Ravensthorpe and Hopetoun Townsite Bushfire Prone Vegetation Mapping and BAL Contour Plan 2023 Review

Shire of Ravensthorpe

Final V1.0

14/03/2024

BUSHFIRE | ENVIRONMENTAL | WATER | GIS

Site Details					
Address:	Ravensthorpe and Hopetoun Townsites				
Suburb:	Ravensthorpe and Hopetoun	**State:**	W.A.	**Postcode**	6346 - 6348
Local Government Area:	Shire of Ravensthorpe				
Description of Building Works:	Shire of Ravensthorpe: Ravensthorpe and Hopetoun Townsite Bushfire Prone Vegetation Mapping and BAL Contour 2023 Review				

Report Details			
Report / Job Number:	RAV001-005	**Report Version:**	Final
Assessment Date Start:	6 November 2023	**Assessment Date End:**	8 November 2023
Report Date:	14 March 2024		
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BPAD Practitioner	Bob McGonnell (Level 1)	**Accreditation No.**	BPAD-58381
BPAD Practitioner	Leanne Shilton (Level 1)	**Accreditation No.**	BPAD-62196
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1. Introduction and Background

The Shire of Ravensthorpe (SoR) commissioned Bio Diverse Solutions (Bushfire Practitioners) to review the previous vegetation assessment and update the BAL Contour Plans (BDS, 2021, 2022) over the townsites of Ravensthorpe and Hopetoun within the Shire of Ravensthorpe. The Bushfire Prone Vegetation Mapping and the WAPC Bushfire Planning framework have increased the level of complexity when lodging development applications in the Shire and the information from this assessment guides the townsite(s) works and priorities contained within their "Bushfire Mitigation Plans". The townsite(s) are located within the Bushfire Prone Area Map (OBRM, 2021).

This project aims to re-assess the previously mapped bushfire prone vegetation of the townsite to Australian Standards (AS3959-2018) and the OBRM mapping standards. The dataset is then to be used to assist in refining the WA State Bushfire Prone Area Map over the town, mapping the extent of the bushfire risks to the town and critical assets, assist in any future planning within the townsite and give brief comments for bushfire risk mitigation. BAL Contour plans have been generated to guide the Shire's decision making on planning and development applications. These are not to be used for BAL Assessments unless a detailed site/building plan is certified by a BAL Assessor.

1.1. Statutory Conditions

This document is aligned to the following policy and guidelines:

- *Planning and Development Act 2005*
- *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 v1.4 (WAPC, 2021)
- *Building Act 2011*
- *Building Regulations 2012*
- Building Code of Australia (National Construction Code)
- *Fire and Emergency Services Act 1998*
- AS3959-2018 "Construction of Buildings in Bushfire Prone Areas" current and endorsed standards
- *Bushfires Act 1954*
- Shire of Ravensthorpe Annual Fire Break Notice (2023/24)

1.2. Suitably Qualified Bushfire Consultant

This document has been prepared by Melanie Haymont who has 6 years' experience working with Local Governments on the State Bushfire Mitigation Planning Program (between 2016-2021) and has the following accreditation in bushfire management:

- Advanced Fire Fighting
- Bushfire fighting
- Fire Control Officer
- Prescribed Burning Operations
- Aurora bushfire modelling
- Structural Modules – Introduction to Structural Fires
- Diploma of public safety (Emergency Management)

Melanie Haymont is an accredited Level 1 Bushfire Practitioner (Accreditation No: BPAD-58389) and has been an accredited Bushfire Consultant for the last two years. Melanie is a suitably qualified Bushfire Practitioner to prepare this document.

Mapping contained within this document has been prepared by Bob McGonnell who has three years of experience working in the bushfire and environmental field and has the following qualifications:

- B.Sc. Environmental Management and Sustainability.

Bob is an accredited Level 1 Bushfire Practitioner (BPAD-58381), with extensive experience with Arc GIS mapping software.

This document has been prepared by Kathryn Kinnear (nee White), who has 30 years bushfire planning experience and 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: BPAD-30794). Bio Diverse Solutions are Silver Corporate Members of the Fire Protection Australia Association. Kathryn is a suitably qualified Bushfire Practitioner to prepare this report.

1.3. Consultation

Consultation has occurred with the Shire of Ravensthorpe Bushfire Risk Mitigation Coordinator Malcom Grant during the field assessment, preparation of and review of this report.

2. Aims of this Project

The aims of the project are:

- Prepare a revised Vegetation Classes Map for the townsites to determine current classifiable vegetation to AS3959-2018;
- Assess the extent of bushfire risks to the townsites and critical assets;
- To guide the townsite's site works and priorities contained within their "Bushfire Risk Mitigation Plans";
- Provide brief bushfire mitigation strategies to the Shire to assist with ongoing fire mitigation works in the townsite(s);
- Provide updated BAL Contour Plans over the townsite to guide the Shire's decision making, on planning and development applications; and
- Provide a BAL Contour Plan to show the effectiveness of proposed bushfire mitigation treatments (MAF applications).

2.1. Objectives

The objectives of this report are:

- Understand and document the extent of the bushfire risk and hazards to the townsite;
- Review of the bushfire prone vegetation applicable to the allocated boundary and within 150m of the boundary;
- Prepare brief observations on bushfire mitigation and management measures of all land within the subject site(s) with due regard to people, property, infrastructure and the environment; and
- Aligned to the recommended assessment procedure of AS3959-2018 Method 1 BAL Assessment procedure and WAPC Guidelines for Planning in Bushfire Prone Areas Ver 1.4 (WAPC, 2021).

2.2. Methodology

The Bushfire Attack Level (BAL) for each townsite was determined by using the *"Simplified procedure described in Clause 2.2 (AS3959-2018)* (Method 1). The following methodology (scope of works) was undertaken by Bio Diverse Solutions in preparing the vegetation classifications and BAL Contour Plans for the townsite(s):

1. Review of the previous 2018 and 2021 townsite mapping.
2. Preparation of pre-field GIS maps with a pre-determined boundary.
3. Overlay in GIS software the boundary .shp files and generate a 150m assessment boundary (150m buffer from the allocated boundary) for field assessment, preparation of field maps and digitisation of datasets for each townsite.
4. Detailed site assessment and review of all classifiable vegetation to-2018 within the allocated boundary and within 150m of the boundary.
5. Field capture included classification of vegetation types to AS3959-2018 Section 2.2.3 to either a Forest Type A, Woodland Type B, Shrubland Type C, Scrub Type D, or Grassland Type G. All classifiable vegetation was GPS referenced (as a plot reference) in the field using a Samsung Galaxy S ArcGIS mapping application, field capture sheets (manual entry) and hand mapped on hard copy field maps.
6. Field measurement of Effective Slope (ES) as per Section 2.2.5 AS3959-2018 was undertaken using a Nikon Forestry Pro with a minimum of 2 slopes measured for each plot. ES is shown on the mapping as a representation of the field capture.
7. Field assessment included assessment of "Low fuel and non-vegetated areas" to AS3959-2018 Clauses (a)-(f) Section 2.2.3.2 of AS3959-2018 and GPS capture of these.
8. GIS mapping using ArcMap software of all classifiable vegetation to AS3959-2018 within the 150m setback of the boundary as per the recommended methodology by WAPC Guidelines for Planning in Bushfire Prone Areas Version 1.4 (WAPC, 2021).
9. Input of data (population of fields) to GIS .shp/.lyr .
10. Undertake BAL Contour GIS mapping from the bushfire risks to WAPC Guidelines (WAPC, 2021) methodology;
11. Quality assurance checks of all data fields in .shp/.lyr files.
12. Preparation of Metadata documentation and files associated with the .shp/lyr files for the Shire.
13. Preparation of a report outlining the aims, methodology, GIS mapping outcomes and brief bushfire mitigation strategies for each townsite.

Notes on methodology

- Each vegetation classification to AS3959-2018 Table 2.3 was described/pictorially in plots in 2016/2017, with examples of differing plot photos showing vegetative structure for each plot.
- For the purpose of the BAL Contour Plans each vegetation classification to AS3959-2018 Table 2.3 was described/pictorially represented as either a Type A – Plot 1, Type B- Plot 2, Type C- Plot 3, Type D- Plot 4 or Type G- Plot 5, with examples of differing plot photos showing vegetative structure as listed in the report. The detailed field capture sheets and the .shp file has corresponding field capture plot numbers/identification.
- The Bushfire Prone Area Map requirements or advice for AS3959-2018 was not used to guide any field assessment or verification of boundaries.
- Construction requirements/advice for AS3959-2018 BAL FZ- BAL12.5 was not within the scope of this project.

2.3. Previous Bushfire Assessment and Notable changes

History of the project includes:

- **2016 –** The original site assessment of the townsites occurred in 2016 with site assessment and field verification undertaken by Bio Diverse Solutions Accredited BAL Assessors. A report was prepared for the Shire (April 2017) which documented the vegetation classifications and BAL Contours over the townsite. Areas of risk were identified and mitigation measures were implemented by the Shire through their bushfire mitigation program.
- **2018 –** The assessment boundary was extended in 2018 to 150m from the townsite boundary which was consistent with the updated WAPC guidelines methodology (WAPC, 2021). The Ravensthorpe townsite boundary was also extended to the southeast to assess and map the Entertainment Centre and Sporting Complex. This is the designated 'Community Refuge Centre" through the Local Emergency Management Arrangements (LEMA) document, which outlines all emergency management arrangements and procedures for the Local Government Agency.
- **2021 –** This allowed for inclusion of previous report and mapping. Extend the Ravensthorpe townsite assessment boundary (subject site) to the southeast. Inclusion of the school, day care, sports club, caravan/camping site, mining camp and motel to the vulnerable land uses within the Ravensthorpe townsite. Reassess the vegetation and updated report and mapping issued to Shire. Amend the report to align with any relevant changes required from the updated Guidelines for Planning in Bushfire Prone Areas (WAPC, 2021).
- **2023 –** The bushfire mitigation program was commencing after the townsite review. Bushfire mitigation assumptions are based on the proposed program. There had been a wildfire in the Whale Bay/Seaview estate in February 2022 which claimed four houses.

2.4. AS3959-2018 disclaimer

The survivability of buildings is also dependant on a combination of measures such as landscaping, water supplies, access, building design and maintenance. Care should also be exercised when siting and designing for these measures when constructing a building under AS3959-2018 Standard.

This Standard is 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 (AS3959-2018).

2.5. Structure of this report

The report has been prepared in two sections relating to each townsite. Each townsite (section) of this report details the following:

- Review of original bushfire prone vegetation classifications (additional 2016/17 Plot data) to AS3959-2018
- Vegetation Classes (GIS) Map
- Discussion on potential bushfire impacts and hazards
- BAL Contour Plan(s)
- Brief recommendations and Works Program Map(s) and Treatment Plans
- Post Treatment BAL Contour Plan
- New 2023 Plot Data (Appendix A).

It should be noted that the original vegetation datasets undertaken in 2016/2017 and classifications still reflect the vegetation type. Where change has occurred through bushfire mitigation works or other site works then an updated vegetation plot data is outlined in Section 3 (Ravensthorpe townsite) and Section 4 (Hopetoun townsite) of this report. Evidence for new plot data can be found in Appendix A of this document.

3. Ravensthorpe Townsite

3.1. Vegetation Classification Ravensthorpe

Vegetation verification/re-assessment occurred on the 6th and 7th November 2023 by Bob McGonnell (BPAD-58381) and Leanne Shilton (BPAD-62196) with all vegetation within 150m of the boundary classified/verified in accordance with the previous assessments and Section 2.2.3 of AS3959-2018. Vegetation was assessed in accordance with AS3959-2018 with the potential to determine the Bushfire Attack Level is identified below and shown on the Vegetation Classes Maps (Figure 1 and 2). Refer to Appendix A for vegetation classification plot data photographs.

Table 1: Summary of the Plot Data (Ravensthorpe)

Plot Number	Vegetation Type	Effective Slope
1	Excluded 2.2.3.2 (a)	N/A
2	Excluded 2.2.3.2 (e)	N/A
3	Excluded 2.2.3.2 (f)	N/A
4	Forest Type A	Upslope/flat
5	Forest Type A	Downslope >0-5 degrees
6	Forest Type A	Downslope >5-10 degrees
7	Woodland Type B	Upslope/flat
8	Woodland Type B	Downslope >0-5 degrees
9	Woodland Type B	Downslope >5-10 degrees
10	Scrub Type D	Upslope/flat
11	Scrub Type D	Downslope >0-5 degrees
12	Scrub Type D	Downslope >5-10 degrees
13	Grassland Type G	Upslope/flat
14	Grassland Type G	Downslope >0-5 degrees
15	Grassland Type G	Downslope >5-10 degrees

Note: Plot numbers have remained unchanged from the previous 2021 assessment.

