



BUSHFIRE ATTACK LEVEL (BAL) CONTOUR ASSESSMENT

Lot 9184, Old Yanchep Road, Banksia Grove

Version: 1.0 Reference: 7263 Date: November 2017



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Date: 29/11/2017



Reviewed by: Darrel Krammer
Date: 30/11/2017

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1.0 Introduction

1.1 Subject Site

The subject site of this BAL Contour assessment is Lot 9184 Old Yanchep Road, Banksia Grove, referred to as the North East Precinct of the Banksia Grove development. The site is located within the municipality of the City of Wanneroo.

Figure 1A illustrates the subject site and its immediate surrounds.

The site is identified as being Bushfire Prone on the *Map of Bush Fire Prone Areas 2017* (OBRM, 2017).

The subject site has approval for subdivision (WAPC 147816) dated 18 June 2014. The North East Precinct involves the freehold subdivision of Lot 9184 to create 636 new residential lots. Additionally, a 2.5917ha balance lot adjacent to the existing Flynn Drive road will be reserved for future road widening, as planned under the Metropolitan Region Scheme.

Figure 1B illustrates the Subdivision Plan.

Lot sales and development will be staged progressively from the south to the north across the subject site.

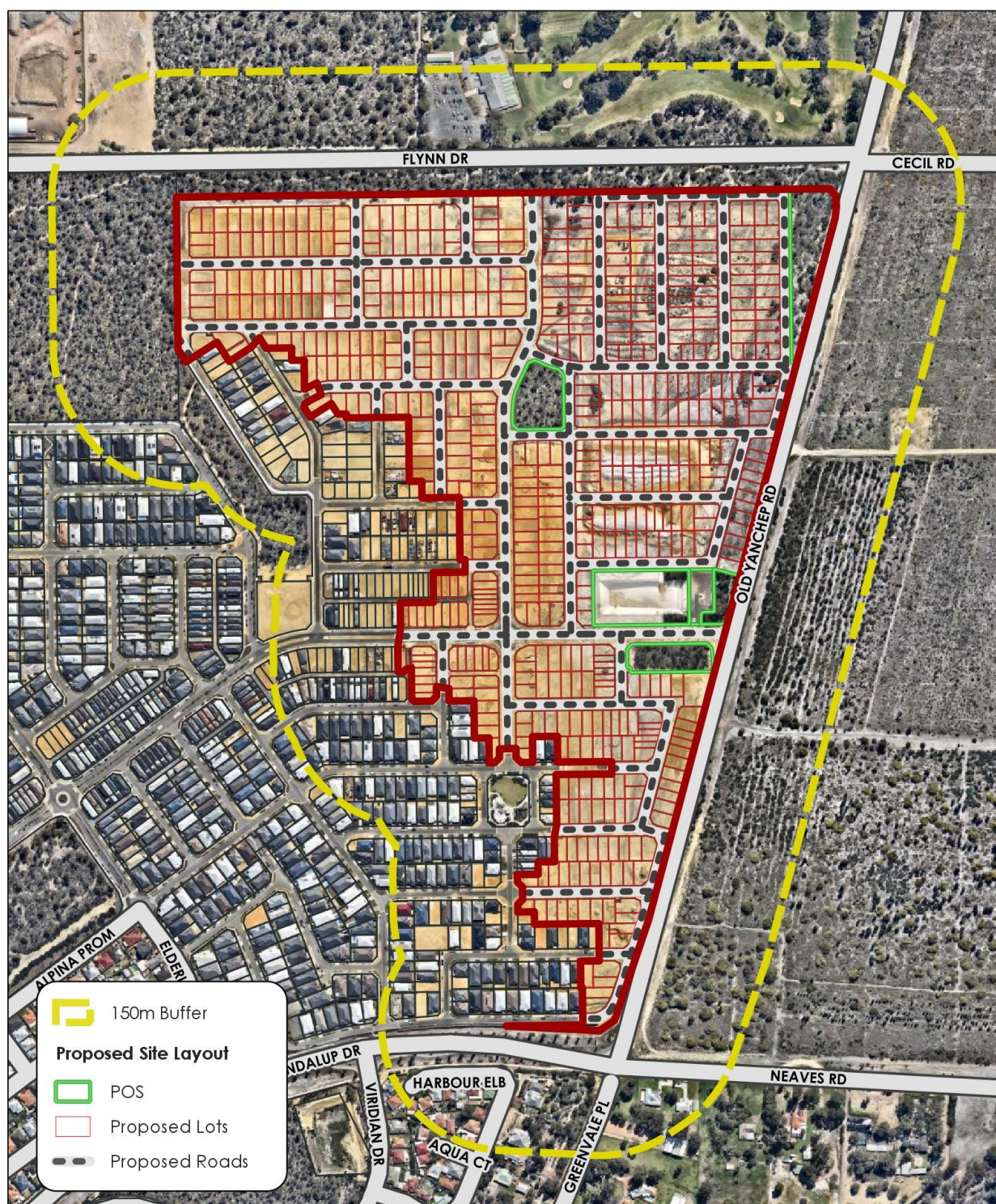
Figure 1C illustrates the Overall Staging Plan.

1.2 Purpose of Report

The purpose of this BAL Contour Map report is to provide a Bushfire Attack Level (BAL) assessment covering the proposed subdivided lots within the North East Precinct of the Banksia Grove development. Specifically, this report determines the BAL ratings that may be achieved for future buildings on the subdivided lots based on the Subdivision Concept Plan, reference 981-526A-01 dated 26th September 2017.

This report incorporates a two-stage assessment. The first stage assesses the indicative BAL ratings for the proposed lots in all development stages. The second stage re-assesses the proposed lots subsequent to the future development of the balance lot reserved for the future widening of Flynn Drive. The area impacted by the vegetation within the balance lot includes development stages 49, 51, 54 and 55. The indicative BAL ratings of the impacted lots within this area will potentially be reduced in future due to the vegetation management and/or removal required for the proposed widening of Flynn Drive.

A Bushfire Management Plan (BMP) has previously been prepared and approved incorporating this development (Natural Area Consulting, 2015).



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BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
Site Overview

- Site Boundary
- Cadastre
- Roads



Size: A4

Scale: 1:6,000

0 50 100 150 200 250 m

Ref: 7263_001_01_SiteOverview_20171004
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-10-04
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

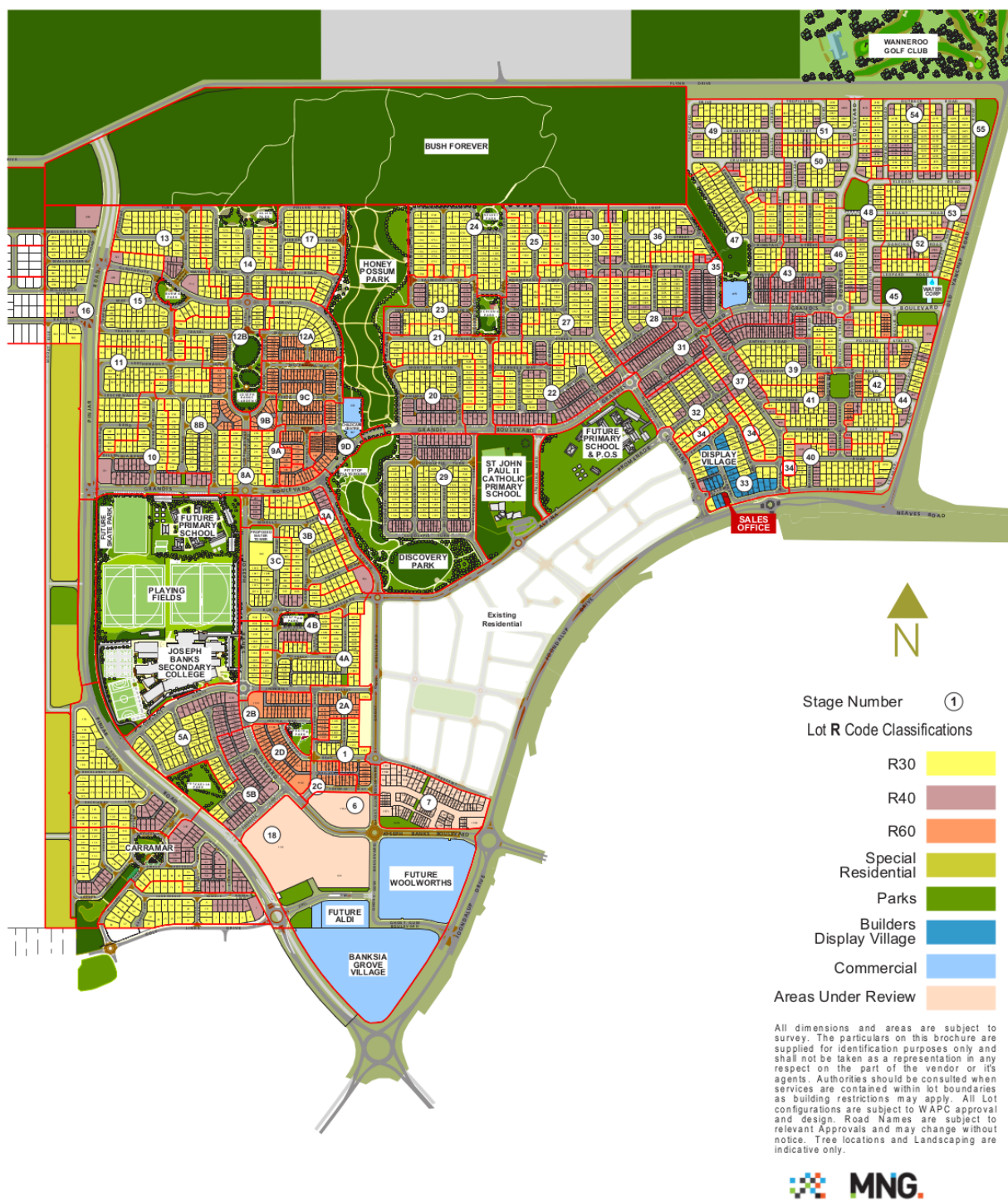
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Figure 1A: Site Overview





Overall Staging Plan



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Figure 1C: Overall Staging Plan

2.0 Bushfire Attack Level (BAL) Assessment

2.1 Effective Slope

Effective slope under each vegetation plot was assessed in accordance with the methodology detailed in AS 3959-2009 *Construction of buildings in bushfire prone areas* (AS 3959) (Standards Australia, 2009). Slope data was measured on site and cross referenced with Landgate elevation data.


The effective slope of each vegetation plot is listed under the photos provided in Section 2.2 below.

2.2 Vegetation Classification

The site was inspected on the 12th October 2017 and assessed in accordance with AS 3959-2009 Methodology 1.

The location and extent of AS 3959 vegetation structures, including Clause 2.2.3.2 exclusions, within 150 metres of the site are mapped in Figure 2A and 2B, and illustrated in the photos below. Figure 2A illustrates the Stage 1 vegetation classifications and Figure 2B illustrates the Stage 2 vegetation classifications subsequent to the development of the balance lot and widening of Flynn Drive.

Bushfire fuel loads are identified as consistent with AS 3959 Table B2 for radiant heat flux modelling purposes. All bushfire structures and fuel loads are assessed in their mature states (including revegetation and rehabilitation areas) unless otherwise identified.

Plot 1	
Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A
<i>Plot 1 comprises the low threat development areas of previous stages of the Banksia Grove subdivision located to the west of the subject site.</i>	
<div><div><div>DIRECTION 121 deg(T)</div><div>31.68813°S 115.81051°E</div><div>ACCURACY 5 m DATUM WGS84</div></div><div>BMP Flynn Rd & Old Yanch... a 12/10/17, 8:44:49 am</div></div> <p>Photo ID: 1a</p>	

Plot 2

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Downslope 7°

Plot 2 comprises a downslope section of remnant vegetation to the west of the site. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.



Photo ID: 2a



Photo ID: 2b



Photo ID: 2c

Plot 3

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Flat/upslope

Plot 3 comprises the Bush Forever vegetation located to the west of the site. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.



Photo ID: 3a



Photo ID: 3b



Photo ID: 3c



Photo ID: 3d

Plot 3



Photo ID: 3e

Plot 4

Existing	Class B Woodland
Post Development	Exclusions 2.2.3.2(e) non-vegetated area, and 2.2.3.2(f) low-threat vegetation.
Effective Slope	Downslope 3°

Plot 4 comprises the vegetation located in the buffer to the south of, and adjacent to, the existing Flynn Drive reserve. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.

Post-development this area will be incorporated into the Flynn Drive road reserve according to the road widening planned under the Metropolitan Region Scheme.



Photo ID: 4a



Photo ID: 4b

Plot 4



Photo ID: 4c



Photo ID: 4d



Photo ID: 4e



Photo ID: 4f



Photo ID: 4g

Plot 5

Existing	Class B Woodland
Post Development	Exclusions 2.2.3.2(e) non-vegetated area, and 2.2.3.2(f) low-threat vegetation.
Effective Slope	n/a

Plot 5 comprises the remnant vegetation located within the north-east corner of the site. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.


Post-development this area will be public open space managed for low threat according to the approved Bushfire Management Plan.



Photo ID: 1a



Photo ID: 1b

Plot 6	
Existing	Class G Grassland
Post Development	Class G Grassland
Effective Slope	Downslope 2°
Plot 6 comprises the cleared area to the north west of the site and north of Flynn Drive. The vegetation consists grass potentially not managed for low threat in future.	
<div><div><div>DIRECTION 344 deg(T)</div><div>31.68566°S 115.81002°E</div><div>ACCURACY 5 m DATUM WGS84</div></div><div>BMP Flynn Rd & Old Yanch...</div><div>b</div><div>12/10/17, 9:24:16 am</div></div> <p>Photo ID: 6a</p>	

Plot 7

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Downslope 3°

Plot 7 comprises the wooded area to the north west of the site and north of Flynn Drive. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.



Photo ID: 7a



Photo ID: 7b



Photo ID: 7c



Photo ID: 7d

Plot 8

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 8 comprises the area managed for low threat located within the the golf course to the north of the site.



Photo ID: 8a



Photo ID: 8b



Photo ID: 8c

Plot 9

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Downslope 2°

Plot 8 comprises the un-managed wooded area located within the golf course to the north of the site. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasstrees and grass.



