

**Lot 70 Winthrop
Avenue
College Grove WA**

Bushfire Management Plan



27/08/2018

Kathryn Kinnear

Bio Diverse Solutions

DOCUMENT CONTROL

TITLE

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Reviewer (s): B. Theyer

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REVISION RECORD

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The recommendations and measures contained in this assessment report are based on the requirements of the Australian Standards 3959 – Building in Bushfire Prone Areas, WAPC SPP3.7, Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017) and CSIRO’s research into Bushfire behaviour. These are considered the minimum standards required to balance the protection of the proposed dwelling and occupants with the aesthetic and environmental conditions required by local, state and federal government authorities. They DO NOT guarantee that a building will not be destroyed or damaged by a bushfire. All surveys and forecasts, projections and recommendations made in this assessment report and associated with this proposed dwelling are made in good faith on the basis of the information available to the fire protection consultant at the time of assessment. The achievement of the level of implementation of fire precautions will depend amongst other things on actions of the landowner or occupiers of the land, over which the fire protection consultant has no control. Notwithstanding anything contained within, the fire consultant/s or local government authority will not, except as the law may require, be liable for any loss or other consequences (whether or not due to negligence of the fire consultant/s and the local government authority, their servants or agents) arising out of the services rendered by the fire consultant/s or local government authority.



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CONTENTS

1. EXECUTIVE SUMMARY.....1

2. PROPOSAL DETAILS.....2

 2.1.LOCATION.....2

 2.2.DEVELOPMENT PROPOSAL.....2

 2.3.STATUTORY FRAMEWORK.....5

 2.4.SUITABLY QUALIFIED BUSHFIRE CONSULTANT.....5

 2.5.OBJECTIVES.....6

3. ENVIRONMENTAL CONSIDERATIONS.....7

 3.1.NATIVE VEGETATION – MODIFICATION AND CLEARING.....7

 3.2.RE-VEGETATION/LANDSCAPE PLANS.....7

4. BUSHFIRE ASSESSMENT RESULTS.....8

 4.1.ASSESSMENT INPUTS.....8

 4.1.1.VEGETATION CLASSIFICATION AS3959.....8

 4.1.2.FIRE DANGER INDEX.....17

 4.1.3.SLOPE UNDER CLASSIFIED VEGETATION.....17

 4.2.ASSESSMENT OUTPUTS.....17

 4.2.1.BAL CALCULATION AS3959 (BAL CONTOUR PLAN).....17

5. IDENTIFICATION OF BUSHFIRE HAZARD ISSUES.....20

 5.1.BUSHFIRE RISKS.....20

 5.2.ACCESS.....20

6. ASSESSMENT TO THE BUSHFIRE PROTECTION CRITERIA.....22

7. OTHER FIRE MITIGATION MEASURES.....27

 7.1.EVAPORATIVE AIR CONDITIONERS.....27

 7.2.BARRIER FENCING.....27

 7.3.INDIVIDUAL BUSHFIRE PLAN.....27

8. RESPONSIBILITIES FOR IMPLEMENTATION.....29

 8.1.FUTURE LOT OWNER’S RESPONSIBILITY.....29

 8.2.DEVELOPER’S RESPONSIBILITY.....29

 8.3.LOCAL GOVERNMENT RESPONSIBILITY.....30

9. DISCLAIMER.....31

10. REFERENCES.....32



LIST OF TABLES

- Table 1: Bushfire protection criteria applicable to the site
- Table 2: Effective slope allocation to classified vegetation
- Table 3: BAL Allocation Plan of Subdivision
- Table 4: Bushfire protection criteria applicable to the site
- Table 5: Vehicular Access Technical Requirements (WAPC, 2017)
- Table 6: Implementation actions future lot owners
- Table 7: Implementation actions current land owners/developer
- Table 8: Implementation actions City of Bunbury

LIST OF FIGURES

- Figure 1: Location Plan
- Figure 2: Structure Plan
- Figure 3: Conceptual Layout Plan
- Figure 4: Bushfire Prone Area Mapping
- Figure 5: Vegetation Classes Mapping
- Figure 6: BAL Allocation (Contour) Plan
- Figure 7: Access Plan
- Figure 8: Tree Canopy Coverage – ranging from 15 to 70% at maturity (WAPC, 2017)

1. Executive Summary

Tecon Australia commissioned Bio Diverse Solutions (Bushfire Consultants) to prepare a Bushfire Management Plan to guide all future bushfire management for a proposed Structure Plan area and the (subsequent) proposed residential subdivision of Lot 70 Winthrop Avenue College Grove. The Structure Plan proposal is to subdivide the subject area to 30 residential lots ranging in size from 209m² to 987m² (R40 designation). The Structure Plan (SP) concept also includes preservation of remnant vegetation in the south as POS, Landscaped POS in the north west around a significant tree, public road construction and the construction of an Emergency Access Way along the northern boundary.

The Subject Site was assessed as having internal areas of Woodland Type B and adjacent bushfire risks of Woodland Type B. Slopes were assessed in direction of fire run as per AS3959 methodology and low to moderate slopes prevail adjacent to the site with all internal vegetated areas being upslope of the development. BAL allocation across the site has demonstrated BAL 29 or less can prevail over the lots in the SP once constructed. APZ areas are contained within the subject site and also utilise adjacent low fuel areas of urban areas and road reserves (Trinity Rise) to achieve APZ areas associated with BAL 29 or less. The separation of the lots to the internal Woodland Type B is either through road reserve (14.5m wide) or via a low fuel managed zone (southern boundary). Vacant lots in possession of the developer are to be to WAPC standards and maintained by the developer until lots are relinquished to new lot owners.

Access into the subject site will be provided along the established road of Trinity Rise, however this road is a dead-end road so an alternative access route (EAW) will be provided along the northern boundary (existing driveway access) to Winthrop Avenue. The secondary access will allow of recess and egress in a bushfire emergency to the east and west to separate destinations. Internal public road reserves are 14.5m meeting the minimum standards required by the WAPC guidelines. No battle axe lots or cul-de-sacs are within the SP design meeting the bushfire protection criteria.

Water supply will be through the extension of the existing reticulated scheme water into the area. An assessment to the WAPC Guidelines for Planning in Bushfire Prone Areas (Vers 1.3, 2017) Acceptable Solutions of the 4 bushfire protection criteria is summarised below, refer to Table 1.

Table 1: Bushfire protection criteria applicable to the site

Element	Acceptable Solution	Applicable or not Yes/No	Meets Acceptable Solution
Element 1 – Location	A1.1 Development Location	Yes	Compliant BAL 29 or less applied to lots in subdivision.
Element 2 – Siting and Design	A2.1 Asset Protection Zone	Yes	Compliant, APZ in BAL 29 or less for the whole of subdivision. APZ's utilise existing urban areas and is located within the development footprint.
Element 3 – Vehicular Access	A3.1 Two Access Routes	Yes	Compliant two access points to 2 destinations
	A3.2 Public Road	Yes	Compliant
	A3.3 Cul-de-sacs	No	N/A
	A3.4 Battle axes	No	N/A
	A3.5 Private driveways	Yes	Compliant
	A3.6 Emergency Access Ways	Yes	Compliant meets minimum technical requirements
Element 3 – Vehicular Access	A3.7 Fire Service Access Ways	No	Public road network used.
	A3.8 Firebreaks	Yes	Compliant on parent lot, not applicable to future urban lots
Element 4 – Water	A4.1 Reticulated areas	Yes	Compliant
	A4.2 Non-reticulated areas	N/A	N/A
	A4.3 Individual lots in non-reticulated areas	N/A	N/A

2. Proposal Details

Tecon Australia commissioned Bio Diverse Solutions (Bushfire Consultants) to prepare a Bushfire Management Plan (BMP) to guide all future bushfire management for a SP and future proposed residential subdivision of Lot 70 Winthrop Avenue College Grove. This BMP has been prepared to assess the subject site to the current and endorsed Guidelines for Planning in Bushfire Prone Areas Vers 1.3 (WAPC, 2017) and State Planning Policy 3.7 (WAPC, 2015).

Such planning takes into consideration standards and requirements specified in various documents such as Australian Standard (AS) 3959-2009, Western Australian Planning Commission (WAPC) Guidelines for Planning in Bushfire Prone Areas Vers 1.3 (WAPC, 2017) and State Planning Policy 3.7 (WAPC, 2015). These policies, plans and guidelines have been developed by WAPC to ensure uniformity to planning in designated “Bushfire Prone Areas” and consideration of the relevant bushfire hazards when identifying or investigating land for future development.

2.1. Location

The subject site is described as Lot 70 Winthrop Avenue College Grove is 2.2ha and located approximately 7km south of Bunbury CBD in the locality of College Grove. The Subject Site is vacant land with remnant vegetation on the north and eastern extents of the property. The location of the Subject Site is shown on Figure 1.

