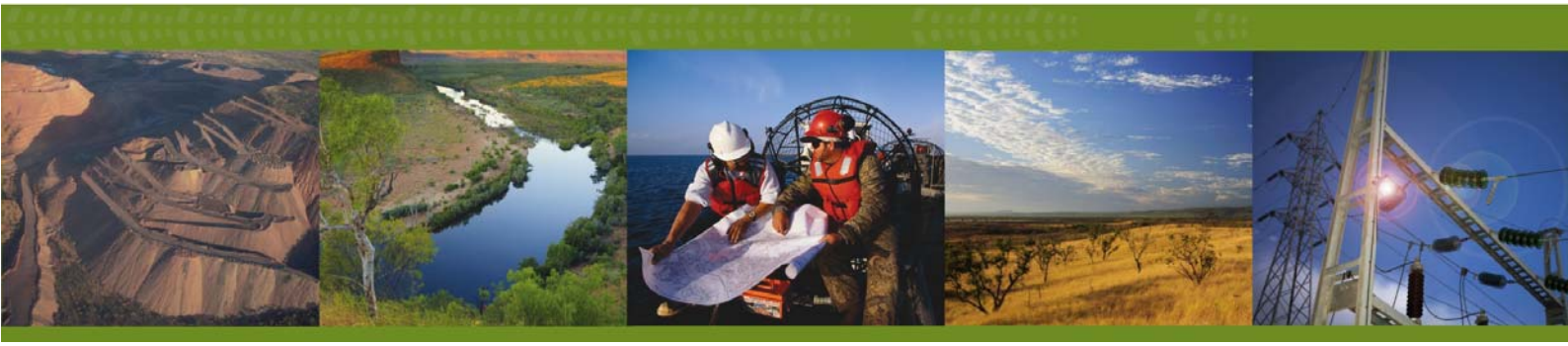
E
Fire Management Plan
(November, 2013)



Fire Management Plan

Lots 635, 739 and 740 Baldivis Road

Prepared for
Spatial Property Group
by Strategen

November 2013

STRATEGEN
environmental consultants

Fire Management Plan

Lots 635, 739 and 740 Baldivis Road

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November 2013

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Client: Spatial Property Group

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
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Filename: SPP13196_01 R001 Rev 0 - 1 November 2013

Table of contents

List of tables

List of figures

List of appendices

1. Introduction

1.1 Background

Spatial Property Group (SPG) is proposing to implement a Local Structure Plan (LSP) for Lots 635, 739 and 740 Baldivis Road in the City of Rockingham (the project area). The LSP outlines proposed development of the project area, predominantly for residential purposes. Roberts Day has prepared the LSP on behalf of SPG, as presented in Figure 1.

There is an inherent bush fire risk to proposed life and property assets of the development, which is mainly due to proximity of the permanent vegetation extent to the east within Tramway Reserve. City of Rockingham (CoR) has approved the current LSP but Western Australian Planning Commission has advised that a Fire Management Plan (FMP) is required prior to final LSP endorsement.

SPG has commissioned Strategen to prepare an FMP to support the LSP for the project area in accordance with *Planning for Bush Fire Protection Guidelines Edition 2* (PFBFP Guidelines, WAPC et al. 2010). A completed FMP compliance checklist is contained in Appendix 1.

1.2 Purpose and application of the plan

The purpose of the FMP is to provide guidance on how to plan for and manage the bush fire risk to the project area through recommendation of a range of bush fire risk mitigation measures in accordance with requirements of PFBFP Guidelines. This is particularly relevant when existing fire appliances in the area may be unable to offer a fast emergency suppression response. Therefore, proposed assets within the project area should be self-protecting from wildfire.

The responsibility to implement the FMP applies to the developer (SPG), CoR and perspective landowners to ensure bush fire management measures are adopted and implemented on an ongoing basis to achieve bush fire management objectives.

1.3 Stakeholder consultation

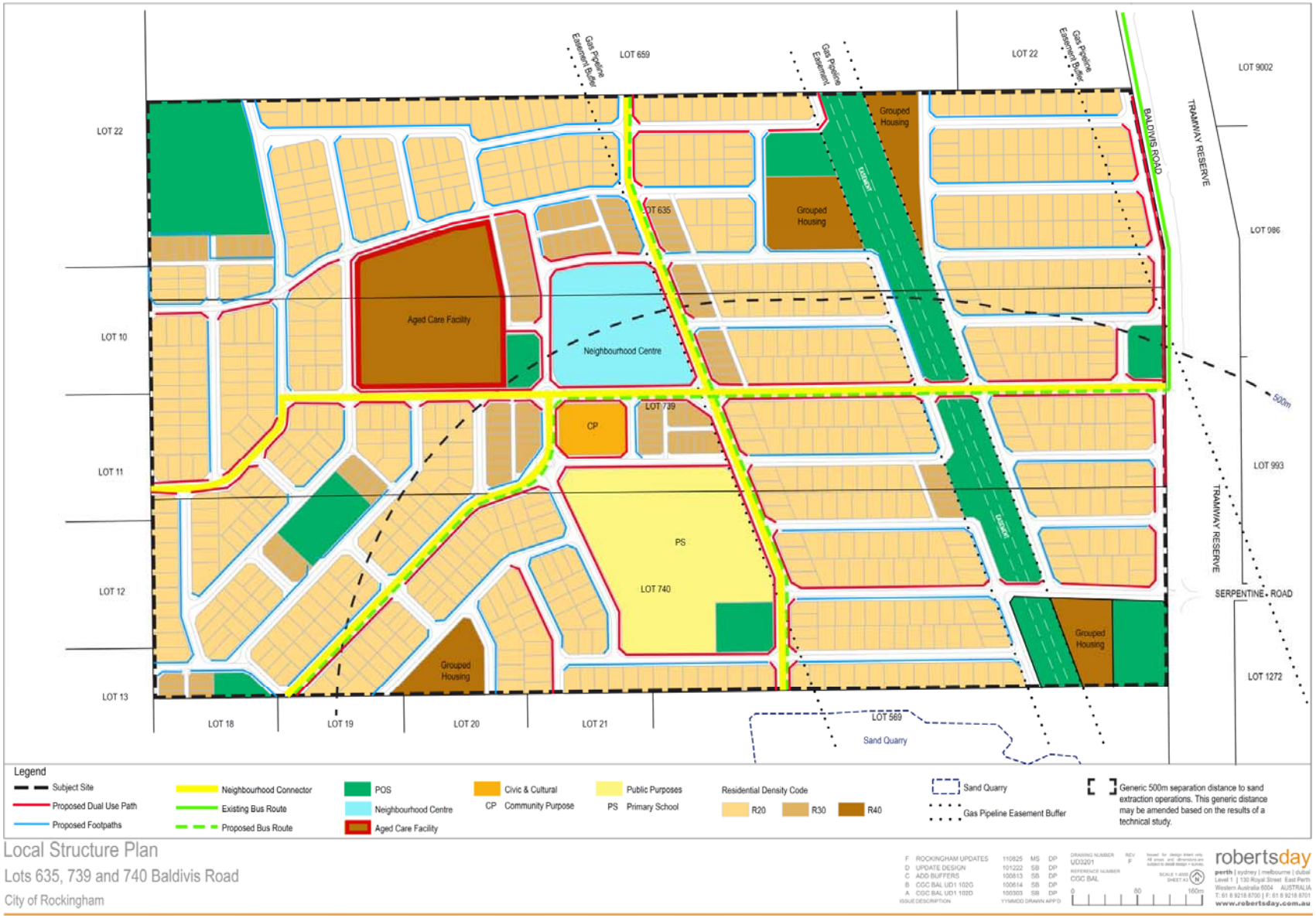
Strategen has undertaken consultation with the developer, CoR and DFES to ensure aims and objectives of the FMP are in accordance with stakeholder expectations and the FMP maintains compliance with PFBFP Guidelines.

1.4 Document review

This FMP should be reviewed formally by CoR every five years following the date of approval to ensure:

1. Implementation of the FMP is assessed and corrective actions are applied in cases of non-compliance.
2. The effectiveness and impact of fire prevention work is evaluated and any significant changes in management are captured and assessed in a revised FMP.

Basic updates to the FMP should be conducted as required by CoR to capture any significant changes in fire threat throughout the course of development as the surrounding landscape is progressively developed.



Source: Roberts Day 2011

STRATEGEN	Fire Management Plan: Lots 635, 739 and 740 Baldivis Road Local Structure Plan	Figure 1

2. Aim and objectives

2.1 Aim

The FMP aims to reduce potential impacts to life, property and environmental assets of the proposed LSP development from uncontrolled bush fire. This will be achieved by preparing an FMP that:

- quantifies the bush fire hazard and assesses the bush fire risk to the project area
- documents bush fire prevention requirements of the project area to provide ongoing protection to future residents, visitors and built assets of the subject land
- identifies bush fire protection issues, appropriate strategies and those persons and/or organisations who have a responsibility to implement the FMP
- is in accordance with PFBFP Guidelines and is compatible with bush fire management on neighbouring subdivisions
- provides guidance for the developer, CoR and perspective landowners to protect the subject land and assets in the event that fire appliances may not be available to offer a fast suppression response.

2.2 Objectives

Key objectives of the FMP and the relevant section/s of this document in which they are addressed are outlined in Table 1.

Table 1 Key objectives of the FMP

Objective	Section
Define areas where values are located (i.e. location of assets)	Section 3.8
Define and rank fire hazard areas	Section 4.2.1
Nominate individuals and organisations responsible for fire management and associated works within the project area	Section 5.7
Propose fire management measures for the project area, with due regard for life, property and the environment	Section 5
Define an assessment procedure that will evaluate the effectiveness and impact of proposed, as well as existing fire prevention work and strategies	Section 6.3
Provide performance criteria and acceptable solutions for all fire management works in accordance with PFBFP Guidelines	Section 4.3

3. Description of the area

3.1 Site overview

The project area comprises Lots 635, 739 and 740 Baldivis Road in the City of Rockingham (Figure 2). The project area is located approximately 45 km south of the Perth Central Business District, 10 km southeast of the Rockingham City Centre and 3 km south of the Baldivis Town Centre.

The project area consists of approximately 88.5 ha of sparsely vegetated land. Historically, the lots were subject to livestock grazing for many years. This has resulted in a cleared landscape with residual overstorey trees and a prominent grassland understorey. The project area contains a dwelling and associated rural infrastructure that will be removed on development of the site. The Parmelia Gas Pipeline passes from north to south through the eastern portion of the project area and Baldivis Road forms the site's eastern boundary (Figure 3).

New residential estates are situated adjacent north and west of the project area in accordance with the South Baldivis District Structure Plan (Plate 1 and Plate 2). Proposed residential areas and a sand quarry are situated adjacent south of the project area (Plate 3). A 'Parks and Recreation' reserve (Tramway Reserve) is situated adjacent east of the project area and forms a vegetated, linear reservation extending 22 km between the Beeliar and Serpentine Regional Parks (Figure 3).

Given the current and proposed scale of land development in the South Baldivis locality, much of the vegetation extent and associated bush fire hazard has been removed from this area. Consequently, the adjacent east Tramway Reserve is considered the only permanent source of significant vegetation and bush fire hazard in the vicinity of the project area.

Plate 1 New residential area to the north (Highbury Park development)

Plate 2 New residential area to the west (Smirk Road development)

Plate 3 Proposed residential area to the south within Lot 18

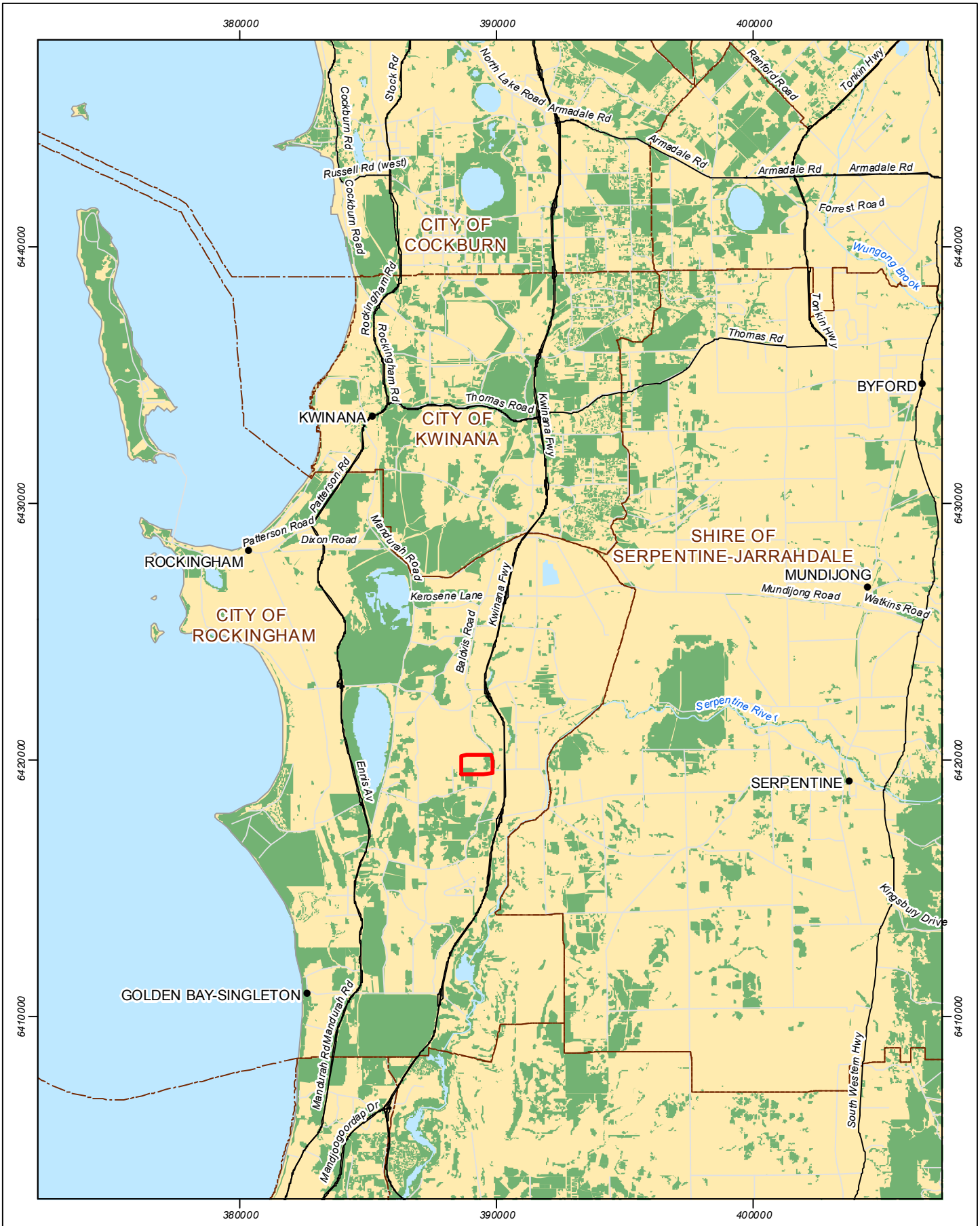


Figure 2 Regional location

Scale 1:200,000 at A4

0 1 2 3 4 5 km

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 17/10/2013
Author: JCrute
Source: Topography: Geoscience Australia 2011.

Legend

- Town
- Major road
- Minor road
- Project area boundary
- Major river
- Lakes
- NativeVegetation_Extent selection
- Local government boundary

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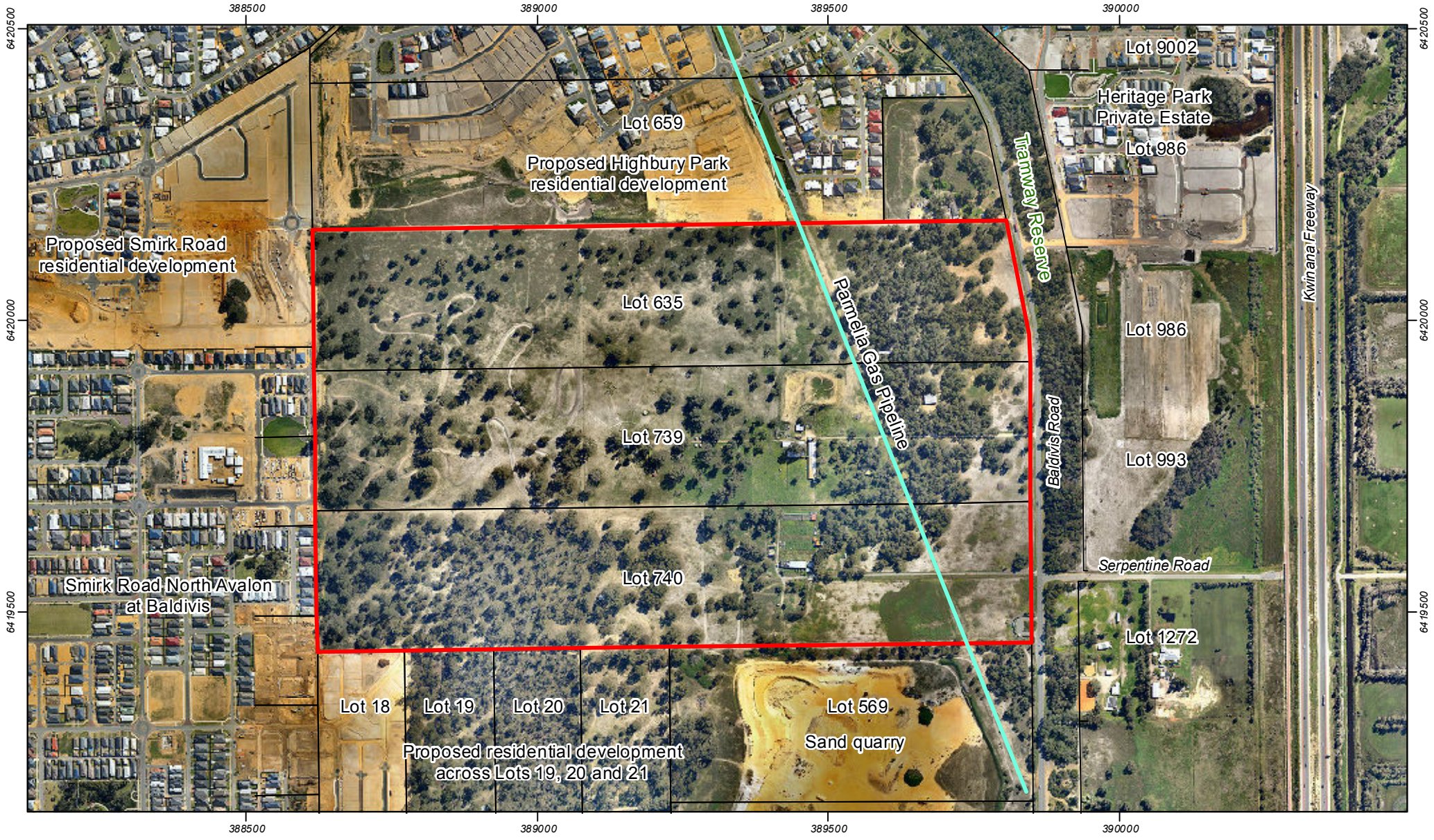

Figure 3 Site overview

Scale 1:9,000 at A4

0 50 100 150 200 250 m

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 23/10/2013

Author: JCrute

Source: Client 2013.

Legend

- Project area boundary
- Existing cadastre

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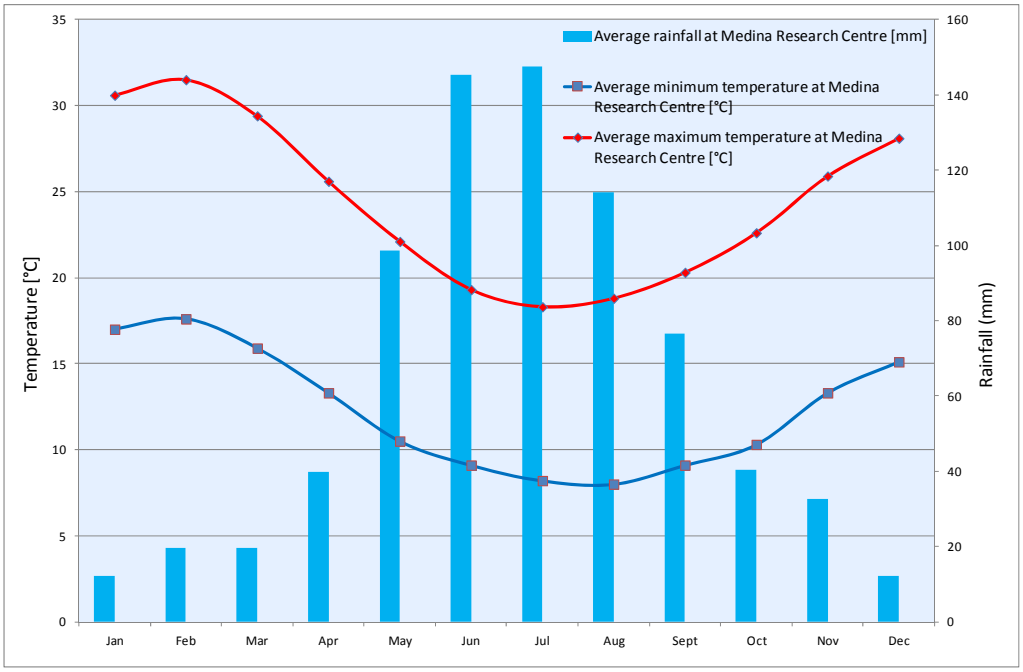
3.2 Local climate

The Baldivis locality experiences a Mediterranean climate characterised by mild, wet winters and warm to hot, dry summers. The Bureau of Meteorology (BoM) weather station at Medina Research Centre (Station No. 9194) provides average monthly climate statistics for the Baldivis locality (Figure 4).

Average annual rainfall recorded at Medina Research Centre since 1983 is 763.9 mm (BoM 2013). Rainfall may occur at any time of year; however, most occurs in winter in association with cold fronts from the southwest. Highest temperatures occur between December and March, with average monthly maximums ranging from 28.1°C in December to 31.5°C in February (BoM 2013). Lowest temperatures occur between June and September, with average monthly minimums ranging from 8°C in August to 9.1°C in June and September (BoM 2013).



