



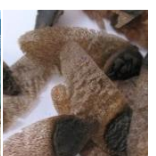
Natural Area
CONSULTING MANAGEMENT SERVICES

ABN Group

Bushfire Management Plan Lots 569 and 1263 Baldivis Road, and Lot 21 Sixty Eight Road, Baldivis

10 April 2015

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Document Control

| Version | Date | Prepared by | Reviewed by | Approved by |
|---------|------------------|-------------|--------------|--------------|
| 1 | 05 November 2014 | Sue Brand | Luke Summers | Luke Summers |
| Draft 2 | February 2015 | Sue Brand | Luke Summers | Luke Summers |
| Draft 3 | 10 April 2015 | Sue Brand | Luke Summers | Luke Summers |

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1.0 Introduction

Natural Area Holdings Pty Ltd (Natural Area) was commissioned by the ABN Group to prepare a Bushfire Management Plan for Lots 569 and 1263 Baldivis Road and Lot 21 Sixty Eight Road in Baldivis to support the development of a local structure plan (LSP). The site is located approximately 45 km south of the Perth Central Business District and covers approximately 44 ha. The area is bounded by Baldivis Road to the east, Sixty-Eight Road to the south, and private property to the north and west (Figure 1). The majority of Lots 569 and 1263 is disused quarry that has been cleared with small pockets of bushland remaining around the perimeter, and Lot 21 is currently vegetated (Figure 1). Offsite vegetation is present on private property to the west, along with the road verges and properties fronting the south side of Sixty Eight Road and the eastern side of Baldivis Road.

Many Australian ecosystems require bushfire at regular intervals as part of their natural lifecycle. Vegetation within these ecosystems have developed characteristics which promote the spread of fire, such as flammable bark, dry coarse leaf litter and leaves which contain flammable oils (CSIRO, 2008). Accordingly, residential areas in proximity to remnant native vegetation are at risk from bushfire impacts such as smoke, ember attack and radiant heat. In knowing the risks, it is possible to identify varying mitigation strategies that allow urban development to occur in proximity to remnant bushland areas. However, it needs to be emphasised that the mitigation strategies reduce the risks, but does not eliminate them.

The Bushfire Management Plan has been prepared to support the City of Rockingham and Western Australian Planning Commission (WAPC) planning approvals process. It provides fire risk mitigation options that will be applied as development at the site proceeds. The quarry within Lots 569 and 1263 Baldivis Road will be filled to enable subdivision and building of urban residential properties. When preparing the Plan, Natural Area Consulting has considered the requirements outlined in the *Planning for Bushfire Protection Guidelines* prepared by the Western Australian Planning Commission, the Department of Planning and the Fire and Emergency Services Authority (2010, Edition 2), and *AS 3959 – 2009 Construction of Buildings in Bushfire Prone Areas*. Activities involved with the plan preparation process included:

- assessing the vegetation types present within and adjacent to the proposed development site using the second edition of Planning for Bush Fire Protection Guidelines (Western Australian Planning Commission, Department of Planning and Fire and Emergency Services Authority, 2010, Edition 2)
- assigning hazard ratings based on the vegetation types present
- determining projected BAL ratings and suggest likely management strategies that could be implemented based on current and projected site considerations
- preparation of the management plan.

The outcomes of the assessment process are documented in this Plan, with key sections including:

- the aim and objectives of the Bushfire Management Plan
- location, zoning and current site characteristics
- fire problem
- Bushfire Management Plan
- roles and responsibilities of the developer, landowners and the City of Rockingham.

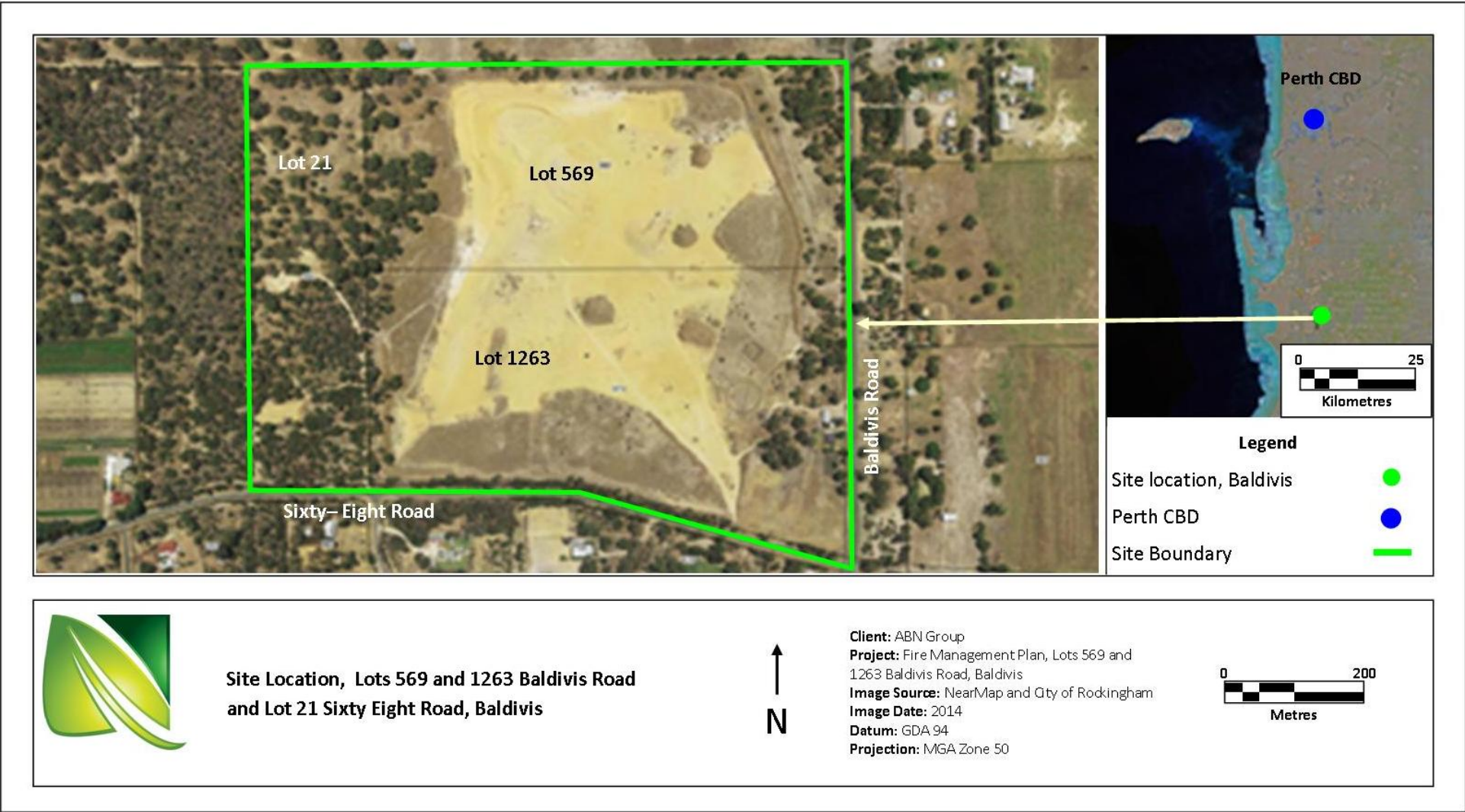


Figure 1: Site Location, Lots 569 and 1263 Baldvis Road and Lot 21 Sixty Eight Road, Baldvis

2.0 Management Plan Aim

The aim of the Bushfire Management Plan (BMP) is to outline the fire management methods and requirements that will be implemented within the proposed development site. Accordingly, broad aims include:

- reduce the threat of fire to the life and property of future residents and the environment
- allow easy access of fire-fighters if a fire does occur in surrounding areas.

2.1 Management Plan Objectives

The objectives of this Bushfire Management Plan are to:

- propose bush fire prevention measures for the interface between the bushland areas to the west of the development area, along with vegetated areas to the south and east
- define the building construction standards where vegetated areas interface with the urban development
- identify access for fire-fighting operations and daily maintenance in an around vegetated areas
- propose bush fire prevention measures around the stages of urban development
- identify current and future landowner, developer and City of Rockingham responsibilities for various components of this Bushfire Management Plan
- document the acceptable solutions adopted for the development site.

3.0 Location and Zoning

The subject land is located within the City of Rockingham (Figure 1). Lots 569 and 1263 are zoned urban, with the northern portion of Lot 21 zoned urban and the southern portion urban deferred (City of Rockingham, 2014). TPS Amendment 144 designates bushfire prone areas within the City of Rockingham. Lot 21 Sixty Eight Road, along with portions of Lots 569 and 1263 Baldivis Road are designated as being bushfire prone (Figure 2).

At the time of preparation, the entire site is the responsibility of the developers. Lots will range in area from 225 m² to a maximum of 550 m², with the majority in the range of 300 - 400 m². In time, these individual Lots will be sold at an appropriate phase of the development process. Density ratings for the site are expected to include R25 and R40, and R60 for the density housing location.

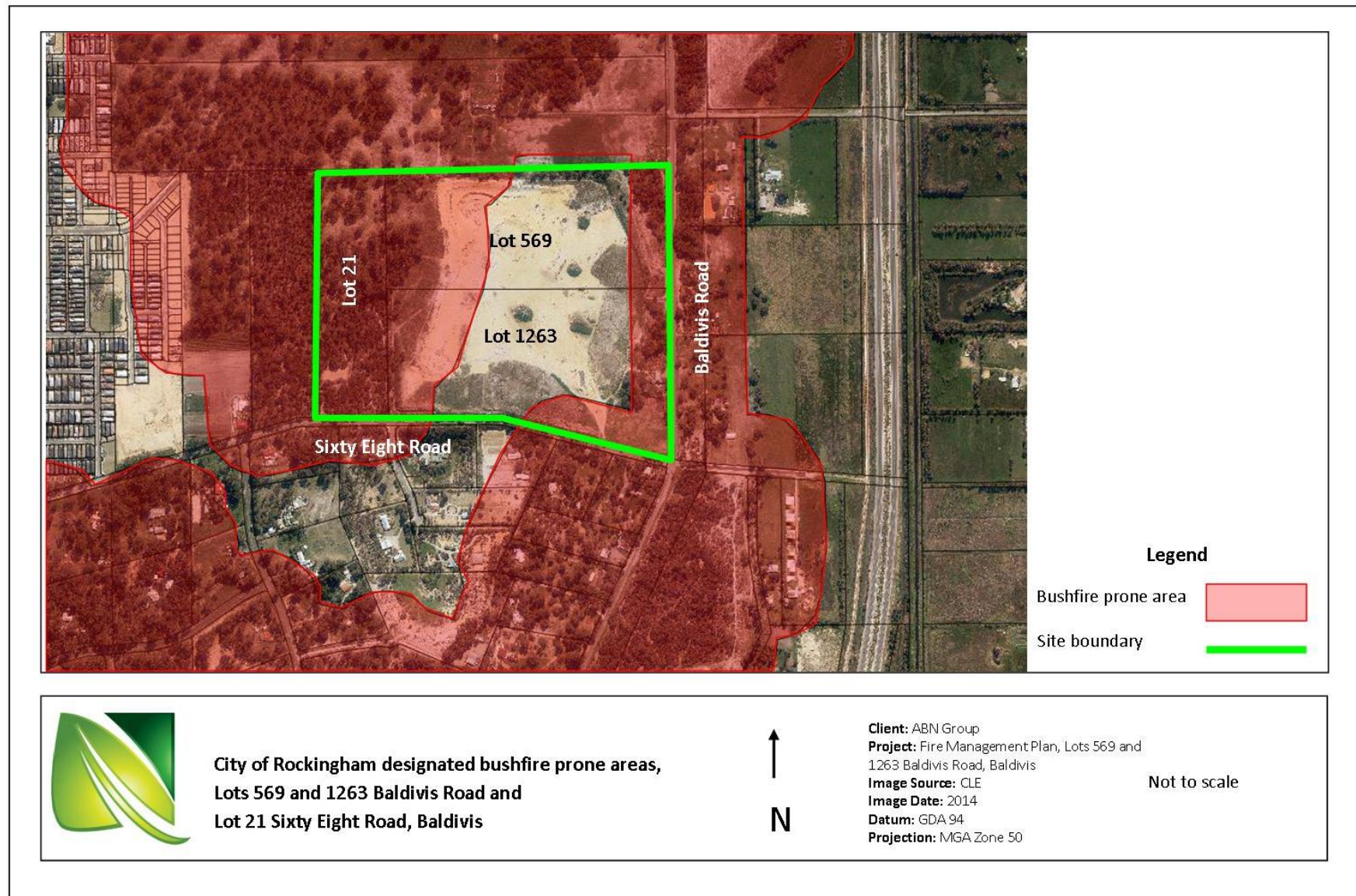


Figure 2: City of Rockingham designated bushfire prone areas, Lots 569 and 1263 Baldvis Road and Lot 21 Sixty Eight Road, Baldvis

4.0 Current Site Characteristics

4.1 Regional Context

Perth is located within the Swan Coastal Plain region of the Interim Biogeographical Regionalisation of Australia (IBRA). The Swan Coastal Plain comprises of two major divisions, namely Swan Coastal Plain 1 – Dandaragan Plateau and Swan Coastal Plain 2 – Perth Coastal Plain. The site is located in the Perth subregion, which is broadly characterised as including areas of Jarrah and Banksia woodlands on sandy soils in a series of sand dunes, along with wetland areas, often within the interdunal swales (Mitchell, Williams and Desmond, 2002).