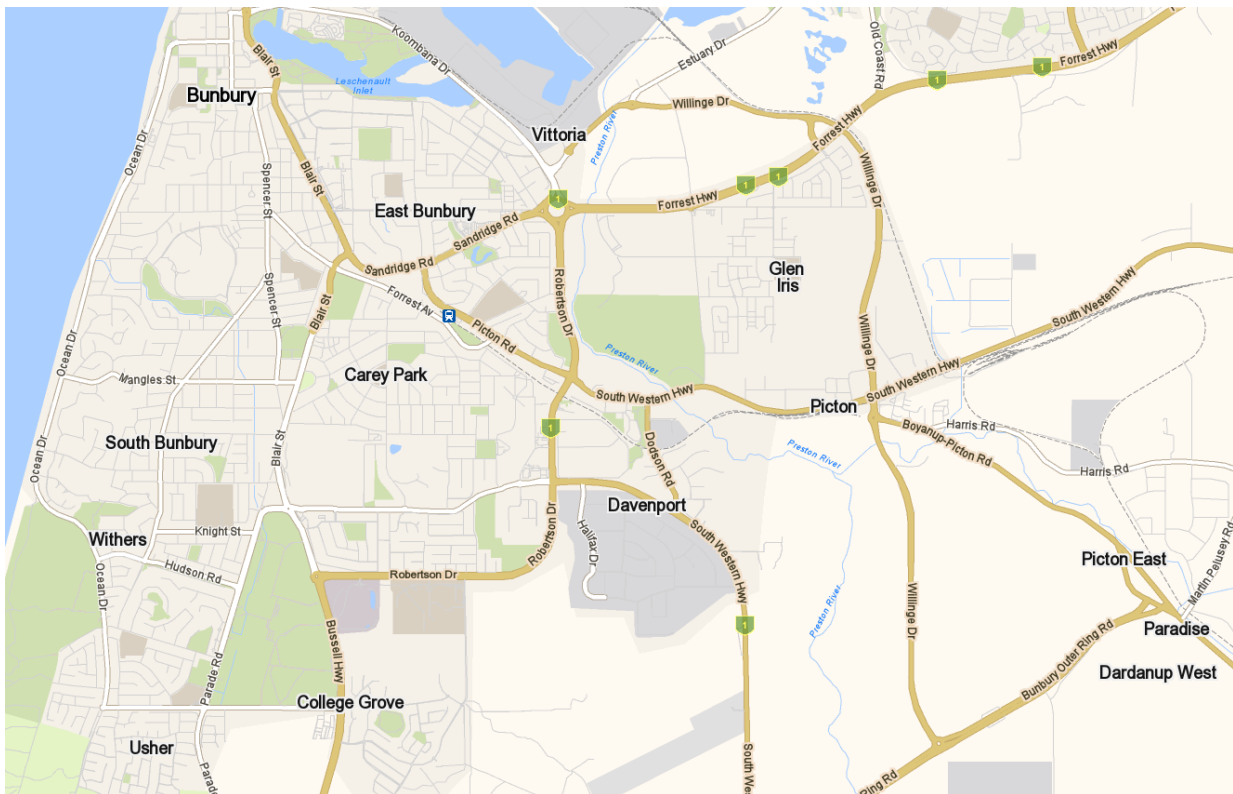


Figure 1: Location Plan

2.2. Development Proposal

The subject site is zoned Urban under the Greater Bunbury Regional Scheme (GBRS), refer to Figure 2. The purpose of the Urban zone is “to provide for residential development and associated local employment, recreation and open space, shopping schools and other community facilities”. This development will provide a high-quality residential development providing for a greater variety of affordable infill development in the Urban zone. This Structure Plan acts to ensure that the proposed development will further the objectives of the GBRS, by providing medium density development in a well serviced urban infill location.

The proposal is to subdivide the subject area to 30 residential lots ranging in size from 209m² to 987m² (R40 designation) refer to Figure 3. The plan of subdivision also includes preservation of remnant vegetation in the south as POS, Landscaped POS in the north west around a significant tree, public road construction and the construction of an Emergency Access Way along the northern boundary. Refer to Figure 2 and Figure 3.

The City of Bunbury Town Planning Scheme No.8 provides the planning framework to achieve sustainable development in the locality, by integrating economic, social and environmental aspirations. The Scheme outlines the applicable zoning and related objectives for each zone, of which the subject site is zoned Urban Development.

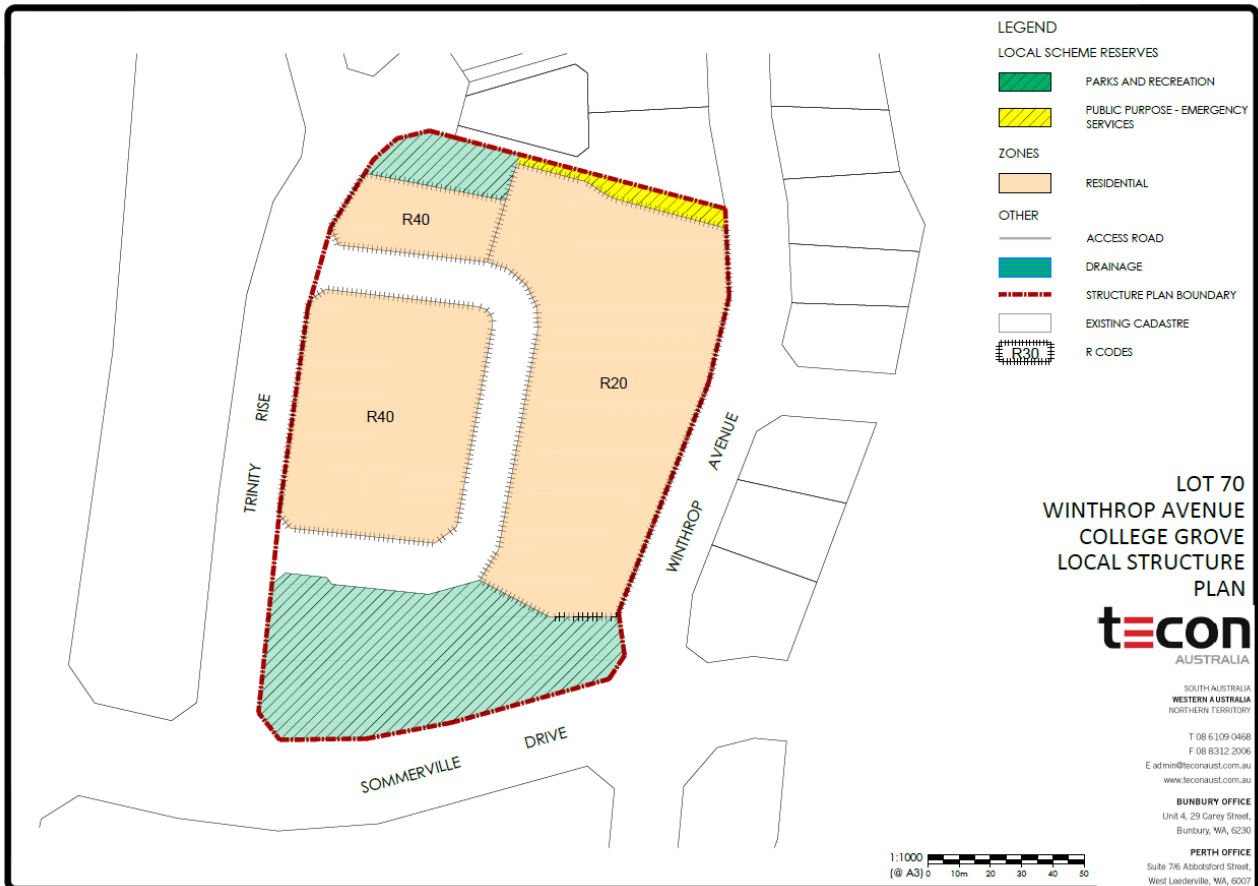


Figure 2: Structure Plan

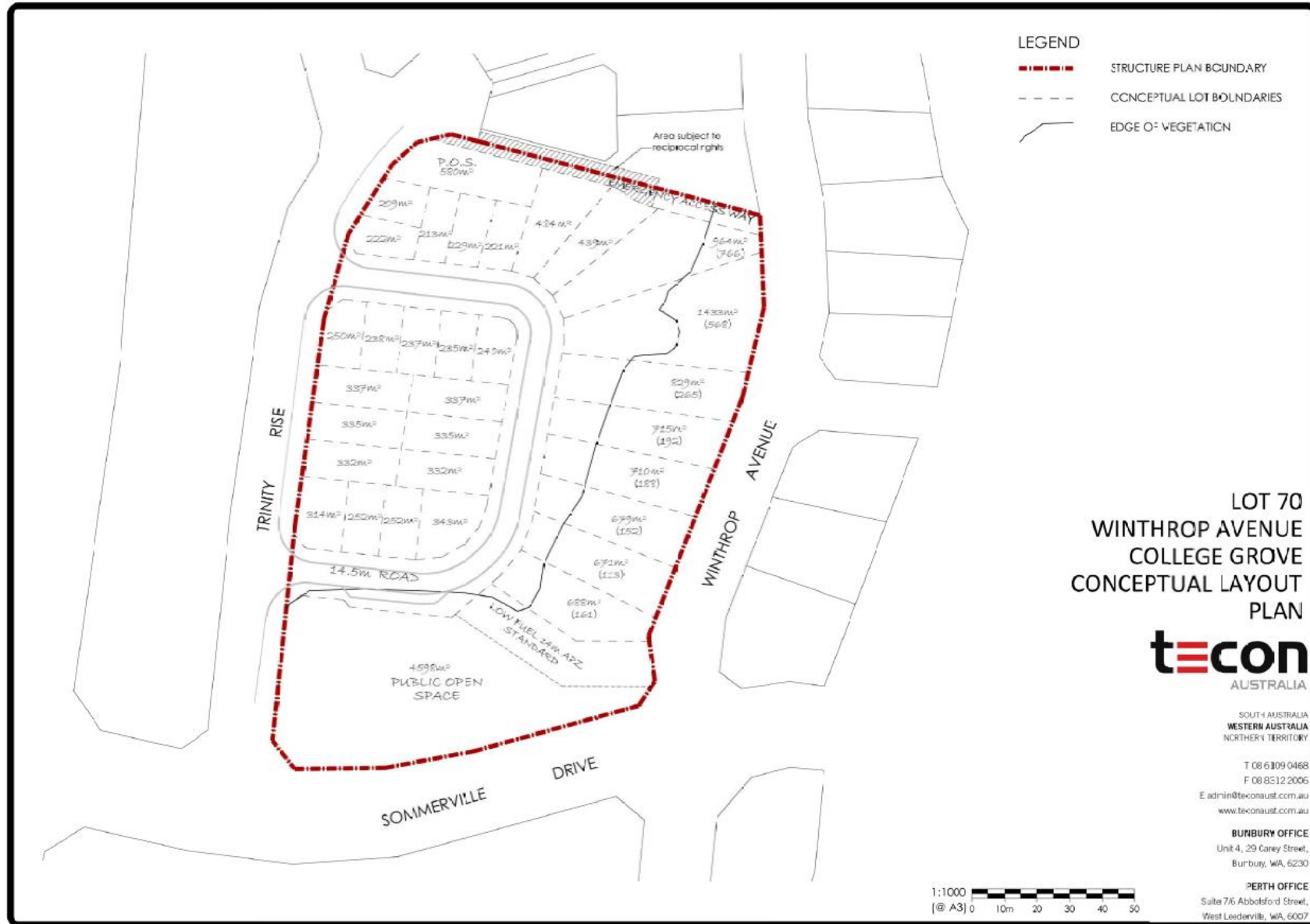


Figure 3: Conceptual Layout Plan

The publicly released Bushfire Prone Area Mapping (DFES, 2017) shows the Subject Site is located within a Bushfire Prone Area (situated within 100m of >1 ha of bushfire prone vegetation). Refer to Figure 4, Bushfire Prone Area Mapping.