Source: BoM 2013

Figure 4 Average monthly climate statistics for Medina Research Centre (Station No. 9194)

3.2.1 Predominant fire weather

Southwest Western Australia generally experiences a cool to mild growing season in the months of August through to November of each year, followed by four months of summer drought conditions, which is when the potential for wildfire occurrence is at its peak. The worst fire weather conditions occur during this dry period when a low pressure trough forms off the west coast and strong winds develop from the north or northeast. These conditions are sometimes associated with 'Extreme' or 'Catastrophic' fire danger indices, which are consistent with very high temperatures, low relative humidity and strong winds.

Based on the predominant summer climatic conditions of the local area, these high fire danger conditions are considered to occur less than 5% of the time during the designated bush fire season, which equates to around 9 days between December and March (McCaw and Hanstrum 2003).

Average 9:00 am and 3:00 pm January wind profiles for Medina Research Centre are contained in Appendix 2. These illustrate that the predominant winds during this high risk period are from the east and southeast in the morning averaging around 13 km/h; and from the southwest in the afternoon averaging around 21 km/h (BoM 2013).

These dominant wind patterns are considered to occur 95% of the time during the designated bush fire season. The mean 9:00 am and 3:00 pm relative humidity in January for Medina Research Centre is 53% and 42% respectively. These predominant fire weather conditions correlate with an average fire danger index of 'High', as determined using the Commonwealth Science and Industrial Research Organisation Fire Danger and Fire Spread Calculator (CSIRO 1999).

3.3 Landform

The project area is located on the Swan Coastal Plain, which is characterised by a low-lying coastal plain mainly covered with woodlands. Banksia and Jarrah-banksia woodlands are the usual vegetation contained within the dune systems (McKenzie et al. 2003). The basic landform is undulating sand hills of free draining sand, underlain in parts by some pinnacle limestone (RPS 2011).

3.4 Topography

Site topography is generally undulating due to the presence of dune systems. The project area slopes upwards to the west from Baldivis Road at a minimum elevation of 5.5 mAHD (Australian Height Datum) to a ridge that extends north-south almost through the centre of the site at a maximum elevation of 39.5 mAHD (Figure 5). From here, the site falls northwest to a localised low point of 15 mAHD and to the north to a low of 17 mAHD (RPS 2011).

The steepest slopes occur to the east of the project area adjacent to Baldivis Road at up to 15 degrees. Surrounding vegetation is generally located down-slope of the project area. This is particularly apparent in Tramway Reserve to the east, meaning proposed built assets will be located up-slope from the predominant vegetation.

Prior to development, some sand mining is proposed to reduce levels through a north/south band across the site from a maximum of 38 mAHD down to 28 mAHD. This is required to enable provision of a water supply and will result in additional vegetation clearing requirements (Roberts Day 2011). Earthworks are preliminary at this stage, but the maximum grade that will be allowable for a road will be 10%, meaning final slopes throughout the site will be equal to or less than 10%.

3.5 Predominant soil types

The project area comprises sandy soils (S7 and S8 geological classification), which are stable and highly permeable (RPS 2011). The soil types are described as follows:

- S7 soils: derived from Tamala Limestone, these soils comprise the majority of the site except the lower-lying south-eastern corner and consist of pale yellowish brown sands, medium to course-grained sub-angular quartz, with traces of feldspar, moderately sorted and of residual origin (RPS 2011).
- S8 soils: Bassendean sands, located in the south-eastern corner of the project area, consist of very light grey sands at the surface, which change to yellow at depth, fine to medium-grained sand, sub-rounded quartz, moderately well sorted and of eolian origin (RPS 2011).

Figure 5 Site topography

Scale 1:9,000 at A4

0 50 100 150 200 250 m

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 23/10/2013

Author: JCrute

Source: Client 2013.

Legend

- Project area boundary
- Surface elevation (mAHD)

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3.6 Vegetation and flora

3.6.1 On-site vegetation extent

Vegetation complex mapping of the Swan Coastal Plain indicates the project area occurs within the Karrakatta Complex (Central and South), which is characterised by an open forest of *Eucalyptus gomphocephala* (Tuart)-*Eucalyptus marginata* (Jarrah)-*Corymbia calophylla* (Marri) and woodland of Jarrah-banksia species (Heddle et al. 1980, Figure 6).

Current land use across the project area has resulted in a highly modified environment compared to that outlined by regional vegetation complex mapping. Past agricultural use has resulted in large portions of the project area being completely cleared of native vegetation, with only small pockets of degraded or modified vegetation remaining on site in some areas. Consequently, the on-site vegetation extent consists of a cleared landscape with residual Tuart, Jarrah and Marri trees over a prominent grassland understorey. More specifically, the project area consists of the following, as outlined in RPS (2011):

- a large stand of Marri regrowth extending approximately 300 m west of Baldivis Road
- a large area of Tuart woodland and scattered Jarrah across the south-western portion of the site
- scattered Jarrah predominantly throughout Lot 635.

This parkland landscape is evident across the majority of the site, which is proposed to be predominantly cleared as part of the proposed residential development.

A 2009 spring flora and vegetation survey, as well as associated agency database searches, confirmed that no flora of conservation significance occur within the project area (RPS 2011).

3.6.2 Surrounding vegetation extent

The majority of the surrounding vegetation extent has also been significantly modified compared to regional vegetation complex mapping. New development areas to the north and west of the project area have produced a predominantly cleared landscape, which will be replicated to the south as part of a proposed development footprint. Residential and rural-residential land holdings located further to the east are also predominantly cleared of native vegetation.

The permanent vegetation extent is situated within Tramway Reserve to the east of the project area. The vegetation is relatively consistent with the Karrakatta Complex (Central and South) description, but with a higher proportion of *Allocasuarina fraseriana* (Sheoak), Jarrah, banksia and understorey weed invasion.

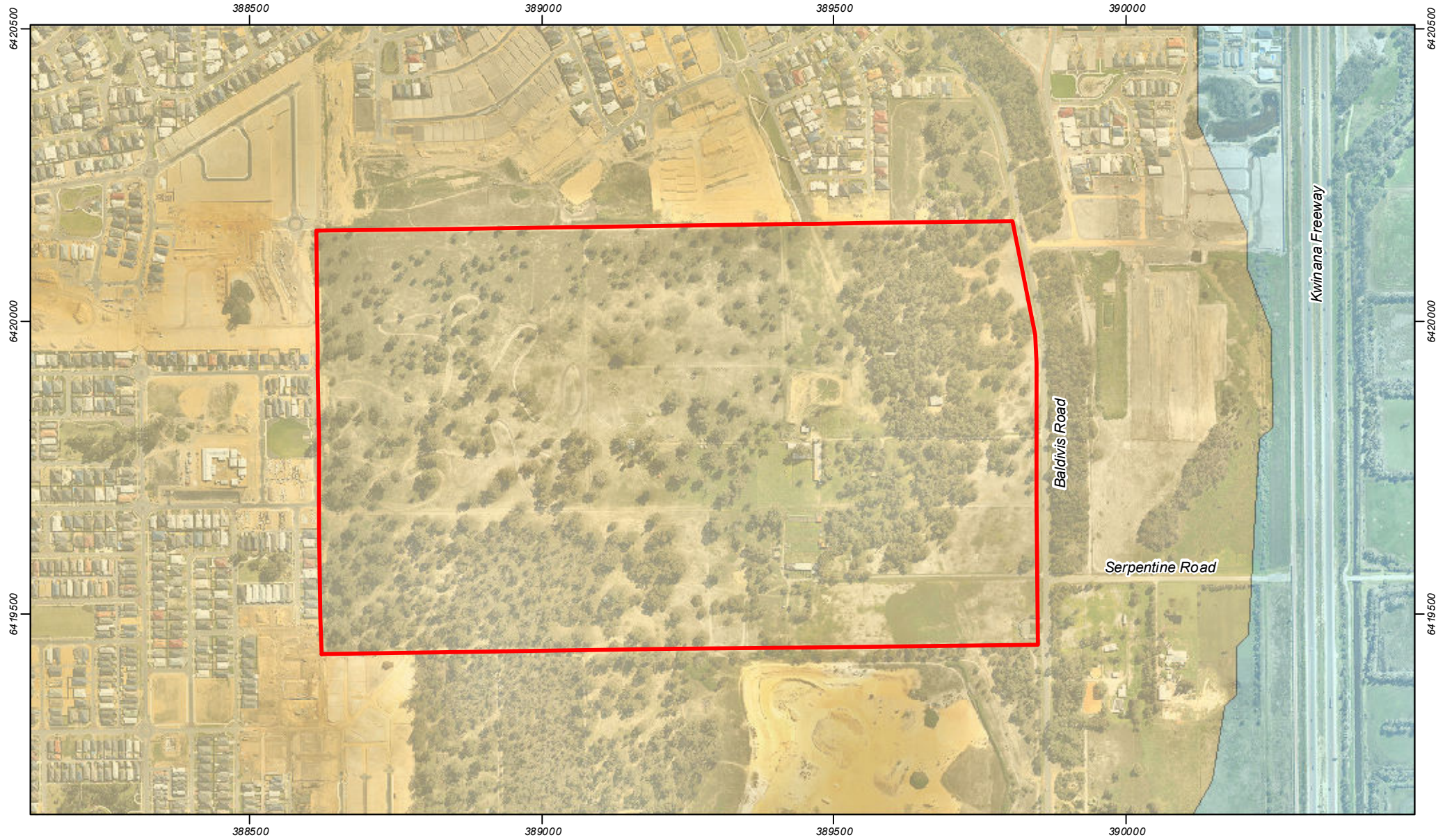

Figure 6 Vegetation complexes

Scale 1:9,000 at A4

0 50 100 150 200 250 m

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 23/10/2013

Author: JCrute

Source: Client 2013.

Legend

Project area boundary

Vegetation complex

Karrakatta complex - central and south

Serpentine River complex

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3.7 Land use

3.7.1 Current land use

The project area currently consists of undeveloped, agricultural land that was historically used for livestock grazing and has a residential dwelling accessed from Baldivis Road. Grazing is estimated to have ceased within the last five years. Lot 739 is currently used as a recreational paintball facility. The project area was previously operated as a poultry farm, although this activity has been discontinued and the associated buildings demolished (Roberts Day 2011).

The above land use is consistent with the current zoning classification of 'Urban Deferred' under the Metropolitan Region Scheme (MRS) and 'Development' under the City of Rockingham Town Planning Scheme No. 2 (DoP 2013).

3.7.2 Proposed land use

The project area is proposed to be developed in accordance with the LSP outlined in Figure 1 following the lifting of the 'Urban Deferred' zoning under the MRS. The LSP design proposes the creation of approximately 830 residential lots (with densities ranging from R20 through to R40), a primary school, aged care facility, community site and a neighbourhood centre (Roberts Day 2011). In addition, the design provides approximately 8.46 ha of Public Open Space (POS) set within a highly legible road network that connects the development to adjoining residential estates.

The 10 POS areas outlined in Figure 7 will provide both restricted and unrestricted POS to service drainage and local amenity requirements of the development. The following will be achieved for POS areas as part of the proposed development:

- existing native trees will be retained where possible, particularly within the Parmelia Gas Pipeline easement and POS attached to the primary school
- revegetation of POS areas using local native species where available to assist in enhancing potential habitat for native fauna.

3.7.3 Surrounding land use

Proposed residential development of the project area is consistent with the surrounding pattern of urban development, as described in the South Baldivis District Structure Plan and approved LSPs for adjoining lands.

Land surrounding the project area comprises numerous approved residential estates, such as Highbury Park to the north, Smirk Road and another residential estate to the west and Heritage Park Private Estate to the east (Figure 3). Preliminary planning has also commenced for proposed development of Lots 19, 20 and 21 located south of the project area. The extent of current and proposed urban development in the locality has resulted in a predominantly cleared landscape, with the remaining vegetation extent and associated bush fire hazard limited to isolated remnants.

A 'Parks and Recreation Reserve' (Tramway Reserve) located adjacent east of the project area forms a vegetated, linear reservation extending 22 km between the Beeliar and Serpentine Regional Parks, recognising the alignment of the former tramway corridor. The adjacent east Tramway Reserve is considered the only permanent source of significant vegetation and bush fire hazard in the vicinity of the project area.

Source: Roberts Day 2011

STRATEGEN	Fire Management Plan: Lots 635, 739 and 740 Baldivis Road Public Open Space Plan	Figure 7

3.8 Site assets

3.8.1 Current site assets

Life and property assets of the project area are currently limited to a single dwelling and associated rural infrastructure, as well as a visitor presence associated with the recreational paintball facility. These assets are proposed to be removed on development of the site. Environmental assets are also maintained on site in the form of numerous potential habitat trees for avian fauna of conservation significance. The majority of trees will be cleared to accommodate the proposed development.

3.8.2 Proposed assets

Proposed development of the project area will result in significant intensification of life and property assets across the site in the form of 830 residential lots (with densities ranging from R20 through to R40), a primary school, aged care facility, community site and a neighbourhood centre. Following development of the project area, environmental assets will be limited to retained vegetation and revegetated areas within POS, which aims to use local native species to enhance potential habitat for native fauna.

3.9 Water supply

Water supply for the proposed development will be connected to the existing reticulated system through extension from adjoining residential estates. Water Corporation has provided advice that the land can be serviced with reticulated water to a level of 30 mAHD, meaning portions of the landscape elevated above this level will be cut down to achieve the desired elevation (Roberts Day 2011).

3.10 Power supply

Power supply for the proposed development will be connected to the existing underground system through extension from adjoining residential estates or by extension from Baldivis Road (Roberts Day 2011).

3.11 Site access

The project area is currently accessed via driveways navigating west off Baldivis Road. Numerous internal access tracks provide access throughout each lot.

The proposed development provides east/west connections from Baldivis Road through to residential estates to the west and facilitates future connections north to south through the site (Roberts Day 2011). In addition, the proximity of the site to the Kwinana Freeway provides high speed access to Perth and Mandurah.

The local road network enables safe and legible movement throughout the site and to adjoining development areas and includes proposed routes for future public transport services. The proposed road network is highly connected, maximising pedestrian permeability (Roberts Day 2011).

Dual use paths are proposed to be provided on neighbourhood connectors with footpaths adjacent to open space and on the higher order local access streets.

4. Fire problem

4.1 Bush fire history

Uncontrolled bush fires are common occurrences in the City of Rockingham. The most recent uncontrolled bush fires to occur in the vicinity of the project area are as follows:

- 13 December 2010: a fire ignited at 1:12 pm between Baldivis Road and Kwinana Freeway, north of Safety Bay Road, and burnt 20 ha of bushland. Fire crews saved four homes and several sheds. Part of the woodland vegetation within Tramway Reserve was burnt.
- 30 November 2010: a fire ignited in Rockingham Lakes Regional Park approximately seven kilometres south of the project area. The fire took several days to contain. Over 40 homes were threatened and over 530 hectares of woodland vegetation was burnt.
- 12 April 2009: a fire ignited near Eighty and Fifty Road and DFES warned residents to close all doors and windows and turn off evaporative coolers. Fifty Road was closed between Baldivis Road and Safety Bay Road. This fire affected a large proportion of Rockingham Lakes Regional Park (Bush Forever Site 356) and a total of 780 ha of woodland vegetation was burnt.

In general, City of Rockingham is susceptible to a range of potential ignition sources, most notably suspected arson and accidental causes such as vehicle accidents, sparks from industrial/agricultural work and power line faults.

There are numerous emergency service resources in the City of Rockingham that could provide a suppression response to the project area within 15 minutes, including local and career bush fire brigades at Baldivis, Rockingham, Secret Harbour and Singleton.

4.2 Bush fire hazards

A bush fire hazard assessment aims to classify the bush fire hazard at both the strategic and local level, which leads to an assessment of the Bushfire Attack Level (BAL). A bush fire hazard assessment has been undertaken across the project area and adjacent land in accordance with procedures outlined in PFBFP Guidelines.

4.2.1 Classifying the bush fire hazard level

Fuel hazard assessment

A comprehensive fuel hazard assessment of the project area and adjacent land was undertaken by Strategen during a site visit on 17 September 2013. The assessment was undertaken on the basis of a visual inspection of the following factors in accordance with the *Visual Fuel Load Guide for the Scrub Vegetation of the Swan Coastal Plain* (FESA 2012):

- vegetation type and structure
- vegetation condition and density
- fuel age
- scrub extent
- litter and trash accumulation.

On-site fuel hazards

On-site fuel hazards comprise open woodland of Tuart, Jarrah and Marri with an understorey of long un-grazed pasture grasses and weeds (Plate 4 and Plate 5). Available fuel loads were estimated to be up to 5 t/ha due to the long un-grazed nature of the understorey fuels and subsequent accumulation of trash and litter (Plate 6). The majority of on-site vegetation is proposed to be removed on development of the project area, with isolated trees retained and managed in POS areas.

Plate 4 Large area of Tuart woodland and scattered Jarrah across the south-western portion of the site

Plate 5 Large stand of Marri regrowth extending approximately 300 m west of Baldivis Road

Plate 6 Accumulation of on-site trash and litter fuels due to long un-grazed nature of understorey grasses

Surrounding fuel hazards

Fuel hazards within the adjacent east Tramway Reserve consist of woodland of Jarrah, Sheoak and banksia over a weed infested grassland understorey. Available fuel loads vary throughout the reserve due to an irregular fire history, with some areas containing evidence of a burn approximately four years ago, and other areas clearly long unburnt with very high trash and litter accumulation. Available fuel loads were estimated to be approximately 5–8 t/ha throughout burnt areas (Plate 7) and up to 30 t/ha throughout long unburnt areas (Plate 8) and these are expected to increase if annual management is not implemented. Fuel hazards within the Tramway Reserve are located down-slope of the project area and considered the only permanent source of bush fire hazard in the vicinity of the project area.

The Tramway Reserve is 50 m wide and has a potentially long fire run from the north. Baldivis Road provides approximately 20 m hazard separation between the Tramway Reserve and the eastern project area boundary (Plate 9).

Fuel hazards within adjacent south Lots 19 and 20 consist of woodland of banksia and Sheoak over a native grass and sedge understorey (Plate 10). Tuart trees once occupied this area but the majority have since been harvested. There is no evidence of past bush fire occurrence or fuel hazard reduction and consequently, available fuel loads were estimated to be up to 10 t/ha with capacity to increase if annual management is not implemented (Plate 11). These lots are currently subject to structure planning and proposed residential development will remove the majority of native vegetation from within this area.

Fuel hazards within the adjacent south Lot 21 and sand quarry were not considered to be significant. They contain open woodland vegetation of scattered banksia, Sheoak, Jarrah and Tuart trees around large, cleared areas. Available fuel loads were estimated to be up to 5 t/ha, which will be removed on future development of the lots.

Plate 7 Burnt areas of Tramway Reserve (5–8 t/ha)

Plate 8 Long unburnt areas of Tramway Reserve (up to 30 t/ha)

Plate 9 20 m hazard separation to the east provided by Baldivis Road

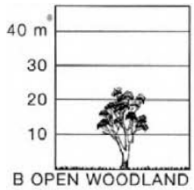
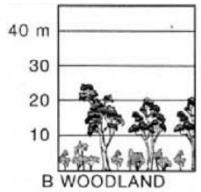
Plate 10 Woodland of banksia and Sheoak over a native grass and sedge understorey within adjacent south Lots 19 and 20

Plate 11 Accumulation of Sheoak bark and litter within adjacent south Lots 19 and 20 (up to 10 t/ha)

Vegetation class and type

Further to the abovementioned fuel hazard assessment, vegetation class and type was assessed for the project area and adjacent land in accordance with procedures outlined in PFBFP Guidelines (Table 2).

Table 2 Predominant vegetation class and type

Vegetation location and fuel load	Vegetation classification	Vegetation type	Figure	Description
On-site open woodland (up to 5 t/ha)	(B) Woodland	Open woodland	 B OPEN WOODLAND FIGURE 2.2-06	Trees 10–30 m high; 10-30% foliage cover dominated by eucalypts; understorey low trees to tall shrubs typically dominated by Acacia, Callitris or Casuarina.
Adjacent south open woodland within Lot 21 and sand quarry (up to 5 t/ha)				
Adjacent east woodland within Tramway reserve (up to 30 t/ha	(B) Woodland	Woodland	 B WOODLAND FIGURE 2.2-05	
Adjacent south woodland within Lots 19 and 20 (up to 10 t/ha)				

Location of bush fire hazards

The location of existing bush fire hazard areas is outlined in the vegetation class map (Figure 8). This map has been created using the abovementioned vegetation class and type descriptions and assessed available fuel loads.

Bush fire hazard levels

Bush fire hazard levels of the predominant vegetation in and around the project area are displayed in the bush fire hazard assessment map (Figure 9). Classifying the bush fire hazard by assessing the predominant vegetation is a key to the initial determination of site suitability for development. This also leads to determination of the potential level of construction standard by the application of AS 3959–2009 *Construction of buildings in bushfire prone areas* for any proposed development (SA 2009).

The pre-development, on-site bush fire hazard level is ‘Moderate’, due to the project area containing open woodland vegetation on slopes of up to 15 degrees.

The pre-development bush fire hazard level within surrounding land is predominantly ‘Low’, which is consistent with significant areas of surrounding developed land. Smaller areas of ‘Moderate’ and ‘Extreme’ bush fire hazards are contained in isolated areas of open woodland to the south and woodland to the south and east.

According to PFBFP Guidelines, land with an assessed ‘Moderate’ to ‘Extreme’ bush fire hazard level is classified as bush fire prone land, which triggers application of AS 3959–2009 for any proposed development (WAPC et al. 2010).

Figure 8 Vegetation class map

Scale 1:9,000 at A4

0 50 100 150 200 250 m

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 23/10/2013

Author: JCrute

Source: Client 2013.

