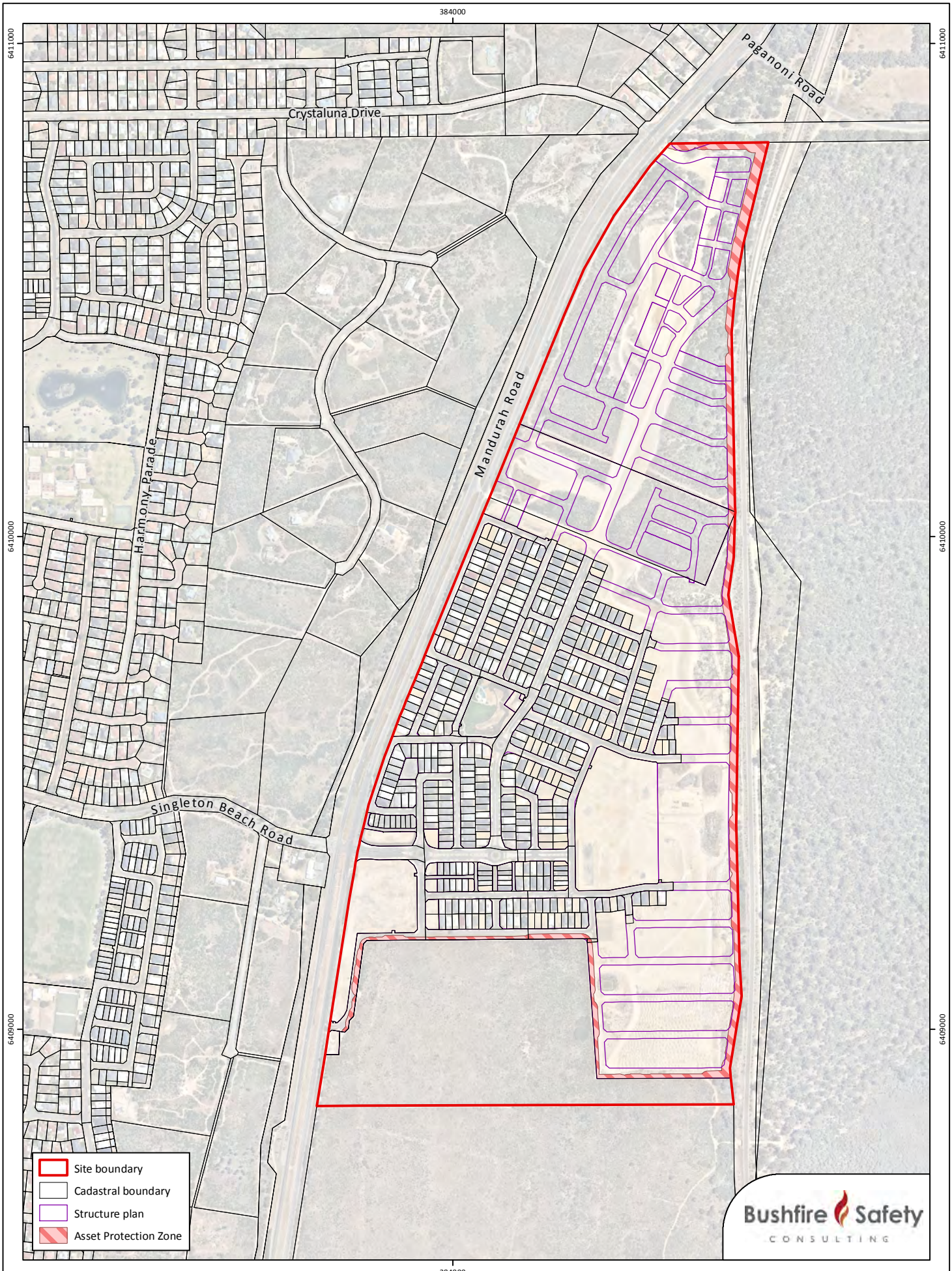

Figure 7: Indicative Asset Protection Zone Requirements

Project:	Bushfire Management Plan The Vista Karnup
Client:	Gold Right Pty Ltd

Plan Number:
EP14-047(05)--F85a

Drawn:	ADB
Date:	13/10/2017
Checked:	ADB
Approved:	KK
Date:	13/10/2017

N

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Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