4.2 Climate

The climate experienced in the area is Mediterranean, with dry, hot summers and cool, wet winters. The Bureau of Meteorology (2014) describes the climate at the Perth Airport (Station 009021) as:

- average rainfall is 771.6 mm pa, with the majority falling between May and August
- average maximum temperature ranges from 17.9 °C in winter to 31.9 °C in summer, with the highest recorded maximum being 46.7 °C
- average minimum temperatures range from 8.0 °C in winter to 17.5 °C in summer, with the lowest recorded minimum being -1.3 °C
- predominant wind directions include morning easterlies followed by westerly sea breezes during summer months when the risk of fire is greatest. The average wind speed is 23.8 km/h with gusts of more than 100 km/h possible, particularly during storm events.

4.3 Soils

Soils typically have a close association with vegetation present at a particular site, with four recognised as being at the site. Three soils are associated with the Spearwood Dune System and one with the Bassendean Dune System. All are characterised by deep sandy soils. The soil types are described in Table 1 and shown in Figure 3.

Table 1: Soil type descriptions

| Soil Type | Name | Description |
|------------------|---------------------|---|
| 211Sp_S1b | Spearwood S1b Phase | Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15% |
| 211Sp-S2a | Spearwood S2a Phase | Lower slopes (1 – 5%) of dune ridge with moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils and minor limestone outcrop |
| 211Sp-S3 | Spearwood S3 Phase | Inter-dunal swales and depressions with gently inclined side slopes and deep rapidly drained siliceous yellow-brown sands |
| 212Bs-B2 | Bassendean B2 Phase | Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B-horizon or a weak iron-organic hardpan at 1 – 2 m |

Source: SLIP NRM Portal, 2014

4.4 Topography

The site has a variable topography due to its previous use as a quarry with heights ranging from 6.62 m AHD in excavated areas to 38 m AHD within Lot 21 (Figure 4). The quarry pit includes shallow depressions and soil stockpiles with variable heights. Earthworks will be required at the site to enable development and the construction of urban residential buildings. Preliminary earthworks design indicates that the finished levels will be consistent with the natural surface level across the site.

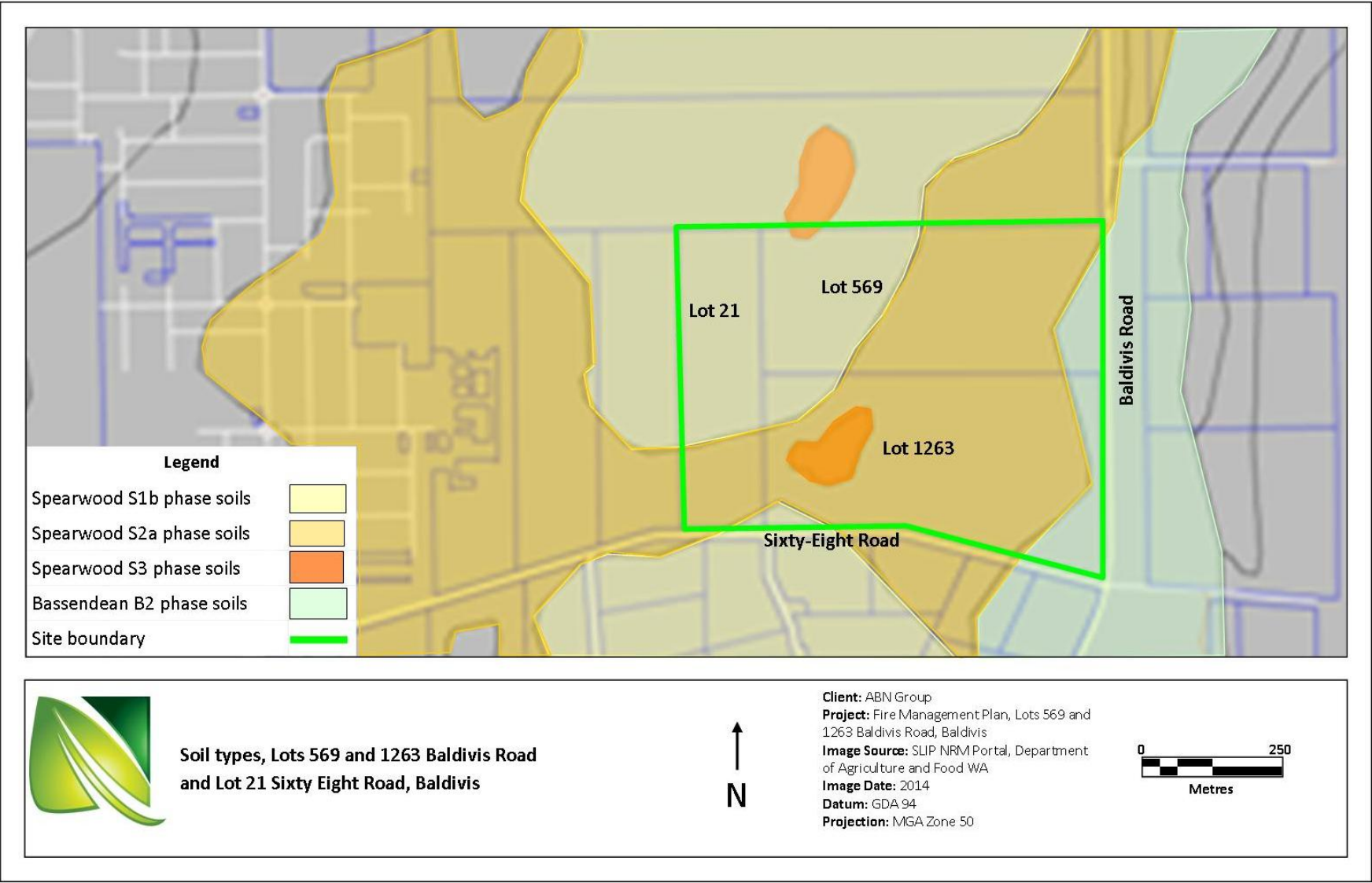


Figure 3: Soils types, Lots 569 and 1263 Balddivis Road and Lot 21 Sixty Eight Road, Balddivis

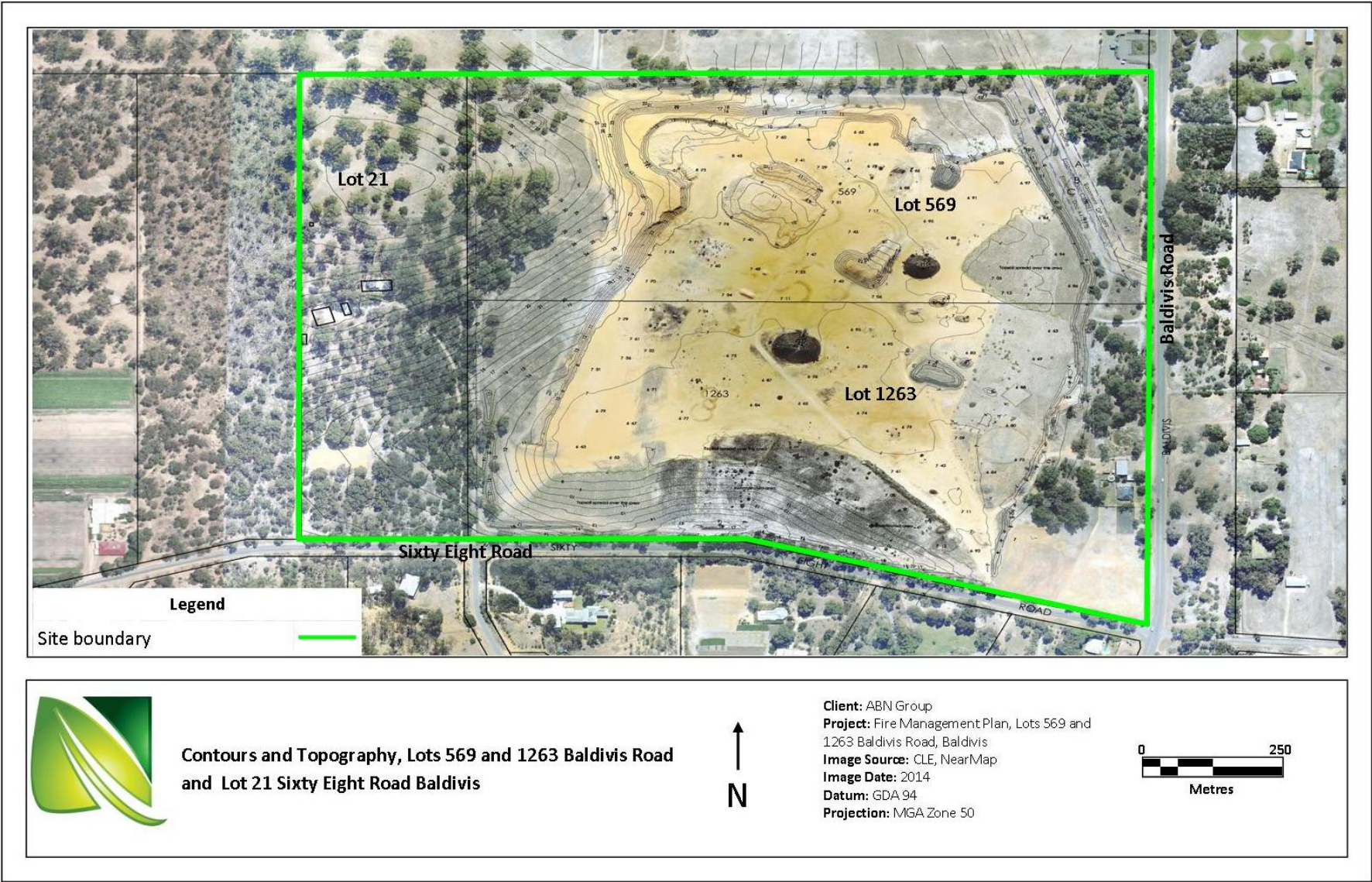


Figure 4: Contours and Topography, Lots 569 and 1263 Baldvis Road and Lot 21 Sixty Eight Road Baldvis

4.5 Vegetation

The amount and type of vegetation and flora present at a site directly contributes to the risks associated with fire, its spread, and impacts on property, the environment and people. Much of Lots 569 and 1263 are clear of native vegetation due to previous quarrying activities. Lot 21 is vegetated with a Jarrah – Banksia Woodland, with a middle storey of shrubs and a grassy understorey (Figure 5). Surrounding lots are either cleared or contain similar vegetation as Lot 21. Road verges contain remnant Jarrah and Banksia trees (Figure 6).



Figure 5: Vegetation within Lot 21.



Figure 6: Jarrah and Banksia within the road reserve

4.5.1 Offsite Vegetation

Vegetation off site also needs to be considered due to the potential for fire spread into or out of these areas, as conditions allow. The major vegetated areas outside of the development will be Lot 20 to the west, and existing vegetation on private property to the north, east and south. Some vegetation is also present within the road reserves for both Sixty Eight Road and Baldivis Road (Figure 1). Lot 20 is owned by a developer and will be cleared at some future stage for residential housing. The property to the north is also owned by a developer, with a subdivision application expecting approval in the near future. When that approval is granted, much of the vegetation on site is expected to be cleared during development activities. In time, the bushfire risk associated with each of these locations will be reduced.

4.6 Existing Land Use and Assets

Lots 569 and 1263 Baldivis Road and Lot 21 Sixty Eight Road is owned by the ABN Group. A house occupied by a caretaker and associated outbuildings are located on the eastern boundary of Lot 1263, and will be demolished to make way for the proposed development. No other assets exist within the subject site.

Lot 20 to the west is uncleared, and housing and a range of outbuildings are present on lots to the east and south. Property immediately to the north of the site is largely cleared with some remnant scattered trees.

4.7 Water Supply

As the subdivision proceeds, the site will be connected to scheme water with fire hydrants required approximately every 200 m within the built up area. Clearance on the placement of hydrants will be required from the Department of Fire and Emergency Services (DFES) and the Water Corporation. Hydrants will need to be clearly identifiable, with markings installed by the developer prior to sign off. Hydrants will be marked via the following:

- a blue 'cats eye' reflective indicator to the left of the centre line of the road
- a small blue 'H' painted on the curbing
- a white and red stripe around the power pole nearest to the hydrant.

Note that contractors or others carrying out building or other works at the site must not cover hydrants and/or the markings indicating their location. In the event activities occur that do result in hydrants or markings being covered, damaged, or removed, it will be the responsibility of the relevant contractor to rectify the situation.

4.8 Access

At present, access to the site is available in the form of tracks and driveways. Lot 21 is accessible from a sandy track that acts as a firebreak along the boundary of Lots 1263 and 569. Driveways from Baldivis Road provide access to Lots 1263 and 569.

As the development progresses, access will be formalised through the creation of roads within the development (Figure 11). The current design of the development site indicates two entry roads from both Baldivis Road and Sixty Eight Road, ensuring access throughout the site. During construction, existing tracks and driveways will provide two access points. Where this is not possible, additional temporary tracks will be constructed to ensure there will always be two access points available.

5.0 Fire Problem

In order to identify the potential fire risks and mitigation strategies, it is necessary to describe the fire problem associated with the site. The assessment takes into consideration the:

- type and classification of vegetation present at the site
- distance between the dominant vegetation classification and the walls of existing or proposed buildings across from the classified vegetation
- the topography and slope of the land between proposed buildings and the classified vegetation
- land use.

