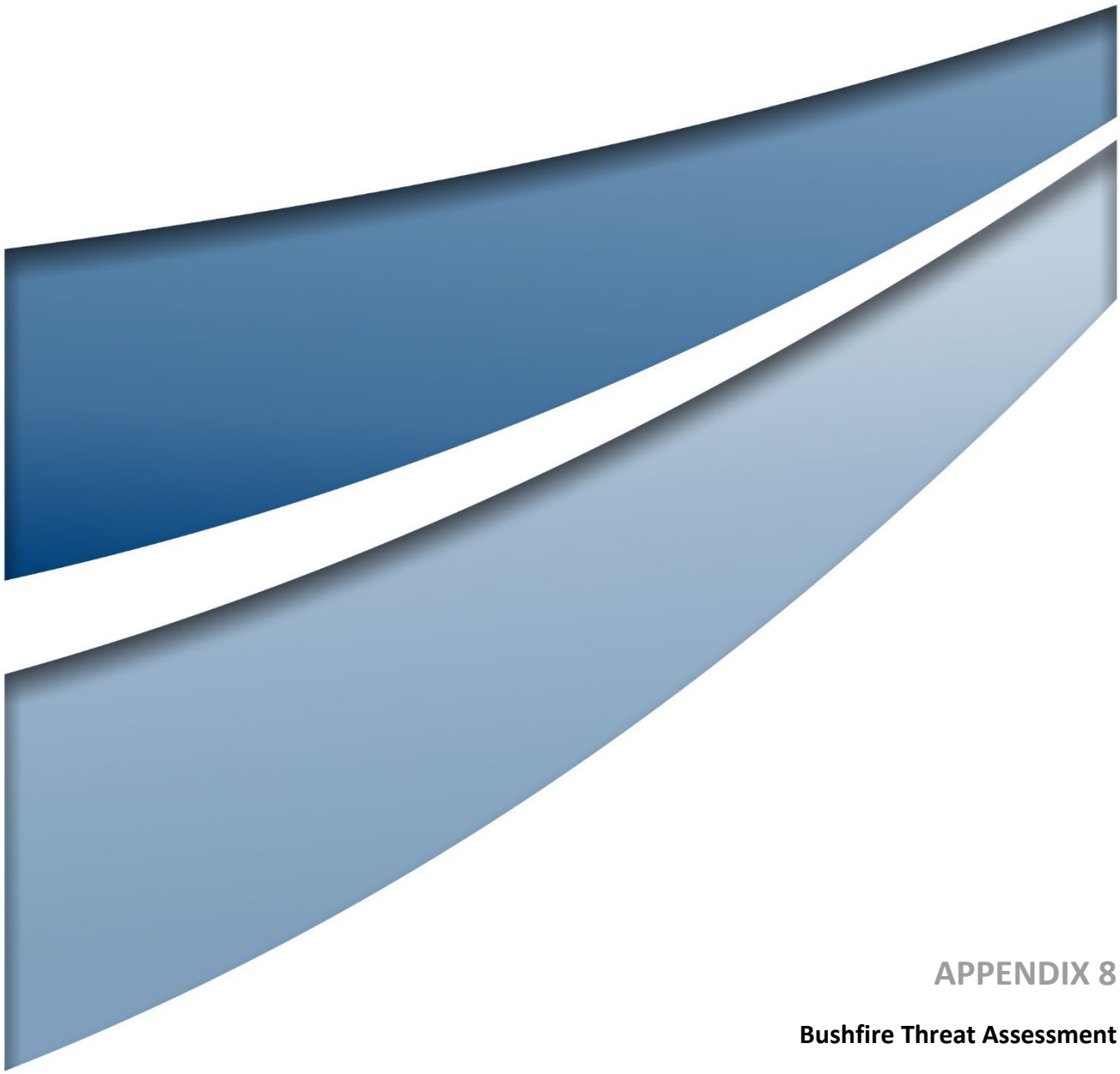

APPENDIX 8

Bushfire Threat Assessment

This report has been prepared for Richmond Valley Solar & BESS Pty Ltd (ABN 43 672 993 869) a wholly owned special purpose vehicle of Ark Energy Projects Pty Ltd and the Proponent of the Project. Richmond Valley Solar & BESS Pty Ltd will herein be referred to as Ark Energy or Ark Energy Projects.

BLACKASH
BUSHFIRE CONSULTING

Bushfire Threat Assessment

Ark Energy Pty Ltd
Proposed solar farm and BESS
Richmond Valley NSW

Prepared for
Umwelt Australia Pty Limited

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Version 1.0
30 April 2024

Project Name:	Richmond Valley Solar Farm (J3338)
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Version	Primary Author(s)	Description	Date Completed
0.7	David Lemcke & Lew Short	Final draft for client review – new layout	17 April 2024
1.0	David Lemcke & Lew Short	Final draft for client review	30 April 2024

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Contents

Glossary

This section defines those core terms and concepts which are adopted throughout the report.

Term	Definition
Asset Protection Zone (APZ)	A fuel-reduced area surrounding a built asset or structure which provides a buffer zone between a bushfire hazard and an asset. The APZ includes a defendable space within which firefighting operations can be carried out. The size of the required APZ varies with slope, vegetation and FFDI.
Bushfire Emergency Management & Operations Plan (BEMOP)	A plan developed during the detailed design phases and as part of the Fire Safety Study response, to clearly detail bushfire protection measures and risk mitigation strategies to be undertaken on an ongoing basis to prepare for the eventuality of bushfires.
Bushfire Emergency Response Plan (BERP)	A plan developed to assist and direct the emergency response of staff, contractors, visitors and emergency services in the event of a bushfire igniting on site, or a bushfire impacting the site.
Battery Energy Storage System (BESS)	An energy storage system that can store and deploy generated energy, typically by a group of batteries that charge (i.e., collect energy) and store electrical energy from the grid or energy generation facility and then discharge that energy at a later time to provide electricity or other grid services when needed.

Bushfire	A general term used to describe fire in vegetation, includes grass fire.
Bushfire attack mechanisms	The various ways in which a bushfire can impact upon people and property and cause loss or damage. These mechanisms include flame contact, radiant heat exposure, ember attack, fire wind and smoke.
Bushfire Attack Level (BAL)	A means of measuring the severity of a building's potential exposure to ember attack, radiant heat, and direct flame contact. The BAL is used as the basis for establishing the requirements for construction to improve protection of building elements and to articulate bushfire risk.
Bushfire Design Requirements	A separate design document to assist the master planning with requirements and specifications to provide compliance with PBP.
Bushfire prone land (BPL)	An area of land that can support a bushfire or is likely to be subject to bushfire attack, as designated on a bushfire prone land map.
Bushfire Hazard	Any vegetation that has the potential to threaten lives, property, or the environment.
Bushfire Threat	Potential bushfire exposure of an asset due to the proximity and type of a hazard and the slope on which the hazard is situated.
Hazard	A hazard is any source of potential harm or a situation with a potential to cause loss. A hazard is therefore the source of risk.
Likelihood	The chance of an event occurring. Likelihood may be represented as a statistical probability (such as an annual exceedance probability), or whether this is not possible, it can be represented qualitatively using measures such as 'likely', 'possible' and 'rare'.
Managed land	Land that has vegetation removed or maintained to a level that limits the spread and impact of bushfire. This may include developed land (residential, commercial, or industrial), roads, golf course fairways, playgrounds, sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries. Most common will be gardens and lawns within curtilage of buildings. These areas are managed to meet the requirements of an APZ.
Mitigation	The lessening or minimizing of the adverse impacts of a bushfire event. The adverse impacts of bushfire cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques, retrofitting and hazard-resistant construction as well as on ground works to manage fuel and separate assets from bushland.

Planning for Bushfire Protection 2019 (PBP)	NSW Rural Fire Service publication effective from 1 March 2020 which is applicable to all new development on bushfire prone land in NSW.
Project	The proposed scope of works for the Richmond Valley Solar Farm and Battery Energy Storage System as defined in Section 4 of this report.
Resilience	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management. UNDRR 2017
Risk	The degree of risk presented by that interaction will depend on the likelihood and consequence of the bushfire occurring. Risk may be defined as the chance of something happening, in a specified period of time that will have an impact on objectives. It is measured in terms of consequences and likelihood.
Risk assessment	A systematic process of evaluating the potential risks that may be involved in a projected activity or undertaking, having regard to factors of likelihood, consequence, vulnerability, and tolerability.
Risk-based land use planning	The strategic consideration of natural hazard risk and mitigation in informing strategic land use planning activities.
Site	The area proposed for the Richmond Valley Solar Farm and BESS.
Strategic Bushfire Study (SBS)	Provides the opportunity to assess whether new development is appropriate in the bushfire hazard context.
TI SEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021

1. Introduction

Project Introduction

Ark Energy Pty Ltd ('Ark Energy') via Umwelt (Australia) Pty Ltd has engaged Blackash Bushfire Consulting to complete a Bushfire Threat Assessment (BTA), as part of the State Significant Development (SSD) consent process, to construct, operate and decommission the Richmond Valley Solar Farm (RVSF) in northern New South Wales (NSW). The solar farm would be a large-scale solar photovoltaic (PV) generation facility with associated infrastructure for its management and connection to the national electricity market (the Project). The Project site would be located on multiple lots at 255 & 420 Avenue Road, Myrtle Creek, approximately 25km south of Casino and 2km east of the main arterial road in the area, Summerland Way (the Site).

The site covers approximately 1474ha, with the project infrastructure to occupy an indicative Project Footprint (PF) of approximately 803ha and solar array footprint of 542ha, refer Figure 1.

Bushfire Compliance Summary

Table 1 is a summary of compliance with relevant documents and approaches to limit bushfire attack and meet the requirements of the NSW planning framework for new development in Bushfire Prone Areas.

Table 1: Summary

Planning for Bushfire Protection 2019 Classification	Other Development
NCC Classification	TBC – based on buildings/structures
Location	420 Avenue Road, Myrtle Creek NSW
Local Government Area	Richmond Valley Council
Can this proposal comply with AS3959:2018	Yes – based on NCC classifications
Does this development comply with the requirements of *Planning for Bushfire Protection 2019?*	Yes – based on the detailed design phase

Does this development comply with the Aims and objectives of *Planning for Bushfire Protection 2019*?	Yes – based on the detailed design phase
Is the proposal for a State Significant Development (SSD)	Yes
Is referral to the NSW RFS required?	No
Is a Bush Fire Safety Authority (BFSA) required?	No

Assessment Framework	☒ *Planning for Bushfire Protection 2019:*
	☒ Meets the deemed to satisfy provisions
	☐ Alternate solution/ performance-based assessment

Purpose of this Report

This BTA Report accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), in support of a State Significant Development Application (SSDA) for the construction and operation of a new solar farm at Richmond Valley, NSW (SSD-41020244).

SEARs for the Project were issued on 21 September 2022. The SEARs relevant to bushfire hazard are presented in Table 2 informed the preparation of this Bushfire Assessment Report. This report addresses the Secretary's Environmental Assessment Requirements (SEARs) issued for the Project, notably:

Table 2: SEARs general requirements extract.

SEARs General Requirement	Response
Hazards – including: identify potential hazards and risks associated with bushfires / use of bushfire prone land including the risks that a solar farm would cause bush fire and demonstrate compliance with Planning for Bush Fire Protection 2019;	Preparation of this Bushfire Threat Assessment Report.

The Project is on designated bushfire prone land. All new development on BPL must comply with the NSW Rural Fire Service (RFS) document *Planning for Bushfire Protection 2019* (PBP). This Bushfire Risk

Assessment supports the environmental impact statement (EIS) for the Project. It documents the assessment of bushfire risk in accordance with PBP, including the requirement for Asset Protection Zones (APZ). As State Significant Development (SSD), the Project must comply with the aim and objectives of PBP. This technical paper provides an assessment of the forecast impacts of the Project on the surrounding landscape and as required by PBP, with special consideration for the vulnerability of the Project and the mitigation measures with regard to bushfire.

A site inspection from the public roads was performed under the scope of the assessment.

Project Overview

The Project involves the construction, operation and decommissioning of approximately 500 megawatts (MW) DC solar photovoltaic (PV) generation, Battery Energy Storage System (BESS) of approximately 275 MW and storage capacity of up to 2,200-megawatt hour (MWh) capacity over 8 hours and a transmission line to connect the Project from the substation to the national electricity market. The Project will include various associated infrastructure including, temporary construction facilities, operation and maintenance buildings, internal access roads, civil works and other required electrical infrastructure. Table 3 provides a Project summary.

Table 3: Project summary

Project Element	Summary of the Project
Project Application Number	SSD-41020244
Project Description	The Project involves the construction, operation and decommissioning of up to 500 megawatts (MW) of solar DC PV generation, Battery Energy Storage System (BESS) with a power capacity of 275 megawatts and an energy storage capacity of up to 2,200-megawatt hour (MWh) over eight hours and approximately 2 km of transmission line to connect the Project from the switching substation to the NEM. The Project will include various associated facilities and infrastructure including, temporary construction facilities, O&M facility, internal roads, civil works, fencing and other required electrical infrastructure.
Project Address	420 Avenue Road, Myrtle Creek NSW
Project Site Area (site)	Approximately 1,475 ha
Project Footprint (PF)	Approximately 803 ha
Solar Array Footprint	Approximately 542 ha subject to detailed design
Schedule of Land	The Project is located across 10 cadastral lots owned by two different landholders.

Solar Panels	Up to 730,000 bifacial solar panels on ground-mounted single axis tracking framework. Row spacing: 5.4 m Tracker Height: 2.5 m Maximum Panel Height (at full tilt): 4 m. Model panel dimensions: 2384mm x 1303mm Tracking angle: +/- 60 degrees Ground Coverage Ratio: 44.15%
PV Inverter Stations	118
Substation	Dimensions: 135 m x 120 m (Approximately 1.6ha) Voltage step up: 33 kV / 330 kV
Switching Substation	Dimensions: 170m x 75m (Approximately 1.3 ha)
Battery Storage	Centralised 275 MW / 2,200 MWh BESS situated on elevated ground adjacent to the substation. Dimensions: 201 m x 250 m (Approximately 5ha)
Electrical Reticulation	Construction of a 2 km double circuit 330 kV transmission line including 11 transmission towers at 55 m in height in the north-western portion of the Project Area. Power conversion located alongside PV modules consisting of approximately 118 inverters. Cabling between solar arrays, inverters and the onsite substation will via a network of underground cables (up to 1 m deep and 1 m wide).
Temporary Construction Facilities	Main construction facilities to include office amenities, parking (approximately 0.4ha), storage, a control room and data, water and electrical reticulation. Laydown areas suitable for storing plant material and equipment, solar arrays and cable drums, and areas to support waste management activities.
Permanent Operational Facilities	This would include the system control building, switch room and storage facilities (Approximately 0.2ha) and car parking.
Project Access	The Project has 3 proposed access points off Avenue Rd. The main access point (SA2) would be the central access point approximately 3.0 km from the intersection of Avenue Rd and Main Camp Rd. The two secondary access points (SA1 and SA2) will be on the southern side of Avenue Rd. Major solar components would be delivered via heavy and OSOM vehicles from the Port of Brisbane, via Motorway/Highway, Summerland Way, Main Camp Road, Avenue Road and access into the Project Area via SA2 on the northern side of Avenue Rd. Light vehicle access would be facilitated off Avenue Rd.

