



Bushfire Attack Level Assessment

(AS3959-2009) Construction of buildings in bushfire-prone areas

West Karnup Stage 1A subdivision

Part Lot 806 Mandurah Road, Karnup
(WAPC References 146429 and 147620)

City of Rockingham

July, 2014

Report prepared for: Gold Right Pty Ltd

(Version A)

Report prepared by:

Rohan Carboon B. App. Sci. G. Cert. (Bushfire Protection)

Managing Director

Bushfire Safety Consulting Pty Ltd

P O Box 84

STONEVILLE WA 6081

Mobile: 0429 949 262

Email: enquiries@bushfiresafety.net

Website: www.bushfiresafety.net

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Introduction

Gold Right Pty Ltd (Gold Right) own a number of land parcels that collectively comprise the area covered by the endorsed West Karnup Local Structure Plan (LSP), referred to herein as the West Karnup LSP area. The West Karnup LSP area is located approximately 54 kilometres south-west of the Perth Central Business District (CBD) within the City of Rockingham, and Gold Right now intend to progress with the subdivision of the site in accordance with the endorsed LSP.

A Fire Management Plan (FMP) was prepared by Bushfire Safety Consulting for the West Karnup LSP area (Bushfire Safety Consulting 2013a). The FMP identified those areas within the proposed development that may be subject to bushfire hazard management considerations.

This Bushfire Attack Level (BAL) assessment has been prepared to satisfy the Developer's Responsibilities for subdivision within the LSP area as outlined in the endorsed FMP for the broader West Karnup LSP area (attached in **Attachment 1**), which required a detailed BAL assessment to be undertaken at subdivision stage to determine the level of exposure for proposed lots and the subsequent increased construction standards required. This assessment specifically addresses Stage 1A which forms part of a much larger staged residential development (WAPC references 146429 and 147620) that will continue well into the future. The Stage 1A area is approximately 13 hectares (ha) in size and covers part of Lot 806 Mandurah Road, Karnup. The Stage 1A area is herein referred to as "the site" and its location is shown spatially in **Appendix A**. Future development stages approved by the WAPC will each be provided with a separate BAL assessment before the creation of titles in order to provide an accurate representation of the bushfire hazards posed at the time of development.

The following BAL assessment determines those lots within the site that will be exposed to threat from surrounding bushfire fuels, and specifies the minimum construction standards required under the Australian Standard (AS 3959-2009 Construction of Buildings in Bushfire-Prone Areas). Exposed lots will require a Section 70A Notification on titles informing purchasers of the responsibilities of the FMP and of any bushfire building construction requirements.

As well as residential development, Stage 1A supports a commercial centre (as shown in **Appendix A**) (WAPC 147620). The Building Code of Australia (BCA) identifies commercial and industrial buildings as Class 6, 7, 8 or 9 buildings and the *Australian Standard (AS 3959:2009) Construction of buildings in bushfire prone areas* (AS 3959) bushfire construction standards are not triggered on these classes of buildings, therefore commercial lots within the site will not be subject to this BAL assessment. A separate FMP was prepared for the Commercial site (Bushfire Safety Consulting 2013b), which demonstrated that the predicted radiant heat flux exposure levels remain below BAL-29 (although BAL standards do not apply) and

therefore all proposed buildings fall within the acceptable level of risk (BAL-29 or lower).

The factors that affect building survival in a bushfire include:

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

The likelihood of building loss is highly dependent on the vulnerability a building to the mechanisms of bushfire attack (Leonard 2009).

The objective of the standard (AS 3959-2009) is “to prescribe particular construction details for buildings to reduce the risk of ignition from a bushfire while the front passes” (Standards Australia 2009). Building to the standard (AS 3959-2009) does not guarantee a dwelling will survive a bushfire.

Methodology and Assumptions

AS 3959-2009 has six categories of Bushfire Attack Level, namely BAL-LOW, BAL-12.5, BAL19, BAL-29, BAL-40 and BAL-FZ. These categories are based on heat flux exposure thresholds. The method for determining the BAL involves a site assessment of vegetation and of local topography. The BAL identifies the appropriate construction standards that applies as a minimum for buildings in bushfire-prone areas (AS 3959-2009).