Legend

- Project area boundary
- **Vegetation class**
- Open woodland (up to 5 t/ha)
- Woodland (up to 10 t/ha)
- Woodland (up to 30 t/ha)

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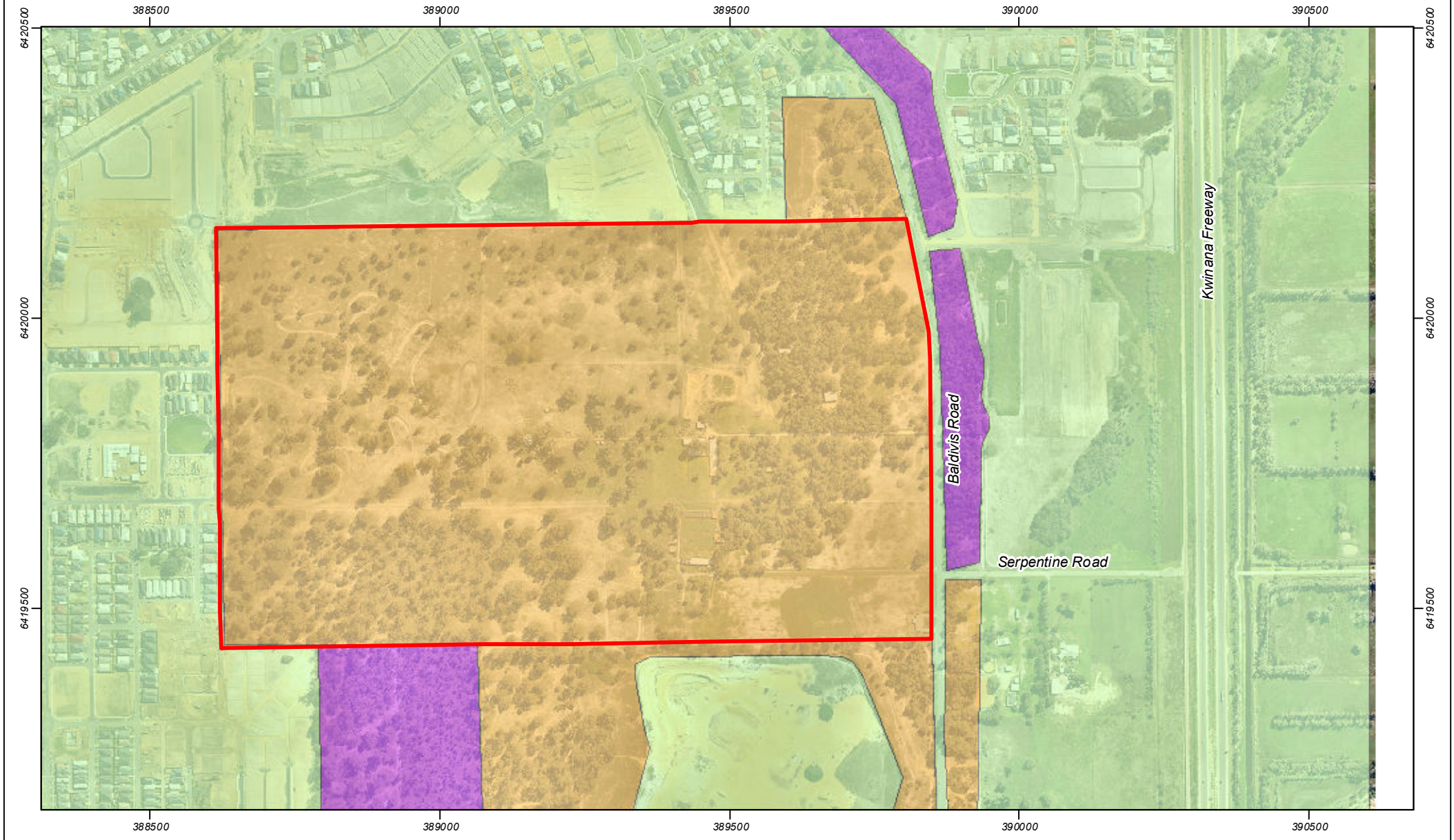

Figure 9 Bush fire hazard assessment map

Scale 1:9,000 at A4

0 50 100 150 200 250 m

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 23/10/2013

Author: JCrute

Source: Client 2013.

Legend

- Project area boundary
- **Bush fire hazard level**
- Low bush fire hazard level
- Moderate bush fire hazard level
- Extreme bush fire hazard level

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4.3 Bush fire hazard performance criteria

The relationship between the various bush fire hazard levels and development performance criteria is set out in Table 3. The project area and majority of surrounding land to the north, west and south will maintain a 'Low' bush fire hazard rating following current and proposed development of the locality. However, since the project area is situated within 100 m of permanent, 'Extreme' bush fire hazards to the east in Tramway Reserve, a comprehensive suite of bush fire risk mitigation measures will need to be implemented to protect future assets of the site from these hazards.

Compliance with performance criteria for a moderate bush fire hazard level will be achieved as a precaution, focussing on the key areas of development location, vehicular access, water supply, siting of development and design of development. Performance criteria for these elements will be achieved through adoption of recommended acceptable solutions in accordance with PFBFP Guidelines.

Table 3 Bush fire hazard levels and performance criteria

Bush fire hazard level	Bush fire protection performance criteria required
Low hazard	Development does not require special bush fire planning controls. Despite this, DFES strongly recommends that ember protection features be incorporated in design where practicable.
Moderate hazard	Performance criteria for: • location (Element 1) • vehicular access (Element 2) • water (Element 3) • siting of development (Element 4) • design of development (Element 5).
Extreme hazard	Development is to be avoided in areas with these hazard levels.

Source: WAPC et al. 2010

Compliance of the LSP development with bush fire protection performance criteria and associated acceptable solutions is documented in the compliance checklist (Appendix 1).

4.4 Classifying the Bushfire Attack Level (BAL)

This procedure, as outlined in PFBFP Guidelines and AS 3959–2009, uses a combination of the state-adopted Fire Danger Index rating of FDI 80, vegetation class, slope and the distance maintained between proposed development areas and predominant vegetation to specify the BAL[1]. Based on the specified BAL, construction requirements for proposed buildings can then be assigned.

In accordance with the LSP for the proposed development, a minimum 40 m low fuel separation distance will be provided between individual dwellings of the proposed development and the permanent 'Extreme' bush fire hazards to the east. The buffer will consist of 20 m provided by Baldivis Road (Plate 9) and an additional 20 m provided by the proposed internal road reserve, footpaths and building setbacks. The predominant vegetation class within Tramway Reserve is 'Woodland' and proposed buildings will be located up-slope at up to 10 degrees. These parameters trigger the implementation BAL 19 construction standards for external lots along the eastern boundary; and BAL 12.5 construction standards for internal lots within 100 m of Tramway Reserve, as indicated in Table 4.

[1] A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat, expressed in kilowatts per square metre, which is the basis for establishing the requirements for construction to improve protection of building elements from attack by bush fire.

Table 4 Determination of Bushfire Attack Level (BAL)

Vegetation class	Bush fire attack level (BAL)				
	BAL FZ	BAL 40	BAL 29	BAL 19	BAL 12.5
	Distance (m) of the site from the predominant vegetation class				
	Vegetation is down-slope (building is up-slope) >5 to 10 degrees				
(B) Woodland	<16 (not appropriate)	16–<22 (not appropriate)	22–<31	31–<43	43–<100

Source: WAPC et al. 2010

Recommended BAL for external lots along the eastern boundary

Recommended BAL for internal lots within 100 m of Tramway Reserve

The relevant sections of AS 3959–2009 that outline construction standards for buildings in areas specified as BAL 12.5 and BAL 19 are provided in Table 5. Construction standards for BAL 12.5 and BAL 19 are fully explained in Appendix 3.

Table 5 Construction standards

BAL	Classified vegetation within 100 m of the site and heat flux exposure thresholds	Description of predicted bush fire attack and levels of exposure	AS 3959–2009 section
BAL 12.5	≤12.5 kW/m^2	Ember attack	3 and 5
BAL 19	>12.5 kW/m^2 ≤19 kW/m^2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux.	3 and 6

Source: WAPC et al. 2010

4.5 Inherent bush fire risk

An inherent bush fire risk assessment has been undertaken for the project area under pre-development conditions, which quantifies the level of risk of loss or damage to site assets from uncontrolled bush fire, prior to the implementation of bush fire risk treatment and mitigation measures.

The risk assessment is derived from the DFES *Rural Urban Bush Fire Threat Analysis* (Smith 2003) and Australian Standard/New Zealand Standard AS/NZS ISO 31000:2009 *Risk management – Principles and guidelines* (SA & SNZ 2009). Risks are evaluated through determining likelihood and consequence of ignition, as well as a scoring system based on the parameters outlined in Table 6.

Results of the risk assessment are outlined in Table 6. The assessment revealed that the inherent risk of loss or damage to current site assets from uncontrolled bush fire is 'Moderate', mainly due to the on-site fuel hazard rating, current level of resident and visitor presence and probability of wildfire occurrence.

Table 6 Inherent bush fire risk assessment for the project area

Parameter	Risk to site assets
On-site fuel hazard rating	Moderate
Are assets located up-slope from vegetation?	Yes
Are assets located in the flame zone?	No
Resident/visitor presence (low, moderate, high)	Moderate
Values or assets (low, moderate, high)	High
Fire unit access risk (low, moderate, high)	Moderate
Fire suppression response time (minutes)	<15
Probability of wildfire occurrence (low, moderate, high)	Moderate
Level of bush fire management (low, moderate, high)	Moderate
Overall inherent risk (low, moderate, high)	**Moderate**

4.6 Summary of key bush fire issues

The following is a summary of key bush fire issues for the project area, which have been taken into consideration in developing bush fire risk mitigation measures for the proposed residential development:

1. Uncontrolled bush fires are common occurrences in the City of Rockingham, which is susceptible to a range of potential ignition sources, most notably suspected arson and accidental causes.
2. Normal response times to an uncontrolled bush fire occurring within or adjacent to the project area are expected to be within 15 minutes from local bush fire brigades stationed at Baldivis, Rockingham, Secret Harbour and Singleton.
3. The predominant on-site bush fire hazards consist of open woodland of Tuart, Jarrah and Marri with an understorey of long un-grazed pasture grasses and weeds (up to 5 t/ha, 'Moderate' bush fire hazard level). This hazard is expected to be reduced to a 'Low' rating on clearing and development of the site.
4. The predominant, permanent bush fire hazards within surrounding land are located within Tramway Reserve and consist of woodland of Jarrah, Sheoak and banksia over a weed infested grassland understorey (up to 30 t/ha, 'Extreme' bush fire hazard).
5. The remaining level of bush fire hazard throughout adjacent lands is predominantly 'Low', which is consistent with the significant level of land development to the north and west of the project area. 'Moderate' and 'Extreme' bush fire hazards to the south will be reduced to a 'Low' rating in the short term following proposed development of this area.
6. As a precaution, performance criteria and acceptable solutions will be achieved for a 'Moderate' bush fire hazard level, focussing on the key elements of development location, vehicular access, water supply, siting of development and design of development.
7. The eastern portion of the project area is proposed to be situated up-slope at up to 10 degrees from permanent, 'Extreme' bush fire hazards within Tramway Reserve. Consequently, proposed assets within the eastern portion of the project area are considered to be subject to the highest, ongoing bush fire risk.
8. This triggers the application of AS 3959–2009 and implementation of heightened levels of construction standard for buildings within those lots situated within 100 m from 'Extreme' bush fire hazard to the east.
9. A minimum 40 m low fuel separation distance is proposed between future built assets of the development and predominant 'Woodland' vegetation to the east within Tramway Reserve. As such, BAL 19 construction standards are recommended for all external lots along the eastern boundary; and BAL 12.5 construction standards are recommended for all internal lots within 100 m of Tramway Reserve.
10. The inherent bush fire risk to current life and property assets of the project area is 'Moderate', which is mainly due to the on-site fuel hazard rating, current level of resident and visitor presence and probability of wildfire occurrence in the locality.

5. Bush fire risk mitigation

The following subsections outline how the proposed LSP development will mitigate the inherent bush fire risk to life, property and the environment to achieve a suitable and effective bush fire management outcome for the site. This will be achieved by meeting performance criteria and associated acceptable solutions in accordance with PFBFP Guidelines. Where applicable, these measures are illustrated on an aerial image of the project area in Figure 11 to assist with implementation of the FMP.

5.1 Development location

Strategic location, layout and management of future development at the planning stage can reduce future fire threat and risk to critical life and property assets.

The project area currently maintains a 'Moderate' bush fire hazard rating; however, this will be reduced to a 'Low' hazard rating following vegetation clearance and proposed development, which will result in maintenance of a significant built footprint across the site.

Approximately 8.46 ha of POS will be maintained throughout 10 locations to service drainage and local amenity requirements of the development. The POS concept will specifically aim to achieve the following:

- retain existing native trees where possible, particularly within the Parmelia Gas Pipeline easement and POS attached to the primary school
- revegetate POS areas, using local native species where available.

All POS areas will be subject to vegetation management on an ongoing basis to ensure available fuel loads are maintained annually within 2 t/ha. This can be achieved through retention of the overstorey and mechanical management of understorey fuels (i.e. slashing or mowing) and through manual removal of trash and litter fuels. This will result in creation of a 'Low' bush fire hazard rating across all POS areas.

The above measures will ensure the development is not located on land subject to either an extreme bush fire hazard level or construction standards applicable to BAL 40 or BAL FZ. This meets performance criteria for development location (Element 1) by adopting acceptable solution A1.1.

5.2 Vehicular access

The proposed LSP development will provide a comprehensive internal road network. The proposed road network provides up to 16 links to the surrounding public road network in Baldivis Road to the east and current/proposed residential estates to the north, south and west. This measure adopts acceptable solution A2.1 by ensuring all residents and visitors of the development are provided with at least two vehicular access routes connecting to the surrounding public road network at all times.

All public roads and private driveways will be constructed to specifications in accordance with Main Roads WA and DFES requirements (which align with acceptable solutions A2.2 and A2.5).

The on-site vegetation extent will be predominantly cleared on implementation of the proposed development; therefore, emergency access ways, fire service access routes, gates, firebreaks and associated signage are not considered necessary as part of the development. The external road network, particularly Baldivis Road, is considered sufficient to provide emergency service access in the event that wildfire threatens the site in adjacent bushland areas.

The above measures will ensure the development meets performance criteria for vehicular access (Element 2).

5.3 Water supply

A reticulated water supply will be provided to the proposed LSP development through extension of the existing system from adjoining residential estates.

A network of hydrants will also be provided along the internal road network at locations which meet relevant water supply authority and DFES requirements.

The above measures will ensure the development meets performance criteria for water supply (Element 3) by adopting acceptable solution A3.1.

5.4 Siting of development

When considering the overall bush fire management of the project area, protection should be afforded to critical life and property assets (residents, visitors and built assets) as a minimum requirement. Low fuel buffers between fire hazard areas and critical assets, as well as application of AS 3959–2009, can be implemented to achieve this.

Bush fire hazards within the adjacent east Tramway Reserve are considered the predominant, long term bush fire risks to the project area. Consequently, AS 3959-2009 and sufficient defendable space in the form of Building Protection Zones (BPZs) and Hazard Separation Zones (HSZs) will need to be applied to adequately protect proposed built assets from the bush hazards within Tramway Reserve.

5.4.1 Application of AS 3959–2009

Heightened levels of construction standard are recommended for all buildings within lots on the eastern periphery of the project area as a result of the increased BAL imposed by the adjacent bushland within Tramway Reserve (refer to BAL assessment outlined in Section 4.4). Construction standards will be increased to:

- BAL 19 for all buildings within external lots along the eastern boundary
- BAL 12.5 for all buildings within internal lots located within 100 m of Tramway Reserve.

Lots requiring increased construction standards are depicted in Figure 11. Remaining lots of the development will not be required to apply heightened levels of construction standard since they will not be subject to significant levels of bush fire attack.

5.4.2 Low fuel buffers

Buildings within lots designated as BAL 19 and BAL 12.5 will need to have low fuel buffers implemented in accordance with AS 3959–2009. This will be achieved through provision of a minimum 40 m low fuel separation distance between built assets of the project area and ‘Extreme’ bush fire hazards of Tramway Reserve. The low fuel buffer will be in the form of a BPZ and will comprise:

- 20 m wide Baldivis Road reserve
- 20 m wide internal road reserve, footpaths and building setbacks.

The above buffer distance is suitable to achieve the specified BALs. There is no requirement for further hazard separation around the BPZ since the level of building construction has been increased in accordance with PFBFP Guidelines.

The above measures will ensure the development meets performance criteria for siting of development (Element 4) by adopting acceptable solution A4.1, A4.2, A4.3 and A4.5. These measures are provided schematically in Figure 10.

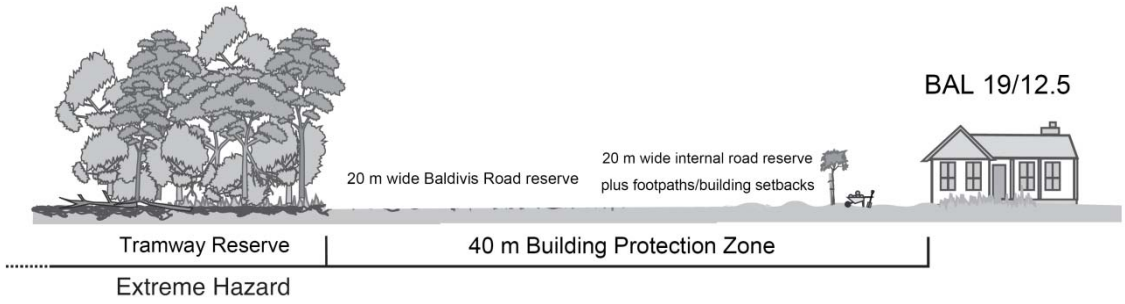

Figure 10 Bush fire risk mitigation to achieve performance criteria for siting of development

5.5 Design of development

Development design, as indicated in Figure 1, is expected to reduce the vulnerability of life and property from the affects of bush fire and greatly assist bush fire prevention and suppression operations. Given the proposed development is considered to comply with development location (Element 1), vehicular access (Element 2), water supply (Element 3) and siting of development (Element 4), compliance with design of development (Element 5) is achieved through adoption of acceptable solution A5.1.

5.6 Additional bush fire risk mitigation

The following measures will be considered in addition to those outlined previously to provide a more thorough level of bush fire protection to the project area:

1. Development staging: the proposed development will be staged such that any residences abutting vegetated land subject to future urban development will not be constructed until the bush fire hazard on the abutting vegetated land has been adequately reduced through clearing and development. This is relevant for proposed residences which abut vegetated Lots 19, 20 and 21 to the south.
2. Fire safe refuge areas: the neighbourhood centre is the designated fire safe refuge area for residents and visitors of the LSP development. The neighbourhood centre is central to the development, easily accessible and maintains sufficient distance to surrounding bush fire hazard areas. Residents and visitors of the proposed development should evacuate to the neighbourhood centre in the event that wildfire threatens lives or property within or adjacent to the site.
3. Annual fuel inspections: these may be undertaken by CoR staff and failure to comply with this FMP and the specified requirements of the current CoR fire control notice may result in the issuing of fines of up to $250 (refer to Appendix 4 for the current CoR fire control notice).
4. Landowner education and awareness: landowners should be provided a copy of local government and DFES bush fire information booklets that are currently available. In addition, attendance by landowners at annual DFES bush fire awareness briefings would be advantageous.

5.7 Summary of bush fire risk mitigation and works program

A summary of the bush fire risk mitigation measures described in Section 5 and a works program is provided in Table 7. These measures will be implemented to ensure ongoing protection of on-site assets is achieved. Additional optional techniques are also provided and can be adopted by residents to further mitigate their risk to life and property from uncontrolled bush fires. Responsibilities are also defined to assist with implementation of each management measure.

Table 7 Summary of bush fire risk mitigation measures and works program

Bush fire risk mitigation	Recommended works	Timing	Responsibility
Development location	Undertake clearing and development in accordance with the LSP to ensure the site maintains a low bush fire hazard level. Refer to FMP Section 5.1.	On implementation of the LSP development	Developer
	Manage all POS areas within 2 t/ha through retention of the overstorey and mechanical management of understorey fuels (i.e. slashing or mowing) and through manual removal of trash and litter fuels. Refer to FMP Section 5.1.	Annually, prior to the onset of the designated bush fire season	Developer during development, CoR thereafter
Vehicular access	Provide a comprehensive internal road network in accordance with the LSP to ensure all residents and visitors of the development are provided with at least two vehicular access routes connecting to the surrounding public road network at all times. Refer to FMP Section 5.2.	On implementation of the LSP development	Developer
	Construct all public roads and private driveways in accordance with Main Roads WA and DFES requirements. Refer to FMP Section 5.2.	On implementation of the LSP development	Developer
Water supply	Provide a reticulated water supply through extension of the existing reticulated system from adjoining residential estates. Refer to FMP Section 5.3.	On implementation of the LSP development	Developer
	Provide a network of hydrants along the internal road network at locations which meet relevant water supply authority and DFES requirements. Refer to FMP Section 5.3.	On implementation of the LSP development	Developer
Siting of development	Apply AS 3959–2009 and heightened levels of construction standard for all buildings proposed within lots designated in Figure 11 as BAL 19 and BAL 12.5. Refer to FMP Section 5.4.1 and Figure 11.	On development of individual lots	Developer
	Provide a minimum 40 m low fuel buffer to the east of lots designated in Figure 11 as BAL 19 and BAL 12.5. Refer to FMP Section 5.4.2 and Figure 11.	On implementation of the LSP development	Developer
Design of development	Comply with all acceptable solutions for development location (Element 1), vehicular access (Element 2), water supply (Element 3) and siting of development (Element 4). Refer to FMP Section 5.5.	On implementation of the LSP development	Developer
Development staging	Stage the development to ensure any residences abutting vegetated land subject to future urban development will not be constructed until the bush fire hazard on the abutting vegetated land has been adequately reduced through clearing and development. This is relevant for proposed residences which abut vegetated Lots 19, 20 and 21 to the south. Refer to FMP Section 5.6.	On implementation of the LSP development	Developer
Fire safe refuge areas	Residents and visitors to take refuge at the neighbourhood centre if wildfire threatens lives and property on or adjacent to the site. Refer to FMP Section 5.6.	In the event of wildfire on or adjacent to the site	Residents and visitors
Annual fuel hazard inspections	Comply with the current CoR fire control notice. Refer to Appendix 5.	Annually, prior to the onset of the designated bush fire season	Developer, CoR and perspective landowners
	Undertake an inspection of fuel hazards across the LSP area to assess compliance with the FMP and annual fire control notice. Refer to FMP Section 5.6.	Annually, prior to the onset of the designated bush fire season	CoR staff
	Issue work orders or fines where compliance with the *Bush Fires Act 1954* or the FMP has been compromised. Refer to FMP Section 5.6.	Annually, prior to the onset of the designated bush fire season	CoR staff

Bush fire risk mitigation	Recommended works	Timing	Responsibility
Landowner education and awareness	Distribution of bush fire information booklets and attendance at annual DFES bush fire awareness briefings. Refer to FMP Section 5.6.	Annually	Perspective landowners, CoR, DFES
Optional building requirements	Restriction on the installation of evaporative air-conditioners, mesh screens or shutters. Installation of residential building sprinkler systems.	On implementation of the LSP development	Developer, perspective landowners
Restricted and prohibited burning times	Comply with the annual fire control notice and DFES/CoR-determined burning periods. Refer to Appendix 5.	As specified by DFES/CoR	CoR, perspective landowners
FMP review	Review the social, financial and environmental benefits of the FMP and level of compliance, and update accordingly.	Five yearly	CoR

6. Implementation of the Fire Management Plan

6.1 Implementation of bush fire risk mitigation measures

The full range of bush fire risk mitigation measures and location of implementation as specified in this FMP is provided in Figure 11, which is overlain on an aerial image of the project area to assist with implementation.