Figure 4: Bushfire Prone Area Mapping (SLIP, 2018)

2.3. Statutory Framework

This document has been prepared to assist in the preparation of the proposed Structure Plan (SP) for Lot 70 Winthrop Avenue, College Grove. This document and the recommendations contained within are aligned to the following policy and guidelines:

- *Planning and Development Act 2005;*
- *Planning and Development Regulations 2009;*
- *Planning and Development (Local Planning Scheme) Regulations 2015;*
- State Planning Policy 3.7 Planning in Bushfire Prone Areas;
- Guidelines for Planning in Bushfire Prone Areas;
- *Building Act 2011;*
- *Building Regulations 2012;*
- Building code of Australia (National Construction Code);
- *Fire and Emergency Services Act 1998.*
- AS 3959-2009 “Construction of Buildings in Bushfire Prone Areas” current and endorsed standards;
- *Bushfires Act 1954;* and
- City of Bunbury Annual Fire Break Order.

2.4. Suitably Qualified Bushfire Consultant

This BMP has been prepared by Kathryn Kinnear (nee White), who has 10 years operational fire experience with the (formerly) DEC (1995-2005) and has the following accreditation in bushfire management:

- Incident Control Systems;
- Operations Officer;
- Prescribed Burning Operations;
- Fire and Incident Operations;
- Wildfire Suppression 1, 2 & 3;
- Structural Modules – Hydrants and hoses, Introduction to Structural Fires, and Fire extinguishers; and
- Ground Controller.

Kathryn Kinnear currently has the following tertiary Qualifications:

- BAS Technology Studies & Environmental Management;
- Diploma Business Studies; and
- Graduate Diploma in Environmental Management.

Kathryn Kinnear is an accredited Level 2 Bushfire Practitioner (Accreditation No: BPAD30794). Bio Diverse Solutions are Silver Corporate Members of the Fire Protection Australia Association and Kathryn is a suitably qualified Bushfire Practitioner to prepare this Bushfire Management Plan.

2.5. Objectives

The objectives of this BMP are to assess the bushfire risks associated with the existing site/SP proposal and any subsequent subdivision. The BMP aims to reduce the occurrence of, and minimise the impact of bushfires, thereby reducing the threat to life, property and the environment. It also aims to guide the subdivision design by assessing the proposed subdivision according to the Bushfire Protection Criteria Acceptable Solutions as outlined in the Guidelines for Planning in Bushfire Prone Areas Vers 1.3 (WAPC, 2017).

The BMP objectives are to:

- Achieve consistency with objectives and policy measures of SPP 3.7 (WAPC, 2015);
- Assess any building requirements to AS3959-2009 (current and endorsed standards) and BAL Construction;
- Assess the proposal against the Bushfire Protection Criteria Acceptable Solutions as outlined in the Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017);
- Understand and document the extent of the bushfire risk and hazards pertinent to the Subject Site;
- Prepare bushfire risk management measures for bushfire management of all land within the Subject Site with due regard to people, property, infrastructure and the environment;
- Nominate individuals and organisations responsible for fire management and associated works for implementation within the Subject Site; and
- Ensure alignment to the recommended assessment procedure which evaluates the effectiveness and impact of proposed, as well as existing, bushfire risk management measures and strategies.

3. Environmental Considerations

3.1. Native vegetation – modification and clearing

The SP will require the removal of vegetation along the eastern boundary of the site for the urban development. The lots will be fuel reduced (to WAPC standards by the developer and maintained until the lots re-sold and relinquished to new owners. Significant trees (>500mm diameter trees) identified across the site will remain, excepting for 1 located in the north east corner where the EAW will link to Winthrop Avenue.

A Level 2 Flora Survey was undertaken by the City of Bunbury in 2015. No rare or priority listed flora was noted on site. Areas of “Good condition” vegetation is to remain in POS, with the “Degraded” and “Completely Degraded” areas will be the newly established residential areas.

A Fauna Survey was undertaken of the site by Greg Harewood which found no rare or threatened species were present on site. Five significant trees (>500mm DBH) were noted during the survey, however no tree hollows were noted for fauna species. No evidence was found of black cockatoos roosting on site, however chewed banksia cones were noted and was attributed to Carnaby’s black Cockatoo. The assessment of fauna impacts from clearing the site was assessed by G Harewood to be negligible or very low.

The SP has preserved the areas of “Good condition” vegetation in the south and therefore the SP is unlikely to trigger any further environmental approvals from the *Wildlife Act 1950* or the *EPBC Act 1999*. Protection of significant trees has occurred across the site excepting one in the north east corner.

3.2. Re-vegetation/Landscape Plans

There is no revegetation proposed for the subdivision. The subdivision has not commenced and at this point in time, landscaping plans are not prepared. All landscaping of road reserves and the northern POS area is to be to APZ standards. Refer to Section 6 of this report.

4. Bushfire Assessment Results

4.1. Assessment Inputs

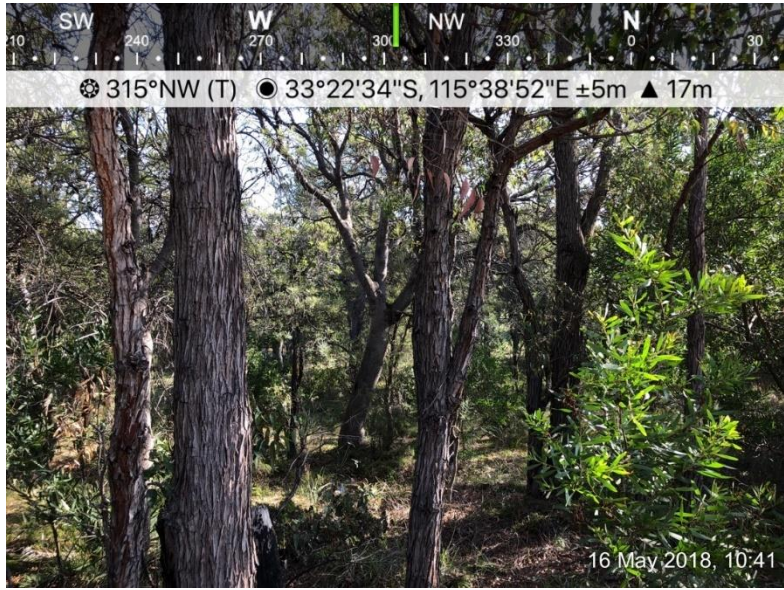
Bushfire Assessment inputs for the site has been calculated using the Method 1 procedure as outlined in AS3959-2009. This incorporates the following factors:

- WA adopted Fire Danger Index (FDI), being FDI 80;
- Vegetation Classes;
- Slope under classified vegetation; and
- Distance between proposed development site and classified vegetation.

A site inspection was undertaken on 16th May 2018 by Kathryn Kinnear (BPAD 30794) to assess the current land use, topography/slope, vegetation and conditions of the site and its surroundings. Photographs of the Subject Site and surrounding areas were taken and have been presented in this report.

4.1.1. Vegetation classification AS3959

All vegetation within 150m of the site / proposed development was classified in accordance with Clause 2.3 and Exclusions as per Clause 2.2.3.2 of AS 3959-2009. Each plot is representative of the Vegetation Classification to AS3959-2009 Table 2.3 and shown on the Vegetation Classification Mapping (Figure 5), Page 16.

Plot	1	Classification or Exclusion Clause	Woodland Type B
			<p>Location: To the west, north west and south west of the subject site</p> <p>Separation distance: 16m.</p> <p>Dominant species & description: <i>Banksia sessilis</i>, <i>Banksia grandis</i> Tuart and Peppermint trees, occasional <i>Zamia</i>, with a grassy understorey. Not multilayered.</p> <p>Vegetation coverage: 10-30% foliage cover.</p> <p>Average vegetation height: 8-12m.</p> <p>Surface fuel loading: 15-25t/ha.</p> <p>Effective slope: >0-5 degrees Downslope (direction of fire run north/south noted in field).</p>
<p><i>Photo Id 1: View to the north west through Plot 1 located to the west of Trinity Rise.</i></p>			

Plot	1	Classification or Exclusion Clause	Woodland Type B
			<p>Location: Located to the west (west of Trinity Rise), north west and south west of the subject site.</p> <p>Separation distance: 16m-17m to lot boundary.</p> <p>Dominant species & description: <i>Banksia sessilis</i>, <i>Banksia grandis</i> Tuart and Peppermint trees, occasional <i>Zamia</i>, with a grassy understorey. Not multilayered.</p> <p>Vegetation coverage: 10-30% foliage cover.</p> <p>Average vegetation height: 8-12m.</p> <p>Surface fuel loading: 15-25t/ha.</p> <p>Effective slope: >0-5 degrees downslope (direction of fire run north/south noted in field).</p>

Photo Id 2: View to the north west through Plot 1 located to the north west of the subject site.

Plot	1	Classification or Exclusion Clause	Woodland Type B
			<p>Location: Located to the west (west of Trinity Rise), north west and south west of the subject site.</p> <p>Separation distance: 16m-17m to lot boundary.</p> <p>Dominant species & description: <i>Banksia sessilis</i>, <i>Banksia grandis</i> Tuart and Peppermint trees, occasional <i>Zamia</i>, with a grassy understorey. Not multilayered.</p> <p>Vegetation coverage: 10-30% foliage cover.</p> <p>Average vegetation height: 8-12m.</p> <p>Surface fuel loading: 15-25t/ha.</p> <p>Effective slope: >0-5 degrees downslope (direction of fire run south, south west noted in field).</p>

Photo Id 3: View south through Plot 1, to the south of Somerville Drive.