It is a legal requirement of the lot owner to comply with Section 33(1) of the *Bush Fires Act 1954*. Specific responsibilities under this legislation are outlined in the City of Rockingham’s Fire Control Notice which can be downloaded at <http://www.rockingham.wa.gov.au/Residents/Home-safety-and-security/Fire-safety.aspx#A> . This document contains the Fire Control Notice that details all individual land owners legal responsibilities within the City of Rockingham.

The City of Rockingham Fire Control Notice also states “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”.

This BAL assessment is undertaken on the basis that the developer's (Gold Right) legal responsibilities under the Fire Control Notice will be achieved and maintained and specific responsibilities outlined in the LSP's endorsed FMP will be achieved.

Surrounding Vegetation, Effective Slope and Setback Distances

Vegetation

Fuel layers in a typical forest environment can be broken-down into five segments as shown in **Figure 1**. These defined fuel layers are used in the vegetation description which follows.



Figure 1: The five fuel layers in a forest environment that could be associated with fire behaviour (Gould et al. 2007)

The onsite survey undertaken for this assessment identified two vegetation classes surrounding the site which qualify as “classified vegetation” according to AS39859-2009. The vegetation classifications include ‘Scrub’ and ‘Shrubland’. Earthworks associated with the approved subdivision have progressed within and surrounding the site, largely removing the rest of the classified vegetation from within the site and surrounding area.

On the west side of Mandurah Road a strip of ‘Woodland’ trees has been planted which form a row that runs parallel to the road (**Figure 2**). West of this row of trees in the sand dune dominated area, ‘Scrub’ vegetation is dominant. The scrub consists of Acacia species and other shrubs 2-4 metres in height. The dominant fuel layer west of Mandurah Road is the ‘Woodland’ over elevated scrub, which will pose an ‘Extreme’ hazard to residential development within the site.

Scrub vegetation occurs in small patches south of the site within the proposed bushland conservation area. The small areas of scrub are patchy in this area, but do consist of Acacia dominated zones 2-3 metres in height (**Figure 3**) This vegetation is

more than 100m from proposed residential lots, and will therefore pose no hazard to development which will require increased construction standards for dwellings. This is discussed further below.



Figure 2 & 3: The degraded woodland vegetation strip west of Mandurah Road (left) and the typical scrub vegetation with acacia species (right)

'Shrubland' vegetation is the dominant vegetation class south of the site within the proposed bushland conservation area. This open heath vegetation averages 1 metre in height through most areas and includes grass fuels intermixed with native species (**Figure 4**). This vegetation type has fuels predominantly in the near surface and elevated layer (**Figure 5**). This vegetation is more than 100m from proposed residential lots, and will therefore pose no hazard to development which will require increased construction standards for dwellings. This is discussed further below.



Figures 4 & 5: Shrubland vegetation south of the site averages 1m in height (left and right)

Low threat vegetation

Vegetation that does not trigger a BAL assessment according to AS3959-2009 includes one or a combination of the following:

- Vegetation of any type more than 100 metres from the site.
- Single areas of vegetation less than 1 hectare in area and not within 100 metres of

other areas of vegetation being classified.

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

In the Mandurah Road reserve immediately adjacent to the western boundary of the site is a strip of vegetation between 5 and 9 metres in width. This consists of grass vegetation for a large portion of the interface (**Figure 6**) and also contains some areas with a single row of *Acacia* scrub amongst grass fuels (**Figure 7**). Roadside slashing of grass fuels by the City of Rockingham occurs in large areas in the Mandurah Road Reserve adjacent to the site and this management of grass fuels will ensure the threat is low.



Figures 6 & 7: The 7m wide grassland strip of vegetation that will be adjacent to the acoustic wall (left) and a line of Acacia scrub between Mandurah Road and the Acoustic wall (right)

The grassland vegetation in between the dual carriage ways of Mandurah Road, and west of Mandurah Road is mown and maintained at a very low fuel level by the City of Rockingham (**Figure 8**).

The post development vegetation classification details for the site are mapped in **Appendix A**.



Figure 8: The mown grass fuels in the middle of the dual carriage way – Mandurah Road.

Effective Slope

The effective slope of the land under the areas of classified vegetation is outlined in **Appendix B**. The majority of the scrub vegetation west of Mandurah Road has an effective upslope between 0-5 degrees because the landscape rises into a sand dune dominated environment.

Measured perpendicular to the southern boundary, most of the shrubland vegetation has an effectively flat slope.