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Appendix A

Revised Local Structure Plan

emerge ASSOCIATES

Bushfire Safety CONSULTING

LEGEND :

- Subject Site

ZONES

- Residential 25
- Residential 30
- Residential 40
- Residential 60
- Commercial
- RMD **

RESERVES

- Road Reserve
- (A) Public Open Space/Ref Number
- Reserve for Conservation
- Public Purposes
  - PS - Primary School
  - PU - Public Utilities

ROAD HIERARCHY

- Integrator B
- Neighbourhood Connector A
- Neighbourhood Connector B
- Access Street B
- Light Controlled Intersection
- Full Movement Intersection

PATH NETWORK

- Dual Use Paths

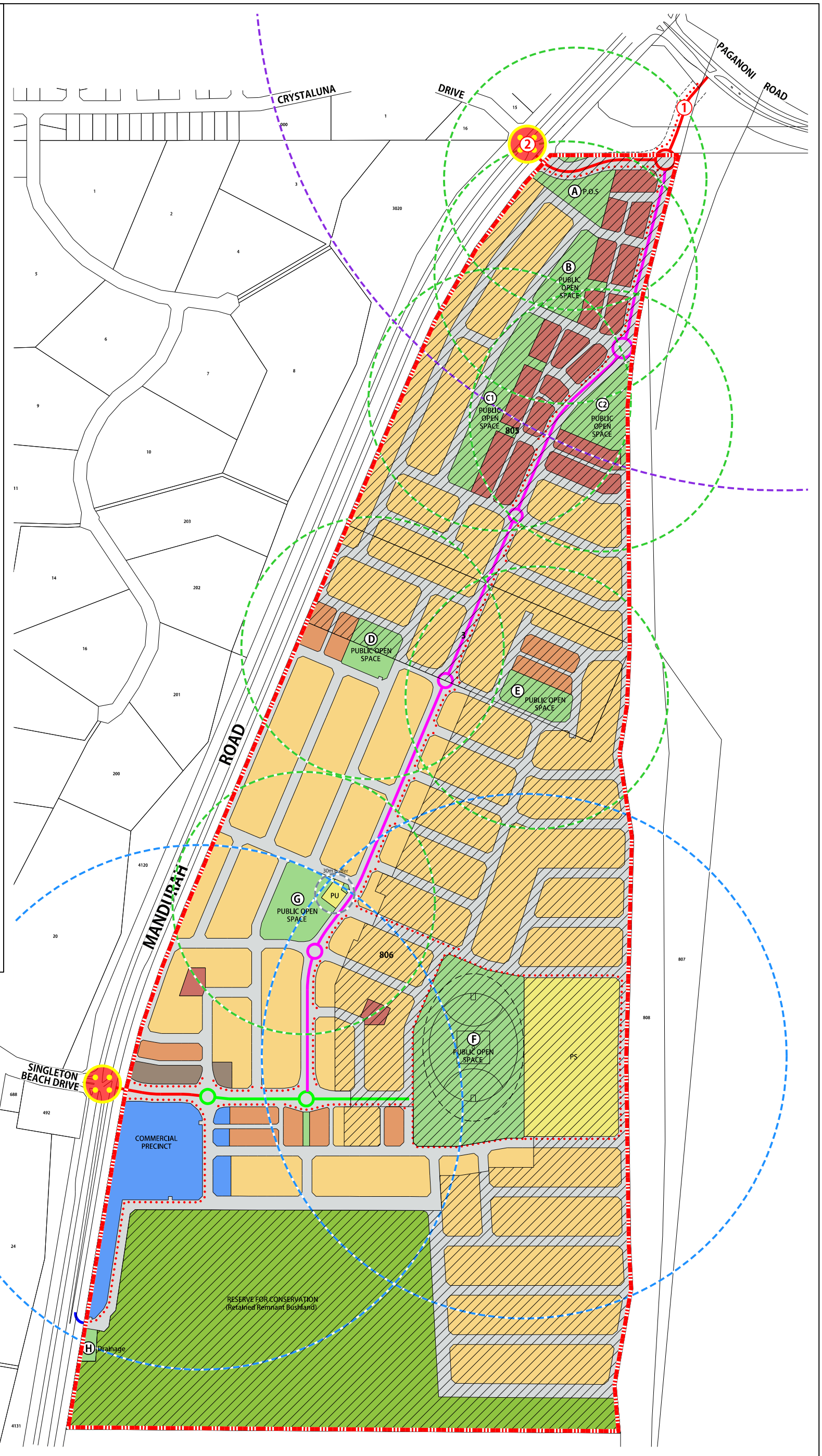
WALKABLE CATCHMENTS

- 200m POS walkable catchment
- 400m Major Community Node walkable catchment
- 800m TOD walkable catchment

** Planning Policy No.3.3.22 Medium-Density Single House Development Standards-Development Zones

① Alignment of road connection to Paganoni Road through Lot 172 shall be such that it minimises loss of vegetation

② A 'Seagull' intersection and 'Left-in/Left-out' access point on Mandurah Road (opposite Crystaluna Drive). The intersection shall be such that a reconfiguration to a four way 'Light Controlled' intersection is possible in the future



Revised Local Structure Plan

The Vista Karnup

NORTH

Scale 1: 6000 @ A3

25 0 50 100 150 200 250 metres

COMPILED: STUDIO CFM		DRAWN BY:	RF
DATE:	26/6/2012	REVISED:	15/06/2017
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studio CFM TOWN PLANNING URBAN DESIGN

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Appendix B

Vegetation Photo Locations

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Photo Location 1 – Forest (Class A)

Photo Location 2 - Forest (Class A)

Photo Location 3 – Forest (Class A)

Photo Location 4 - Forest (Class A)

Photo Location 5 – Woodland (Class B)

Photo Location 6 – Woodland (Class B)

Photo Location 7 – Woodland (Class A)

Photo Location 8 – Shrubland (Class C)

Photo Location 9 – Shrubland (Class C)

Photo Location 10 - Shrubland (Class C)

Photo Location 11 – Shrubland (Class C)