Internal Roads	Approximately 52 km of compacted access roads of approximately 4 m in width would be constructed throughout the Development Footprint. Existing internal roads will be used where available although existing roads will be developed to accommodate vehicle movement across the Project Area. A sealed main access road will be 6 m wide leading to the substation and parking area.
Perimeter Fencing and security	Perimeter security fencing around the Development Footprint to a height of approximately 2.1 m plus CCTV at each entrance and the substations.
APZ	Protection zones between project infrastructure and vegetation will be maintained to a minimum of 10 m and up to 100 m around critical infrastructure such as the BESS and substations.
Biodiversity Corridor	A 30 m biodiversity corridor will be planted beyond the northern extent of the Development Footprint on the eastern side of Avenue Rd. The corridor will create a continuous canopy from Ellangowan State Forest and Bungawalbin State Forest.
Workforce	Approximately 327 FTE workers at the Construction 'Peak'. Operation: Approximately 10-15 FTE equivalent
Construction Hours	• 7:00 am to 6:00 pm – Monday to Friday. • 8:00 am to 1:00 pm – Saturday. • Sunday and Public Holidays – no works to be completed.
Operational Hours	24/7
Construction Period	Up to 24 months
Operational Period	Up to 30 years
Capital Investment	Estimated $1.2 billion.

The location within the region is shown as Figure 1.

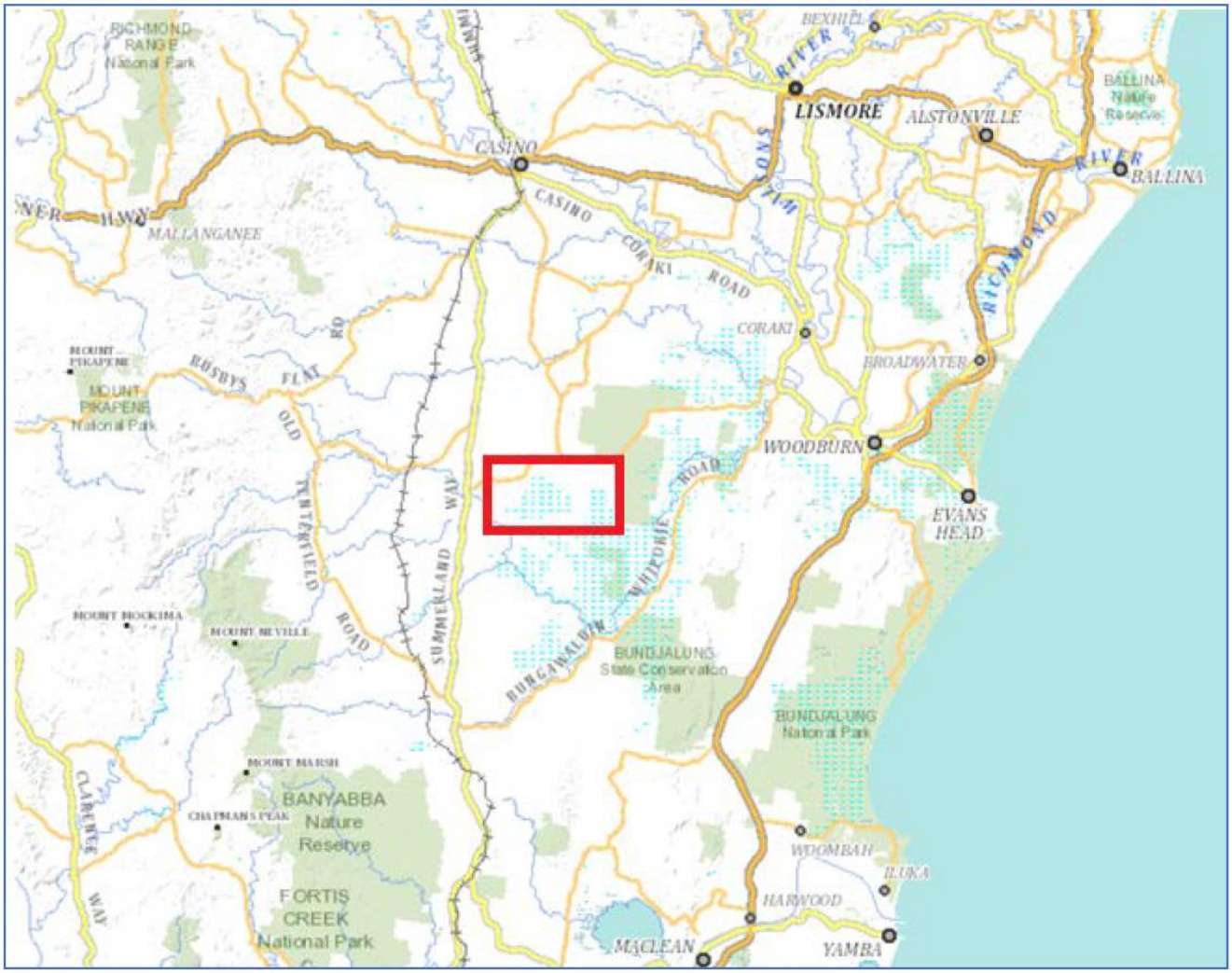

Figure 1: Location within region (per Ark Energy)

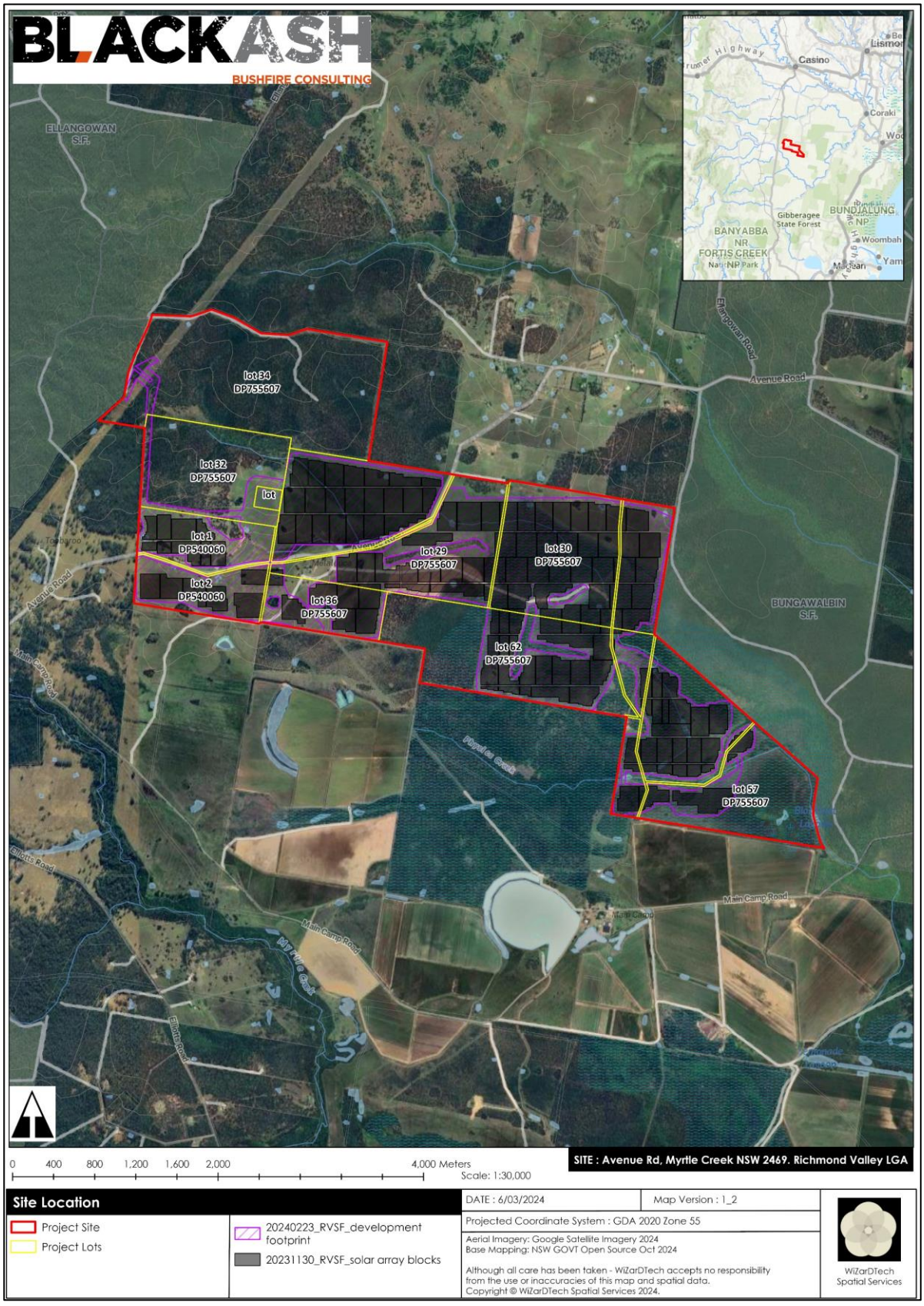

Figure 2: Location of Project with development footprint

Figure 3: Example of single axis tracking system (approx. 0.8m high). System proposed at RVSF will be minimum of 2.5m above ground level at axis.

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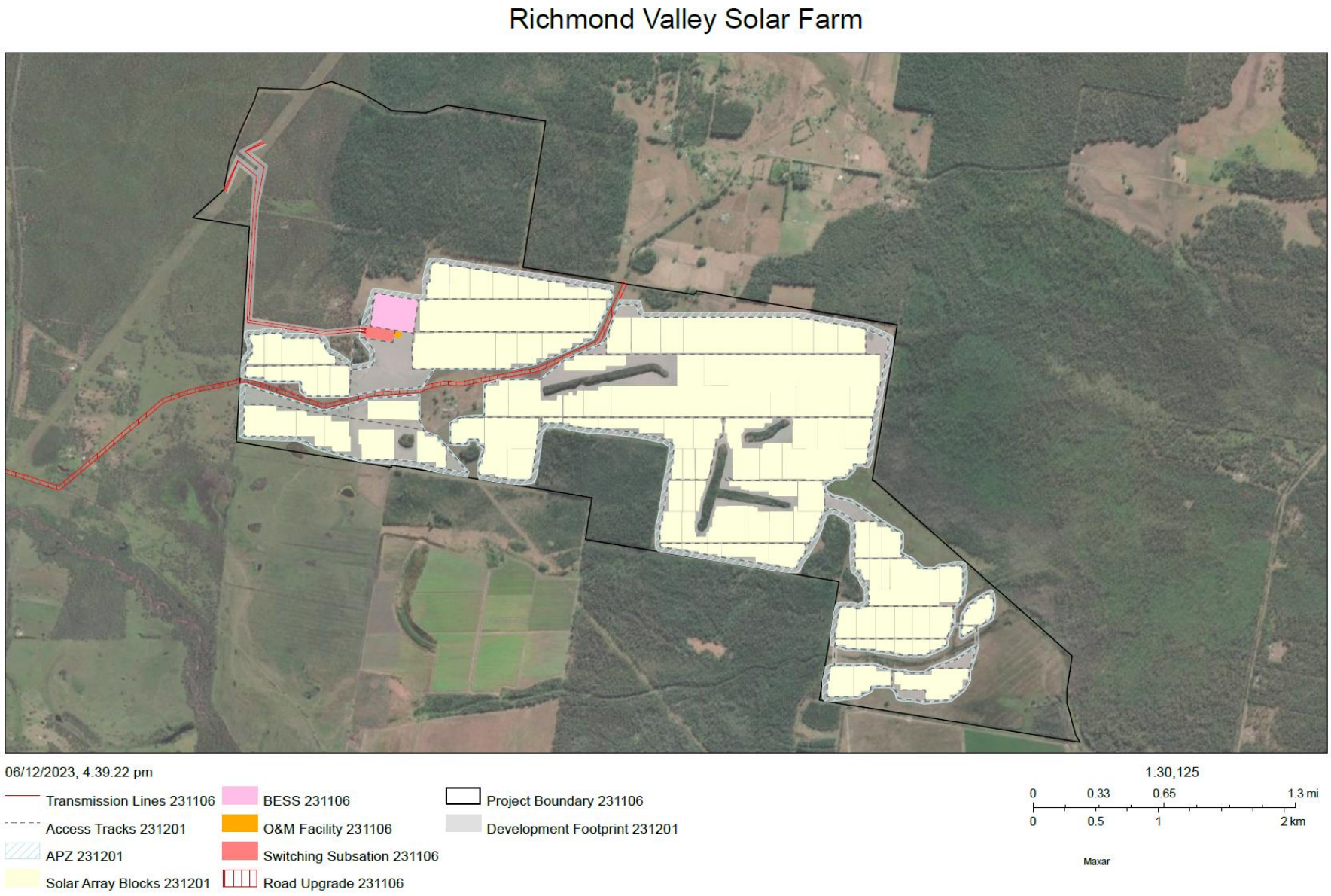

Figure 4: Concept layout showing key features including the bushfire Asset Protection Zones (APZ)

The site is located within the Richmond Valley Council local government area (LGA) and is located predominantly within the locality of Myrtle Creek, with Ellangowan to the north. The overall site covers approximately 1475 ha, with the project footprint (PF) of approximately 803 ha within the overall site being the solar farm and associated infrastructure.

The PF is on both sides of Avenue Road. The area to the west of Avenue Road is currently used for cattle grazing and for timber clearing (under a Property Vegetation Plan). The area to the southeast of Avenue Road was historically used for private native forestry and is now used primarily for cattle grazing. The site topography generally slopes to the south-east towards Physics Creek with ridgelines to the southwest, west, north, and east.

The PF is mostly cleared agricultural land, with larger areas of intact / dense vegetation primarily in the north-western corner abutting the Ellangowan State Forest. This area was identified through avoiding land which is subject to environmental constraints (for example, areas with substantial native vegetation present, aboriginal heritage sites, or areas subject to flooding). The habitat areas within the site are highly fragmented, however some connectively between vegetated areas does remain in parts. The site abuts the Ellangowan State Forest to the north-west and Bungawalbin State Forest to the east. The site is not within proximity of any National/World Heritage places or Ramsar Wetlands. The overall site is characterised as sitting in a rural landscape with a mixture of agricultural operations, forestry and native vegetation as the main uses.

The site has a history of being impacted by bushfire and the October 2019 Busby's Flat fire was a very major and intense bushfire impacting the site that burnt over 50,000 ha in the local area and destroyed approximately 40 homes. Together with the Myall Creek Road fire, these fires together impacted approximately 48% of the Richmond Valley LGA and destroyed 62 homes in the LGA. There are approximately 49 rural residential dwellings within a 4 km radius of the site and various agricultural uses, agricultural commercial operations and associated infrastructure.

The method of connection to the high transmission line, specifics of the BESS and substation, and specific construction layout of the arrays will continue to be refined through the detailed project design process. Significant work has already been undertaken to ensure bushfire protection measures are incorporated into the overall design process. Throughout the design process the concept of understanding the vulnerability of the future assets to bushfire and relevant mitigation strategies has been explored and has included design amendments to reduce risk and the incorporation of Asset Protection Zones (APZ).

The detailed layout and overall developmental configuration has been informed by the technical assessments performed during the preparation of the EIS and will continue through the detailed design phase of the Project. Project infrastructure will be positioned, where possible, to avoid identified constraints with 'safer' areas identified and signposted, and additional water supplies in suitable locations and compliant with RFS standards.

Limitations

Australia has a history of high consequence bushfires, which have caused loss of life, damage and disruption. Risk based land use planning provides the tolerable bushfire risk levels through documents such as PBP, legislation, policy and guidelines.

Risk based land use planning has consistently been identified as one of the key means to reduce natural disaster risks to assets and communities. Improved risk-based land use planning in areas that are subject to natural hazard are fundamental to developing and enhancing resilient development, critical infrastructure and communities.

The objectives of PBP articulates the criteria to determine tolerable risk to assets and people associated with 'other' development. As SSD, the Project is exempt from the requirement under the EP&A Act to comply with PBP and does not require a BFSA. However, the SEARs issued under the EP&A Act for SSD projects requires this Project to be assessed for the potential hazards and risks to bushfires, which aligns with compliance against the PBP. The level of bushfire risk to and from the proposed development means PBP should been considered in the design and operation of the Project. Solar farms are addressed in PBP under Section 8.3.5, however in general terms, electricity assets such as BESS, substations and high-voltage transmission lines are not specifically addressed in PBP. As the design phase progresses it is expected that additional requirements will be sought by the chief combat agencies including typically a Fire Safety Study and a Bushfire Emergency Management and Operations Plan.