Setback Distances

Remnant vegetation east of the site is more than 100m from proposed residential lots and will therefore pose no bushfire hazard considerations for the site, therefore requiring no internal setbacks along the eastern boundary of the site. This vegetation is subject to future subdivision processes and will be cleared in the short to medium term to make way for residential development as per the endorsed West Karnup LSP.

Dwellings on the western perimeter will be separated from the western hazard by the width of the Mandurah Road Reserve plus any internal roads and lot frontage setbacks. These distances vary between 50 -75 metres minimum.

Methodology and Assumptions

The following BAL assessment for the proposed dwellings (see Table 1) was determined using the methodology in Appendix A of AS 3959-2009. This methodology is also outlined in the *Planning for Bush Fire Protection Guidelines* (WAPC 2010).

The criteria to determine the BAL is outlined as follows:

Designated FDI : 80

Flame Temperature: 1090

Slope : Flat, Upslope & Downslope (See Table 1)
 Vegetation Class : Scrub and Shrubland
 Setback distances : various metres (See Table 1)

Outcome

BAL ratings for exposed residential areas of the development were determined using the methodology in Appendix A of AS 3959. This methodology is also outlined in the *Planning for Bush Fire Protection - Edition 2* (WAPC, 2010). The determined BAL ratings are shown spatially in **Appendix C**.

It should be noted that the Building Code of Australia (BCA) identifies commercial and industrial buildings as Class 6, 7, 8 or 9 buildings and AS 3959 bushfire construction standards are not triggered on these classes of buildings. However, an FMP prepared for the commercial site (Bushfire Safety Consulting 2013b) demonstrated that all proposed buildings fall within the acceptable level of risk (BAL-29 or lower).

Classified vegetation remaining to the south of the site, within the proposed reserve area, has not been included in this BAL assessment as it is located more than 100m from any proposed residential lots. The only areas of classified vegetation that will pose BAL implications for proposed residential lots within the site are located west of Mandurah Road. No lots within the site will be exposed to a BAL rating above BAL-12.5.

BAL assessment location (Appendix C)	Classified Vegetation	Setback Distance (metres)	Effective Slope (degrees)	BAL Rating
Western interface	Woodland	≥55-≤100	Upslope	BAL-12.5
Eastern interface	Shrubland	>100	Upslope	N/A
Southern interface	Shrubland	>100	Flat	N/A
Southern interface	Scrub	>100	Downslope 0-5	N/A

Table 1: Bushfire Attack Level (BAL) Assessment for exposed residential lots around the perimeter of the site (See Appendix C for site details)

The current land use and vegetation management surrounding the site results in 15 lots along the western boundary of the site being exposed to BAL-12.5. This is shown

in **Appendix C**. Specifically this includes Lots 3, 4, 5, 15, 16, 17, 18, 19, 20, 21, 22, 23, 57, 58 and 59 as identified on Deposited Plan 401236.

A Bushfire Attack Level of BAL-12.5 means the risk is considered to be low. The construction elements are expected to be exposed to a radiant heat flux not greater than 12.5kW/m². There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat (Standards Australia 2009). The recommended construction sections in this case are 3 and 5 in AS 3959-2009.

A Bushfire Attack Level of BAL-LOW means the risk is considered to be very low. There is insufficient risk to warrant any specific construction requirements but there is still some risk.

Those lots exposed to increased BALs, as shown in **Appendix D**, will be subject to a Section 70A Notification on titles informing purchasers of the responsibilities of the FMP and of any bushfire building construction requirements.

Conclusions

This Bushfire Attack Level (BAL) assessment was prepared to satisfy the Developer's Responsibilities for the subdivision of Stage 1A within the broader West Karnup LSP area as outlined in the endorsed FMP, which required a detailed BAL assessment to be undertaken at subdivision stage to determine the level of exposure for proposed lots and the subsequent increased construction standards required.

This BAL assessment determined that no lots fall within an unacceptable level of risk, and BAL-12.5 is not exceeded. Fifteen lots along the western boundary of the site are exposed to BAL-12.5 (Lots 3, 4, 5, 15, 16, 17, 18, 19, 20, 21, 22, 23, 57, 58 and 59 as identified on Deposited Plan 401236) which will trigger increased construction standards under AS 3959. These exposed lots will require a Section 70A Notification on titles informing purchasers of the responsibilities of the FMP and of any bushfire building construction requirements.