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (a)	N/A
2	Excluded 2.2.3.2 (e)	N/A
3	Excluded 2.2.3.2 (f)	N/A
4	Forest Type A	Upslope/flat
5	Forest Type A	Downslope >0-5 degrees
6	Forest Type A	Downslope >5-10 degrees
7	Woodland Type B	Upslope/flat
8	Woodland Type B	Downslope >0-5 degrees
9	Woodland Type B	Downslope >5-10 degrees
10	Scrub Type D	Upslope/flat
11	Scrub Type D	Downslope >0-5 degrees
12	Scrub Type D	Downslope >5-10 degrees
13	Grassland Type G	Upslope/flat
14	Grassland Type G	Downslope >0-5 degrees
15	Grassland Type G	Downslope >5-10 degrees

Figure 1: Ravensthorpe Vegetation Classes (West)

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BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Slopes Degrees
- Photo Point
- Vegetation/Plot Boundary

Vegetation

- Forest Type A
- Woodland Type B
- Scrub Type D
- Grassland Type G
- Excluded 2.2.3.2

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Ravensthorpe Vegetation Classes (West)

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (a)	N/A
2	Excluded 2.2.3.2 (e)	N/A
3	Excluded 2.2.3.2 (f)	N/A
4	Forest Type A	Upslope/flat
5	Forest Type A	Downslope >0-5 degrees
6	Forest Type A	Downslope >5-10 degrees
7	Woodland Type B	Upslope/flat
8	Woodland Type B	Downslope >0-5 degrees
9	Woodland Type B	Downslope >5-10 degrees
10	Scrub Type D	Upslope/flat
11	Scrub Type D	Downslope >0-5 degrees
12	Scrub Type D	Downslope >5-10 degrees
13	Grassland Type G	Upslope/flat
14	Grassland Type G	Downslope >0-5 degrees
15	Grassland Type G	Downslope >5-10 degrees

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BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Slopes Degrees
- Photo Point
- Vegetation/Plot Boundary

Vegetation

- Forest Type A
- Woodland Type B
- Scrub Type D
- Grassland Type G
- Excluded 2.2.3.2

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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Shire of Ravensthorpe
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Ravensthorpe Vegetation Classes (East)

BAL Assessor	QA Check	Drawn by
BRM & LTS	KPK	BRM
STATUS	**FILE**	**DATE**
FINAL	RAV001	14/03/2024

Figure 2: Ravensthorpe Vegetation Classes (East)

3.2. Identification of Bushfire Impacts Ravensthorpe

There has been a significant investment in the bushfire mitigation program by the Shire of Ravensthorpe in and surrounding the Ravensthorpe townsite post the 2021/22 assessment, this has resulted in a substantial reduction in radiant heat impacts on key locations and enhanced the ability to arrest the development of wildfire within the townsite.

The bushfire threats associated with the townsite include:

- Large remnant vegetation areas associated with Crown reserves to the north and south.
- Small areas of remnant/overgrown vegetation in private property and the creek line to the south.
- Some continuous vegetation links exist adjacent to the strategic firebreaks in north, south and west of the townsite, linking external bushfire risks into the townsite.

These remnant vegetation (bushfire prone vegetation) areas can carry bushfire from the north and south into the townsite. The town centre is predominantly low fuel in nature with encroaching vegetation along the fringing areas of the townsite. A summary of the bushfire issues pertinent to the Ravensthorpe townsite is provided below:

- Large strategic firebreaks along the north, northeast, south and northwest are designed to protect the townsite. These breaks will assist in defending the townsite from large, landscape scale bushfires. However, they generally do not change the BAL allocation over the townsite.
- Strategic work to the north of dwellings along Daw Street and adjacent to the Hospital has seen a marked reduction in BAL allocation in these areas.
- Risk of bushfire attack over the townsite predominantly originates from the north and south where continuous bushfire prone vegetation exists. Specifically, from the following Plots:
    - Forest Type A – Plot 4, 5 and 6.
    - Woodland Type B – Plot 7 and 8.
    - Grassland Type G – Plot 13 and 14.
- The western and eastern entry points along the highway are generally vegetated and do present risk of bushfire along the highway entry/exit points.
- The town centre areas are generally low fuel in nature and present limited risk of bushfire attack.
- Creek areas present continuous bushfire fuels but also present problems for fuel reduction as removal of vegetation will increases scouring, erosion and slumping of the creek beds.
- The caravan and camping site in town (opposite BP) is considered a “vulnerable land use” under the SPP 3.7, given the potential for this area to contain people who may have a limited ability to respond in a bushfire emergency.
- The Mining/FIFO camp to the north of town may also be considered a “vulnerable land use”.
- The Vulnerable Land Use and Critical assets:
    - The power station is noted to be in BAL 29 or less area (BAL12.5).
    - The school, entertainment centre and sporting complex, townsite caravan and camping site, sports club building and motel are all located in BAL-29 of lower;
    - The 2023 vegetation reassessment now has the hospital located in BAL-29 or lower, which is a substantial reduction from the 2021 assessment.
    - The caravan park, daycare centre and mining camp all have areas of BAL-40 and BAL-FZ impact.

3.3. BAL Contour Plan

A BAL rating was assigned from each distinctive vegetation plot as classified to AS3950 2018 and shown as a series of BAL Contours. The broad scale of the presented map is for diagrammatic purposes only. The detailed GIS mapping dataset provided to the Shire should be consulted for any planning and development considerations. A Certified BAL Assessment is required prior to building approval.

Note: Utilising these BAL Contour Maps for Ravensthorpe and Hopetoun townsite building and planning approvals must be done in consultation with an accredited bushfire consultant.

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (a)	N/A
2	Excluded 2.2.3.2 (e)	N/A
3	Excluded 2.2.3.2 (f)	N/A
4	Forest Type A	Upslope/flat
5	Forest Type A	Downslope >0-5 degrees
6	Forest Type A	Downslope >5-10 degrees
7	Woodland Type B	Upslope/flat
8	Woodland Type B	Downslope >0-5 degrees
9	Woodland Type B	Downslope >5-10 degrees
10	Scrub Type D	Upslope/flat
11	Scrub Type D	Downslope >0-5 degrees
12	Scrub Type D	Downslope >5-10 degrees
13	Grassland Type G	Upslope/flat
14	Grassland Type G	Downslope >0-5 degrees
15	Grassland Type G	Downslope >5-10 degrees

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Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Assets and Vulnerable Land Use

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

Not for Development or Building Approval unless approved/certified by a Bushfire Consultant

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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Ravensthorpe BAL Contour Plan (West)

BAL Assessor	QA Check	Drawn by
BRM & LTS	KPK	BRM
STATUS	**FILE**	**DATE**
FINAL	RAV001	14/03/2024

Figure 3: Ravensthorpe BAL Contour Plan (West)

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (a)	N/A
2	Excluded 2.2.3.2 (e)	N/A
3	Excluded 2.2.3.2 (f)	N/A
4	Forest Type A	Upslope/flat
5	Forest Type A	Downslope >0-5 degrees
6	Forest Type A	Downslope >5-10 degrees
7	Woodland Type B	Upslope/flat
8	Woodland Type B	Downslope >0-5 degrees
9	Woodland Type B	Downslope >5-10 degrees
10	Scrub Type D	Upslope/flat
11	Scrub Type D	Downslope >0-5 degrees
12	Scrub Type D	Downslope >5-10 degrees
13	Grassland Type G	Upslope/flat
14	Grassland Type G	Downslope >0-5 degrees
15	Grassland Type G	Downslope >5-10 degrees

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BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Assets and Vulnerable Land Use

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

Not for Development or Building Approval unless approved/certified by a Bushfire Consultant

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GDA MGA 2020 Zone 51

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IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

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Ravensthorpe, WA 6346

Ravensthorpe BAL Contour Plan (East)

BAL Assessor	QA Check	Drawn by
BRM & LTS	KPK	BRM
STATUS	**FILE**	**DATE**
FINAL	RAV001	14/03/2024

Figure 4: Ravensthorpe BAL Contour Plan (East)

3.4. Recommendations for Bushfire Management/Mitigation Ravensthorpe

The assessment of Ravensthorpe townsite has determined the following recommendations for bushfire mitigation, also refer to Figure 5 Works Program Ravensthorpe:

- The Vulnerable Land Use of the Ravensthorpe caravan park has had significant work carried out to the vegetation adjacent, to the south this has led to a reduction in the radiant heat impacts emanating on to the main road this will enhance the ability of responding personnel to supress fire originating or spreading through this vegetation. Further fuel reduction could be carried out to the west (plot 4), the north (plot 10) and east (plot 7). Fuel reduction standards (*note this is not broad scale clearing*) are to be as per the WAPC 2021 recommended Schedule 1 APZ standards, refer to Section 5.0 of this report and Appendix B.
- Works to the strategic fire break north of Dunn Street and the caravan park has decreased the potential intensity of a bushfire in the north, previously this fire break was BAL-FZ it currently presents as BAL-29. With the strengthening of this break the potential to carry out a prescribed burn in the reserve to the east of Floater Road and the south of the Ring Road, see Figure 5 Works Program.
- Fuel management, parkland clearing or the installation of another strategic break in the Stevenson Street Reserve will give good separation to the south of the mining camp and Ravensthorpe townsite, see Figure 5 Works Program.
- The Entertainment Centre and Sporting Complex is a designated Community Refuge Centre as per the LEMAC planning requirements. Under the Department of Planning, Lands and Heritage (DPLH) Guidelines for Planning in Bushfire Prone Areas v1.4 (DPLH, 2021) *".Where a building is to function as an on-site shelter, there is to be sufficient separation distance from the predominant bushfire prone vegetation to avoid exposure to a radiant heat flux exceeding 10kW/m2 (with an assumed flame temperature of 1200K); or where an open space area is to function as an onsite shelter, there is to be sufficient separation distance from the bushfire prone vegetation to avoid exposure to a radiant heat flux exceeding 2kW/m2 (with an assumed flame temperature of 1200K)".*
- The BAL contour plan indicates there has been a reduction in BAL on the Entertainment Centre and Sporting Complex building from the 2021/22 assessment further work is recommended to achieve the radiant heat levels desirable for onsite refuge. BAL-29 is still currently impacting the north western corner of the recreation centre building, and the majority of the building is impacted by BAL-12.5 (12.5kW/m2) which is considered too high for an onsite refuge.
- The centre of the oval is impacted by a BAL rating of BAL-12.5 (12.5kW/m2), which is considered too high for an open-air refuge.
- Consideration to achieve a radiant heat impact of 10kW/m^2 or less through fuel reduction on the western side of the Entertainment Centre and Sporting Complex building and on the eastern side of the day care centre is recommended. Calculation from a Level 3 Bushfire Practitioner would be required to achieve 10kW/m^2 on the Entertainment Centre and Sporting Complex building to define the separation distance required.
- Additional fuel reduction is suggested adjacent to the Hospital and associated accommodation buildings to ensure BAL-29 can prevail over all buildings.
- The current mechanical works to the northeast of the of the mining camp is still not sufficient to ensure BAL-29 can prevail over the entire site, more mechanical works are suggested for the reserves to the north of the camp, see Figure 5 Works Program
- Ongoing fuel reduction (recommended mechanical works) to the west of the mining camp to ensure BAL-29 can prevail over the entire site.
- The childcare centre (Vulnerable Land Use) located on Coleman Street is currently located in BAL-FZ and should have fuel reduction strategies implemented to WAPC 2021 APZ standards to achieve a minimum of BAL-29 and be managed at all times. Fuel reduction standards (*note this is not broad scale clearing*) are to be as per the WAPC recommended APZ standards, refer to Section 5.0 and Appendix B.
- Significant works to the vegetation surrounding the Hospital complex have seen a reduction in BAL from BAL-FZ to the majority of the complex located in BAL-29 or lower.
- Linking plots of vegetation in the west of the townsite have the potential to carry fire in a north/south direction in this part of town. It is recommended the Fire Management Notice apply to these blocks to control this wick.
- It is noted there has been substantial works carried out on Plot 5 to the north of Morgans Street. This management has been carried out in the form of prescribed burning, so the positive impacts are not reflected through the BAL contour, however this work will have a pronounced effect on abating the spread of fire from the north, south or east.
- Crown Land within management of the Shire adjacent to private dwellings/lodgings should be fuel reduced to a minimum of 20m to assist in Asset Protection Zones (APZ) to the townsites dwellings and further protection of life and property from bushfire events. Slashing should occur for a minimum of 20m where vegetation is not attributable to creek protection areas.
- In the creeks to the northwest and south, 20m separation areas via low fuel slashing has been identified as requiring implementation. This separation may then enable further exclusions to AS3959-2018 if a 20m or greater separation is utilised.
- That consideration be given to address the matter of the elevated hazard in the remaining vegetated parcels of unallocated Crown lands and unmanaged reserves south of the Heavy Haul Road portion of South Coast Highway abutting the townsite is coordinated between all those responsible parties in order to compliment those works already undertaken abutting and within the townsite. Recommend that this area is included in the next vegetation and BAL contour plan update for the townsite to assess the bushfire risk in this area.
- It is recommended that land owners of vacant land are required under the annual bushfire notice to maintain cleared land to <100mm in height and remove dead and flammable material. Review may be required of the annual fire break notice to ensure urban land

<2000m^2 is not a bushfire hazard to adjacent properties. Provision of this through the gazetted annual fire break notice pursuant to Section 33 of the *Bushfires Act 1953*.