Plot	2	Classification or Exclusion Clause	Grassland Type G
		<p>Location: Internal to the subject site in previously cleared areas.</p> <p>Separation distance: 0m (internal).</p> <p>Dominant species & description: Slashed grasses of Kikuyu and Cooch grasses. Internal future development (APZ) area.</p> <p>Vegetation coverage: <10% Trees.</p> <p>Average vegetation height: 100mm.</p> <p>Surface fuel loading: 2- 4.5t/ha</p> <p>Effective slope: >0-5 degrees Downslope</p>	

Photo Id 4: View to the north west through internal grassland area.


Plot	2	Classification or Exclusion Clause	Grassland Type G
		<p>Location: External to the subject site, west of Trinity Rise.</p> <p>Separation distance: 17m.</p> <p>Dominant species & description: Slashed grasses of Kikuyu and Cooch grasses. Management unknown.</p> <p>Vegetation coverage: <10% Trees.</p> <p>Average vegetation height: 100mm.</p> <p>Surface fuel loading: 2- 4.5t/ha</p> <p>Effective slope: >0-5 degrees Downslope</p>	



Photo Id 5: View to the north west through grassland type G located to the north west of Trinity Rise.

Plot	3	Classification or Exclusion Clause	Woodland Type B
			<p>Location: Internal to the site to the east and south in remanent uncleared areas.</p> <p>Separation distance: 0m (internal).</p> <p>Dominant species & description: <i>Banksia sessilis</i>, <i>Banksia grandis</i> Tuart and Peppermint trees, occasional <i>Zamia</i>, with a grassy understorey. Not multilayered. Noted to be previously disturbed.</p> <p>Vegetation coverage: 10-30% foliage cover.</p> <p>Average vegetation height: 8-15m.</p> <p>Surface fuel loading: 15-25t/ha.</p> <p>Effective slope: Upslope.</p>

Photo Id 6: View to the east through Plot 3 located inside the subject site.

Plot	3	Classification or Exclusion Clause	Woodland Type B
			<p>Location: External to the south of Somerville Drive.</p> <p>Separation distance: 26m.</p> <p>Dominant species & description: <i>Banksia sessilis</i>, <i>Banksia grandis</i> Tuart and Peppermint trees, occasional <i>Zamia</i>, with a grassy understorey. Not multilayered. Noted to be previously disturbed.</p> <p>Vegetation coverage: 10-30% foliage cover.</p> <p>Average vegetation height: 8-15m.</p> <p>Surface fuel loading: 15-25t/ha.</p> <p>Effective slope: Upslope.</p>

Photo Id 7: View to the east/south east through Plot 3 located to the south of Somerville Drive.

Plot	3	Classification or Exclusion Clause	Woodland Type B
			<p>Location: External to the site to the east in Water Corporation WA reserve.</p> <p>Separation distance: 62m.</p> <p>Dominant species & description: Tuart and Peppermint trees with a grassy understorey. Not multilayered. Noted to be previously disturbed.</p> <p>Vegetation coverage: 10-30% foliage cover.</p> <p>Average vegetation height: 8-15m.</p> <p>Surface fuel loading: 15-25t/ha.</p> <p>Effective slope: Upslope.</p>
<p><i>Photo Id 8: View to the south east through Plot 3 located in WCWA reserve off Saint John Mews.</i></p>			
Plot	3	Classification or Exclusion Clause	Woodland Type B
			<p>Location: Internal to the site.</p> <p>Separation distance: 0m (Internal).</p> <p>Dominant species & description: Tuart and Peppermint trees, with occasional Zamia and juvenile trees, with a grassy understorey. Not multilayered. Noted to be very disturbed.</p> <p>Vegetation coverage: 10-30% foliage cover.</p> <p>Average vegetation height: 8-15m.</p> <p>Surface fuel loading: 15-25t/ha.</p> <p>Effective slope: Upslope.</p>
<p><i>Photo Id 9: View to the southwest through Plot 3 located inside the subject site (NW corner).</i></p>			


Plot	4	Classification or Exclusion Clause	Exclusion 2.2.3.2 Low Fuel and Non-vegetated areas (e)
			<p>Location: Surrounding subject site in existing urban areas.</p> <p>Description: Buildings, roads, footpaths and other hardstand areas as per exclusion clause 2.2.3.2 (e) of AS3959-2009.</p>

Photo Id 10: View of Winthrop Ave to the east of the subject site.

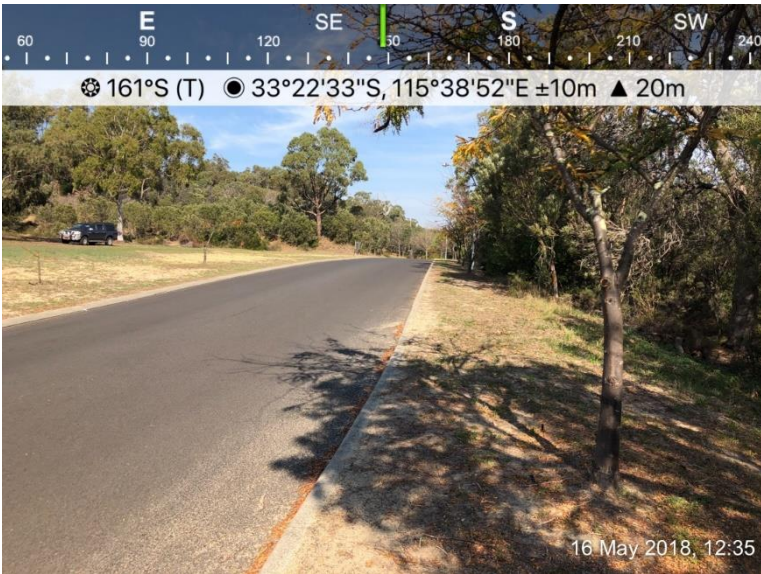
Plot	4	Classification or Exclusion Clause	Exclusion 2.2.3.2 Low Fuel and Non-vegetated areas (e)
			<p>Location: Surrounding subject site in existing urban areas.</p> <p>Description: Buildings, roads, footpaths and other hardstand areas as per exclusion clause 2.2.3.2 (e) of AS3959-2009.</p>

Photo Id 11: View of Trinity Rise located to the west of the subject site.


Plot	5	Classification or Exclusion Clause	Exclusion 2.2.3.2 Low Fuel and Non-vegetated areas (f)
			<p>Location: Surrounding subject site in existing urban areas.</p> <p>Description: Maintained gardens and verges, mowed lawns and managed areas as per exclusion clause 2.2.3.2 (f) of AS3959-2009.</p> <p>Available fuel loading: <2t/ha.</p>

Photo Id 12: View of mowed verges along Bussell Highway to the west of the subject site.



Plot	5	Classification or Exclusion Clause	Exclusion 2.2.3.2 Low Fuel and Non-vegetated areas (f)
			<p>Location: Surrounding subject site in existing urban areas.</p> <p>Description: Maintained gardens and verges mowed lawns and managed areas as per exclusion clause 2.2.3.2 (f) of AS3959-2009.</p> <p>Available fuel loading: <2t/ha.</p>

Photo Id 13: View of mowed POS area 4 to the north of the subject site off Trinity Rise.

Plot	5	Classification or Exclusion Clause	Exclusion 2.2.3.2 Low Fuel and Non-vegetated areas (f)
			<p>Location: Surrounding subject site in existing urban areas.</p> <p>Description: Maintained gardens and verges, mowed lawns and managed areas as per exclusion clause 2.2.3.2 (f) of AS3959-2009.</p> <p>Available fuel loading: <2t/ha.</p>
<p><i>Photo Id 14: View to the southwest of mowed verges along Somerville Drive.</i></p>			

COMMENTS ON VEGETATION CLASSIFICATIONS:

- Distances from vegetation were made based on surface fuels to edge of lot (subject site) boundary;
- Effective slopes were measured in the field using a Nikon Forestry Pro and represented on the respective plots;
- Method 1 (AS3959-2009) Simplified procedure was used for vegetation classification process;
- All vegetation was classified within the subject site and within 150m of the lot boundaries to AS3959 Table 2.3; and
- The perimeter of the vegetation was measured using field GPS and notations on field GIS maps.