Photo ID: 9a



Photo ID: 9b



Photo ID: 9c

Plot 10

Existing	Class C Shrubland
Post Development	Class C Shrubland
Effective Slope	Downslope 1°

Plot 10 comprises the area to the north east of the site and north of Cecil Road. The vegetation consists of mixed shrub species below 1m in height, and grass.



Photo ID: 10a

Plot 11

Existing	Class C Shrubland
Post Development	Class C Shrubland
Effective Slope	Downslope 2°

Plot 11 comprises the area to the north east of the site and east of Old Yanchep Road. The vegetation consists of mixed shrub species below 1m in height, and grass.



Photo ID: 11a



Photo ID: 11b

Plot 11



Photo ID: 11c

Plot 12

Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Flat/upslope

Plot 12 comprises a strip of vegetation to the north east of the site and within the Old Yanchep Road reserve. The vegetation consists of mixed shrub species below 4m in height, and grass.



Photo ID: 12a



Photo ID: 12b

Plot 13

Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Flat/upslope

Plot 12 comprises the area to the east of the site and east of Old Yanchep Road. The vegetation consists of mixed shrub species below 4m in height, and grass.



Photo ID: 13a



Photo ID: 13b



Photo ID: 13c

Plot 14

Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Flat/upslope

Plot 14 comprises the area to the south east of the site and east of Old Yanchep Road. The vegetation consists of mixed shrub species below 4m in height, and grass.



Photo ID: 14a



Photo ID: 14b



Photo ID: 14c

Plot 15

Existing	Class G Grassland (Open Woodland)
Post Development	Class G Grassland (Open Woodland)
Effective Slope	Downslope 2°

Plot 15 comprises the developed area to the south east of the site and south of Neaves Road. The vegetation consists of grassland and shade trees with less than 10% canopy cover.



Photo ID: 15a

Plot 16

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Downslope 2°

Plot 16 comprises the remnant wooded area located to the south of the site and south of Neaves Road. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasstrees and grass.



Photo ID: 16a



Photo ID: 16b

Plot 17

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 17 comprises the low threat developed areas located to the south of the subject site.



Photo ID: 17a



Photo ID: 17b

Plot 18

Existing	Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 18 comprises the strip of low threat managed vegetation in the southern section of the Joondalup Drive reserve.



Photo ID: 18a

Plot 19

Existing	Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 19 comprises the strip of low threat managed vegetation in the northern section of the Joondalup Drive reserve.



Photo ID: 19a

Plot 20

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 20 comprises the low threat development areas of previous stages of the Banksia Grove subdivision located to the south west of the subject site.



Photo ID: Nearmap imagery October 2017

Plot 21

Existing	Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 21 comprises the low threat managed vegetation in the park to the south of the site.



Photo ID: 21a



Photo ID: 21b

Plot 22

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 22 comprises the area of the subject site undergoing civil works, and managed for low threat in accordance with the approved Bushfire Management Plan.

Port development this area will comprise residential houses, gardens, lawns road reserves managed for low threat in accordance with the approved Bushfire Management Plan.



Photo ID: 22a



Photo ID: 22b



Photo ID: 22c

Plot 23

Existing	Class B Woodland
Post Development	Exclusion 2.2.3.2(f) low-threat vegetation.
Effective Slope	n/a

Plot 23 comprises the vegetation located in the area of the subdivision drainage basin, pump station and adjacent public open space. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasstrees and grass.

Post-development this area will be managed for low threat in accordance with the approved Bushfire Management Plan.



Photo ID: 23a



Photo ID: 23b

Plot 24

Existing	Exclusion 2.2.3.2(b) single area of vegetation less than 1ha.
Post Development	Exclusion 2.2.3.2(f) low-threat vegetation.
Effective Slope	N/A

Plot 24 comprises the vegetation located in the subdivision's central area of public open space. This area of Woodland vegetation is less than 1ha in area and more than 100m from classified vegetation. Post-development this area will be managed for low threat in accordance with the approved Bushfire Management Plan.



Photo ID: 24a



Photo ID: 24b

Plot 25

Existing	Exclusion 2.2.3.2(e) low-threat vegetation.
Post Development	Exclusion 2.2.3.2(e) low-threat vegetation.
Effective Slope	n/a

Plot 25 comprises the non-vegetated areas of the existing road network.

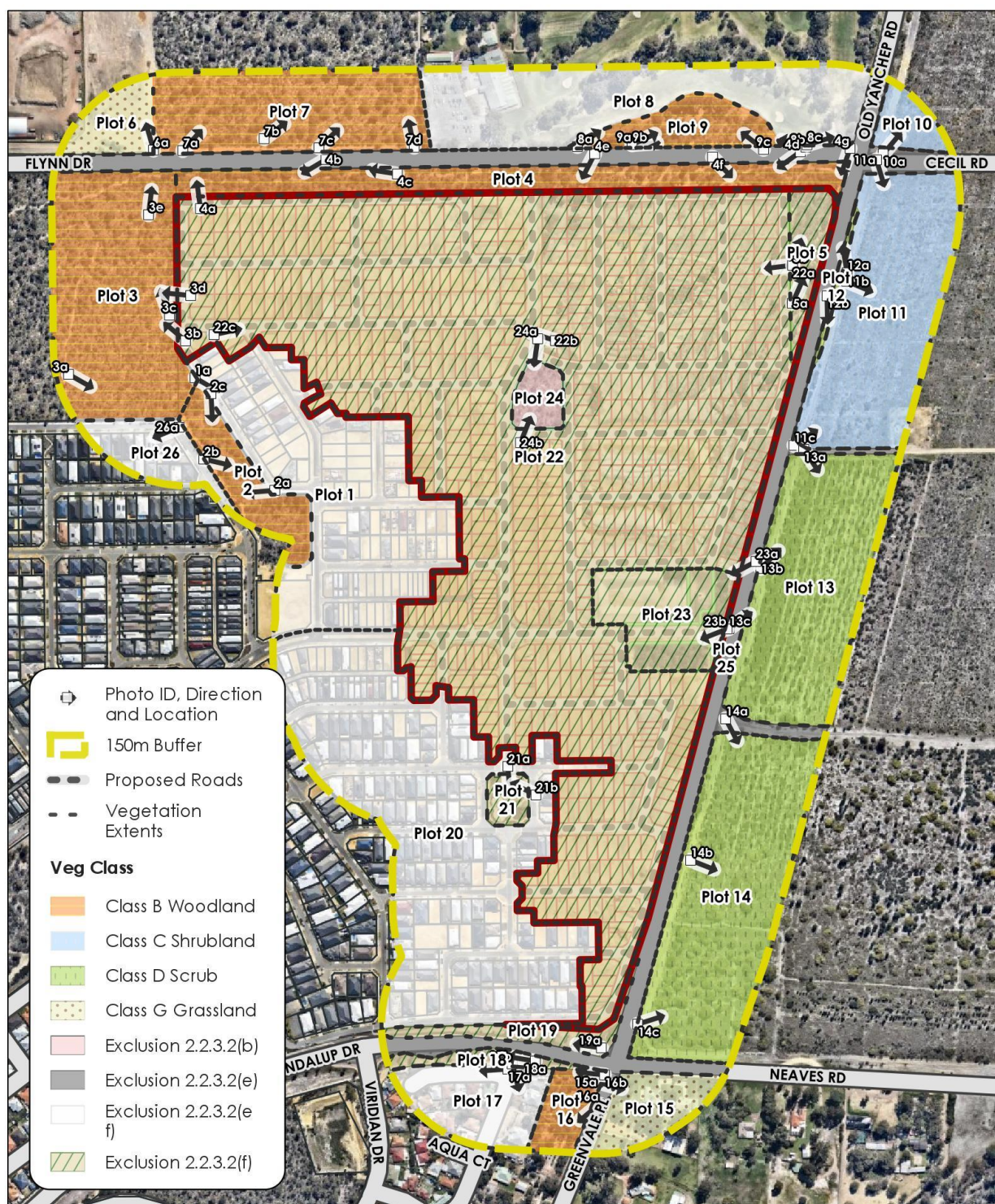
Plot 26

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 26 comprises an area of low threat urban land to the west of the subject site.



Photo ID: 26a



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BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
Vegetation Classification - Stage 1

Site Boundary
 Cadastre
 Roads



Size: A4

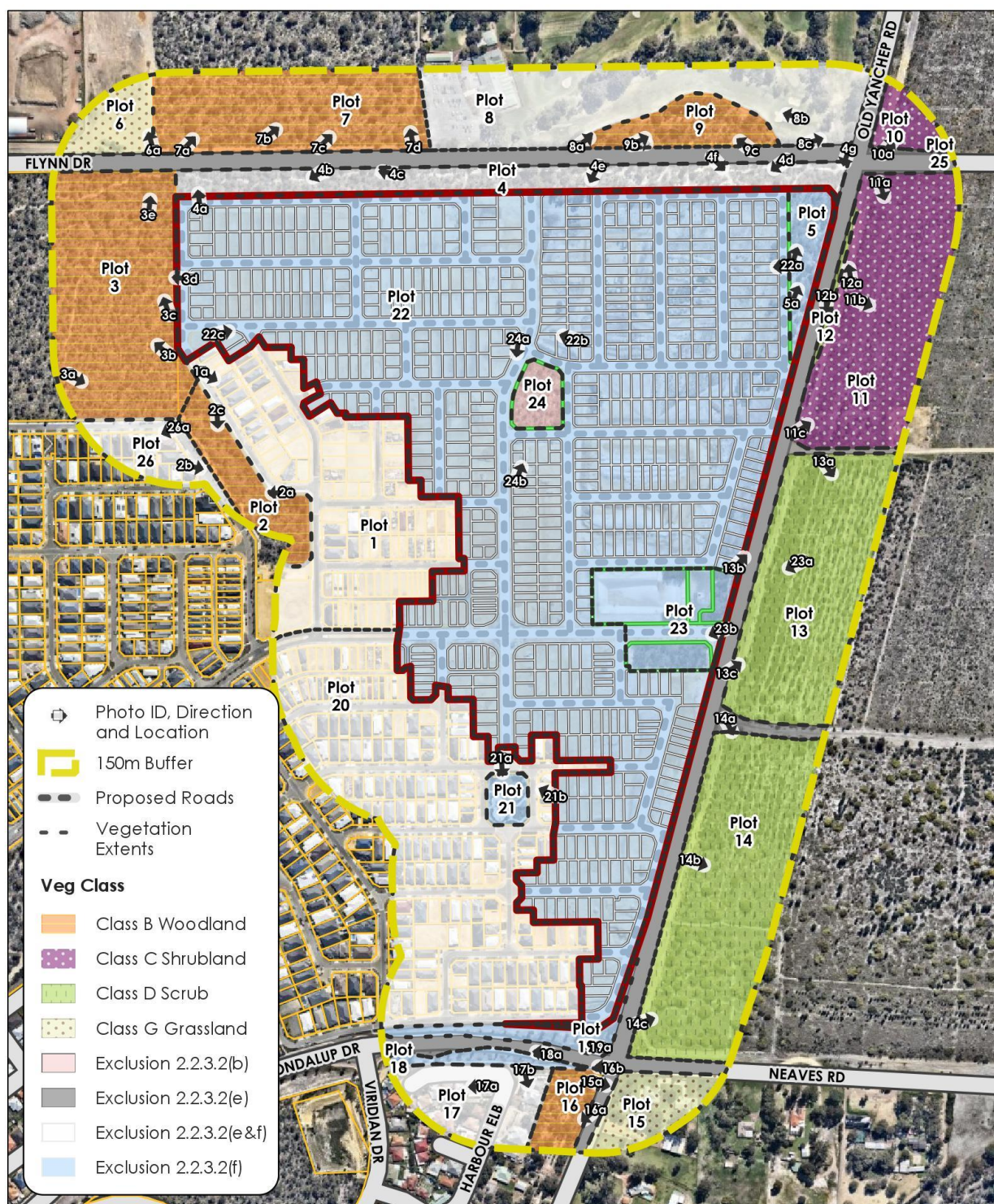
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Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-11-27
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

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Figure 2A: Vegetation Classifications – Stage 1



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BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
Vegetation Classification - Stage 2

- Site Boundary
- Cadastre
- Roads



Size: A4

Scale: 1:6,000

0 50 100 150 200 250 m

Ref: 7263_002_01_Veg Class_Stage 1 20171127
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
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Figure 2B: Vegetation Classifications – Stage 2 post development & widening of Flynn Drive

2.3 BAL Analysis

The BAL Contour Map (Figures 2C to 2G) and Table 2A detail the maximum BAL applicable to the external boundary of each new lot, prior to the development of the balance lot and widening of Flynn Drive. It should be noted that the BAL ratings in Table 2A are the worst case BAL and there is the potential for a future dwellings to achieve lower BAL ratings through building setbacks. Site specific BAL assessments will need to be conducted to determine whether a lower BAL would be applicable to any future building works.

