

## East Baldvis Structure Plan

A Report for RPS Group

# Bushfire Hazard Assessment Report

PREPARED BY:



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## 1. Executive Summary

The Bushfire Hazard Assessment Report (the report) has been produced to accompany the District Structure Plan submitted to the City of Rockingham in early 2010. The assessment methodology of the bushfire hazard and reporting is consistent with the Planning for Bushfire Protection guidelines (WAPC et. al. 2010). Additional details that influence bushfire behaviour such as site slope (ie. topography) and the local weather data are discussed.

The subject land is predominantly grassland and is thus a low bushfire hazard level. Small (ie - 1 - 5 hectare areas), relatively isolated areas of forest and woodland occur which are rated as extreme bushfire hazard level. There are also small areas of moderate bushfire hazard rating.

## 2. Introduction

The subject land is approximately 380 hectares in size and is located in the City of Rockingham (Figure 1). It is bounded by the Kwinana freeway in the east, Baldivis road in the west, Safety Bay road to the south and Millar road to the north (figure 2). The subject land is held in multiple ownership by a number of different parties.



**Figure 1: The subject land in the City of Rockingham. (image: nearmap.com)**

In early 2010, a District Structure Plan (DSP) of the area was submitted to the City of Rockingham. As part of the City's assessment of the DSP, a bushfire hazard assessment is required. This report has been produced to fulfill that requirement. The site assessment methodology and criteria used are consistent with the document 'Planning for Bush Fire Protection guidelines - edition 2' (WAPC. et al, 2010).

This report additionally examines the variables that influence bushfire behaviour including:

1. Fuel (relative quantity and structure)
2. Topography
3. Weather ( temperature, humidity and wind speed and predominate direction)

## 2.1 Assessment Area

The assessment area comprises of a section of land approximately 6.5 kilometres from north to south and 750 metres east to west. To enable an accurate assessment of vegetation classes down to 0.25 hectares in size the subject land was divided into three separate units, a north, central and south study section (figure 2).



**Figure 2: Subject land boundaries and study sections. (image: nearmap.com)**

## 3. Vegetation Assessment

The vegetation assessment methodology included a detailed aerial photographic interpretation process using high resolution and recent (ie. October 2010) aerial photography. The site was then visited and vegetation types and classes inspected to field check the accuracy of the aerial photographic interpretation. The relative amount and structure of fuel loads were also examined in the vegetation classes.

### 3.1 Vegetation Classes

There are five vegetation classes on the subject land, they are grassland, scrub, shrubland, woodland and forest. The predominant vegetation class is grassland, it occupies over an estimated 90% of the total area in the subject land. Detailed vegetation class maps are found in Appendix 1,2 and 3. The area assessed also included a 100 metre zone surrounding the study site. This was included to provide an indication of the study sites immediate surroundings that could impact on any future Bushfire Attack Level (BAL) assessments on buildings were the land to be designated as bushfire prone by the City of Rockingham in the future.

#### 3.2.1 Grassland

The vegetation types that made up the grassland assessment included pasture grasses, weeds and tussock grasslands. There are also small areas of sedges and phragmites sp. Criss crossing the grasslands are single rows of shelter belt trees usually located along fence lines. In the northern half of the study site north (Appendix 1), along the western edge of study site central (Appendix 2) and scattered throughout study site south (Appendix 3) are remnant over-storey tree species such as eucalypt sp. and melelauca sp. which do not form dense enough foliage stands to be classed as woodlands. The foliage cover is less than 10% meaning there is insignificant foliage cover to be classified as open woodland. If the over-storey foliage cover is less than 10% including situations with trees and shrubs the vegetation classification is grassland (WAPC. et al, 2010).

#### 3.2.2 Scrub

The vegetation class scrub includes both open and closed scrub vegetation types. Scrub is described as being shrubs greater than 2 metres in height. Closed scrub has a foliage cover greater than 30% and open scrub has 10 - 30 % foliage cover (Standards Australia 2009). Open and closed scrub vegetation types occur as essentially small isolated stands averaging 1 - 2 hectares in size. The scrub predominantly occurs as a stand alone vegetation class in the study site north (Appendix 1), however it does grow as the under-storey and middle-storey layer in many areas of forest vegetation class.

### 3.2.3 Shrubland

There is no shrubland found on the entire study site, however a small area greater than 0.25 hectares was identified in the 10 metre zone outside of the study site in the north-east corner (Appendix 1). This low shrubland vegetation type appears to have been planted for revegetation following construction of the Kwinana Freeway. There are narrow corridors of shrubland and scrub vegetation between the eastern study site boundary and the eastern lane of the Kwinana freeway for the entire length of the subject land. The vegetation continuity is dissected by a bicycle lane and both double vehicle lanes. It falls outside of the subject land and was not mapped in this assessment because the corridors of vegetation are often only 5 - 15 metres wide. It may need to be considered for more site specific bushfire assessment work such as Bushfire Attack Level assessments at a later date.

### 3.2.4 Woodland

Vegetation class woodland comprises five vegetation types, two were assessed as being on the study site, woodland and open woodland. The description for these two vegetation types includes trees 10-30 metres in height and 10-30% foliage cover (Standards Australia 2009). Distinguishing between woodland and open woodland is a bit subjective as there is only a small difference in percentage foliage cover. The criteria used in this report included an assessment of the likelihood of there being enough foliage cover to sustain a canopy fire from tree canopy to tree canopy. If tree canopies were on average less than 10 metres apart it was generally classified as woodland, if the distance averaged greater than 10 metres it was classified as an open woodland. The litter, ground, shrub / scrub and middle-storey fine fuels significantly affect bushfire behaviour in woodlands.