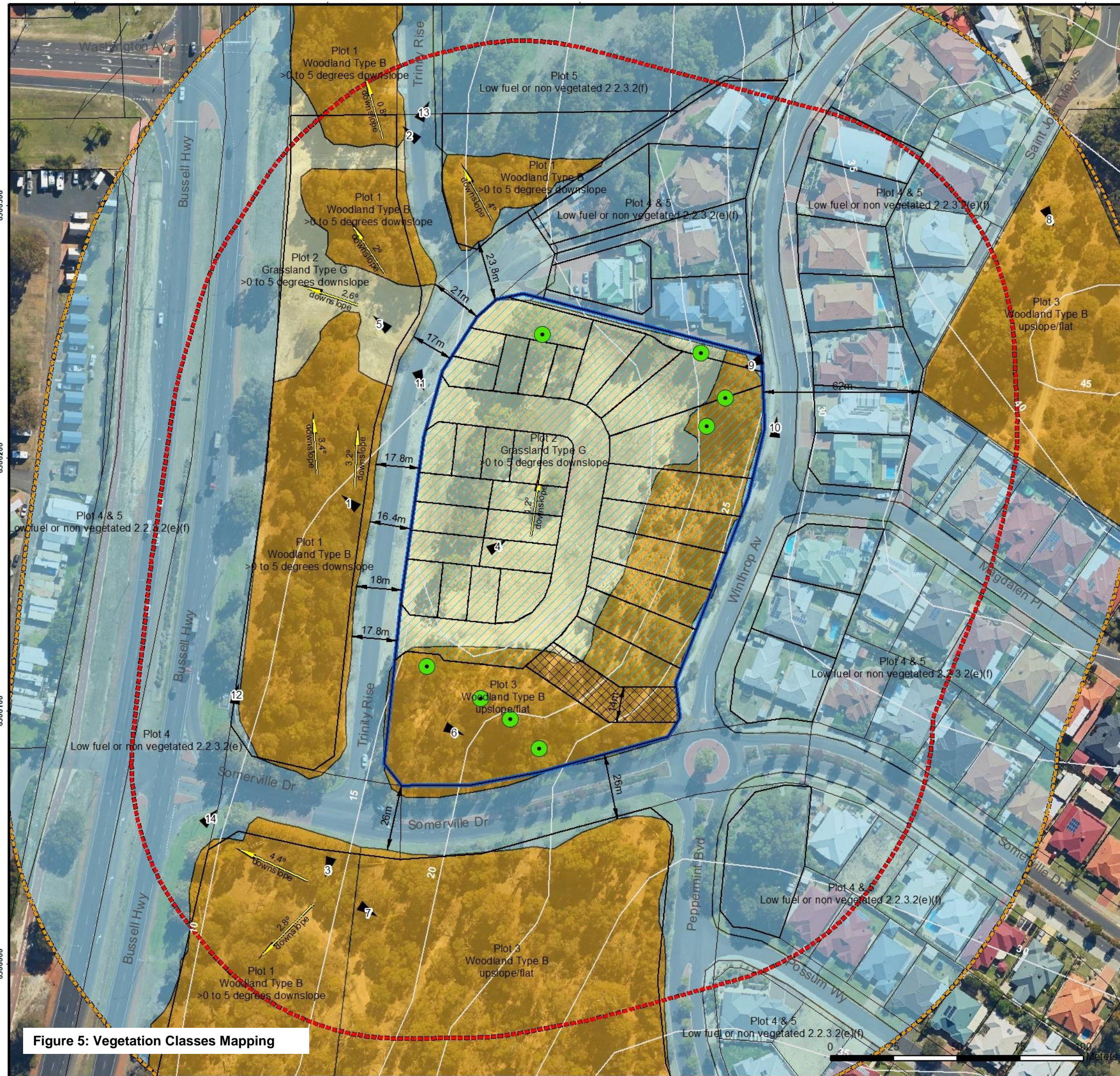
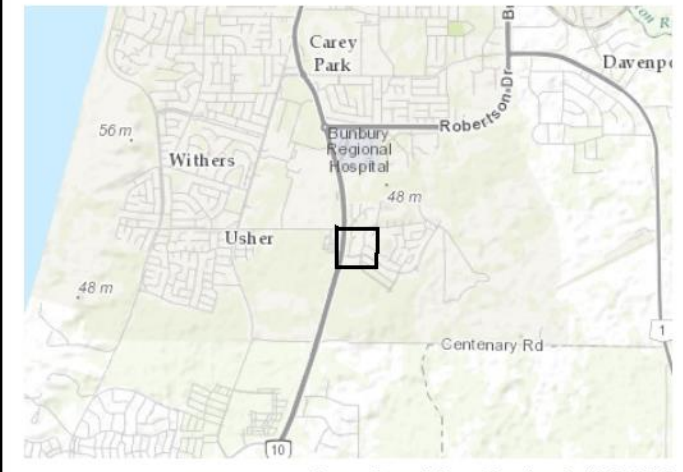


Figure 5: Vegetation Classes Mapping

This BAL Plan was prepared by:
 Kathryn Kinnear, Bio Diverse Solutions
 Accreditation No: BPAD30794
 Jurisdiction: Level 2 - WA



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 Australia
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Overview Map Scale 1:100,000

Legend

- Subject Site
 - 100m Assessment Boundary
 - 150m Assessment Boundary
 - Cadastre
 - Developable Area
 - Low Fuel 14m APZ standards
 - Photo Point
 - Significant Trees
 - 5m Contours
 - Slope Degrees
 - Separation Distance
- Vegetation**
- Woodland Type B
 - Grassland Type G
 - Low fuel or non vegetated 2.2.3.2
- Scale
 1:1,500 @ A3
 GDA MGA 94 Zone 50

Data Sources
 Aerial Imagery: WA Now, Landgate Subscription Imagery
 Cadastre, Relief Contours and Roads: Landgate 2017
 IRIS Road Network: Main Roads Western Australia 2017
 Overview Map: World Topographic map service, ESRI 2012

CLIENT
 Tecon Australia
 Lot 70 Winthrop Ave
 College Grove, WA 6230

Vegetation Classes

BAL Assessor KK	QA Check BT	Drawn by SA
STATUS FINAL	FILE MSC0193	DATE 15/08/2018

4.1.2. Fire Danger Index

The Western Australian adopted FDI is 80 as outlined in AS3959-2009 and endorsed by Australasian Fire and emergency Services Authorities Council. The FDI input for this project is also therefore 80.

4.1.3. Slope Under Classified Vegetation

Slope under classifiable vegetation (Effective Slope) was assessed in accordance with Section 2.2.5 of AS3959-2009. Table 2 below summarises the slopes assigned to each plot of classifiable vegetation for the BAL calculation.

Table 2: Effective slope allocation to classified vegetation

Plot Number	Vegetation Classification	Effective Slope
1	Woodland Type B	Downslope >0-5 degrees
2	Grassland Type G	Downslope >0-5 degrees
3	Woodland Type B	Upslope
4	Low Fuel and Non-vegetated areas (e)	N/A
5	Low Fuel and Non-vegetated areas (f)	N/A

Plots 4 and 5 are allocated exclusion Clauses 2.2.3.2 and therefore do not have an effective slope allocation.

4.2. Assessment Outputs

4.2.1. BAL Calculation AS3959 (BAL Contour Plan)

A Method 1 BAL calculation (in the form of BAL contours) has been completed for the proposed subdivision (southern portion of assessment area) in accordance with AS 3959-2009 methodology. The BAL rating gives an indication of the level of bushfire attack (i.e. the radiant heat flux) that may be received by proposed buildings and subsequently informs the standard of building construction required to increase building tolerance to potentially withstand such impacts in line with the assessed BAL.

The assessed BAL ratings for the subdivision development are depicted as BAL contours, as shown on Figure 6.

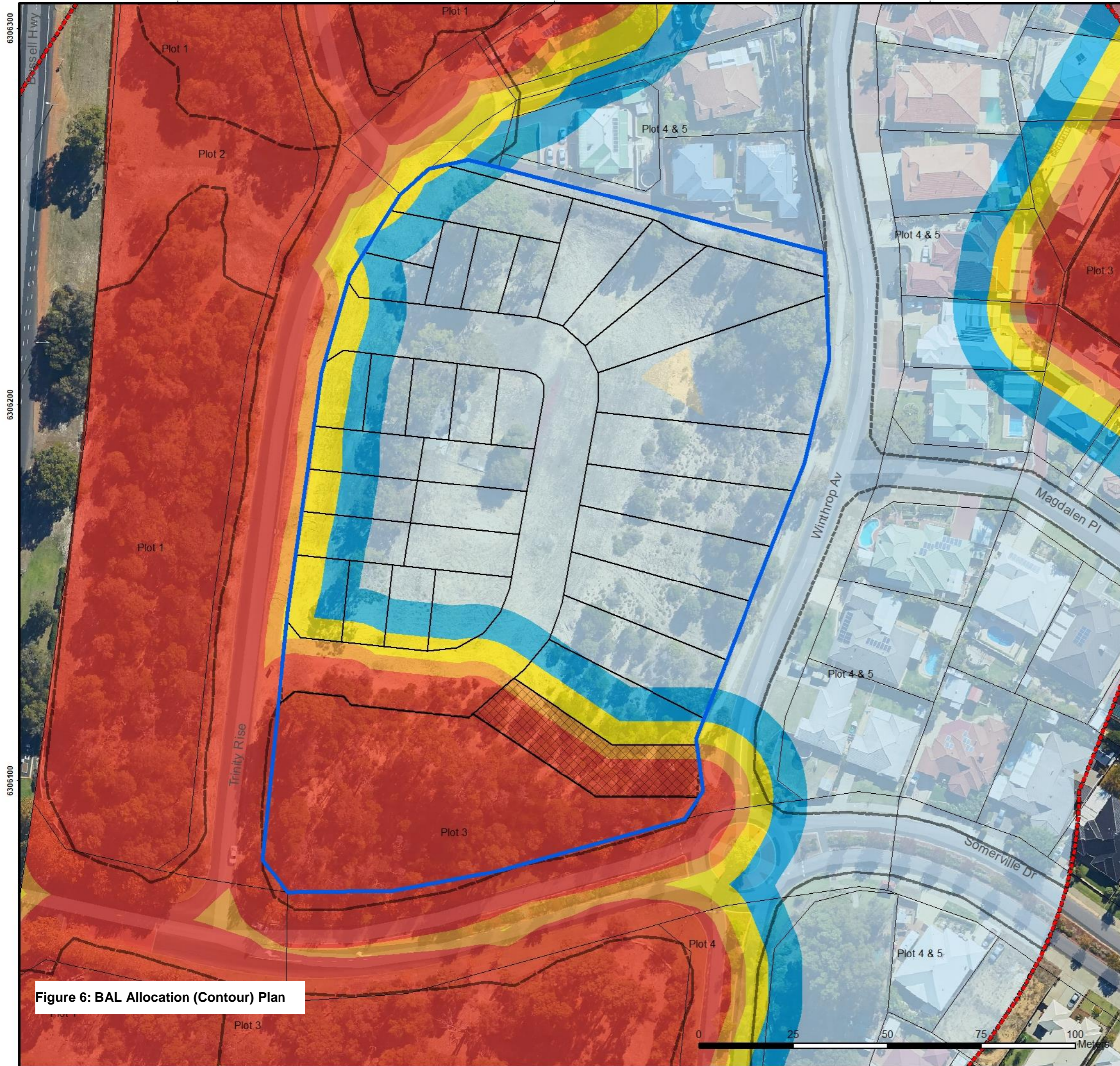
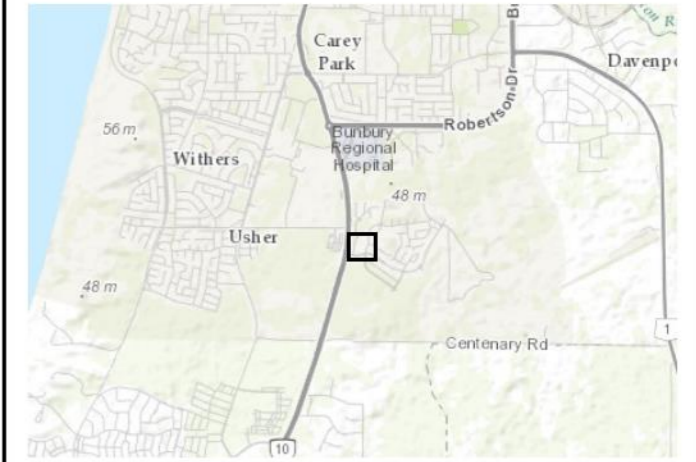