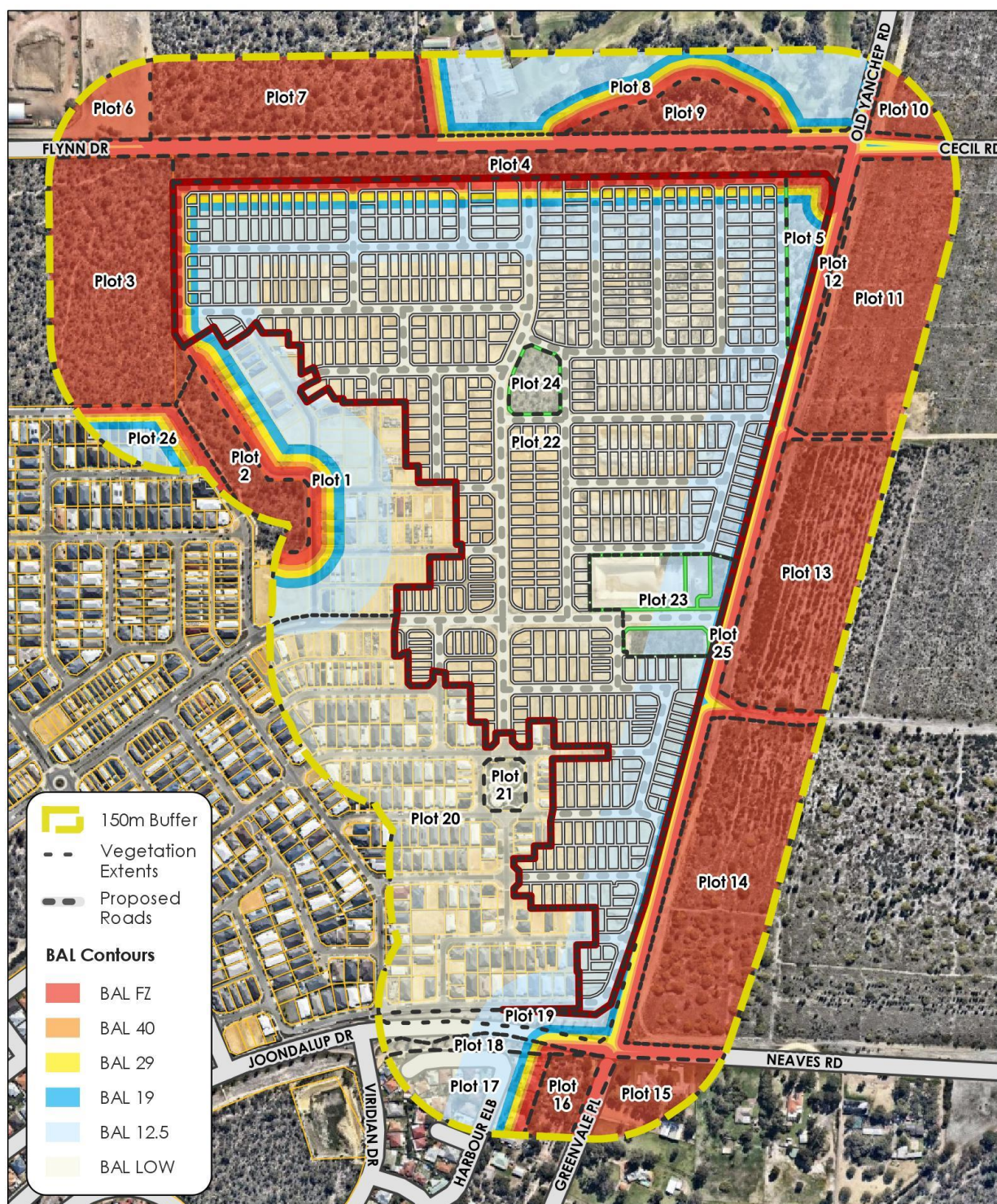
Table 2B details the revised worst case BAL ratings that would apply to the proposed lots subsequent to the future widening of Flynn Drive, once the vegetation in the balance lot is removed or managed for low threat in accordance with the approved Bushfire Management Plan.

Table 2A: Maximum BAL rating that applies to each lot boundary, prior to widening of Flynn Drive

Indicative Lots *	BAL Rating
61,63,65,66	BAL-FZ
33,34,35,36,37,38,39,40,41,42,43,44,45,54,55,56,57,58,59,60,70,72,73,75,77,78,79,81,82,84,85,87	BAL-40
4,6,15,17,30,31,32,62,67	BAL-29
53,68,71,74,76,80,83,86,120,121,122,123,124,125,126,127,128,129,130,131,148,149,150,151,152,153,154,155,156,157,158,160	BAL-19
1,2,3,5,7,8,9,10,11,12,13,14,16,18,19,20,21,22,23,24,25,26,27,28,29,46,47,48,49,50,51,52,64,69,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,159,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199	BAL-12.5
All other Lots	BAL-LOW
NOTES: * the indicative lot numbers have been adopted for identification purposes in this report only.	

Table 2B: Maximum BAL rating that applies to each lot boundary post development and widening of Flynn Drive

Indicative Lots *	BAL Rating
N/A	BAL-FZ
N/A	BAL-40
4,6,15,17,30,31,32,33	BAL-29
120,121,122,123,124,125,126,127,128,129,130,131, 148,149,150,151,152,153,154,155,156,157,158,160	BAL-19
1,2,3,5,7,8,9,10,11,12,13,14,16,18,19,20,21,22,23,24,25,26,27,28,29,34,35, 36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59, 60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83, 84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105, 106,107,108,109,110,111,112,113,114,115,116,117,118,119,132,133,134,135, 136,137,138,139,140,141,142,143,144,145,146,147,159,161,162,163,164,165, 166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183, 184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199	BAL-12.5
All other Lots	BAL-LOW
NOTES: * the indicative lot numbers have been adopted for identification purposes in this report only.	



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BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours: Stage 1

- Site Boundary
- Cadastre
- Roads



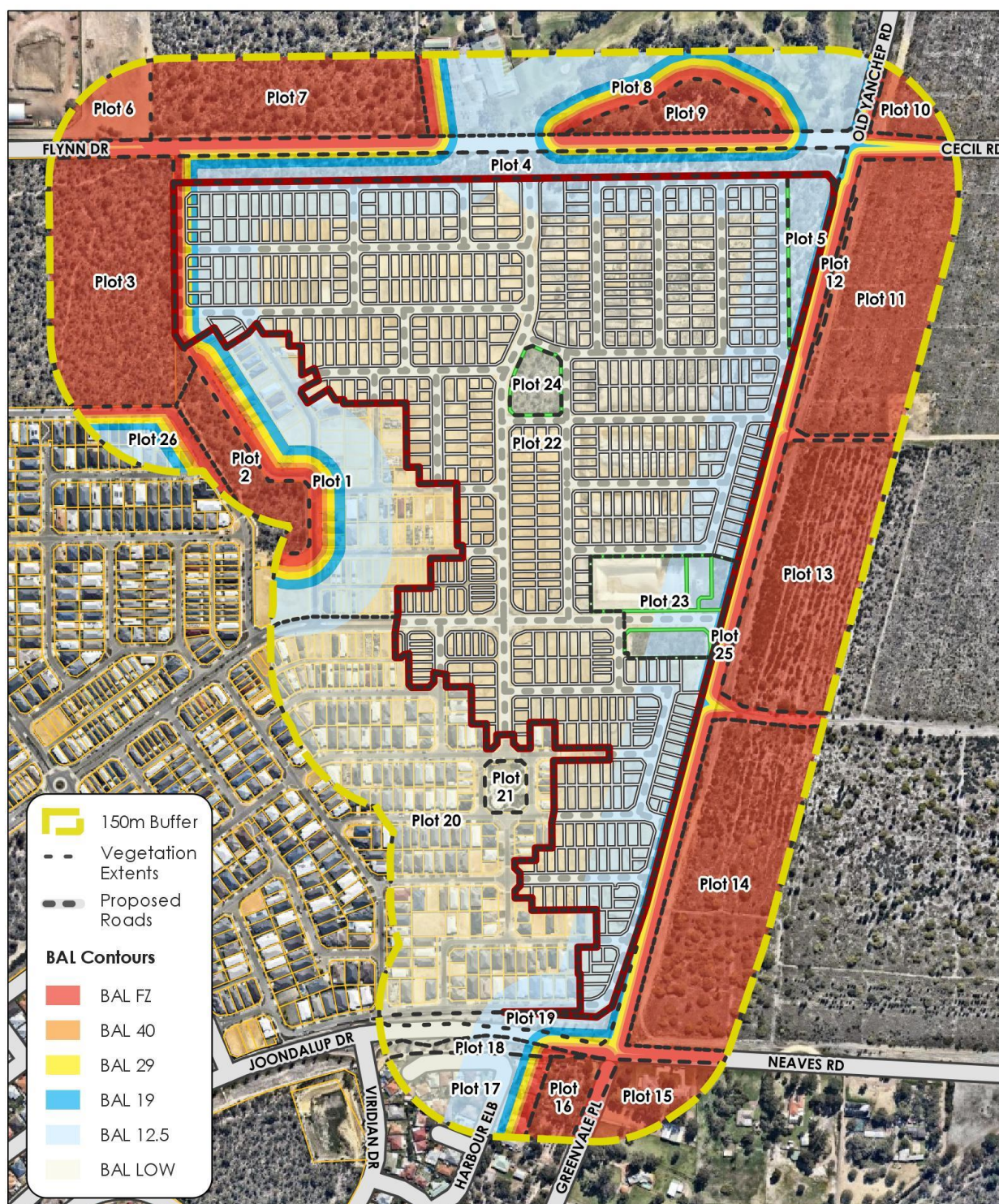
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Ref: 7263_003_01_BAL NE20171127
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

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Figure 2C: BAL Contour map – Stage 1



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Size: A4

Scale: 1:6,000

BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours: Stage 2

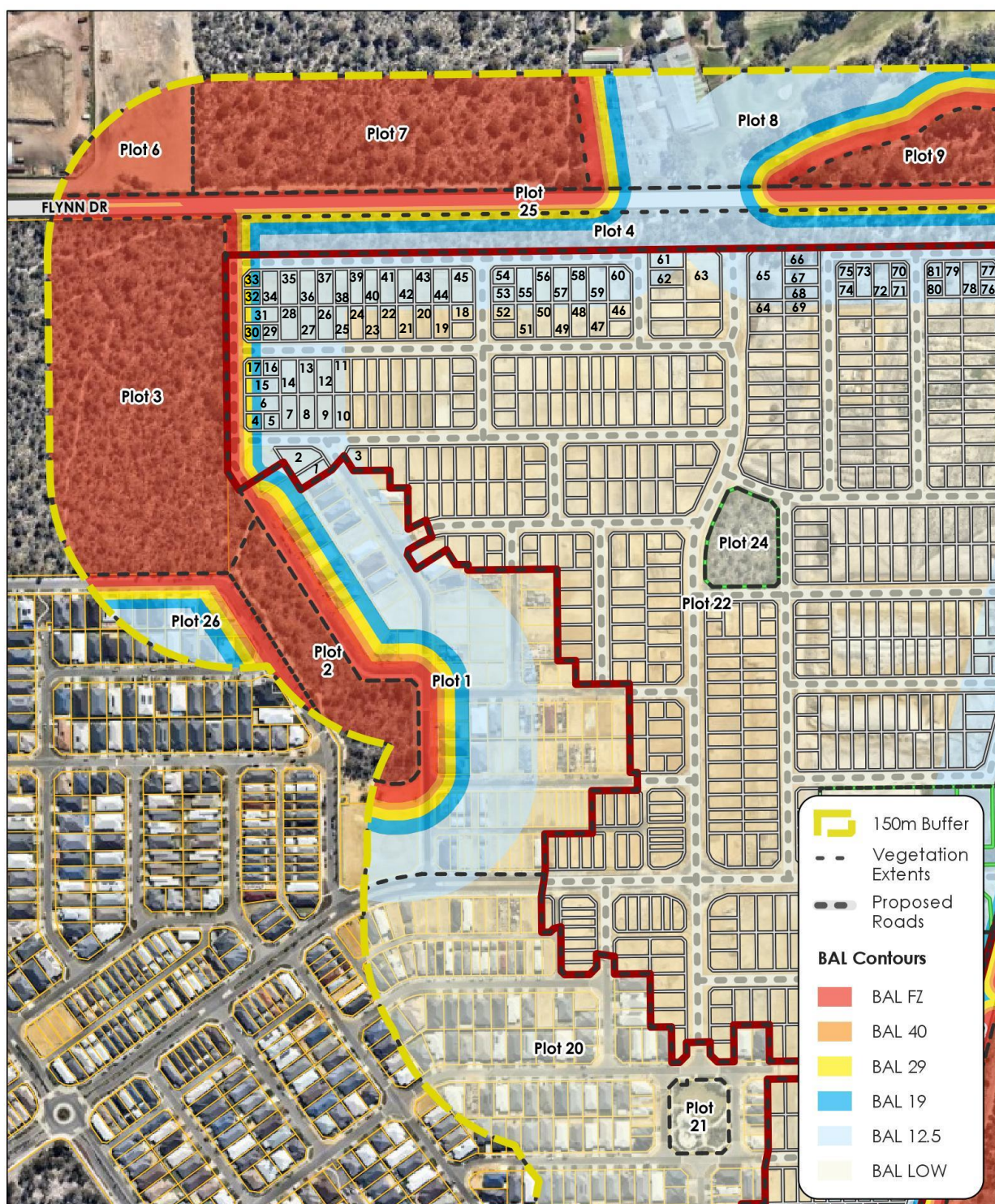
- Site Boundary
- Cadastre
- Roads

0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE 20171127
Projection: GDA94 MGA50
Author: MW - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

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Figure 2D: BAL Contour map – Stage 2 post development & widening of Flynn Drive



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Size: A4
Scale: 1:4,200

BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours , North West Detail
Stage 2

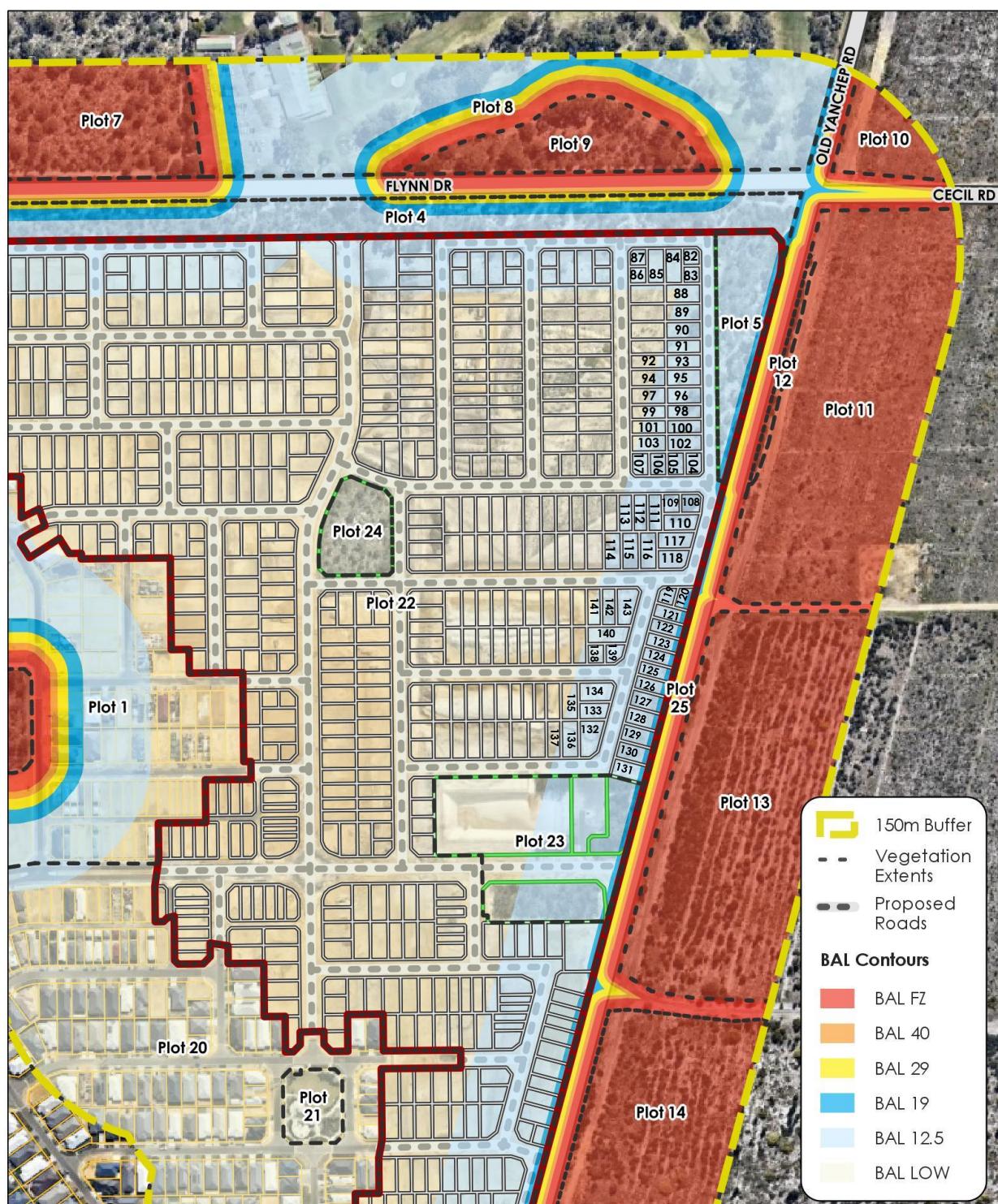
0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE 20171127
Projection: GDA94 MGA50
Author: MWL - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