- It is recommended that the Shire ensures land owners implement APZ standards to a minimum of 20m around existing buildings within the townsite/Shire. Provision of this through the gazetted annual fire break notice pursuant to Section 33 of the *Bushfires Act 1953*. Refer to Section 5.0 and Appendix B – Schedule 1 requirements.
- It is recommended the Shire implements APZ standards to their maintenance of street verges, parks and gardens adjacent to bushfire prone (classifiable vegetation) to ensure these maintained areas are not linking or creating wicks into the townsite or encourage ember establishment in bushfire conditions. Refer to further information Section 5.0 and Appendix B of this document.
- Lots that require fuel reduction have been marked as 'Fire Management Notice to Apply' on Figure 5 Works Program Map Ravensthorpe.
- Potential areas for additional fuel reduction have been marked as 'Recommended Mechanical Works' on Figure 5.
- All proposed treatments indicated on Figure 5 (except prescribed burning) have been excluded from the Post Treatment BAL Contour maps (Figures 6 and 7), to show how fuel mitigation can reduce the potential radiant heat impact on certain areas of the townsite. These maps are indicative only and are not to be used for Development or Building Approval.

Note: Post Treatment BAL Contour Maps are not to be used for Development or Building Approval

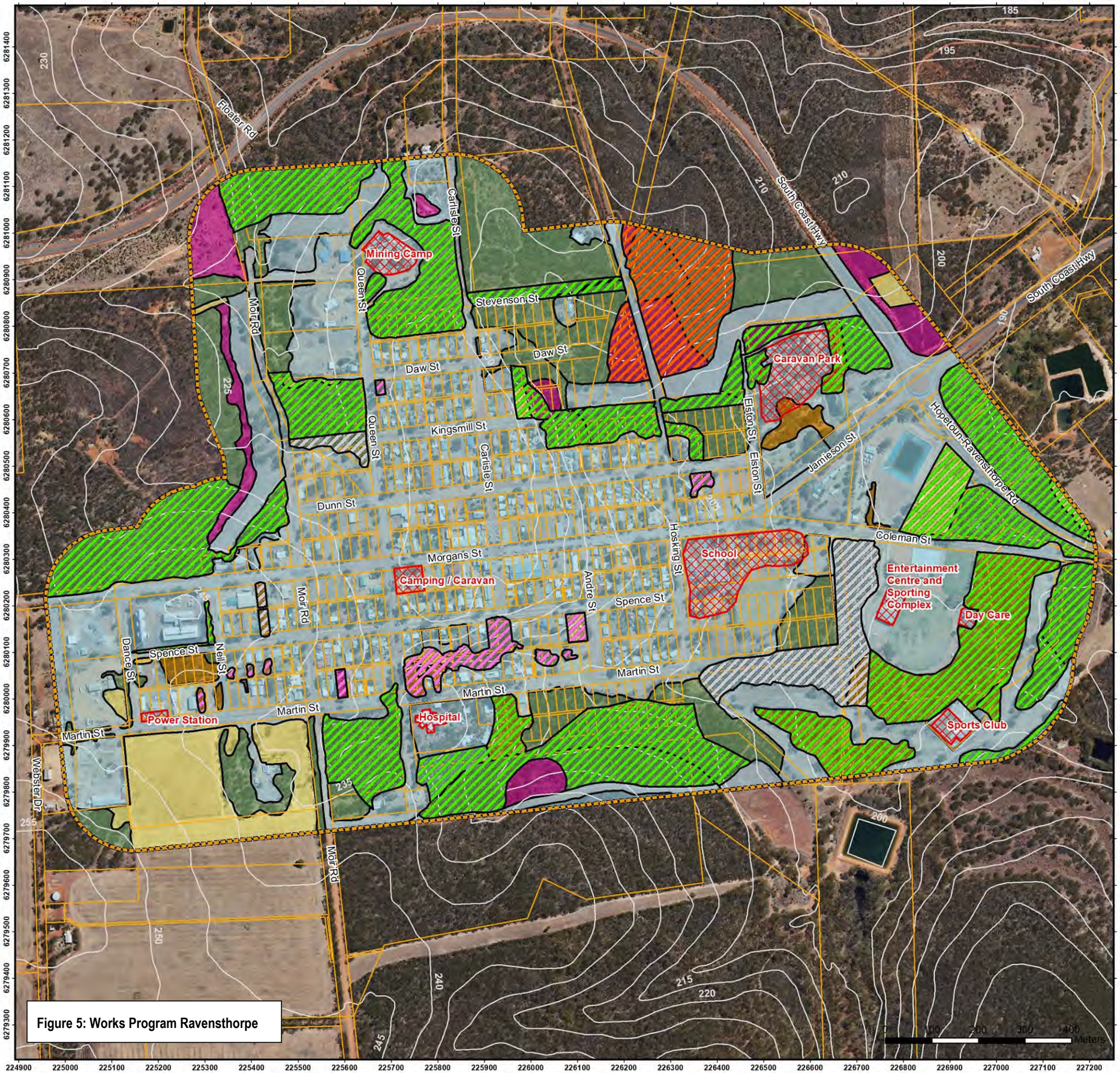

Figure 5: Works Program Ravensthorpe

Albany Office:
29 Hercules Crescent
Albany, WA 6330
(08) 9842 1575

Denmark Office:
7/40 South Coast Highway
Denmark, WA 6333
(08) 9848 1309

Esperance Office:
2A/113 Dempster Street
Esperance, WA 6450
(08) 9072 1382

BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- 150m Assessment Boundary
- Cadastre
- 5m Contours
- MW_PC - Mechanical Works Parkland Clearing
- TM - Townsite Maintenance
- PB - Prescribed Burn (Nominal Cells)
- FCN - Fire Contol Notice to Apply
- Assets and Vulnerable Land Use
- Vegetation/Plot Boundary

Vegetation

- Forest Type A
- Woodland Type B
- Scrub Type D
- Grassland Type G
- Excluded 2.2.3.2

Scale
1:8,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Ravensthorpe Works Program

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (a)	N/A
2	Excluded 2.2.3.2 (e)	N/A
3	Excluded 2.2.3.2 (f)	N/A
4	Forest Type A	Upslope/flat
5	Forest Type A	Downslope >0-5 degrees
6	Forest Type A	Downslope >5-10 degrees
7	Woodland Type B	Upslope/flat
8	Woodland Type B	Downslope >0-5 degrees
9	Woodland Type B	Downslope >5-10 degrees
10	Scrub Type D	Upslope/flat
11	Scrub Type D	Downslope >0-5 degrees
12	Scrub Type D	Downslope >5-10 degrees
13	Grassland Type G	Upslope/flat
14	Grassland Type G	Downslope >0-5 degrees
15	Grassland Type G	Downslope >5-10 degrees

Figure 6: Ravensthorpe Post Works BAL Contour Plan (West)

Albany Office:
29 Hercules Crescent
Albany, WA 6330
(08) 9842 1575

Denmark Office:
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Denmark, WA 6333
(08) 9848 1309

Esperance Office:
2A/113 Dempster Street
Esperance, WA 6450
(08) 9072 1382

BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Assets and Vulnerable Land Use
- Vegetation/Plot Boundary

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

This BAL Contour Map is Indicative only, it has been produced to show how fuel mitigation can reduce the potential radiant heat impact on certain areas of the townsite. Not for Development or Building Approval.

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Ravensthorpe Post Works BAL Contour Plan (West)

BAL Assessor	QA Check	Drawn by
BRM & LTS	KPK	BRM
STATUS	**FILE**	**DATE**
FINAL	RAV001	14/03/2024

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (a)	N/A
2	Excluded 2.2.3.2 (e)	N/A
3	Excluded 2.2.3.2 (f)	N/A
4	Forest Type A	Upslope/flat
5	Forest Type A	Downslope >0-5 degrees
6	Forest Type A	Downslope >5-10 degrees
7	Woodland Type B	Upslope/flat
8	Woodland Type B	Downslope >0-5 degrees
9	Woodland Type B	Downslope >5-10 degrees
10	Scrub Type D	Upslope/flat
11	Scrub Type D	Downslope >0-5 degrees
12	Scrub Type D	Downslope >5-10 degrees
13	Grassland Type G	Upslope/flat
14	Grassland Type G	Downslope >0-5 degrees
15	Grassland Type G	Downslope >5-10 degrees

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Esperance, WA 6450
(08) 9072 1382

BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Assets and Vulnerable Land Use
- Vegetation/Plot Boundary

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

This BAL Contour Map is Indicative only, it has been produced to show how fuel mitigation can reduce the potential radiant heat impact on certain areas of the townsite. Not for Development or Building Approval.

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Ravensthorpe Post Works BAL Contour Plan (East)

BAL Assessor	QA Check	Drawn by
BRM & LTS	KPK	BRM
STATUS	**FILE**	**DATE**
FINAL	RAV001	14/03/2024

Figure 7: Ravensthorpe Post Works BAL Contour Plan (East)

4. Hopetoun Townsite

4.1. Vegetation Classification

Vegetation verification/re-assessment occurred on the 6th and 7th November 2023 by Bob McGonnell (BPAD-58381) and Leanne Shilton (BPAD-62196) with all vegetation within 150m of the boundary classified/verified in accordance with the previous assessments and Section 2.2.3 of AS3959-2018. Vegetation was assessed in accordance with AS3959-2018 with the potential to determine the Bushfire Attack Level is identified below and shown on the Vegetation Classes Maps (Figure 1 and 2). Refer to Appendix A for vegetation classification plot data photographs.

Table 2: Summary of the Plot Data (Hopetoun)

Plot Number	Vegetation Type	Effective Slope
1	Excluded 2.2.3.2 (e)	N/A
2	Excluded 2.2.3.2 (f)	N/A
3	Forest Type A	Upslope/flat
4	Forest Type A	Downslope >0-5 degrees
5	Woodland Type B	Upslope/flat
6	Scrub Type D	Upslope/flat
7	Scrub Type D	Downslope >0-5 degrees
8	Scrub Type D	Downslope >5-10 degrees
9	Shrubland Type C	Downslope >10-15 degrees
10	Grassland Type G	Downslope >0-5 degrees

Note: Plot 6 Woodland Type B Downslope >0-5 degrees from the previous 2021 assessment has been re-classified and merged with existing Plot 4 Forest Type A Downslope >0-5 degrees. Plot 6 has been removed from the plot data.