References

Bushfire Safety Consulting (2013a) Fire Management Plan Lots 3, 805 & 806 Mandurah Road, Karnup

Bushfire Safety Consulting (2013b) Fire Management Plan Commercial Precinct Development Lots 806 Mandurah Road, Karnup

City of Rockingham Firebreak Notice (at: <http://www.rockingham.wa.gov.au/Residents/Home-safety-and-security/Fire-safety.aspx#A>)

Leonard J. (2009) Report to the 2009 Victorian Royal Commission Building Performance in Bushfires. CSIRO Sustainable Ecosystems.

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

Western Australian Planning Commission (WAPC), FESA & Department of Planning and Infrastructure (2010), Planning for Bush Fire Protection. Western Australian Planning Commission. Perth

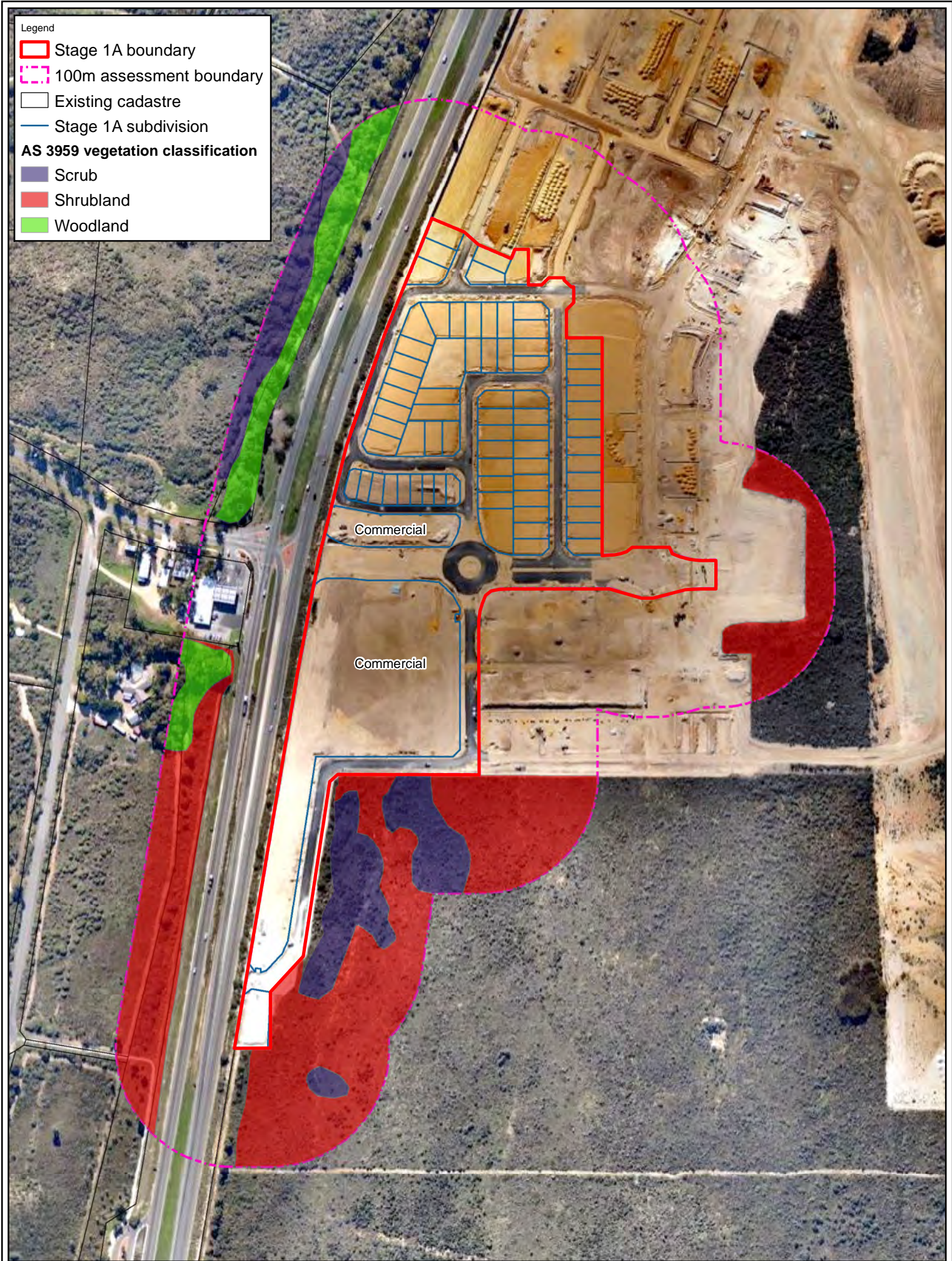
APPENDICES

Appendix A: Post Development Vegetation Classification

Appendix B: Topography and Effective Slope Under Classified Vegetation

Appendix C: AS 3959 Bushfire Attack Levels

Appendix D: Exposed Lots Requiring Notification on Title



Appendix A: Post Development Vegetation Classification

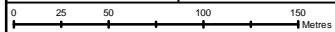
Project: Bushfire Attack Level Assessment
West Karnup Stage 1A Subdivision