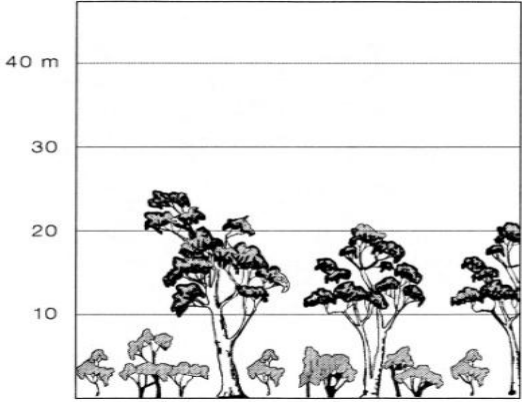
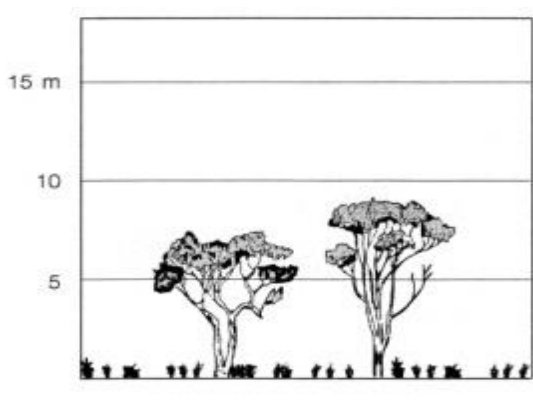


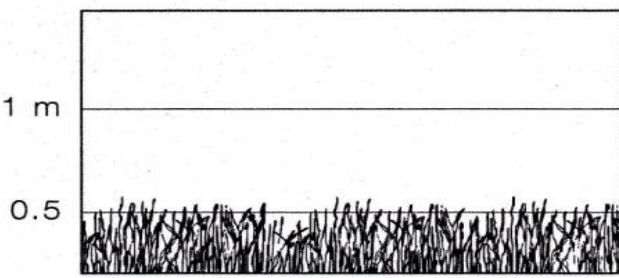
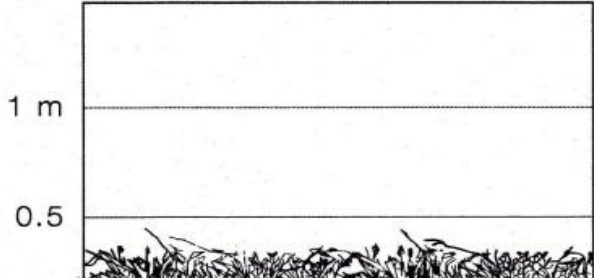


Vegetation at the site was classified according to the descriptions provided in AS 3959 – 2009, and includes the following four vegetation types:

- Type B Woodland – woodland (B5), trees 10 – 30 m high, 10 – 30% foliage cover, understorey or low trees to tall shrubs
- Type B Woodland – low woodland (B7), low trees and shrubs 2 – 10 m high, < 10% foliage cover, with a grassy understorey or low shrubs
- Type G Grassland – closed tussock grassland (G22), all forms of grassland including situations with shrubs and trees if the foliage cover is less than 10%
- Type G Grassland – dense sown pasture (G25), as for G22

Table 2 provides descriptions of each vegetation type, with the location of each shown in Figure 7.

The greatest fire threat is primarily from human access combined with the woodland areas and weedy understorey. A fire in these areas has the potential to create areas of higher flames that could result in ember attack to neighbouring land and built-up areas. Note also that summer weather conditions also contribute to the fire threat through mid-level disturbances bringing unstable atmospheric conditions from the north or north-west that result in thunderstorms and the potential for lightning strike as a fire ignition source.

Table 2: Vegetation types

| Woodland (B-5) | Low Woodland (B-7) |
|---|--|
|  |  |
|  |  |
| Closed Tussock Grassland (G-21) | Dense Sown Pasture (G-25) |
|  |  |
|  |  |

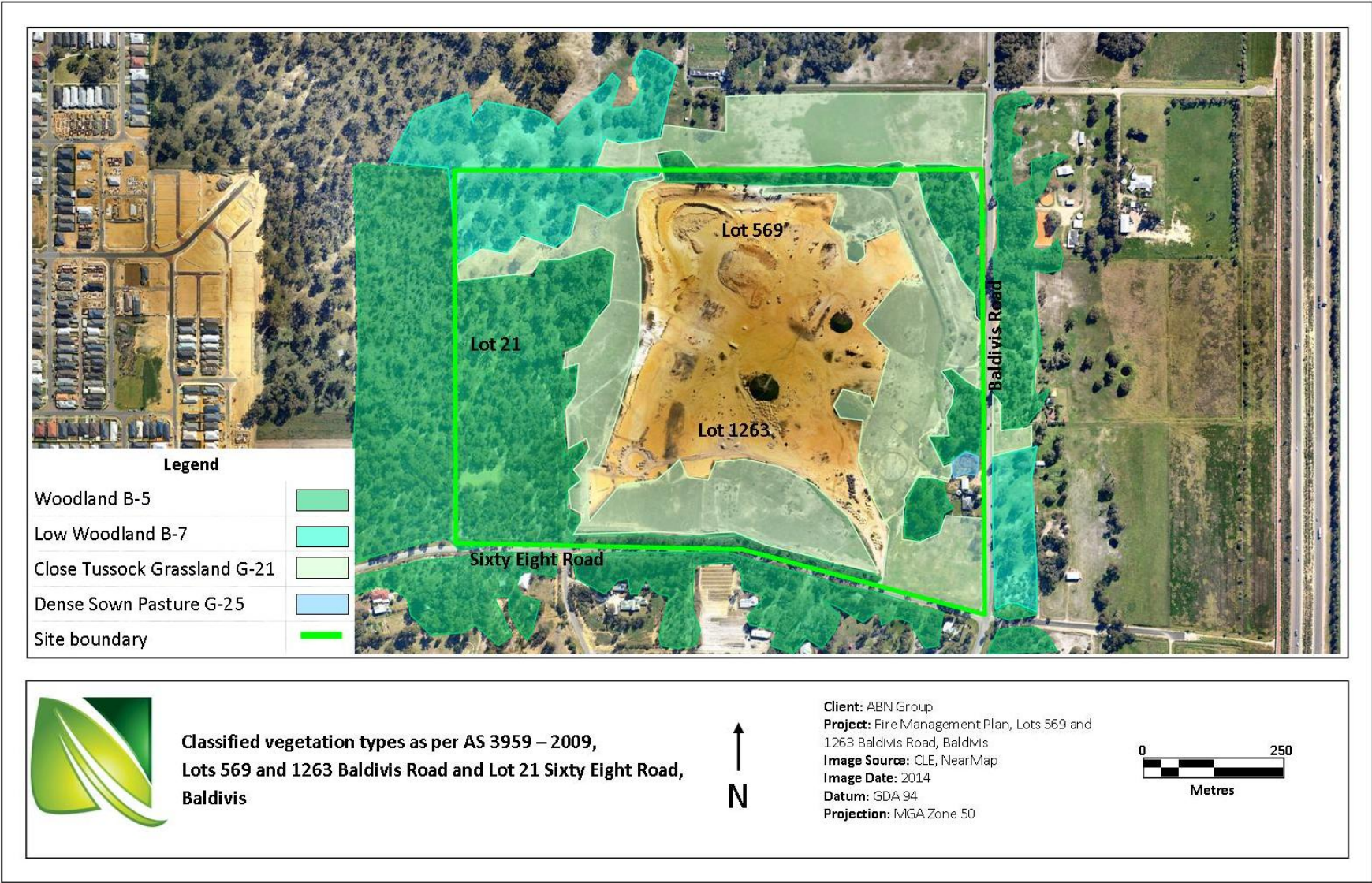


Figure 7: Classified vegetation types as per AS 3959 – 2009, Lots 569 and 1263 Balddivis Road and Lot 21 Sixty Eight Road, Balddivis

5.1 Fire History

Landgate imagery for August 2011 shows signs that a fire may have occurred in the northern portion of Lot 21 during between March and August 2011; the timing suggests this was a controlled burn. There are reports of fire at a location on Sixty Eight Road in 2009, but it was not possible to determine the actual site or its proximity to the subject site.

5.2 Bushfire Risk

Risk relates to the likelihood of a negative or detrimental consequence arising out the interaction between hazards, community and the environment. The Planning for Bush Fire Protection Guidelines (Western Australian Planning Commission, Department of Planning, and Fire and Emergency Services Authority, 2010, Edition 2), describes three hazard levels relating to bush fire risks. These are:

- **Low** – primarily areas of no standing native vegetation, pasture or cropping areas with limited vegetation or suburban areas with maintained gardens and < 0.25 ha of standing vegetation
- **Moderate** – open woodlands and shrublands, low shrubs with slopes < 10° or flat land, suburban areas with some native tree cover, pasture or cropped areas with slopes > 10°
- **Extreme** – forests, woodlands and/or tall shrubs.

The nature of the vegetation in and around Lots 21 Sixty Eight Road and Lots 569 and 1263 Baldivis Road mean that all three hazard ratings are applicable. These areas are consistent with the fire prone rated areas determined by the City of Rockingham (Figure 2). Figure 8 shows the pre-development hazard rating based on the current site characteristics. As development at the site proceeds, the hazard rating within the site will decrease (Figure 9). It is expected to decrease further when clearing occurs in Lot 20 to the west and the partially vegetated lot to the north.

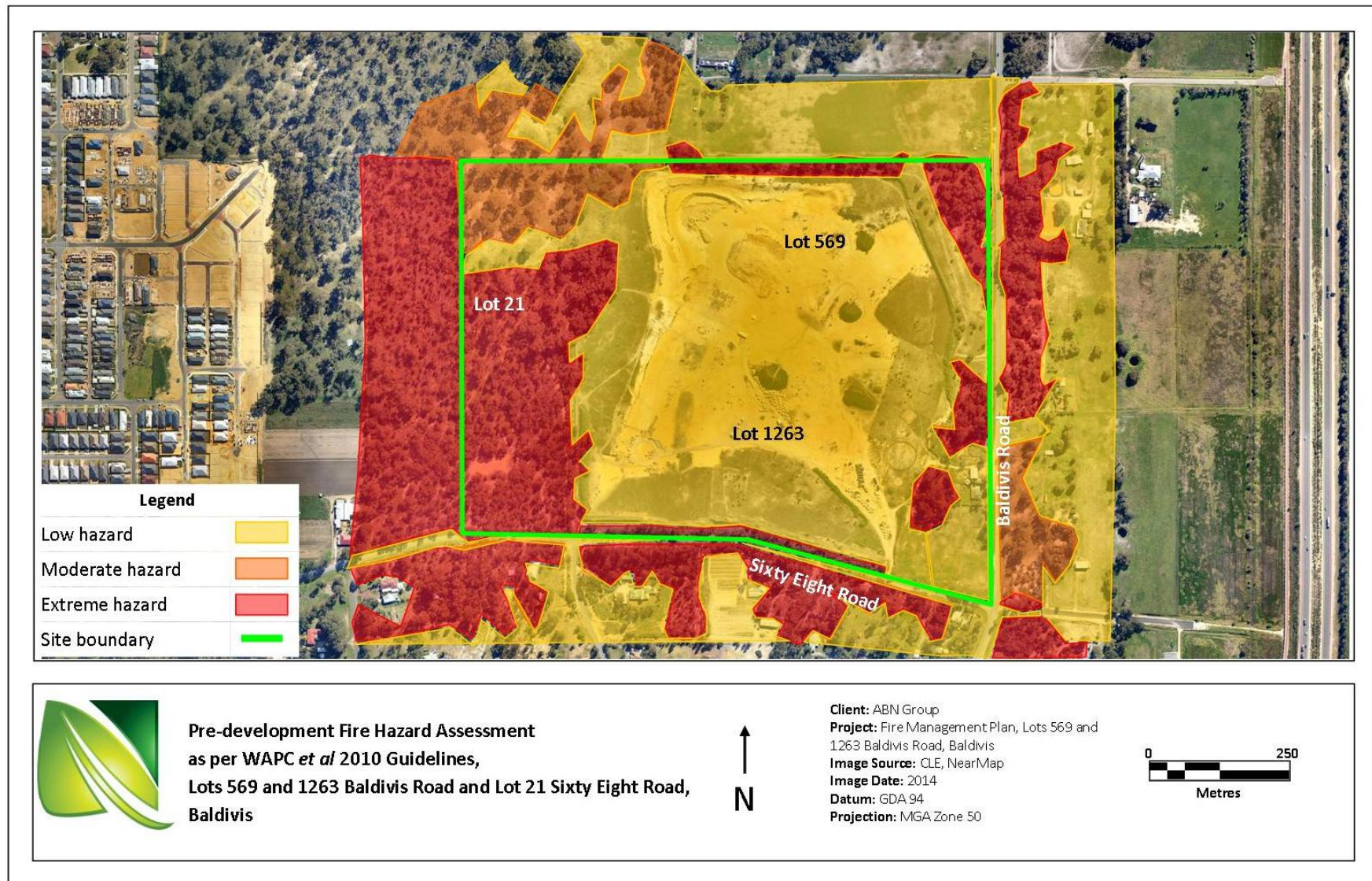


Figure 8: Pre-development Fire Hazard Assessment as per WAPC et al 2010 Guidelines, Lots 569 and 1263 Baldvis Road and Lot 21 Sixty Eight Road, Baldvis