- Site Boundary
- Cadastre
- Roads

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Figure 2E: BAL Contour map – North West Detail



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Size: A4
Scale: 1:4,200

BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours , North East Detail
Stage 2

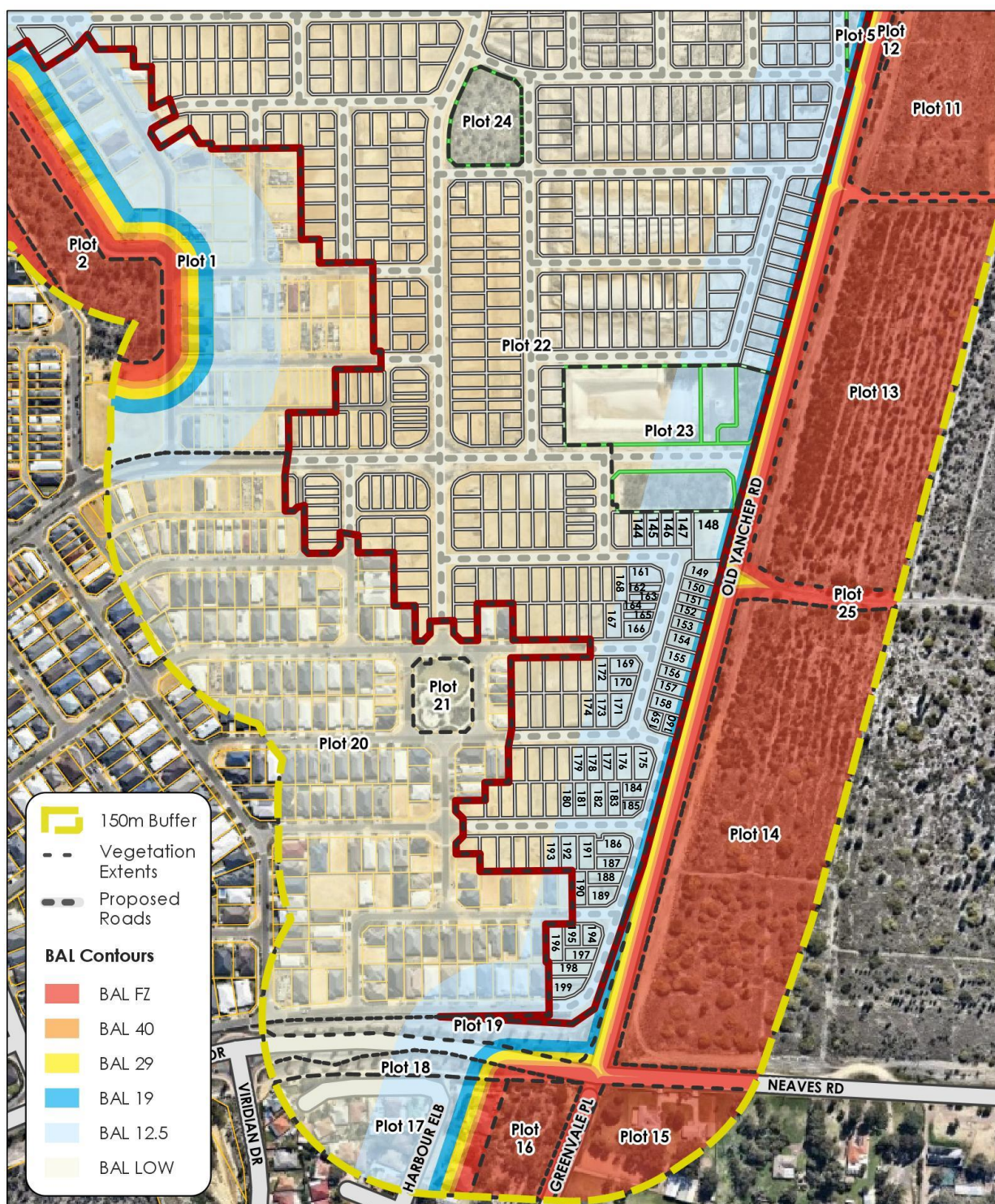
- Site Boundary
- Cadastre
- Roads

0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE 20171127
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

Disclaimer: Although the data within this map is considered accurate at the time of creation, RUIC Fire does not guarantee, and accepts no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any data used within this map.

Figure 2F: BAL Contour map –North East Detail



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Size: A4
Scale: 1:4,200

BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours , South Detail
Stage 1

0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE 20171127
Projection: GDA94 MGA50
Author: MW - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

- Site Boundary
- Cadastre
- Roads

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Figure 2G: BAL Contour map – South Detail

3.0 Bushfire Attack Levels Explained

A Bushfire Attack Level (BAL) assessment is a means of measuring the severity of a buildings potential exposure to ember attack, radiant heat and direct flame contact in a bushfire event, and thereby determining the construction measures required for the dwelling.

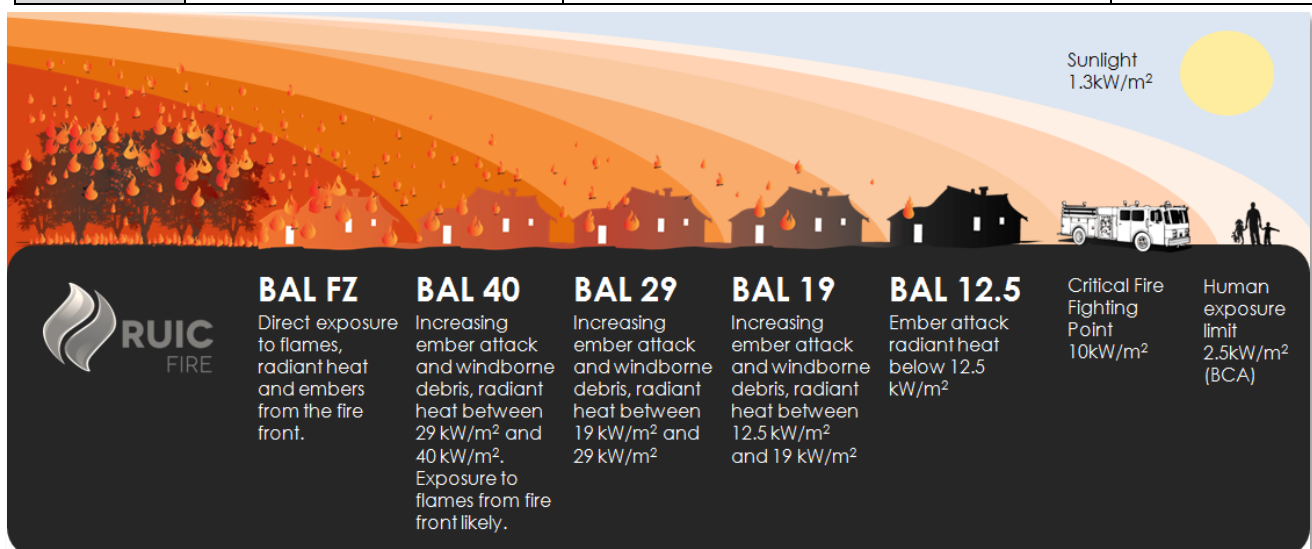
The methodology used for the determination of the BAL rating, and the subsequent building construction standards, are directly referenced from Australian Standard AS 3959-2009 *Construction of buildings in bushfire prone areas*.

The BAL rating is determined through identification and assessment of the following parameters;

- Fire Danger Index (FDI) rating; assumed to be FDI-80 for WA,
- All classified vegetation ***within 100m*** of the subject building,
- Separation distance between the building and the classified vegetation source/s, and
- Slope of the land under the classified vegetation.

AS 3959-2009 has six (6) levels of BAL, based on the radiant heat flux exposure to the building, and also identifies the relevant sections for building construction, as detailed below;

Bushfire Attack Level (BAL)	Classified vegetation within 100m of the site and heat flux exposure thresholds	Description of predicted bushfire attack and levels of exposure	Construction Section (within AS3959)
BAL-LOW	See clause 2.2.3.2	There is insufficient risk to warrant specific construction requirements	4
BAL-12.5	$\leq 12.5\text{kW/m}^2$	Ember attack	3 & 5
BAL-19	$>12.5\text{kW/m}^2$ to $\leq 19\text{kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 & 6
BAL-29	$>19\text{kW/m}^2$ to $\leq 29\text{kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 & 7
BAL-40	$>29\text{kW/m}^2$ to $\leq 40\text{kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames	3 & 8
BAL-FZ	$>40\text{kW/m}^2$	Direct exposure to flames from fire front in addition to heat flux and ember attack	3 & 9



4.0 References

- OBRM. (2017). Map of Bush Fire Prone Areas 2017. Office of Bushfire Risk Management, Perth, WA.
- Natural Area Consulting. (2015). Fire Management Plan, Banksia Grove. Natural Area Holdings Pty Ltd, Whiteman, WA.
- Standards Australia. (2009). AS 3959-2009 Construction of buildings in bushfire prone areas. SAI Global.
- WAPC. (2015a). State Planning Policy 3.7 Planning in Bushfire Prone Areas. Western Australian Planning Commission & Department of Planning.
- WAPC. (2015b). Planning Bulletin 111/2016 Planning in Bushfire Prone Areas. Western Australian Planning Commission.
- WAPC. (2017a). Guidelines for Planning in Bushfire Prone Areas Version 1.2. Western Australian Planning Commission, Department of Planning & Department of Fire and Emergency Services.
- WAPC. (2017b). Guidelines for Planning in Bushfire Prone Areas Appendices Version 1.2. Western Australian Planning Commission, Department of Planning & Department of Fire and Emergency Services.



BUSHFIRE ATTACK LEVEL (BAL) CONTOUR ASSESSMENT

Lot 9184, Old Yanchep Road, Banksia Grove

Version: 1.0 Reference: 7263 Date: November 2017



Project Number: 7263
Project Name: North East Precinct, Banksia Grove
Author: Jeremy Durston, BPAD36525 Level 1
Reviewed by: Darrel Krammer, Grad Cert Bushfire Protection, BPAD33412 Level 2
Version: 1.0
Date of issue: 30th November 2017



Author: Jeremy Durston
Date: 29/11/2017



Reviewed by: Darrel Krammer
Date: 30/11/2017

DISCLAIMER AND LIMITATION

This report is prepared solely for **Banksia Grove Development Nominees** and the owners of the lots subject to the assessment and is not for the benefit of any other person and may not be relied upon by any other person.

This Bushfire Attack Level (BAL) Contour Assessment is limited to the BAL Contour Map scope as identified in *Guidelines for Planning in Bushfire Prone Areas Appendix 3* (WAPC, 2017b). AS 3959-2009 Methodology one (1) was used for the assessment methodology. It is expressly stated that RUIC Fire and the writer do not guarantee that if such standards are complied with or if a property owner exercises prudence, that a building or property will not be damaged or that lives will not be lost in a bush fire.

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1.0 Introduction

1.1 Subject Site

The subject site of this BAL Contour assessment is Lot 9184 Old Yanchep Road, Banksia Grove, referred to as the North East Precinct of the Banksia Grove development. The site is located within the municipality of the City of Wanneroo.

Figure 1A illustrates the subject site and its immediate surrounds.

The site is identified as being Bushfire Prone on the *Map of Bush Fire Prone Areas 2017* (OBRM, 2017).

The subject site has approval for subdivision (WAPC 147816) dated 18 June 2014. The North East Precinct involves the freehold subdivision of Lot 9184 to create 636 new residential lots. Additionally, a 2.5917ha balance lot adjacent to the existing Flynn Drive road will be reserved for future road widening, as planned under the Metropolitan Region Scheme.

Figure 1B illustrates the Subdivision Plan.

Lot sales and development will be staged progressively from the south to the north across the subject site.