Figure 6: BAL Allocation (Contour) Plan

This BAL Plan was prepared by:
 Kathryn Kinnear, Bio Diverse Solutions
 Accreditation No: BPAD30794
 Jurisdiction: Level 2 - WA



29 Hercules Crescent
 Albany, WA 6330
 Australia
 Tel: 08 9842 1575
 Fax: 08 9842 1575



Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- Low Fuel 14m APZ Standards
- BAL Contours**
- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW



Scale
 1:1,000 @ A3
 GDA MGA 94 Zone 50

Data Sources
 Aerial Imagery: WA Now, Landgate Subscription Imagery
 Cadastre, Relief Contours and Roads: Landgate 2017
 IRIS Road Network: Main Roads Western Australia 2017
 Overview Map: World Topographic map service, ESRI 2012

CLIENT
 Tecon Australia
 Lot 70 Winthrop Ave
 College Grove, WA 6230

BAL Contour Plan

BAL Assessor KK	QA Check BT	Drawn by SA
STATUS FINAL	FILE MSC0193	DATE 15/08/2018

Table 3: BAL Allocation Plan of subdivision

Method 1 BAL Determination				
Vegetation Type (Table 2.3)	Slope (Table 2.4.3)	Distance to Vegetation (m)	Highest BAL Contour	Modified BAL Contour
Woodland Type B (Plot 1)	Downslope >0 to 5 degrees	16-17m	BAL 40	R-code setback will apply, BAL 29 and BAL 19 can prevail
Grassland Type G (Plot 2)	Downslope >0 to 5 degrees	17m	BAL 19	BAL 19 and BAL 12.5 can prevail
Woodland Type B (Plot 3)	Upslope	12m	BAL 29	BAL 29, 19 and 12.5 can prevail.

Note the Lot numbers (Figure 6) have not been allocated on the SP as this is a “Conceptual Layout Plan”, it is recommended that the BAL Contour Plan is updated with the WAPC subdivision application so that BAL allocation can be designated against individual lots at that point in time.

5. Identification of bushfire hazard issues

5.1. Bushfire risks

The identified bushfire risks associated with the subject site is the continuous vegetation to the north and south of the subject site (SP area). These areas present as predominantly Woodland Type B and downslope of the subject site (>0-5 degrees in direction of fire run). Internal woodland areas are located upslope in relation to the whole of the SP area. Under hot, dry and unstable conditions (Severe to catastrophic/bushfire weather) the subject site is most at risk from bushfire from the north and south directions.

Post construction of the SP all of the lots will have separation to the bushfire risks from road reserves. A 14m setback is proposed to the POS area in the south of the SP to ensure the 1 lot adjacent to the southern POS area (which will remain vegetated) is not exposed to radiant heat impacts greater than BAL 29. A 1m sliver of BAL 40 occurs along Trinity Rise, R-code setbacks will apply and therefore the buildings will be in BAL 29. The POS area in the north of the SP is to be managed low fuel area and has been designated to protect a significant tree located in this area. POS areas will be maintained by the developer until relinquished to the City of Bunbury with the City of Bunbury agreeable to the management arrangements for these areas.

5.2. Access

The SP is constrained with vehicular access issues prevalent by the legacy of the original subdivision/urban development of the area. Somerville Road is the only connecting road to the north/east (to Robertson Drive) and west (to Bussell Highway). Winthrop Avenue links back onto Somerville Avenue and has no alternative access. Trinity Rise is a long cul-de-sac with no access to the north, terminating at private property. The site is constrained by slopes to the eastern portion of the site (parallel to Winthrop Ave) which limits full public access in this direction. The formal public access is from Trinity Rise to the west and south onto Somerville Drive, this is a legacy to previous subdivision development and urban infill. In the event of a bushfire only one access point prevails.

Site assessment of the area found that the adjacent lots on the northern boundary of the subject site have very long narrow driveways into two battle axe lots. See Photograph 15 below. Discussion with one of the house occupants indicated people use the driveway as a footpath linking Winthrop Avenue to Trinity Rise. The occupants also use the SP site for turning and manoeuvring as the driveway access is so narrow. To provide a link from Trinity Rise to Winthrop Avenue the developer proposes to construct a 3m additional bitumen seal along the existing driveway (widen out to 6m) and link via a "Public Purpose Reserve for Emergency Services Access" to Winthrop Avenue. This will be gated but not locked. Its purpose will be for the residents along Trinity Rise to access Winthrop Avenue for Emergency Access Way and Fire Services Access. Refer to Access Plan Figure 7, page 20



Photograph 15: View to the west along battle axe driveways along the northern boundary of the SP.

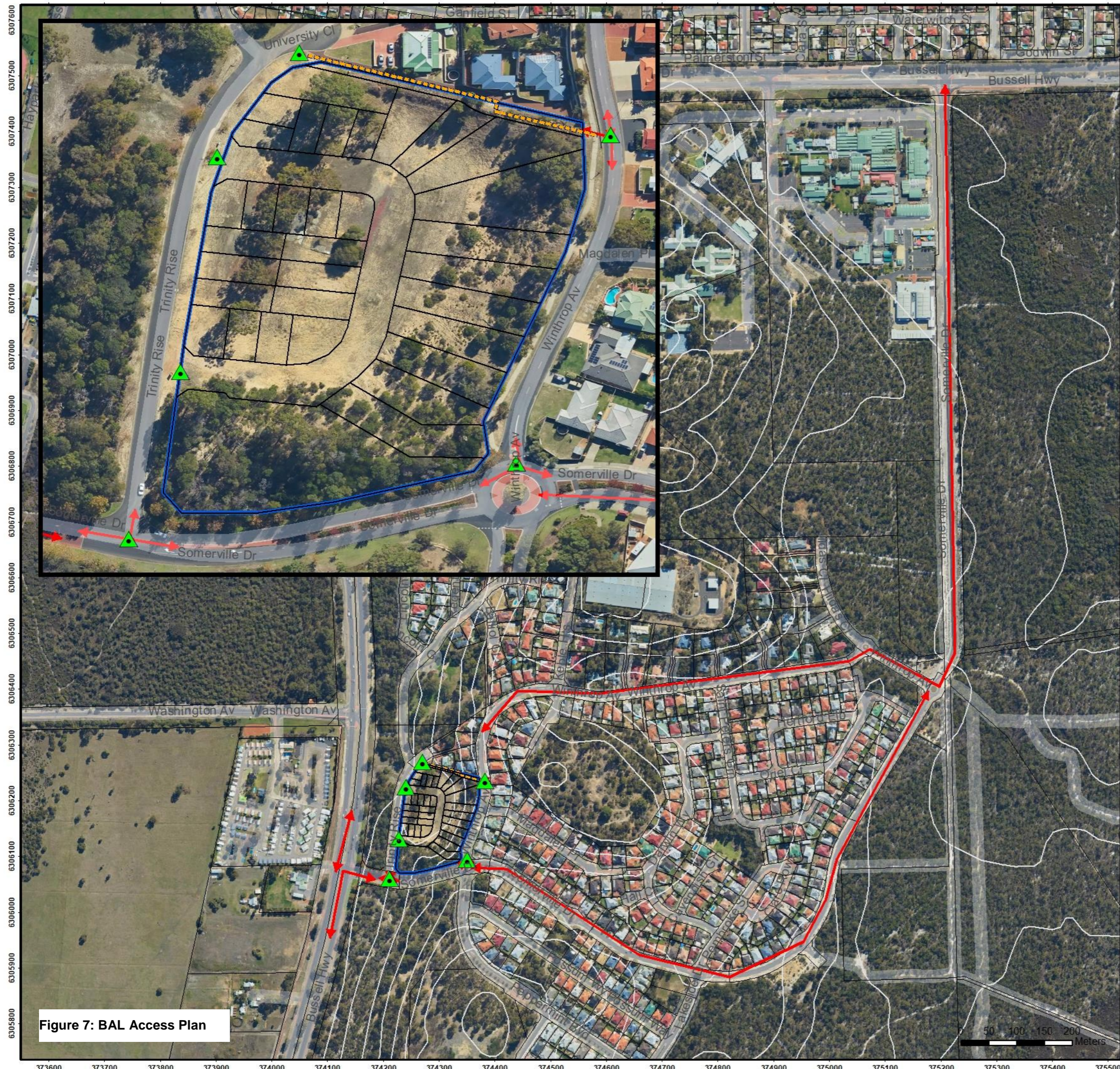
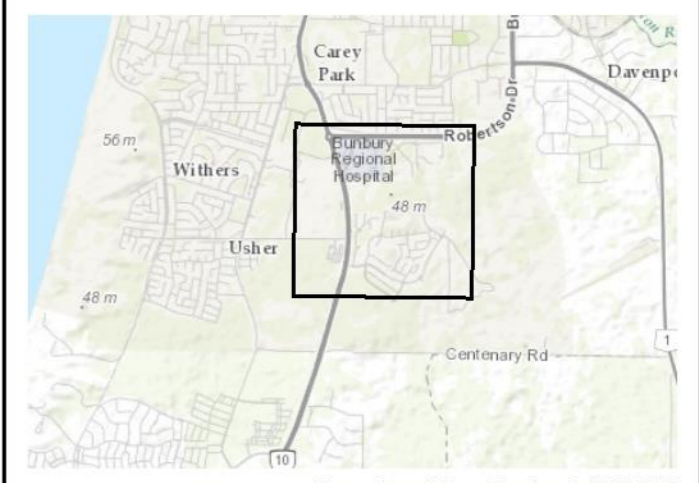