### 3.2.5 Forest

The vegetation type in the forest vegetation class is open forest, it is characterised by trees 10- 30 metres high and foliage cover between 30 and 70% (Standards Australia 2009). There is significant variations across the study site in the fuel loads and fuel structure in the open forest vegetation type. Where the forest is largely undisturbed and intact such as inside and outside of the northern boundary of study site north there is essentially a dense banksia woodland growing throughout the open forest. This vegetation type also occurs in an area in the south west of study site central (Appendix 2) and along the western boundary of study site south (Appendix 3). Some areas also have a scrub layer further adding elevated fine fuels to the fuel structure of the forest. In wet depressions north of Mundijong road an open forest community of swamp paperbark (*Melaleuca raphiophylla*) and Flooded gum (*Eucalyptus rubis*) occur (Environmental Resources Management Australia 2000)

At the southern end of study site north (Appendix 1), west of Baldivis road, the forest vegetation class has a grassy understorey. This also occurs in the forest areas on the western side of study

site south (Appendix 3). Compared to scrub under-storey and banksia woodland in the forest vegetation class, the fire behaviour would be significantly less in areas of forest with grassy under-storey only.

Some active areas of revegetation have been classified as open forest as the density of foliage is approaching 30% and will increase. A small area of the native garden outside of the study site in the Rockingham Regional Memorial Park is classified as forest, as essentially it is a dense scrub layer and over-storey eucalypts.

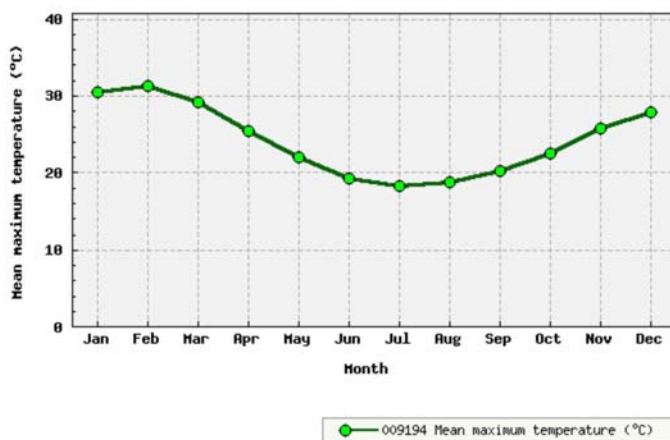
## 4. Slope

The topography of the study site is relatively uniform with minimal height variations. The slope of the land will not play a significant role in predicted bushfire behaviour nor future site planning from a bushfire behaviour perspective.

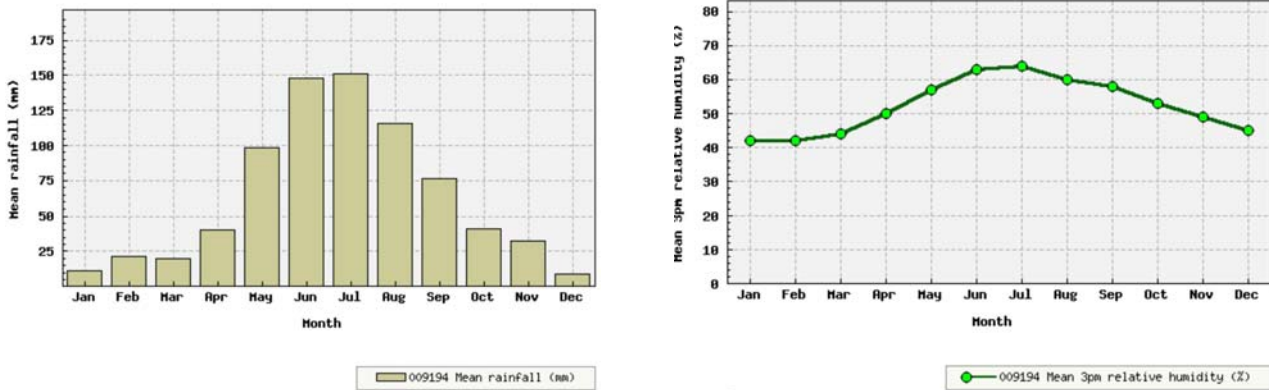
## 5. Fire climate

Statistics from the Medina Bureau of Meteorology Research Centre which is 5 kms north west of the study site indicate the area experiences warm dry summers, cool wet winters (Figure 3 & 4), it is classified as a Mediterranean climate.

Weather conditions significantly affect the behaviour of bushfires. Bushfires burn more aggressively when high temperatures combine with low humidity and strong winds. Virtually all house losses occur during severe, extreme or catastrophic (ie when the Fire Danger Indices are over 50) conditions (Blanchi et al. 2008).