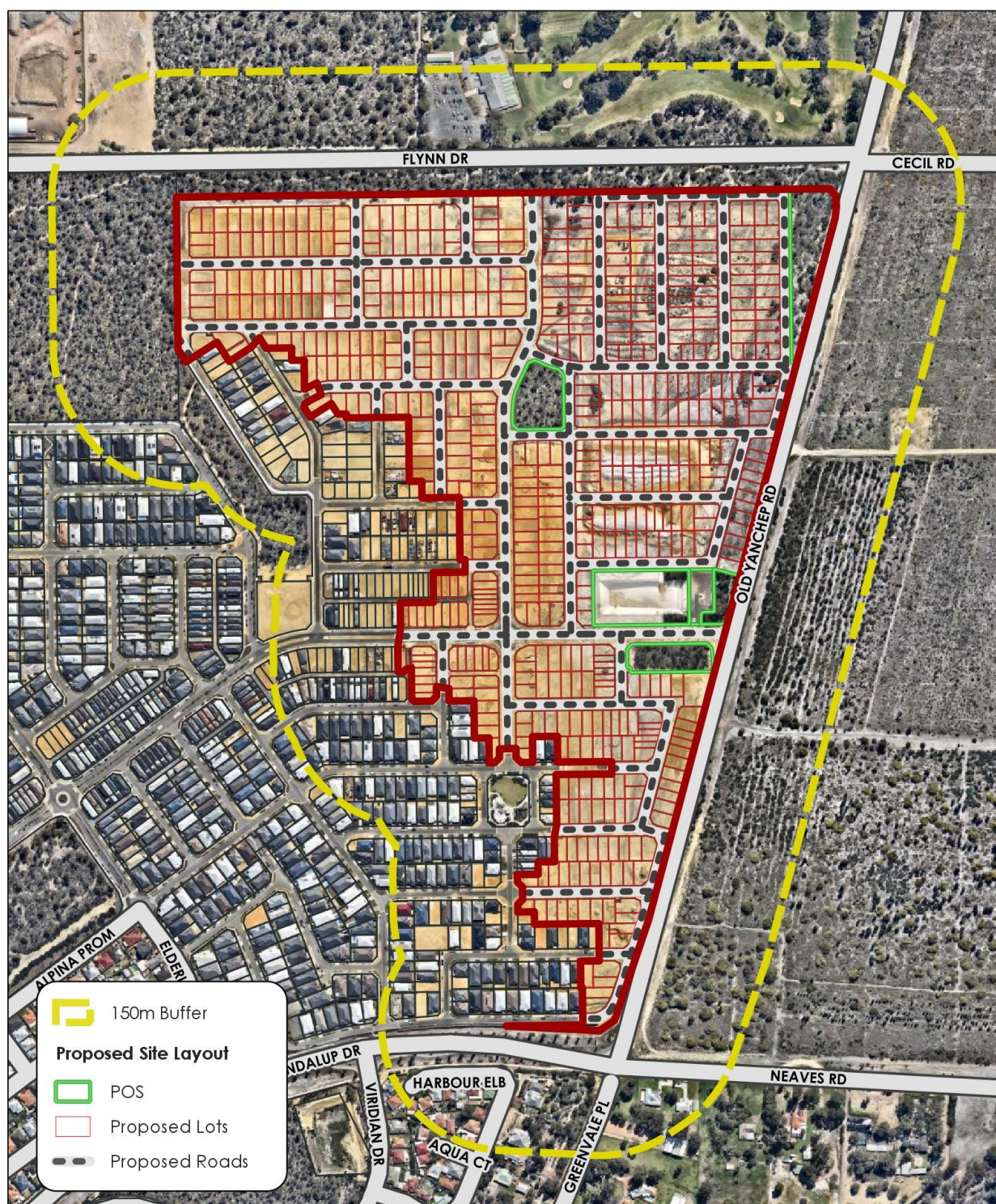
Figure 1C illustrates the Overall Staging Plan.

1.2 Purpose of Report

The purpose of this BAL Contour Map report is to provide a Bushfire Attack Level (BAL) assessment covering the proposed subdivided lots within the North East Precinct of the Banksia Grove development. Specifically, this report determines the BAL ratings that may be achieved for future buildings on the subdivided lots based on the Subdivision Concept Plan, reference 981-526A-01 dated 26th September 2017.

This report incorporates a two-stage assessment. The first stage assesses the indicative BAL ratings for the proposed lots in all development stages. The second stage re-assesses the proposed lots subsequent to the future development of the balance lot reserved for the future widening of Flynn Drive. The area impacted by the vegetation within the balance lot includes development stages 49, 51, 54 and 55. The indicative BAL ratings of the impacted lots within this area will potentially be reduced in future due to the vegetation management and/or removal required for the proposed widening of Flynn Drive.

A Bushfire Management Plan (BMP) has previously been prepared and approved incorporating this development (Natural Area Consulting, 2015).



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BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
Site Overview

- Site Boundary
- Cadastre
- Roads



Size: A4

Scale: 1:6,000

0 50 100 150 200 250 m

Ref: 7263_001_01_SiteOverview_20171004
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-10-04
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

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Figure 1A: Site Overview

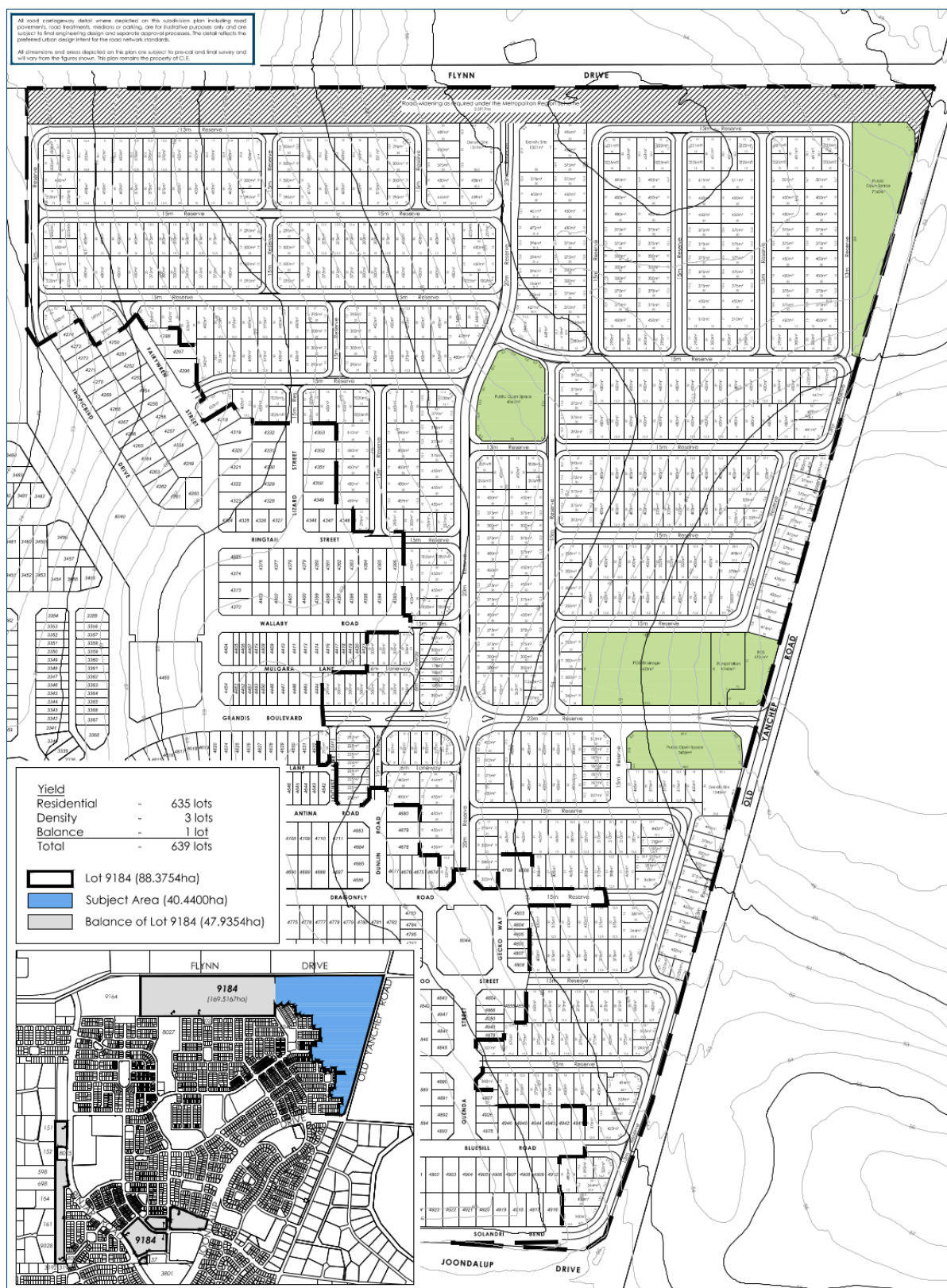
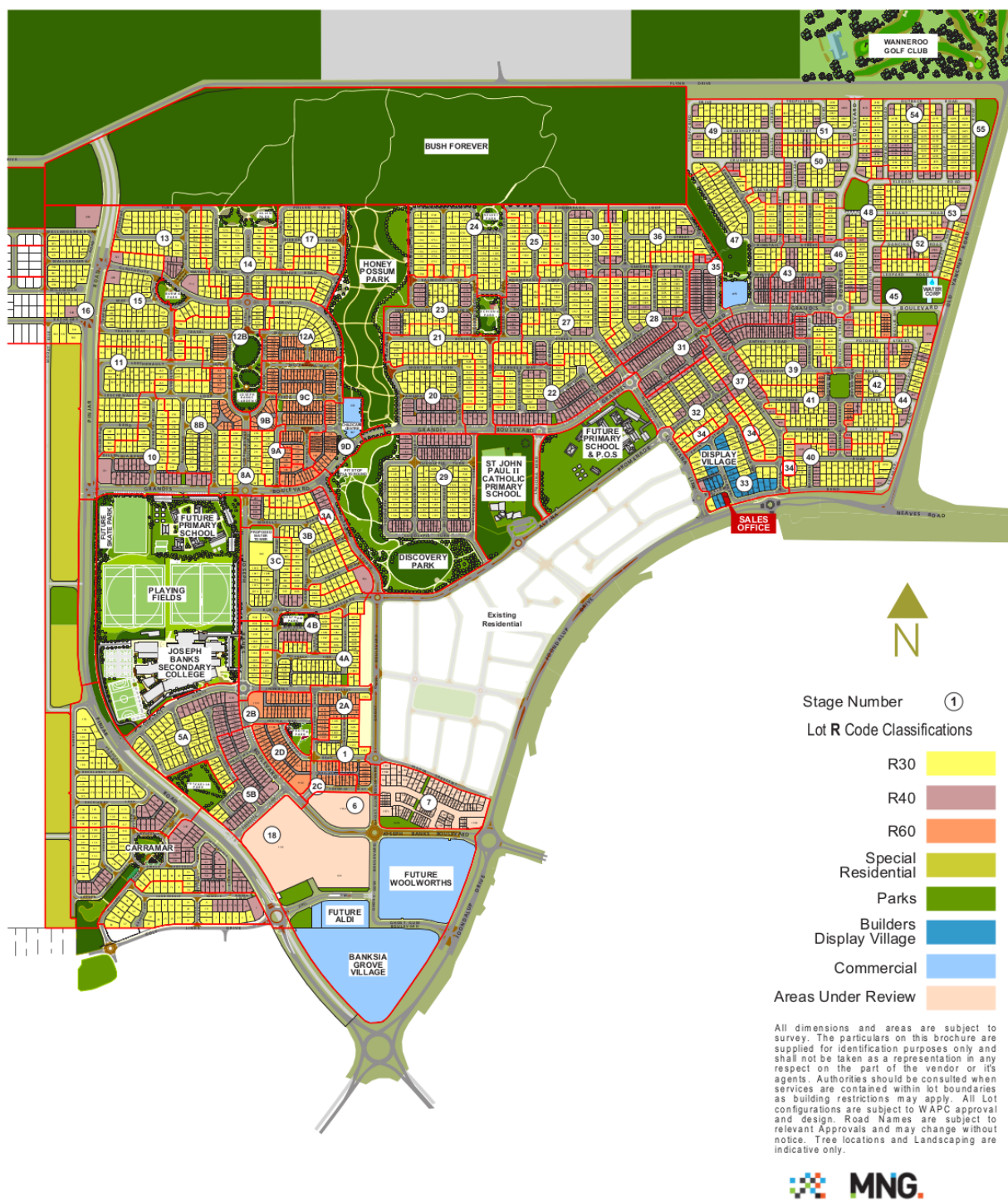


Figure 1B: Subdivision Concept Plan



Overall Staging Plan



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Figure 1C: Overall Staging Plan

2.0 Bushfire Attack Level (BAL) Assessment

2.1 Effective Slope

Effective slope under each vegetation plot was assessed in accordance with the methodology detailed in AS 3959-2009 *Construction of buildings in bushfire prone areas* (AS 3959) (Standards Australia, 2009). Slope data was measured on site and cross referenced with Landgate elevation data.


The effective slope of each vegetation plot is listed under the photos provided in Section 2.2 below.

2.2 Vegetation Classification

The site was inspected on the 12th October 2017 and assessed in accordance with AS 3959-2009 Methodology 1.

The location and extent of AS 3959 vegetation structures, including Clause 2.2.3.2 exclusions, within 150 metres of the site are mapped in Figure 2A and 2B, and illustrated in the photos below. Figure 2A illustrates the Stage 1 vegetation classifications and Figure 2B illustrates the Stage 2 vegetation classifications subsequent to the development of the balance lot and widening of Flynn Drive.

Bushfire fuel loads are identified as consistent with AS 3959 Table B2 for radiant heat flux modelling purposes. All bushfire structures and fuel loads are assessed in their mature states (including revegetation and rehabilitation areas) unless otherwise identified.

Plot 1	
Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A
<i>Plot 1 comprises the low threat development areas of previous stages of the Banksia Grove subdivision located to the west of the subject site.</i>	
<div><div><div>DIRECTION 121 deg(T)</div><div>31.68813°S 115.81051°E</div><div>ACCURACY 5 m DATUM WGS84</div></div><div>BMP Flynn Rd & Old Yanch... a 12/10/17, 8:44:49 am</div></div> <p>Photo ID: 1a</p>	

Plot 2

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Downslope 7°

Plot 2 comprises a downslope section of remnant vegetation to the west of the site. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.



Photo ID: 2a



Photo ID: 2b



Photo ID: 2c

Plot 3

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Flat/upslope

Plot 3 comprises the Bush Forever vegetation located to the west of the site. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.



Photo ID: 3a



Photo ID: 3b



Photo ID: 3c



Photo ID: 3d

Plot 3



Photo ID: 3e

Plot 4

Existing	Class B Woodland
Post Development	Exclusions 2.2.3.2(e) non-vegetated area, and 2.2.3.2(f) low-threat vegetation.
Effective Slope	Downslope 3°

Plot 4 comprises the vegetation located in the buffer to the south of, and adjacent to, the existing Flynn Drive reserve. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.