Client: Gold Right Pty Ltd

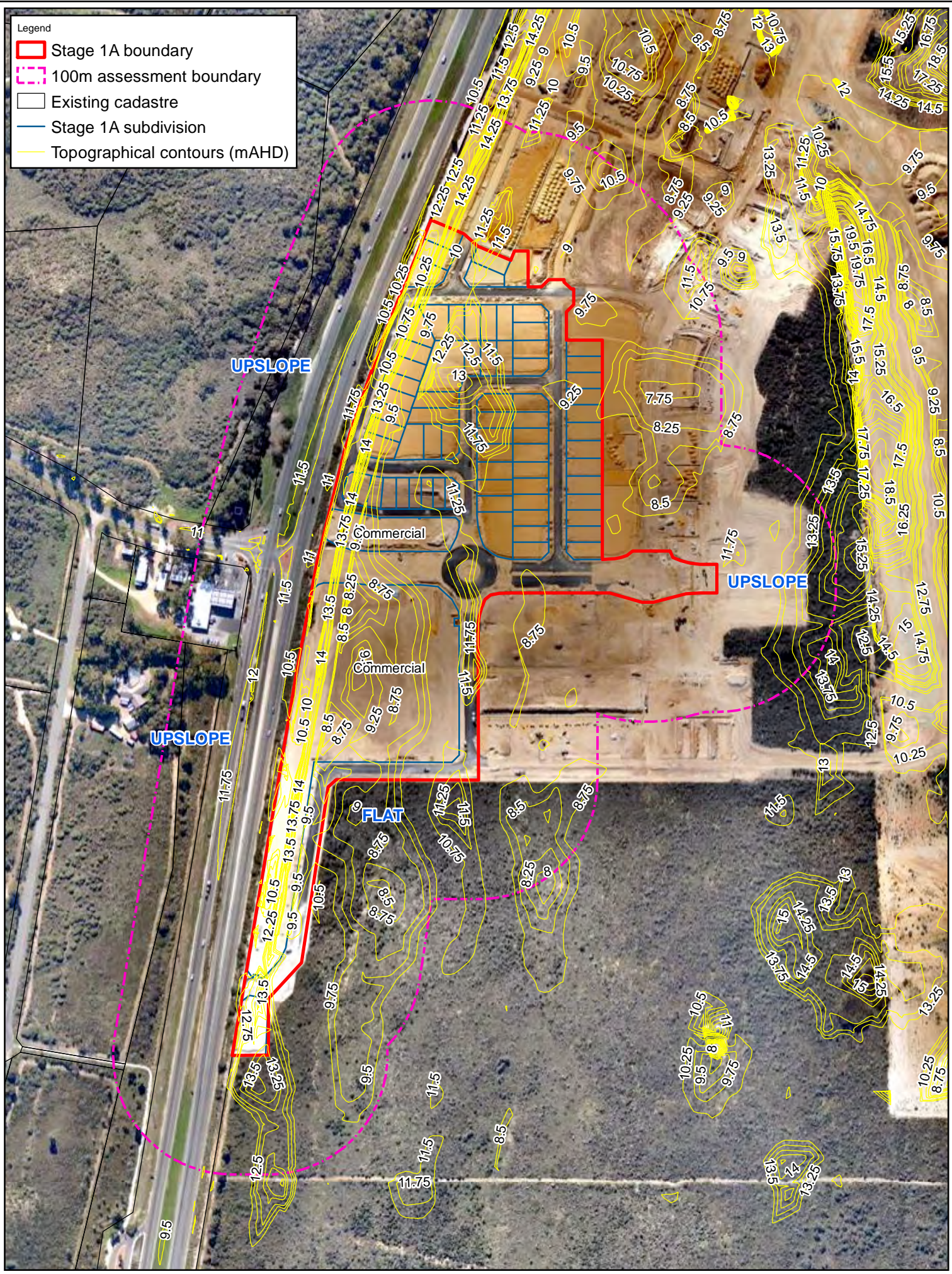


Plan Number: EP13-035(04)-F67

Drawn: GRO	Date: 31/07/14
Approved: VMK	Date: 31/07/14
Checked: CKK	Scale: 1:4,000@A4



- Legend
- ▭ Stage 1A boundary
 - ▭ 100m assessment boundary
 - Existing cadastre
 - Stage 1A subdivision
 - Topographical contours (mAHD)



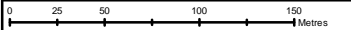
Appendix B: Topography and Effective Slope Under Classified Vegetation