In order to understand the nature of bushfire risks posed to the assets, people working on the site and people using the access road to and from the site, it is critical to contemplate the elements of bushfire risk which may be relevant.

Bushfire History

The site and broader landscape have an assumed and documented history of bushfires. The most significant was the Busby's Flat Fire which impacted across the site and the wider area in October 2019. The Fire Extent and Severity Mapping (FESM) is a rapid assessment method by National Parks and Wildlife

Service (NPWS) in collaboration with others in NSW. The purpose was originally to deliver timely fire severity mapping during the fire season using satellite imagery and machine learning. The system is becoming increasingly sophisticated and better ground truthed for continuous improvement, and NPWS is now publishing annual reports for comparison purposes as well as making the data available through the very well supported public GIS Sharing and Enabling Environment Data Portal (SEED). The darker the shade mapped the hotter the fire and more severe the scar. This information is used for multiple purposes including future erosion and sedimentation hotspots and future prescribed burn planning. This type of bushfire mapping provides a greater level of detail than traditional mapping.

Figure 5 shows the FESM in the area across the FESM series of years since 2016, excluding the 19/20 year. The darker the shading the more intense the fire and severe the burn. Figure 6 is a closer extract showing the impact of bushfires in and around the site during the 2019/20 season. The mapping shows grassfire extent less well, however regardless it is clear to see that grasslands and actively managed areas are much less affected than forested areas.

It is also apparent that during bad fire weather conditions with an FBI of 50+, particularly over multiple days or following an extended period of drought, no amount of preparation works such as hazard reduction burning, fire trail maintenance, mechanical vegetation works etc is going to significantly slow or stop a fully developed fire in the heavily forested areas surrounding the site.

In keeping with the basic premise of all natural disaster risk management, the balance to be found is what is an acceptable risk of impact to the site, or indeed from the site.

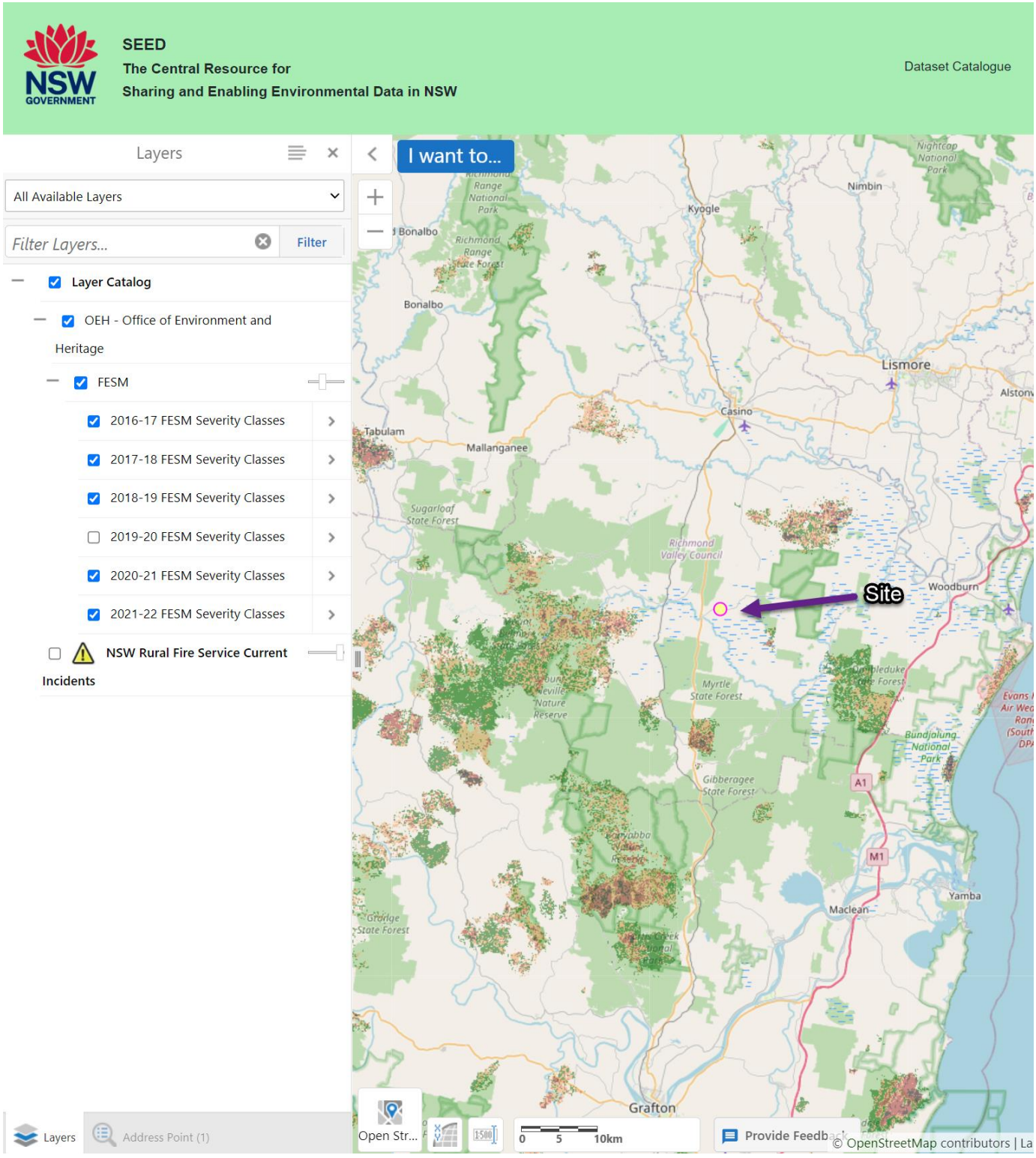

Figure 5: FESM mapping extract via SEED Portal for noted years. The darker the shade the hotter and more severe the fire.

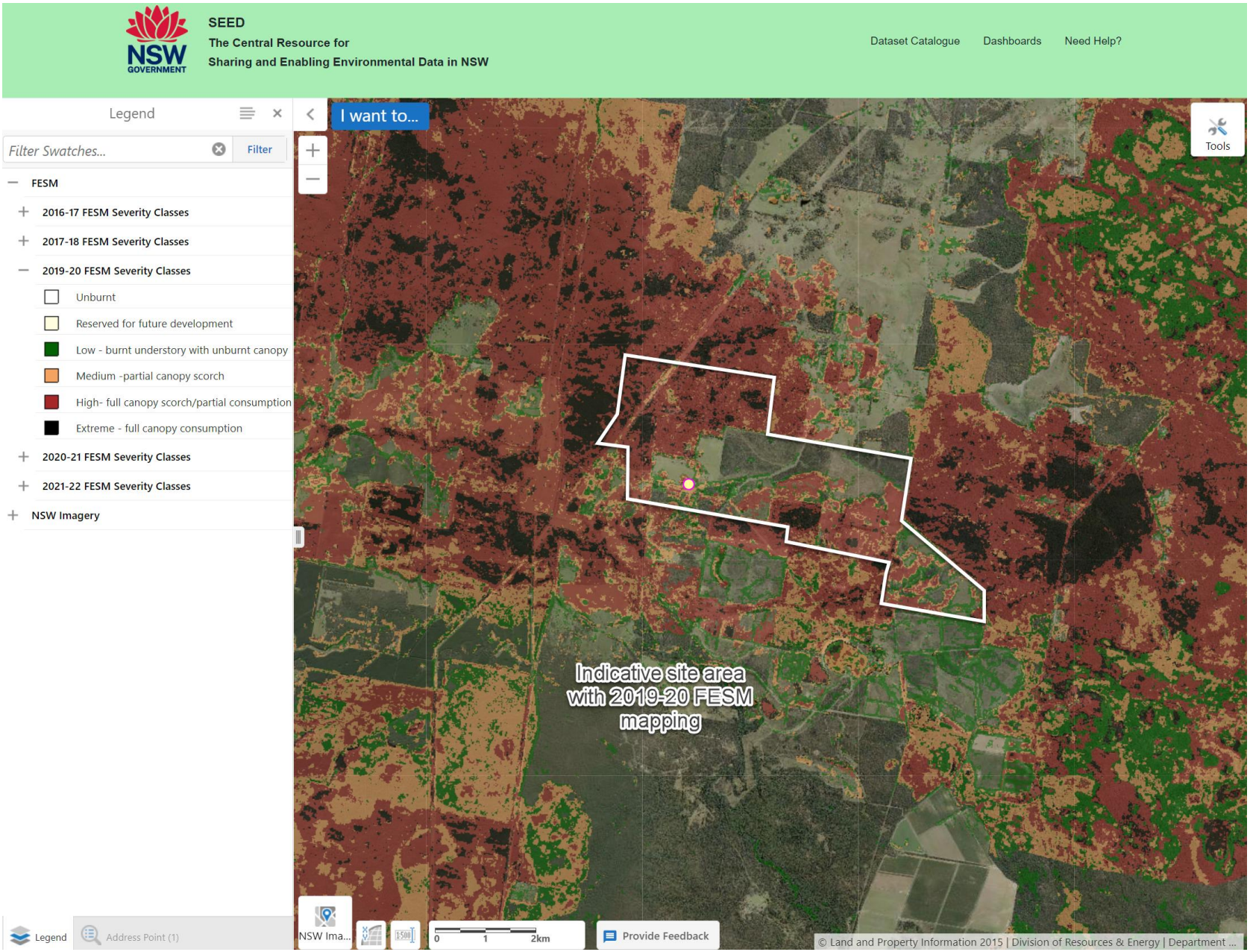

Figure 6: FESM mapping for 2019/20 fire in Project area.

Bushfire risk concepts to consider for solar farms in forested areas.

There are a number of interrelated risk scenario concepts that need to be considered and balanced when considering the suitability of the site for the Project. These fall into the broad categories of:

- The potential impact of bushfires on critical power generation systems i.e. solar farm & BESS
- The potential impact of additional ignition sources arising from the solar farm & BESS
- The potential for higher risk of bushfire impact on surrounding residential, agricultural and forest users (e.g. local residents, agricultural workers, Forestry Corporation staff, contractors, volunteers, visitors etc.) and surrounding communities if there is a greater risk of bushfire associated with the projects.
- The potential for positive impacts on local bushfire management arising from the active management, additional investment and additional trained staff associated with the Project.

These potential scenarios affect different stakeholders in various ways, and it is reasonable to expect there may be a different perceived level of risk associated with solar farms by different stakeholders. These perspectives have been playing out across jurisdictions in Australia in various ways and will be explored further below.

The first impact, that of bushfire on solar farm infrastructure and operations, is a focus for the developer and operator primarily, although there may be wider impacts on electricity supply. This is a matter for Ark Energy and partners to determine the appropriate risk tolerance for disruption to their activities, balancing the various practical and commercial aspects of bushfire impact and the potential scale of a bushfire impact on the assets. The establishment of APZ substantially larger than required by PBP including a 100m APZ around the BESS and maintenance of the connecting high voltage power easement to APZ standards will significantly mitigate bushfire risk, particularly from the northwest of the site which is associated with bad fire weather days with hot, dry north to westerly winds.

It is unclear at what level of fire intensity there may be a generalised short term impact on operations up to a particular fire intensity (e.g. lower performance from smoke affected panels or need to shut down temporarily) which is determined as acceptable, and at what threshold there may be beyond which catastrophic failure may occur. This also relates to the solar farm as a whole across the landscape, that is one sector of arrays may be impacted by bushfire and this is considered acceptable, whereas an impact on the whole solar farm may be considered unacceptable.

2. Legislation, Policy and Guidelines

Statutory Requirements

The Project is considered State Significant Development (SSD) under the *Environmental Planning and Assessment Act 1979* (EP&A Act) as it satisfies the requirements of Clause 2.6 of the *State Environmental Planning Policy (Planning Systems) 2021* (PS SEPP), being:

1. *Development is declared to be State significant development for the purposes of the Act if—*
   a. *The development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and*
   b. *The development is specified in Schedule 1 or 2 of the PS SEPP.*

Environmental Planning and Assessment Act 1979

The NSW EP&A Act requires that any development on BPL for any purpose complies with the aim and objectives of PBP. SSD is exempt from this requirement but is generally encouraged to comply with PBP. As such, a Bush Fire Safety Authority (BSFA) is not required for SSD. However, the SEARs issued under the EP&A Act for this SSD Project requires this Project to be assessed for the potential hazards and risks to bushfires, which aligns with compliance against the PBP.

Environmental Planning and Assessment Act, 1979: Section 10.3 Bushfire Prone Land

The designation of BPL in NSW is required under the EP&A Act (s.10.3). BPL Maps provide the trigger for the various development assessment provisions. The BPL Map is a trigger for the consideration of bushfire matters for new development (Figure 7). It is not intended as a detailed measure of risk. The BPL Map should be updated once the development is constructed.

Rural Fires Act, 1997

The (NSW) Rural Fires Act 1997 (RF Act) establishes the NSW Rural Fire Service, defines its functions and makes provision for the prevention, mitigation and suppression of rural fires. Section 63 of the RF Act requires public authorities and owners and occupiers of land to prevent bushfires and to manage land they are responsible for. The RF Act states that it is the duty of public authorities, landowners and occupiers to take all notified and practical steps to prevent ignition and minimise spread on or from their land.

The RF Act provides for the RFS Commissioner to declare the bushfire danger period which generally runs from October to March (inclusive), which can be modified by the RFS. Total fire bans (TOBANs) may be issued by the RFS Commissioner in the interests of public safety. Section 63 places an ongoing bushfire management requirement on the Project to mitigate the risk of bushfire within the Site.

Planning for Bushfire Protection 2019

This is the key bushfire risk assessment planning document in NSW. This document contains specifications for planning and building on land identified as bushfire prone. PBP seeks to provide for human safety (including fire fighters) during bushfire events and minimise the effects of bushfires on property; while considering development potential, site characteristics and protection of the environment. As an SSD, the Project is exempt from the requirement under the EP&A Act to comply with PBP. However, the SEARs issued under the EP&A Act for SSD projects requires this Project to be assessed for the potential hazards and risks to bushfires, which aligns with compliance against the PBP.

Further detail on regulatory framework is included in Appendix 2.