Figure 7: BAL Access Plan

This BAL Plan was prepared by:
 Kathryn Kinnear, Bio Diverse Solutions
 Accreditation No: BPAD30794
 Jurisdiction: Level 2 - WA



29 Hercules Crescent
 Albany, WA 6330
 Australia
 Tel: 08 9842 1575
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Overview Map Scale 1:100,000

Legend

- Access Points
- Access routes
- EAW
- Subject Site
- Cadastre



Scale
 1:6,689 @ A3
 GDA MGA 94 Zone 50

Data Sources
 Aerial Imagery: WA Now, Landgate Subscription Imagery
 Cadastre, Relief Contours and Roads: Landgate 2017
 IRIS Road Network: Main Roads Western Australia 2017
 Overview Map: World Topographic map service, ESRI 2012

CLIENT
 Tecon Australia
 Lot 70 Winthrop Ave
 College Grove, WA 6230

Access Plan

BAL Assessor KK	QA Check BT	Drawn by SA
STATUS FINAL	FILE MSC0193	DATE 15/08/2018



6. Assessment to the bushfire protection criteria

The Guidelines for Planning in Bushfire Prone Areas (WAPC, 2017) outlines bushfire protection criteria which subdivision and development proposals are assessed for compliance. The bushfire protection criteria (Appendix 4, WAPC, 2017) are a performance-based criteria utilised to assess bushfire risk management measures and they outline four elements, being:

- Element 1: Location
- Element 2: Siting and Design of Development;
- Element 3: Vehicle Access; and
- Element 4: Water.

(WAPC, 2017)

The SP area is required to meet the “Acceptable Solutions” of each Element of the bushfire mitigation measures (WAPC, 2017). The proposal will be assessed against the bushfire protection criteria Acceptable Solutions for Elements A1, A2, A3 and A4. An assessment to the bushfire protection criteria is provided over the page in Table 4.

Table 4: Bushfire protection criteria applicable to the site

Element	Acceptable Solution	Applicable or not Yes/No	Structure Plan meets Acceptable Solution
Element 1 – Location	A1.1 Development Location	Yes	<p>Compliant.</p> <p>The structure plan has a conceptual lot layout for residential (R40) lots. A BAL Contour Plan generated over the site indicates that BAL 29 or less can apply to the future lots. A 1m sliver of BAL 40 occurs along Trinity Rise, R-code setbacks will apply and therefore the buildings will be in BAL 29. A 14m low fuel buffer will apply along the boundary interface of the southernmost lot and the POS area to the south. The POS area to the south will remain fully vegetated as Woodland Type B. These areas will be managed by the CoB in perpetuity. All lots will be cleared/mulched to WAPC APZ standards (see section below) to ensure that at time of building approval adjacent lots are in a low fuel state.</p> <p>Road separation to bushfire risks is provided to all other lots through sound road design and lot layout. Lot numbering has not been allocated at this point in time of the planning process. Upon WAPC subdivision, this will occur and an updated BAL contour plan should be provided to allocate BAL to individual lots.</p> <p>SP deemed compliant to Acceptable Solution A1.1.</p>
Element 2 – Siting and Design	A2.1 Asset Protection Zone (APZ)	Yes	<p>Compliant.</p> <p>Individual APZ's will not apply to every building in the subdivision is urban and low fuel will apply to all of the lots. The APZ areas for individual lots will utilise the low fuel of adjoining urban areas, streets and buildings. The developer is to ensure all lots are cleared and maintained to APZ standards until ownership is relinquished to new lot owners, refer to WAPC standards, Appendix 1. Any landscaping of road reserves and replanting is to be to WAPC APZ standards, refer to Appendix 1.</p> <p>The 14m Low fuel separation adjacent to the POS in the south will be maintained by the developer and then in perpetuity by the CoB. Limestone mulching and spraying of weeds is recommended. Standing trees can remain providing they are 10m apart as per WAPC APZ standards – refer to Appendix 1. The plan of subdivision has an APZ area compliant to BAL 29 or less and is contained within the subject site.</p> <p>SP deemed compliant to Acceptable Solution A1.2.</p>

Table 4 cont.

Element	Acceptable Solution	Applicable or not Yes/No	Structure Plan meets Acceptable Solution
Element 3 – Vehicular Access	A3.1 Two Access Routes	Yes	<p>Compliant</p> <p>The SP is located in a previously approved urban area/lot layout and regarded as a “Legacy” to previous urban infill surrounding the development. Somerville Drive is the only connecting road to the north/east (to Robertson Drive) and west (to Bussell Highway). Winthrop Avenue links back onto Somerville Avenue and has no alternative access. Trinity Rise is a long cul-de-sac with no access to the north, terminating at private property. The site is constrained by slopes to the eastern portion of the site (parallel to Winthrop Ave) which limits full public access in this direction. The formal public access is from Trinity Rise to the west and south onto Somerville. Two access routes will be provided via a temporary EAW from Trinity Rise to the east to connect to Winthrop Avenue. Refer to further detail below in A3.6. The EAW will give unimpeded access in the event a bushfire occurs from the north or south and Trinity Rise is blocked. Refer to Figure 7 Access Plan. The EAW links two public roads which is consistent with the acceptable solutions of the WAPC guidelines.</p> <p>SP deemed complaint to Acceptable Solution A3.1.</p>
	A3.2 Public Road	Yes	<p>Compliant</p> <p>14.5m internal road reserves are proposed to be constructed from Trinity Rise. The internal roads meet the minimum width required by WAPC being 6m. The minimum technical standards for public roads as per Table 5 and detailed in engineering drawings for approval by the CoB.</p> <p>SP deemed complaint to Acceptable Solution A3.2.</p>
	A3.3 Cul-de-sacs	No	No cul-de-sacs are proposed for the SP, not assessed to A2.3.
	A3.4 Battle axes	No	No battle axes are proposed for the SP, not assessed to A2.3.
	A3.5 Private driveways	Yes	<p>Compliant</p> <p>Private driveways are to be constructed to a minimum of 4m by the new lot owners and are to meet the minimum technical requirements of Table 5 and detailed in building designs by the lot owners for approval by the CoB at building approval stages.</p> <p>SP deemed complaint to Acceptable Solution A3.5.</p>

Table 4 cont.

Element	Acceptable Solution	Applicable or not Yes/No	Structure Plan meets Acceptable Solution
	A3.6 Emergency Access Ways	Yes	<p style="text-align: center;">Compliant</p> <p>An EAW is proposed in the north and will link the two existing public roads of Trinity Rise to Winthrop Avenue. Along the northern boundary the existing adjacent lots have very long narrow driveways to two battle axe lots. Discussion with one of the house occupants indicated people use the driveway as a footpath linking Winthrop Avenue to Trinity Rise. The occupants of these battle axe lots also use the subject site for turning and manoeuvring as the driveway access is so narrow. To provide a link from Trinity Rise to Winthrop Avenue the developer proposes to construct a 3m additional bitumen seal along the existing driveway (widen out to 6m) and link via a "Public Purpose Reserve for Emergency Services Access" to Winthrop Avenue. This will be gated but not locked. Its purpose will be for the residents along Trinity Rise for Emergency Access Way. The EAW will give unimpeded access in the event a bushfire occurs from the north or south and Trinity Rise is blocked. Refer to Figure 7 Access Plan. The EAW links two public roads which is consistent with the acceptable solutions of the WAPC guidelines. The minimum technical standards for EAW's are to be as per Table 5 and detailed in engineering drawings for approval by the CoB. SP deemed complaint to Acceptable Solution A3.6.</p>
	A3.7 Fire Service Access Ways	No	No FSA's proposed as the public road network will be utilised. Not assessed to A3.7.
	A3.8 Firebreaks	Yes	Compliant to CoB Fire Break Notice. Future urban areas have no firebreak requirement. Low fuel to WAPC APZ standards.
Element 4 – Water	A4.1 Reticulated areas	Yes	<p style="text-align: center;">Compliant.</p> <p>Water supply will be through the extension of the existing reticulated scheme water into the area. Connections are known to be available. Fire hydrant (street) outlets to be installed to WCWA standards installed in accordance with the Water Corporation's No 63 Water Reticulation Standard and are to be identified by standard pole and/or road markings. Standards are to be as per WCWA and approval by the CoB. SP deemed complaint to Acceptable Solution A4.1.</p>
	A4.2 Non-reticulated areas	No	Not assessed to A4.2.
	A4.3 Individual lots in non-reticulated areas	No	Not assessed to A4.3.

Table 5: Vehicular Access Technical Requirements (WAPC, 2017)

Technical requirements	Public Road	Cul-de-sacs	Private Driveways	Emergency Access Ways (EAW)
Minimum trafficable surface (m)	*6	6	4	*6
Horizontal clearance (m)	6	6	6	6
Vertical clearance (m)	4.5	4.5	4.5	4.5
Maximum grades	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15
Maximum crossfall	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5
Maximum Length	N/A	200m	50m	600m

*Denotes the width can include a 4m wide paving with one metre wide constructed road shoulders

7. Other Fire Mitigation Measures

7.1. Evaporative air conditioners

Evaporative air conditioning units can catch fire as a result of embers from bushfires entering the unit. These embers can then spread quickly through the home causing rapid destruction. It can be difficult for fire-fighters to put out a fire in the roof spaces of homes.

It is also recommended that land owners:

- Ensure that suitable external ember screens are placed on roof top mounted evaporative air conditioners compliant with AS3959-2009 (current and endorsed standards) and that the screens are checked annually; and
- Maintain evaporative air conditioners regularly as per DFES recommendations, refer to the DFES website for further details:
<http://www.dfes.wa.gov.au>

7.2. Barrier Fencing

In November 2010 the Australian Bushfire CRC issued a "Fire Note" (Bushfire CRC, 2010) which outlined the potential for residential fencing systems to act as a barrier against radiant heat, burning debris and flame impingement during bushfire. The research aimed to observe, record, measure and compare the performance of commercial fencing of Colourbond steel and timber (treated softwood and hardwood).