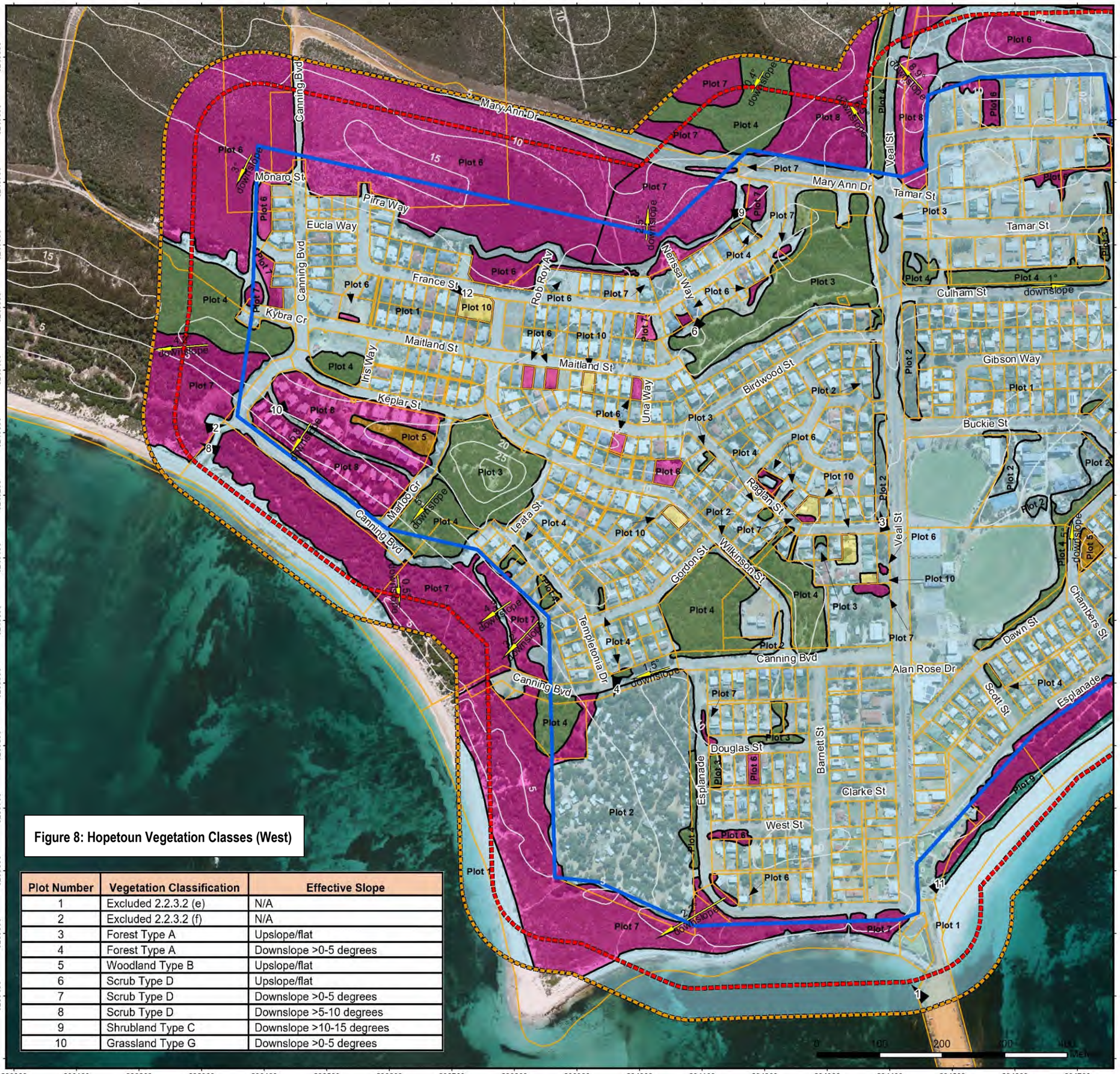

Figure 8: Hopetoun Vegetation Classes (West)

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (e)	N/A
2	Excluded 2.2.3.2 (f)	N/A
3	Forest Type A	Upslope/flat
4	Forest Type A	Downslope >0-5 degrees
5	Woodland Type B	Upslope/flat
6	Scrub Type D	Upslope/flat
7	Scrub Type D	Downslope >0-5 degrees
8	Scrub Type D	Downslope >5-10 degrees
9	Shrubland Type C	Downslope >10-15 degrees
10	Grassland Type G	Downslope >0-5 degrees

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Esperance, WA 6450
(08) 9072 1382

BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Slopes Degrees
- Photo Point
- Vegetation/Plot Boundary

Vegetation

- Forest Type A
- Woodland Type B
- Shrubland Type C
- Scrub Type D
- Grassland Type G
- Excluded 2.2.3.2

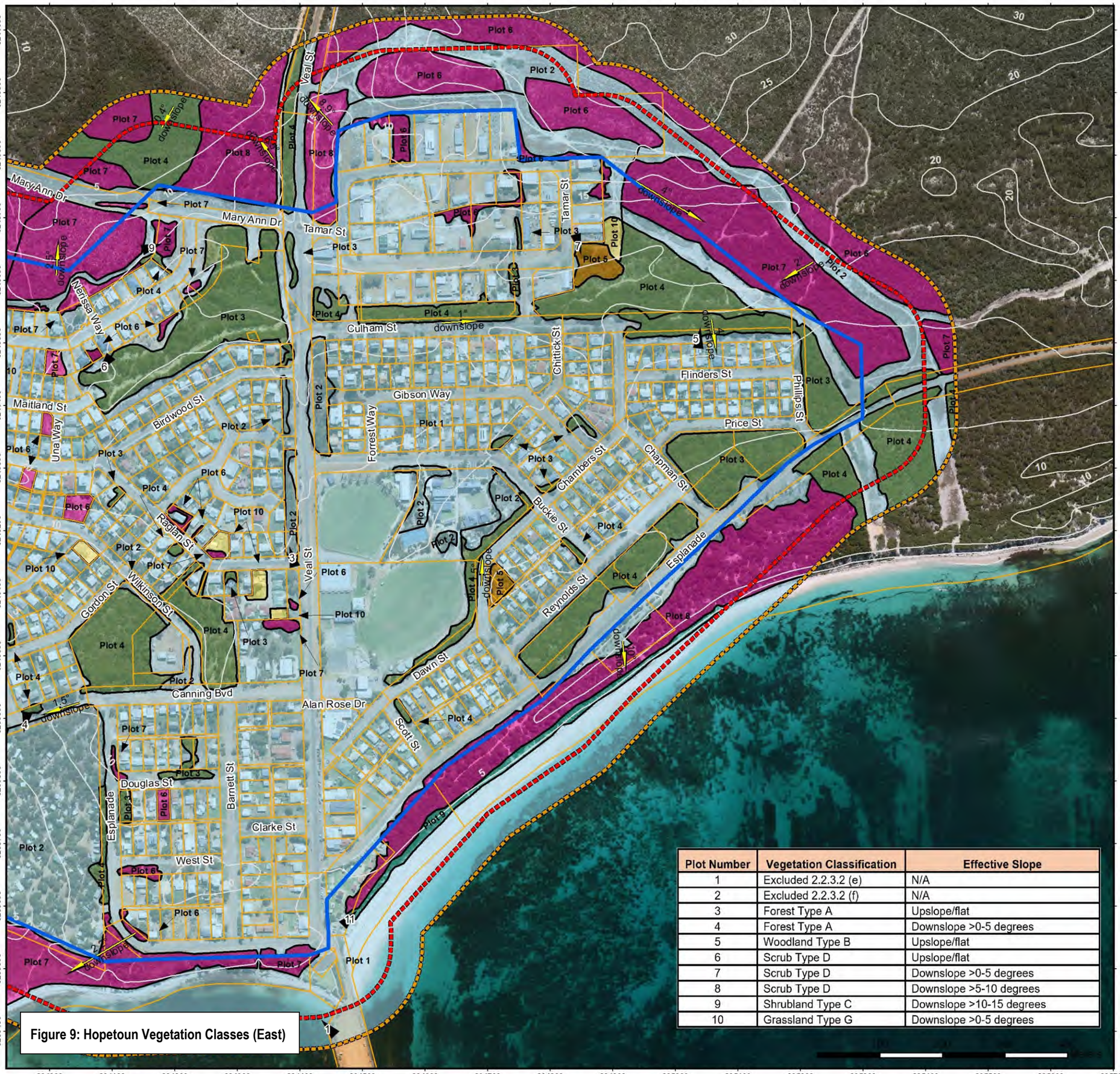
Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Hopetoun Vegetation Classes (West)

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**



Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (e)	N/A
2	Excluded 2.2.3.2 (f)	N/A
3	Forest Type A	Upslope/flat
4	Forest Type A	Downslope >0-5 degrees
5	Woodland Type B	Upslope/flat
6	Scrub Type D	Upslope/flat
7	Scrub Type D	Downslope >0-5 degrees
8	Scrub Type D	Downslope >5-10 degrees
9	Shrubland Type C	Downslope >10-15 degrees
10	Grassland Type G	Downslope >0-5 degrees

Figure 9: Hopetoun Vegetation Classes (East)

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BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Slopes Degrees
- Photo Point
- Vegetation/Plot Boundary

Vegetation

- Forest Type A
- Woodland Type B
- Shrubland Type C
- Scrub Type D
- Grassland Type G
- Excluded 2.2.3.2

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Hopetoun Vegetation Classes (East)

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**

4.2. Identification of Bushfire Impacts Hopetoun

The bushfire threats associated with the townsite include:

- The vegetated wicks which are present from the remnant verge vegetation areas entering the town site from the north (Culham Street and Veal Street) and the southeast / southwest (adjacent to foreshore areas).
- Large remnant vegetation areas associated with Crown reserves adjacent to the townsite to the north, west and the east.
- Central Crown, Water Corporation WA and Landcorp Reserves central to the townsite.
- Small areas of remnant/overgrown vegetation on private property, lots in the north and south of the townsite.
- Some continuous vegetation links exist adjacent to the strategic firebreaks linking external bushfire risks into the townsite.
- High fuel loads were noted in the Seaview Village in the west of the townsite, this creates connectivity between the townsite and the larger areas of remnant vegetation in the west.

These remnant vegetation (bushfire prone vegetation) areas can carry bushfire from the north, east and south into the townsite. The town centre and the south parts of the townsite are generally low fuel in nature and present limited risk of bushfire from the ocean.

A summary of the bushfire issues pertinent to Hopetoun townsite are provided below:

- Large strategic firebreaks along the west, north and east are designed to protect the townsite at large from bushfire. Separation of these links by a minimum of 20m will reduce bushfire impact on the townsite. This is particularly noted near Pirra Way where there is linking vegetation between the strategic breaks and dwellings which could lead to ember and radiant heat impacts to adjacent dwellings. These breaks will assist in defending the townsite from large, landscape scale bushfires. However, they generally do not change the BAL allocation over the townsite.
- At the time of the assessment, all bushfire mitigation works had not been completed on the strategic breaks. Therefore, the vegetation has been classified as it presented at the time of the assessment.
- Strategic work along Canning Boulevard and the northeast of the Caravan Park has seen a marked reduction in BAL allocation in these areas.
- Strategic work has taken place to the north of Canning Boulevard, south of Gordon Street, north of Culham Street, north of the Esplanade and south of Prince Street. This mitigation work is creating a low fuel buffer from patches of bushfire prone vegetation and adjacent buildings within the townsite.
- Risk of bushfire attack over the townsite is from the east and west where continuous bushfire vegetation exists. Specifically, from the following Plots:
    - Scrub Type D – all Plots identified.
    - Forest Type A – all Plots identified.
- Linking foreshore areas, present continuous bushfire fuels but also present problems for fuel reduction as removal of vegetation will increases erosion and changes to the fragile environment.
- The undeveloped land of Landcorp's between France Street and Birdwood Street has undergone fuel reduction along the southern areas adjacent to private property. The fuel reduction is not complete along the north whereby fuels are linking back onto properties and into an undeveloped lot off France Street.
- The caravan and camping on the Esplanade is considered a "Vulnerable Land Use" under the State Planning Policy (SPP 3.7) (WAPC, 2021), given the potential for this area to contain people who may have a limited ability to respond in a bushfire emergency.
- The Vulnerable Land Use and Critical assets:
    - The sports centre, community centre and motel are all located predominantly in BAL-29 or lower;
    - The school is partially located in BAL-FZ;
    - The caravan park has areas of BAL-40 and BAL-FZ impact.
    - The camper van parking site on the Esplanade has areas of BAL-40 and BAL-FZ impact.

4.3. BAL Contour Plan

BAL was assigned from each distinctive vegetation plot as classified to AS3950 2018 and shown as a series of BAL Contours. The broad scale of the presented map is for diagrammatic purposes only. The detailed GIS mapping dataset provided to the Shire should be consulted for any planning and development considerations.

Note: Utilising these BAL Contour Maps for Ravensthorpe and Hopetoun townsite building and planning approvals must be done in consultation with an accredited bushfire consultant.