Post-development this area will be incorporated into the Flynn Drive road reserve according to the road widening planned under the Metropolitan Region Scheme.



Photo ID: 4a



Photo ID: 4b

Plot 4



Photo ID: 4c



Photo ID: 4d



Photo ID: 4e



Photo ID: 4f



Photo ID: 4g

Plot 5

Existing	Class B Woodland
Post Development	Exclusions 2.2.3.2(e) non-vegetated area, and 2.2.3.2(f) low-threat vegetation.
Effective Slope	n/a

Plot 5 comprises the remnant vegetation located within the north-east corner of the site. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.


Post-development this area will be public open space managed for low threat according to the approved Bushfire Management Plan.



Photo ID: 1a



Photo ID: 1b

Plot 6	
Existing	Class G Grassland
Post Development	Class G Grassland
Effective Slope	Downslope 2°
Plot 6 comprises the cleared area to the north west of the site and north of Flynn Drive. The vegetation consists grass potentially not managed for low threat in future.	
<div><div><div>DIRECTION 344 deg(T)</div><div>31.68566°S 115.81002°E</div><div>ACCURACY 5 m DATUM WGS84</div></div><div>BMP Flynn Rd & Old Yanch...</div><div>b</div><div>12/10/17, 9:24:16 am</div></div> <p>Photo ID: 6a</p>	

Plot 7

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Downslope 3°

Plot 7 comprises the wooded area to the north west of the site and north of Flynn Drive. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasses and grass.



Photo ID: 7a



Photo ID: 7b



Photo ID: 7c



Photo ID: 7d

Plot 8

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 8 comprises the area managed for low threat located within the the golf course to the north of the site.



Photo ID: 8a



Photo ID: 8b



Photo ID: 8c

Plot 9

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Downslope 2°

Plot 8 comprises the un-managed wooded area located within the golf course to the north of the site. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasstrees and grass.



Photo ID: 9a



Photo ID: 9b



Photo ID: 9c

Plot 10

Existing	Class C Shrubland
Post Development	Class C Shrubland
Effective Slope	Downslope 1°

Plot 10 comprises the area to the north east of the site and north of Cecil Road. The vegetation consists of mixed shrub species below 1m in height, and grass.



Photo ID: 10a

Plot 11

Existing	Class C Shrubland
Post Development	Class C Shrubland
Effective Slope	Downslope 2°

Plot 11 comprises the area to the north east of the site and east of Old Yanchep Road. The vegetation consists of mixed shrub species below 1m in height, and grass.



Photo ID: 11a



Photo ID: 11b

Plot 11



Photo ID: 11c

Plot 12

Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Flat/upslope

Plot 12 comprises a strip of vegetation to the north east of the site and within the Old Yanchep Road reserve. The vegetation consists of mixed shrub species below 4m in height, and grass.



Photo ID: 12a



Photo ID: 12b

Plot 13

Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Flat/upslope

Plot 12 comprises the area to the east of the site and east of Old Yanchep Road. The vegetation consists of mixed shrub species below 4m in height, and grass.



Photo ID: 13a



Photo ID: 13b



Photo ID: 13c

Plot 14

Existing	Class D Scrub
Post Development	Class D Scrub
Effective Slope	Flat/upslope

Plot 14 comprises the area to the south east of the site and east of Old Yanchep Road. The vegetation consists of mixed shrub species below 4m in height, and grass.



Photo ID: 14a



Photo ID: 14b



Photo ID: 14c

Plot 15

Existing	Class G Grassland (Open Woodland)
Post Development	Class G Grassland (Open Woodland)
Effective Slope	Downslope 2°

Plot 15 comprises the developed area to the south east of the site and south of Neaves Road. The vegetation consists of grassland and shade trees with less than 10% canopy cover.



Photo ID: 15a

Plot 16

Existing	Class B Woodland
Post Development	Class B Woodland
Effective Slope	Downslope 2°

Plot 16 comprises the remnant wooded area located to the south of the site and south of Neaves Road. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasstrees and grass.



Photo ID: 16a



Photo ID: 16b

Plot 17

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 17 comprises the low threat developed areas located to the south of the subject site.



Photo ID: 17a



Photo ID: 17b

Plot 18

Existing	Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 18 comprises the strip of low threat managed vegetation in the southern section of the Joondalup Drive reserve.



Photo ID: 18a

Plot 19

Existing	Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 19 comprises the strip of low threat managed vegetation in the northern section of the Joondalup Drive reserve.



Photo ID: 19a

Plot 20

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 20 comprises the low threat development areas of previous stages of the Banksia Grove subdivision located to the south west of the subject site.



Photo ID: Nearmap imagery October 2017

Plot 21

Existing	Exclusion 2.2.3.2 (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (f) low threat vegetation
Effective Slope	N/A

Plot 21 comprises the low threat managed vegetation in the park to the south of the site.



Photo ID: 21a



Photo ID: 21b

Plot 22

Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 22 comprises the area of the subject site undergoing civil works, and managed for low threat in accordance with the approved Bushfire Management Plan.

Port development this area will comprise residential houses, gardens, lawns road reserves managed for low threat in accordance with the approved Bushfire Management Plan.



Photo ID: 22a



Photo ID: 22b



Photo ID: 22c

Plot 23

Existing	Class B Woodland
Post Development	Exclusion 2.2.3.2(f) low-threat vegetation.
Effective Slope	n/a

Plot 23 comprises the vegetation located in the area of the subdivision drainage basin, pump station and adjacent public open space. The vegetation consists of Eucalypt, Sheoak and Banksia trees with canopy cover below 30%. The understorey consists of shrubs, grasstrees and grass.

Post-development this area will be managed for low threat in accordance with the approved Bushfire Management Plan.



Photo ID: 23a



Photo ID: 23b

Plot 24

Existing	Exclusion 2.2.3.2(b) single area of vegetation less than 1ha.
Post Development	Exclusion 2.2.3.2(f) low-threat vegetation.
Effective Slope	N/A

Plot 24 comprises the vegetation located in the subdivision's central area of public open space. This area of Woodland vegetation is less than 1ha in area and more than 100m from classified vegetation. Post-development this area will be managed for low threat in accordance with the approved Bushfire Management Plan.



Photo ID: 24a



Photo ID: 24b

Plot 25

Existing	Exclusion 2.2.3.2(e) low-threat vegetation.
Post Development	Exclusion 2.2.3.2(e) low-threat vegetation.
Effective Slope	n/a

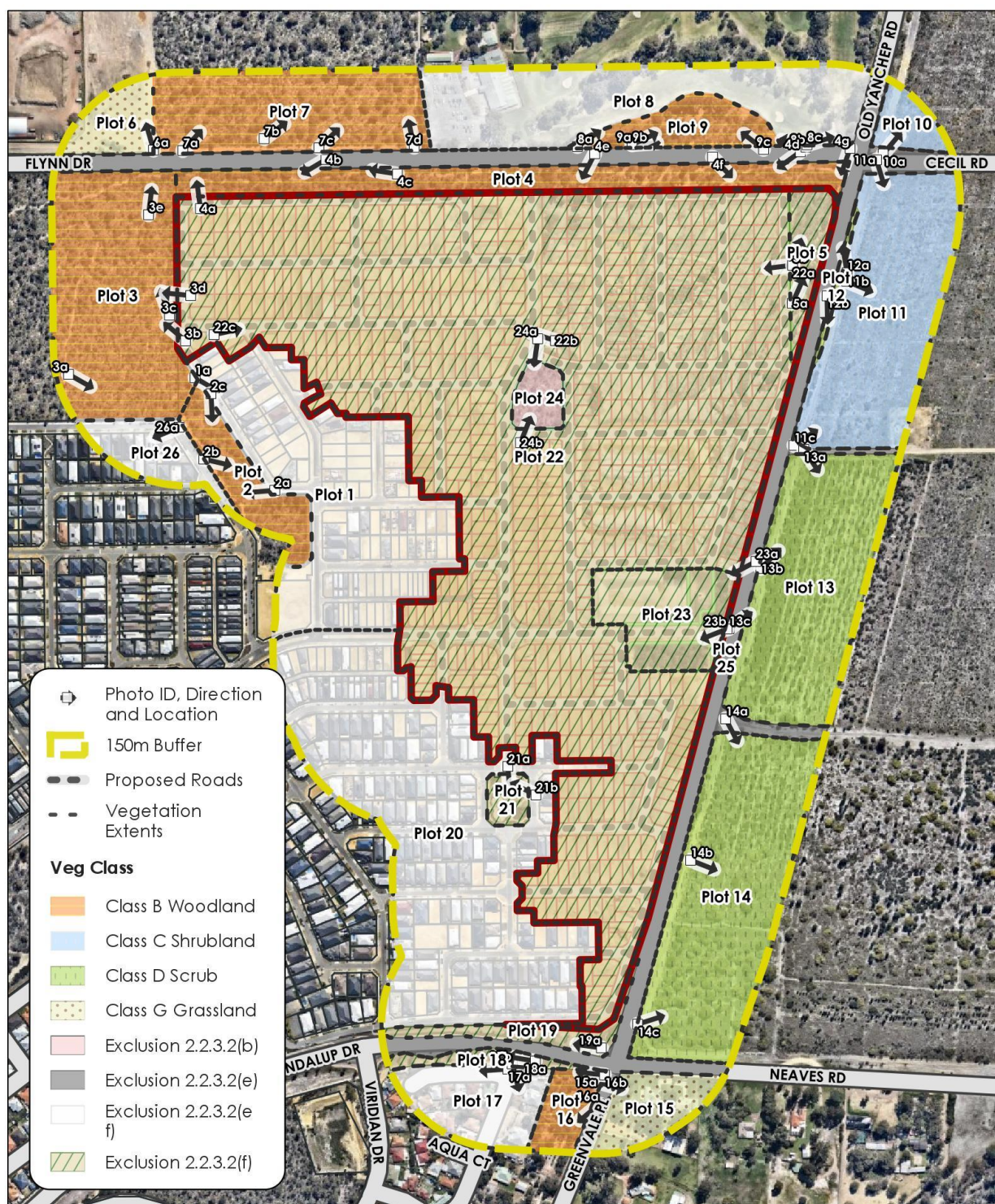
Plot 25 comprises the non-vegetated areas of the existing road network.

Plot 26	
Existing	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Post Development	Exclusion 2.2.3.2 (e) non-vegetated areas and (f) low threat vegetation
Effective Slope	N/A

Plot 26 comprises an area of low threat urban land to the west of the subject site.



Photo ID: 26a



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BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
Vegetation Classification - Stage 1

- Site Boundary
- Cadastre
- Roads



Size: A4

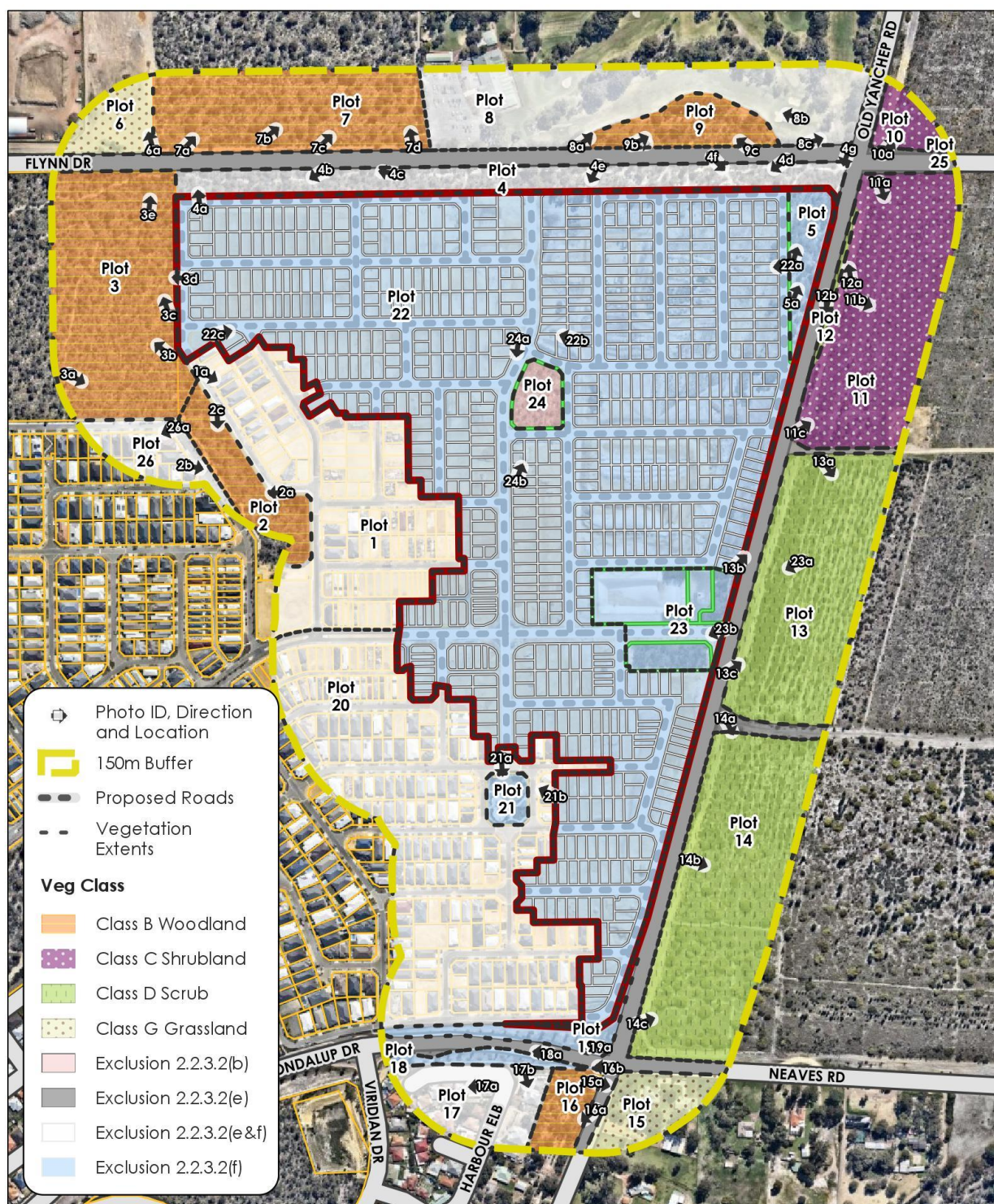
Scale: 1:6,000

0 50 100 150 200 250 m

Ref: 7263_002_01_Veg Class_Stg 1 20171127
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-11-27
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

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Figure 2A: Vegetation Classifications – Stage 1



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BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
Vegetation Classification - Stage 2

- Site Boundary
- Cadastre
- Roads



Size: A4

Scale: 1:6,000



Ref: 7263_002_01_Veg Class_Stage 1 20171127
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

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Figure 2B: Vegetation Classifications – Stage 2 post development & widening of Flynn Drive

2.3 BAL Analysis

The BAL Contour Map (Figures 2C to 2G) and Table 2A detail the maximum BAL applicable to the external boundary of each new lot, prior to the development of the balance lot and widening of Flynn Drive. It should be noted that the BAL ratings in Table 2A are the worst case BAL and there is the potential for a future dwellings to achieve lower BAL ratings through building setbacks. Site specific BAL assessments will need to be conducted to determine whether a lower BAL would be applicable to any future building works.