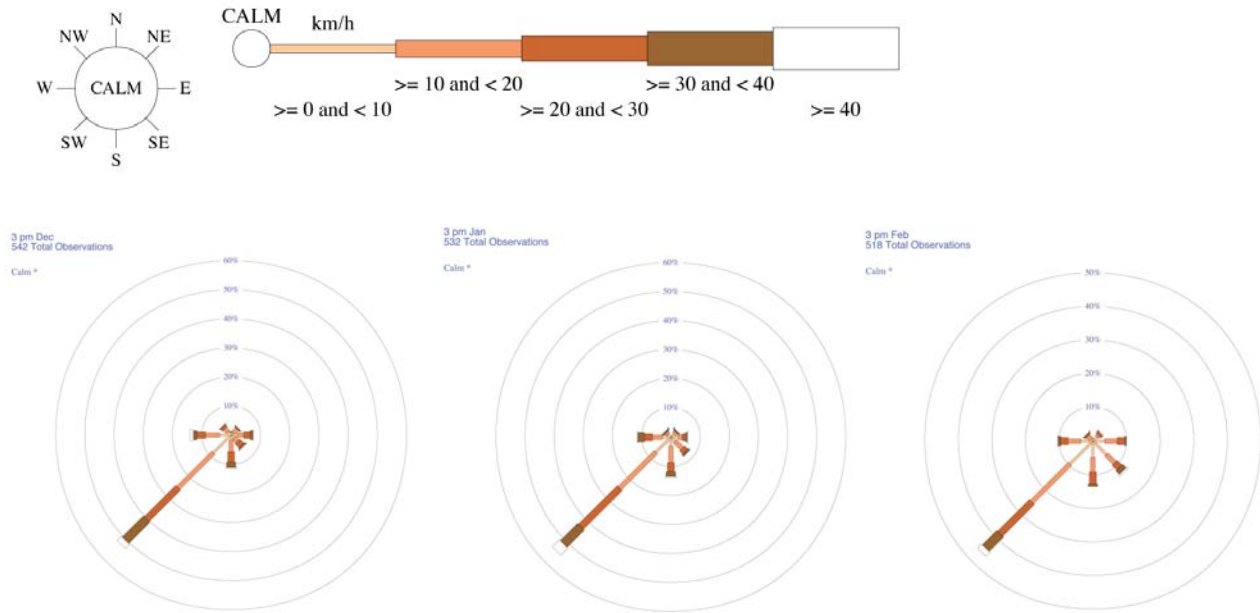
**Figure 3: Mean maximum recorded temperatures for Medina Bureau of Meteorology Research Centre between 1983 and 2010**



**Figure 4: Mean rainfall (between 1983-2010) and mean humidity levels at 3pm (between 1983-2010) recorded at nearby Medina Bureau of Meteorology Research Centre.**

Grassfires respond almost immediately to changes in wind speed and direction (Cheney & Sullivan 2008). Because of its proximity to the coast the study site is influenced by land and sea breezes. These are created by the daily heating and cooling of the land surface adjacent to the ocean. The sea breeze occurs when the land when the air over the land heats up and becomes more buoyant and rises, denser moist air over the ocean then flows inland. Sea breezes can strengthen prevailing wind, reduce it or even reverse it, depending on the strength and direction of the two airstreams (Cheney and Sullivan 2008). The land breeze is the opposite and occurs when the land cools and air flows from the land towards the ocean to replace the rising warmer air. It is generally less turbulent than the sea breeze.

The predominant winds in the summer months at 3pm near the study site are south-westerlies. The wind roses from the nearby Medina Bureau of Meteorology Research Centre confirm this (figure 5) from statistics taken over the past 27 years. In terms of wind strength, direction and frequency, the south west wind is clearly dominant occurring 40-50% of the time. Winds from the west and south occur 10-15% of the time. West and south west of the study site is the Rockingham Regional Park where the Karnup bushfire occurred in early December 2010, There are native vegetation corridors which have the potential to carry a bushfire the 5 kilometres to the study site from this direction, if being driven by west or south west winds.



**Figure 5: Rose of wind direction and wind speed in km/hr for December, January and February between 1983 - 2010 at the nearby Medina Bureau of Meteorology Research Centre.**

**Interpreting Figure 5 - Wind speed Vs Direction Plot**  
 Wind roses summarise the occurrence of winds at a location, showing their strength, direction and frequency. The percentage of calm conditions is represented by the size of the centre circle - the bigger the circle, the higher is the frequency of calm conditions. Each branch of the rose represents wind coming from that direction, with north to the top of the diagram. Eight directions are used. The branches are divided into segments of different thickness and colour, which represent wind speed ranges in that direction. Speed ranges of 10km/hr are used. The length of each segment within a branch is proportional to the frequency of winds blowing within corresponding range of speeds from that direction (BOM 2010).

## 6. Bushfire Hazard Levels

Bushfire hazard levels have been assigned to the pre-dominant vegetation classes and vegetation types as per the planning for Bushfire Protection guidelines - edition 2 (WAPC et. al. 2010).

All forest areas are classified as ‘extreme’ bushfire hazard rating. Woodland has been classified as ‘extreme’ bushfire hazard for woodland vegetation type and ‘moderate’ bushfire hazard for open woodland vegetation type. Vegetation class scrub is classified as ‘extreme’ bushfire hazard for closed scrub vegetation type and ‘moderate’ for open scrub vegetation type. The shrubland vegetation class is classified as ‘moderate’ in this assessment.

The grassland which is by far the dominant vegetation class is classified as ‘low’ bushfire hazard rating. Included in the ‘low’ bushfire hazard rating is the surrounding roads and urban areas. An overall image of bushfire hazard rating is found in figure 6, however detailed bushfire hazard maps are found in Appendix 4,5 and 6.