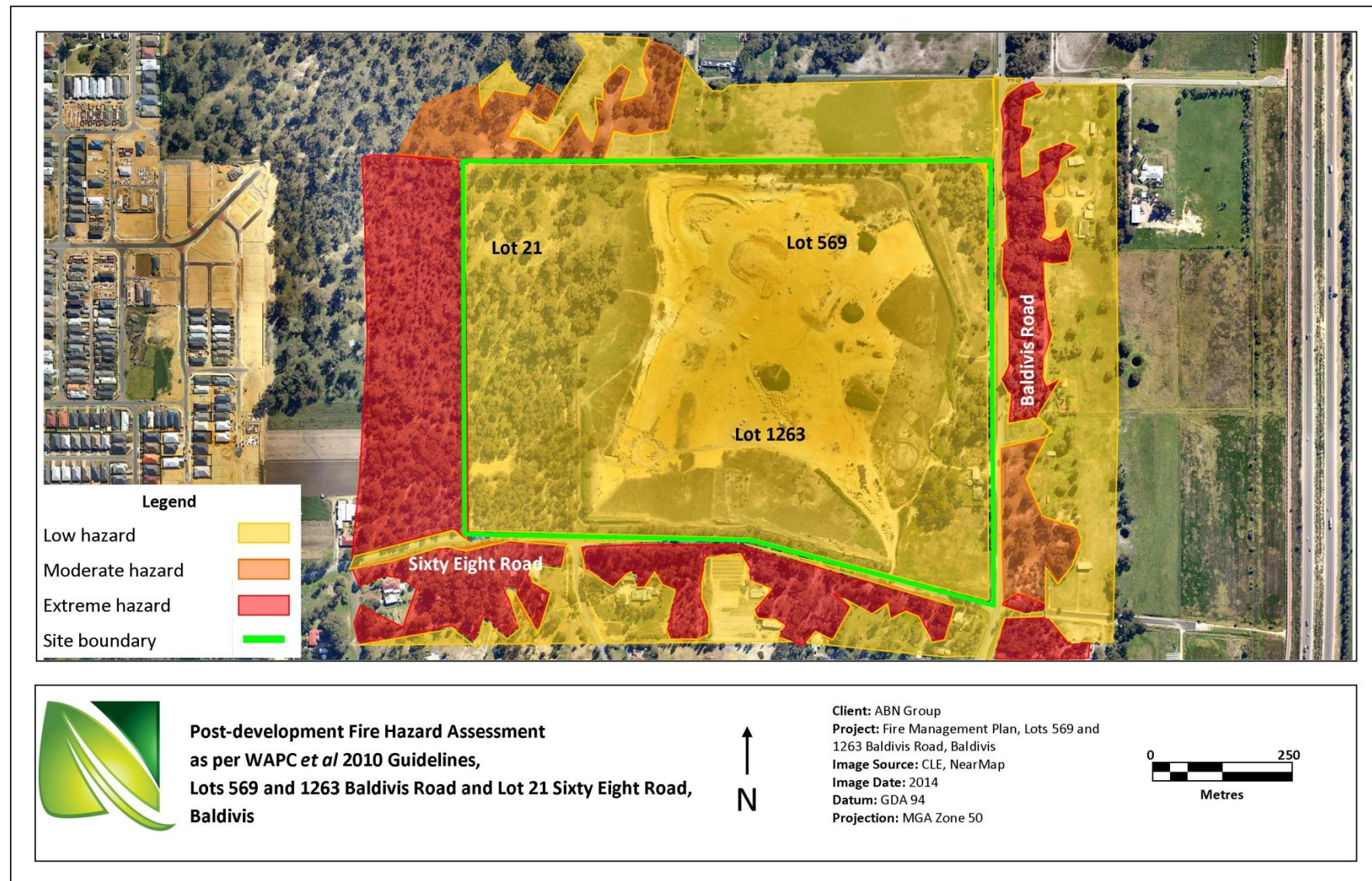


Figure 9: Post-development Fire Hazard Assessment as per WAPC *et al* 2010 Guidelines, Lots 569 and 1263 Balddivis Road and Lot 21 Sixty Eight Road, Balddivis

5.3 Bushfire Hazard

Bushfire hazard assessments provide a qualitative measure of intensity of fire and likely threat of fire to the site and surrounding areas. The assessment of fire risk takes into account existing site conditions including:

- topography, in particular, the slope or gradient of the land
- vegetation cover and associated fuel loads
- relationship to surrounding development.

The steepness of a landscape influences the combustion rate of vegetation, with fire typically accelerating uphill and decelerating when travelling downhill. The speed of a fire front doubles with every 10° increase in slope, thus a fire on a 20° slope would be expected to advance four times faster than on flat ground (Australian Government, 2013). Using assessment criteria published in the 2nd edition of *Planning for Bush Fire Protection Guidelines* (WAPC *et al*, 2010) the pre-development hazard is considered to be extreme across Lot 21, portions of Lots 569 and 1263, and areas of bushland on neighbouring properties due to the presence of Type B woodland vegetation (Figure 7). Areas where the vegetation has less canopy connectivity have been assigned a moderate hazard rating, with all other areas assigned a low hazard rating.

Knowing the vegetation type, the distance to the vegetation, and the slope of the land under the classified vegetation, the bushfire attack level (BAL) for housing within the vicinity of bushland areas can be determined.

5.4 Average Slope

According to AS 3959 – 2009 and the *Planning for Bush Fire Protection Guidelines* (WAPC *et al*, 2010), the slope refers to the slope under the classified vegetation in relation to buildings, and can be presented in degrees, approximate slope ratios and percentages. These documents also indicate that all classified vegetation that is upslope will assume a value of 0° or flat land, as fires travel slower down a hill. The slope has been determined using the rise over run method, or dividing the difference in height between two points (rise) by the run (horizontal distance). The result can then be used to express the slope as a percentage when multiplied by 100, or the slope angle expressed in degrees when taking the arctangent of the rise/run ratio. In relation to the subject site, all results indicate the average slope is either upslope or flat land, i.e.: 0° (see below for justification).

Overall, the subject land slopes gently towards the north-west corner, rising from an average height of 10 m AHD in the east to a maximum height of 38 m in the north-western portion of Lot 21 (Figure 10). A minimum of 4 m of soil was removed from the site during quarrying activities, with the lowest point on the site being 6.2 m AHD. Accordingly, vegetation to the west and north of Lots 21 and 569 is considered to be upslope or flat land from a fire management perspective. Land to the north, east and south is also considered to be upslope or flat land. Extensive fill works will be required to provide a stable, flat surface for the construction of buildings in the future. In particular, this assessment has not considered the slope associated with the quarry on Lots 569 and 1263 as this will be filled as part of the civil construction process when development at the site commences. Fill is expected to result in levels consistent with the natural surface of the site, with some reduction in height in Lot 21.

A review of contour lines (Figure 10) indicates that on average, the following occurs in relation to the slope under the classified vegetation which occurs offsite to the north, east, south and west:

- in the eastern portion of Lots 1263 and 569 towards Baldivis Road, the direction of contours is directly to the north and south, thus the slope is 0° or flat land
- the land slopes very gently to the east, resulting in an average slope of 0.0°, thus is flat land
- in the south-western portion of Lot 1263, the land rises from 10 m AHD to 16 m AHD towards the southern side of Sixty Eight Road, after which it drops back to 10 m AHD; thus this area is upslope and considered to be flat land
- contours in the southern portion of Lot 21 are either directly north-south or reveal a gentle rise to the south, thus the site is upslope or flat land
- contours in the east – west direction from Lot 21 towards Lot 20 (west) are also linear, indicating the site is 0° or flat land
- the 38 m AHD high point in the north west will be subjected to civil engineering works, with the expected level to be consistent with the rest of the site, thus the gradient will also be consistent with other portions of the site.

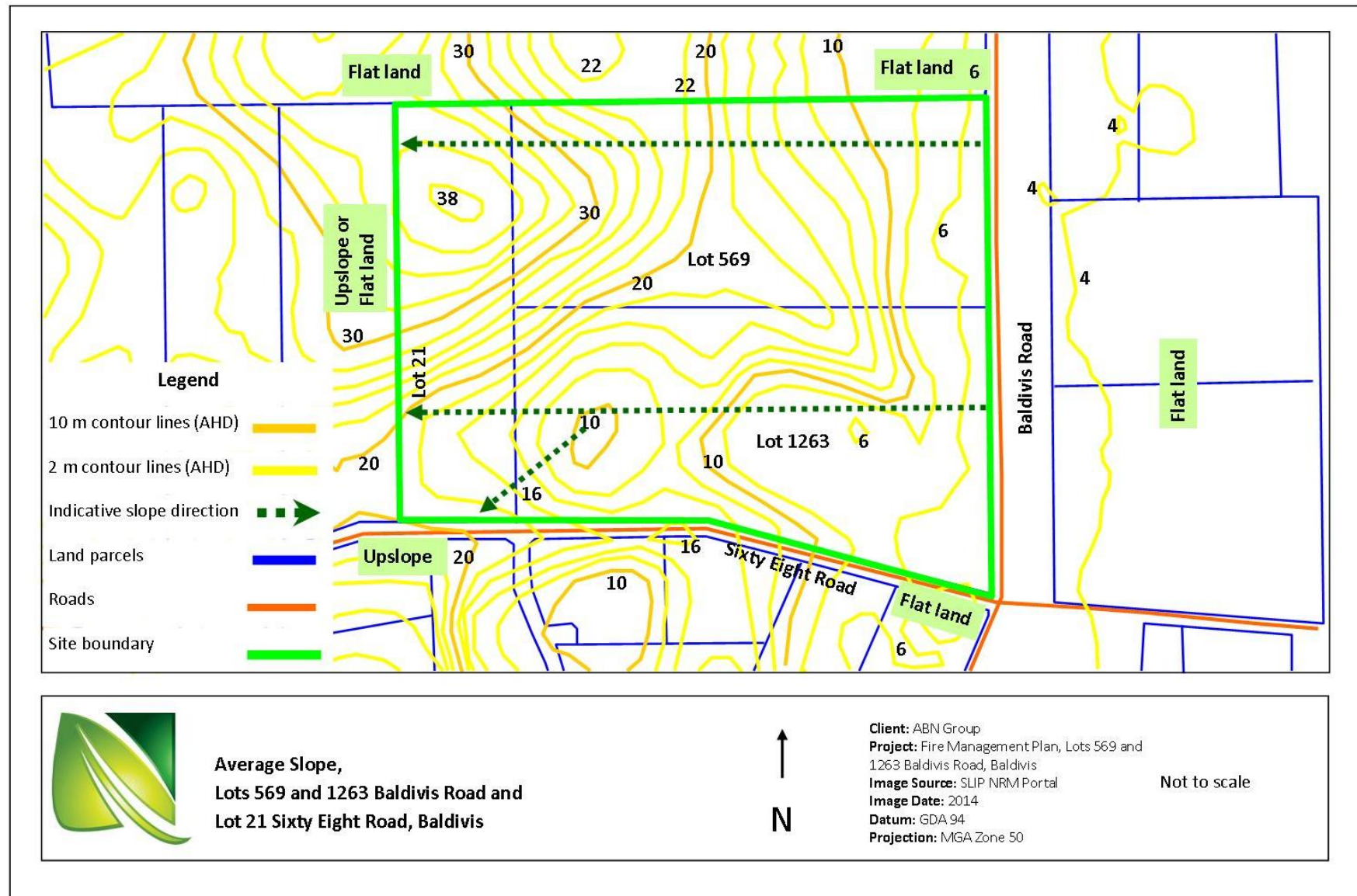


Figure 10: Slope assessment, Lots 569 and 1263 Balddivis Road and Lot 21 Sixty Eight Road, Balddivis

5.5 Bushfire Attack Level (BAL)

The Bushfire Attack Level is the measurement of the severity of a building's exposure to ember attack, radiant heat (heat flux), direct flame contact, and is measured in kilowatts per metre squared (kW/m²). In simple terms, it can be described as an assessment of the risk of damage to a building from bushfire from embers, radiant heat (heat flux), larger debris and flames. Table 3 describes the six risk levels used and their relationship to a particular BAL rating. The assignment of a BAL rating to Lots within a subdivision is an acceptable solution to achieve an adequate hazard separation with the aim of providing an increased level of protection against bushfire attack. Increased protection comes through increased construction standards and the setting of minimum distance requirements between building walls and vegetation in accordance with Australian Standard AS 3959 - 2009. Note that the assigning of a BAL rating does not guarantee the protection of homes from fire impacts; rather, it decreases the likelihood of impacts.

Table 3: BAL description – AS 3959 – 2009

| BAL rating | Risk Level | Description | Applicable AS 3959 – 2009 Sections |
|------------|------------|--|------------------------------------|
| Low | Very low | Insufficient risk to warrant any specific construction requirements but there is still some risk | 4 |
| 12.5 | Low | <ul style="list-style-type: none"> risk of ember attack exposure to radiant heat | 3 and 5 |
| 19 | Moderate | <ul style="list-style-type: none"> risk of ember attack burning debris ignited by wind embers likelihood of exposure to radiant heat | 3 and 6 |
| 29 | High | <ul style="list-style-type: none"> increased risk of ember attack increased risk of burning debris ignited by windborne embers likelihood of exposure to a high level of radiant heat | 3 and 7 |
| 40 | Very high | <ul style="list-style-type: none"> increased risk of ember attack increased risk of burning debris ignited by windborne embers likelihood of exposure to a high level of radiant heat some likelihood of direct exposure to flames | 3 and 8 |
| FZ | Extreme | <ul style="list-style-type: none"> extremely high risk of ember attack extremely high risk of burning debris ignited by windborne embers likelihood of exposure to an extreme level of radiant heat likelihood of exposure to flames from the fire front | 3 and 9 |

A BAL-low requires no additional building construction requirements and is the preferred rating, and applies to all Lots 100 m or more from classified vegetation. For those Lots within 100 m of classified vegetation rated as being bushfire prone, a BAL rating of 12.5 or higher will apply according to the vegetation type, slope and distance. Construction criteria specified for the various BAL ratings is provided in Section 6.1.4.1. For those Lots at Sixty Eight Road and Baldivis Road, up to three BAL ratings will apply, namely BAL low, BAL 12.5 and either BAL 19 or BAL 29, depending on final subdivision design. Minimum distances between

building walls and vegetation for each BAL rating and slope class are calculated from the edge of the classified vegetation to building walls, and which acts as a building separation zone with a low fire fuel load. Strategies that assist with implementing a hazard separation include the following:

- strategic firebreaks
- road reserves
- clearing and landscaping
- minimum set back distances from property boundaries to building walls.