The findings of the research found that:

".. Colourbond steel fencing panels do not ignite and contribute significant heat release during cone calorimeter exposure" (exposure to heat)

.."Colourbond steel (fencing) had the best performance as a non-combustible material. It maintained structural integrity as a heat barrier under all experimental exposure conditions, and it did not spread flame laterally and contribute to fire intensity during exposure"

It is also noted that non-combustible fences are recommended by WAPC (APZ standards: Fences and sheds within the APZ are constructed using non-combustible materials e.g. colourbond iron, brick, limestone, metal post and wire). The developer will be encouraged to build Colourbond or non-combustible fences where applicable.

7.3. Individual bushfire plan

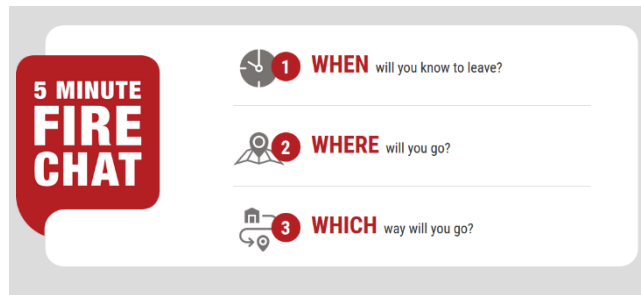
Residents should prepare their own individual fire plans, as they need to make a commitment to develop a bushfire survival plan detailing preparations and actions to take if a bushfire threatens. By compiling information as outlined above, the individual lot owner can be prepared for their response in a bushfire emergency. Home owners should not rely on emergency personnel to attend their home and thus it is stressed to prepare an individual bushfire emergency plan regarding their intentions and property. This Bushfire Management Plan is not an individual bushfire emergency plan. More information can be gained from the DFES website (s):

www.dfes.wa.gov.au

www.emergency.wa.gov.au



www.emergency.wa.gov.au



www.emergency.wa.gov.au

8. Responsibilities for implementation

8.1. Future Lot owner’s Responsibility

It is recommended the future property owners shall be responsible for the following:

Table 6 – Implementation actions future lot owners

Future Lot owner– Ongoing management				
No	Implementation Action	Initial	Annual	All times
1	Build to AS3959 as it applies to their property	✓		
2	Maintain individual lot fuels at all times in accordance with the COB Fire Break Notice and WAPC APZ standards (Appendix 1).			✓
3	Construct driveway standards to Table 5.	✓		

8.2. Developer’s responsibility

It is recommended the developer be responsible for the following:

Table 7 – Implementation actions current land owners/developer

Developer – Prior to issue of titles		
No	Implementation Action	Subdivision Clearance
1	Ensure prospective buyers are aware of the BAL Contour Plan and the applicable BAL to their property through provision of BAL Contour Plan. Update the BAL contour plan and provide certification of BAL Contour prior to lodgement of titles (post construction).	✓
2	Maintain balance of land in accordance with the CoB Fire Break Notice and the provisions of the BMP.	✓
3	Implement and maintain fuel reduction of flammable material across all property/lots in ownership (APZ standards to apply refer to Appendix 1). Ongoing maintenance through slashing/mowing the 14m low fuel buffer to <100mm in height during the bushfire season (November to March inclusive) or limestone mulching of the area to a minimum of 100mm thickness.	✓
4	Construct all vehicle access in the subdivision to the minimum standards as outlined in Table 5.	✓
5	Construct EAW to along northern boundary during subdivision construction periods.	✓
6	Ensure reticulated water connections available to residents as per WCWA standards.	✓
7	Fire hydrant (street) outlets to be installed to WCWA standards installed in accordance with the Water Corporation’s No 63 Water Reticulation Standard and are to be identified by standard pole and/or road markings.	✓

8.3. Local Government Responsibility

It is recommended the local government be responsible for the following:

Table 8 – Implementation actions City of Bunbury

LGA– Clearance of conditions		
No	Implementation Action	Subdivision Clearance
1	Request for the update of the BAL contour plan and certification of BAL Contour prior to clearance of titles (post construction).	✓
2	Ensure vehicle access standards are achieved as per Table 5 and demonstrated in the civil engineering drawings.	✓
3	Ensure reticulated water provided as per WCWA standards.	✓
4	Fire hydrant (street) outlets to be installed to WCWA standards installed in accordance with the <i>Water Corporation's No 63 Water Reticulation Standard</i> and are to be identified by standard pole and/or road markings.	✓
5	Developing and maintaining District Fire Fighting Facilities and related infrastructure.	N/A, ongoing
6	Provide advice on standards and methods to achieve community fire protection to owners/occupiers of land through issue and enforcement of the current CoB Fire Break Order (yearly advice brochure updated annually).	N/A, ongoing
7	CoB, through their Bush Fire Brigade Organisation is the Controlling Authority for fire suppression and prescribed burning operations on the area.	N/A, ongoing

9. Disclaimer

The recommendations and measures contained in this assessment report are based on the requirements of the Australian Standards 3959-2009 – Building in Bushfire Prone Areas, WAPC State Planning Policy 3.7 (WAPC, 2015), WAPC Guidelines for Planning in Bushfire Prone Areas (WAPC, 2015), and CSIRO's research into Bushfire behaviour. These are considered the minimum standards required to balance the protection of the proposed dwelling and occupants with the aesthetic and environmental conditions required by local, state and federal government authorities. They DO NOT guarantee that a building will not be destroyed or damaged by a bushfire. All surveys and forecasts, projections and recommendations made in this assessment report and associated with this proposed dwelling are made in good faith on the basis of the information available to the fire protection consultant at the time of assessment. The achievement of the level of implementation of fire precautions will depend amongst other things on actions of the landowner or occupiers of the land, over which the fire protection consultant has no control. Notwithstanding anything contained within, the fire consultant/s or local government authority will not, except as the law may require, be liable for any loss or other consequences (whether or not due to negligence of the fire consultant/s and the local government authority, their servants or agents) arising out of the services rendered by the fire consultant/s or local government authority.

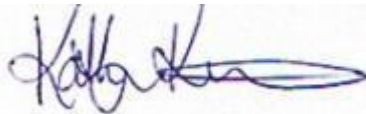
AS3959-2009 disclaimer: It should be borne in mind that the measures contained within this Standard (AS3959-2009) cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions.

Building to AS3959-2009 is a standard primarily concerned with improving the ability of buildings in designated bushfire prone areas to better withstand attack from bushfire thus giving a measure of protection to the building occupants (until the fire front passes) as well as to the building itself.
(AS3959, 2009)

SECTION 8: Certification

I hereby certify that I have undertaken the assessment of the above site and determined the Bushfire Attack Level stated above in accordance with the requirements of AS 3959-2009 (Incorporating Amendment Nos 1, 2 and 3) and the Guidelines for Planning in Bushfire Prone Areas Ver 1.3 (WAPC, 2017).

SIGNED, ASSESSOR: ..



..... DATE:

27/08/2018

Kathryn Kinnear, Bio Diverse Solutions
Accredited Level 2 Bushfire Practitioner (Accreditation No: BPAD30794)



10. References

AS 3959-2009 Australian Standard, *Construction of buildings in bushfire-prone areas*, Building Code of Australia, Primary Referenced Standard, Australian Building Codes Board and Standards Australia.

Bushfire CRC (2010) *Managing Forest in South West Western Australia*, Research project undertaken by Dr Lachlan McCaw and Dr Roy Wittkuhn, retrieved from: <http://www.bushfirecrc.com/projects/b11/managing-forest-fires-south-western-australia>

City of Bunbury Fire Break Order, yearly advice brochure, accessed June 2018 from: <http://www.bunbury.wa.gov.au>

Department of Fire and Emergency Services Website accessed June 2018: <http://www.dfes.wa.gov.au>

Western Australian Planning Commission (WAPC) (2017) *Guidelines for Planning in Bushfire Prone Areas Version 1.3*. Western Australian Planning Commission and Department of Planning WA, Government of Western Australia.

Western Australian Planning Commission (WAPC) (2015) *State Planning Policy 3.7 Planning in Bushfire Prone Areas*. Department of Planning WA and Western Australian Planning Commission.

State Land Information Portal (SLIP) (2018) *Map of Bushfire Prone Areas*. Office of Bushfire Risk Management (OBRM) data retrieved from: <https://maps.slip.wa.gov.au/landgate/bushfireprone/>

Appendix 1

WAPC Asset Protection Zone (APZ) standards to apply

Standards for an Asset Protection Zone (APZ) (WAPC, 2017)

Fences: Within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.

Objects: Within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.

Fine Fuel load: Combustible dead vegetation matter less than 6 millimetres in thickness reduced to and maintained at an average of two tonnes per hectare.

Trees (> 5 metres in height): Trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy. See Figure 11 (WAPC Figure 16, Appendix 4) below.

Figure 16: Tree canopy cover – ranging from 15 to 70 per cent at maturity

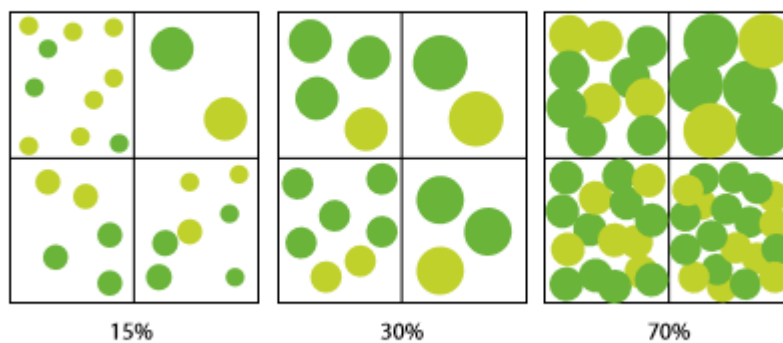


Figure 8 – Tree Canopy Cover

(WAPC, 2017)

Shrubs (0.5 metres to 5 metres in height): Should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m² in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.

Ground covers (<0.5 metres in height): Can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 millimetres in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs. –

Grass: Should be managed to maintain a height of 100 millimetres or less.