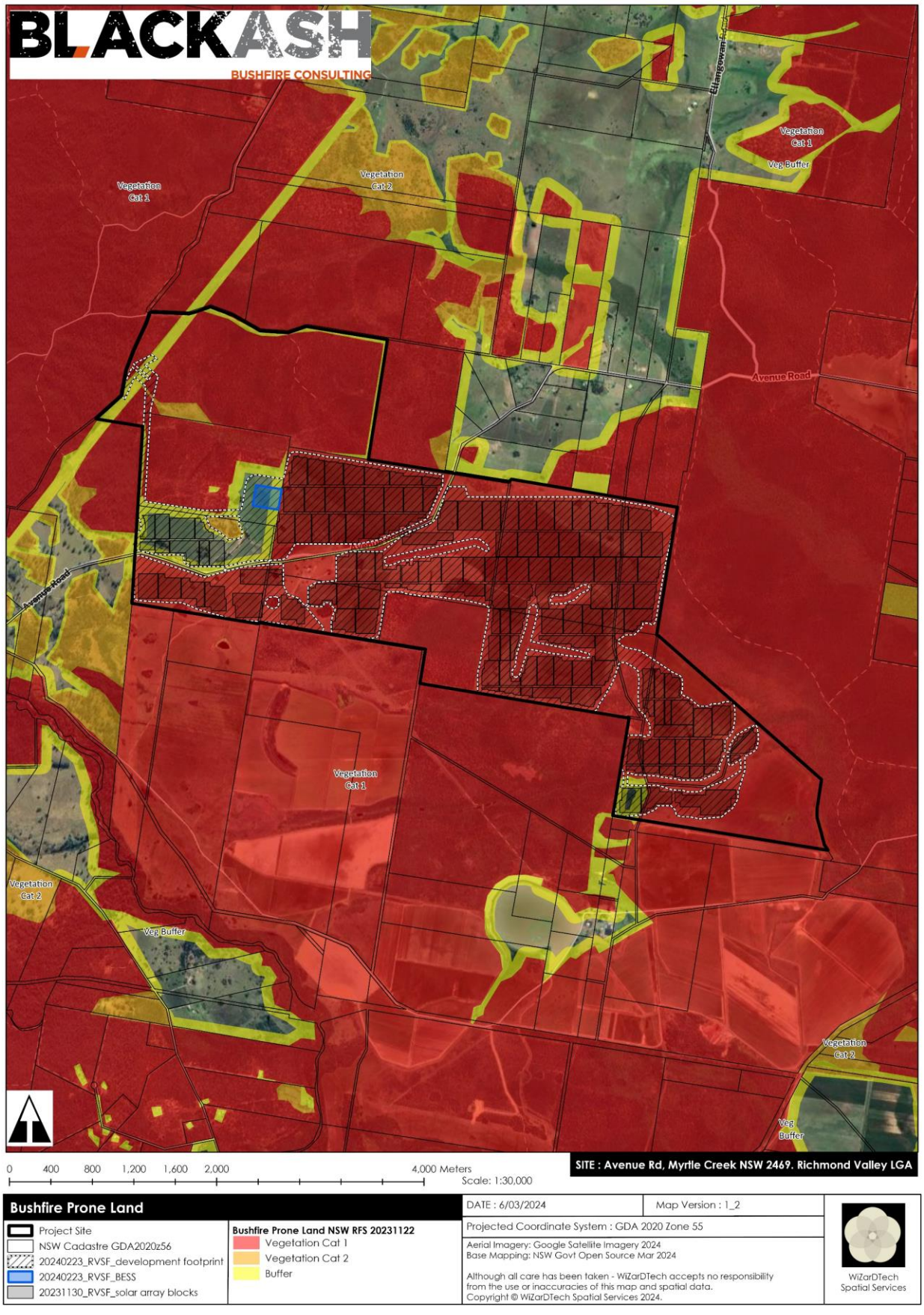

Figure 7: Bushfire Prone Land Map

3. Bushfire Risk Management Plan Review

The *Northern Rivers Bush Fire Risk Management Plan 2021* (BRMP) is a strategic document that identifies community assets at risk and sets out a five-year program of coordinated multi-agency (state and local) treatments to reduce the risk of bushfire to the assets. The Risk Plan (p. 7) identifies the typical climate in the Northern Rivers area as identified by the Bushfire Management Committee (BFMC) (in which the Site and Project are located) notes:

> *The typical / average climate in the Northern Rivers BFMC area is warm subtropical with a well-defined summer / autumn rainfall peak (January to March) and a dry winter and spring. The climate in forested areas at higher altitudes tends towards warm temperate. The temperature and rainfall conditions vary across the district. The rainfall can be unreliable during the late winter / spring period, particularly on the lower altitude landforms.*
>
> *The bush fire season generally coincides with strong south-west to north-west winds, which tend to prevail during late winter / spring (August / September) and often result in very high to severe fire danger days, particularly where the drought indices are low. The majority of serious bush fires occur from this period until the onset of summer rains, which normally start from December and continue through to autumn. Longer fire seasons are experienced when summer rainfall is lower than normal, with the bush fire season extending through summer to early autumn.*
>
> *The Northern Rivers BFMC area commences its Bush Fire Danger Period on the 1st of September each year in recognition of a typical early onset of bush fire dangers across the region. This is one month earlier than the statutory period. In a typical year, the Bush Fire Danger Period generally ends in February due to typically high rainfall that occurs in the late summer months. This is assessed by the BFMC each year and varied as required.*

The BRMP provides the following regarding the history of bushfire frequency and ignition cause:

> *The Northern Rivers BFMC area has around 120 bush fires per year, of which 7 on average can be considered to be major fires.*
>
> *The main sources of ignition in the Northern Rivers BFMC area are:*
>
> - *Pre-bush fire danger period burns;*
> - *Illegal burning off;*
> - *Arson;*
> - *Escapes from legal burning off; and*
> - *Lightning.*

The 2019/2020 bush fire season was one of the worst on record with nearly 48% of the Richmond Valley LGA experiencing fire. The Northern Rivers (along with most of NSW) was severely drought-affected, with wet sclerophyll vegetation in the Mt Nardi area also affected by fire.

The Risk Plan follows the RFS guidelines for the assessment of bushfire risk. Identifying the level of bushfire risk firstly involved identifying important community assets considered to be at risk from bushfire in the *Orana* BFMC area, and then assessing the likelihood and consequence ratings. The risk planning process requires that all asset types assess the likelihood of a bushfire occurring. This involves considering fire history, including ignition cause and patterns, known fire paths, access, containment potential and potential fire run (size of the vegetated area).

The Risk Plan does not identify the development site specifically (see Figure 10); however it puts the site in the broader landscape context.

It is instructive to consider the ratings of various surrounding asset groups. An extract from the BFRMP Asset Register forms Figure 8 and shows the focus of higher risk assets in the area is generally the relatively isolated rural residential areas, and the NSW Forestry Corporation assets which are all rated as having an Extreme Risk. It is noted that the updated BRMP was developed after the catastrophic 2019/2020 bushfire season. Figure 9 is an extract from the BRMP Treatment Register.

Appendix 2 Asset Register

Map reference number	Asset type	Asset sub type	Asset name	LGA	Display area	Likelihood	Consequence	Risk	Priority	Treatment number
46	Human Settlement	Residential	Ellangowan Residential Area	Richmond Valley	Richmond Valley	Almost certain	Major	Extreme	1C	48;52;53;43
47	Human Settlement	Residential	Tabbimoble Rural Residential	Richmond Valley	Richmond Valley	Almost certain	Major	Extreme	1C	48;19;47;52;51;42;45
48	Human Settlement	Residential	Bungawalbyn Rural Residential	Richmond Valley	Richmond Valley	Almost certain	Major	Extreme	1C	48;19;47;52;51;44
49	Human Settlement	Residential	Myall Creek Rural Residential	Richmond Valley	Richmond Valley	Almost certain	Major	Extreme	1C	48;19;47;52;51;44
50	Human Settlement	Residential	Myrtle Creek Rural Residential	Richmond Valley	Richmond Valley	Almost certain	Major	Extreme	1C	48;19;47;52;51;42
51	Human Settlement	Residential	Kippenduff Rural Residential	Kyogle	Richmond Valley	Almost certain	Major	Extreme	1C	48;42;45
52	Cultural	Non Indigenous	New Italy Museum Complex	Richmond Valley	Richmond Valley	Almost certain	Major	Extreme	1C	48
53	Human Settlement	Residential	Clearfield Rural Residential	Richmond Valley	Kyogle;Lismore	Almost certain	Major	Extreme	1C	48;45
54	Economic	Commercial Forest	Forests NSW Plantations	Kyogle	Kyogle	Almost certain	Major	Extreme	1C	54;51
55	Economic	Commercial Forest	Forests NSW Plantations	Lismore	Lismore	Almost certain	Major	Extreme	1C	51;54
56	Economic	Commercial Forest	Forests NSW Plantations	Richmond Valley	Richmond Valley	Almost certain	Major	Extreme	1C	51;54
0	Human Settlement	Residential	Whiporie Village	Richmond Valley	Richmond Valley	Likely	Major	Very High	2A	58;61;57;51;53;42
0	Human Settlement	Residential	Rural properties north of Wiangaree	Kyogle	Kyogle	Likely	Major	Very High	2A	4;48;56;43

Figure 8: Extract from Northern Rivers BRMP Risk Register

Appendix 3 Treatment Register

Priority (Risk Rating)	Asset ID	Asset Name	Class	Subclass	Strategy	Treatment ID	Action Description	Responsible Agencies
	46	Ellangowan Residential Area	Human Settlement	Residential	Community Education	43	Undertake Community Engagement	RFS
					Hazard Reduction	48	Maintain Roadside Vegetation	LGA
					Property Planning	52	Promote & Implement Static Water Supply Program	RFS
						53	Develop, maintain and promote CPP	RFS
	50	Myrtle Creek Rural Residential	Human Settlement	Residential	Community Education	42	Community Engagement RFS	RFS
					Hazard Reduction	47	Implement Strategic Fire Advantage Zone	RFS
						48	Maintain Roadside Vegetation	LGA
					Property Planning	19	Implement NPWS Reserve Fire Management Strategy	NPWS
						51	Implement Forests NSW Fire Management Plans	FCNSW
						52	Promote & Implement Static Water Supply Program	RFS
	54	Forests NSW Plantations	Economic	Commercial Forests	Property Planning	51	Implement Forests NSW Fire Management Plans	FCNSW
						54	Undertake Fire Protection Planning	FCNSW
	55	Forests NSW Plantations	Economic	Commercial Forests	Property Planning	51	Implement Forests NSW Fire Management Plans	FCNSW
						54	Undertake Fire Protection Planning	FCNSW
	56	Forests NSW Plantations	Economic	Commercial Forests	Property Planning	51	Implement Forests NSW Fire Management Plans	FCNSW
						54	Undertake Fire Protection Planning	FCNSW

Figure 9: Extract from Northern Rivers BRMP Treatment Register

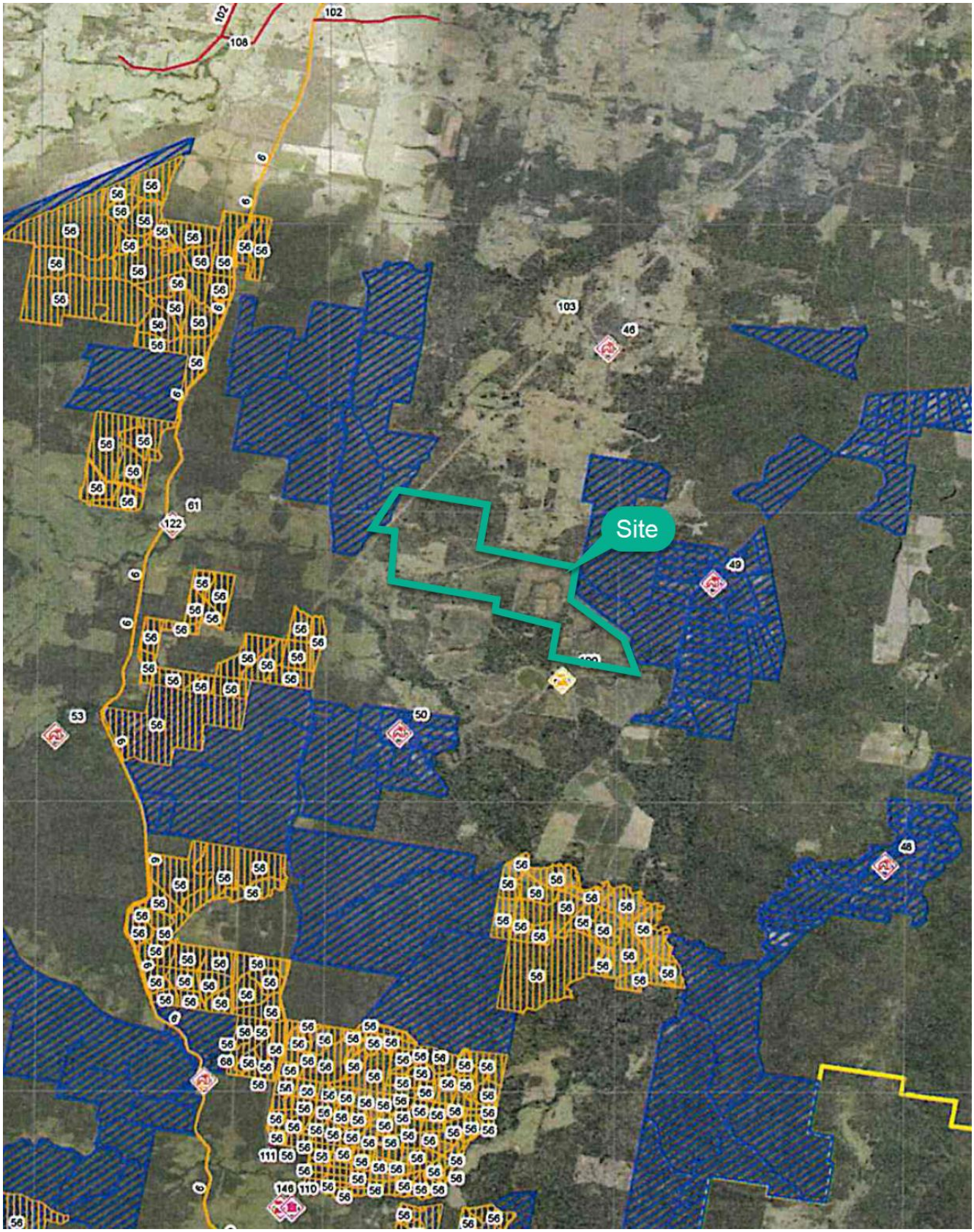

Figure 10: Extract from BRMP Map 3 showing assessed risk context. The blue shaded areas are Strategic Fire Advantage Zones identified for future strategic Hazard Reduction Burning.

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Zone	Purpose	Suppression Objective(s)	Zone characteristics
Asset Protection Zone	To protect human life, property and highly valued public assets and values.	To enable the safe use of **Direct Attack** suppression strategies within the zone. To minimise bush fire impacts on undefended assets.	As per RFS document *Standards for Asset Protection Zones.*
Strategic Fire Advantage Zone	To provide strategic areas of fire protection advantage which will reduce the speed and intensity of bush fires, and reduce the potential for spot fire development; To aid containment of wildfires to existing management boundaries.	To improve the likelihood and safe use of: **Parallel Attack** suppression strategies within the zone. and/or **Indirect Attack** (back burning) in high to very high fire weather conditions within the zone. To reduce the likelihood of: Crown fire development within the zone. and/or Spot fire ignition potential from the zone.	Zone width related to suppression objectives and dependent upon: • Topography • Aspect • Spotting propensity • Location of adjacent firebreaks • Mosaic pattern of treatment Assess Overall Fuel Hazard (OFH) once vegetation communities reach minimum fire thresholds within this plan. Management practices should aim to achieve mosaic fuel reduction patterns so that the majority of the SFAZ has an OFH of less than high.
Land Management Zone	To meet relevant land management objectives in areas where APZs or SFAZs are not appropriate.	As per the land management and fire protection objectives of the responsible land management agency. To reduce the likelihood of spread of fires. To undertake mosaic burning	As appropriate to achieve land management e.g. heritage and/or fire protection e.g. broad scale mosaic burning objectives.
Fire Exclusion Zone	To exclude bush fires.	N/A	Variable dependant on size of fire sensitive area requiring protection.

Table 3.1 Bush Fire Management Zones: Purpose, objectives and characteristics

Figure 11: BRMP Table 3.1 defining the purpose, objectives and characteristics of the different vegetation zones.

The Treatment Register for the rural residential areas and the forested areas shows the following treatments:

- Undertake community engagement
- Maintain roadside vegetation
- Promote and implement Static Water Supply program
- Develop, maintain and promote CPP
- Implement Strategic Fire Advantage Zone
- Implement NPWS Reserve Fire Management Strategy
- Implement Forests NSW Fire Management Plans
- Promote and implement Static water supply program.

These treatments are in addition to the BFMC wide treatments undertaken by the various agencies and land managers. Of particular relevance around the project site are the identification of the Strategic Fire Advantage Zones (SFAZ) in the adjoining Forests NSW estate, and the implementation of the agency fire management plans. Both these treatments are linked to more specific planning for the maintenance of fire trails, water supply and APZ on that public land, and to undertaking planned HR burning to put a mosaic of controlled burns into the landscape over time.