The above have been considered when determining BAL ratings for Lots 569 and 1263 Baldivis Road and Lot 21 Sixty Eight Road, noting that ratings apply to an entire Lot, not a part thereof. Minimum distances for the vegetation type and gradient for the site are provided in Table 4; these ratings assume that the expected fill requirements are applied to relevant portions of the site.

Table 4: Minimum distance (metres) to vegetation for BAL ratings – B5 and B7 Woodland

| BAL | Distance to Classified Vegetation (m) | Slope |
|------|---------------------------------------|----------------------|
| 12.5 | 29 – <100 | Upslope or flat land |
| 19 | 20 – <29 | Upslope or flat land |
| 29 | 14 – <20 | Upslope or flat land |

5.6 BAL Assessment

The BAL assessment for all Lots on the site within 100 m of classified vegetation takes into consideration the following:

- current subdivision layout proposed in the local structure plan
- projected fill requirements required to provide an even surface to build on
- recommended clearing and landscaping designed with fire mitigation strategies in mind
- location of vegetation to be retained within public open space (POS) areas.

Figure 11 shows the locations of those portions of the site within 100 m of classified vegetation, minimum distances from classified vegetation according to vegetation type, along with an indication of BAL ratings that will be applied. Setback distances have been measured from the edge of the vegetated areas, as described in Elements 4.1 and 4.2 of the Planning for Bush Fire Protection Guidelines (West Australian Planning Commission, Department of Planning and the Fire and Emergency Services Authority, 2010, 2nd Edition), and Section 2.2.4 of AS 3959 – 2009. All distances were measured using a GIS program, which allows measurement with a greater precision than is available in other software programs. Further refinement of the BAL-rated areas will occur at the subdivision design stage, when the actual Lot layout is known.

The local structure plan has used the existing road reserves for both Baldivis Road and Sixty Eight Road as one means of separating the future development from classified vegetation to the east and south, respectively. In addition, internal access roads have been provided to further increase the distance to vegetation, and where they cannot be provided, the Lots will be created with adequate depth or width to ensure appropriate setback distances can be achieved. These requirements will be outlined in Detailed Area Plans (DAPs).

5.6.1 Lots Adjacent to Sixty Eight Road

The current width of Sixty Eight Road will increase in accordance with the local structure plan by 2.2 m to the north during the development process to allow the extension of services, and will necessitate the removal of trees currently within the road reserve. This will mean that the minimum setback distance will be measured from the edge of vegetation on the southern side of Sixty Eight Road, and will include the 22.2 m wide road reserve. Figures 11 and 12 indicate that some Lots will abut directly onto Sixty Eight Road, while others will have the additional width of an internal road. Those immediately adjacent to Sixty Eight Road will have either a BAL-29 or BAL-19 rating, with the actual dependent on final distance to classified vegetation and lot layout, and will be determined during subdivision design stage. All other Lots within 100 m of the classified vegetation will have a BAL-12.5 rating. A limestone masonry wall will be constructed as a means of improving the aesthetic values of the subdivision and reduce traffic noise, with construction specifications provided in Figure 13.

5.6.2 Lots Adjacent to Baldivis Road

A density-housing site is planned for the north-east corner of the site immediately adjacent to Baldivis Road (Figures 11 and 12). The distance from the classified vegetation indicates that those Lots backing onto Baldivis Road are expected to have either a BAL-29 or BAL-19 rating, with the actual dependent on final distance to vegetation and the lot layout. The design brief for the density-housing site will include the requirement to consider fire through positioning of the buildings, hardstand parking and low fuel landscaping to ensure appropriate separation distances will be achieved.

All other Lots within 100 m of the classified vegetation will have a BAL-12.5 rating. Vegetation currently within the western portion of the road reserve will be removed to allow the location of services, meaning that minimum required setback distances will be measured from classified vegetation on the eastern side of the road. A limestone masonry wall will be constructed as a means of improving the aesthetic values of the subdivision and reduce traffic noise (Figure 13).

5.6.3 Lots Along Northern and Western Boundaries

Preliminary designs for the development site indicate a row of lots will be constructed along the Lot 20 – 21 boundary, along with a number along the northern border in the north-west corner of the site, as shown in Figures 11 and 12. As vegetation currently exists to the west in Lot 20 and to the north of the site, minimum setback distances cannot be achieved within the relevant Lot boundaries. These lots will not be created until development occurs to the north and west, and the vegetation from those sites removed. In the short term, a 100 m hazard separation zone will be created and maintained by the developer on the site, meaning there will be no Lots within 100 m of classified vegetation and thus no BAL-rating will be applied.

5.6.4 Masonry Wall

A masonry wall will be constructed around the perimeter of the development location. This wall will be 1.8 m high, and constructed of limestone blocks some 300+ mm wide. While the purpose of the wall is for aesthetic reasons, it will also act to reduce noise and provide an added layer of protection against fire (as described in Section A4.5 in Element 4: Siting of Development (p 43 of Planning for Bush Fire Protection Guidelines, Western Australian Planning Commission, Department of Planning and the Fire and Emergency Services Authority, Edition 2, 2010).

5.6.5 Public Open Space

Areas of public open space that will be provided in the development will be landscaped and vegetated in a manner that ensures a low bushfire hazard level.

5.6.6 Future High School

The site for the future high school has not been assigned a BAL rating, as appropriate building construction requirements for public buildings are detailed in the Building Code of Australia. In the event that the proposed land use changes, a review of the site in terms of BAL rating(s) will be required.



**BAL rated areas (all),
Lots 569 and 1263 Baldvis Road and
Lot 21 Sixty Eight Road, Baldvis**



Client: ABN Group
Project: Fire Management Plan, Lots 569 and 1263 Baldvis Road, Baldvis
Image Source: CLE
Image Date: 2014
Datum: GDA 94
Projection: MGA Zone 50

Not to scale

Figure 11: BAL rated areas, Lots 569 and 1263 Baldvis Road and Lot 21 Sixty Eight Road, Baldvis

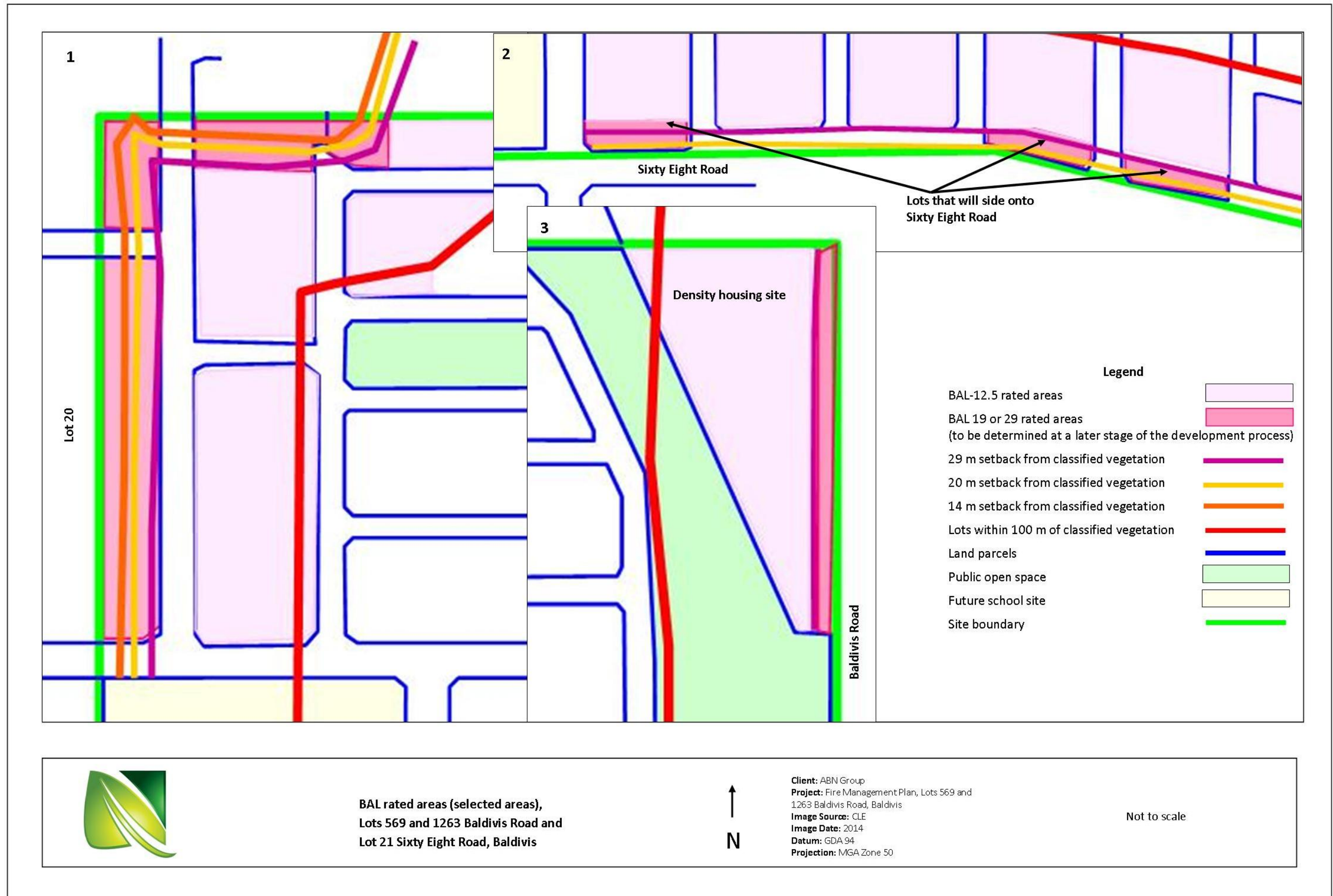
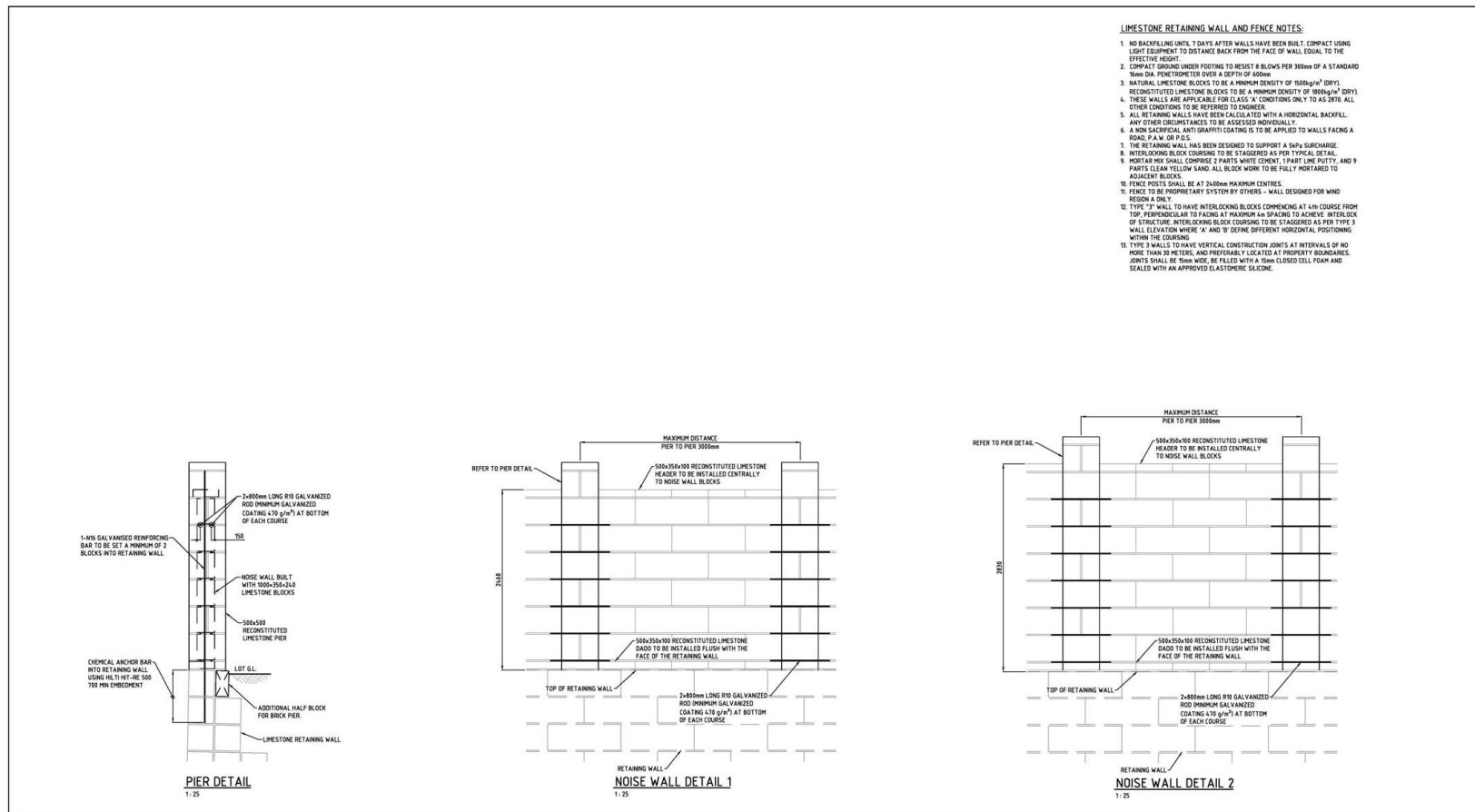