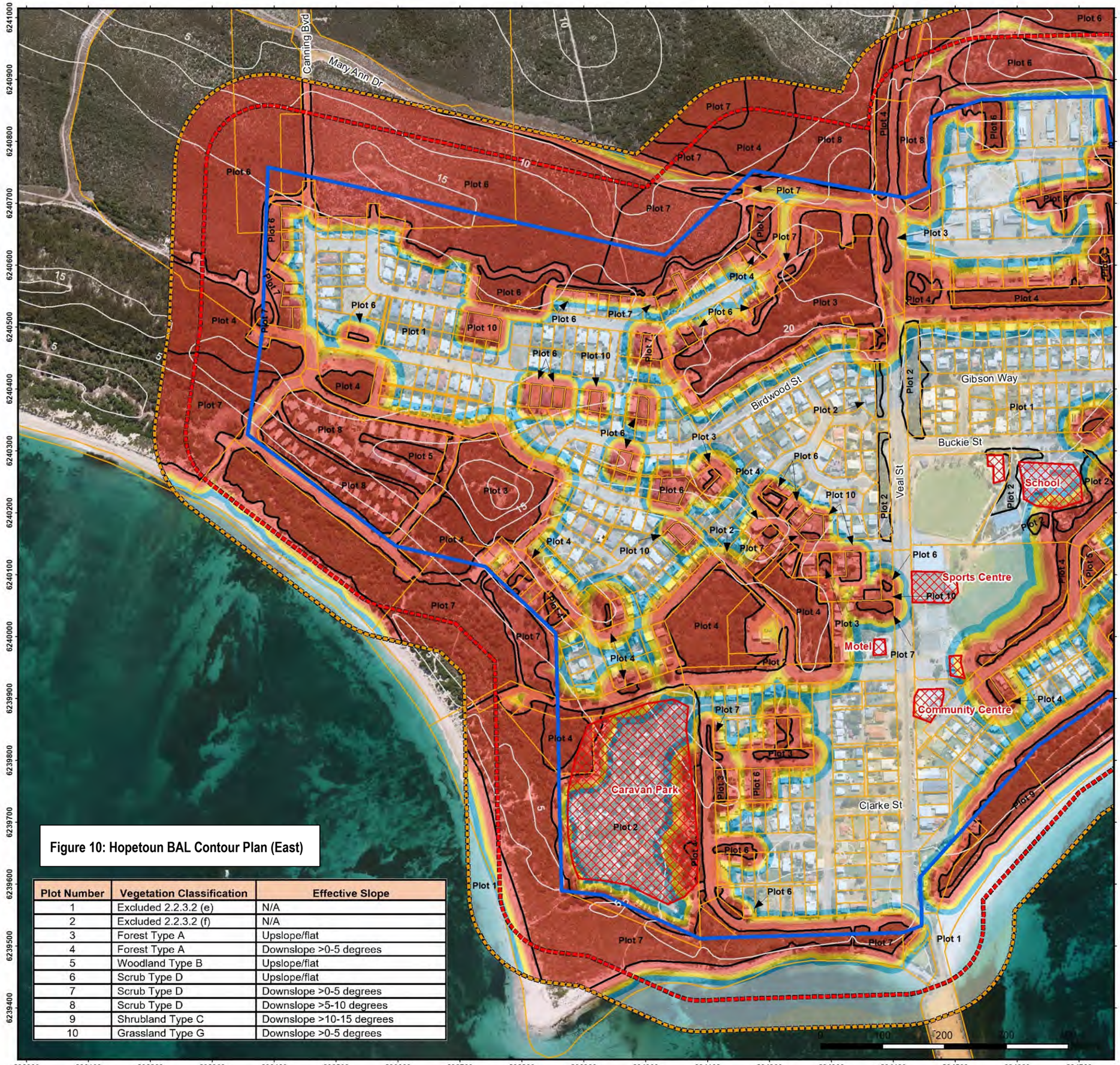

Figure 10: Hopetoun BAL Contour Plan (East)

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (e)	N/A
2	Excluded 2.2.3.2 (f)	N/A
3	Forest Type A	Upslope/flat
4	Forest Type A	Downslope >0-5 degrees
5	Woodland Type B	Upslope/flat
6	Scrub Type D	Upslope/flat
7	Scrub Type D	Downslope >0-5 degrees
8	Scrub Type D	Downslope >5-10 degrees
9	Shrubland Type C	Downslope >10-15 degrees
10	Grassland Type G	Downslope >0-5 degrees

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Esperance, WA 6450
(08) 9072 1382

BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Assets and Vulnerable Land Use
- Vegetation/Plot Boundary

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

Not for Development or Building Approval unless approved/certified by a Bushfire Consultant

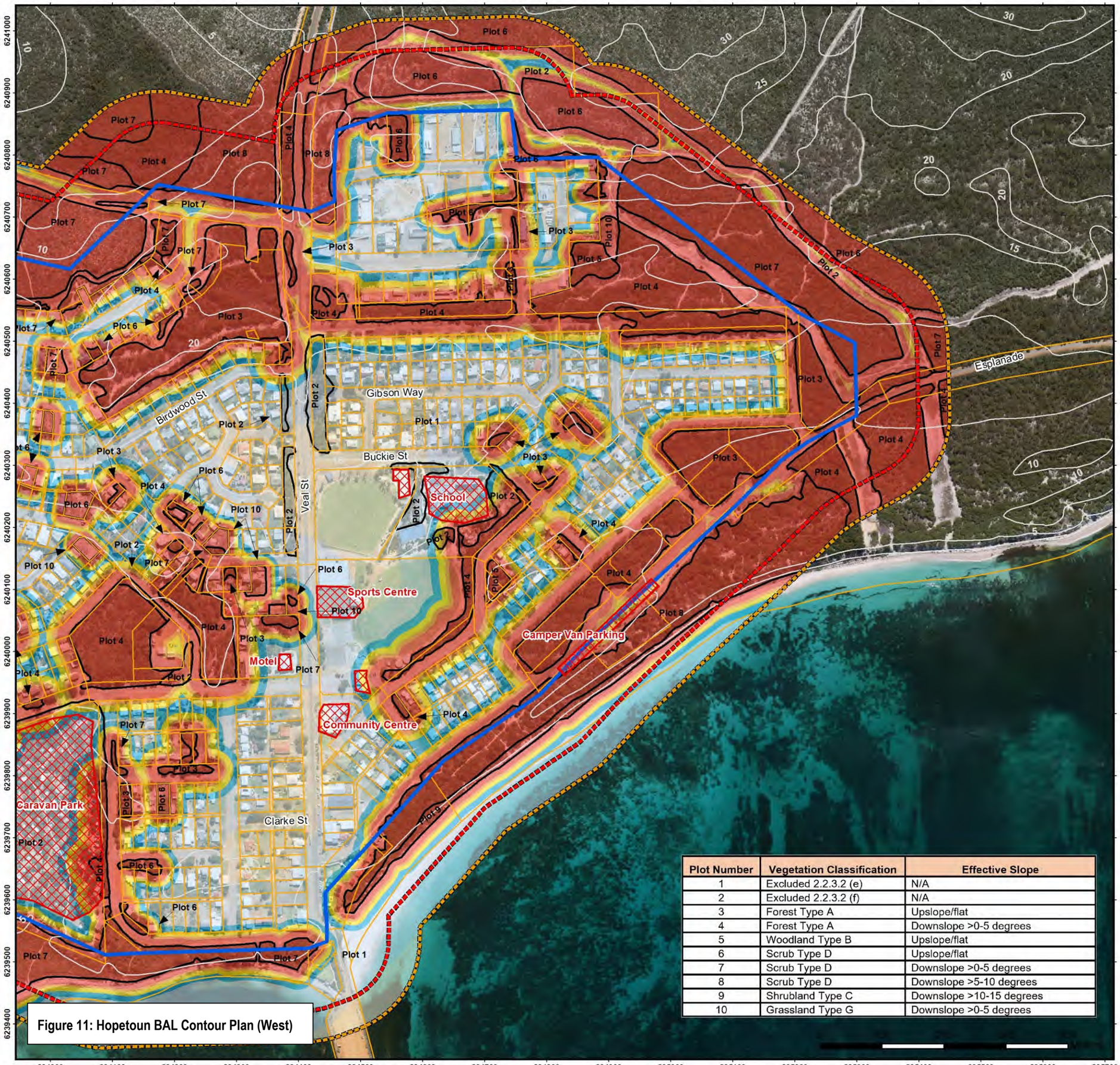
Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Hopetoun BAL Contour Plan (West)

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**



Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (e)	N/A
2	Excluded 2.2.3.2 (f)	N/A
3	Forest Type A	Upslope/flat
4	Forest Type A	Downslope >0-5 degrees
5	Woodland Type B	Upslope/flat
6	Scrub Type D	Upslope/flat
7	Scrub Type D	Downslope >0-5 degrees
8	Scrub Type D	Downslope >5-10 degrees
9	Shrubland Type C	Downslope >10-15 degrees
10	Grassland Type G	Downslope >0-5 degrees

Figure 11: Hopetoun BAL Contour Plan (West)

Albany Office:
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Albany, WA 6330
(08) 9842 1575

Denmark Office:
7/40 South Coast Highway
Denmark, WA 6333
(08) 9848 1309

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2A/113 Dempster Street
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BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Assets and Vulnerable Land Use
- Vegetation/Plot Boundary

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

Not for Development or Building Approval unless approved/certified by a Bushfire Consultant

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Hopetoun BAL Contour Plan (East)

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**

4.4. Recommendations for bushfire management/mitigation Hopetoun

The assessment of Hopetoun townsite has determined the following recommendations for bushfire mitigation, also refer to Figure 12 Works Program Hopetoun:

Note: Mitigation works had not commenced at the time of this assessment, the proposed mitigation program has been included in the works program map, Figure 12, so the post works BAL Contour may provide a more accurate reflection of the current radiant heat impacts.

- Further mechanical works to the reserve north of the properties on Flinders Street, the rear of these properties is currently subjected to BAL-FZ, See Figure 12 Works Program Map.
- The eastern end of Tamar Street has areas of vegetation which has the potential to wick fire into this industrial area and then further south along Hakea Street, mechanical works and the application of the Fire Management Notice is recommended for this area.
- The properties on the south side of Culham Street from Hakea Street to Chambers Street, the Shire has not undertaken any works in this 150m-250m strip of the road reserve and adjoining UCL due to threated flora in the vicinity. DBCA is providing advice and guidance of what could be undertaken to address this narrow strip.
- Seaview Village, which comes under the management of First Quantum Minerals (FQM) will be required under the Fire Management Notice to manage vegetation on the site, compliance should be monitored by the SoR, as the Village is currently subjected to a BAL-FZ rating and as such has the potential to carry fire deep into the Hopetoun residential area.
- Numerous properties in the Hopetoun residential area were non-compliant to the Fire Management Notice, particularly in the west of the townsite, enforcement of the notice will see a reduction of risk to this part of the community.
- The vulnerable land use of the Hopetoun Caravan Park and the school should have fuel reduction strategies implemented internal to the site to APZ standards at all times. Fuel reduction standards (*note this is not broad scale clearing*) are to be as per the WAPC 2021 recommended Schedule 1 APZ standards, refer to Section 5.0 and Appendix B.
- Additional fuel reduction is suggested to the north and south of the camper van parking site on the Esplanade to ensure BAL-29 can prevail over the entire site.
- Additional fuel reduction is suggested to the east, south and west of the caravan park to ensure BAL-29 can prevail over the entire site.
- Crown Land within management of the Shire adjacent to private dwellings/lodgings should be fuel reduced to a minimum of 20m to assist in Asset Protection Zones (APZ) to the townsites dwellings and further protection of life and property from bushfire events. Slashing should occur for a minimum of 20m where vegetation is not attributable to foreshore protection areas.
- If areas of fuel reduction occurred to 20m separation adjacent to the strategic slashed breaks then exclusions to AS3959-2018 could occur i.e. if a 20m or greater separation is utilised, exclusion (c) or (d) of AS3959-2018 can be applied.
- Landcorp to provide clear separation from bushfire hazards on their land to adjacent dwellings along France Street, a minimum of 20m is recommended.
- It is recommended that land owners of vacant land are required under the annual firebreak notice to maintain cleared land to <100mm in height and remove dead and flammable material. Review may be required of the annual firebreak notice to ensure urban land <2000m^2 is not a bushfire hazard to adjacent properties. Provision of this through the gazetted annual firebreak notice pursuant to Section 33 of the *Bushfires Act 1953*.
- It is recommended that the Shire ensures land owners implements APZ standards to a minimum of 20m around existing buildings within the townsite/Shire. Provision of this through the gazetted annual firebreak notice pursuant to Section 33 of the *Bushfires Act 1953*. Refer to Section 5.0.
- It is recommended the Shire implements Schedule 1 APZ standards to their maintenance of street verges, parks and gardens adjacent to bushfire prone (classifiable) vegetation to ensure these maintained areas are not creating wicks into the townsite or encourage ember establishment in bushfire conditions. Refer to further information Section 5.0 of this document.
- Lots that require fuel reduction have been marked as 'Fire Management Notice to Apply' on Figure 12 Works Program.
- Potential areas for additional fuel reduction have been marked as 'Recommended Mechanical Works' on Figure 12 Works Program.
- All proposed treatments indicated on Figure 12 Works Program map (except prescribed burning) have been excluded from the Post Treatment BAL Contour maps (Figures 13 and 14), to show how fuel mitigation can reduce the potential radiant heat impact on certain areas of the townsite. These maps are indicative only and are not to be used for Development or Building Approval.