Overall, the BRMP recognises the Extreme Risk profile of the rural residential and forestry assets immediately adjoining the site. There are both threats and opportunities to consider with respect to the Project. Understanding that bushfires will always be a part of the landscape there are opportunities to both manage the risk from the site, and recognise the opportunities identified by the BRMP for the Project to make a positive contribution to community bushfire preparedness.

4. Assessment Methodology

This SSD project is subject to the DPE SEARs which requires an assessment of potential hazards and risks including but not limited to:

> *identify potential hazards and risks associated with bushfires / use of bushfire prone land including the risks that a solar farm would cause bush fire and demonstrate compliance with Planning for Bush Fire Protection 2019;*

For this stage of the process Fire and Rescue NSW (23/7/23) and the RFS (4/9/23) have provided broad input for the proposal, which is incorporated into this BTA, and the agencies are awaiting further detail at EIS submission. Section 2.4.2 of the PBP in relation to SSD projects states "*Given the scale of SSI and SSD projects, the requirements of this document (PBP) should still be applied and seeking advice from the NSW RFS is encouraged.*" Typically once the formal assessment phase of the EIS is undertaken both agencies provide detailed feedback and draft consent conditions.

In undertaking this BTA, Blackash has firstly undertaken a landscape wide assessment of the bushfire risk and secondly, a review of the Northern Rivers Bush Fire Risk Management Plan 2021 to gain an appreciation of the broader strategic risk affecting the Project. The bushfire landscape assessment considers the likelihood of a bushfire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.

Thirdly, PBP articulates the formal regulatory framework for new development in NSW, along with the relevant bushfire protection measures to be contemplated in the delivery of bushfire-resilient development design. The document provides detailed provisions for various types of development which is focused at residential and Special Fire Protection Purpose development which are vulnerable uses such as schools, hospitals, aged care etc.

The Project is considered as 'other development' in PBP. 'Other development' includes industrial, commercial and infrastructure development. PBP does not provide a framework for the Project in a meaningful way as the document is focused on new residential development on BPL. However, 'other development' must satisfy the aim and objectives of PBP. This assessment includes an analysis of the hazard, threat and subsequent bushfire risk to the Project and provides recommendations that satisfy the aims and objectives of PBP. Section 8.3.5 of PBP (p. 77) 'Wind and solar farms' provides specific considerations.

PBP identifies the methodology to determine Bushfire Attack Levels (BAL) based on calculated radiant heat levels at a site. This assessment is based on mapping of vegetation formations and slope assessment in accordance with PBP. This assessment is based on a detailed GIS analysis of the Site with accessible public data layers utilising the following resources:

- Planning for Bushfire Protection (RFS, 2019);
- Aerial mapping; and
- Detailed GIS analysis.

Bushfire risk, as influenced by fire history and future mitigation strategies (e.g., hazard reduction burning), has no bearing on the determination of bushfire protection strategies for future development of the Project. This is due to the fact that PBP assesses bushfire threat based purely on vegetation and slope (i.e., hazard and not risk), making the assumption that a fire may occur at a near worst-case fire weather scenario and with maximum fuel loads.

The more detailed consideration of bushfire risk to the Project has followed the methodology outlined in accordance with PBP. The following methodology is from PBP (p. 80) which has been used to determine the BAL at the Site. The process to determine BAL is outlined below:

To Determine Bushfire Attack Level (BAL):

- Step 1: Determine vegetation formation in all directions around the building to 140 metres
- Step 2: Determine the effective slope of the land from the building for 100 metres
- Step 3: Determine the relevant FFDI for the council area where development is to be undertaken
- Step 4: Determine the separation distance by measuring from the edge of the unmanaged vegetation to the closest external wall of an asset
- Step 5: Match the relevant FFDI, appropriate vegetation, distance, and effective slope to determine the appropriate BAL using the relevant tables in PBP.

The FFDI, vegetation formations (bushfire fuels) and the topography (effective slope) combine to create the bushfire threat that may affect bushfire behaviour at the Site, and which determine the planning and building response of PBP. A detailed assessment has been undertaken to determine the bushfire hazard and likely radiant heat at the Site.

5. Assessment

Impact of the Project on Bushfire Risk

Given the presence of bushfire prone land, bushfire history and dense vegetation in proximity of the Project Area there is an existing bushfire risk as well as potential for the Project to alter this risk.

Community concerns regarding new technology and practices have been identified during consultation and in particular how these may impact the landscape and bushfires, and whether a suite of risk mitigation measures can be developed and maintained to reasonably manage risk. These issues and perceptions are particularly important given the presence of bushfire prone land, dense vegetation and the impacts of the high intensity bushfires recently experienced by the local community.

There appears to be little actual data on the impact of wildfires on solar farms at this stage, largely due to the recent nature of the industry and limited reporting or literature on the impact of bush and grass fires on existing solar farms. Grassland areas result in quicker fires with much shorter "dwell" or "residence" times compared to forest fires. The fires move fast and burn off most of the fuel immediately rather than forest fires that may burn much hotter and longer. Forest fires also give off considerably more embers which can also travel further. This further supports the proposition that suitable APZ, first response firefighting capability and substantial water supplies will be required.

Similarly, there is no data suggesting that solar farms have been a source of bushfire ignition in Australia to date. Any electrical equipment, including solar panels, can potentially pose a fire risk if they malfunction or if there are issues with maintenance or installation. Risk mitigation measures will significantly reduce any chance of bushfire ignition and include:

- ongoing management of PF to APZ standard,
- the use of larger than required APZ around both the BESS (100m) and the overall PF (BAL-29 standards – 11-29m),
- ongoing site staff presence for bushfire awareness and initial suppression,
- permanent firefighting water supplies,
- automatic fire detection and suppression systems to power generation industry standard.

Fire intensity can be calculated and is typically measured in the radiant heat flux generated kW/m^2. With respect to bushfires this provides a very good surrogate for the other bushfire attack mechanisms including direct flame contact, convective and conductive heat exposure, potential intense winds generated, impacts of windborne debris, impacts of burning debris and embers, and the impacts of smoke. Figures 12 & 13 are presented to provide greater clarity on bushfire attack mechanisms and

impacts of radiant heat. The building construction standards introduced in the figures below will be discussed further within the report.

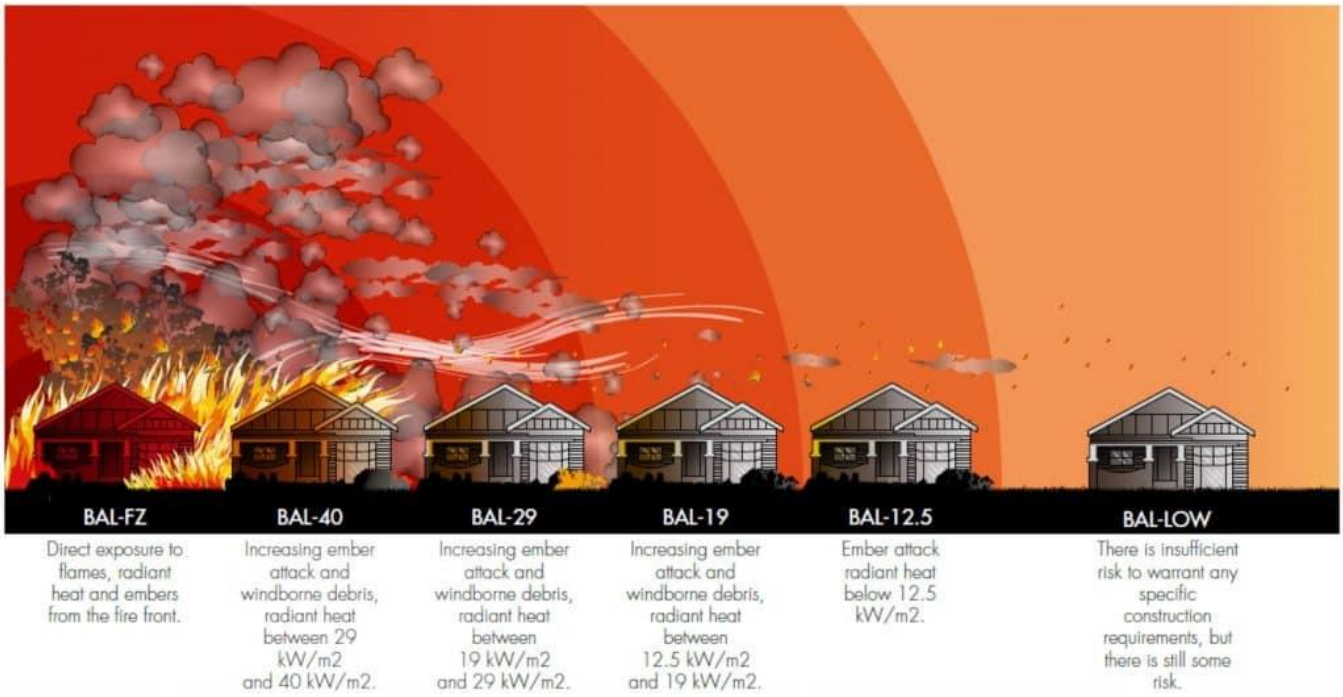

Figure 12: Bushfire attack mechanisms and relationship to radiant heat levels and building construction standards (CFA; AS3959:2018)

Radiant heat flux kW/m²	Observed effect
1	Maximum for indefinite skin exposure
3	Hazardous conditions, firefighters expected to operate for a short period (10 minutes)
4.7	Extreme conditions, firefighters in protective clothing will feel pain after 60 seconds of exposure
6.4	Pain after 8 seconds of skin exposure
7	Likely to be fatal to unprotected person after exposure for several minutes
10	Critical conditions, firefighters not expected to operate in these conditions although they may be encountered. Considered to be life threatening in less than 60 seconds in protective equipment. Fabrics inside a building could ignite spontaneously with long exposure.
12.5 (BAL-12.5)	Volatiles from wood may be ignited by pilot after prolonged exposure. Standard float glass could fail during the passage of a bushfire.
16	Blistering of skin after 5 seconds
19 (BAL-19)	Screened float glass could fail during the passage of a bushfire.
29 (BAL-29)	Ignition of most timbers without piloted ignition (3 minutes of exposure) during the passage of a bushfire. Toughened glass could fail.
40+	Flame zone – exposure to direct flame contact from fire front

Figure 13: The effects of radiant heat (NSW RFS 2006; CFA 2012)

The total prevention of bushfires is not possible, and neither is the protection of all assets. What is common when considering all these scenarios are the overarching common goals to prevent bushfire ignitions, design and prepare to facilitate effective bushfire suppression where possible, reduce the likelihood of bushfire spread on the property, and focus on protecting human life where suppression is no longer possible. It is likely that the risk of a solar farm or BESS igniting a bushfire is very small given the suite of risk mitigation measures.

Larger than required APZ proposed for the site both protect the solar farm assets from bushfire, and also reduce the chance of any ignition caused through electrical failure from spreading or developing into a bushfire. The presence of permanent trained staff and bushfire prevention protocols will significantly reduce the chance of any ignition spreading.

Permanent trained staff onsite will be an additional resource to see, report, and potentially provide an initial bushfire response to fires caused by lightning strikes and other typical ignitions in the local area, reducing the likelihood or impact of bushfires in the wider local area.

The single axis tracking frames are of heavy duty steel construction and are likely to be highly resistant to bushfire attack, with typical industry standard panels designed for extended operation in the field. The only vegetation underneath the arrays and generally within the development footprint overall will be grassland that is maintained to the required APZ standard, effectively 'managed land'. The 2.5m mounting height will be of benefit in facilitating ongoing maintenance, and it is understood that key cabling for the system will be provided underground.

The substation will use well established setback distances typically surrounded by gravel hardstand to aid construction and servicing. The BESS will similarly be surrounded by a **100m APZ** setback on the north and west sides exposed to bushfire risk as well as non-combustible hardstand areas of approximately 20m width around the BESS to aid construction and ongoing maintenance. This layout will also provide very significant protection against any potential fire escape into the bushland should there be a fire in the BESS and provide substantial areas for firefighting operations.

Additionally, the transmission line extending from the substations to the high voltage grid connection point along the northern side of that section of the solar farm will be maintained to APZ standards. This will result in an effective **50m** wide APZ along this part of the Project.

There is no cumulative impact on bushfire risk if other solar farms are developed to similar standards, other than a larger area of managed land.

Landscape Scale Assessment

The *Victorian Planning Permit Applications Bushfire Management Overlay – Landscape Scale Threat Assessment* has been used as the framework to assess the broader landscape scale potential of bushfire affecting the Site. Blackash has expanded and modified the criteria to emphasise the priority of life safety, and the criticality of bushfire emergency management and evacuation planning as part of the broader landscape risk assessment process. NSW does not have a landscape scale risk assessment process for new development and the use of the modified Victorian model is appropriate for assessment purposes.

The Blackash Landscape Scale Assessment Tool (LSAT) combines quantitative and qualitative techniques which are scaffolded by the Landscape Scale Threat Assessment and associated documentation. The approach is shown in Table 1 and uses elements of the Bayesian decision making model and Expert Judgment techniques backed by data. Bayesian decision making has been used where there is both objective and subjective data to analyse, and decisions need to be made on the probability of successful outcomes where there are high levels of uncertainty. Expert Judgement has been used in the assessment and determination of the landscape scale risk.

The likelihood of a bushfire, its severity and intensity, and the potential impact on life and property varies depending on where a site is in the broader landscape. Landscape scale fires will place greater pressure on emergency response capability and will have a wider impact on roads and the length of time roads cannot be safely used. This will affect the likelihood of successful evacuations taking place across larger areas.

Multiple factors have been considered for the landscape scale assessment. Key considerations in our assessment have included:

- Extent and continuity of vegetation
- Topography
- Prevailing winds
- The potential fire run and area that is likely to be impacted by the fire
- The impact on evacuation routes to safer places considering road networks, distances, and landscape factors
- The location and exposure of the development to bushfire
- The ability to seek bushfire shelter on site or at alternative locations
- The extent of neighbourhood-scale damage the bushfire may produce.

The Landscape Scale Assessment Tool (LSAT) rates the Project bushfire risk as High Threat (see Figure 14). The proposed development is subject to **High** landscape scale bushfire risk.

It is important to note that the LSAT has been developed with a focus on life safety and future residential suitability, rather than being directly analogous to this development, however again this provides another useful tool in assessing the suitability of the site and guiding the future design requirements to manage risk to a tolerable level.