Figure 12: BAL rated areas (selected areas), Lots 569 and 1263 Baldvis Road and Lot 21 Sixty Eight Road, Baldvis



Limestone masonry wall construction requirements,
Lots 569 and 1263 Baldvis Road and
Lot 21 Sixty Eight Road, Baldvis

Client: ABN Group
Project: Fire Management Plan, Lots 569 and
1263 Baldvis Road, Baldvis
Image Source: Pritchard Francis
Image Date: 2014

Figure 13: Limestone masonry wall construction requirements, Lots 569 and 1263 Baldvis Road and Lot 21 Sixty Eight Road, Baldvis

6.0 Fire Protection Elements and Performance Criteria

The *Planning for Bushfire Protection Guidelines* prepared by the Western Australian Planning Commission, Department of Planning, Fire and Emergency Services Authority (Edition 2, 2010) describe the objectives and underpinning principles for bushfire protection in subdivisions. The objectives of the guidelines are to:

- identify areas where bushfire risks to people and property are significant and determine the hazard level applying to those areas
- avoid increased risk to people and property through the appropriate consideration of the fire risk during the subdivision design process
- ensure the subdivision considers the appropriate fire protection requirements and includes the fire protection measures specified in risk areas.

The principles underpinning the guidelines are:

- bushfire hazards must be considered throughout the planning process to ensure the risk to people and property is reduced
- local government authorities need to broadly identify bushfire hazard levels within their local planning strategies and schemes
- development within locations with an extreme bushfire hazard or attack level between BAL-40 and BAL-FZ should be avoided unless appropriate fire protection strategies can be implemented to the satisfaction of the WAPC, DFES and/or the local government authority
- areas with an extreme bushfire hazard where more intensive development is planned and considered to be unavoidable, permanent hazard reduction measures must be implemented to the satisfaction of the WAPC, DFES and/or the local government authority
- structure plans in areas with a moderate or extreme bushfire hazard levels must be supported by an assessment of the bushfire risk and compliance with the performance criteria and acceptable solutions.

As development proceeds, all sites within 100 m of bushland areas will need to meet the criteria associated with an extreme bushfire hazard rating through the adoption of performance criteria and acceptable solutions as described in the bushfire protection guidelines. However, the site will also need to be managed during the staging of development activities. Both situations will be described in this section.

6.1 Fire Protection – Subdivision

6.1.1 Element 1: Location

The majority of the proposed development at Lots 569 and 1263 Baldivis Road and Lot 21 Sixty Eight Road in Baldivis is in an area where the bushfire hazard level is manageable. Distance from classified vegetation will mean a maximum either a BAL-19 or BAL-29 rating on selected Lots, with the majority being allocated a BAL-12.5 rating. Those projected Lots along the western and northern boundary where minimum separation distances cannot be achieved immediately will be developed at a future stage, when Lot 20 and the northern development proceeds and vegetation is cleared.

6.1.2 Element 2: Vehicular Access

The intent of the guidelines is to ensure that vehicular access within a subdivision is safe at all times in the event of a bushfire, both for residents and responders. The internal layout of roads and fire access ways will allow this (Figure 11). The following performance criteria solutions can be demonstrated within the proposed subdivision:

- two or more vehicular access routes are available to residents that connect to the public road network, along both Baldivis Road and Sixty Eight Road, as described in Section 4.8 of this plan
- public roads will meet the minimum requirements summarised in Table 5
- no cul-de-sacs or battleaxe blocks are planned
- no private driveways will be more than 50 m from a public road
- all lots will be urban lots
- in the short term, vegetation along the western and northern boundaries will be cleared to act as a firebreak/low fuel zone between offsite vegetation and the development.

Table 5: Vehicle access standards to assist with bushfire protection

| Standard | Public Roads |
|------------------------------|--------------------------------------|
| Minimum trafficable surface | 6 metres |
| Horizontal clearance | 6 metres |
| Vertical clearance | 4 metres |
| Maximum grade | 1 in 8 |
| Maximum grade over <50 m | 1 in 5 |
| Maximum average grade | 1 in 7 |
| Minimum weight capacity | 15 tonnes |
| Maximum crossfall | 1 in 33 |
| Curves minimum inner radius | 12 metres |
| Turning head | Not required, no cul-de-sacs planned |
| Signage | Not required |
| Gates (vehicle access gates) | Not required |
| Personnel entry gates | Not required |
| Design and construction | Approved by City of Rockingham |
| Turn around areas | Not required |

6.1.2.1 Strategic Firebreak/Low Fuel Zone

A strategic firebreak/low fuel zone will be constructed along the western and northern boundaries in the vicinity of offsite classified vegetation. This area will act as a low fuel zone between the vegetation and other Lots within the development site as construction proceeds.

6.1.2.2 Fuel Load and Reduction

The presence of potential fuel, particularly dry vegetation, weeds and rubbish, contributes to the frequency and intensity of fires that might occur at a given location. Where possible, it is recommended that the fire fuel load is maintained below 8 tonnes per hectare to reduce the potential for fire spread. Weed control measures, such as chemical control and/or slashing of long grass to a maximum height of 50 mm (5 cm) is required in areas where understorey species are largely absent.

6.1.3 Element 3: Water

The intent of the guidelines is to ensure that water is available within the subdivision to assist with defending life and property in the event of a bushfire. All houses within the subdivision will be connected to the Water Corporation's reticulated drinking water supply network. Hydrants are required approximately every 200 m within the residential portion of the subdivision, with the design complying with the Water Corporation Design Standard 63.

The developer will install a series of markings to indicate the presence of hydrants, namely:

- a blue 'cats eye' reflective indicator to the left of the centre line of the road
- a small blue 'H' painted on the curbing
- a white and red stripe around the power pole nearest to the hydrant.

Clearance on the placement of hydrants will be required from DFES and the Water Corporation. Hydrants will need to be clearly identifiable, with markings installed by the developer prior to sign off.

Note that hydrants and/or their location markers must not be covered by contractors or others whilst carrying out works (e.g.: building construction) at the site. In the event activities occur that result in their being covered over, or markings covered, damaged, or removed, the responsibility for rectifying the situation will rest with the contractor concerned.

6.1.4 Element 4: Siting of Development

The intent of the guidelines is to ensure that the siting of the development minimises the level of bush fire impact.

6.1.4.1 Hazard Separation – Moderate to Extreme Hazard Levels

The aim of the guidelines is to ensure that the siting of the development minimises the level of bush fire impact on property in higher risk areas. For buildings within fire prone areas, a hazard separation zone of at least 100 m between vegetation and building walls that includes a 20 m building protection zone is preferred (Figure 14). Where that is not possible, Appendix 2 of the Planning for Bush Fire Protection Guidelines (WAPC et al, 2010) indicates in notes to P4 under Element 4: Siting of development that the minimum distance of 100 m (hazard separation zone) and 20 m (building protection zone) set out in A4.1 and A4.2 can be reduced when the requirements of AS 3959-2009 Construction of Buildings in Bushfire Prone Areas are applied as an acceptable solution. This will be the case for buildings proposed within the vicinity of the vegetated areas around the proposed development at Lots 1263 and 569 Baldvis Road and Lot 21 Sixty Eight Road. Both the Standard and the Guidelines provide the minimum acceptable setback distances from classified vegetation based on the average slope and vegetation type and the required BAL-rating for the nominated distance.

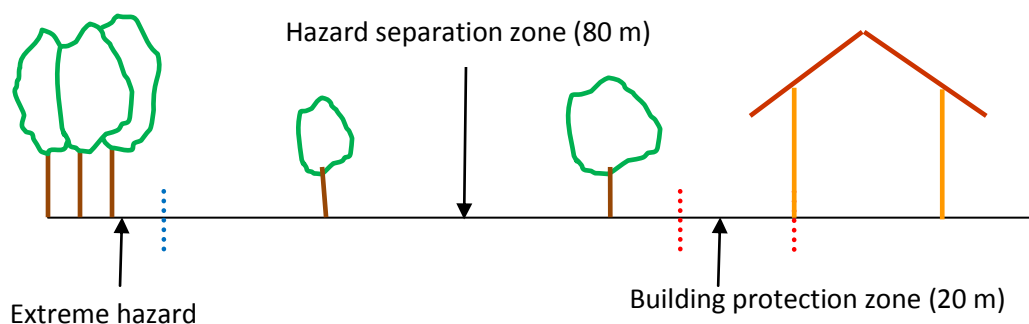


Figure 14: Ideal hazard separation zone between vegetation and buildings

6.1.4.2 Hazard Separation – Low Bush Fire Hazard Level

All other Lots that are not subject to a reduced hazard separation and/or building protection zone will comply with the minimum 20 m building protection zone.

6.1.4.3 Building Protection Zone

The aim of the building protection zone is to reduce the immediate threat to buildings and other infrastructure from radiant heat, direct flame contact and ember attack, as well as acting to provide a defensible space (Figures 14 and 15).

The proposed subdivision of Lots 569 and 1263 Baldivis Road and Lot 21 Sixty Eight Road in Baldivis has been designed to provide appropriate hazard separation and building protection zones that either meet the ideal situation (Figure 14) or a reduced hazard separation and/or building protection zone as described in the Planning for Bush fire Protection Guidelines (WAPC et al, 2010) between the offsite vegetation and building walls in nominated Lots (Figure 15). Those Lots planned for the perimeter of Lot 21 in the west and north will not be developed until Lot 20 and the northern development proceeds, and vegetation in those locations is cleared.

For all Lots located within 100 m of classified vegetation, BAL-ratings will apply as a reduction in the hazard separation and building protection zones will occur. The actual BAL-rating will be determined in accordance with the Planning for Bush Fire Protection Guidelines (WAPC et al, 2010) and Amendment 2 of AS 3959 – 2009 (February, 2011) and is dependent on the distance from the edge of the classified vegetation and building walls. Figures 11 and 12 show projected locations of BAL-rated areas, assuming a maximum of BAL-29 reducing to BAL-12.5 as distance from the edge of the vegetation increases to 100 m. When the actual lot configuration is known, the hazard separation and building protection zones will be reassessed to ensure a minimum building protection zone is provided. It is expected that building protection and hazard separation zones are likely to include:

- a road reserve that will include paved road surface, kerbing, and pedestrian access ways
- a minimum nominated setback distance from the Lot boundary to building wall
- additional distance to vegetation, as specified by AS 3959 – 2009.

The building protection zone for the Lots assigned a BAL rating will range in distance from a minimum of 14 m from the edge of classified vegetation to a maximum of 29 m from building walls, based on the B-type vegetation present at the site (Figures 11, 12 and 15). Within this area,

- fuel loads will be reduced and maintained at no more than 2 tonnes per hectare
- tree crowns will be a minimum of 10 m apart
- lower branches of trees/shrubs are trimmed so as to reduce the potential of ignition from ground fires
- trees and shrubs will not be planted in clumps, kept to a height of less than 2 m and be a minimum of 2 m away from buildings without any overhang by crowns
- have no dead material within the crown or the bole
- fences and sheds will be constructed from non-combustible material, such as colourbond, brick or limestone.

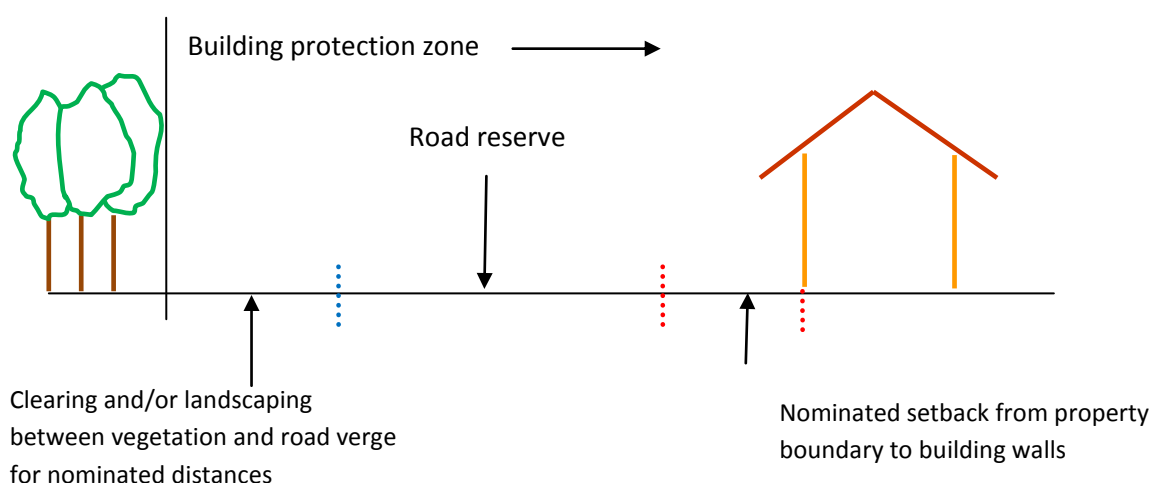


Figure 15: Reduced Hazard Separation Zone and Building Protection Zone in accordance with AS 3959 - 2009

The actual number of Lots that will be assigned a BAL rating will be determined when the Lot configuration is finalised, and this Bushfire Management Plan will be updated to reflect the updated assessment. Any Lot more than 100 m from offsite classified vegetation will not require a BAL rating (Figures 11, 12, 15). Those Lots requiring construction that meets building requirements detailed in AS 3959 – 2009 Construction of Buildings in Bushfire Prone Areas (Standards Australia, 2009) could expect to add a minimum of 4 – 10% additional costs for housing, with the actual depending on the assigned BAL, materials chosen and the builder engaged to carry out the work. Potential owners of these Lots will be advised that there are additional building requirements to be met during the sales process. The relevant construction standards detailed in AS 3959 – 2009 are provided in Table 6, meaning that buildings will need to comply with relevant sections of the Standard, such as Sections 3 and 5 or Sections 3 and 7.