**Figure 6: Bushfire Hazard Rating Levels in the study area and within a 100 metre zone of the boundary. Areas not coloured are “Low” bushfire hazard risk areas.**

## 7. Conclusion

The subject land is predominantly covered in grassland, it occupies an estimated 90% of the total area. Grassland vegetation class is classified as low bushfire hazard level rating. The entire site has negligible slope and hence will not influence the behaviour of a bushfire. Weather variables are a significant factor in determining bushfire behaviour, and the site does experience predominantly south-west winds in the summer months. Grass fires are also highly responsive to wind speeds and direction.

Small, relatively isolated areas of forest and woodlands provide the extreme bushfire hazard rating areas. There are similarly small isolated areas of moderate bushfire hazard where open woodland and open scrub occur. The 100 metre zone surrounding the site similarly contains relatively isolated areas of open forest and woodland (ie. extreme risk areas). The exception to this is the northern boundary of the study site which is adjacent to a significant area of open forest / banksia woodland which has very high fuel loads.

## 8. Appendices

Six appendices are contained in the following fold out maps. The first three appendices contain vegetation mapping data and appendices 4-6 contain the bushfire hazard level maps.

## 9. References

Blanchi, R & Leonard, J (2008) Property Safety - judging structural safety. In 'Community Bushfire Safety'. (J. Handmer, eds) CSIRO Publishing, Melbourne

BOM website 2010. ([http://www.bom.gov.au/climate/averages/tables/cw\\_009194.shtml](http://www.bom.gov.au/climate/averages/tables/cw_009194.shtml))

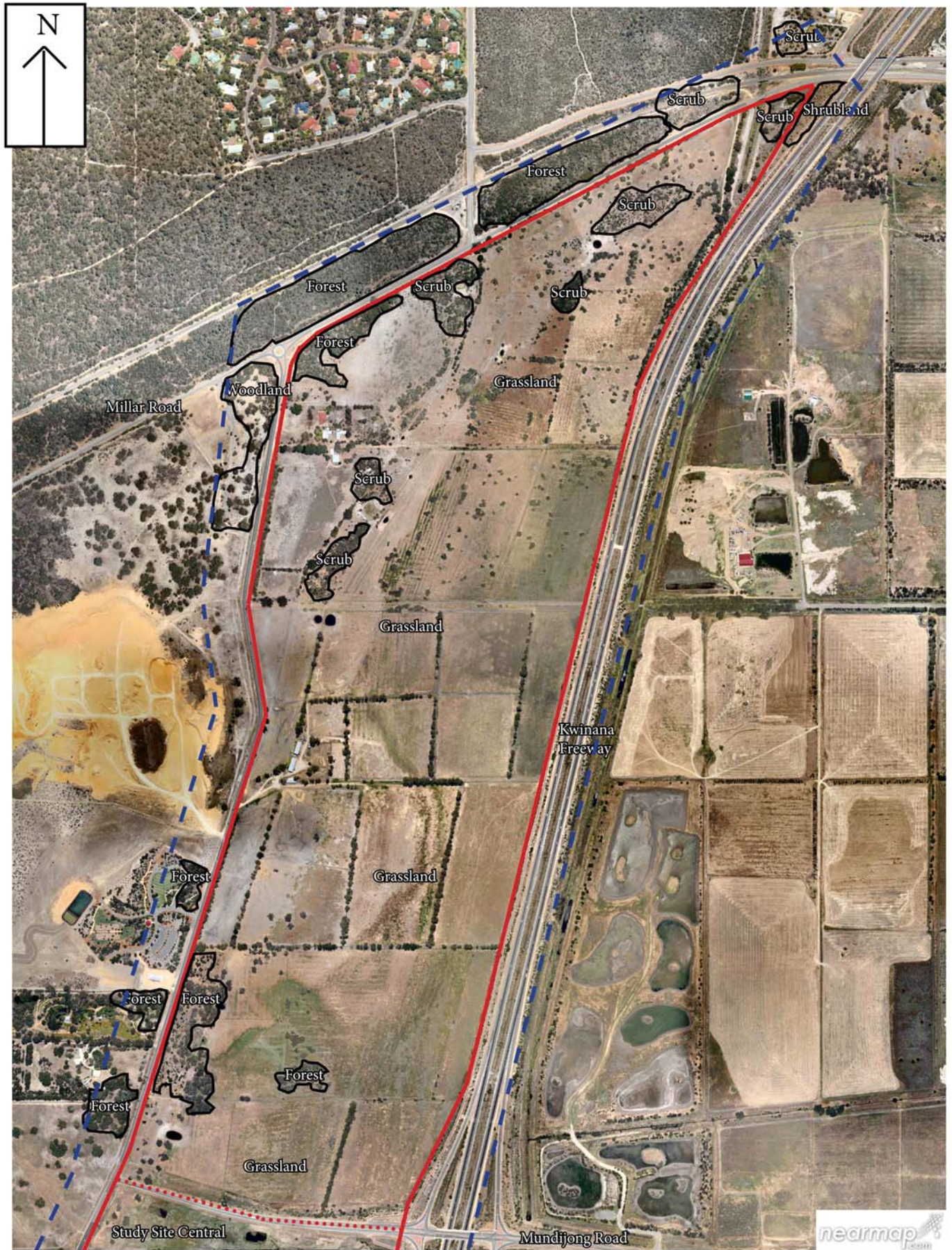
Cheney P & Sullivan A (2008) Grassfires, fuel, weather and fire behaviour - second edition. CSIRO Publishing Collingwood, Australia

Environmental Resources Management Australia (2000) Baldivis Tramway Reserve Management Plan - Final Report for the City of Rockingham.