6.2 Residual bush fire risk

The residual bush fire risk is the level of risk remaining after the LSP development and associated bush fire risk mitigation measures have been implemented. A residual bush fire risk assessment for the project area is provided in Table 8.

The residual bush fire risk to life and property assets was assessed as low, due to the increased level of bush fire management proposed across the site and the subsequent expected reduction in on-site fuel loads, access risk and probability of wildfire occurrence.

Table 8 Residual bush fire risk assessment for the project area

Parameter	Risk to site assets
On-site fuel hazard rating	Low
Are assets located up-slope from vegetation?	Yes
Are assets located in the flame zone?	No
Resident/visitor presence (low, moderate, high)	High
Values or assets (low, moderate, high)	High
Fire unit access risk (low, moderate, high)	Low
Fire suppression response time (minutes)	<15
Probability of wildfire occurrence (low, moderate, high)	Low
Level of bush fire management (low, moderate, high)	High
Overall inherent risk (low, moderate, high)	**Low**

6.3 Assessment of bush fire management measures

Implementation of the bush fire management measures outlined in this FMP will ensure that should a wildfire occur within or adjacent to the project area, fire intensity on-site will be minimised and life, property and environmental assets are expected to be protected. In addition, a fire occurring on the site is highly likely to be readily contained within 15 minutes, which is the normal emergency response time provided by local bush fire brigades.

The cost of undertaking the various tasks and initiatives outlined in the FMP will provide significant cost benefit to the developer and perspective landowners when compared with the possible loss of life, infrastructure and environmental values of the site.

Five yearly review of the FMP will assess the social, financial and environmental effectiveness of the management measures described in Section 5.

Figure 11 Fire Management Plan: Lots 635, 739 and 740 Baldivis Road

Scale 1:9,000 at A4

0 50 100 150 200 250 m

Coordinate System: GDA 1994 MGA Zone 50

Note that positional errors may occur in some areas

Date: 23/10/2013

Author: JCrute

Source: Client 2013.

Legend

- Public vehicular access points
- Project area boundary
- Roads
- Road reserve
- Existing cadastre
- 100 m Buffer to 'Extreme' bush fire hazard area

Increased construction standards

- BAL 12.5
- BAL 19

- Aged care facility
- Civic and cultural
- Grouped housing
- Neighbourhood centre
- POS
- Primary school

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6.4 Legislative requirements, specifications and standards

The legislative requirements, specifications and standards applicable to implementation of this FMP are referenced in Section 7 and Appendix 5 and pertain to the following:

- *Bush Fires Act 1954*
- *Planning and Development Act 2005*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Environmental Protection Act 1986*
- *Wildlife Conservation Act 1950*
- Building Code of Australia
- Planning for Bush Fire Protection Guidelines (Edition 2)
- Australian Standard AS 3959–2009 Construction of Buildings in Bushfire Prone Areas
- current City of Rockingham Fire Control Notice.

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Appendix 1
Fire Management Plan compliance checklist

Compliance checklist for performance criteria and acceptable solutions

Element	Acceptable solution	Compliance	Yes/No	Explanation (if no)
1. Location	A1.1 Development location	Does the proposal comply with performance criteria P1 by applying acceptable solution A1.1?	Yes	
2. Vehicular access	A2.1 Two access routes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.1?	Yes	
	A2.2 Public roads	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.2?	Yes	
	A2.3 Cul-de-sacs	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.3?	N/A	
	A2.4 Battle axes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.4?	N/A	
	A2.5 Private driveways	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.5?	Yes	
	A2.6 Emergency access ways	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.6?	N/A	
	A2.7 Fire service access routes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.7?	N/A	
	A2.8 Gates	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.8?	N/A	
	A2.9 Firebreak widths	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.9?	N/A	
	A2.10 Signs	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.10?	N/A	
3. Water	A3.1 Reticulated areas	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.1?	Yes	
	A3.2 Non-reticulated areas (a)	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.2?	N/A	
	A3.3 Non-reticulated areas (b)	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.3?	N/A	
4. Siting of development	A4.1 Hazard separation – moderate to extreme bush fire hazard level	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.1?	Yes	
	A4.2 Hazard separation – low bush fire hazard level	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.2?	Yes	
	A4.3 Building protection zone	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.3?	Yes	
	A4.4 Hazard separation zone	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.4?	Yes	
	A4.5 Reduction in bush fire attack level due to shielding	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.5?	Yes	
5. Design of development	A5.1 Compliant development	Does the proposal comply with performance criteria P5 by applying acceptable solution A5.1?	Yes	
	A5.2 Non-compliant development	Does the proposal comply with performance criteria P5 by applying acceptable solution A5.2?	N/A	

Note: Performance criteria and acceptable solutions are in accordance with *Planning for Bush Fire Protection Guidelines (Edition 2)* (WAPC et al. 2010).

Applicant Declaration

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

Full name: Roger Banks

Applicant signature: 

Date: 1/11/2013

Appendix 2

January wind profiles for Medina Research Centre

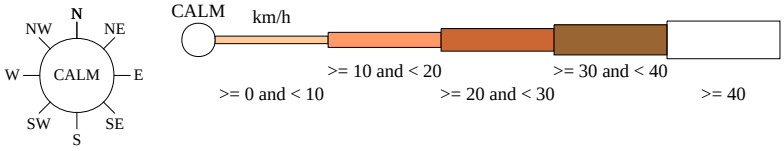
Rose of Wind direction versus Wind speed in km/h (01 Apr 1983 to 30 Sep 2010)

Custom times selected, refer to attached note for details

MEDINA RESEARCH CENTRE

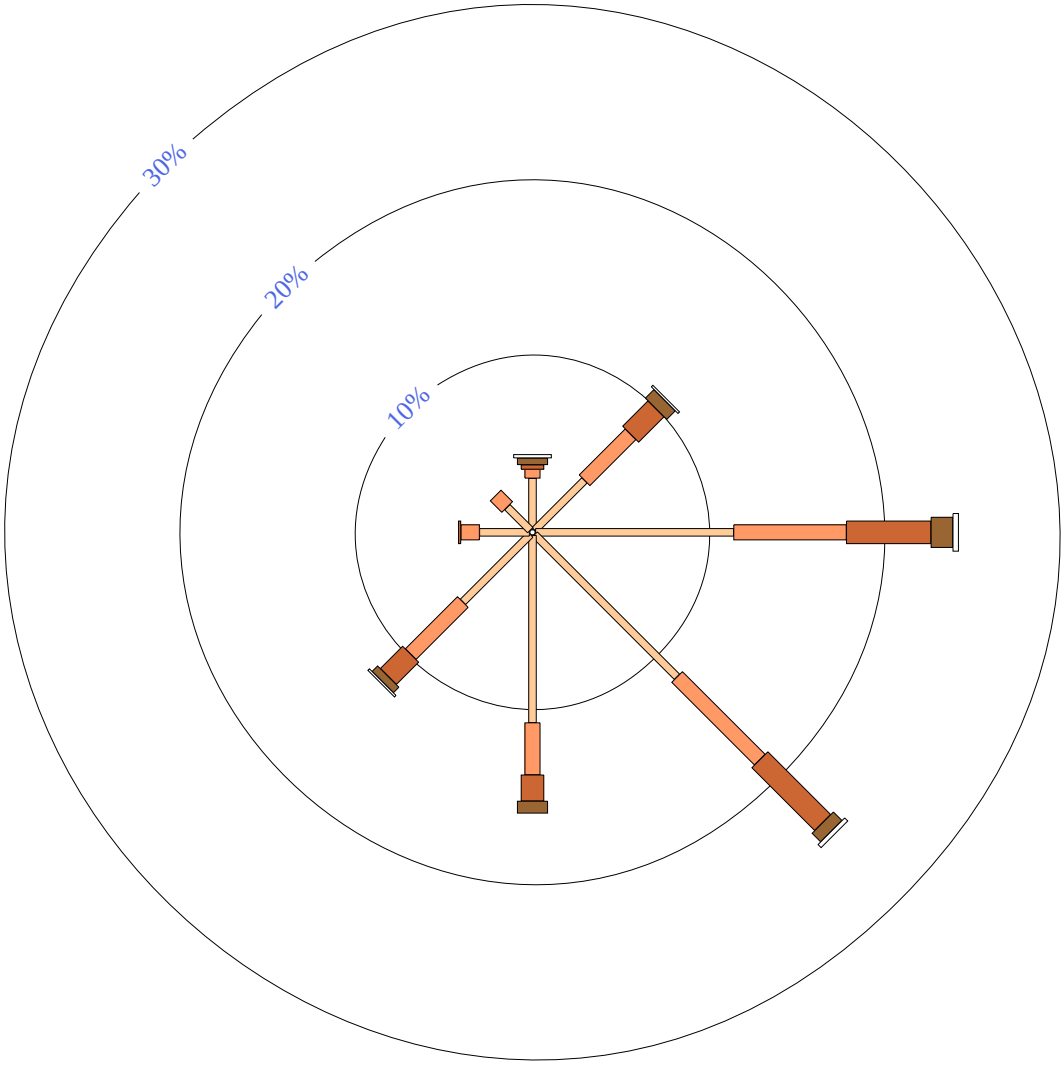
Site No: 009194 • Opened Apr 1983 • Still Open • Latitude: -32.2208° • Longitude: 115.8075° • Elevation 14m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



9 am Jan
796 Total Observations

Calm 1%



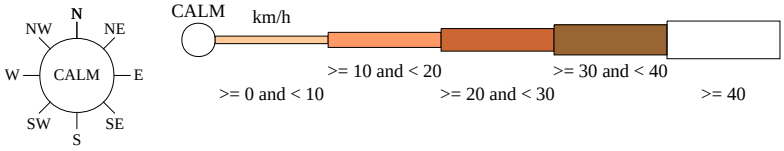
Rose of Wind direction versus Wind speed in km/h (01 Apr 1983 to 30 Sep 2010)

Custom times selected, refer to attached note for details

MEDINA RESEARCH CENTRE

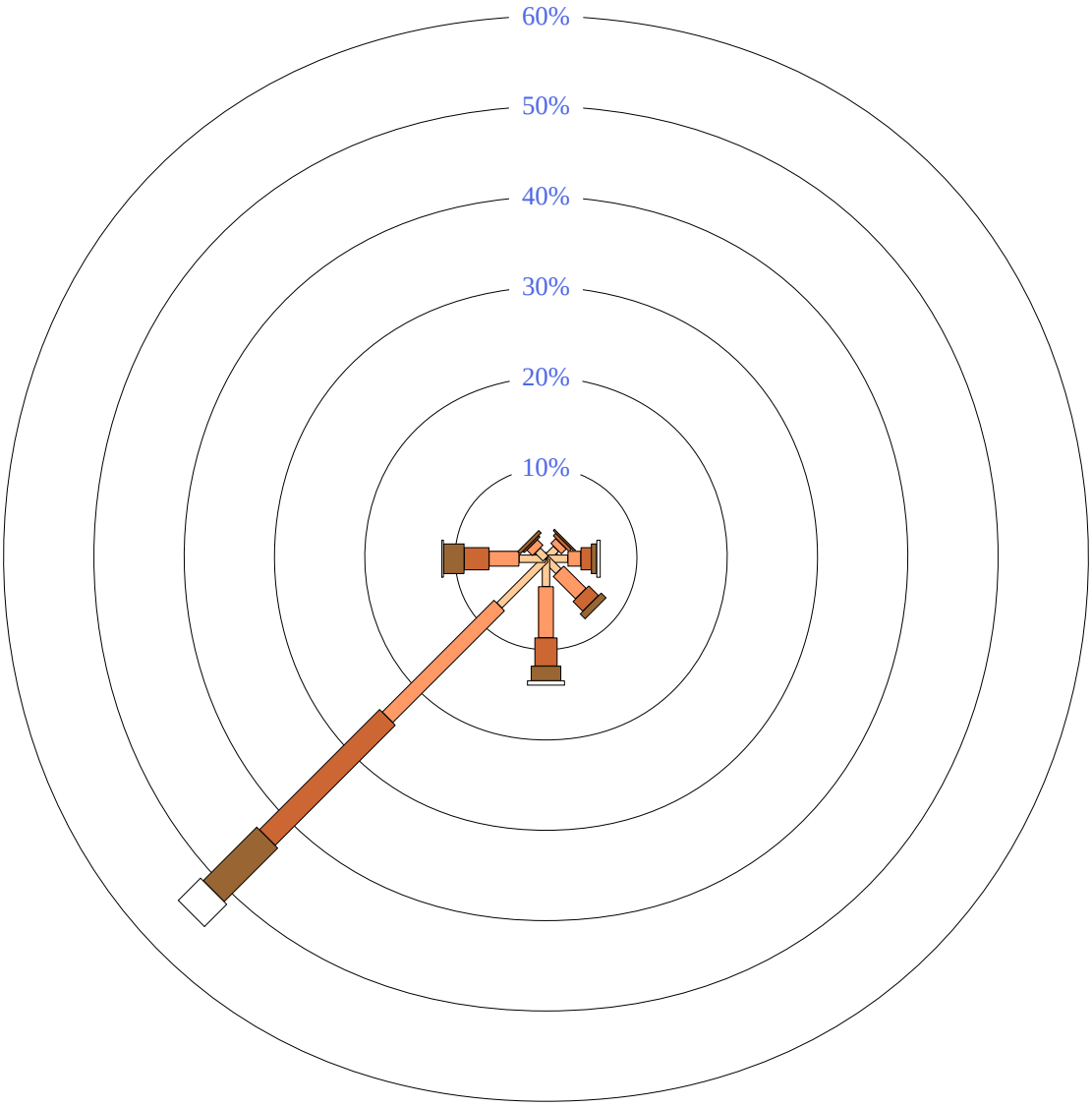
Site No: 009194 • Opened Apr 1983 • Still Open • Latitude: -32.2208° • Longitude: 115.8075° • Elevation 14m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



3 pm Jan
532 Total Observations

Calm *



Appendix 3
Construction standards for BAL 12.5 and BAL 19 as per AS 3959–2009

SECTION 5 CONSTRUCTION FOR BUSHFIRE ATTACK LEVEL 12.5 (BAL — 12.5)

5.1 GENERAL

A building assessed in Section 2 as being BAL—12.5 shall comply with Section 3 and Clauses 5.2 to 5.8.

NOTE: There are a number of Standards that specify requirements for construction; however, where this Standard does not provide construction requirements for a particular element, the other Standards apply.

Any element of construction or system that satisfies the test criteria of AS 1530.8.1 may be used in lieu of the applicable requirements contained in Clauses 5.2 to 5.8 (see Clause 3.8).

NOTE: BAL—12.5 is primarily concerned with protection from ember attack and radiant heat up to and including 12.5 kW/m^2 where the site is less than 100 m from the source of bushfire attack.

5.2 SUBFLOOR SUPPORTS

This Standard does not provide construction requirements for subfloor support posts, columns, stumps, piers and poles.

NOTE: The exclusion of requirements for subfloor supports applies to the principal building only and not to verandas, decks, steps, ramps and landings (see Clause 5.7).

C5.2 *Ideally, storage of combustible materials beneath a floor at this BAL would not occur and on this assumption, there is no requirement to enclose the subfloor space or to protect flooring materials from bushfire attack. However, should combustible materials be stored, it is recommended the area be protected as materials stored in the subfloor space may be ignited by embers and cause an impact to the building.*

5.3 FLOORS

5.3.1 Concrete slabs on ground

This Standard does not provide construction requirements for concrete slabs on the ground.

5.3.2 Elevated floors

This Standard does not provide construction requirements for elevated floors, including bearers, joists and flooring.

5.4 EXTERNAL WALLS

5.4.1 Walls

That part of an external wall surface that is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less

than 18 degrees to the horizontal and extending more than 110 mm in width from the wall (see Figure D3, Appendix D) shall be of—

(a) non-combustible material; or

(b) fibre-cement external cladding, a minimum of 6 mm in thickness; or

(c) bushfire-resisting timber (see Appendix F); or

(d) a timber species as specified in Paragraph E1 and listed in Table E1, Appendix E; or

(e) a combination of any of Items (a), (b), (c) or (d) above.

There are no requirements for external wall surfaces 400 mm or more from the ground or for external wall surfaces 400 mm or more above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the wall (see Figure D3, Appendix D).

5.4.2 Joints

All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed to prevent gaps greater than 3 mm.

Alternatively, sarking-type material may be applied over the outer face of the frame prior to fixing any external cladding.

5.4.3 Vents and weepholes

Vents and weepholes in external walls shall be screened with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium, except where the vents and weepholes are less than 3 mm (see Clause 3.6), or are located in an external wall of a subfloor space.

5.5 EXTERNAL GLAZED ELEMENTS AND ASSEMBLIES AND EXTERNAL DOORS

5.5.1 Bushfire shutters

Where fitted, bushfire shutters shall comply with Clause 3.7 and be made from—

(a) non-combustible material; or

(b) a timber species as specified in Paragraph E1 and listed in Table E1, Appendix E; or

(c) bushfire-resisting timber (see Appendix F); or

(d) a combination of any of Items (a), (b) or (c) above.

5.5.2 Windows

Window assemblies shall comply with one of the following:

(a) They shall be completely protected by a bushfire shutter that complies with Clause 5.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) For window assemblies less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see Figure D3, Appendix D), window frames and window joinery shall be made from one of the following:

(A) Bushfire-resisting timber (see Appendix F).

or

(B) A timber species specified in Paragraph E2 and listed in Table E2, Appendix E.

or

(C) Metal.

Or

(D) Metal-reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel and the frame and sash shall satisfy the design load, performance and structural strength of the member.

(ii) Externally fitted hardware that supports the sash in its functions of opening and closing shall be metal.

(iii) Where glazing is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see Figure D3, Appendix D), the glazing shall be Grade A safety glass minimum 4 mm, or glass blocks with no restriction on glazing methods.

NOTE: Where double glazed units are used the above requirements apply to the external face of the window assembly only.

(iv) Where glazing is other than that specified in Item (iii) above, annealed glass may be used.

(v) The openable portions of windows shall be screened with mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

5.5.3 Doors—Side-hung external doors (including French doors, panel fold and bi-fold doors)

Side-hung external doors, including French doors, panel fold and bi-fold doors, shall comply with one of the following:

(a) They shall be protected by a bushfire shutter that complies with Clause 5.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) Doors shall be—

(A) non-combustible; or

(B) a solid timber door, having a minimum thickness of 35 mm for the first 400 mm above the threshold; or

(C) a door, including a hollow core door, with a non-combustible kickplate on the outside for the first 400 mm above the threshold; or

(D) a fully framed glazed door, where the framing is made from materials required for bushfire shutters (see Clause 5.5.1), or from a timber species specified in Paragraph E2 and listed in Table E2, Appendix E.

(ii) Where doors incorporate glazing, the glazing shall comply with the glazing requirements for windows.

(iii) Doors shall be tight-fitting to the doorframe and to an abutting door, if applicable.

(iv) Where any part of the door assembly is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the door (see Figure D3, Appendix D), that part of the door assembly shall be made from one of the following:

(A) Bushfire-resisting timber (see Appendix F).

or

(B) A timber species specified in Paragraph E2 and listed in Table E2, Appendix E.

or

(C) Metal.

or

(D) Metal-reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel and the door assembly shall satisfy the design load, performance and structural strength of the member.

(v) Weather strips, draught excluders or draught seals shall be installed at the base of side-hung external doors.

5.5.4 Doors—Sliding doors

Sliding doors shall comply with one of the following:

(a) They shall be protected by a bushfire shutter that complies with Clause 5.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) Any glazing incorporated in sliding doors shall be Grade A safety glass complying with AS 1288.

(ii) There is no requirement to screen the openable part of the sliding door. However, if screened, the screens shall be a mesh or perforated sheet made of corrosion-resistant steel, bronze or aluminium.

NOTE: The construction of manufactured sliding doors should prevent the entry of embers when the door is closed. There is no requirement to provide screens to the openable part of these doors as it is assumed that a sliding door will be closed if occupants are not present or during a bushfire event. Screens of materials other than those specified may not resist ember attack.

(iii) Sliding doors shall be tight-fitting in the frames.

5.5.5 Doors—Vehicle access doors (garage doors)

The following apply to vehicle access doors:

(a) The lower portion of a vehicle access door that is within 400 mm of the ground when the door is closed (see Figure D4, Appendix D) shall be made from—

(i) non-combustible material; or

(ii) bushfire-resisting timber (see Appendix F); or

(iii) fibre-cement sheet, a minimum of 6 mm in thickness; or

(iv) a timber species specified in Paragraph E1 and listed in Table E1, Appendix E; or

(v) a combination of any of Items (i), (ii), (iii) or (iv) above.

(b) Panel lift, tilt doors or side-hung doors shall be fitted with suitable weather strips, draught excluders, draught seals or guide tracks, as appropriate to the door type, with a maximum gap no greater than 3 mm.

(c) Roller doors shall have guide tracks with a maximum gap no greater than 3 mm and shall be fitted with a nylon brush that is in contact with the door (see Figure D4, Appendix D).

(d) Vehicle access doors shall not include ventilation slots.

5.6 ROOFS (INCLUDING VERANDA AND ATTACHED CARPORT ROOFS, PENETRATIONS, EAVES, FASCIAS, GABLES, GUTTERS AND DOWNPIPES)

5.6.1 General

The following apply to all types of roofs and roofing systems:

(a) Roof tiles, roof sheets and roof-covering accessories shall be non-combustible.

(b) The roof/wall junction shall be sealed, to prevent openings greater than 3 mm, either by the use of fascia and eaves linings or by sealing between the top of the wall and the underside of the roof and between the rafters at the line of the wall.

(c) Roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

5.6.2 Tiled roofs

Tiled roofs shall be fully sarked. The sarking shall—

(a) have a flammability index of not more than 5;

(b) be located directly below the roof battens;

(c) cover the entire roof area including the ridge; and

(d) be installed so that there are no gaps that would allow the entry of embers where the sarking meets fascias, gutters, valleys and the like.