Table 6: Construction Level vs Bushfire Attack Level

| BAL | AS 3959 – 2009 Construction level |
|------|--------------------------------------|
| Low | None specified |
| 12.5 | Sections 3 and 5 |
| 19 | Sections 3 and 6 |
| 29 | Sections 3 and 7 |
| 40 | Sections 3 and 8 |
| FZ | Sections 3 and 9 |



Increasing requirements and associated construction costs

(Source: AS 3959 – 2009)

The relevant construction standards detail the requirements for:

- subfloor supports
- floors
- external walls
- external doors, windows and other glazed elements
- roofs, including those of verandas, garages, and carports
- verandas, decks, steps, ramps and landings
- water and gas supply pipes.

It should be noted that AS 3959 – 2009 indicates that construction requirements for the next lower BAL than that determined for a particular site may be applied where a particular elevation on a building is not exposed to the source of the bushfire attack because other portions of the building act as shielding (Figure 16). Thus, for buildings located in an area determined to be BAL 29, for example, walls not immediately facing the fire threat can be constructed in accordance with BAL 19. Note that no lessening of construction standards can occur in areas assessed as BAL 12.5.

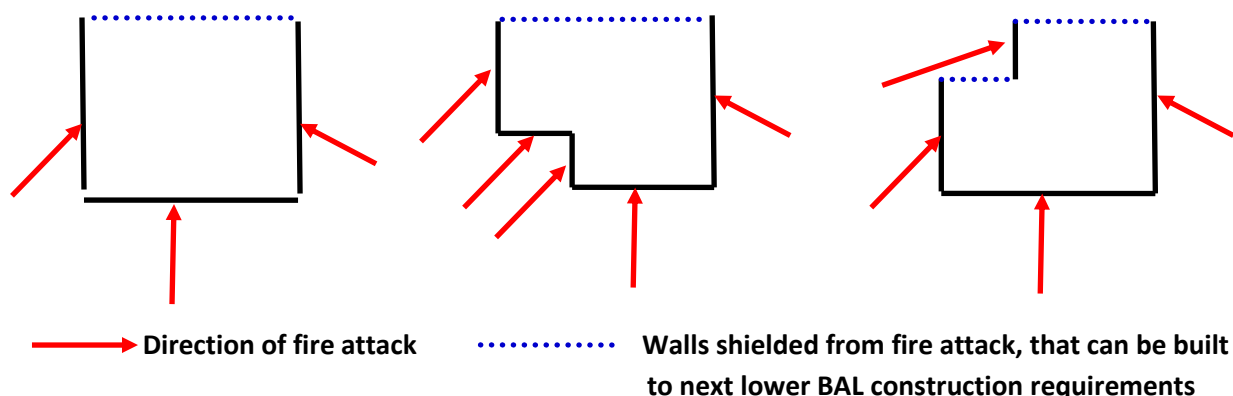


Figure 16: Shielding and BAL rating

6.1.4.4 Hazard Separation Zone

Sections 6.1.4.1 – 6.1.4.3 demonstrates that hazard separation requirements outlined in Section A4.4 of the Planning for Bush Fire Protection Guidelines (WAPC *et al*, 2010) can be met (Figures 11, 12, 14 and 15).

6.1.4.5 Education

Housing in close proximity to the vegetated areas will always be subject to some risk from the effects of a fire, particularly smoke, radiant embers and potentially spot fires. It is recommended that Lot owners within 1 km of the vegetation, particularly those where a BAL rating has been determined, are made aware of the potential risks from fire and what to do in the event a fire is noticed, such as:

- informing DFES as soon as a fire is noticed
- if installed, turning off evaporative air conditioners, or if possible to do so, continue running water through the unit with the fan turned off
- if evaporative air conditioners haven't been used prior to smoke being detected, it is advisable to wet the filter pads with a garden hose or run the unit to wet the filter pads, then turn it off when smoke appears overhead
- ensuring accessibility is maintained to enable easy movement of emergency vehicles.

It is also recommended that they are supplied with a copy of the current edition of the FESA publication 'Survive – The Home Owner's Bush Fire Survival Manual' (2008). This information can be provided along with other information during sale negotiations with purchasers and material provided by the City to residents on a regular basis. This guide is also available on the DFES website.

6.1.5 Element 5: Design of Development

Except for the areas identified as being in proximity to classified vegetation (Figures 11 and 12) that have been assigned a BAL rating, the design of the development complies with Element 4: Siting of Development. The non-compliant areas will be constructed in accordance with the requirements of AS 3959 – 2009.

6.1.6 Assessment of Fire Management Strategies

The risk assessment process is composed of three key stages that are used as the basis of determining the level of risk associated with various activities, in this case, the potential of damage to property and people in the event of fire within the proposed subdivision, with particular attention on the vegetated areas to the east. The stages involved with the risk assessment process include:

- risk identification - identify and document the potential risks and impacts associated with the occurrence of fire at the site
- qualitatively ranking potential environmental impacts to establish relative significance
- establishing and documenting control measures to mitigate against potentially significant impacts.

Risk ranking is generally undertaken by assigning numeric likelihood and consequence levels to each identified risk issue. A risk matrix (Table 9) is presented based on the likelihood and consequence criteria outlined in Tables 7 and 8. Once the level of risk has been determined, risks can be prioritised. For all significant risks, control strategies are established to ensure that the adequate controls are implemented.

Table 7: Risk Assessment Likelihood Descriptor

| Level | Likelihood | Description |
|-------|----------------|---|
| 1 | Rare | Very unlikely / may occur only in exceptional circumstances |
| 2 | Unlikely | Known to have occurred at some time |
| 3 | Probable | The event will probably occur, or has occurred under some conditions |
| 4 | Likely | The event is expected to occur under some conditions or has occurred more than once in recent years |
| 5 | Almost certain | The event is a common or frequent occurrence |

Table 8: Risk Assessment Consequence Classification

| Level | Consequence | Description |
|-------|---------------|--|
| 1 | Insignificant | Confined to immediate area, rapid clean-up, no damage to housing, or people |
| 2 | Minimal | Confined to isolated area, rapid clean-up, minimal damage, minor injuries |
| 3 | Moderate | Impact confined to the boundaries of the site or other vegetated area, clean-up may require external assistance, moderate damage and/or injury |
| 4 | Major | Major damage, significant but non-life-threatening injury, impacts within 1 km of site or vegetated area boundary, considerable clean-up using range of resources. |
| 5 | Catastrophic | Severe damage, loss of life, extensive clean-up and recovery period, requires ongoing operators and external resources |

Table 9: Risk Assessment Matrix

| | | Consequence | | | | |
|------------|----------------|---------------|-------|----------|-------|--------------|
| | | 1 | 2 | 3 | 4 | 5 |
| Likelihood | | Insignificant | Minor | Moderate | Major | Catastrophic |
| 5 | Almost certain | 5 | 10 | 15 | 20 | 25 |
| 4 | Likely | 4 | 8 | 12 | 16 | 20 |
| 3 | Moderate | 3 | 6 | 9 | 12 | 15 |
| 2 | Unlikely | 2 | 4 | 6 | 8 | 10 |
| 1 | Rare | 1 | 2 | 3 | 4 | 5 |

- Extreme risk; immediate action required
- High risk; senior management attention needed
- Moderate risk; management responsibility must be specified
- Low risk; manage by routine procedures

The nature of the site, the proximity of the area to offsite vegetation means that the strategies described in this Plan represent the best available options to reduce the risks associated with bushfire. Rapid response to fires within the vegetated areas will remain a key measure that will assist with limiting the spread of fire to houses within the site boundary. While the proximity of housing in streets immediately adjacent to vegetated areas will mean a moderate potential for spot fires, transportation of embers and smoke during

fires, education of the community will contribute to the effectiveness of response measures. Table 10 documents the outcomes of the risk assessment process and potential management strategies.

Table 10: Risks and Management Strategies

| Issue | Potential Impact | Raw Risk | | | Management Strategies | Residual risk | | |
|---|---|------------|-------------|------------|---|---------------|-------------|------------|
| | | Likelihood | Consequence | Risk Level | | Likelihood | Consequence | Risk Level |
| Offsite vegetation on Lot 20 and in northern development | | | | | | | | |
| Required minimum separation distances from offsite vegetation to west and north | <ul style="list-style-type: none">Proposed blocks within Lot 21 in BAL-40 or BAL-FZ | 5 | 4 | E | <ul style="list-style-type: none">Blocks will not be developed until development in Lot 20 to the west and the northern development have been approved and vegetation is cleared100m hazard separation zone will be maintained during development stagingVegetation within the west and northern portion of Lot 21 will be cleared to act as a strategic firebreak/low fuel zone between offsite vegetation and the development | 2 | 2 | L |
| Quarry | | | | | | | | |
| Steep slope associated with quarry | <ul style="list-style-type: none">Difficulty for vehicle and personnel access in the event of a fire, and associated spread of the fire | 3 | 3 | M | <ul style="list-style-type: none">Filling of the quarry with the surface to be consistent with the natural surface level | 2 | 2 | L |
| Risk of ember attack on surrounding buildings | <ul style="list-style-type: none">Spot fires in and around subdivision or neighbouring areas | 3 | 3 | M | <ul style="list-style-type: none">Information provided to potential property purchasers, including the provision of relevant DFES publications, BMP and similarRequirement for evaporative air conditioners on properties within 100 m of vegetated areas to be shieldedApplication of additional construction requirements as described in AS 3959 in appropriate locationsSignificant areas of higher vegetation will be cleared, filled and landscaped during | 3 | 2 | M |

| Issue | Potential Impact | Raw Risk | | | Management Strategies | Residual risk | | |
|---------------------------------|---|------------|-------------|------------|--|---------------|-------------|------------|
| | | Likelihood | Consequence | Risk Level | | Likelihood | Consequence | Risk Level |
| | | | | | development, leaving low herbaceous material with reduced potential of ember movement <ul style="list-style-type: none"> Application of AS 3959 – 2009 detailing minimum distances from vegetation to nominated building Lots | | | |
| Other offsite vegetation | | | | | | | | |
| Presence of offsite vegetation | <ul style="list-style-type: none"> Fire occurring offsite in vegetation to the east and south and spreading onto development site Larger and more persistent embers from woody vegetation, with greater potential for movement within the air | 2 | 3 | M | <ul style="list-style-type: none"> Assessment of vegetation within 100 m of site boundary Limited potential for fire from offsite vegetation to the east and south Application of AS 3959 construction standards where appropriate Installation of masonry wall along Baldivis Road and Sixty Eight Road that enhance fire management measures | 2 | 2 | L |

6.2 Fire Protection – Subdivision Staging

While the Bushfire Management Plan has the aim of ensuring the proposed development is designed with due consideration to the potential for ignition of fires and their spread, the Developer also needs to ensure the protection of property and the environment during the various stages of construction. Each stage will incorporate a series of fire protection requirements until the subdivision is completed, including:

- the clearing of a 100 m temporary hazard separation zone will be created around each subsequent stage of the development as per Section 6.1.4.1
- the retaining of the temporary hazard separation zone in the ownership of the developer and maintained in accordance with requirements detailed in Section 6.1.4.1
- the construction of a strategic firebreak of the same standard described in Section 6.1.2.4 along the western and northern boundaries in the vicinity of the offsite vegetation
- vegetation within the hazard separation zone is to be slashed and maintained below 50 mm and contain no overhanging branches.

6.3 Implementation

Implementation of this Plan will commence immediately and will be the responsibility of the Developer, ABN Group, until such time as relevant portions of the site are formerly handed over to the City of Rockingham or the new owners of the Lots. The installation of vehicle access points and similar in the vicinity of the area of vegetation to be retained will occur at an appropriate stage of the development process, as they are dependent on final design, environmental approvals processes, engineering and drainage requirements, and similar. When installed, maintenance of any fencing, gates and access points will be the responsibility of the developer until handover to the City, at which time ongoing maintenance requirements will need to be incorporated into annual budgetary processes. Activities that will be involved with the implementation of this plan are described in Table 11.