Landscape Scale Assessment Tool

Richmond Valley Solar Farm and BESS

Landscape scale bushfire risk factors

Parameter	Low landscape scale threat	Moderate landscape scale threat	High landscape scale threat	Extreme landscape scape threat	Site risk
1. Surrounding Vegetation	Landscape scale bushfire cannot directly approach the site as it is surrounded by urban development and non-mapped vegetation or managed land.	Landscape scale bushfire can only approach from one aspect and the site is within a suburban, township or urban area considered managed land. Typically an island of bushfire vegetation within a wider urban development area or interface site impacted only by linear vegetation corridors of 100m width or less.	Landscape scale bushfire can approach from more than one aspect and site is on the bushland-urban interface with the developed area considered as managed land. Typically contigous bushfire vegetation with a typical fire run in any direction of 0.1-2.0 km distance.	Landscape scale bushfire can approach from more than one aspect and/or fires have many hours or days to grow and develop before impacting and/or site is surrounded by significant unmanaged vegetation. Typically large areas of contigous bushland with fire runs of more than 2 km possible.	Extreme
2. Bushfire Behaviour	Extreme bushfire behaviour at the site is not possible given the broader landscape.	Extreme bushfire behaviour at the site is unlikely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	Extreme bushfire behaviour at the site is likely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	Extreme bushfire behaviour is very likely in this broader landscape due to combination of factors of vegetation type, vegetation fragmentation, aspect and topography.	Moderate
3. Impact of severe fire behaviour (FFDI 80 or 100 as relevant) coming onto site from wider fire catchment	There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation) and will not result in neighbourhood scale destruction of the site.	The type and extent of vegetation beyond 150m from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	The type and extent of vegetation beyond 150m is likely to result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	The type and extent of vegetation beyond 150m will result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to the site.	High
4. Vegetation Corridors	Vegetation within the site cannot enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation within the site is unlikely to enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation within the site may enable fire to enter and move through the site by a continuous fire path from the primary fire source.	Vegetation corridors on site provide for passage of fire to enter and move through the site from the primary fire source.	Low
5. Separation	Hazard separation between extreme bushfire hazard and buildings of greater than 100m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of 50-100m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of 20-50m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	Hazard separation between extreme bushfire hazard and buildings of <20m. Extreme bushfire hazard does not include vegetated corridors of less than 100m width or grasslands.	High
6. Shelter	Immediate access is available to a place that provides shelter from bushfire. This includes existing or proposed buildings on site constructed in accordance with PBP and urban areas more than 100m from bushland hazard.	Access is readily available to a place that provides shelter from bushfire. This will often be the surrounding developed area. In the case of an eco-tourist facility it will be the designated bushfire refuge built in accordance with PBP requirements.	Access to a place that provides shelter from bushfire is not certain during a wildfire and existing buildings are not built to PBP standards.	Access to a place that provides shelter from bushfire is not possible during a wildfire.	Low
7. Evacuation	Multiple evacuation routes are available and unlikely to be impacted by fire.	Evacuation to alternate location that provides life safety refuge is <1km and can be completed by foot or vehicle.	Evacuation to alternate location that provides life safety refuge is 1km-10km.	Evacuation to alternate location that provides life safety refuge is > 10km.	Extreme
8. Isolation and emergency services	Seamless integration with existing settlement - no impact on evacuation or access for emergency services.	Short bushland pinch points that may carry fire across roads and restrict access briefly during passage of fire. Unlikely impact on evacuation or access for emergency services.	Short bushland pinch points that are likely to carry fire across roads and restrict access temporarily. Likely impact on evacuation or access for emergency services.	Large areas of bushland or multiple pinch points that are likely to carry fire across roads in forest areas and will block evacuation or emergency service access routes for extended time.	Extreme
9. Firefighting water supplies	Site is within urban area and has access to reticulated water supply OR site has dedicated firefighting water supply in accordance with PBP requirements.	Site is on the periphery of urban area and has access to reticulated water supply that may be more susceptible to interuption.	Site is outside urban area and relies on an on site water supply not in accordance with PBP.	Site is in an isolated area and relies on an on site water supply not in accordance with PBP.	Low
		Overall Threat Rating	**High Risk**	**Total risk score**	230

Assessed at Forest Fire Danger Index of 80 as the design fire, using Method 1 in accordance with PBP 2019

The scoring system uses a multiplier for each Threat level based on a conservative life safety approach.

The scaled scores for each Threat assessment are totalled and final scores are placed within a range to produce the final Risk Rating

Figure14: Summary LSAT score and threat rating based on project operational state.

Planning for Bushfire Protection 2019:

The **aim** of PBP (p. 10) is:

- *to provide for the protection of human life and minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment*.

The **objectives** (PBP p. 10) are to:

- *Afford buildings and their occupants protection from exposure to a bushfire*
- *Provide for a defendable space to be located around buildings*
- *Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings*
- *Ensure that appropriate operational access and egress for emergency service personnel and occupants is available*
- *Provide for ongoing management and maintenance of Bushfire Protection Measures; and*
- *Ensure that utility services are adequate to meet the* needs of firefighters

The current planning and building systems are primarily based around the protection of assets/buildings through a combination of bushfire protection measures (BPM) to achieve an acceptable risk mitigation outcome, remembering it is rarely possible to reduce risk entirely in the Australian landscape.

Combinations of BPM are used to achieve acceptable outcomes for different types of development at different sites and provide some flexibility to satisfying the aim and objectives of *Planning for Bushfire Protection 2019* (PBP) which is the key NSW document managing bushfire risk mitigation in new development. The BPM are shown in Figure 15. Appropriate combinations depend upon geographic location and site circumstances.

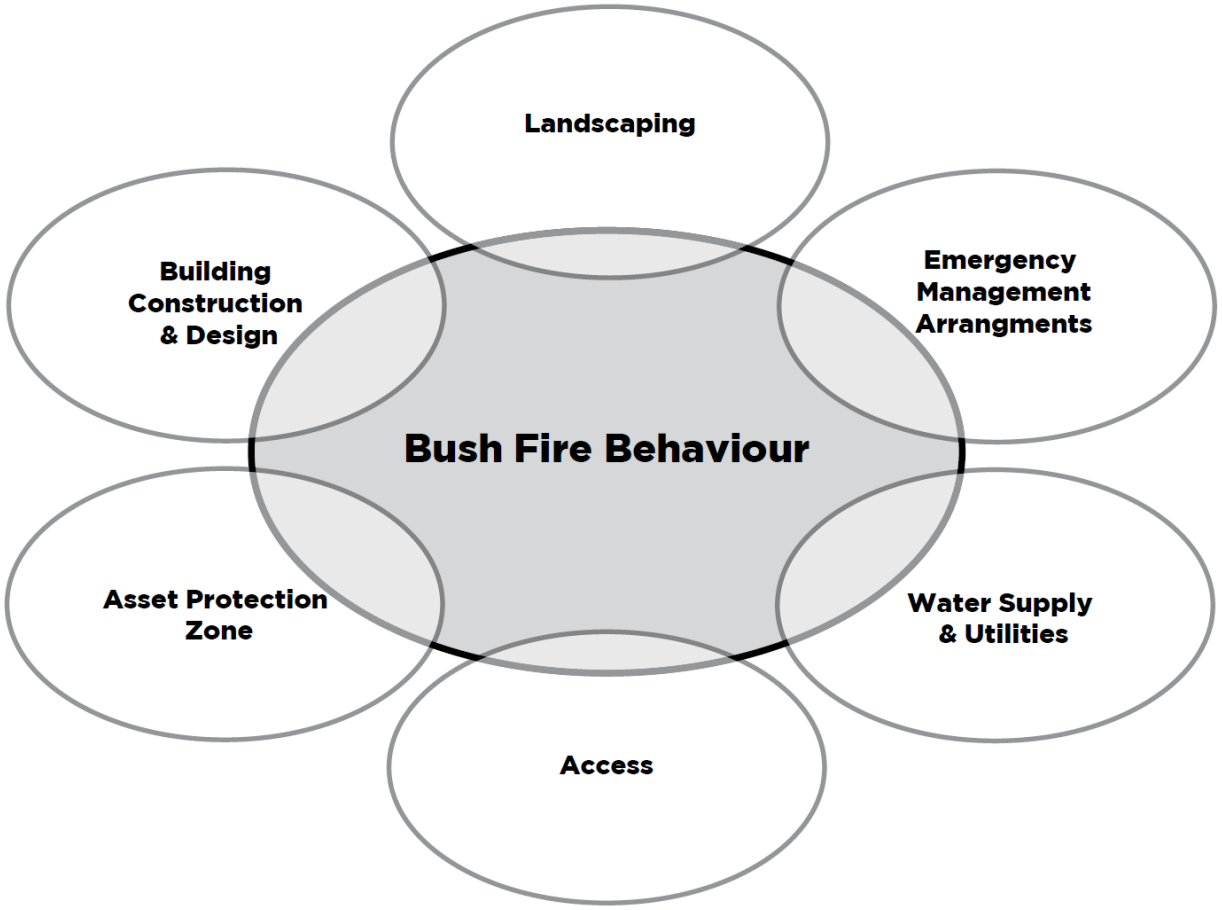

Figure 7: Bushfire Protection Measures in combination (PBP p. 26)

PBP addresses the specific considerations and requirements for solar farms in Section 8.3.5 (p. 77):

Wind and solar farms require special consideration and should be provided with adequate clearances to combustible vegetation as well as firefighting access and water. The following should be provided for wind and solar farms:

- *A minimum **10m APZ** for the structures and associated buildings/infrastructure; and*
- *The APZ must be maintained to the standard of an IPA for the life of the development.*

Infrastructure for the purposes of requiring APZ excludes:

- *road access to the site; and*
- *power or other services to the site and associated fencing.*

Essential equipment should be designed and housed in such a way as to minimise the impact of bushfires on the capabilities of the infrastructure during bushfire emergencies. It should also be designed and maintained so that it will not serve as a bushfire risk to surrounding bush.

A Bush Fire Emergency Management and Operations Plan (BEMOP) should be prepared for the development that identifies all relevant risks and mitigation measures associated with the construction and operation of the solar farm. This should include:

- *Detailed measures to prevent or mitigate fires igniting;*
- *Work that should not be carried out during total fire bans;*
- *Availability of fire-suppression equipment, access and water;*
- *Storage and maintenance of fuels and other flammable materials;*
- *Notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate; and*
- *Appropriate bushfire emergency management planning.*

It is important to be aware of operations that may be carried out on days of Total Fire Ban and any prohibited activities or exemptions that are notified by the Commissioner of the NSW RFS under the RF Act s.99.

The 10 metre APZ as prescribed by PBP is a general requirement and does not factor in the criticality of infrastructure and the associated tolerable risk of radiant heat at those assets. The tolerable level of radiant heat exposure to the critical infrastructure and assets will need to be determined by Ark Energy during the detailed design phase. Larger APZ have been implemented in this BTA along with other mitigation strategies, depending on the determined vulnerability, to address the heightened criticality of those infrastructure and assets.

A much higher standard of radiant heat reduction has been applied to the PF, with the BESS having a minimum **100m APZ** and all other infrastructure having a maximum level of BAL-29 which provides a varying width of **11-29m APZ** around the PF. The methodology used is consistent with PBP and AS 3959 and is detailed in Appendices.

With these significantly larger APZ and the size of the PF that will be 'managed land', approximately 90% of the PF is more than 100m from BPL.

Table 4 provides a summary of PBP Section 8.3.5 compliance.

Table 4: Summary of compliance with PBP Section 8.3.5 (p77)

PBP 8.3.5 requirement	Comment	Complies?
A minimum 10m APZ for the structures and associated buildings / infrastructure;	The PF is provided with APZ well in excess of 10m, with the majority of site maintained to APZ standards, and remaining areas of site outside PF maintained to typical rural standard through slashing and grazing. Formal APZ: • BESS – minimum **100m** • Substation – minimum **100m** • Switching substation – minimum **25m** • Solar arrays & related infrastructure – **11m – 25m**	**Yes**
The APZ must be maintained to the standard of an Inner Protection Area (IPA) for the life of the development	The PF will be continually maintained to IPA standard as part of normal operations. This can be conditioned and will be part of the Bushfire Emergency Management & Operations Plan (BEMOP).	**Yes**
Essential equipment designed and housed to minimise impact of bushfires, and to not serve as a bushfire risk.	All infrastructure designed and sited to reduce impact of bushfires, and to prevent bushfire risk. Larger than required APZ, hardstand areas around critical components, numerous access roads internally, initial attack firefighting capability and water supplies provided on site.	**Yes**
Detailed BEMOP to be produced	This will be developed as part of next stage following Fire Safety Study (FSS) and will be key part of ongoing operations. A Bushfire Emergency Response Plan (BERP) will be a sub-plan of the BEMOP.	**Yes**
Comply with Total Fire Ban Day (TOBAN) requirements under RF Act s.99	All construction and operations will be conditioned to comply with TOBAN requirements.	**Yes**
Comply with PBP Aim & Objectives (p.10)	Project has been developed to incorporate a suite of bushfire risk mitigation measures that are designed into the layout and include consideration for ongoing maintenance of all bushfire protection measures and incorporation into local bushfire planning.	**Yes**

Detailed Bushfire Risk Site Assessment

Fire Weather

The fire weather is dictated by PBP and assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds. The FBI and the now superseded Forest Fire Danger Index (FFDI) measures the degree of danger of fire in Australian vegetation.

For the purposes of PBP, the FBI required to be used for development assessment purposes is based on local government boundaries. The Site has an FBI of **80** as required by the RFS and PBP.

It may be possible that days of higher FBI may be experienced at the Site. This may result in fire situations where conditions challenge survivability of buildings and their occupants. The framework provided for by PBP has been used in this assessment.

Bushfire hazard assessment

The vegetation formations (bushfire fuels) and the topography (effective slope) combine with the designated fire weather FBI to create the bushfire threat that may affect bushfire behaviour at the site, and which determine the planning response. An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as setbacks from the hazard.

Vegetation Structure

Predominant vegetation is classified by structure or formation using the system adopted by David Keith (2004) and by the general description using PBP. Vegetation types give rise to radiant heat and fire behaviour characteristics. The predominant vegetation has been determined for the Site over a distance of at least 140 metres in all directions from the proposed Site boundary or key assets on the Site. Where a mix of vegetation types exist, the type providing the greater hazard to the Project is said to predominate.

A summary of the vegetation impacting on the Site is demonstrated in Figure 16. The overall site is divided into smaller areas for detailed assessment. Inside the security fenced area of the site would be managed to Asset Protection Zone Standards and would be managed land, with retained bushland allowed to regenerate, and existing grassland areas outside the security fence managed to a typical rural standard via agistment/slashing as required.

Slopes Influencing Bushfire Behaviour

The slope assessment for the Site has been undertaken in the GIS analysis and is a component of determining the BAL rating. The slope of the land under the classified vegetation has a direct influence on the rate of fire spread, the intensity of the fire and the ultimate level of radiant heat flux. The effective slope is the slope of the ground under the hazard (vegetation). It is not the slope between the vegetation and the asset (slope located between the asset and vegetation is the site slope).

The effective slope is the slope under the vegetation which will most significantly influence the bushfire behaviour for each aspect. This is usually the steepest slope which has been used in this assessment. The detailed slope analysis has been completed and is demonstrated overall in Figure 16. The overall site is divided into smaller areas for detailed assessment.