Note: Post Treatment BAL Contour Maps are not to be used for Development or Building Approval

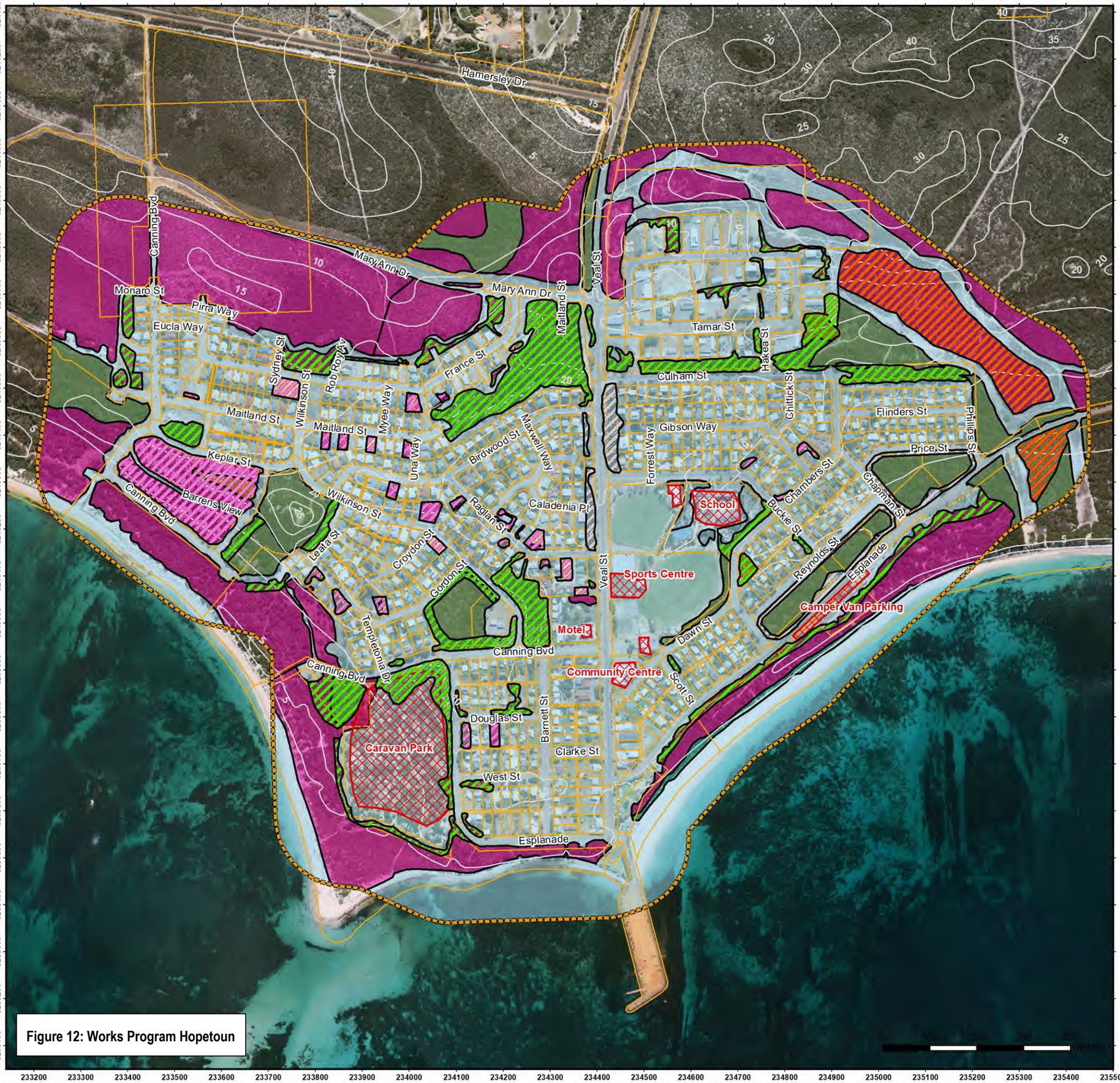

Figure 12: Works Program Hopetoun

Albany Office:
29 Hercules Crescent
Albany, WA 6330
(08) 9842 1575

Denmark Office:
7/40 South Coast Highway
Denmark, WA 6333
(08) 9848 1309

Esperance Office:
2A/113 Dempster Street
Esperance, WA 6450
(08) 9072 1382

BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- 150m Assessment Boundary
- Cadastre
- 5m Contours
- MW_PC - Mechanical Works Parkland Clearing
- TM - Townsite Maintenance
- PB - Prescribed Burn (Nominal Cells)
- FCN - Fire Control Notice to Apply
- Assets and Vulnerable Land Use
- Vegetation/Plot Boundary

Vegetation

- Forest Type A
- Woodland Type B
- Shrubland Type C
- Scrub Type D
- Grassland Type G
- Excluded 2.2.3.2

Scale
1:8,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Hopetoun Works Program

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**

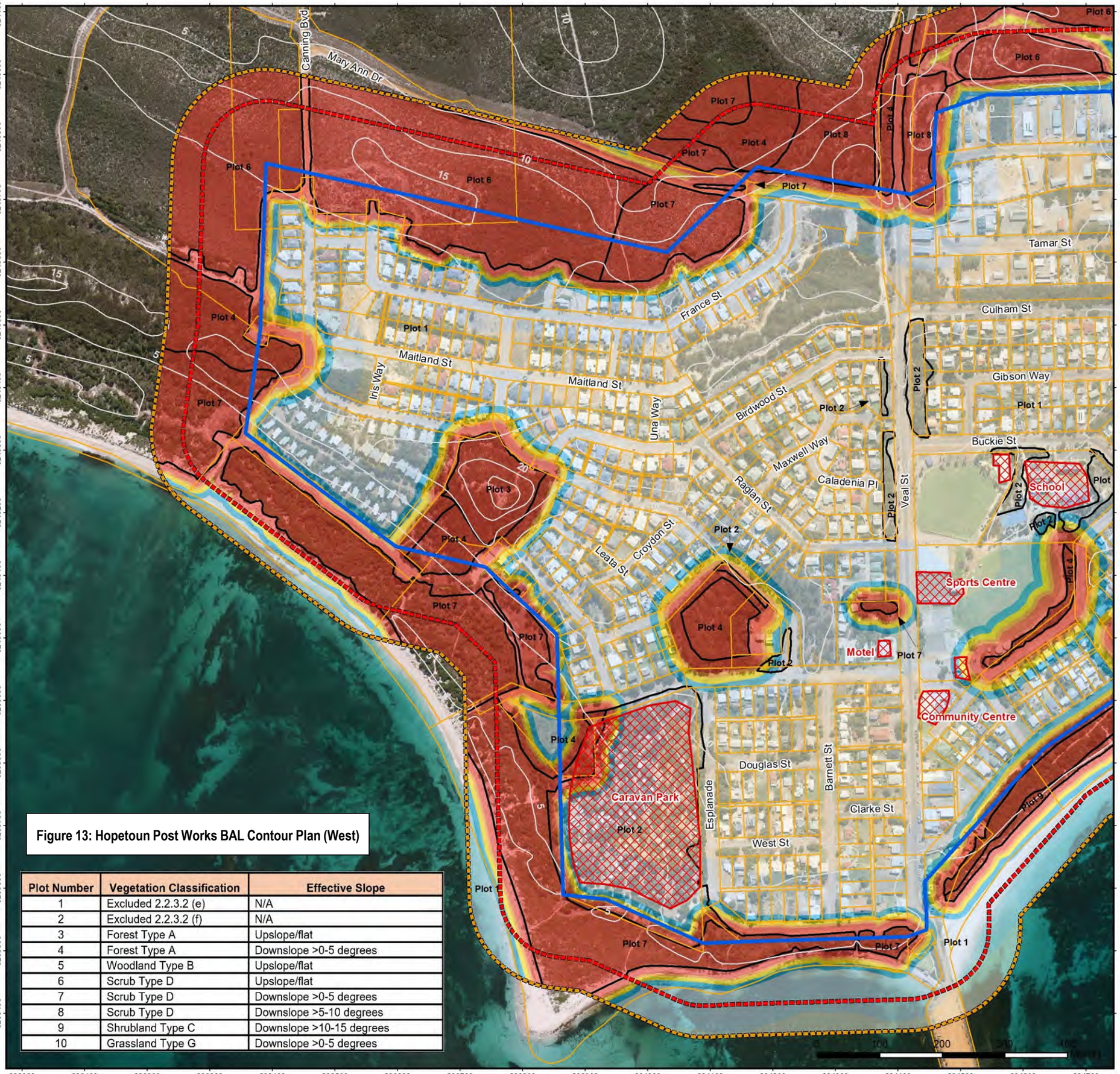

Figure 13: Hopetoun Post Works BAL Contour Plan (West)

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (e)	N/A
2	Excluded 2.2.3.2 (f)	N/A
3	Forest Type A	Upslope/flat
4	Forest Type A	Downslope >0-5 degrees
5	Woodland Type B	Upslope/flat
6	Scrub Type D	Upslope/flat
7	Scrub Type D	Downslope >0-5 degrees
8	Scrub Type D	Downslope >5-10 degrees
9	Shrubland Type C	Downslope >10-15 degrees
10	Grassland Type G	Downslope >0-5 degrees

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2A/113 Dempster Street
Esperance, WA 6450
(08) 9072 1382

BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Assets and Vulnerable Land Use
- Vegetation/Plot Boundary

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

This BAL Contour Map is Indicative only, it has been produced to show how fuel mitigation can reduce the potential radiant heat impact on certain areas of the townsite. Not for Development or Building Approval.

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Hopetoun Post Works
BAL Contour Plan (West)

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**

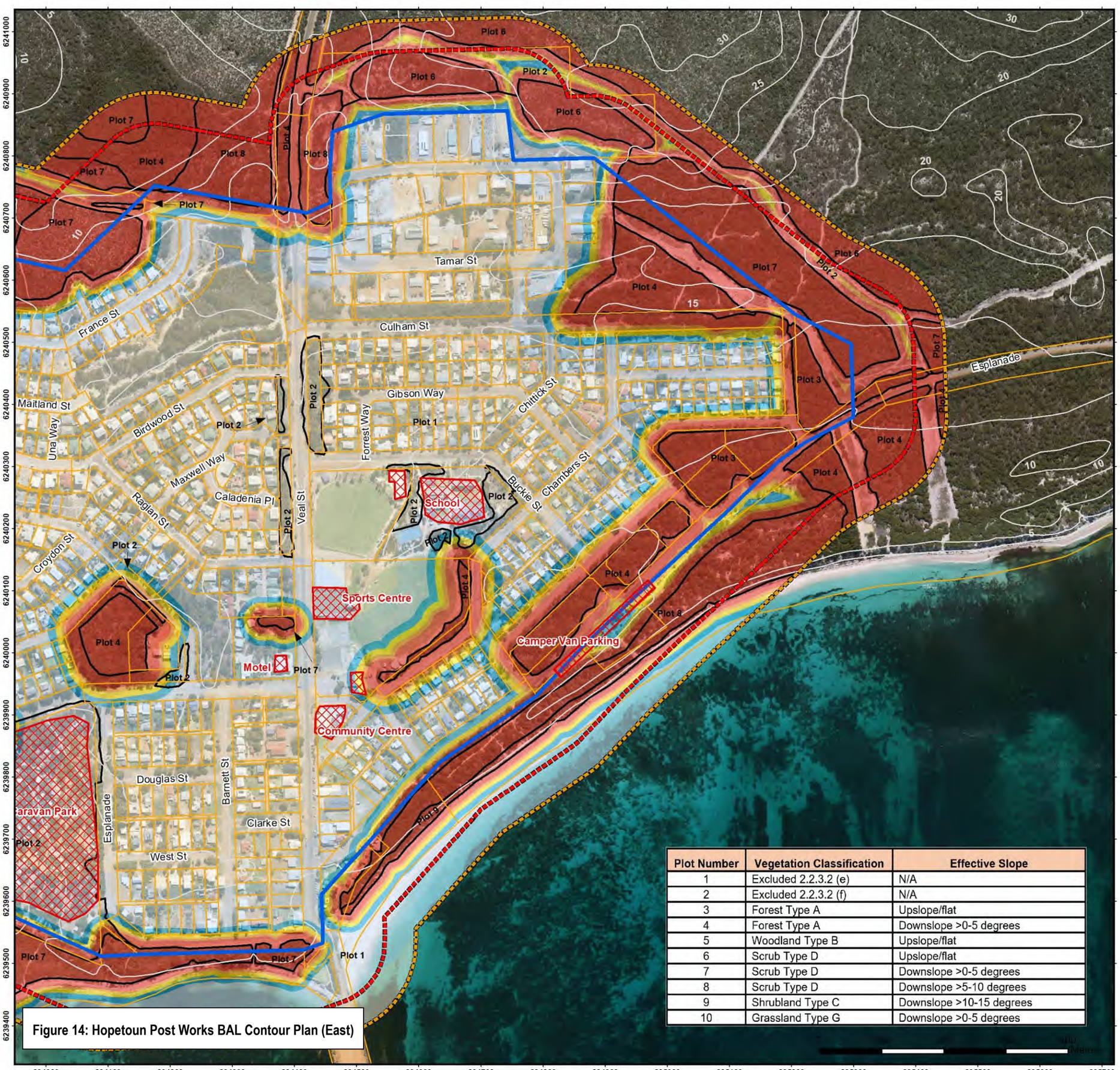

Figure 14: Hopetoun Post Works BAL Contour Plan (East)