Project: Bushfire Attack Level Assessment
West Karnup Stage 1A Subdivision

Client: Gold Right Pty Ltd



Plan Number: EP13-035(04)-F68	
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Approved: VMK	Date: 31/07/14
Checked: CKK	Scale: 1:4,000@A4



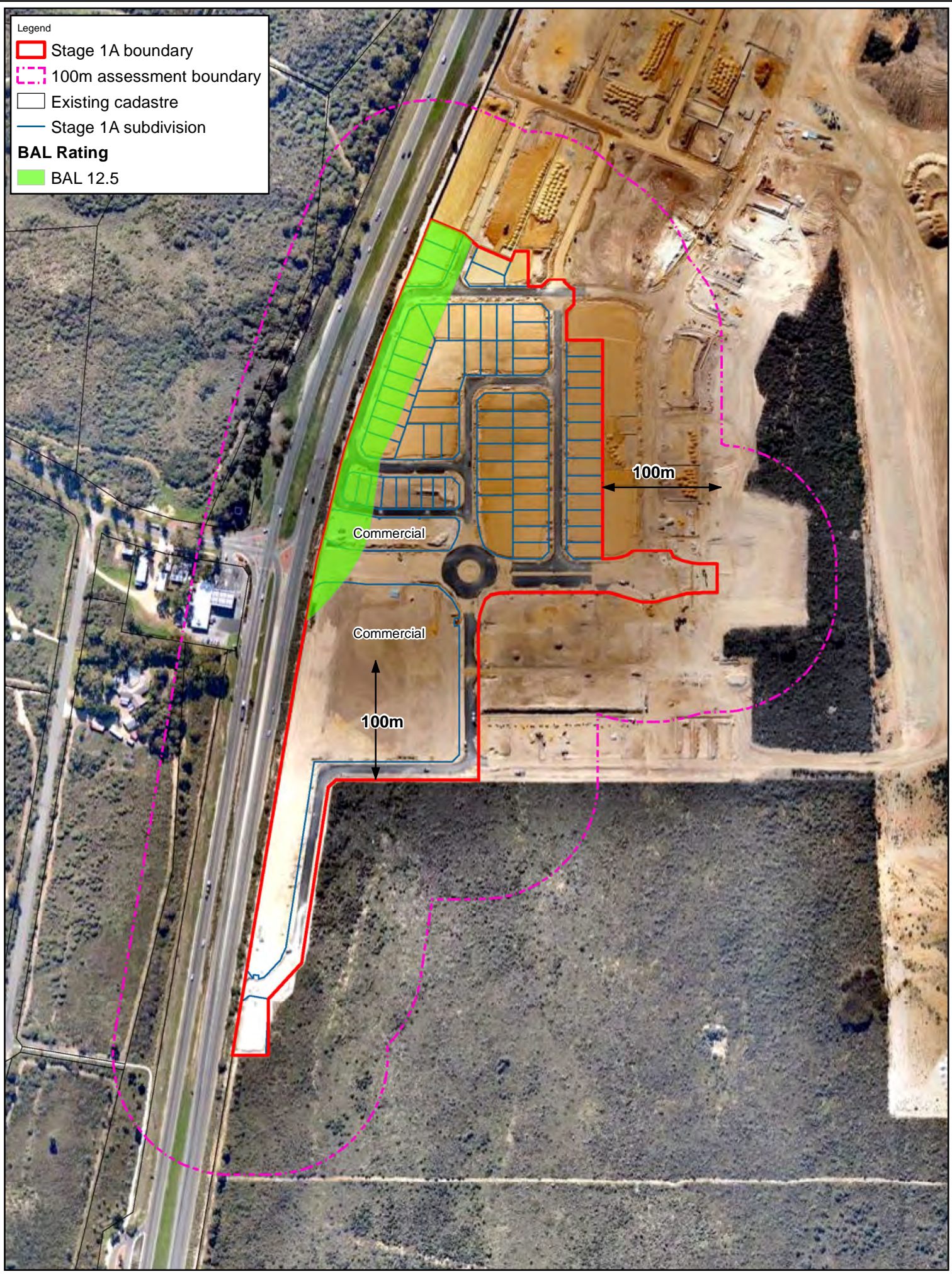
Sources: The following datasets were used in the production of this map: Layer - CUSTODIAN (date)