5.6.3 Sheet roofs

Sheet roofs shall—

(a) be fully sarked in accordance with Clause 5.6.2, except that foil-backed insulation blankets may be installed over the battens;

or

(b) have any gaps greater than 3 mm, under corrugations or ribs of sheet roofing and between roof components, sealed at the fascia or wall line and at valleys, hips and ridges by—

(i) a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium; or

(ii) mineral wool; or

(iii) other non-combustible material; or

(iv) a combination of any of Items (i), (ii) or (iii) above.

5.6.4 Veranda, carport and awning roofs

The following apply to veranda, carport and awning roofs:

(a) A veranda, carport or awning roof forming part of the main roof space [see Figure D1(a), Appendix D] shall meet all the requirements for the main roof, as specified in Clauses 5.6.1, 5.6.2, 5.6.3, 5.6.5 and 5.6.6.

(b) A veranda, carport or awning roof separated from the main roof space by an external wall [see Figures D1(b) and D1(c), Appendix D] complying with Clause 5.4 shall have a non-combustible roof covering.

NOTE: There is no requirement to line the underside of a veranda, carport or awning roof that is separated from the main roof space.

5.6.5 Roof penetrations

The following apply to roof penetrations:

(a) Roof penetrations, including roof lights, roof ventilators, roof-mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors, shall be adequately sealed at the roof to prevent gaps greater than 3 mm. The material used to seal the penetration shall be non-combustible.

(b) Openings in vented roof lights, roof ventilators or vent pipes shall be fitted with ember guards made from a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

(c) All overhead glazing shall be Grade A laminated safety glass complying with AS 1288.

(d) Glazed elements in roof lights and skylights may be of polymer provided a Grade A safety glass diffuser, complying with AS 1288, is installed under the glazing. Where glazing is an insulating glazing unit (IGU), Grade A toughened safety glass, minimum 4 mm, shall be used in the outer pane of the IGU.

(e) Flashing elements of tubular skylights may be of a fire-retardant material, provided the roof integrity is maintained by an under-flashing of a material having a flammability index no greater than 5.

(f) Evaporative cooling units shall be fitted with butterfly closers at or near the ceiling level or, the unit shall be fitted with non-combustible covers with a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

(g) Vent pipes made from PVC are permitted.

5.6.6 Eaves linings, fascias and gables

The following apply to eaves linings, fascias and gables:

(a) Gables shall comply with Clause 5.4.

(b) Eaves penetrations shall be protected the same as for roof penetrations, as specified in Clause 5.6.5.

(c) Eaves ventilation openings greater than 3 mm shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

Joints in eaves linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds.

This Standard does not provide construction requirements for fascias, bargeboards and eaves linings.

5.6.7 Gutters and downpipes

This Standard does not provide material requirements for—

(a) gutters, with the exception of box gutters; and

(b) downpipes.

If installed, gutter and valley leaf guards shall be non-combustible.

Box gutters shall be non-combustible and flashed at the junction with the roof with non-combustible material.

5.7 VERANDAS, DECKS, STEPS, RAMPS AND LANDINGS

5.7.1 General

Decking shall be either spaced or continuous (i.e., without spacing).

There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings.

C5.7.1 *Spaced decking is nominally spaced at 3 mm (in accordance with standard industry practice); however, due to the nature of timber decking with seasonal changes in moisture content, that spacing may range from 0–5 mm during service. The preferred dimension for gaps is 3 mm (which is in line with other 'permissible gaps') in other parts of this Standard. It should be noted that recent research studies have shown that gaps at 5 mm spacing afford opportunity for embers to become lodged in between timbers, which may contribute to a fire. Larger gap spacings of 10 mm may preclude this from happening but such a spacing regime may not be practical for a timber deck.*

5.7.2 Enclosed subfloor spaces of verandas, decks, steps, ramps and landings

5.7.2.1 *Materials to enclose a subfloor space*

This Standard does not provide construction requirements for the materials used to enclose a subfloor space except where those materials are less than 400 mm from the ground.

Where the materials used to enclose a subfloor space are less than 400 mm from the ground, they shall comply with Clause 5.4.

5.7.2.2 *Supports*

This Standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles.

5.7.2.3 *Framing*

This Standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e., bearers and joists).

5.7.2.4 *Decking*

This Standard does not provide construction requirements for decking that is more than 300 mm from a glazed element.

Decking less than 300 mm (measured horizontally at deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck (see Figure D2, Appendix D) shall be made from—

(a) non-combustible material; or

(b) bushfire-resisting timber (see Appendix F); or

(c) a timber species, as specified in Paragraph E1 and listed in Table E1 of Appendix E;

(d) PVC-U; or

(e) a combination of any of Items (a), (b), (c) or (d) above.

5.7.3 Unenclosed subfloor spaces of verandas, decks, steps, ramps and landings

5.7.3.1 *Supports*

This Standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles.

5.7.3.2 *Framing*

This Standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e., bearers and joists).

5.7.3.3 *Decking*

This Standard does not provide construction requirements for decking unless it is less than 300 mm from a glazed element.

Decking less than 300 mm (measured horizontally at deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck (see Figure D2, Appendix D) shall be made from—

(a) non-combustible material; or

(b) bushfire-resisting timber (see Appendix F); or

(c) a timber species, as specified in Paragraph E1 and listed in Table E1, Appendix E; or

(d) a combination of any of Items (a), (b) or (c) above.

5.7.4 Balustrades, handrails or other barriers

This Standard does not provide construction requirements for balustrades, handrails and other barriers.

5.8 WATER AND GAS SUPPLY PIPES

Above-ground, exposed water and gas supply pipes shall be metal.

SECTION 6 CONSTRUCTION FOR BUSHFIRE ATTACK LEVEL 19 (BAL — 19)

6.1 GENERAL

A building assessed in Section 2 as being BAL—19 shall comply with Section 3 and Clauses 6.2 to 6.8.

NOTE: There are a number of Standards that specify requirements for construction; however, where this Standard does not provide construction requirements for a particular element, the other Standards apply.

Any element of construction or system that satisfies the test criteria of AS 1530.8.1 may be used in lieu of the applicable requirements contained in Clauses 6.2 to 6.8 (see Clause 3.8).

NOTE: BAL—19 is primarily concerned with protection from ember attack and radiant heat greater than 12.5 kW/m2 up to and including 19 kW/m2.

6.2 SUBFLOOR SUPPORTS

This Standard does not provide construction requirements for subfloor support posts, columns, stumps, piers and poles.

NOTE: The exclusion of requirements for subfloor supports applies to the principal building only and not to verandas, decks, steps, ramps and landings (see Clause 6.7).

C6.2 Ideally, storage of combustible materials beneath a floor at this BAL would not occur and on this assumption, there is no requirement to enclose the subfloor space or to protect flooring materials from bushfire attack. However, should combustible materials be stored, it is recommended the area be protected as materials stored in the subfloor space may be ignited by embers and cause an impact to the building.

6.3 FLOORS

6.3.1 Concrete slabs on the ground

This Standard does not provide construction requirements for concrete slabs on ground.

6.3.2 Elevated floors

This Standard does not provide construction requirements for elevated floors, including bearers, joists and flooring.

6.4 EXTERNAL WALLS

6.4.1 Walls

That part of an external wall surface that is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18

degrees to the horizontal and extending more than 110 mm in width from the wall (see Figure D3, Appendix D) shall be made from—

(a) non-combustible material; or

(b) fibre-cement external cladding, a minimum of 6 mm in thickness; or

(c) bushfire-resisting timber (see Appendix F); or

(d) a timber species, as specified in Paragraph E1 and listed in Table E1, Appendix E; or

(e) a combination of any of Items (a), (b), (c) or (d) above.

This Standard does not provide construction requirements for external wall surfaces 400 mm or more from the ground or for external wall surfaces 400 mm or more above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the wall (see Figure D3, Appendix D).

6.4.2 Joints

All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed to prevent gaps greater than 3 mm.

Alternatively, sarking-type material may be applied over the outer face of the frame prior to fixing any external cladding.

6.4.3 Vents and weepholes

Vents and weepholes in external walls shall be screened with mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium, except where they are less than 3 mm (see Clause 3.6), or are located in an external wall of a subfloor space.

6.5 EXTERNAL GLAZED ELEMENTS AND ASSEMBLIES AND EXTERNAL DOORS

6.5.1 Bushfire shutters

Where fitted, bushfire shutters shall comply with Clause 3.7 and be made from—

(a) non-combustible material; or

(b) a timber species, as specified in Paragraph E1 and listed in Table E1, Appendix E; or

(c) bushfire-resisting timber (see Appendix F); or

(d) a combination of any of Items (a), (b), or (c) above.

6.5.2 Windows

Window assemblies shall comply with one of the following:

(a) They shall be completely protected by a bushfire shutter that complies with Clause 6.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) For window assemblies less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings, having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see Figure D3, Appendix D), window frames and window joinery, shall be made from one of the following:

(A) Bushfire-resisting timber (see Appendix F).

or

(B) A timber species, as specified in Paragraph E2 and listed in Table E2, Appendix E.

or

(C) Metal.

or

(D) Metal-reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel and the frame and the sash shall satisfy the design load, performance and structural strength of the member.

(ii) Externally fitted hardware that supports the sash in its functions of opening and closing, shall be metal.

(iii) Where glazing is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings, having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the window frame (see Figure D3, Appendix D), the glazing shall be toughened glass, minimum 5 mm, or glass blocks with no restriction on glazing methods.

NOTE: Where double-glazed units are used, the above requirements apply to the external face of the window assembly only.

(iv) Where glazing is other than that specified in Item (iii) above, annealed glass may be used. Where annealed glass is used, the fixed and openable portions of windows shall be screened externally with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

(v) Where toughened glass is used, the openable portions of windows shall be screened internally or externally with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

(vi) Glazed elements that are designed to take internal screens shall use toughened glass and the openable portion shall be screened in such a way to have no gaps greater than 3 mm in diameter. Screening material shall be a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

6.5.3 Doors—Side-hung external doors (including French doors, panel fold and bi-fold doors)

Side-hung external doors, including French doors, panel fold and bi-fold doors, shall comply with one of the following:

(a) They shall be protected by a bushfire shutter that complies with Clause 6.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) Doors shall be—

(A) non-combustible; or

(B) a solid timber door, having a minimum thickness of 35 mm for the first 400 mm above the threshold; or

(C) a door, including a hollow core door, with a non-combustible kickplate on the outside for the first 400 mm above the threshold; or

(D) a fully-framed glazed door, where the framing is made from materials specified for bushfire shutters (see Clause 6.5.1).

(ii) Where doors incorporate glazing, the glazing shall be toughened glass minimum 5 mm.

(iii) Doors shall be tight-fitting to the doorframe and to an abutting door, if applicable.

(iv) Where the doorframe is less than 400 mm from the ground or less than 400 mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110 mm in width from the door (see Figure D3, Appendix D) the doorframe shall be made from one of the following:

(A) Bushfire-resisting timber (see Appendix F).

or

(B) A timber species, as specified in Paragraph E2 and listed in Table E2, Appendix E.

or

(C) Metal.

or

(D) Metal-reinforced PVC-U. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel and the door assembly shall satisfy the design load, performance and structural strength of the member.

(v) Weather strips, draught excluders or draught seals shall be installed at the base of side-hung external doors.

6.5.4 Doors—Sliding doors

Sliding doors shall comply with one of the following:

(a) They shall be completely protected by a bushfire shutter that complies with Clause 6.5.1.

or

(b) They shall be completely protected externally by screens with a mesh with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

or

(c) They shall comply with the following:

(i) Any glazing incorporated in sliding doors shall be toughened glass, minimum 5 mm.

(ii) There is no requirement to screen the openable part of the sliding door. However, if screened, the screens shall be mesh or perforated sheet made of corrosion-resistant steel, bronze or aluminium.

NOTE: The construction of manufactured sliding doors should prevent the entry of embers when the door is closed. There is no requirement to provide screens to the openable part of these doors as it is assumed that a sliding door will be closed if occupants are not present or during a bushfire event. Screens of materials other than those specified may not resist ember attack.

(iii) Sliding doors shall be tight-fitting in the frames.

6.5.5 Doors—Vehicle access doors (garage doors)

The following apply to vehicle access doors:

(a) The lower portion of a vehicle access door that is within 400 mm of the ground when the door is closed (see Figure D4, Appendix D) shall be made from—

(i) non-combustible material; or

(ii) bushfire-resisting timber (see Appendix F); or

(iii) fibre-cement sheet, a minimum of 6 mm in thickness; or

(iv) a timber species, as specified in Paragraph E1 and listed in Table E1, Appendix E; or

(v) a combination of any of Items (i), (ii), (iii) or (iv) above.

(b) Panel lift, tilt doors or side-hung doors shall be fitted with suitable weather strips, draught excluders, draught seals or guide tracks, as appropriate to the door type, with a maximum gap no greater than 3 mm.

(c) Roller doors shall have guide tracks with a maximum gap no greater than 3 mm and shall be fitted with a nylon brush that is in contact with the door (see Figure D4, Appendix D).

(d) Vehicle access doors shall not include ventilation slots.

6.6 ROOFS (INCLUDING VERANDA AND ATTACHED CARPORT ROOFS, PENETRATIONS, EAVES, FASCIAS, GABLES, GUTTERS AND DOWNPIPES)

6.6.1 General

The following apply to all types of roofs and roofing systems:

(a) Roof tiles, roof sheets and roof-covering accessories shall be non-combustible.

(b) The roof/wall junction shall be sealed, to prevent openings greater than 3 mm, either by the use of fascia and eaves linings or by sealing between the top of the wall and the underside of the roof and between the rafters at the line of the wall.

(c) Roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

6.6.2 Tiled roofs

Tiled roofs shall be fully sarked. The sarking shall—

(a) have a flammability index of not more than 5, when tested to AS 1530.2;

(b) be located directly below the roof battens;

(c) cover the entire roof area including the ridge; and

(d) be installed so that there are no gaps that would allow the entry of embers where the sarking meets fascias, gutters, valleys and the like.

6.6.3 Sheet roofs

Sheet roofs shall—

(a) be fully sarked in accordance with Clause 6.6.2, except that foil-backed insulation blankets may be installed over the battens;

or

(b) have any gaps greater than 3 mm under corrugations or ribs of sheet roofing and between roof components sealed at the fascia or wall line and at valleys, hips and ridges by—

(i) a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium; or

(ii) mineral wool; or

(iii) other non-combustible material; or

(iv) a combination of any of Items (i), (ii), or (iii) above.

6.6.4 Veranda, carport and awning roofs

The following apply to veranda, carport and awning roofs:

(a) A veranda, carport or awning roof forming part of the main roof space [see Figure D1(a), Appendix D] shall meet all the requirements for the main roof, as specified in Clauses 6.6.1, 6.6.2, 6.6.3, 6.6.5 and 6.6.6.

(b) A veranda, carport or awning roof separated from the main roof space by an external wall [see Figures D1(b) and D1(c), Appendix D] complying with Clause 6.4 shall have a non-combustible roof covering.

NOTE: There is no requirement to line the underside of a veranda, carport or awning roof that is separate from the main roof space.

6.6.5 Roof penetrations

The following apply to roof penetrations:

(a) Roof penetrations, including roof lights, roof ventilators, roof-mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors shall be adequately sealed at the roof to prevent gaps greater than 3 mm. The material used to seal the penetration shall be non-combustible.

(b) Openings in vented roof lights, roof ventilators or vent pipes shall be fitted with ember guards made from a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

(c) All overhead glazing shall be Grade A laminated safety glass complying with AS 1288.

(d) Glazed elements in roof lights and skylights may be of polymer provided a Grade A safety glass diffuser, complying with AS 1288, is installed under the glazing. Where glazing is an insulating glazing unit (IGU), Grade A toughened safety glass of minimum 4 mm shall be used in the outer pane of the IGU.

(e) Flashing elements of tubular skylights may be of a fire-retardant material, provided the roof integrity is maintained by an under-flashing of a material having a flammability index no greater than 5.

(f) Evaporative cooling units shall be fitted with butterfly closers at or near the ceiling level, or the unit shall be fitted with non-combustible covers with a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

6.6.6 Eaves linings, fascias and gables

The following apply to eaves linings, fascias and gables:

(a) Gables shall comply with Clause 6.4.

(b) Eaves penetrations shall be protected the same as for roof penetrations, as specified in Clause 6.6.5.

(c) Eaves ventilation openings greater than 3 mm shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet with a maximum aperture of 2 mm, made of corrosion-resistant steel, bronze or aluminium.

Joints in eaves linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds.

This Standard does not provide construction requirements for fascias, bargeboards and eaves linings.

6.6.7 Gutters and downpipes

This Standard does not provide material requirements for—

(a) gutters, with the exception of box gutters; and

(b) downpipes.

If installed, gutter and valley leaf guards shall be non-combustible.

Box gutters shall be non-combustible and flashed at the junction with the roof with non-combustible material.

6.7 VERANDAS, DECKS, STEPS, RAMPS AND LANDINGS

6.7.1 General

Decking shall be either spaced or continuous (i.e., without spacings).

There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings.

C6.7.1 Spaced decking is nominally spaced at 3 mm (in accordance with standard industry practice); however, due to the nature of timber decking with seasonal changes in moisture content, that spacing may range from 0–5 mm during service. The preferred dimension for gaps is 3 mm (which is in line with other ‘permissible gaps’) in other parts of this Standard. It should be noted that recent research studies have shown that gaps at 5 mm spacing afford opportunity for embers to become lodged in between timbers, which may contribute to a fire. Larger gap spacings of 10 mm may preclude this from happening but such a spacing regime may not be practical for a timber deck.

6.7.2 Enclosed subfloor spaces of verandas, decks, steps, ramps and landings

6.7.2.1 *Materials to enclose a subfloor space*

This Standard does not provide construction requirements for the materials used to enclose a subfloor space except where those materials are less than 400 mm from the ground.

Where the materials used to enclose a subfloor space are less than 400 mm from the ground, they shall comply with Clause 6.4.

6.7.2.2 *Subfloor supports*

This Standard does not provide construction requirements for subfloor support posts, columns, stumps, stringers, piers and poles.

6.7.2.3 *Framing*

This Standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e., bearers and joists).

6.7.2.4 *Decking*

This Standard does not provide construction requirements for decking that is more than 300 mm from a glazed element.

Decking less than 300 mm (measured horizontally at deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck (see Figure D2, Appendix D) shall be made from—

(a) non-combustible material; or

(b) bushfire-resisting timber (see Appendix F); or

(c) a timber species, as specified in Paragraph E1 and listed in Table E1, Appendix E; or

(d) a combination of any of Items (a), (b), or (c) above.

6.7.3 Unenclosed subfloor spaces of verandas, decks, steps, ramps and landings

6.7.3.1 *Supports*

This Standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles.

6.7.3.2 *Framing*

This Standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e., bearers and joists).

6.7.3.3 *Decking*

This Standard does not provide construction requirements for decking that is more than 300 mm from a glazed element.

Decking less than 300 mm (measured horizontally at deck level) from glazed elements that are less than 400 mm (measured vertically) from the surface of the deck (see Figure D2, Appendix D) shall be made from—

(a) non-combustible material; or

(b) bushfire-resisting timber (see Appendix F); or

(c) a timber species, as specified in Paragraph E1 and listed in Table E1, Appendix E; or

(d) a combination of any of Items (a), (b), or (c) above.

6.7.4 Balustrades, handrails or other barriers

This Standard does not provide construction requirements for balustrades, handrails and other barriers.

6.8 WATER AND GAS SUPPLY PIPES

Above-ground, exposed water and gas supply pipes shall be metal.

Appendix 4
City of Rockingham Fire Control
Notice 2013/2014

Fire Control Notice

First and Final Notice (Under Section 33 of the *Bushfires Act 1954*)

NOTICE TO OWNERS AND/OR OCCUPIERS OF LAND IN THE CITY OF ROCKINGHAM

As a landowner or occupier you have a legal requirement under Section 33 of the *Bush Fires Act 1954* to carry out fire prevention work on your property in accordance with the provisions of this Fire Control Notice. Inspection of all properties will be carried out in all areas for compliance with this notice after 30 November. Persons who fail to comply with the requirements of this order will be issued with an infringement notice ($250).

It is the property owners' not the contractors who are responsible for the standard and quality of the fire prevention work undertaken and maintained as per this notice.

***BUSHFIRES ACT 1954* (as amended)**
Pursuant to the powers contained in Section 33 of the *Bushfires Act 1954* (as amended) you are hereby required, on or before 30 November 2013, to remove from land owned or occupied by you all flammable material or to clear firebreaks to mineral earth in accordance with the following and thereafter to maintain the land or the firebreaks clear of all flammable material up to and including 31 May 2014.


Correct Rural Firebreak


Incorrect Rural Firebreak

1. Rural Land
On or before 30 November 2013 and thereafter up until and including 31 May 2014.

1.1 Have FIREBREAKS not less than three (3) metres wide immediately inside and along all boundaries of land and including the land abutting road, rail and drain reserves and all public open space reserves, with all overhanging tree branches, tree limbs etc. to be trimmed back clear of the firebreak area to a height of four metres.

1.2 Have FIREBREAKS not less than three metres wide so far as to surround all buildings, sheds and haystacks, with all overhanging branches, trees, limbs etc. to be trimmed back clear of the firebreak area to a height of four metres.

2. Urban Areas (Vacant Land)
On or before 30 November 2013 and maintained until and including 31 May 2014.

2.1 Have the entire vacant land clear of all flammable material where the area of land is less than 2,000m^2 by SLASHING, MOWING or other means to a height no greater than 50mm.

2.2 Where the area of land exceeds 2,000m^2 have FIREBREAKS not less than three metres wide immediately inside and along all boundaries of the vacant land with all overhanging tree branches, trees, limbs etc. to be trimmed back clear of the firebreak area to a height of four metres.

3. Alternative Situations
Variation applications must be lodged in writing to the City of Rockingham by the third week in October each year.

An Application to Vary Location and Type of Firebreaks can be downloaded from the City's website or is available from the Emergency Services Administration Officer on 9527 0732.

4. Fire Management Plans
All properties within subdivisions/developments within the City of Rockingham shall comply with the Fire Management Plans for their estates to the satisfaction of Council or its duly authorised Officer.