Plot Number	Vegetation Classification	Effective Slope
1	Excluded 2.2.3.2 (e)	N/A
2	Excluded 2.2.3.2 (f)	N/A
3	Forest Type A	Upslope/flat
4	Forest Type A	Downslope >0-5 degrees
5	Woodland Type B	Upslope/flat
6	Scrub Type D	Upslope/flat
7	Scrub Type D	Downslope >0-5 degrees
8	Scrub Type D	Downslope >5-10 degrees
9	Shrubland Type C	Downslope >10-15 degrees
10	Grassland Type G	Downslope >0-5 degrees

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2A/113 Dempster Street
Esperance, WA 6450
(08) 9072 1382

BPAD Bushfire Planning & Design

BIO DIVERSE SOLUTIONS

Overview Map Scale 1:100,000

Legend

- Subject Site
- 100m Assessment Boundary
- 150m Assessment Boundary
- Cadastre
- 5m Contours
- Assets and Vulnerable Land Use
- Vegetation/Plot Boundary

BAL Contours

- BAL-FZ
- BAL-40
- BAL-29
- BAL-19
- BAL-12.5
- BAL-LOW

This BAL Contour Map is Indicative only, it has been produced to show how fuel mitigation can reduce the potential radiant heat impact on certain areas of the townsite. Not for Development or Building Approval.

Scale
1:6,000 @ A3
GDA MGA 2020 Zone 51

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2022
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
Shire of Ravensthorpe
65 Morgans St
Ravensthorpe, WA 6346

Hopetoun Post Works
BAL Contour Plan (East)

BAL Assessor	*QA Check*	*Drawn by*
BRM & LTS	**KPK**	**BRM**
STATUS	*FILE*	*DATE*
FINAL	**RAV001**	**14/03/2024**

5. Asset Protection Zones

An Asset Protection Zone (APZ) is an area surrounding a building or asset that is managed to reduce the bushfire hazard to an acceptable level (WAPC, 2021). This is also defined as a "defendable space" which is an area adjacent to the asset within which firefighting operations can be undertaken to defend the structure (WAPC, 2021). Habitable buildings, sheds, water tanks and other assets should have an APZ utilising low threat or non-vegetated areas (roads, driveways, hardstand areas, maintained gardens, mowed lawns, slashing, trimming etc).

The 2020 Bushfire Risk Treatment standards allow for vegetation to be modified round existing buildings. The WAPC Schedule 1 APZ standard is recommended to be defined in the annual gazetted Shire firebreak notice. Any replanting, revegetation and landscaping in bushfire prone areas is recommended to meet the Schedule 1 APZ standards as per WAPC Guidelines v 1.4 (WAPC, 2021). The WAPC Schedule 1 APZ standard is provided in Appendix B.

The Shire should ensure their personnel responsible for implementing and maintaining Shire managed verges, reserves and parks are aware of the WAPC Schedule 1 APZ standards. Design of new areas, infill planting and maintenance works adjacent to remnant (bushfire prone) vegetation should also utilise fire-retardant species. A list of fire-retardant species for the South Coast region is provided in Appendix C. The Country Fire Authority (CFA) *"Landscaping for Bushfire – Garden Design and Plant Selection"* (CFA, 2022) is a recommended guide for landscapers and maintenance workers involved with management of public parks, verges and garden areas.

Contractors for the Shire tasked with fuel reduction in parks, gardens and street verges should be aware and understand the WAPC Schedule 1 APZ required standards (see Appendix B) and complete mitigation works to the APZ standard. It is particularly vital they understand the requested works area is not to be devastated by broadscale clearing, for example trees can remain (trimmed and fuel reduced) and clumps of shrubs can remain in areas no greater than 5m2 in size. The WAPC APZ standard can form a guide for the contractors who are appointed by the Shire to conduct fuel reduction works (Note for large strategic firebreak slashing this would not be required). Contractors should be briefed from project managers to ensure they understand the required works for fuel reduction.

6. Disclaimer

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, 2021) 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.

7. Certification

I hereby certify that I have undertaken the assessment of the above site and determined the Bushfire Attack Level (s) stated in this document have been prepared in accordance with the requirements of AS 3959-2018 and the Guidelines for Planning in Bushfire Prone Areas (WAPC, 2021).

SIGNED, ASSESSOR: ..... DATE: 14/03/2024

Kathryn Kinnear Bio Diverse Solutions

Accredited Level 2 Bushfire Practitioner (Accreditation No: BPAD-30794)

8. Revision Record

Revision	Summary	Prepared By	Reviewed By	Date
Draft ID	Internal Q.A review	Melanie Haymont and Kathryn Kinnear	Bob McGonnell	5/02/2024
Draft ID	Internal Q.A review	Kathryn Kinnear	Michelle Gray	5/02/2024
Draft ID V1	Released to Shire for draft review	Kathryn Kinnear	Mal Grant	5/02/2024
Draft ID V2	Released to Shire for draft review	Kathryn Kinnear	Mal Grant	28/02/2024
Final	Issued to Shire as Final	Kathryn Kinnear	Mal Grant	14/03/2024

9. References

AS3959-2018 Australian Standard inc Amendments No 1, 2 and 3, *Construction of buildings in bushfire-prone areas*, Building Code of Australia, Primary Referenced Standard, Australian Building Codes Board and Standards Australia.

Catchpole WR, Bradstock RA, Choate J, Fogarty LG, Gellie N, McCarthy GJ, MCaw WL, Mardsend-Smedley JB and Pearce G co-operative Development of equations for heathland fire behaviour. In 'Proc. 3rd Int. Conf. Forest Fire Research and 14th Conf. On fire and Forest Meteorology. (ED VIEGAS DX) Luso Coimbra Portugal: 1998, 631-645pp.

Country Fire Service (CFA) Victoria (2022) Landscaping for Bushfire – Garden Design and Plant Selection. Victorian Government.

OBRM Map of Bushfire Areas Standard accessed from the Department of Fire and Emergency Services Website accessed January 2021:http://www.dfes.wa.gov.au

Western Australian Planning Commission (WAPC) (2021) Guidelines for Planning in Bushfire Prone Areas Version 1.4. Western Australian Planning Commission and Department of Planning, Lands and Heritage, Government of Western Australia.

Western Australian Planning Commission (WAPC) (2015) State Planning Policy 3.2 Planning in Bushfire Prone Areas. Department of Planning, Lands and Heritage and Western Australian Planning Commission.

State Land Information Portal (SLIP) (2021) Map of Bushfire Prone Areas. Office of Bushfire Risk Management (OBRM) data retrieved from:https://maps.slip.wa.gov.au/landgate/bushfireprone/

Ravensthorpe - 2023 Assessment

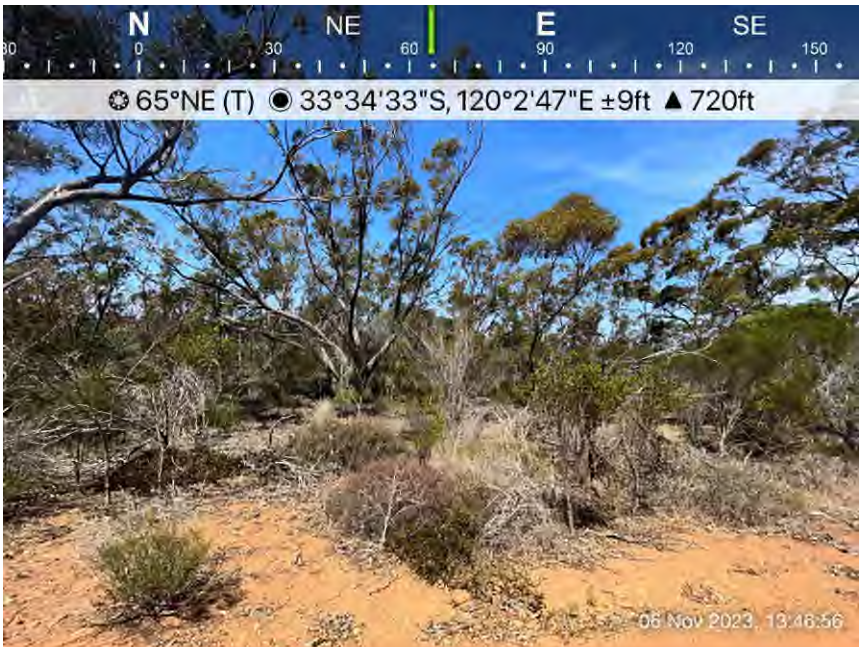
Plot	1	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (a)
			**Location:** North and south of the subject site. **Separation Distance:** >100m. **Description:** Areas of classified vegetation >100m from the subject site. Excluded as per AS3959-2018 exclusion clause 2.2.3.2 (a).
Photo Id 1: View to the southeast towards vegetation located >100m from the subject site to the south.			

Plot	2	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (e)
			**Location:** Internal and external of the subject site. **Description:** Roads and other non-vegetated areas. Excluded as per AS3959-2018 exclusion clause 2.2.3.2 (e).
Photo Id 2: View to the east-northeast along Martin Street, located internal to the subject site in the southwest.			

Plot	3	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (f)
			**Location:** Internal and external of the subject site. **Separation Distance:** >100m. **Description:** Areas of low-threat vegetation. Excluded as per AS3959-2018 exclusion clause 2.2.3.2 (e).
Photo Id 3: View facing northwest towards vegetation managed in a low-threat state, located central to the subject site.			

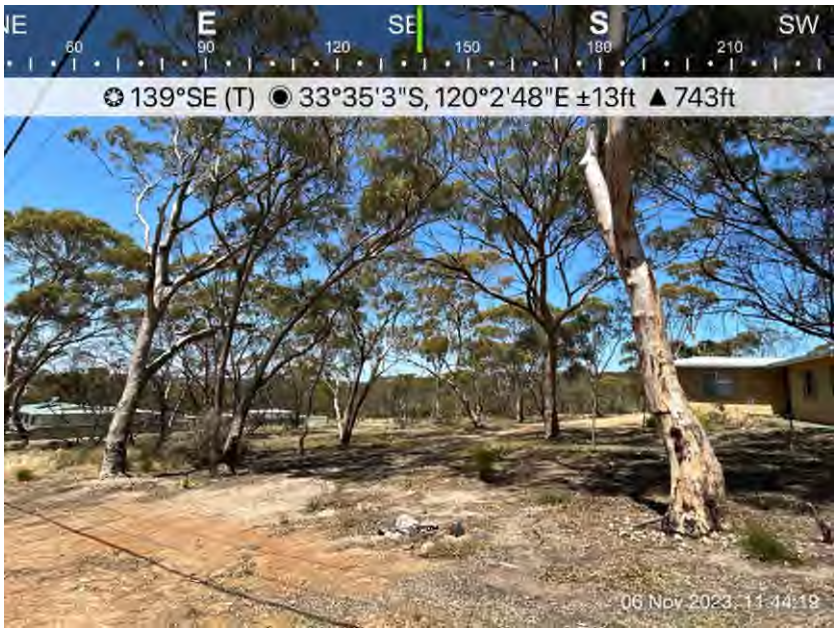
Plot	3	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (f)
			**Additional photo of Plot 3.**
Photo Id 4: View facing east towards vegetation managed in a low-threat state, located internal to the subject site in the east.			