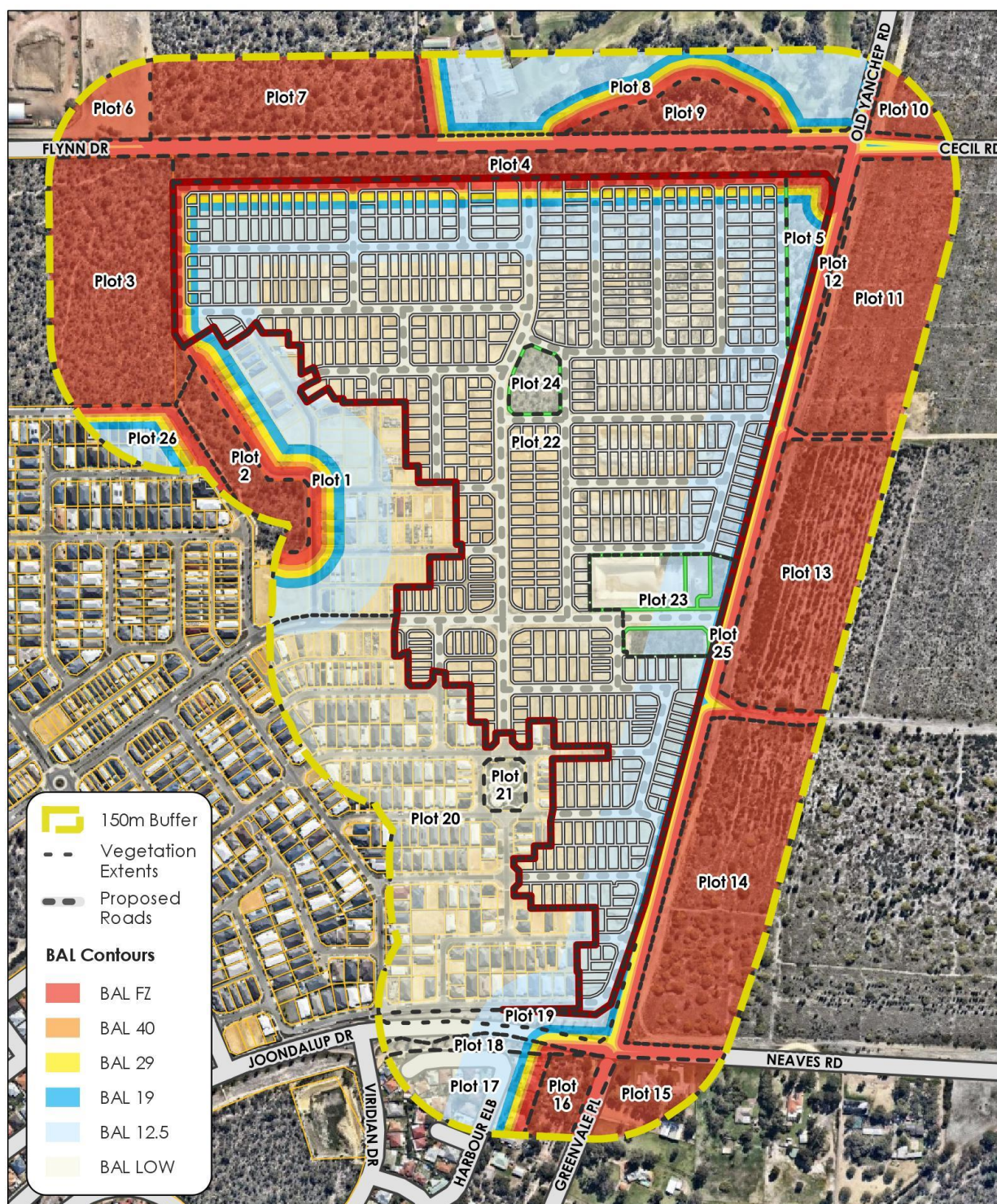
Table 2B details the revised worst case BAL ratings that would apply to the proposed lots subsequent to the future widening of Flynn Drive, once the vegetation in the balance lot is removed or managed for low threat in accordance with the approved Bushfire Management Plan.

Table 2A: Maximum BAL rating that applies to each lot boundary, prior to widening of Flynn Drive

Indicative Lots *	BAL Rating
61,63,65,66	BAL-FZ
33,34,35,36,37,38,39,40,41,42,43,44,45,54,55,56,57,58,59,60,70,72,73,75,77,78,79,81,82,84,85,87	BAL-40
4,6,15,17,30,31,32,62,67	BAL-29
53,68,71,74,76,80,83,86,120,121,122,123,124,125,126,127,128,129,130,131,148,149,150,151,152,153,154,155,156,157,158,160	BAL-19
1,2,3,5,7,8,9,10,11,12,13,14,16,18,19,20,21,22,23,24,25,26,27,28,29,46,47,48,49,50,51,52,64,69,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,159,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199	BAL-12.5
All other Lots	BAL-LOW
NOTES: * the indicative lot numbers have been adopted for identification purposes in this report only.	

Table 2B: Maximum BAL rating that applies to each lot boundary post development and widening of Flynn Drive

Indicative Lots *	BAL Rating
N/A	BAL-FZ
N/A	BAL-40
4,6,15,17,30,31,32,33	BAL-29
120,121,122,123,124,125,126,127,128,129,130,131, 148,149,150,151,152,153,154,155,156,157,158,160	BAL-19
1,2,3,5,7,8,9,10,11,12,13,14,16,18,19,20,21,22,23,24,25,26,27,28,29,34,35, 36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59, 60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83, 84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105, 106,107,108,109,110,111,112,113,114,115,116,117,118,119,132,133,134,135, 136,137,138,139,140,141,142,143,144,145,146,147,159,161,162,163,164,165, 166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183, 184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199	BAL-12.5
All other Lots	BAL-LOW
NOTES: * the indicative lot numbers have been adopted for identification purposes in this report only.	



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BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours: Stage 1

- Site Boundary
- Cadastre
- Roads



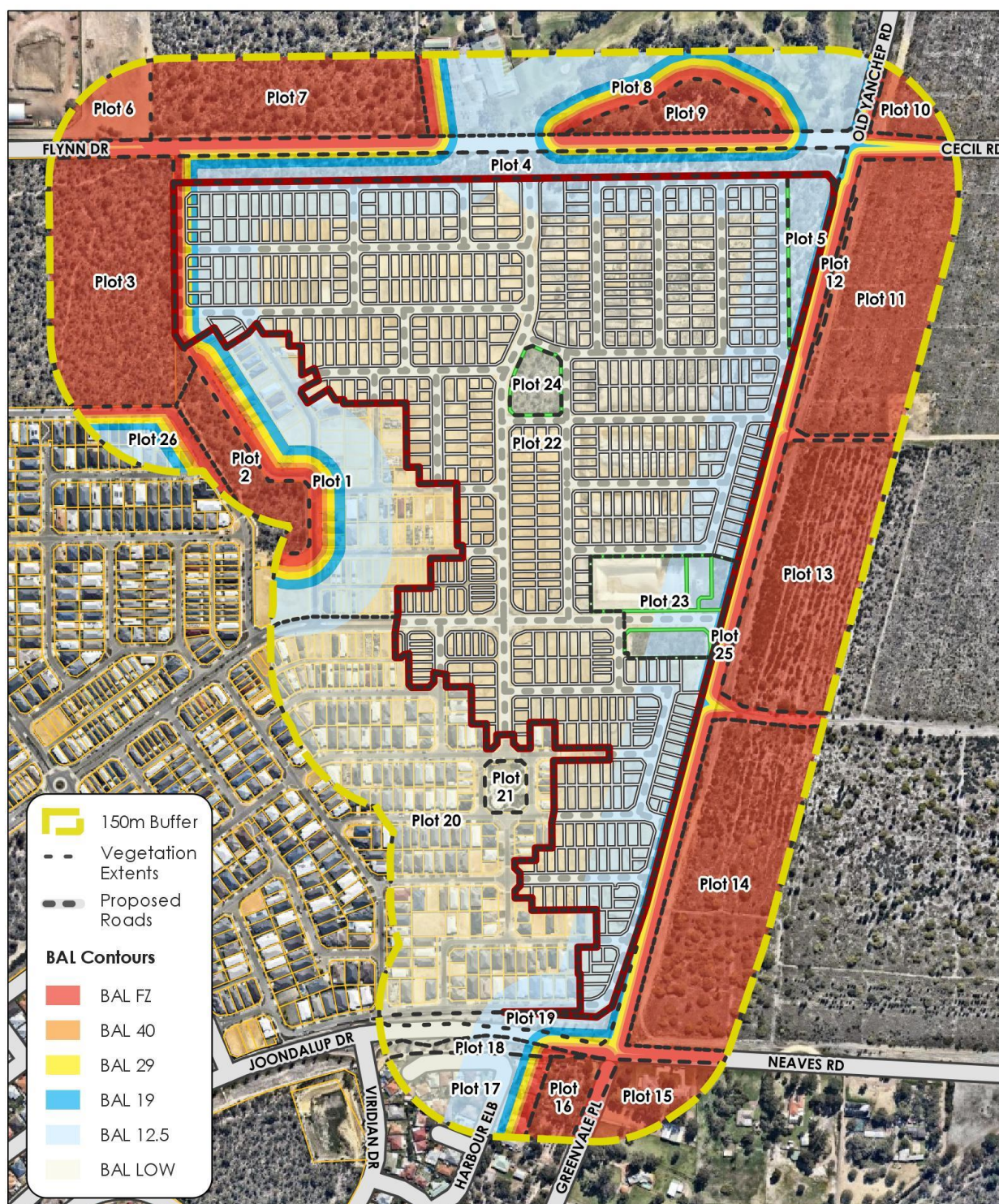
Size: A4
Scale: 1:6,000

0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE20171127
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

Disclaimer: Although the data within this map is considered accurate at the time of creation, RUIC Fire does not guarantee, and accepts no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any data used within this map.

Figure 2C: BAL Contour map – Stage 1



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Size: A4

Scale: 1:6,000

BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours: Stage 2

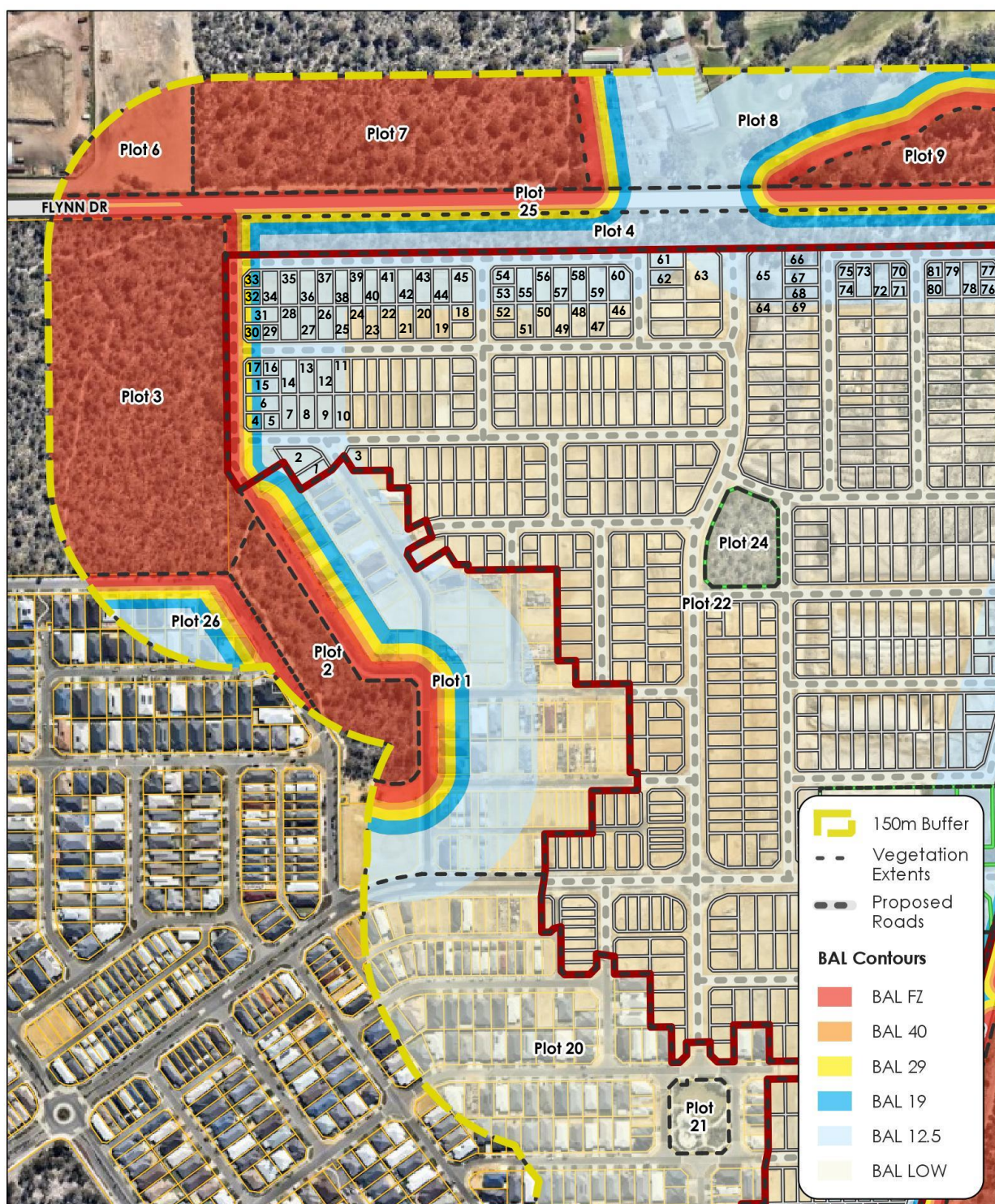
- Site Boundary
- Cadastre
- Roads

0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE 20171127
Projection: GDA94 MGA50
Author: MW - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

Disclaimer: Although the data within this map is considered accurate at the time of creation, RUIC Fire does not guarantee, and accepts no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any data used within this map.