5. Penalty
If you do not meet your responsibilities specified in this Notice you will be fined a minimum of $250 and be required to meet the cost of the City's efforts to make your property comply with the Fire Control Notice.

Fire Control Enquiries
8.30am – 4.30pm Monday to Friday
Phone: 9527 0732
Email: firecontrol@rockingham.wa.gov.au

www.rockingham.wa.gov.au

city of Rockingham
where the coast comes to life

Appendix 5
AFAC bush fire glossary

afac
Australasian Fire and Emergency Service Authorities Council

BUSHFIRE GLOSSARY

Prepared by Rural and Land Management Group for AFAC Agencies

January 2012

Disclaimer
While all possible care has been taken to ensure a comprehensive and accurate publication, the Australasian Fire Authorities Council and its servants or agents shall not be liable for technical or editorial errors contained herein or omissions there from; nor for incidental or consequential liability in any way resulting from the information or advice that is contained in this publication or use of that material.

January 2012

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Preface

The AFAC Bushfire Glossary has been developed to promote an exchange of information between member agencies on terminology used specifically in bushfires.

The Glossary has been developed based on a set of agreed business rules. It includes the bushfire technical terms, their definition or description as adopted and applied by the AFAC member agencies. It does include some fire terms that are of a general industry wide nature for completeness. It excludes terms for which an agreed definition could not be reached by the member agencies.

This document is not designed to be a text book or to provide a discussion of a term beyond the definition/description of that term. Nor is it an attempt to modify or redefine terms defined in codes, standards or legislation. Terms that have been adopted for use by the fire management industry from another discipline will maintain the meaning ascribed to them in their originating discipline.

It is proposed that this Glossary will be reviewed regularly to ensure that it continues to be relevant and meets the needs of AFAC member agencies. This is the fifth review. It is the current 2012 version.

AFAC acknowledges the significant contribution of the Rural and Land Management Glossary Working Group lead by Greg Esnouf and Country Fire Authority staff, Matthew Fraser and Jo Richards, who contributed generously of their time and expertise in the establishment of this document and the work of the Genesis Institute to provide a framework for refining the glossary.

Previous versions of the Glossary were titled Wildfire Glossary. The term wildfire has been replaced with the term bushfire in line with a trend towards using language more accepted by the general public.

The terms appear in alphabetical order excluding spaces. In this way it is possible to find a compound word without knowing if it is one or two words.

Aim

The purpose of this Glossary is to seek to facilitate a greater understanding by using common language between bushfire and land management agencies and support organisations during the prevention of, preparedness for, response to and recovery from bushfires.

Index

Term	Definition
Accelerant	Any substance (such as oil, gasoline, etc) that is applied to a fuel-bed to expedite the burning process.
Adaptor	A fitting used to couple different sized hoses, hoses of the same size with different threads, or different types of couplings, or to connect the male to male, or female to female parts of the same type of coupling.
Adsorption	The taking in of water vapour from the air by dead plant material.
Advance burn	A prescribed fire that reduces fuel through a forest area before felling operations. It is intended to improve the safety of timber harvesting operations and as a silvicultural tool to protect lignotubers and standing trees.
Advancing fire	That portion of the fire with rapid fire spread and higher intensity which is normally burning with the wind and/or up slope.
Aerial detection	The discovering, locating and reporting of fires from aircraft.
Aerial fuel	See: Elevated fuel
Aerial ignition	Ignition of fuels by dropping incendiary devices or materials from aircraft.
Aerial ignition device (AID)	Inclusive term applied to equipment designed to ignite wildland fuels from an aircraft.
Aerial Observer	See: Air Observer
Aerial reconnaissance	Use of aircraft for detection of fires and observing fire behaviour, values-at-risk, suppression activity, and other critical factors to facilitate command decisions on strategy and tactics needed for fire suppression.
Aerosol	Airborne solid or liquid particles dispersed or suspended in a gas stream.
After action review (AAR)	A discussion, focused on performance standards, of an event that enables those involved to discover what happened, why it happened, and how to sustain strengths and improve on weaknesses. An After action review is a tool incident command personnel and units can use to get maximum benefit from every incident. It provides a review of the incident upon its completion to identify and discuss effective and non-effective performance and lessons learned and how to apply them in the future. (adapted from NWCG)
AIIMS structure	The combination of facilities, equipment, personnel, procedures, and communications operating within a common organisational structure with responsibility for the management of allocated resources to effectively accomplish stated objectives relating to an incident (AIIMS).
Air attack	The direct use of aircraft in the suppression of bushfires.
Air attack Supervisor	Primarily responsible for the safety and efficient tactical coordination of aircraft operations when fixed and/or rotary firebombing aircraft are operating at a fire (Air Attack Supervisor Training Manual).
Air base Manager	An experienced, trained person who is appointed to manage all the functions and personnel on an air base or helicopter base.
Air mass	A meteorological term referring to an extensive body of air within which the conditions of temperature and moisture in a horizontal plane are essentially uniform.
Air Observer	The primary role of the air observer is to aerially obtain intelligence to assist the planning of fire suppression operations (NSWRFS).
Air operations	The use of aircraft in support of an incident for the purposes of suppression, transportation of personnel, equipment or supplies, or for aerial reconnaissance.

Term	Definition
Air operations Manager	The air operations manager position is responsible for overall coordination of air operations and air support activities in support of an incident.
Aircraft Officer	The aircraft officer is responsible for ground operations and overall provision of support, enabling a safe and efficient air operation to be conducted.
Airside	The parts of an airport not normally open to unauthorised people. It comprises the apron, taxiways, runways and the areas containing them.
Allocated resources	Resources working at an incident (AIIMS).
Anchor point	An advantageous location, usually a barrier to fire spread, from which to start constructing a fireline. The anchor point is used to minimize the chance of being flanked by the fire while the line is being constructed (NWCG).
Aqueous film forming-foam (AFFF)	A synthetic amber coloured liquid concentrate mixed with water to form an agent that is capable of forming water-solution films on the surface of flammable liquids that prevent the escape of fuel vapours, excludes oxygen and maintain the surface when disturbed (self healing).
Area ignition	Ignition of several individual fires throughout an area, either simultaneously or in rapid succession, and so spaced that they add to and influence the main body of the fire to produce a hot, fast-spreading fire condition. Also called simultaneous ignition.
Area of origin	General location where the fire started.
Arson	The deliberate setting of a fire where the intent of the person responsible was to cause harm or destruction to life or property.
Aspect	The direction towards which a slope faces.
Asphyxiants	Substances which interfere with the respiratory process.
Assembly area	See Staging area.
Assessment	The process of determining if an individual has the prescribed skills, knowledge and experience needed to acquire a specific capability.
Assets	Anything valued by people which includes houses, crops, forests and, in many cases, the environment.
Assisting agency	An agency directly contributing suppression, support or service resources to another agency.
Atmospheric stability	The degree to which the atmosphere resists turbulence and vertical motion.
Attack time	See Elapsed time
Australasian Inter-service Incident Management System (AIIMS)	A nationally adopted structure to formalise a coordinated approach to emergency incident management.
Automatic dispatch	See Pre-planned dispatch.
Automatic weather station (AWS)	The Bureau's standard AWSs use sensors to monitor temperature, humidity, wind speed and direction, pressure and rainfall. Various advanced sensors are available for specialised applications. These sensors can monitor cloud height (ceilometer), visibility, present weather, thunderstorms, soil temperature (at a range of depths) and terrestrial temperature. (Developed from the BOM)
Available fuel	The portion of the total fuel that would actually burn under various environmental conditions.
Available resources	The resources at an incident and available for allocation at short notice. (AIIMS)

Term	Definition
Backburn	1. A fire started intentionally along the inner edge of a fireline during indirect attack operations to consume fuel in the path of a bushfire (Australia). 2. A counterfire commenced from within continuous fuel for the purpose of fighting a fire (New Zealand).
Back fire	See: Backburn (Preferred term).
Backing fire	The part of a fire which is burning back against the wind or down slope, where the flame height and rate of spread are reduced.
Bark fuel	The flammable bark on tree trunks and upper branches.
Bark heaps	Accumulations of bark and branch material resulting from timber harvesting operations. Soil may be mixed with bark heaps, but generally the heap is formed by a machine dropping fresh bark on the top of the heap.
Basal accumulation	Bark fallen from a tree and forming a relatively high and localized accumulation of fine fuel.
Base camp	A location where personnel are accommodated and fed for a period of time. A base camp usually contains catering, ablution and accommodation facilities, a water supply and a lighting system, and may include other facilities such as car parking maintenance and servicing. (AIIMS)
Bay(s)	A marked indentation (s) in the fire perimeter usually located between two fingers.
Beaufort wind scale	A system for estimating wind speeds based on observation of visible wind effects. A series of descriptions of visible wind effects upon land objects or sea surfaces is matched with a corresponding series of wind speed ranges, each being allocated a *Beaufort number.*
Blacking out	The process of extinguishing or removing burning material along or near the fire control line, felling stags, trenching logs to prevent rolling and the like, in order to make the fire safe.
Blackspot	An area where two-way radio coverage does not exist.
Blank cap	The metal cap used on delivery outlets and on the suction inlet of the pump to prevent discharge of water.
Blow down	See: Wind throw.
Blow up	Sudden increase in fireline intensity or rate of spread of a fire sufficient to preclude direct control or to upset existing suppression plans. Often accompanied by violent convection and may have other characteristics of a fire storm. (NWCG)
Bole	The trunk of a tree.
Bole damage	The damage to the trunk of a living tree by fire, mechanical equipment or disease.
Bracken	Bracken fern varies significantly in height and density. If Bracken is generally upright (either alive or dead) with the majority of its biomass in the top half of the plant and only the stems in touch with the ground, then it is considered to be part of the elevated fuel. If however, it has collapsed and most of its biomass is in touch with the ground, then it is considered to be Near-surface fuel.
Branch	A tapered pipe, fitted to the end of a hose line, which increases the velocity (converting pressure energy to kinetic energy) of the water or foam solution travelling through the hose, and forms an effective firefighting jet or spray.
Breakaway	The points at which a fire, after it has been contained, escapes into unburnt areas across a fireline or fire edge.

Term	Definition
Breeching	A device to divide one hose line into two or collect two hose lines into one.
Briefing	A general overview of an operation.
Broad area hazard reduction	Large scale removal of selected fuel before the onset of a bushfire danger period.
Broadcast burning	See: Prescribed burning (Preferred term)
Buffer	A strip or block of land on which the fuels are reduced to provide protection to surrounding lands.
Bulk water carrier	A large tanker used for replenishing water to firefighting tankers.
Burn back	See: Reburn (Preferred term).
Burning brands	Lofted burning material such as bark, usually flaming.
Burning conditions	The state of the combined components of the fire environment that influence fire behaviour and fire impact in a given fuel type. Usually specified in terms of such factors as fire weather elements, fire danger indices, fuel load and slope.
Burning off	Generally setting fire - with more or less regard to areas carrying unwanted vegetation such as rough grass, slash and other fuels.
Burning out	To intentionally light fires to consume islands of unburned fuel inside the fire perimeter.
Burning program	A program of prescribed burns scheduled these for a designated area over a nominated time, normally looking ahead over one fire season (for the coming spring to the following autumn), but can also look ahead five years or more.
Burning rotation	The period between burning of a prescribed area for management purposes.
Burning unit	A specified land area for which prescribed burning is planned.
Burn out	1. A fire set to consume islands of unburnt fuel inside the fire perimeter and between the fire edge and fireline (Australia). 2. A counterfire commenced from a natural or previously constructed firebreak for the purpose of fighting a fire (New Zealand).
Burn over	A section of fire that overruns personnel and/or equipment.
Burn plan	The plan which is approved for the conduct of prescribed burning. It contains a map identifying the area to be burnt and incorporates the specifications and conditions under which the operation is to be conducted.
Bushfire	Un planned vegetation fire. A generic term which includes grass fires, forest fires and scrub fires both with and without a suppression objective.
Bushfire danger period	A period of the year either established by legislation or declared by the relevant agency, when restrictions are placed on the use of fire due to dry vegetation and the existence of conditions conducive to the spread of fire.
Bushfire management	All those activities directed to prevention, detection, damage mitigation, and suppression of bushfires. Includes bushfire legislation, policy, administration, law enforcement, community education, training of fire fighters, planning, communications systems, equipment, research, and the multitude of field operations undertaken by land managers and emergency services personnel relating to bushfire control.
Byram-Keetch Drought index (BKDI)	See: Keetch-Byram Drought Index
Cache	A predetermined complement of supplies stored in a designated location. (CIMS).
Campaign fire	A fire normally of a size and/or complexity that requires substantial firefighting resources, and possibly several days or weeks to suppress.

Term	Definition
Candle (Candling)	A tree (or small clump of trees) is said to candle when its foliage ignites and flares up, usually from the bottom to top.
Candlebark	Long streamers of bark that have peeled from some eucalypt species that form fire brands conducive to very long distance spotting.
Canopy	The crowns of the tallest plants in a forest – the overstorey cover.
Canopy cover	Canopy cover refers to 2 dimensions (ie plan view, area coverage)
Canopy density	Canopy density refers to 3 dimensions (ie mass/volume)
Catastrophic fire danger	The highest fire danger rating as determined by fire agencies and generally with a Forest fire danger index greater than 100 or a Grassland fire danger index greater than 150.
Central ignition	A method of prescribed burning in which fires are set in the centre of an area to create a strong convective column. Additional fires are then set progressively closer to the outer control lines causing indraft winds to build up. This has the effect of drawing the fires towards the centre.
Chaining	The process of flattening vegetation (usually mallee or scrub) by dragging a heavy chain or cable between two large tractors or bulldozers.
Charged line	A line of fire hose filled with water under pressure and ready to use.
CIMS	Coordinated Incident Management System used in New Zealand.
Class A foam	See: Foam
Class labels	Class labels identify the type of hazardous material being stored or transported. These are grouped under broad classifications according to the predominant type of risk involved.
Climate	The atmospheric conditions of a place over an extended period of time.
Clinometer	An instrument used to measure the angle of a slope.
Cloud cover	The amount of sky covered or obscured by cloud, expressed in eighths. Eight eighths is complete cloud cover.
Coarse fuels	Dead woody material, greater than 25mm in diameter, in contact with the soil surface (fallen trees and branches). Some researchers categorise forest fuels as: fine <6 mm diameter; twigs 6-25 mm diameter; coarse >25 mm diameter.
Code of Practice	Document giving methods developed to assist compliance with acts and regulations in the performance of work.
Cold front	A cold front is the delineation between cold polar air moving towards the equator and undercutting warm tropical air moving poleward. The temperature differences across a cold front can be extreme and associated with strong winds. The warm tropical air is forced to rise and become unstable with the development of large cumuliform clouds. Severe weather such as thunderstorms, squall lines and severe turbulence may accompany these cold fronts. (BOM)
Cold trailing	A method of determining whether or not a fire is still burning, involving careful inspection and feeling with the hand, or by use of a hand-held infrared scanner, to detect any heat source.
Collecting head	A collecting head is used to collect (usually from two to four) lines into the suction inlet of a pump.
Combat agency/authority	See: Control authority
Combustion	Rapid oxidation of fuels producing heat, and often light.

Term	Definition
Command	The direction of members and resources of an agency in the performance of the agency's role and tasks. Authority to command is established in legislation or by agreement within an agency. Command relates to agencies and operates vertically within an agency.
Communications plan	Details the methods and systems for people to communicate with each other, the incident management structure, including the actual radio channels/mobile phone numbers. (AIIMS)
Compartment	(1) Forestry Definition – A basic administrative unit of a managed forest. (2) Building Definition - An enclosed space with floor, walls and ceiling.
Competency	Skills and knowledge and their application within an occupation to the standard of performance required in the workplace. (Vic report)
Conduction	The transfer of thermal energy between regions of matter due to temperature gradient.
Contained	The status of a wildfire suppression action signifying that a control line has been completed around the fire, and any associated spot fires, which can reasonably be expected to stop the fire's spread. (NWCG)
Contour lines	Contour lines connect points of equal elevation on a topographical map.
Control	The overall direction of response activities in an emergency situation. Authority for control is established in legislation or in an emergency response plan, and carries with it the responsibility for tasking and coordinating other agencies in accordance with the needs of the situation. Control relates to situations and operates horizontally across agencies.
Control authority	The agency, service, organization or authority with legislative responsibility for control of the incident. (Also referred to as the responsible authority or agency.) (AFAC)
Controlled	The stage during fire suppression activities at which the complete perimeter of a fire is secured and no breakaway is expected.
Controlled burning	See: Prescribed burning.
Control line	See: Fireline
Convection	1. As applied in meteorology, atmospheric motions that are predominantly vertical, resulting in vertical transport and mixing of atmospheric properties; distinguished from advection. 2. As applied in thermodynamics is a mechanism of heat transfer occurring because of the bulk movement of fluids.
Convection burn	See: Central ignition
Convection column	The rising column of smoke, ash, burning embers and other particle matter generated by a fire.
Convective activity	General term for manifestations of convection in the atmosphere, alluding particularly to the development of convective clouds and resulting weather phenomena, such as showers, thunderstorms, squalls, hail, and tornadoes. (NWCG)
Convergence zone	1. See: Junction zone. 2. In fire weather, that area where two winds come together from opposite directions and are forced upwards often creating clouds and precipitation. (NWCG)
Convoy	Two or more vehicles driving together under the control of a single Convoy Leader.

Term	Definition
Coordination	The bringing together of agencies and elements to ensure effective response to an incident or emergency. It is primarily concerned with the systematic acquisition and application of resources in accordance with the requirements imposed by the emergency or emergencies. Coordination relates primarily to resources and operates: • vertically, within an agency, as a function of the authority to command; • horizontally, across agencies, as a function of the authority to control.
Cordon	A cordon is the means to maintain an area and is used to restrict movement into and out of an area.
Coupe	A defined forest area in which timber harvesting takes place.
Crew	See: Fire crew.
Crew leader	Person responsible for the supervision and management of crews
Critical burnout time	Total time a fuel can burn and continue to feed energy to the base of a forward-travelling convection column.
Critical incident stress	Unusually strong emotional reactions which have the potential to interfere with the ability of personnel to function, either at the incident scene or later, arising from any situation faced during operations.
Critical incident stress debriefing	The process in which teams of professional and peer counsellors provide emotional and psychological support to incident personnel who are or have been involved in a critical (highly stressful) incident.
Cross bearings	Intersecting lines of sight from two or more points on the same object; used to determine the location of bushfire from lookouts.
Crown fire	A fire that advances from top to top of trees or shrubs.
Crown scorch	Browning of the needles or leaves in the crown of a tree or shrub caused by heat from a fire.
Crowning	A fire ascending into the crowns of trees and spreading from crown to crown.
Crowning potential	A probability that a crown fire may start, calculated from inputs of foliage moisture content and height of the lowest part of the tree crowns above the surface. (NWCG)
Curing	Drying and browning of herbaceous vegetation due to mortality or senescence.
Dead fuel	Fuels with no living tissue in which moisture content is governed almost entirely by absorption or evaporation of atmospheric moisture (relative humidity and precipitation). (NWCG)
Debrief	To gather information from the participants in an action so as to gauge the success or otherwise of the action at the end of the task, shift, tour or incident.
Deep-seated fire	A fire burning far below the surface in duff, mulch, peat, or other combustibles as contrasted with a surface fire.
Defensive strategy	A firefighting strategy used where the protection of life and assets is a priority when a fire is: (i) located in inaccessible or remote location OR (ii) too intense to be safely or effectively attacked directly.
Dehydration	Excessive loss of water from the body's tissues. Dehydration may follow any condition in which there is a rapid depletion of body fluids.
Delayed aerial ignition devices (DAID)	An incendiary device that will ignite after a predetermined time.

Term	Definition
Deliberate fire	A fire resulting from a person placing burning material to cause ignition. The intent of the person may have been to cause harm or destruction to life or property (arson-criminal offence) or to modify fuels and/or vegetation for land management purposes (summary offence). See also Arson.
Delivery hose	Hose used to transport water under pressure.
Delivery valve	On a pump, the valved outlet through which water is discharged.
Demobilisation	The orderly release of resources no longer required at an incident.
Depth of burn	The reduction in forest floor litter thickness (cm) due to consumption by fire. Most commonly used in connection with prescribed burning.
Desiccant	A chemical that, when applied to a living plant causes or accelerates the drying out of its aerial parts.
Desorption	The loss of moisture to the atmosphere from dead plant material.
Detection	The discovery of a fire. Individuals, fire towers, reconnaissance aircraft and automatic devices may be used, either alone or in combination.
Dew	The moisture which collects in small droplets on the surface of substances and vegetation by atmospheric condensation, chiefly at night.
Dew point temperature	This is a measure of the moisture content of the air and is the temperature to which air must be cooled in order for dew to form. The dew-point is generally derived theoretically from dry and wet-bulb temperatures, with a correction for the site's elevation. (BOM)
Dieback	The progressive dying, from the top downward, of twigs, branches or tree crowns.
Diffused pattern	A spray pattern (as opposed to straight stream) of water or foam.
Direct attack	A method of fire attack where wet or dry firefighting techniques are used. It involves suppression action right on the fire edge which then becomes the fireline.
Dispatch	The act of ordering attack crews and/or support units to respond to a fire, or from one place to another.
Division	A portion of the incident comprising of two or more sectors. The number of sectors grouped in a Division should be such as to ensure effective direction and control of operations. Divisions are generally identified by a local geographic name.
Dominant height	Mean height of the largest trees in a stand. A specified number per unit area are generally selected.
Downwind	Away from the wind direction. In the direction opposite to the direction from which the wind is blowing. The direction that smoke will travel.
Dozer	A crawler tractor fitted with a blade which can be transported to a fire on a tray truck or trailer. Dozer is a shortened form of "Bulldozer"
Dozer line	Fireline constructed by the front blade of a dozer.
Drain time	The time (minutes) it takes for foam solution to drop out from the foam mass; for a specified percent of the total solution contained in the foam to revert to liquid and drain out of the bubble structure.
Drift	The effect of wind on smoke or on a water drop.
Drip torch	A canister of flammable fuel fitted with a wand, a burner head and a fuel flow control device. It is used for lighting fires for prescribed burning, backburning and burning out.