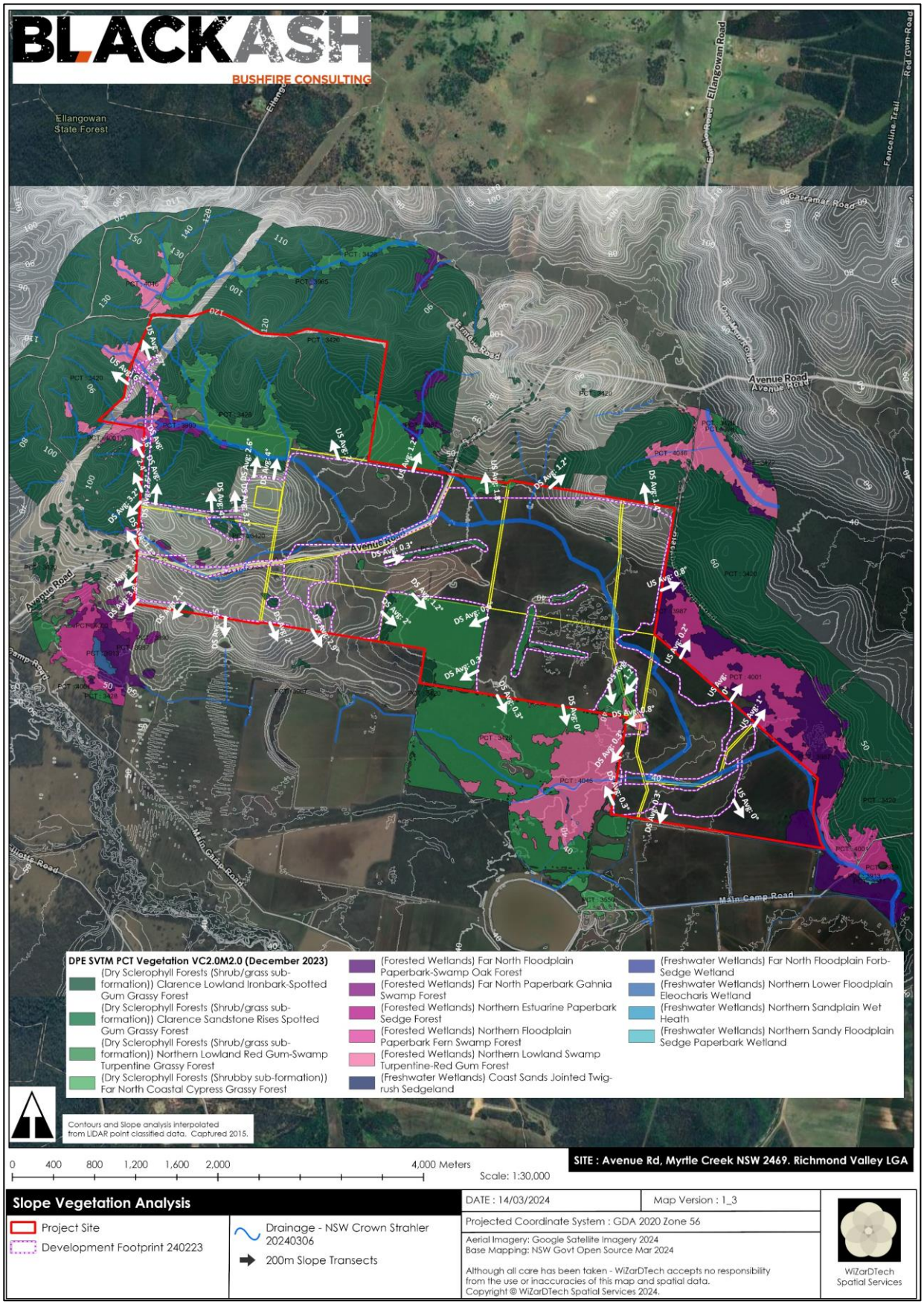

Figure 16: Overall vegetation and slope mapping

Assessment and mitigation of potential impacts – construction and operation

This section presents an assessment of the potential impacts that could not be avoided or minimised and are expected to occur as part of construction.

The key potential bushfire impacts relating to the construction phase of the proposed Project include:

- On site ignitions which may result in a fire escaping to the surrounding land and spreading in an uncontrolled manner causing damage to assets external to the site;
- Occupational fire risk being the risk of workers being caught by out-of-control bushfire impacting the site or while using the access and egress routes;
- provision of access for first responders;
- water for firefighting - given the remote location, an adequate supply of water is essential for first response firefighting purposes. The site contains several farm dams, some of which will be retained, and it is the staging of the development will include significant firefighting water supplies being provided as part of the first stage and expansions as per consent to suit any staging of the development; and
- emergency management during construction.

These issues will be explored in detail in the future Fire Safety Study and the Bushfire Emergency Management and Operations Plan, to be developed in consultation with fire agencies and the local community during future Project stages. These are outlined below.

On-site ignitions

Construction activities pose risks for on-site ignitions which may result in a fire escaping to the surrounding land. These mainly arise from hot work, fire risk work, vegetation clearing and management and use of vehicles on site.

Hot work (activities involving high temperatures) and fire risk work (activities involving heat or with the potential to generate sparks) from maintenance activities may cause fire ignition. These works will be managed under a Hot Work and Fire Risk Work procedure, with measures including suspension of activities on days of elevated fire danger. Certain maintenance activities, including hot works, are prohibited by law on any day declared to be a Total Fire Ban (TOBAN). Essential work during operations may be completed on a TOBAN providing it complies with the Hot Work and Fire Risk Work procedure and any exemption provided by the NSW RFS.

All land managers have responsibilities to prevent the occurrence and spread of fire on or from their land. Escaped fire may result in legal action and punitive damages. Reputational risk is an issue to be

managed to ensure that contractors do not initiate an out-of-control fire that impacts surrounding assets and values.

The Site's developed area would be managed as an APZ and is considered managed land for the purpose of this assessment.

Occupational fire risk management

Considering the bushfire risk and fire history to site, a key risk management activity during construction would be to not expose people to unreasonable risk. The most effective way to reduce the risk for loss of life is to not occupy the Site on above established thresholds for FBI and fires within the surrounding landscape. This would need to occur with an understanding of the evacuation time from the Site and potential for fire to burn through the evacuation roads.

Due to the relatively remote location of the Site, it is recommended that non-essential works be postponed on days with FBI of Extreme or greater. This will reduce the risk to personnel by out-of-control bushfire impacting the site or access and egress routes.

Emergency management during construction and operation

The design, operation and maintenance of the Project will need to consider and provide vegetation management within the asset protection zone around the proposed solar farm that should mitigate the impact of uncontrolled bushfire up to an FBI of 80.

A comprehensive Bushfire Emergency Management and Operations Plan would be completed for the construction and operational phase of the Project. The Bushfire Emergency Management and Operations Plan for the construction phase would be in place prior to the commencement of construction at the Project. The bushfire evacuation procedures should be completed in accordance with NSW Rural Fire Service *Guide to Developing A Bushfire Emergency Management Plan*. On site and off-site evacuation procedures would be included.

The focus of the Bushfire Emergency Management and Operations Plan would be to put in place strategies that do not expose the workers to the effects of bushfire attack and focus on eliminating exposure to bushfire threat. The management team will be able to determine the safest options regarding forecast bushfire risk and providing for early evacuation from site if there are fires in the vicinity.

Disruption to power supply if the site is impacted by fire

Uncontrolled bushfire has the potential to impact the proposed solar farm and associated infrastructure. Bushfire impact could damage or destroy critical infrastructure to an extent that may result in the disruption of power transmission from the site and cause power outages. Electrical engineering design measures will be considered in the detailed design phase to reduce this risk to acceptable levels.

APZ Maintenance

Ongoing vegetation management would be in accordance with the Bushfire Emergency Management and Operations Plan which will include routine inspections of the Project and suitable recordkeeping. Ongoing management would fall under an inspection and maintenance program, which would include identification, recording, prioritisation and rectification of shortfalls. These vegetation management standards are essential to maintain the safe and effective functioning of the facility and transmission connections, and to minimise the risk of fire ignition from vegetation coming into close proximity to the solar farm.

APZs will be managed in accordance with PBP Appendix 4 to provide minimal ground fuel to support a fully developed bushfire.

6. Mitigation and Management Measures

Setbacks from Hazard and Bushfire Attack Levels

The predominant (direct) threat to the proposed Project is from Forest vegetation being driven by north westerly or westerly winds into the site, with fire possible to approach the site from all directions, however generally a fire approaching under those aspects is likely to be under more benign weather conditions. The risk posed by forest fire to the site is significant with potential for large runs of uncontrolled fire through the landscape.

The Bushfire Attack Levels (BAL) for the Site have been determined in accordance with PBP and the *Australian Standards for Construction of Buildings in Bushfire Prone Areas* (AS3959). The BAL is a means of measuring the severity of a building or assets potential exposure to ember attack, radiant heat and direct flame contact (see Table 4). The BAL is used to determine the APZ width for any given combination of fire weather, slope, and vegetation.

In the NCC through AS3959 and in PBP, as discussed previously the BAL is used as the basis for establishing the requirements for construction to improve protection of building elements and to understand the

radiant heat exposures for people in the open. The impact of the radiant heat associated with the BAL is shown in Figure 17.

Heat flux exposure	Description	AS 3959 construction level
N/A	Minimal attack from radiant heat and flame due to the distance of the building from the vegetation, although some attack by burning debris is possible. There is insufficient threat to warrant specific construction requirements.	BAL-LOW
≤12.5	Attack by burning debris is significant with radiant heat (not greater than 12.5kW/m²). Radiant heat is unlikely to threaten building elements (such as unscreened glass). Specific construction requirements for ember protection and accumulation of debris are warranted.	BAL-12.5
>12.5 ≤19	Attack by burning debris is significant with radiant heat flux (not greater than 19kW/m²) threatening some building elements (such as screened glass). Specific construction requirements for embers and radiant heat are warranted.	BAL-19
>19 ≤29	Attack by burning debris is significant and radiant heat flux (not greater than 29kW/m²) threatens building integrity. Specific construction requirements for ember and higher levels of radiant heat are warranted. Some flame contact is possible.	BAL-29
>29 ≤40	Radiant heat flux and potential flame contact could threaten building integrity.	BAL-40
>40	Significant radiant heat and significantly higher likelihood of flame contact from the fire front will threaten building integrity and result in significant risk to residents.	BAL-FZ

Note: Attack from burning debris increases with the Bush Fire Attack Level. Source AS 3959.

Figure 8: Radiant heat flux exposure and relation to BAL (PBP Table A1.7 p.85)

The Project has been designed with a goal of reducing any bushfire impact on Project infrastructure to a maximum of BAL-29. The BAL assessment has been completed based on the current design of the proposed Project and that all vegetation within the security fenced area will be managed as an APZ / managed land, except where there are particular areas retained as native vegetation. To facilitate ongoing maintenance of the security fence it will be set 2.0m inside the edge of the APZ, with that 2.0m area outside the fence maintained to APZ standard. Areas within the Project site that are not reserved for biodiversity purposes will be maintained to a typical rural standard through grazing and/or slashing as required. Figure 18 shows the overall concept. The modelled BAL is therefore calculated from the edge of the fence line APZ. The ultimate arrangement is shown below, however the mapping shows the fence line as the outside of the APZ. Regardless, the BAL is calculated from the edge of the future APZ, providing a BAL received at the asset (e.g. array, building, BESS).

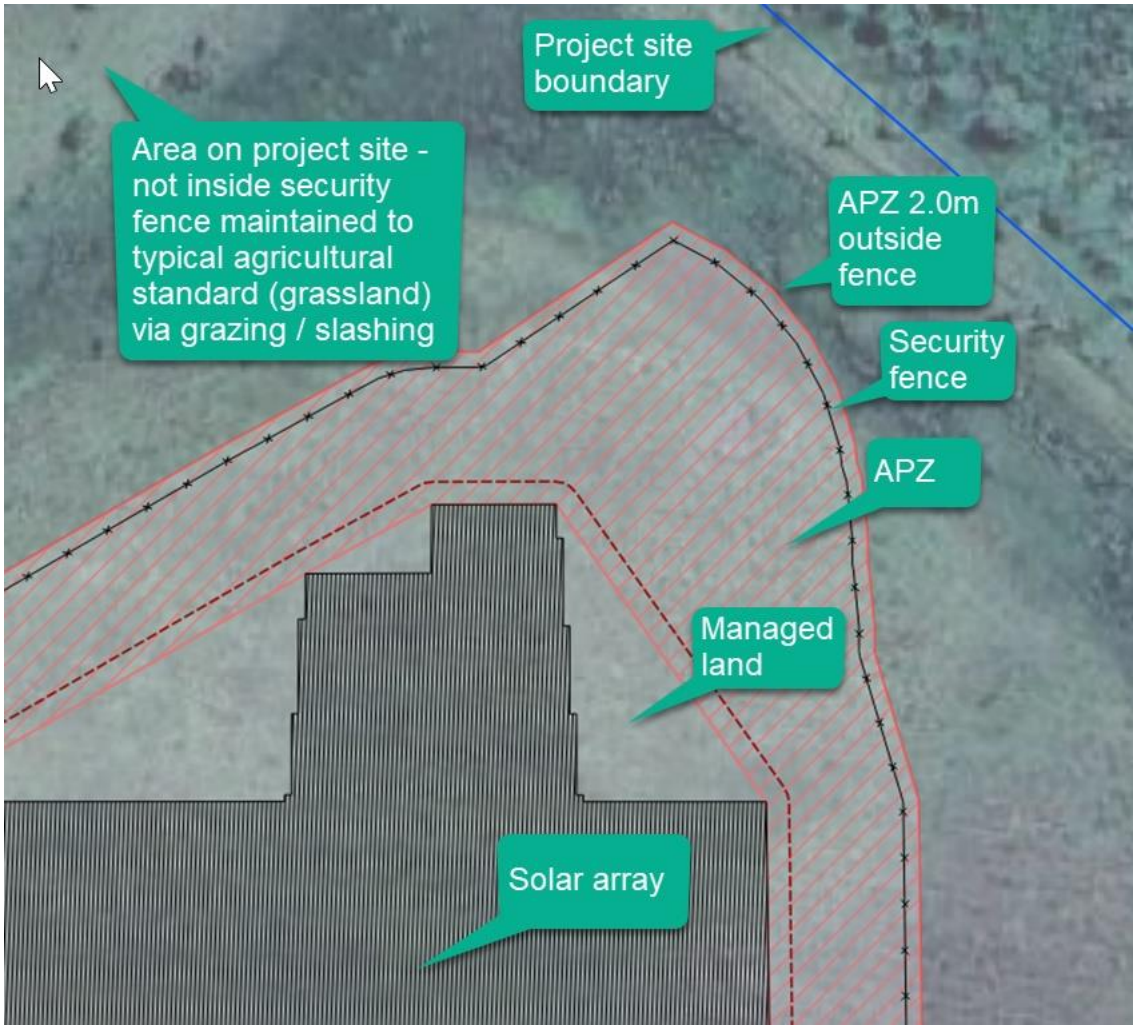

Figure 98: Indicative layout of arrays, APZ, fencing and other land on site

The northwestern side of the site is also the location of the BESS, and as the community has expressed concern the BESS could be a potential bushfire ignition source, the Project provides for a full 100m APZ from the BESS on the north and west sides, with managed lands to the east and south sides.

The BESS will have more than 100m of setback from any bushfire hazard vegetation (modelled edge will be at least 1.0m off the nearest BESS module), this means it is rated as BAL-Low and technically that the BESS will not be on bushfire prone land once the BPL Map is updated. Development in NSW rated BAL-Low requires no specific construction requirements. The larger the APZ the more reduction on the BAL impacting infrastructure and is shown as Figure 19. Figure 20 is shown to both outline the symbology used in the BAL mapping to follow, and to highlight the focus on reducing bushfire threat around the BESS and substations. This outcome is even more conservative as it is modelled as Forest vegetation even though the area on the Project site outside the security fence will be maintained to Grassland standard.

Figure 10: Detail of layout around BESS and substations and greatly reduced BAL at infrastructure.

The substation will be BAL-Low, and the western side of the switching substation will be at a maximum of BAL-19 as modelled, however the maintenance of the transmission easement to APZ standard will effectively provide BAL-Low for this asset as well. This meets and exceeds all PBP requirements.