Legend

- Stage 1A boundary
- 100m assessment boundary
- Existing cadastre
- Stage 1A subdivision

BAL Rating

- BAL 12.5



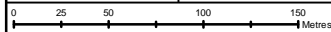
Appendix C: AS 3959 Bushfire Attack Levels

Project: Bushfire Attack Level Assessment
West Karnup Stage 1A Subdivision





Client: Gold Right Pty Ltd

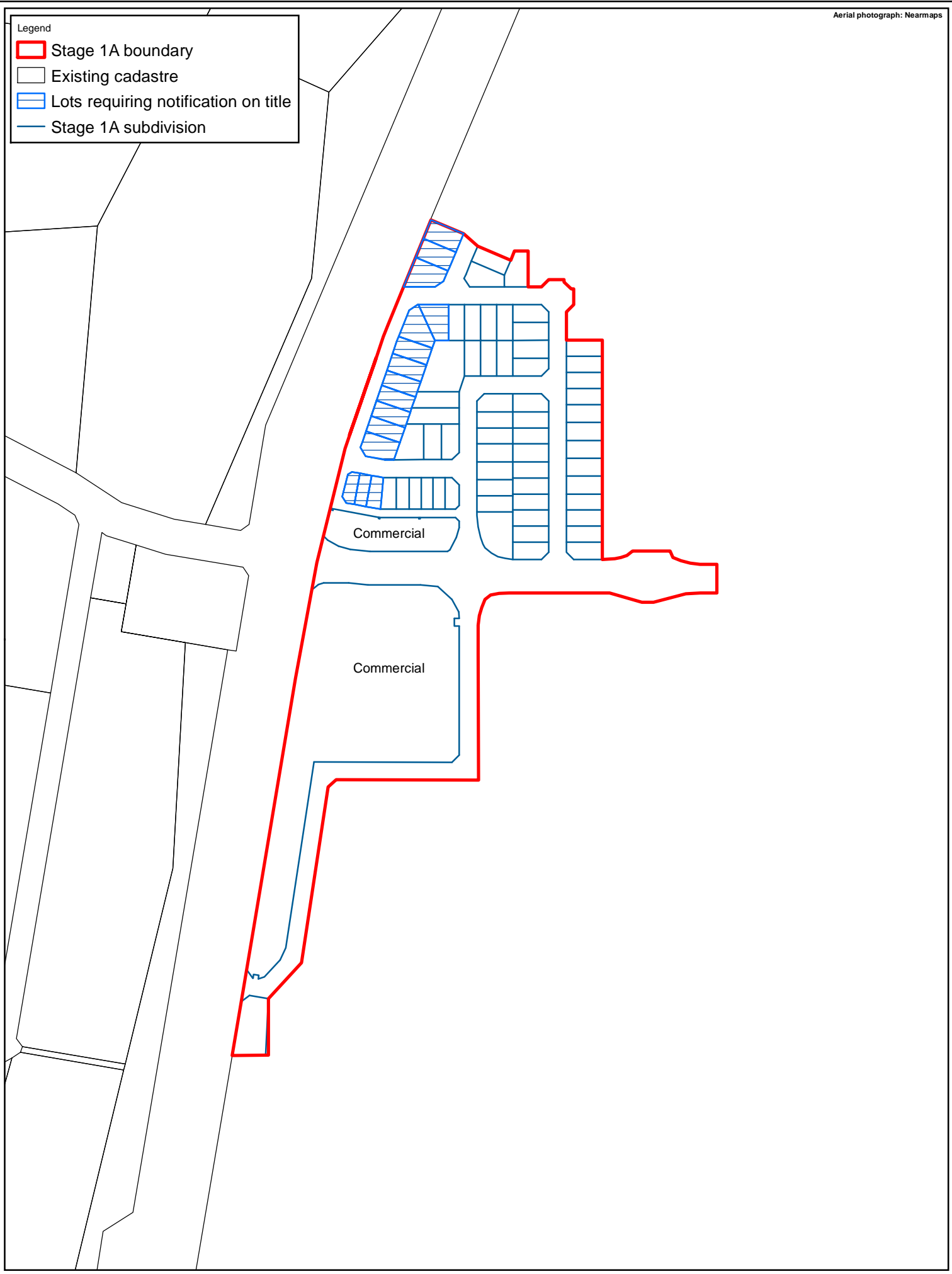


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Approved: VMK	Date: 31/07/14
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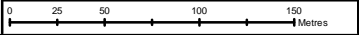
Legend

-  Stage 1A boundary
-  Existing cadastre
-  Lots requiring notification on title
-  Stage 1A subdivision



Appendix D: Exposed Lots Requiring Notification on Title	
Project:	Bushfire Attack Level Assessment West Karnup Stage 1A Subdivision
Client:	Gold Right Pty Ltd



Plan Number: EP13-035(04)--F70	
Drawn: GRO	Date: 31/07/14
Approved: VMK	Date: 31/07/14
Checked: CKK	Scale: 1:4,000@A4
	

ATTACHMENTS

Attachment 1: Development Staging Plan (DPS 2014)



LEGEND:

Staging Boundary

RESIDENTIAL LOT SUMMARY:

STAGE 1	
8.5m	-
10m	9
13m	49
15m	80
17m	13
18m	-
GH	2
Dwellings	9
TOTAL LOTS	153
TOTAL DWELLINGS	160

STAGE 2	
8.5m	-