Term	Definition
Drop pass	Indicates that the firefighting aircraft has the target in sight and will make a drop of fire control agent on this run over the target.
Drop pattern	The distribution of an aerially delivered fire control agent drop on the target area in terms of its length, width, and momentum (velocity x mass) as it approaches the ground. The latter determines the relative coverage level of the fire control agent on fuels within the pattern.
Drop zone (DZ)	Target area for firefighting aircraft, or cargo dropping.
Drought	Prolonged absence or marked deficiency of precipitation (rain). (BOM)
Drought index	A numerical value reflecting the dryness of soils, deep forest litter, logs and living vegetation.
Dry bulb temperature	Technically, the temperature registered by the dry-bulb thermometer of a psychrometer. However, it is identical to the temperature of the air. (Degrees Celsius). (NZ)
Dry firefighting	The suppression of a fire without the use of water. This is normally achieved by removing the fuel by the use of hand tools, burning or machinery.
Duff	The layer of decomposing vegetative matter on the forest floor below the litter layer, the original structure still being recognisable.
Ecological burning	A form of prescribed burning. Treatment with fire of vegetation in nominated areas to achieve specified ecological objectives.
Edge burning	A term used to describe perimeter burning of an area in mild conditions prior to large scale prescribed burning. This practice is used to strengthen buffers and to reduce mop-up operations.
Elevated fuel	The standing and supported combustibles not in direct contact with the ground and consisting mainly of foliage, twigs, branches, stems, bark and creepers.
Embers	Glowing particles cast from the fire (as ‘showers’ or ‘storms’). (Vic report)
Emergency centre	A facility where the coordination of the response and support to the incident is provided.
En route resources	Resources despatched to an incident that have not yet checked in. (AIIMS)
Entrapment	A situation in which individuals are exposed to life threatening or potentially life threatening conditions from which they cannot safely remove themselves.
Equilibrium moisture content (EMC)	The moisture content that a fuel element would attain if exposed for an infinite period in an environment of specified constant dry-bulb temperature and relative humidity. When a fuel element has reached its EMC, it neither gains nor loses moisture as long as conditions remain constant.
Equipment	All material supplied to an incident excluding personnel and vehicles.
Escape route	A planned route away from danger areas at a fire.
Evacuation	The temporary relocation of persons from dangerous or potentially dangerous areas to safe areas.

Term	Definition
Exposures	Parts of the same structure or other structures or property not directly involved in the fire but at risk of being burnt or damaged if the fire is not controlled. In the bushfire context: 1. Property that may be endangered by a fire burning in another structure or by a bushfire. In general, property within 12 metres of a fire may be considered to involve an exposure hazard, although in very large fires the danger may exist at much greater distances. 2. Direction in which a slope faces, usually with respect to cardinal directions (N, S, E, W). 3. The general surroundings of a site, with special reference to its openness to winds and sunshine.
Extinguishing agent	A substance used to put out a fire by cooling the burning material or blocking the supply of oxygen, or chemically inhibiting combustion or combinations of these mechanisms.
Extreme fire behaviour	A level of bushfire behaviour characteristics that ordinarily precludes methods of direct suppression action. One or more of the following is usually involved: • high rates of spread • prolific crowning and/or spotting • presence of fire whirls • a strong convective column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.
Extreme fire danger	The second highest fire danger rating as determined by fire agencies and generally with a Forest fire danger index between 75 and 99 or a Grassland fire danger index greater between 100 and 149.
Facilities	Permanent and temporary facilities where personnel sleep, cook, maintain and repair equipment. (AIIMS)
Fall back fire control line	Any fire control line which is at a distance from the fire perimeter, and is the second control line at which the fire perimeter may be stopped should it cross the first fire control line. Also known as 'fallback line'.
Fine fuel	Fuel such as grass, leaves, bark and twigs less than 6mm in diameter that ignite readily and are burnt rapidly when dry.
Fingers	Long and narrow slivers of fire which extend beyond the head or flanks. (AFAC)
Fire	The chemical reaction between fuel, oxygen and heat. Heat is necessary to start the reaction and once ignited, fire produces its own heat and becomes self-supporting.
Fire access track	A track constructed and/or maintained expressly for fire management purposes.
Fire behaviour	The manner in which a fire reacts to the variables of fuel, weather and topography.
Fire Behaviour Analyst	Person responsible for developing fire behaviour predictions based on fire history, fuel, weather, and topography. (NWCG)amended
Fire behaviour model	A set of mathematical equations that can be used to predict certain aspects of fire behaviour.
Fire behaviour prediction	Prediction of probable fire behaviour usually prepared by a fire behaviour analyst in support of fire suppression or prescribed burning operations. (NWCG)
Fire behaviour prediction system	A system that uses a set of mathematical equations to predict certain aspects of fire behaviour in wildland fuels when provided with data on fuel and environmental conditions.

Term	Definition
Fire bombing	A technique of suppressing a bushfire by dropping water, foam or retardants on it from an aircraft.
Fire brand	A piece of flaming or smouldering material capable of acting as an ignition source. eg eucalypt bark.
Fire climate	The composite pattern or integration over time of the fire weather elements that affect fire occurrence and fire behaviour in a given area.
Fire control	See Fire suppression.
Fire control agent	A substance that acts as an Extinguishing agent, and or a Fire retardant and or a Fire suppressant.
Fire control line	See: Fireline.
Fire crew	A general term for two or more firefighters organised to work as a unit. (NWCG)
Fire danger	Sum of constant danger and variable danger factors affecting the inception, spread, and resistance to control, and subsequent fire damage; often expressed as an index. (NWCG)
Fire danger class	A segment of a fire danger index scale identified by a descriptive term and or a colour code. The classification system may be based on more than one fire danger index and an assessment of risk exposure.
Fire danger index (FDI)	A relative number denoting the potential rates of spread, or suppression difficulty for specific combinations of temperature, relative humidity, drought effects and wind speed.
Fire danger rating	A relative class denoting the potential rates of spread, or suppression difficulty for specific combinations of temperature, relative humidity, drought effects and wind speed, indicating the relative evaluation of fire danger.
Fire ecology	The study of the relationships between fire, the physical environment and living organisms.
Fire edge	Any part of the boundary of a going fire at a given time. *NOTE*: The entire boundary is termed the 'fire perimeter'.
Fire effects	The physical, biological and ecological impact of fire on the environment. (NWCG)
Fire environment	The surrounding conditions, influences, and modifying forces of topography, fuel, and weather that determine fire behaviour. (NWCG)
Firefighter	Any employee, volunteer or agent of any fire agency who occupies, or is designated, to undertake a role for the purpose of fire suppression.
Firefighting operations	Any work or activity directly associated with control of fire.
Fire frequency	A general term referring to the recurrence of fire in a given area over time (NWCG). Also see: Fire regime
Fire front	The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified, the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smouldering combustion. (NWCG)
Fireground	The area in the vicinity of a fire suppression operations, and the area immediately threatened by the fire. It includes burning and burnt areas; constructed and proposed fire lines; the area where firefighters, vehicles, machinery and equipment are located when deployed; roads and access points under traffic management control; tracks and facilities in the area surrounding the actual fire; and may extend to adjoining area directly threatened by the fire.

Term	Definition
Fire hazard	A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control.
Fire intensity	See: Fireline intensity.
Fireline	A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of fire.
Fireline intensity	The rate of energy release per unit length of fire front usually expressed in kilowatts per metre (Kw/m). The rate of energy release per unit length of fire front, defined by the equation I=Hwr, where I = fireline intensity (kW/m) H = heat yield of fuel (kJ/kg)-16,000 kJ/kg w = dry weight of fuel consumed (kg/m2) (mean total less mean unburnt) r = forward rate of spread (m/s) The equation can be simplified to I = w r/2 where I = fireline intensity (kW/m) w = dry weight of fuel consumed (tonnes/ha) r = forward rate of spread (m/hr)
Fire lookout	A structure strategically located and manned to detect the occurrence and the location of fires. It may be a tower or a structure on a high point
Fire management	All activities associated with the management of fire prone land, including the use of fire to meet land management goals and objectives.
Fire potential	The chance of a fire or number of fires occurring of such size, complexity or impact that requires resources (both a pre-emptive management and suppression capability) from beyond the area of the fire origin. (BCRC)
Fire preparedness	All activities undertaken in advance of bushfire occurrence to decrease its extent and severity and to ensure more effective fire suppression.
Fire prevention	All activities concerned with minimising the incidence of bushfire particularly those of human origin.
Fire regime	The history of fire in a particular vegetation type or area including the frequency, intensity and season of burning. It may also include proposals for the use of fire in a given area. (AFAC)
Fire report	An official record of a fire, generally including information on cause, location, action taken, damage, costs, etc., from start of the fire until completion of suppression action. These reports vary in form and detail from agency to agency (NWCG). Also see Report of Fire
Fire retardant	A chemical generally mixed with water, designed to retard combustion by a chemical reaction. It is applied as slurry from the ground or air to fuels ahead of the fire.
Fire risk	Processes, occurrences or actions that increase the likelihood of fires occurring.
Fire run	A rapid advance of a fire front. It is characterised by a marked transition in intensity and rate of spread.
Fire scar	1) A healing or healed-over injury caused or aggravated by fire on a woody plant. 2) A mark left on a landscape by fire.
Fire season	The period during which bushfires are likely to occur, spread and do sufficient damage to warrant organised fire control.
Fire simulator	A device that imposes simulated fire and smoke on a projected landscape scene, for the purpose of informing fire suppression personnel of potential fire situations either for an actual fire or hypothetical fire(s).
Fire spread	Development and travel of fire across surfaces.

Term	Definition
Fire storm	Violent convection caused by a large continuous area of intense bushfire often characterised by destructively violent surface indrafts, a towering convection column, long distance spotting, and sometimes by tornado-like whirlwinds. (AFAC)
Fire suppressant	An additive designed to reduce the surface tension of water and/or to hold water in suspension thus increasing water's efficiency as a fire extinguishing agent. Suppressants are applied directly to the burning fuels.
Fire suppression	The activities connected with restricting the spread of a fire following its detection and before making it safe.
Fire suppression organisation	1. The personnel and equipment collectively assigned to the suppression of a specific fire or group of fires. 2. The personnel responsible for fire suppression within a specified area. 3. The management structure, usually shown in the form of an organization chart of the persons and groups having specific responsibilities in fire suppression. (NWCG)
Fire suppression plan	See Incident action plan (IAP).
Fire tetrahedron	An instructional aid in which the sides of the tetrahedron (comprising 4 triangular shaped figures) are used to represent the 4 components of combustion and flame production process-fuel, heat, oxygen and the chemical chain reaction.
Fire threat	The impact a fire will have on a community.
Fire tower	Tower strategically located and manned to detect and report the occurrence and location of fires. A type of Fire lookout
Fire training simulator	A training device that imposes simulated fire and smoke on a projected landscape scene, for the purpose of instructing fire suppression personnel in fire situations and fire suppression techniques.
Fire triangle	Diagrammatic expression of the three elements that are necessary for a fire to occur. FUEL – HEAT – OXYGEN. The removal of any one of these will extinguish a fire.
Fire weather	Weather conditions which influence fire ignition, behaviour, and suppression. (NWCG)
Fire weather forecast	A weather prediction specially prepared for use in wildland fire operations and prescribed fire. (NWCG)
Fire whirl	Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to over 500 feet in diameter. Large fire whirls have the intensity of a small tornado. (NWCG)
Fire wind	The inflow of air close to a fire caused by the action of convection. It is not to be confused with a prevailing wind.
First attack	See: Initial attack
Fixed wing aircraft	A heavier than air aircraft which obtains lift for flight by forward motion of wings through the air.
Flame angle	The angle of the flame in relation to the ground, caused by wind direction or the effect of a slope.
Flame depth	The depth of the zone within which continuous flaming occurs behind the fire edge.

Term	Definition
Flame height	The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope. (NWCG)
Flame length	The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface), an indicator of fire intensity. (NWCG)
Flame Zone	The highest level of bushfire attack as a consequence of direct exposure to flames from the fire front in addition to heat flux and ember attack. (AS 3959 - 2009)
Flame zone	The area around fuels where the combustion of gases occurs to form flames.
Flaming zone	See: Flame zone.
Flammability	The ease with which a substance is set on fire.
Flammable	Capable of being ignited and of burning with a flame.
Flank attack	Obtaining control of a fire by attacking its side/s (flank).
Flanks of a fire	Those parts of a fire's perimeter that are roughly parallel to the main direction of spread. (NWCG)
Flare up	Any sudden acceleration of fire spread, or intensification of fire, or a part of the fire. A flare up is of relatively short duration and does not radically change existing control plans. (NWCG)
Flash fire	A fast moving fire consuming most of the fine fuels available.
Foam	Foam is a mass of bubbles formed by mixing air with water and a foam concentrate in specific proportions. It is used as a firefighting agent to form a smothering, cooling and/or ignition preventing layer of the surface over a fuel.
Foam blanket	A layer of foam which forms an insulating and reflective barrier to heat and is used for fuel protection, suppression, and mop-up. (NWCG)
Foam Class A	A mixture of foam concentrate & water specifically formulated for extinguishing bushfires. The foam is biodegradable, non toxic and is used at very low concentrates. It may be delivered aspirated or non-aspirated. (See also Foam solution).
Foam Class B	A foam formulated for application on Class B fires
Foam concentrate	The concentrated foaming agent as received from the manufacturer which, when added to water, creates a foam solution.
Foam inductor	Equipment consisting of an inlet connection, ejector pump and a discharge assembly, for the induction of foam concentrate.
Foam solution	The mixture of water and foam concentrate.
Forest	An area, incorporating all living and non-living components, that is dominated by trees having usually a single stem and a mature or potentially mature stand height exceeding 2 metres and with existing or potential crown cover of overstorey strata about equal to or greater than 20 per cent. This definition includes Australia's diverse native forests, woodlands and plantations, regardless of age.
Forest fire	A fire burning mainly in forest and/or woodland.
Forest type	A category for describing a forest commonly based on the predominant tree species, tree form and structure.

Term	Definition
Forward looking infrared (FLIR)	Hand held or aircraft mounted device designed to detect heat differentials and display them. FLIRs have thermal resolution similar to IR line scanners, but their spatial resolution is substantially less; commonly used to detect hot spots and flare ups obscured by smoke, evaluate the effectiveness of firing operations, or detect areas needing mop-up. (NWCG)
Forward rate of spread (FROS)	The speed with which a head fire moves in a horizontal direction across the landscape.
Frontal fire intensity	See: Fireline Intensity
Front end loader	Earthmoving equipment designed to move loose earth and/or loads into vehicles. A multi-purpose bucket is fitted to articulated arms at the front of the vehicle. May be either wheeled or tracked.
Fuel	Any material such as grass, leaf litter and live vegetation which can be ignited and sustains a fire. Fuel is usually measured in tonnes per hectare. Related Terms: Available fuel, Coarse fuel, Dead fuel, Elevated dead fuel, Fine fuel Ladder fuels, Surface fuels, and Total fine fuel.
Fuel age	The period of time lapsed since the fuel was last burnt.
Fuel arrangement	A general term referring to the spatial distribution and orientation of fuel particles or pieces. (NWCG)
Fuel array	The totality of fuels displayed in a location: fine and coarse, live and dead. (Vic report)
Fuel assessment	The estimation or calculation of total and available fuel present in a given area.
Fuel bed depth	Average height of surface fuels contained in the combustion zone of a spreading fire front. (NWCG)
Fuelbreak	A natural or manmade change in fuel characteristics which affects fire behaviour so that fires burning into them can be more readily controlled.
Fuelbreak system	A series of modified strips or blocks tied together to form continuous strategically located fuel breaks around land units.
Fuel continuity	The degree or extent of continuous or uninterrupted distribution of fuel particles in a fuel bed thus affecting a fire's ability to sustain combustion and spread. This applies to aerial fuels as well as surface fuels.
Fuel depth	The average distance from the bottom of the litter layer to the top of the layer of fuel, usually the surface fuel.
Fuel load	The oven dry weight of fuel per unit area. Commonly expressed as tonnes per hectare. (AFAC). (Also known as fuel loading)
Fuel management	Modification of fuels by prescribed burning, or other means. (AFAC)
Fuel map	A map showing areas of varying fuel quantities and types and usually indicates past fire history.
Fuel model	Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified. (NWCG)
Fuel modification	Manipulation or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control (e.g., lopping, chipping, crushing, piling and burning).(NWCG)
Fuel moisture content	The water content of a fuel expressed as a percent of the oven dry weight of the fuel particle. (%ODW)

Term	Definition
Fuel moisture differential	A term used to describe the situation where the difference in the moisture content between fuels on adjacent areas results in noticeably different fire behaviour on each area.
Fuel profile	The vertical cross section of a fuel bed down to mineral earth.
Fuel quantity	See: Fuel load.
Fuel reduction	Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.
Fuel reduction burning	The planned application of fire to reduce hazardous fuel quantities; undertaken in prescribed environmental conditions within defined boundaries.
Fuel separation	The action of separating fuel for the purpose of providing a mineral earth firebreak. Also means the actual gap between fuel layers or particles eg gap between individual hummock grasses or gap between surface and canopy fuels
Fuel type	An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause predictable rate of spread or difficulty of control under specified weather conditions. (AFAC)
Fuel weight	See Fuel load.
General origin area	The larger area where the fire started that is readily identifiable based on macro scale indicators and witness statements. (NWCG)
Going fire	Any bushfire which is expanding and suppression actions have not yet contained the fire.
Grass fire	Any fire in which the predominant fuel is grass or grass like. (NWCG)
Grassland curing	The proportion of dead material in grasslands – usually increases over summer as tillers die off and dry out, increasing the risk of grassland fire.
Grid ignition	A method of lighting prescribed fires where ignition points are set individually at a predetermined spacing through an area.
Ground crew	See: Hand crew.
Ground fire	Fire that consumes the organic material beneath the surface litter ground, such as a peat fire. (NWCG)
Ground fuel	All combustible materials below the surface litter, including duff, roots, peat and saw dust dumps that normally support a glowing or smouldering combustion without flame.
Habitat	The local environment of conditions in which an animal or plant lives.
Hand crew	A fire suppression crew trained and equipped to fight fire with hand tools.
Hand line	A fireline constructed with hand tools. (NWCG) (Wildfire context)
Hand trail	See Hand line.
Hang up	A situation in which a tree is lodged in another and prevents it from falling to the ground.
Hazard	A source of potential harm or a situation with potential to cause loss.
Hazard reduction	See: Fuel Management
Head	See: Head Fire
Head attack	Directly knocking down the head of a fire. Recommended only for low intensity fires where firefighters can be sure that the fire will not flare up unexpectedly.
Head fire	The part of a fire where the rate of spread, flame height and intensity are greatest, usually when burning downwind or upslope.

Term	Definition
Heat exhaustion	A form of shock, due to depletion of body fluids resulting from overexposure to a hot environment.
Heat stress	Illness caused by the body overheating.
Heat stroke	A life-threatening condition that develops when the body's temperature-regulating and cooling mechanisms are overwhelmed and body systems begin to fail.
Heat transfer	The transfer of thermal energy from one physical system to another by conduction, convection or thermal radiation.
Heavy fuels	See: Coarse fuels.
Heel	See: Rear (Preferred term).
Heel fire	See: Backing Fire.
Helibase (HB)	A location for parking, refuelling and maintenance of helicopters operating in support of an incident.
Helicopter	A form of heavier-than-air, rotor-wing aircraft whose lift is produced by engine-driven rotors which behave as if they were both propellers and wings.
Helipad (HP)	A designated location which meets specific requirements for a helicopter to take off and land.
Helitack crew	An initial attack crew specially trained in the tactical and logistical use of helicopters for fire suppression.
Heli-torch	An aerial ignition device hung from or mounted on a helicopter to disperse ignited lumps of gelled gasoline. Used for backburns, burnouts, or prescribed burns. (NWCG)
High fire danger	The second lowest fire danger rating as determined by fire agencies and generally with a Forest fire danger index between 25 and 49 or a Grassland fire danger index between 25 and 49.
High intensity fire	Fires with an average intensity greater than 3000 $kW.m^{-1}$ and flame heights greater than 3 m, causing complete crown scorch or possibly crown fires in forests. Uncontrollable by direct attack. The term is also applied to stationary fires burning in very high fuel loads (such as logging slash).
Hold over fire	See: Sleeper
Hop over	See: Breakaway.
Hose bandage	A means of affecting a temporary repair to a canvas or synthetic hose.
Hose strangler	A crimping device for stopping the flow of water in a hose.
Hot Refueller	A trained person responsible for the operation of the equipment for the 'hot' refuelling of helicopters.
Hot spot	1. A particularly active part of a fire. 2. An area of smouldering fuels requiring to be extinguished during patrol operations.
Humus	Layer of decomposed organic matter on the forest floor beneath the fermentation layer and directly above the soil. It is that part of the duff in which decomposition has rendered vegetation unrecognizable and mixing of soil and organic matter is underway. See Also: Duff & Litter
Hygrometer	An Instrument which measures the humidity in the air.
Ignition	The beginning of flame production or smouldering combustion; the starting of a fire.

Term	Definition
Ignition pattern	The manner in which a prescribed burn, backburn, or burnout is set, determined by weather, fuel, ignition system, topographic and other factors having an influence on fire behaviour and the objective of the burn.
Ignition source	A source of energy sufficient to initiate combustion.
Incendiary	A burning compound or metal used to produce intense heat or flame, like a bomb.
Incendiary device	Device designed and used to start a fire.
Incident	Any unplanned event requiring emergency intervention. (AIIMS)
Incident Action Plan (IAP)	The plan used to describe the incident objectives, strategies, resources and other information relevant to the control of an incident. (AIIMS)
Incident control	See: Incident management
Incident Control Centre (ICC)	The location where the Incident Controller and various members of the Incident Management Team provide overall direction of response activities. (See also Incident Control Point)
Incident Controller	The individual responsible for the management of all incident control activities across a whole incident (AIIMS)
Incident Control Point (ICP)	The location where the Incident Controller and, where established, members of the Incident Management Team provide overall direction of response activities in an emergency situation. (See also Incident Control Centre)
Incident control system (ICS)	A command structure to systematically and logically manage suppression of emergency incidents including bushfires, from small, simple incidents to large, difficult or multiple situations. It is designed to develop in modular fashion from the top (Incident Controller) downwards. Refer NIMS, AIIMS, CIMS
Incident management	The process of controlling the incident and coordinating resources. (EMA)
Incident Management Team (IMT)	The group of incident management personnel comprising the Incident Controller, and the personnel he or she appoints to be responsible for the functions of Operations, Planning and Logistics. (AIIMS)
Incident objective	An incident objective is a goal statement indicating the desired outcome of the incident. Incident objectives guide the development of the Incident Action Plan and must reflect the policies and needs of the control authority and supporting agencies. All factors affecting the incident and its potential impact must be considered before determining the objective. (AIIMS)
Incident strategies	The incident strategies will be developed from the incident objectives and will describe how the Incident Management Team plans to resolve the incident. There is a requirement for strategies to be developed throughout the incident and they should be reviewed for each operational period. (AIIMS)
Indirect attack	A method of suppression in which the control line is located some considerable distance away from the fire's active edge. Generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks or fuelbreaks and favourable breaks in the topography. The intervening fuel is usually backburnt; but occasionally the main fire is allowed to burn to the line, depending on conditions.(NWCG)
Induced wind	See: Fire wind.
Infrared scanning	Use of an optical-electronic system for identifying or obtaining imagery of thermal infrared radiation to detect non-smoking fires or fire perimeters through smoke.
Initial attack	The first suppression work on a fire.