Table 11: Implementation Schedule

| Activity | Responsibility | Maintenance | Responsibility |
|--|----------------|---|--|
| Ensuring bushfire protection of land and property during the various stages of the development, as detailed in this fire management plan | Developer | Checking and maintaining firebreaks, low fuel zones and other protection mechanisms during staging activities on an ongoing basis | Developer |
| Install and maintain of strategic firebreak/low fuel zone to west and north adjacent to areas of offsite vegetation | Developer | Checking of firebreaks and base on regular basis, in accordance with City requirements | Developer until hand over of POS areas to City of Rockingham (CoR) |
| Assessing fire fuel loading in areas of on site vegetation during various stages of the development | Developer | Annually | Developer until hand over of POS areas to CoR |
| Undertake slashing of long grass | Developer | Annual, prior to summer, in | Developer, until |

| Activity | Responsibility | Maintenance | Responsibility |
|--|---|--|--|
| to 50 mm and other weed control to reduce fuel load | | accordance with information issued to ratepayers by the City of Rockingham | sale of individual lots or hand over of POS areas to the CoR |
| Assess fire management implications of proposed landscaping/revegetation plans | Developer | As required, during landscaping design phase | Developer |
| Education | Developer and City of Rockingham | Updating materials and information to reflect current policies, plans, knowledge, or accepted practice | Developer – during sale process City – during normal administrative activities to residents and rate payers |
| BMP review | Developer in consultation with City of Rockingham | Ensure continued suitability of BMP by reviewing contents in conjunction with current site conditions | Developer |

6.4 Plan Review

This Bushfire Management Plan has been developed based on current conditions at the site, but recognises that changes can occur over time and may be subject to review based on detailed design processes. It is recommended that this plan be also be reviewed in the event any of the following occur:

- a fire occurs within the site boundary or a neighbouring property that spreads to the site
- during detailed design phases, particularly once lot layout is finalised, and expected fill levels change, resulting in altered slopes (both upward and downward slopes)
- any landscaping activities are likely to result in areas of classified vegetation greater than 0.25 ha (as defined by AS 3959-2009)
- if any vegetation to be retained on site is altered, and will or is likely to result in an area of classified vegetation greater than 0.25 ha
- on finalisation of the development when the landscape protection area and POS areas are handed over to the City of Rockingham.

7.0 Summary

As development within Lots 569 and 1263 Baldivis Road and Lot 21 Sixty Eight Road proceeds, a number of current fire management risks will be reduced through the clearing of vegetation on site. However the vegetation in and around offsite vegetation will remain as having the most significant fire risk, particularly vegetation to the west in Lot 20 and to the north. The clearing of vegetation within the development site to create a strategic firebreak/low fuel zone in this area is a key strategy aimed at minimising risks from fire in vegetated areas that occur offsite.

Areas of the development that will be subject to increased construction standards as detailed in AS 3959 – 2009 due to the assigning of a BAL rating has been provided, with the actual rating and number of lots affected to be determined when the lot layout has been finalised. The majority of Lots within 100 m of classified vegetation will be allocated a BAL-12.5 rating, with a small number of BAL-29 or BAL-19 rated Lots.

7.1 Requirement

After considering the available information known about the site, the following is required:

- Lots in proximity to classified vegetation that cannot meet the minimum 100 m requirement will have a BAL rating applied or developed at a later stage
- strategic firebreak/access ways around the area of vegetation to be retained on Lot 20 and Lots to the north
- prospective property purchasers be advised of the building requirements associated with construction within bush fire prone areas (refer Figures 11 and 12)
- prospective property purchasers are made aware that in the event of a large bushfire occurring, fire appliances may not be available for every dwelling
- grassed and weedy areas be kept to a minimum, with slashing to 50 mm occurring prior to summer each year
- where required, firebreaks to be maintained in accordance with City of Rockingham requirements
- ensure any required rehabilitation/landscaping plans are also considered in terms of a fire management perspective.

7.2 Responsibilities

Responsibilities for bushfire preparedness and response within the development area are shared by the City of Rockingham, the Developer, DFES, and building owners.

7.2.1 Developer Responsibilities

The Developer is responsible for implementing key portions of this Bushfire Management Plan, including:

- reviewing bushfire hazards and risks associated with the landscape protection areas during the subdivision design process, and ensuring the risks are as low as required to meet the requirements of this BMP and AS 3959 - 2009
- implementing requirements associated with installation and maintenance of appropriate personnel and vehicle access points, and turning and passing areas, around the perimeter of the area of vegetation to be retained in compliance with the WAPC, DoP and DFES guidelines at an appropriate stage of the development process

- installation and maintenance of the strategic firebreak/low fuel zone to the west and north
- maintaining any firebreak areas or similar in accordance with City of Rockingham requirements and guidelines until the land is no longer the responsibility of the developer, such as when the POS area is ceded to the City of Rockingham for ongoing management
- providing appropriate information, including a copy of this Bushfire Management Plan, to potential purchasers and owners of lots within the development that have a BAL of 12.5 or greater to inform them of the bushfire risks and minimum building construction requirements
- arrange for the Section 70A notification on the titles of lots subject to the requirements of this Bushfire Management Plan.

7.2.2 City of Rockingham Responsibilities

It should be noted that the City of Rockingham has the responsibility and powers under the Town Planning Scheme and the *Bush Fires Act 1954* to ensure that this Bushfire Management Plan, City of Rockingham Fire Control notice and any Special orders issued under the *Bush Fires Act 1954* are complied with.

The City of Rockingham will be responsible for:

- maintaining District Fire Fighting Facilities
- maintaining any City equipment and apparatus for fire fighting purposes in good condition
- providing appropriate advice in relation to City requirements for firebreaks, hazard reduction, and similar to the Developer and property owners as required
- ensuring appropriate information is included on titles of lots with a BAL of 12.5 or greater.

7.2.3 DFES Responsibilities

DFES will be responsible for:

- maintaining fire fighting equipment in good condition and repair
- responding to fires within vegetated areas within Lot 9237 in a timely manner in an effort to minimise the spread of fire and damage to nearby housing from ember attack.

7.2.4 Owner Responsibilities

It is the responsibility of individual property owners building houses near the vegetated areas to:

- include ember shields to evaporative air conditioners
- inform DFES as soon as practicable after a fire is noticed within bushland within the subdivision boundary
- respond to advice from the City of Rockingham, DFES, or the Developer in relation to maintaining properties in a manner that will reduce potential damage from ember attack.

8.0 References

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http://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/BushfireManualsandGuides/FESA_Bushfire-Homeowners_Survival_Manual.pdf.

Geoscience Australia. (2013). *What Causes Bushfires*. Retrieved from
<http://www.ga.gov.au/hazards/bushfire/bushfire-basics/causes.html>.

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http://www.dec.wa.gov.au/pdf/science/bio_audit/swan_coastal_plain02_p606-623.pdf, accessed June 2012.

Western Australian Planning Commission, Department of Planning and Fire and Emergency Services Authority. (2010). *Planning for Bushfire Protection Guidelines* (Edition 2). Government of Western Australia. Perth. Western Australia.

Appendix 1 Glossary

| | |
|--------------------------|---|
| AHD | Australian Height Datum |
| AS | Australian Standard |
| BAL | Bushfire Attack Level |
| Building protection zone | Low fuel area immediately surrounding buildings (20 m wide) |
| °C | Degrees Celsius |
| CoK | City of Rockingham |
| DFES | Department of Fire and Emergency Services (previously FESA) |
| DoP | Department of Planning |
| FESA | Fire and Emergency Services Authority (now DFES) |
| BMP | Bushfire Management Plan |
| FZ | Fire zone, or area where property or similar is under threat from flames |
| ha | Hectare |
| Hazard separation zone | area around buildings, including outbuildings, that has a reduced fire fuel loading as a means of reducing potential damage from bushfire, ideally 100 m from buildings to vegetation |
| km | Kilometres |
| kmh | Kilometres per hour |
| m | Metres |
| mm | Millimetres |
| pa | Per annum |
| WAPC | Western Australian Planning Commission |

Appendix 2 Compliance Criteria for Performance Criteria and Acceptable Solutions

| Element | | Compliance | | | | | | Report Section(s) | Response (if required) |
|--|--|--|---|----|---|-----|---|-------------------|---|
| | | If 'no' to any element or sub-element, explain in writing how the proposal satisfactorily complies with the performance criterion P1 for this area of non-compliance and provide with this checklist | | | | | | | |
| Compliance with Element 1: Location | | | | | | | | | |
| <i>The subdivision/development is located in an area where the bush fire hazard is manageable</i> | | | | | | | | | |
| A1.1 | The subdivision/development is located on land that is not subject to either an extreme bush fire hazard land classification or requires construction standards to BAL-40 for BAL-FZ | Yes | | No | ✓ | N/A | | 4.4, 4.5, 5.1 | Construction standards as per AS 3959 – 2009 will apply to nominated locations within the subdivision |
| Compliance with Element 2: Vehicular access | | | | | | | | | |
| <i>The internal layout design and construction of public and private vehicular access in the subdivision/development allows emergency and other vehicles to move through it easily and safely at all times</i> | | | | | | | | | |
| A2.1 | Two access routes – two different vehicular access routes, both of which connect to the public road network, are available to all residents/the public at all times | Yes | ✓ | No | | N/A | | 6.1.2 | |
| A2.2 | Public roads must meet minimum requirements | Yes | ✓ | No | | N/A | | 6.1.2 | |
| A2.3 | Cul-de-Sacs must meet minimum requirements | Yes | | No | | N/A | ✓ | 6.1.2 | No cul-de-sacs planned |
| A2.4 | Battle axes must meet minimum requirements | Yes | | No | | N/A | ✓ | 6.1.2 | No battle-axe blocks planned |
| A2.5 | Private driveways must meet minimum requirements | Yes | | No | | N/A | ✓ | 6.1.2 | No private driveways expected |
| A2.6 | Emergency access ways must meet minimum requirements | Yes | | No | | N/A | ✓ | 6.1.2 | Access will be via gazetted roads within subdivision |
| A2.7 | Fire service access routes must meet minimum requirements | Yes | | No | | N/A | ✓ | 6.1.2 | Access will be via gazetted roads within subdivision |
| A2.8 | Gates must meet minimum requirements | Yes | ✓ | No | | N/A | | 6.1.2 | Comply with City of Rockingham (CoR) requirements |
| A2.9 | Firebreak widths must meet minimum requirements | Yes | ✓ | No | | N/A | | 6.1.2 | Comply with CoR requirements |
| A2.10 | Signs must meet minimum requirements | Yes | | No | | N/A | ✓ | 6.1.2 | |

Compliance with Element 3: Water

The development is provided with a permanent and secure water supply that is sufficient for fire fighting purposes

| | | | | | | | | | |
|-------------|---|-----|---|----|--|-----|---|-------|--|
| A3.1 | Reticulated areas – the development is provided with a reticulated water supply, with fire hydrants in accordance with the specifications of the relevant water supply authority and FESA | Yes | ✓ | No | | N/A | | 6.1.3 | |
| A3.2 | Non reticulated areas – water tanks with a hydrant or standpipe are provided and meet minimum requirements | Yes | | No | | N/A | ✓ | | |
| A3.3 | A dam or dams with permanent water all year is provided and meets minimum requirements | Yes | | No | | N/A | ✓ | | |

Compliance with Element 4: Siting of Development

The siting (including paths and landscaping) of the development minimises the bush fire risk to life and property

| | | | | | | | | | |
|-------------|---|-----|---|----|--|-----|--|---------------------------|--|
| A4.1 | Hazard separation – moderate to extreme - Every building is sited a minimum of 100 m from any classified vegetation or has its construction standard increased to align with the appropriate bush fire attack level for that location as per AS3959 | Yes | ✓ | No | | N/A | | 5.5, 6.1.1, 6.1.4.1 6.1.5 | Construction standards as per AS 3959 – 2009 will apply to nominated areas |
| A4.2 | Hazard separation – low bush fire hazard level – every building is a minimum of 20 m from any classified vegetation | Yes | ✓ | No | | N/A | | 5.5, 6.1.1, 6.1.4.2 | As above |
| A4.3 | Building protection zone – every building is surrounded by a building protection zone that meets minimum requirements | Yes | ✓ | No | | N/A | | 5.5, 6.1.1, 6.1.4.3 | As above |
| A4.4 | Hazard separation zone – every building and its contiguous building protection zone is surrounded by a hazard separation zone that meets minimum requirements | Yes | ✓ | No | | N/A | | 5.5, 6.1.1, 6.1.4.4 | As above |

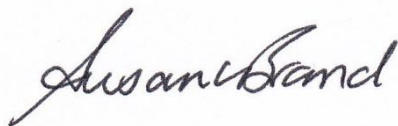
| | | | | | | | | | |
|---|---|-----|---|----|--|-----|---|---------|--|
| A4.5 | Shielding – a reduction in the bush fire attack level due to shielding from direct flame contact or radiant heat via a stand-alone non-combustible structure shall be given consideration when meeting nominated conditions | Yes | ✓ | No | | N/A | | 6.1.4.3 | As provided for in AS 3959 and Planning for Bushfire Protection guidelines |
| Compliance with Element 5: Design of Development | | | | | | | | | |
| <i>The design of the development is appropriate to the level of bush fire hazard that applies to the development site</i> | | | | | | | | | |
| A5.1 | Compliant development – development that complies with acceptable solutions A4.1, A4.2, A4.3, and A4.4 require no further special design requirements | Yes | ✓ | No | | N/A | | 6.0 | Construction standards as per AS 3959 – 2009 will apply to nominated areas |
| A5.2 | Non-compliant development – for development that does not comply with acceptable solutions there is no acceptable solution and must be assessed under performance criterion P5 | Yes | | No | | N/A | ✓ | | |

Applicant Declaration

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

Full name: Susan Catherine Brand

Applicant signature:



Date:

10 April 2015