Plot	3	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (f)
			**Additional photo of Plot 3.**
Photo Id 5: View facing southwest along slashed firebreak, located to west of the subject site.			
Plot	**4, 5 and 6**	**Classification or Exclusion Clause**	**Forest Type A**
			**Location:** Internal and external to the subject site in the north, south, east and west. **Dominant species & description:** Forest vegetation consisting of Eucalyptus trees with dense canopy cover and a multilayered understorey of scrub, shrubs and grasses. **Average vegetation height:** Trees 4-8m. **Vegetation Coverage:** 30-70% foliage cover. **Available fuel loading:** 25-35t/ha. **Effective slope:** Upslope/flat (Plot 4) Downslope >0-5 degrees (Plot 5) Downslope >5-10 degrees (Plot 6)
Photo Id 6: View facing northwest towards forest vegetation, located internal to the subject site in the east.			

Plot	4, 5 and 6	Classification or Exclusion Clause	Forest Type A
			Additional photo of Forest Type A.
Photo Id 7: View facing east-northeast towards forest vegetation, located on the northern boundary of the subject site.			

Plot	4, 5 and 6	Classification or Exclusion Clause	Forest Type A
			Additional photo of Forest Type A.
Photo Id 8: View facing northwest towards forest vegetation, located on the western boundary of the subject site.			

Plot	4, 5 and 6	Classification or Exclusion Clause	Forest Type A
			Additional photo of Forest Type A.
Photo Id 9: View facing west towards forest vegetation, located adjacent to the northern boundary of the subject site.			
Plot	**7, 8 and 9**	**Classification or Exclusion Clause**	**Woodland Type B**
			**Location:** Internal to the subject site in the south, southwest and southeast. External to the subject site in the south and southeast. **Dominant species & description:** Woodland vegetation consisting of mixed Eucalyptus trees. Open canopy with predominately grassy understorey. Limited scrub midstorey. **Average vegetation height:** Trees 4-10m. **Vegetation Coverage:** 10-30% foliage cover. **Available fuel loading:** 15-25t/ha. **Effective slope:** Upslope/flat (Plot 7) Downslope >0-5 degrees (Plot 8) Downslope >5-10 degrees (Plot 9)
Photo Id 10: View facing west towards woodland vegetation, located internal to the subject site in the southeast.			

Plot	7, 8 and 9	Classification or Exclusion Clause	Woodland Type B
			Additional photo of Woodland Type B.
Photo Id 11: View facing southeast towards woodland vegetation, located internal to the subject site in the south.			
Plot	**10, 11 and 12**	**Classification or Exclusion Clause**	**Scrub Type D**
			**Location:** Internal and external to the subject site in the north, south, east and west. **Description:** Scrub vegetation consisting of low Eucalyptus and Acacia trees, understorey of sedges, grasses and some low shrubs (100-400mm). **Average vegetation height:** Scrubs 2-4m. **Vegetation Coverage:** >30% foliage cover. **Available fuel loading**: 25t/ha. **Effective slope:** Upslope/flat (Plot 10) Downslope >0-5 degrees (Plot 11) Downslope >5-10 degrees (Plot 12)
Photo Id 12: View facing west-southwest towards scrub vegetation, located in the northeast of the subject site.			

Plot	10, 11 and 12	Classification or Exclusion Clause	Scrub Type D
			Additional photo of Scrub Type D.
Photo Id 13: View facing west-northwest towards scrub vegetation, located in the south of the subject site.			

Plot	13, 14 and 15	Classification or Exclusion Clause	Grassland Type G
			**Location:** Internal and external to the subject site in the south, east and west. **Description:** Mixed unmanaged grasses. **Average vegetation height:** 100 – 300mm. **Vegetation Coverage:** <10% tree and scrub cover. **Available fuel loading:** 4.5t/ha. **Effective slope:** Upslope/flat (Plot 13) Downslope >0-5 degrees (Plot 14) Downslope >5-10 degrees (Plot 15)
Photo Id 14: View facing south-southeast towards grassland vegetation, located internal to the subject site in the southwest.			

Plot	13, 14 and 15	Classification or Exclusion Clause	Grassland Type G
			Additional photo of Grassland Type G.
Photo Id 15: View facing southeast towards grassland vegetation, located internal to the subject site in the east.			

Hopetoun – 2023 Assessment

Plot	1	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (e)

Location: Internal and external of the subject site.

Description: Roads, waterbodies and other non-vegetated areas.

Excluded as per AS3959-2018 exclusion clause 2.2.3.2 (e).

Photo Id 1: View facing northwest towards foreshore, located in the south of the subject site.

Plot	1	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (e)

Additional photo of Exclusion 2.2.3.2 (e).

Photo Id 2: View facing east along Canning Boulevard, located to the west of the subject site.

Plot	2	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (f)
			**Location:** Internal and external of the subject site. **Separation Distance:** >100m. **Description:** Areas of low-threat vegetation. Excluded as per AS3959-2018 exclusion clause 2.2.3.2 (e).
Photo Id 3: View facing north-northwest towards vegetation managed in a low-threat state, located central to the subject site.			

Plot	2	Classification or Exclusion Clause	Low fuel or non-vegetated areas exclusion 2.2.3.2 (f)
			Additional photo of Exclusion 2.2.3.2 (f).
Photo Id 4: View facing south towards vegetation managed in a low-threat state associated with caravan park, located internal to the subject site in the southwest.			

Plot	3 and 4	Classification or Exclusion Clause	Forest Type A
			**Location**: Internal and external to the subject site in the north, east and west. **Dominant species & description:** Thin strip of low open forest consisting of Eucalyptus trees with dense canopy cover, understorey consisting of predominantly scrub, sedges, shrubs and grasses (100-400mm), multilayered vegetation. **Average vegetation height:** Trees 4-8m. **Vegetation Coverage:** 30-70% foliage cover. **Available fuel loading:** 25-35t/ha. **Effective slope:** Upslope/flat (Plot 3) Downslope >0-5 degrees (Plot 4)
Photo Id 5: View facing north towards forest vegetation, located internal to the subject site in the east.			

Plot	3 and 4	Classification or Exclusion Clause	Forest Type A
			Additional photo of Forest Type A.
Photo Id 6: View facing southwest towards forest vegetation, located central north of the subject site.			

Plot	5	Classification or Exclusion Clause	Woodland Type B

Location: Internal to the subject site.

Dominant species & description: Woodland vegetation consisting of mixed Eucalyptus trees. Open canopy with predominately grassy understorey. Limited scrub midstorey.

Average vegetation height: Trees 4-10m.

Vegetation Coverage: 10-30% foliage cover.

Available fuel loading: 15-25t/ha.

Effective slope:

Upslope/flat (Plot 5)

Photo Id 7: View facing south-southeast towards woodland vegetation, located internal to the subject site in the northeast.

Plot	6,7 and 8	Classification or Exclusion Clause	Scrub Type D

Location: Internal and external to the subject site in the north, east and west.

Dominant species & description: Scrub vegetation consisting of low Eucalyptus and Acacia trees, understorey of sedges, grasses and some low shrubs (100-400mm).

Average vegetation height: Scrubs 2-4m. Occasional eucalypt at 5m.

Vegetation Coverage: >30% foliage cover.

Available fuel loading: 25t/ha.

Effective slope:

Upslope/flat (Plot 6)

Downslope >0-5 degrees (Plot 7)

Downslope >5-10 degrees (Plot 8)

Photo Id 8: View facing west-northwest towards scrub vegetation, located in the west of the subject site.

Plot	6,7 and 8	Classification or Exclusion Clause	Scrub Type D
			Additional photo of Scrub Type D.
Photo Id 9: View facing east-northeast towards scrub vegetation, located internal to the subject site the north.			

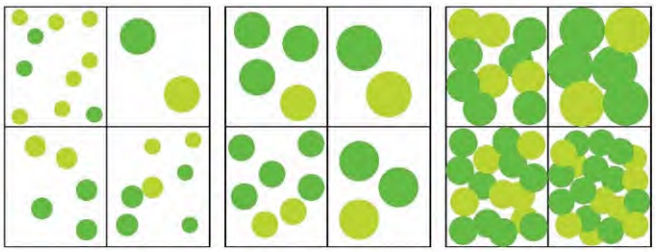
Plot	6,7 and 8	Classification or Exclusion Clause	Scrub Type D
			Additional photo of Scrub Type D.
Photo Id 10: View facing west-southwest towards scrub vegetation, located internal to the subject site in the east.			

Plot	9	Classification or Exclusion Clause	Shrubland Type C
			**Location:** South of the subject site. **Description:** Low shrubs. **Average vegetation height:** 0.5 – 1m. **Vegetation Coverage:** >30% foliage cover. **Available fuel loading**: 25t/ha. **Effective slope:** Downslope >10-15 degrees (Plot 9)
Photo Id 11: View facing northeast towards shrubland vegetation, located south of the subject site.			
Plot	**10**	**Classification or Exclusion Clause**	**Grassland Type G**
			**Location:** Internal to the subject site. **Description:** Mixed unmanaged grasses. **Average vegetation height:** 100 – 300mm. **Vegetation Coverage:** <10% tree and scrub cover. **Available fuel loading:** 4.5t/ha. **Effective slope:** Downslope >0-5 degrees (Plot 10)
Photo Id 12: View facing southeast towards grassland vegetation, located internal to the subject site in the west.			

Appendix B
APZ standards to apply
(WAPC, 2021)

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

OBJECT	REQUIREMENT
Fences within the APZ	• Should be constructed from non-combustible materials (for example, iron, brick, limestone, metal post and wire, or bushfire-resisting timber referenced in Appendix F of AS 3959).
Fine fuel load (Combustible, dead vegetation matter <6 millimetres in thickness)	• Should be managed and removed on a regular basis to maintain a low threat state. • Should be maintained at <2 tonnes per hectare (on average). • Mulches should be non-combustible such as stone, gravel or crushed mineral earth or wood mulch >6 millimetres in thickness.
Trees* (>6 metres in height)	• Trunks at maturity should be a minimum distance of six metres from all elevations of the building. • Branches at maturity should not touch or overhang a building or powerline. • Lower branches and loose bark should be removed to a height of two metres above the ground and/or surface vegetation. • Canopy cover within the APZ should be <15 per cent of the total APZ area. • Tree canopies at maturity should be at least five metres apart to avoid forming a continuous canopy. Stands of existing mature trees with interlocking canopies may be treated as an individual canopy provided that the total canopy cover within the APZ will not exceed 15 per cent and are not connected to the tree canopy outside the APZ. **Figure 19:** Tree canopy cover – ranging from 15 to 70 per cent at maturity  15% 30% 70%
Shrub* and scrub* (0.5 metres to six metres in height). Shrub and scrub >6 metres in height are to be treated as trees.	• Should not be located under trees or within three metres of buildings. • Should not be planted in clumps >5 square metres in area. • Clumps should be separated from each other and any exposed window or door by at least 10 metres.
Ground covers* (<0.5 metres in height. Ground covers >0.5 metres in height are to be treated as shrubs)	• Can be planted under trees but must be maintained to remove dead plant material, as prescribed in 'Fine fuel load' above. • Can be located within two metres of a structure, but three metres from windows or doors if >100 millimetres in height.

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

OBJECT	REQUIREMENT
Grass	• Grass should be maintained at a height of 100 millimetres or less, at all times. • Wherever possible, perennial grasses should be used and well-hydrated with regular application of wetting agents and efficient irrigation.
Defendable space	• Within three metres of each wall or supporting post of a habitable building, the area is kept free from vegetation, but can include ground covers, grass and non-combustible mulches as prescribed above.
LP Gas Cylinders	• Should be located on the side of a building furthest from the likely direction of a bushfire or on the side of a building where surrounding classified vegetation is upslope, at least one metre from vulnerable parts of a building. • The pressure relief valve should point away from the house. • No flammable material within six metres from the front of the valve. • Must sit on a firm, level and non-combustible base and be secured to a solid structure.

** Plant flammability, landscaping design and maintenance should be considered – refer to explanatory notes*