Term	Definition
Instability	The tendency for air parcels to accelerate when they are displaced from their original position; especially, the tendency to accelerate upward after being lifted. Instability is a prerequisite for severe weather - the greater the instability, the greater the potential for severe thunderstorms. (Weather Zone)
Interface	See: Urban Rural interface.
Inversion	A layer of the atmosphere in which temperature increases with increasing elevation. A condition of strong atmospheric stability.
Island	An unburnt area within a fire perimeter.
Isobar	Lines on weather maps joining places which have the same air pressure.(BOM)
I zone	See: Urban Rural interface.
Jump fire	See: Spot fire
Jump over	See: Breakaway
Junction zone	An area of greatly increased fire intensity caused by two fire fronts (or flanks) burning towards one another.
Keetch-Byram Drought Index (KBDI)	A numerical value reflecting the dryness of soils, deep forest litter, logs and living vegetation, and expressed as a scale from 0 - 200 where the number represents the amounts of rainfall (mm) to return the soil to saturation.
Knock down	To reduce the flame or heat on the more vigorously burning parts of a fire edge. (NWCG)
Ladder fuels	Fuels that provide vertical continuity between strata. Fire is able to carry surface fuels into the crowns of trees with relative ease.
Lag time	The time delay in fuel moisture content responding to changing environmental conditions (for example, relative humidity). Technically, it is the time necessary for a fuel particle to lose approximately 63% of the difference between its initial moisture content and its equilibrium moisture content.
Lead agency	The organisation with the legislative or agreed authority for control of an incident.
Lee (leeward)	Away from the wind, on the sheltered side of something that the wind is blowing on.
Legislation	A set of rules made by a State, Territory or Federal Government; includes acts and regulation.
Light fuel	An assessment of fuel quantity indicating a low weight.
Lighting pattern	See: Ignition pattern.
Lightning	The flash of light accompanying a sudden electrical discharge which takes place from or inside a cloud, or less often from high structures or the ground or from mountains. A large electrical spark. Caused when the negative charge in the lower part of the cloud and the positive charge in the upper part of the cloud become so great that they can overcome the natural resistance of the air and discharge between negative and positive takes place. (BOM)
Lightning fire	A fire caused by lightning.
Lightning formation	See: Lightning.
Light patrol unit	See: Tanker.
Line ignition	See: Strip burning.

Term	Definition
Litter	The top layer of the forest floor composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves and needles, little altered in structure by decomposition. (The litter layer of the forest floor). (NWCG)
Litter bed fuel	Dead fine fuel, including surface fuel and fuel lower in the fuel profile.
Litter fall	The addition of litter that falls from vegetation to the forest floor.
Living fuels	Fuels made up of living vegetation.
Living shrub fuel	Living understorey fine fuel less than 2 metres above ground level.
Local winds	Winds which are generated over a comparatively small area by local terrain and weather. They differ from those which would be appropriate to the general pressure pattern. (NWCG)
Log	Documentation of information and actions arising during an incident
Logistics	The provision of facilities, services and materials in support of an incident.
Lookout	1. A person designated to detect and report fires from a fixed vantage point. 2. A member of a fire crew designated to observe the fire and warn the crew when there is danger. 3. For structure see: Fire lookout
Lookout tower	See: Fire tower.
Low intensity fire	A fire which travels slowly and only burns lower storey vegetation, like grass and lower tree branches, with an average intensity of less than 500 $kW.m^{-1}$ and flame height less than 1.5m. Usually causes little or no crown scorch and is easily controlled.
Low-moderate fire danger	The lowest fire danger rating as determined by fire agencies and generally with a Forest fire danger index less than 12 or a Grassland fire danger index less than 12.
Medium fuels	See Course fuels.
Mineral earth	When used in the context of fire control refers to a non-flammable surface (either natural or prepared) which provides a break in understorey, litter and humus fuels and hence a barrier (of varied effectiveness depending, amongst other things, on its width and the intensity of the approaching fire) to fire travelling on or near the ground surface.
Mobilisation	The processes and procedures for organisations to activate, assemble, and transport the requested resources to an incident.
Moisture content	See Fuel moisture content.
Mopping up	See Blacking out
Mosaic	Used in reference to the spatial arrangement of burnt and unburnt fuels at either a local or a landscape scale.
Move up method	See: Step-up method
Multi-agency response	The response to an incident where one or more agencies assist the jurisdictional control agency or agencies.
Multiple fire situation	A circumstance of high fire incidence over short periods of time in any administrative unit, usually overtaxing the normal initial attack capability of the unit.
Natural barrier	Any area where lack of flammable material obstructs the spread of vegetation fires.

Term	Definition
Near surface fuel	Live and dead fuel, including suspended leaves, bark or twigs, effectively in touch with the ground but not lying on it, with a mixture of vertical and horizontal orientation.
Needle bed	A fuel bed consisting mainly of pine needles.
Nozzle	A fitting that is used with a branch to control the size, pattern and/or velocity of water or extinguishing medium being discharged.
One lick method	A progressive system of building a fireline on a wildfire without changing relative positions in the line. Each worker does one to several "licks", or strokes removing a set proportion of the fuel on the line, with a given tool and then moves forward a specified distance to make room for the worker behind. (NWCG)
Operations	The direction, supervision and implementation of tactics in accordance with the Incident Action Plan.
Operations point	The location from which the overall field operations are commanded by the Operations Officer. (AIIMS)
Parallel attack	Method of fire suppression in which fireline is constructed approximately parallel to, and just far enough from the fire edge to enable workers and equipment to work effectively, though the fireline may be shortened by cutting across unburned bays. The intervening strip of unburned fuel is normally burned out as the control line proceeds but may be allowed to burn out unassisted where this occurs without undue delay or threat to the fireline. (NWCG)
Parallel fire suppression	See: Parallel attack.
Parallel method	See: Parallel attack.
Parts of a Fire	See: Bay(s), Fingers, Flanks of a fire, Head.
Patch burning	Burning in patches to prepare sites for group planting or sowing or to form a barrier to subsequent fires. (NWCG)
Patrol	1. To travel over a given route to prevent, detect, and suppress fires. Includes interaction with the public for wildland fire prevention and educational purposes. 2. To go back and forth vigilantly over a length of control line during and/or after construction to prevent breakaways, suppress spot fires, and extinguish overlooked hot spots. 3. A person or group of persons who carry out patrol actions. (NWCG)
Peat	An amorphous organic material formed by anaerobic decomposition which usually means that the area is seasonally or permanently inundated with water. Peat fires burn by smouldering combustion and generate very high amounts of energy per unit area.
Perimeter	See: Fire perimeter.
Peri urban interface	See: Urban rural interface.
Permit burn	A burn carried out under permit from a Fire Authority.
Personal protection equipment (PPE)	The equipment and clothing designed to mitigate the risk of injury from the chemical, physical and thermal hazards that may be encountered at an incident.
Personal protective clothing (PPC)	The clothing designed to mitigate the risk of injury from the chemical, physical and thermal hazards that may be encountered at an incident.
Plan of attack	See: Incident Action Plan (Preferred term)
Planned burning	See: Prescribed burning.
Pocket	See: Island.

Term	Definition
Point of attack	The part of the fire on which work is started when suppression forces arrive.
Point of origin	The specific location where the fire started.
Portable dam	A temporary water storage used in conjunction with power pumps and hose lines.
Predicted rate of spread	The rate of spread predicted by the application of fire spread models utilising appropriate inputs of fuel conditions, topography and weather. Also see Rate of Spread.
Pre-incident plan	Advanced planning and preparation for an emergency situation.
Pre-suppression plan	See Pre-Incident Plan
Prepared community	A community that has developed effective emergency management arrangements at the local level, resulting in: • An alert, informed and active community that supports its voluntary organizations • An active and involved local government • Agreed and coordinated arrangements from prevention, preparedness, response and recovery.
Preparedness	All activities undertaken in advance of the occurrence of an incident to decrease the impact, extent and severity of the incident and to ensure more effective response activities.
Pre-planned dispatch	The pre-planned dispatch of designated suppression forces to fires in predetermined zones. It is usually dependent on the location of the fire, and the forecast fire danger.
Prescribed burn	A fire utilised for Prescribed burning.
Prescribed burn plan	See: Burn plan.
Prescribed burning	The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives.
Prescribed fire	Any fire ignited by management actions to meet specific objectives. A written, approved burn plan must exist, and approving agency requirements (where applicable) must be met, prior to ignition.
Prescription	A written statement defining the objectives to be attained during prescribed burning.
Prevention	All activities concerned with minimising the occurrence of incidents, particularly those of human origin.
Profile litter moisture content	The moisture content, expressed as a percentage of oven-dry weight, of the entire leaf litter bed above the mineral soil surface.
Profile moisture content	See Fuel moisture content.
Psychrometer	The general name for instruments designed for determining the relative humidity of the air. A psychrometer consists of wet and dry bulb thermometers, generally with the aid of psychrometric tables or a psychrometric slide rule. (BOM)
Pulaski tool	A combination chopping and trenching tool widely used in fireline construction, which combines a single-bitted axe blade with a narrow adze-like trenching blade fitted to a straight handle. (NWCG)
Pumper	A firefighting vehicle equipped with a large capacity pump, water tank and hose. Generally intended to be operated when stationary, from reticulated or static water supplies.

Term	Definition
Quick-fill pump	A high volume water pump used for filling tankers.
Rain gauge	The general name for instruments designed to measure the amount of rain that has fallen.
Rakehoe (McLeod tool)	A hand tool used for bushfire fighting, consisting of a combination of a heavy rake and hoe.
Rate of spread (ROS)	The speed with which a fire moves in a horizontal direction across the landscape at a specified part of the fire perimeter. See also Forward rate of spread.
Reaction time	The time taken between the report of a fire or incident, and the departure of the crew. See also Response time.
Rear	1. That portion of a fire spreading directly into the wind or down slope. 2. That portion of a fire edge opposite the head. 3. Slowest spreading portion of a fire edge. Also called heel of a fire. (NWCG)
Reburn	Repeat burning of an area over which a fire has previously passed, but left fuel that later ignites when burning conditions are more favourable. (NWCG)
Reconnaissance	To examine a fire area to obtain information about current and probable fire behaviour and other related fire suppression information. (NWCG)
Recovery	The coordinated process of supporting emergency affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical wellbeing.
Red Flag Warning	A process for passing critical safety information to incident suppression resources and support resources on which they can base decisions regarding strategy, tactics and deployment.
Regeneration burn	A burn lit under prescribed conditions for the purpose of achieving regeneration of a particular vegetation type.
Re-ignition	The action of a material that ignites again after it has been extinguished.
Relative humidity (RH)	The amount of water vapour in a given volume of air, expressed as a percentage of the maximum amount of water vapour the air can hold at that temperature.
Relay pumping	Using a series of pumps positioned at intervals along a line or lines of hose to share the workload of pumping water over a long distance.
Relief	The replacement of personnel whose period of time at the incident has concluded.
Report of fire	The notification of the detection of a fire to the fire service. (AFAC)
Residence time	The time required for the flaming zone of a fire to pass a stationary point; the width of the flaming zone divided by the rate of spread of the fire.
Resources	All personnel and equipment available, or potentially available, for incident tasks.
Response	Actions taken in anticipation of, during, and immediately after an incident to ensure that its effects are minimised, and that people affected are given immediate relief and support.
Response time	The time taken between the report of a fire or incident, and arrival at the scene. It includes both reaction time and travel time.
Responsible authority	See: Control authority.
Retardant	See: Fire retardant.

Term	Definition
Risk	The exposure to the possibility of such things as economic or financial loss or gain, physical damage, injury or delay, as a consequence of pursuing a particular course of action. The concept of risk has two elements, i.e. the likelihood of something happening and the consequences if it happens. (AS4360)
Risk analysis	A systematic use of available information to determine how often specific events may occur and the magnitude of their likely consequences.
Road Management Point	A strategic position from which traffic can be observed and controlled. (See also Traffic Management Point and Vehicle Control Point)
Rural	Any area wherein residences and other developments are scattered and intermingled with forest, range, or farm land and native vegetation or cultivated crops.
Rural urban interface (RUI)	See Urban rural interface
Safe	The stage of bushfire suppression or prescribed burning when it is considered that no further suppression action or patrols are necessary.
Safety zone	An area cleared of flammable materials used for escape if the line is outflanked or in case a spot fire outside the control line renders the line unsafe. In fire operations, crews progress so as to maintain a safety zone close at hand, allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuelbreaks. They are greatly enlarged areas which can be used with relative safety by fire fighters and their equipment in the event of a blow up in the vicinity. (Vic report)
Scorch height	1. The height above ground level up to which foliage has been browned by a fire. 2. A measurement for determining the acceptable height of flame during prescribed burning.
Scout	A person who checks and reports on conditions in the fire area.
Scrub	Refers to vegetation such as heath, wiregrass and shrubs, which grows either as an understorey or by itself in the absence of a tree canopy.
Scrub fire	Fires burning in scrub.
Secondary fire control line	See: Fall back fire control line.
Sector	A specific area of an incident which is under the control of a Sector Commander who is supervising a number of crews.
Seen area	The ground, or vegetation, that is directly visible from an established or proposed lookout point, or aerial detection flight route.
Severe fire danger	The third highest fire danger rating as determined by fire agencies and generally with a Forest fire danger index between 50 and 74 or a Grassland fire danger index between 50 and 74.
Shift	The period resources are allocated during an operation at the incident or on the fireground.
Shift change	Replacement of allocated crews and or equipment during operations.
Situation report **(Sitrep)**	A report on the progress of the fire and the efforts to control it. It confirms the location of the fire, its status and potential and the number, nature and effectiveness of resources deployed. Situation reports are normally provided at regular times until the fire is declared safe.
Size up	The evaluation of a fire to determine a course of action for suppression.
Slash	Accumulated fuel resulting from such natural events as wind, fire, snow breakage, or from such human activities as logging, cutting or road construction.

Term	Definition
Slash burn	A prescribed burn conducted to consume slash for fire hazard reduction or silvicultural purposes.
Sleeper	1. A fire that starts up again after appearing to have been extinguished. 2. A fire that is detected some time after an ignition opportunity (usually from lightning or hop over events).
Slip-on unit	A tank, a live hose reel or tray, a small capacity pump, and an engine combined into a single one-piece assembly that can be slipped onto a truck bed or trailer and used for spraying water and/or foam on bushfires.
Slop over	See: Breakaway
Smoke management	Used by land managers and meteorologists planning a prescribed burn, to ensure that smoke does not cause problems downwind of the burn.
Smoke Plume	The column of smoke that rises from a fire. (See also Convection Column)
Smoker	An isolated small burning item such as a log, stump or tree, in an area of fire otherwise mopped up.
Softwood	A conventional term used to describe a tree, and the timber of trees, belonging to the group of plants with cones, such as pine and cypress.
Soil Dryness Index (SDI)	A form of Drought Index, usually with slightly more detailed inputs than the Keetch-Byram Drought Index. May be on a scale of 0-200 like the KBDI, but some versions have different scales (for example, Western Australia: 0-2000).
Southern Oscillation Index (SOI)	The comparison of surface air pressure differences between Tahiti and Darwin that shows a strong correlation with rainfall.
Spark arrestor	A device fitted to the exhaust system of machinery for trapping carbon sparks.
Spot fire	1. Isolated fire started ahead of the main fire by sparks, embers or other ignited material, sometimes to a distance of several kilometres. 2. A very small fire that requires little time or effort to extinguish.
Spot ignition	An ignition pattern using a series of spaced points of ignition.
Spot over	See: Breakaway
Spotting	Behaviour of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire. (NWCG)
Staging area	An area where resources are mustered and prepared for allocation to an incident. It may include the provision of welfare and equipment maintenance facilities. (AIIMS)
Stand by	The period during which personnel are to be immediately available at home or other location for fire suppression purposes.
Static water supply	A supply of water in a reservoir or pond, of limited capacity.
Step-up method	A method used by a team of firefighters to construct a firebreak in which each firefighter completely constructs a section of the firebreak after which the entire team ‘steps up’ to the next section.
Strike teams	A set number of resources of the same type that have an established minimum number of personnel. Strike Teams always have a leader (usually in a separate vehicle), and have a common communications system. Strike Teams are usually made up of five resources of the same type such as: vehicles, crews, earth moving machinery, etc (AIIMS).

Term	Definition
Strip burning	1. An ignition pattern using lines of continuous fire. 2. In hazard reduction, burning narrow strips of fuel and leaving the rest of the area untreated by fire. (NWCG)
Strip ignition	See: Strip burning.
Stripping	See: Strip burning.
Structure	A constructed object, usually a free-standing building above ground.
Sub surface fire	See: Ground fire
Sub surface fuel	See: Ground fuel
Suction hose	Hose used to draught from static/open water. It has a hard, usually reinforced, exterior to prevent it collapsing when a partial vacuum exists within the hose.
Supply hose	Hose feeding from a water supply to a pump.
Support agency	An organisation contributing services or resources directly to a lead agency.
Surface fire	Fire that burns loose debris on the surface, which includes dead branches, leaves, and low vegetation. (NWCG)
Surface fuel	Litter fuels made up of leaves, twigs, bark and other fine fuel lying on the ground, predominately horizontal in orientation.
Surface moisture content	The moisture content expressed as a percentage of oven dry weight of the top 5-10 mm of leaf litter.
Tactics	These are the tasking of personnel and resources to implement the incident strategies. Incident control tactics are accomplished in accordance with appropriate agency procedures and safety directives. (AIIMS)
Tail fire	See: Backing fire.
Tanker	A mobile firefighting vehicle equipped with a water tank, pump, and the necessary equipment for spraying water and/or foam on bushfires.
Task force	A combination of resources assembled for a specific purpose. Task Force always have a leader (usually in a separate vehicle), and have a common communications system. Task Forces are established to meet tactical needs and may incorporate a mixture of different resources types. (AIIMS)
Task group	A large or complex combination of resources assembled for a specific purpose including intrastate, interstate and international deployments made up of multiple strike teams or task forces and or other response or support resources in any combination.
Technical advisors	Are advisors with special skills needed to support incident activities/functions.(AIIMS)
Temperature (dry bulb)	The ambient air temperature recorded by an exposed thermometer.
Temperature (wet bulb)	Wet bulb temperature is measured by placing a moist, single-layer, muslin sleeve over the bulb of a dry bulb thermometer. The difference between dry and wet bulb readings is used to determine relative humidity and dewpoint values.
Test fire	A controlled fire ignited to evaluate fire behaviour.
Thermal imagery	A display or print out from an infra-red scanning device.
Thermal radiation	The process by which the surface of an object radiates its thermal energy in the form of electromagnetic radiation.

Term	Definition
Thermohygrograph	An instrument that simultaneously and continuously measures and records temperature and relative humidity, normally by tracing each onto a revolving chart. Charts can be either for one day or one week of continuous recording.
Time lag	See: Lag time
Tongues	See: Fingers
Topography	The surface features of a particular area or region. It may include mountains, rivers, populated areas, roads and railways and fuel types.
Torch	See: Candle
Torching	See: Candle
Traffic Management Point	Point along movement routes that are staffed by emergency personnel to direct and control traffic flow. (See also Road Management Point and Vehicle Control Point)
Travel time	The time taken between the departure of a crew, and arrival at the incident. See also Response time.
Under storey	The lowest stratum of a multi-storeyed forest.
Upwind	Towards the wind direction. In the same direction as the direction from which the wind is blowing. The opposite direction to that smoke will travel.
Urban	Area in which residences and other human developments form an essentially contiguous covering of the landscape, includes most area within cities & towns, subdivisions, commercial and industrial parks, and similar development whether inside city limits or not.
Urban interface	See Urban rural interface
Urban rural interface (URI)	The line, area, or zone where structures and other human development adjoin or overlap with undeveloped bushland.
Values at risk	The natural resources or improvements that may be jeopardised if a fire occurs.
Vehicle Control Point	A point on a vehicle access route controlled by a barrier, or similar means, at which a vehicle is required to stop. (See also Road Management Point and Traffic Management Point)
Very high fire danger	The forth highest fire danger rating as determined by fire agencies and generally with a Forest fire danger index between 25 and 49 or a Grassland fire danger index between 25 and 49.
Warning device	Audible devise fitted to fire bombing aircraft to alert ground crews of pending drop.
Water bombing	See: Fire bombing.
Water point	Any natural or constructed supply of water that is readily available for fire control operations.
Water tank	A container capable of storing a large volume of water.
Wetting agent	A chemical added in low concentration to water. It is used in firefighting to break down the surface tension of the water and to improve its penetration into fuels.
Widow maker	See: Hang up
Wilderness Area	Places where wilderness quality defined using thresholds of remoteness, naturalness and total area is recognised and valued by society.
Wildfire	See: Bushfire.
Wildfire control plan	See: Incident Action Plan

Term	Definition
Wildland urban interface (WUI)	See: Urban rural interface
Wind direction	The direction from which the wind blows.
Windfall	See: Wind throw
Wind throw	An area of previously standing timber which has been blown over by strong winds or storms.
Wind speed	The rate of horizontal motion of the air past a given point expressed in terms of distance per unit of time. In the NZ Fire Danger Rating System, wind speed is measured at the standard height of 10 metres in the open, averaged over a 10-minute interval and in kilometres per hour.
Wind strength	Generally measured as wind speed. May be measured by the Beaufort wind scale.
Windrow	A long line of piled slash or debris resulting from forest or scrub clearing.
Windrow burning	The burning of windrows.
Windward	Towards the wind. You are windward if the wind is blowing on your face.
Woodland	A subset of forest plant communities in which the trees form only an open canopy (between 20% and 50% crown cover), the intervening area being occupied by lower vegetation, usually grass or scrub.