Figure 2D: BAL Contour map – Stage 2 post development & widening of Flynn Drive



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Size: A4
Scale: 1:4,200

BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours , North West Detail
Stage 2

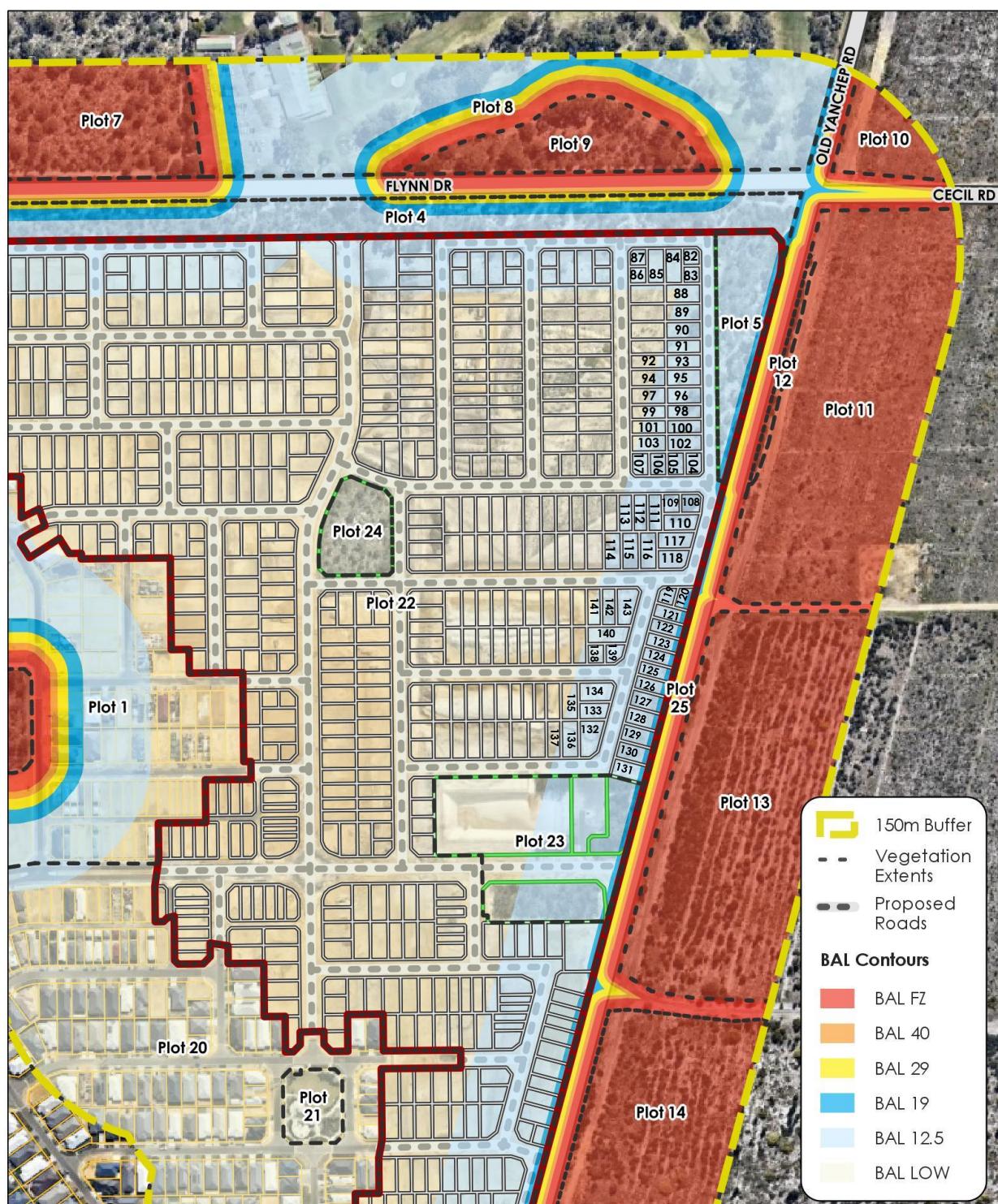
0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE 20171127
Projection: GDA94 MGA50
Author: MWL - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

- Site Boundary
- Cadastre
- Roads

Disclaimer: Although the data within this map is considered accurate at the time of creation, RUIC Fire does not guarantee, and accepts no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any data used within this map.

Figure 2E: BAL Contour map – North West Detail



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Size: A4
Scale: 1:4,200

BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours , North East Detail
Stage 2

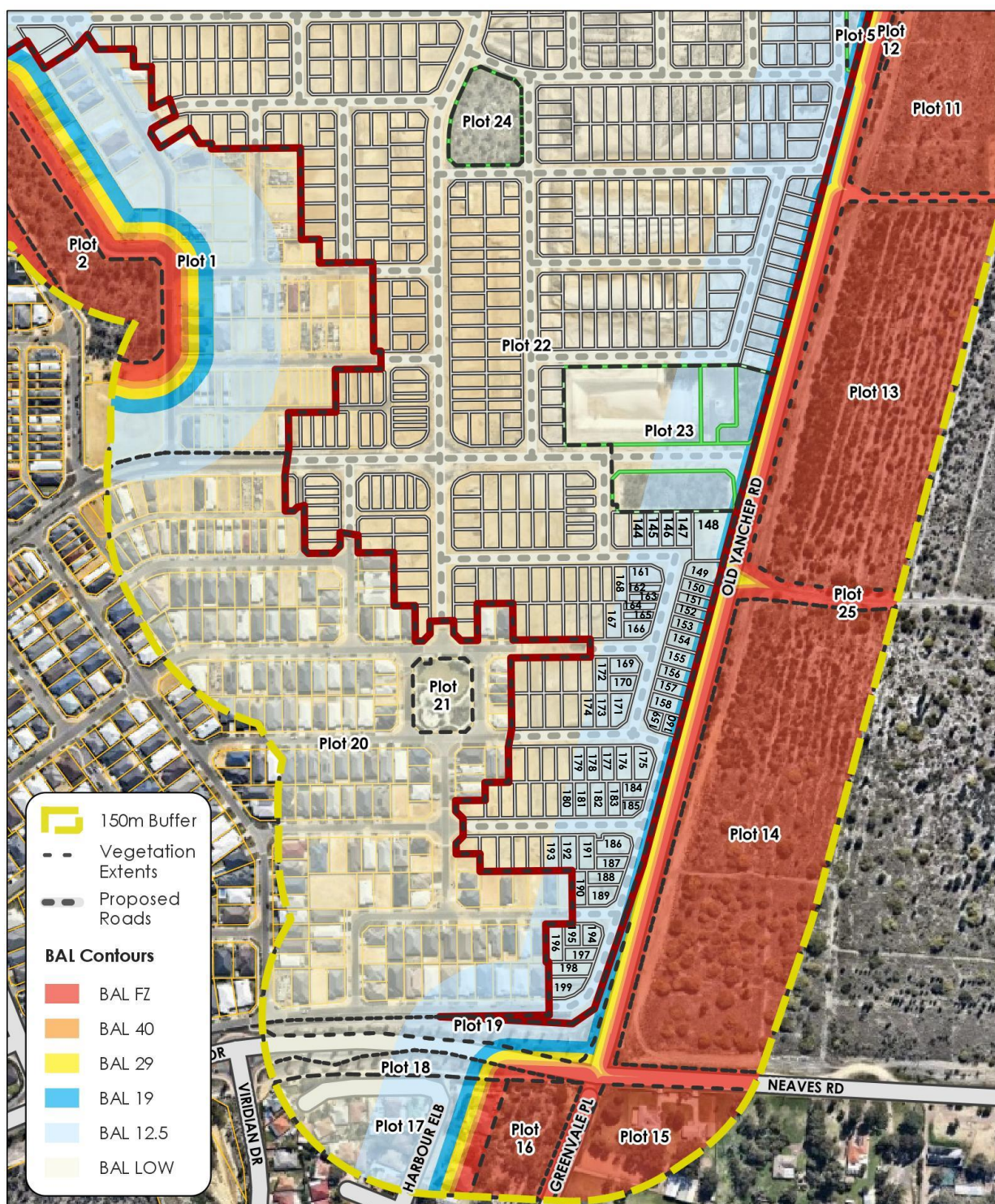
- Site Boundary
- Cadastre
- Roads

0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE 20171127
Projection: GDA94 MGA50
Author: MM - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

Disclaimer: Although the data within this map is considered accurate at the time of creation, RUIC Fire does not guarantee, and accepts no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any data used within this map.

Figure 2F: BAL Contour map –North East Detail



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Size: A4
Scale: 1:4,200

BUSHFIRE MANAGEMENT PLAN MAP
Flynn and Old Yanchep Road,
Banksia Grove
BAL Contours , South Detail
Stage 1

0 50 100 150 200 250 m

Ref: 7263_003_01_BAL NE 20171127
Projection: GDA94 MGA50
Author: MW - RUIC | Date: 2017-11-28
Data Source: Cadastre - Landgate; Imagery -
Nearmap; Roads, Site Boundary - RUIC.

- Site Boundary
- Cadastre
- Roads

Disclaimer: Although the data within this map is considered accurate at the time of creation, RUIC Fire does not guarantee, and accept no legal liability whatsoever arising from or connected to, the accuracy, reliability, currency or completeness of any data used within this map.

Figure 2G: BAL Contour map – South Detail

3.0 Bushfire Attack Levels Explained

A Bushfire Attack Level (BAL) assessment is a means of measuring the severity of a buildings potential exposure to ember attack, radiant heat and direct flame contact in a bushfire event, and thereby determining the construction measures required for the dwelling.

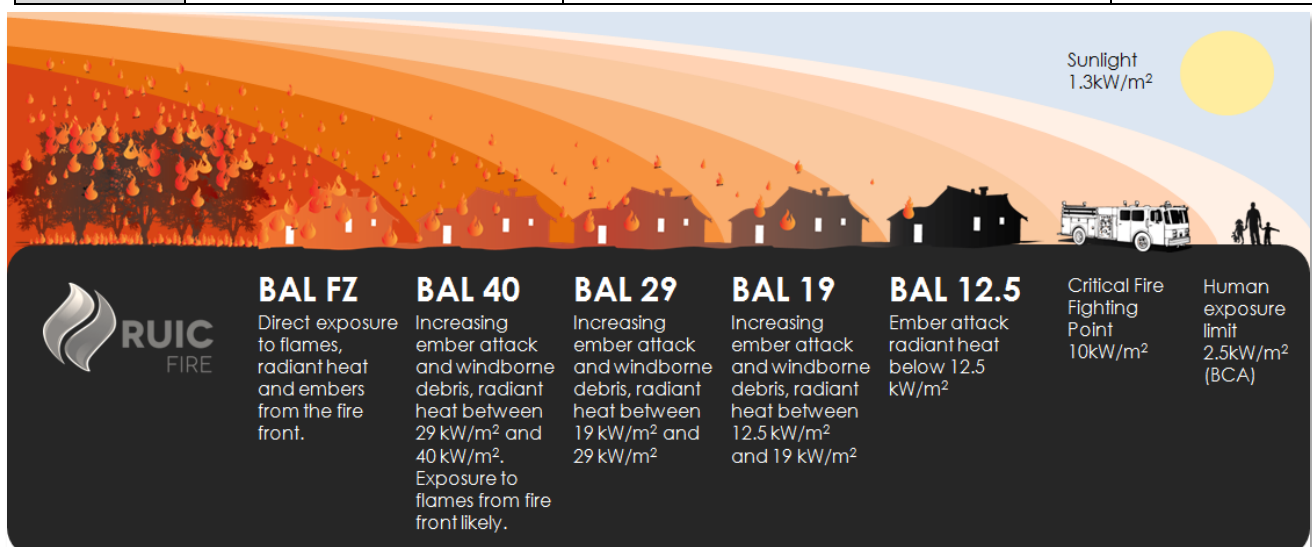
The methodology used for the determination of the BAL rating, and the subsequent building construction standards, are directly referenced from Australian Standard AS 3959-2009 *Construction of buildings in bushfire prone areas*.

The BAL rating is determined through identification and assessment of the following parameters;

- Fire Danger Index (FDI) rating; assumed to be FDI-80 for WA,
- All classified vegetation ***within 100m*** of the subject building,
- Separation distance between the building and the classified vegetation source/s, and
- Slope of the land under the classified vegetation.

AS 3959-2009 has six (6) levels of BAL, based on the radiant heat flux exposure to the building, and also identifies the relevant sections for building construction, as detailed below;

Bushfire Attack Level (BAL)	Classified vegetation within 100m of the site and heat flux exposure thresholds	Description of predicted bushfire attack and levels of exposure	Construction Section (within AS3959)
BAL-LOW	See clause 2.2.3.2	There is insufficient risk to warrant specific construction requirements	4
BAL-12.5	$\leq 12.5\text{kW/m}^2$	Ember attack	3 & 5
BAL-19	$>12.5\text{kW/m}^2$ to $\leq 19\text{kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 & 6
BAL-29	$>19\text{kW/m}^2$ to $\leq 29\text{kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 & 7
BAL-40	$>29\text{kW/m}^2$ to $\leq 40\text{kW/m}^2$	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames	3 & 8
BAL-FZ	$>40\text{kW/m}^2$	Direct exposure to flames from fire front in addition to heat flux and ember attack	3 & 9



4.0 References

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- WAPC. (2017a). Guidelines for Planning in Bushfire Prone Areas Version 1.2. Western Australian Planning Commission, Department of Planning & Department of Fire and Emergency Services.
- WAPC. (2017b). Guidelines for Planning in Bushfire Prone Areas Appendices Version 1.2. Western Australian Planning Commission, Department of Planning & Department of Fire and Emergency Services.