Standards Australia (2009) Australian Standard (AS 3959-2009) Construction of buildings in bushfire-prone areas.

Western Australian Planning Commission (WAPC), Department of Planning and Fire and Emergency Services Authority of Western Australia (FESA) (2010) Planning for Bush Fire Protection guidelines - edition 2. Published by WAPC & FESA

# Appendix 1: Vegetation Classes Map Study Site North



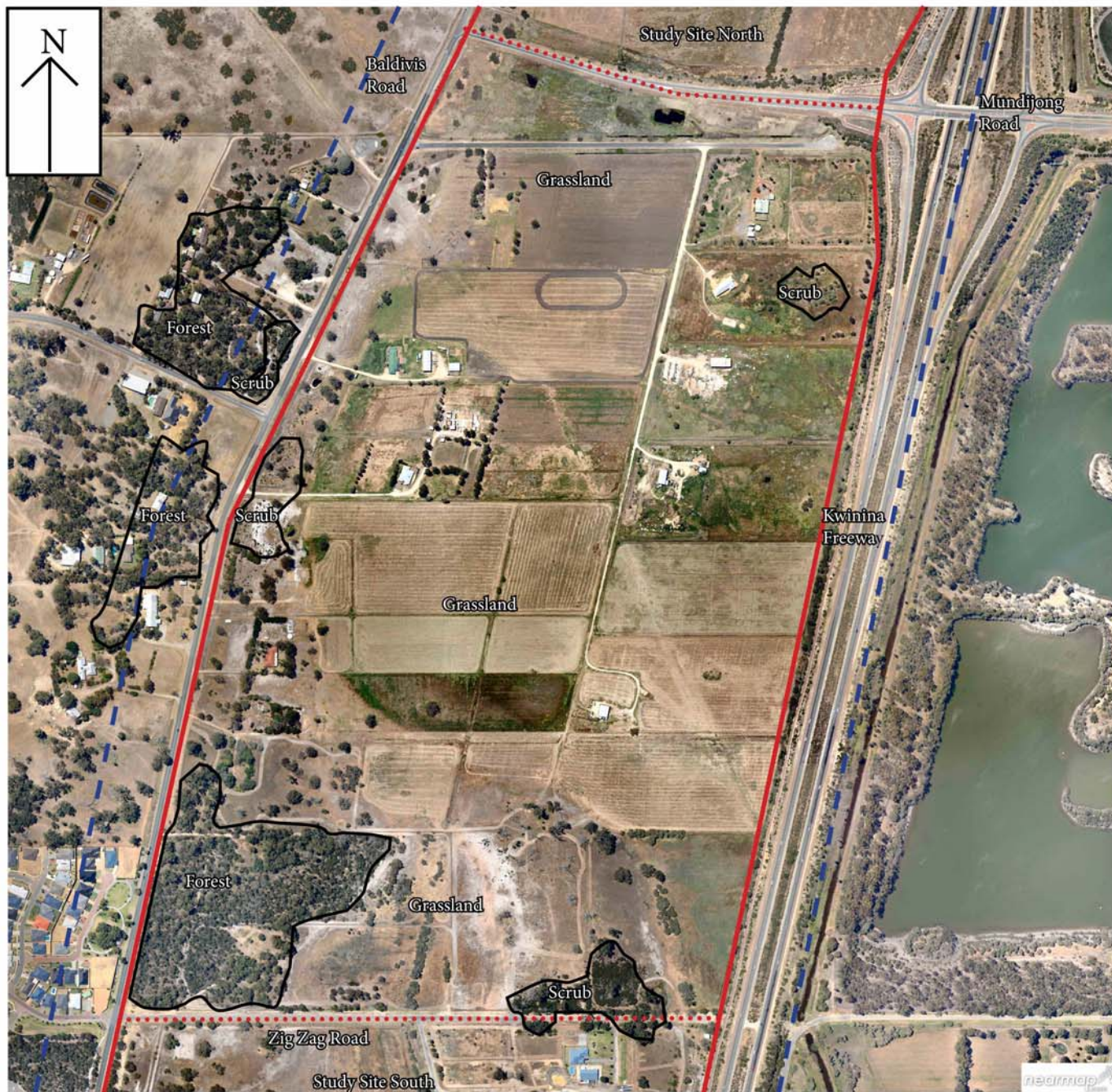
## Legend

- Study site boundary
- ⋯ Internal boundary
- - - 100 metre external zone boundary




Scale:



# Appendix 2: Vegetation Classes Map Study Site Central



## Legend

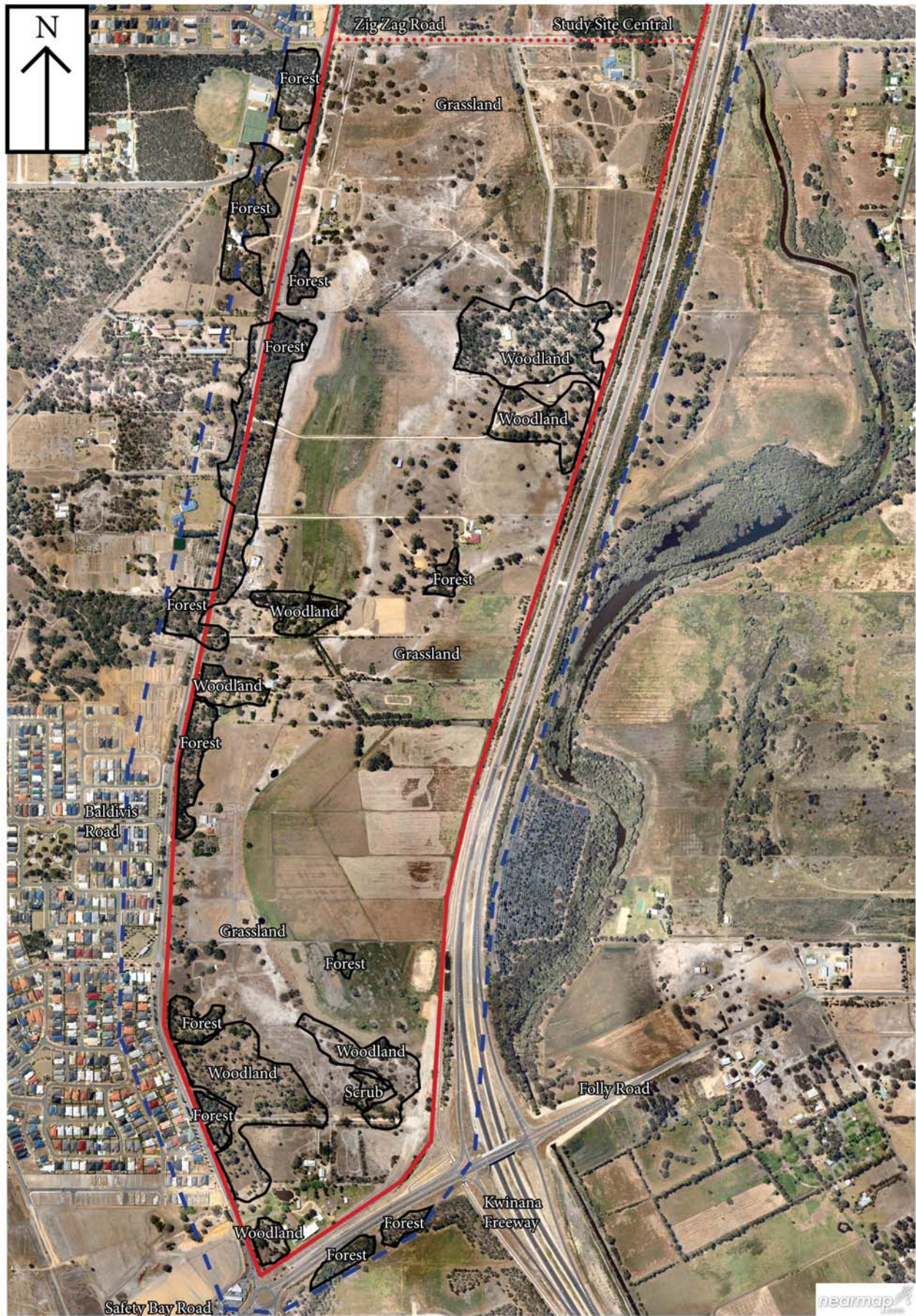
-  Study site boundary
-  Internal boundary
-  100 metre external zone boundary