10m	24
13m	56
15m	78
17m	3
18m	-
GH	1
Dwellings	2
TOTAL LOTS	161
TOTAL DWELLINGS	162

STAGE 3	
8.5m	-
10m	6
13m	49
15m	73
17m	36
18m	-
GH	1
Dwellings	4
TOTAL LOTS	165
TOTAL DWELLINGS	168

STAGE 4	
8.5m	-
10m	-
13m	75
15m	64
17m	28
18m	2
GH	-
Dwellings	-
TOTAL LOTS	169
TOTAL DWELLINGS	169

STAGE 5	
8.5m	4
10m	2
13m	43
15m	59
17m	22
18m	-
GH	-
Dwellings	-
TOTAL LOTS	130
TOTAL DWELLINGS	130

STAGE 6	
8.5m	-
10m	60
13m	62
15m	60
17m	35
18m	11
GH	-
Dwellings	-
TOTAL LOTS	228
TOTAL DWELLINGS	228

STAGE 7	
8.5m	-
10m	51
13m	-
15m	-
17m	-
18m	-
GH	2
Dwellings	43
TOTAL LOTS	53
TOTAL DWELLINGS	94

OVERALL	
8.5m	4
10m	152
13m	334
15m	413
17m	137
18m	13
GH	6
Dwellings	58
LOT 3 TOTAL LOTS	111
TOTAL LOTS	1170
TOTAL DWELLINGS	1222

LOT SUMMARY

Lots 805 & 806 Mandurah Road, KARNUP

for: Gold Right Pty Ltd.

NORTH

Scale 1: 6000 @ A3

COMPILED: DPS, MAPS, JDSI	DRAWN BY: NM
DATE: 08/02/2013	REVISED: 19/02/2014
GRID: PCG 94	DATUM: AHD
DRAWING NUMBER: GOGKA-1-008d	JOB CODE: GOGKAST1
FILE ID: M:\GOGKA\BASE\FEASIBILITY & CONCEPT PLANNING\GOGKA-1-008d.dgn	



28 Brown St, East Perth WA 6004
 PO BOX 6697 EAST PERTH 6892
 T (08) 9268 7900
 F (08) 9268 7999
 E dps@dpswa.com.au