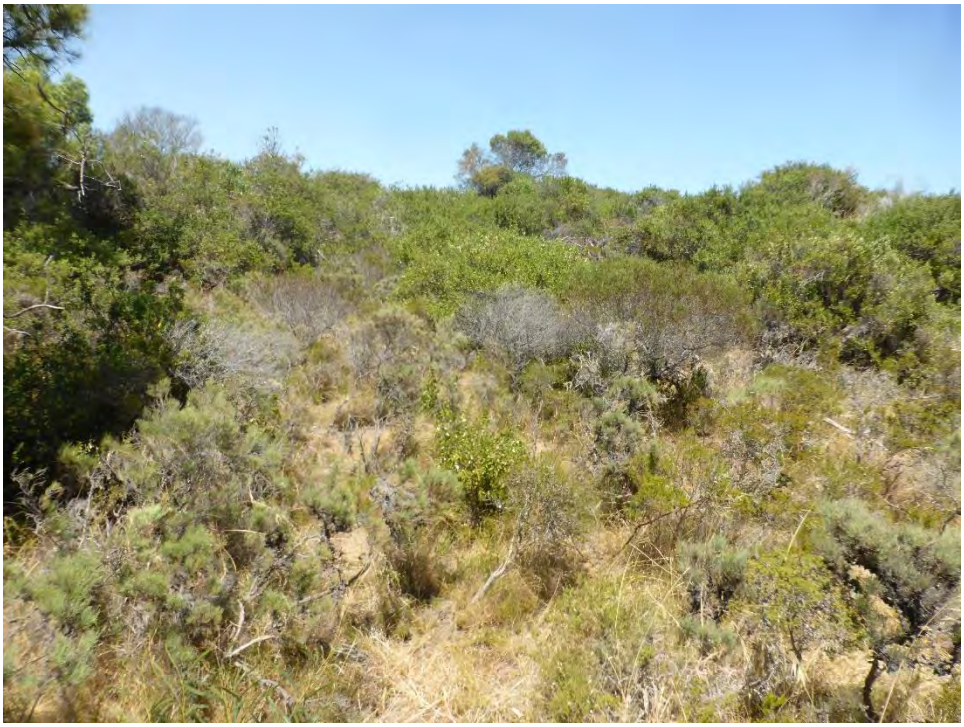

Photo Location 12 – Scrub (Class D)

Photo Location 13 – Scrub (Class D)

Photo Location 14 - Scrub (Class D)

Photo Location 15 – Grassland (Class G)

Photo Location 16 - Grassland (Class G)

Photo Location 17 – Grassland (Class G)

Photo Location 18 - Grassland (Class G)

Photo Location 19 – Low threat vegetation (AS 3959 Exclusion 2.2.3.2(f))

Photo Location 20 - Low threat vegetation (AS 3959 Exclusion 2.2.3.2(f))

Photo Location 21 – Non vegetated area (AS 3959 Exclusion 2.2.3.2(e))

Photo Location 22 – Non vegetated area (AS 3959 Exclusion 2.2.3.2(e))

Appendix C

Compliance Checklist

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Appendix C: Compliance Checklist

Element/Question	Response	Applicable section of BMP
1: Location		
Does the proposal comply with the performance criteria by applying acceptable solution A1.1 (development location)?	Yes. Any future dwellings constructed within the site in accordance with the revised LSP can be located to ensure BAL-29 is not exceeded.	**Section 3.1.2**
2: Siting and design of the Development		
Does the proposal comply with the performance criteria by applying acceptable solution A2.1 (asset protection zone)?	Yes. Any future dwellings constructed within the site in accordance with the revised LSP can be located to ensure BAL-29 is not exceeded.	**Section 3.2.5**
3: Vehicular access		
Does the proposal comply with the performance criteria by applying acceptable solution A3.1 (two access routes)?	Yes. The internal loop road system connects with the broader public road network west and north of the site.	**Section 3.3.2**
Does the proposal comply with the performance criteria by applying acceptable solution A3.2 (public road)?	Yes. Public roads within the site will meet the construction requirements of the Guidelines.	**Section 3.3.3**
Does the proposal comply with the performance criteria by applying acceptable solution A3.3 (cul-de-sac)?	N/A	N/A
Does the proposal comply with the performance criteria by applying acceptable solution A3.4 (battle-axe)?	N/A	N/A
Does the proposal comply with the performance criteria by applying acceptable solution A3.5 (private driveway longer than 50 m)?	N/A	N/A
Does the proposal comply with the performance criteria by applying acceptable solution A3.6 (emergency access way)?	N/A	N/A
Does the proposal comply with the performance criteria by applying acceptable solution A3.7 (fire services access routes)?	N/A	N/A
Does the proposal comply with the performance criteria by applying acceptable solution A3.8 (firebreak width)?	N/A	N/A
4: Water		
Does the proposal comply with the performance criteria by applying acceptable solution A4.1 (reticulated areas)?	Yes. Future residential lots within the site will be serviced by a reticulated water supply.	**Section 3.4.2**
Does the proposal comply with the performance criteria by applying acceptable solution A4.2 (non-reticulated areas)?	N/A	N/A
Does the proposal comply with the performance criteria by applying acceptable solution A4.3 (individual lots within non-reticulated areas)?	N/A	N/A