## Scale:



# Appendix 3: Vegetation Classes Map

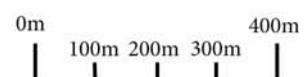
## Study Site South



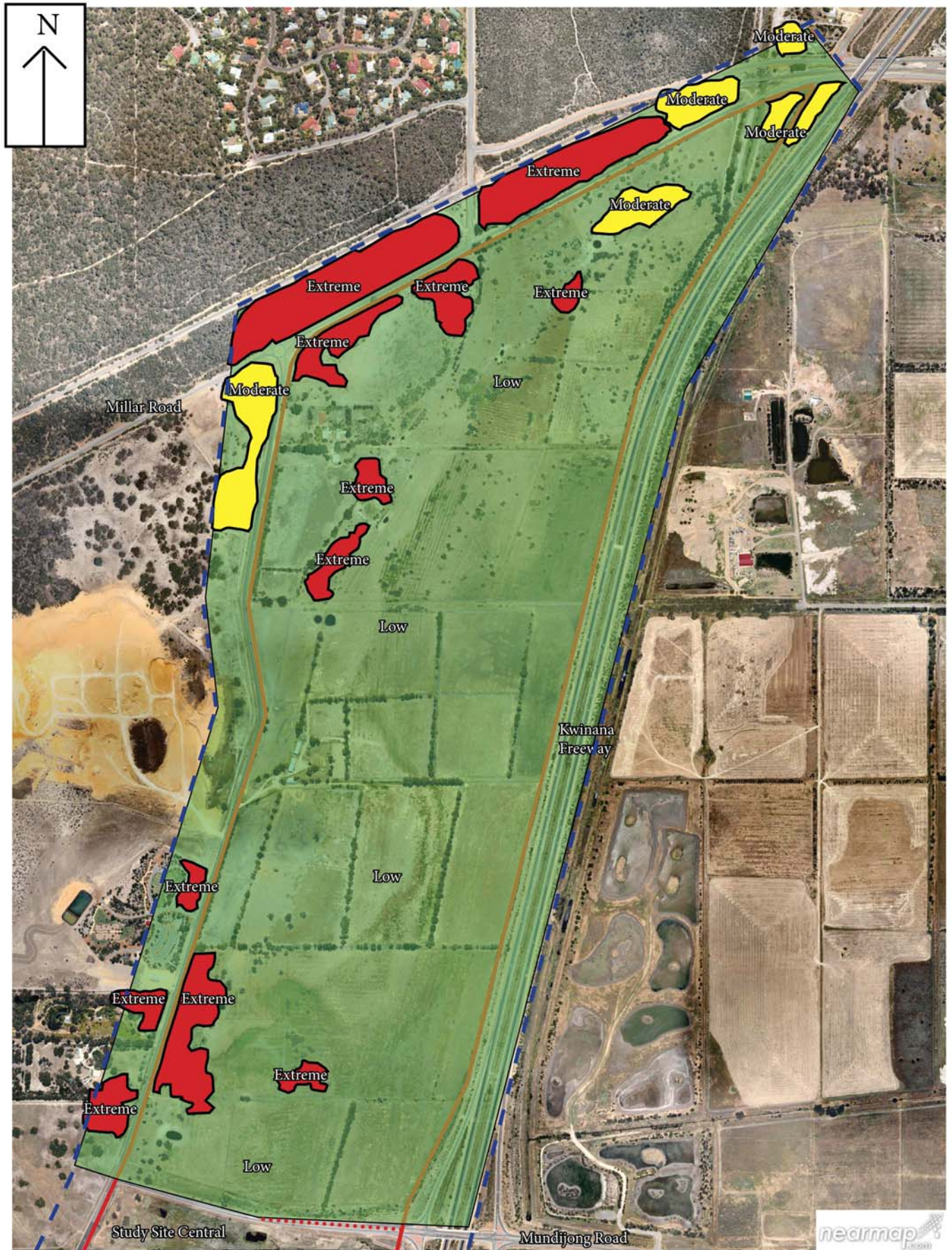
### Legend

- Study site boundary
- ⋯ Internal boundary
- - - 100 metre external zone boundary

Scale:



# Appendix 4: Bush Fire Hazard Level Map Study Site North



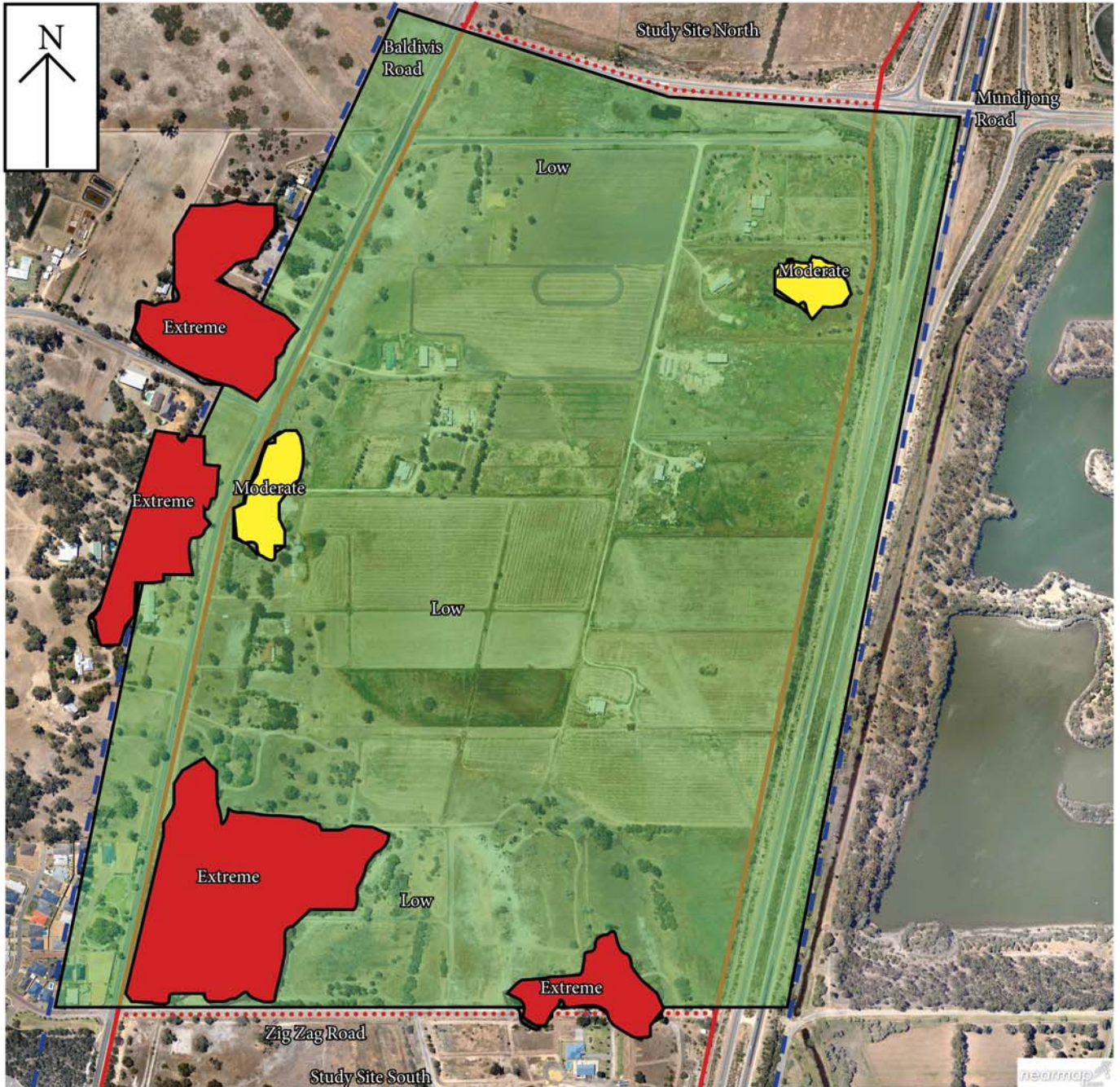
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- Study site boundary
- ⋯ Internal boundary
- - - 100 metre external zone boundary

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# Appendix 5: Bush Fire Hazard Level Map Study Site Central



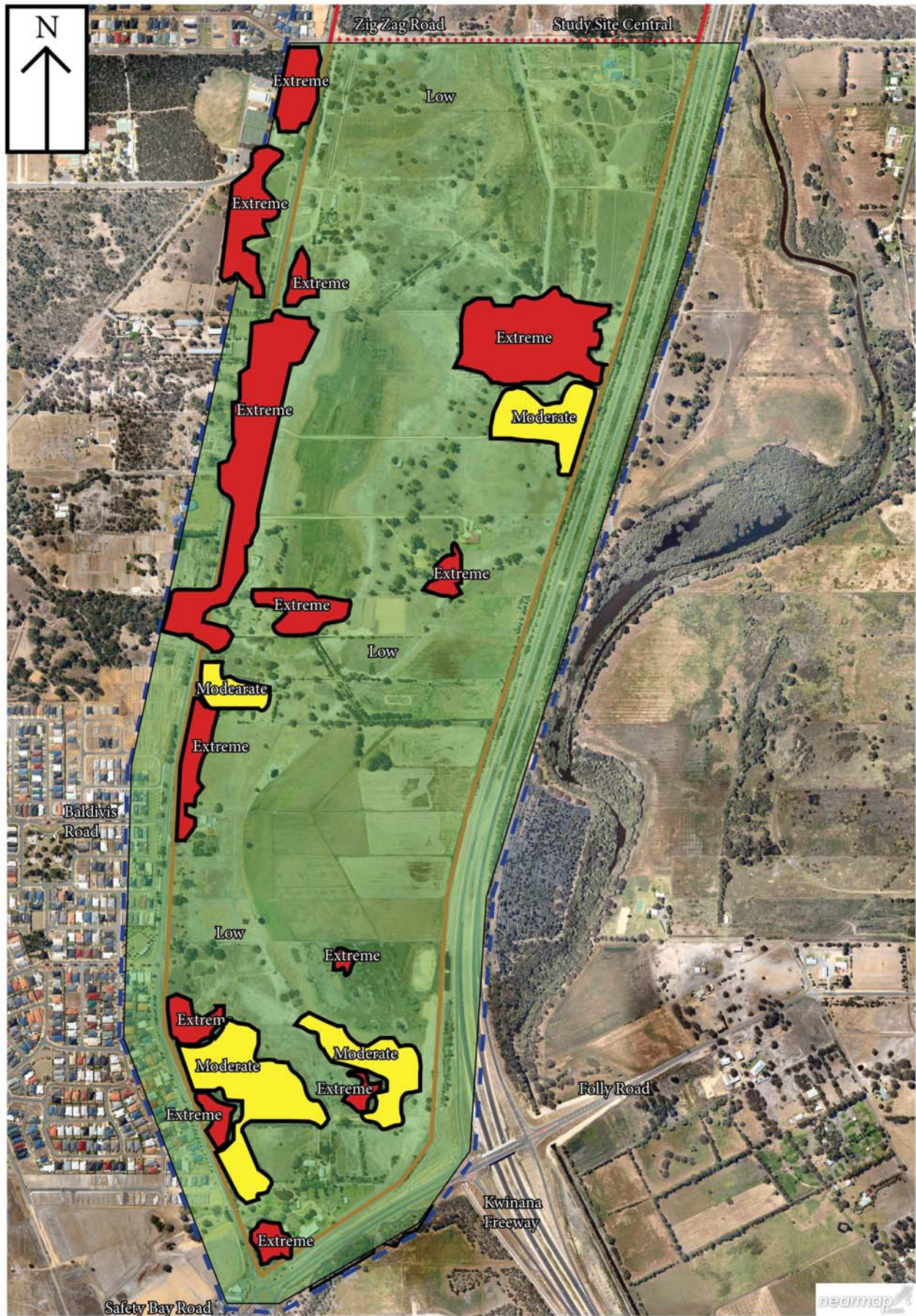
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- Study site boundary
- ..... Internal boundary
- - - 100 metre external zone boundary

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# Appendix 6: Bush Fire Hazard Level Map Study Site South



## Legend

- Study site boundary
- ⋯ Internal boundary
- - - 100 metre external zone boundary

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