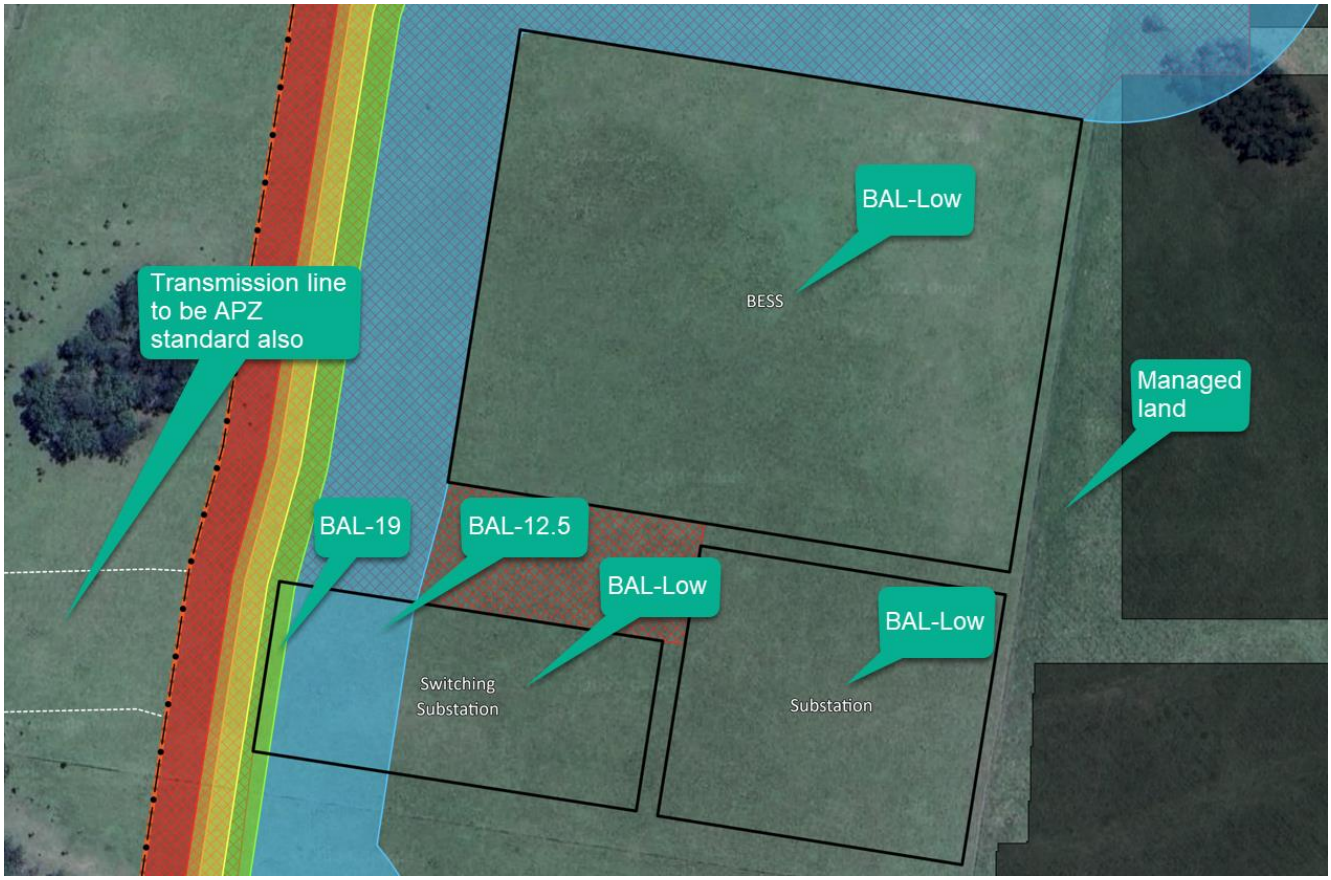

Figure 11: Excerpt from BAL map for critical infrastructure.

Comparison with relevant industry standards is useful to provide greater detail at this stage. Figure 21 is an extract from the current Ausgrid document *NS 187 Passive Fire Mitigation design of Major Substations (2020)*. Section 12 of this document looks at bushfire protection, focusing on the impacts of radiant heat on critical components using APZ. The extract (p. 20) includes Table 3 and shows the maximum radiant heat exposures for various components. The Project design exceeds all these standards. The final switching substation design will incorporate consideration of radiant heat and component suitability.

A typical radiant heat / temperature duration curve applicable to bushfires would be as follows:

- Peak values are reached after 1 minute;
- Values remain at peak for up to 4 minutes; and
- Values recede to ambient linearly over a further 5 minutes.

Refer to Table 3 for limiting radiant heat flux levels for determining minimum safe separation distances. For bushfires, the NSW RFS PBP is the key reference document in establishing the maximum bushfire intensity at a given location. A flame front length equal to the approach boundary length is to be assumed and a flame height based on the PBP shall be used in calculations.

Table 3 – Radiant Heat Exposure Limits for Bushfires

Item	Maximum allowable radiant heat flux (kW/m^2)	Comment
Cable	12.5 20	PVC Cables begin to distort and may ignite. Ignition of XLPE cables between 85 and 550 seconds.
Steel support structure	35	To 60% of yield strength after a maximum duration of 5 minutes. Applies where elastic deflections due to elevated temperatures are not critical.
Porcelain bushing/Insulators	>30	Damage may occur requiring replacement or in extreme case resulting in catastrophic failure. See Note 2.
Polymeric bushing/insulators	>30	Damage may occur requiring replacement or in extreme case resulting in catastrophic failure. See Note 2.
Aluminium busbar	20	Based on 250°C after a maximum duration of 5 minutes. Comparable to withstand temperature under fault conditions.
Copper busbar	25	Busbars may undergo significant distortion and impose significant stresses on rigid insulators.
Transformer tank	>35 (see Note 1)	Refer to above regarding bushings and cables.
Combustibles	12.5	Piloted ignition may occur on timber.

Note 1. Transformers always have some more vulnerable components such as bushings and cables etc. Refer to Clause 7.2.

Note 2. Detailed information on radiant heat exposure limits is not available. However in-service applications exposed to bushfire indicate a high radiant heat limit and a low risk of damage or failure.

The radiant heat limits provided in Table 3 are applicable to identified critical substation structures and HV components. Critical elements are those deemed to be essential for return to service following a bushfire event.

Figure 12: Extract from NS187 Passive Fire Design of Major Substations (Ausgrid 2020) - p. 20

The applicable BAL impacting on the Project infrastructure, demonstrating how this has informed the Project overall is provided in the appendices as Figure 34 - 37 and taking into account issues raised by the community during engagement sessions and submissions to date. Figure 22 shows the BAL mapping across the entire site and Figure 23 shows the BAL rating in more detail across the critical site infrastructure.

The overall site is divided into smaller areas for detailed assessment. It is noted that the Forest vegetation areas highlight the exceedance of the BAL-29 standard more easily as the Grassland areas are subject to much smaller changes in radiant heat flux outputs over distance, due to the nature of the fuel.
Note: the northern boundary of the Project site is modelled as Forest due to the proposed biodiversity / landscape screening corridor that will be the ultimate future vegetation.

On the maps:

- Black hatching is managed land
- Red hatching is APZ
- Yellow shading and line depict extent of BAL-29 area
- Where the APZ (red hatching) is wider than the BAL-29 area (yellow) the radiant heat flux will be 19kW/m^2 or less.

The key messages are:

- more than 90% of the solar array infrastructure will be more than 100m from the hazard vegetation, and therefore BAL-Low,
- key critical infrastructure including the BESS and the substation will be more than 100m from the hazard vegetation, and therefore BAL-Low,
- the switching substation will be BAL-19 at the western edge and the majority of the site will be BAL-12.5 or BAL-Low,
- a minimum BAL-29 standard can be achieved for all infrastructure on site, with the vast majority of the infrastructure affected by less than 19kW/m^2 of radiant heat flux.

The majority of the site is unlikely to be impacted directly by bushfire impacts other than wind, smoke and embers.

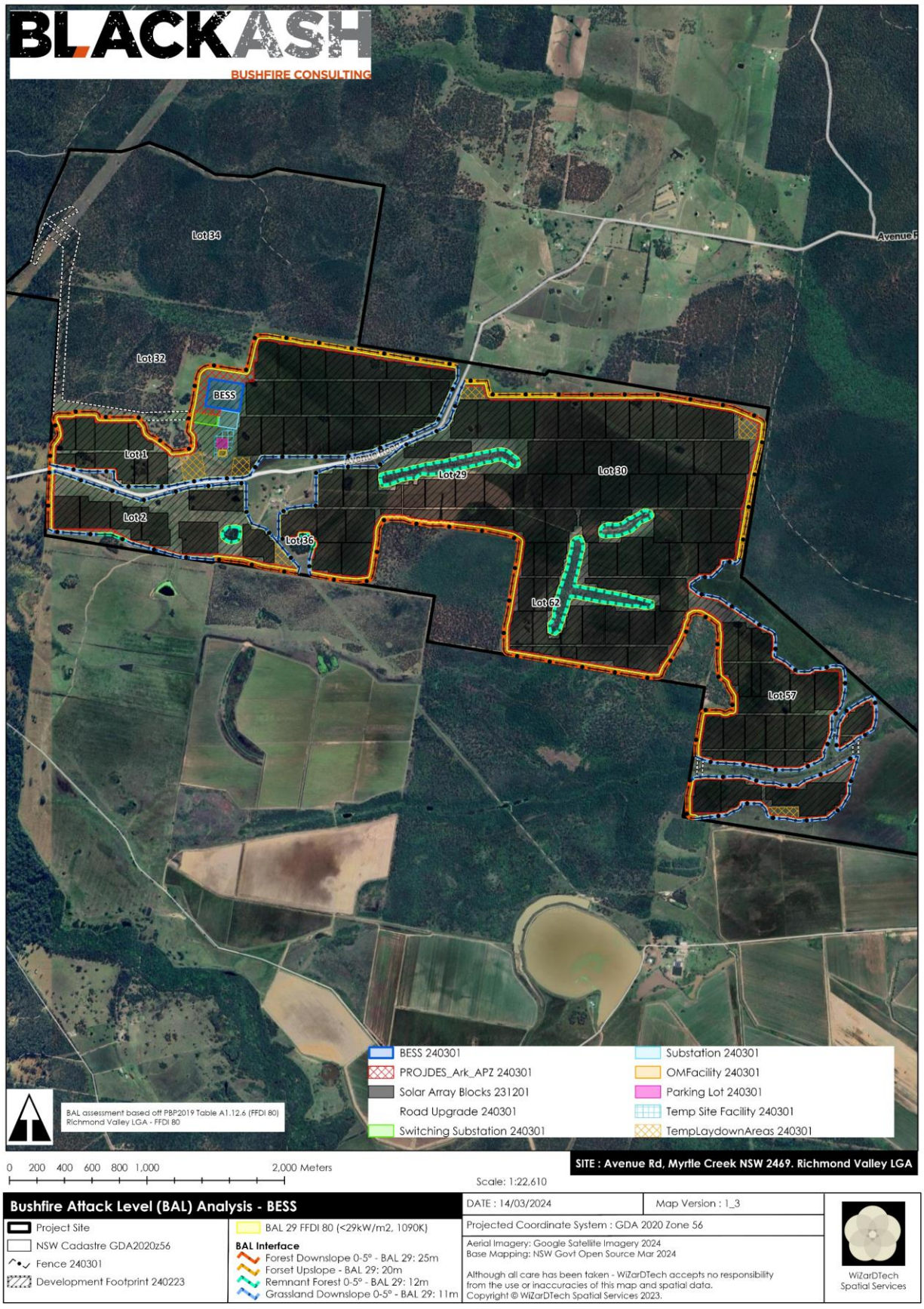

Figure 13: Overall BAL map for site

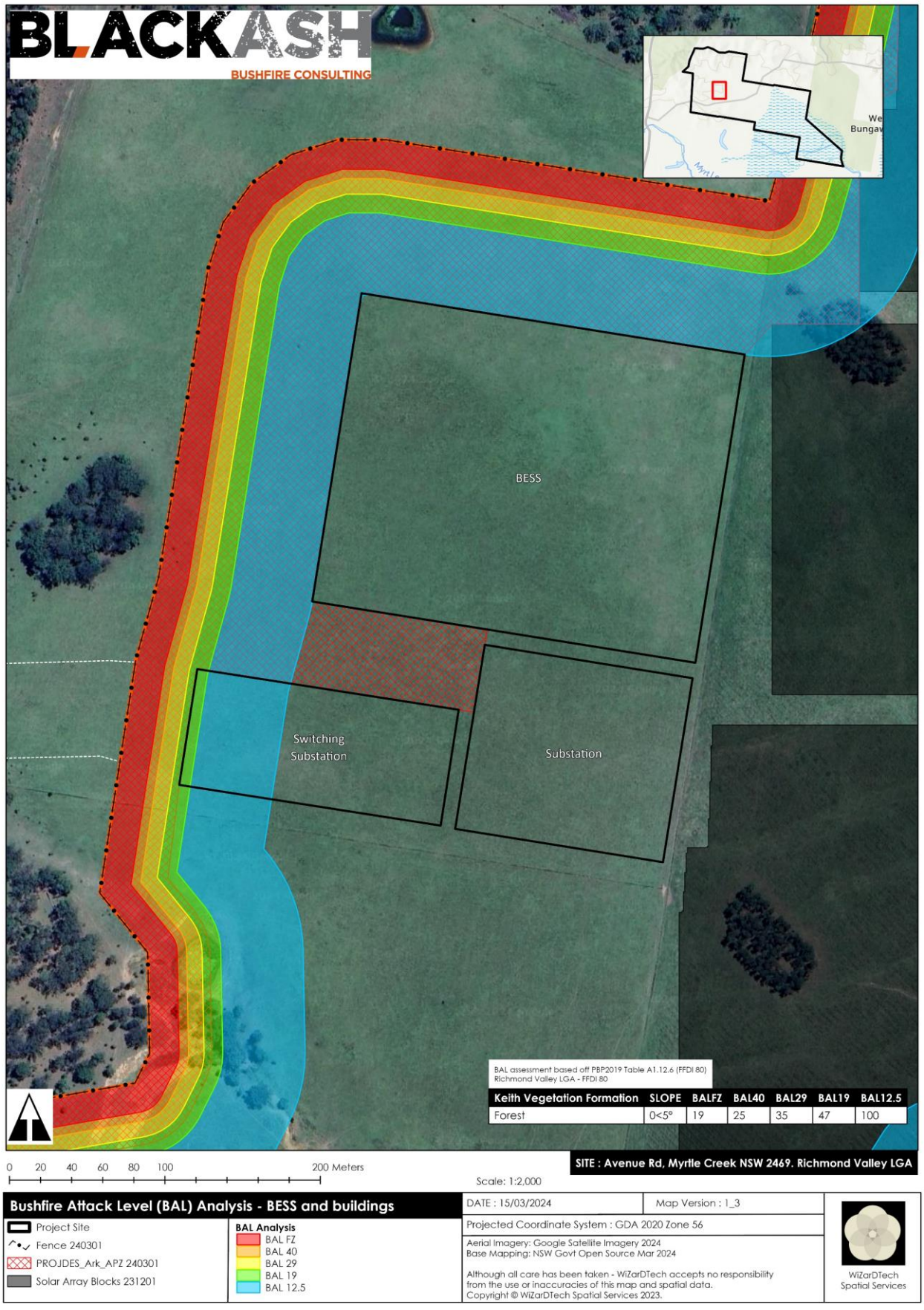

Figure 14: BAL Map around critical infrastructure – all BAL shown in bands.

Asset Protection Zones

The APZ is a fuel-reduced, physical separation between buildings and solar farm components and bushfire hazards. The APZ is managed continuously over time to minimise fuel loads and reduce potential radiant heat levels, flame, smoke and ember attack. The APZ can include roads, pathways, and managed areas. The appropriate APZ distance is based on FBI, vegetation type, effective slope, and the nature of the development.

As discussed above the development the standard that Ark Energy has agreed to accommodate for the development is a minimum of BAL-29 construction standard, that is radiant heat flux load is below 29kW/m^2 as the maximum exposure on assets within the PF.

Key messages are:

- The APZ within the security fenced site (and 2.0m on the outside of the fence) will be managed to Inner Protection Area (IPA) standards in accordance with the *NSW RFS Standards for Asset Protection Zones* and Appendix 4 of PBP.
- The transmission line easement will also be maintained to APZ standard providing additional benefits to areas on the northwest side of the Project site.
- The APZ will be established to incorporate requirements for the biodiversity corridor / landscape screen along the northern side of the site.
- The white line shown on the map is the 10m APZ required by PBP. This clearly demonstrates that the proposed APZ will meet and exceed the PBP requirements.

Figures 24 shows the APZ across the site, Figure 25 provides a detailed overview of the APZ around critical infrastructure and more detailed figures are provided within the appendices for other components of the site as Figures 30-33.

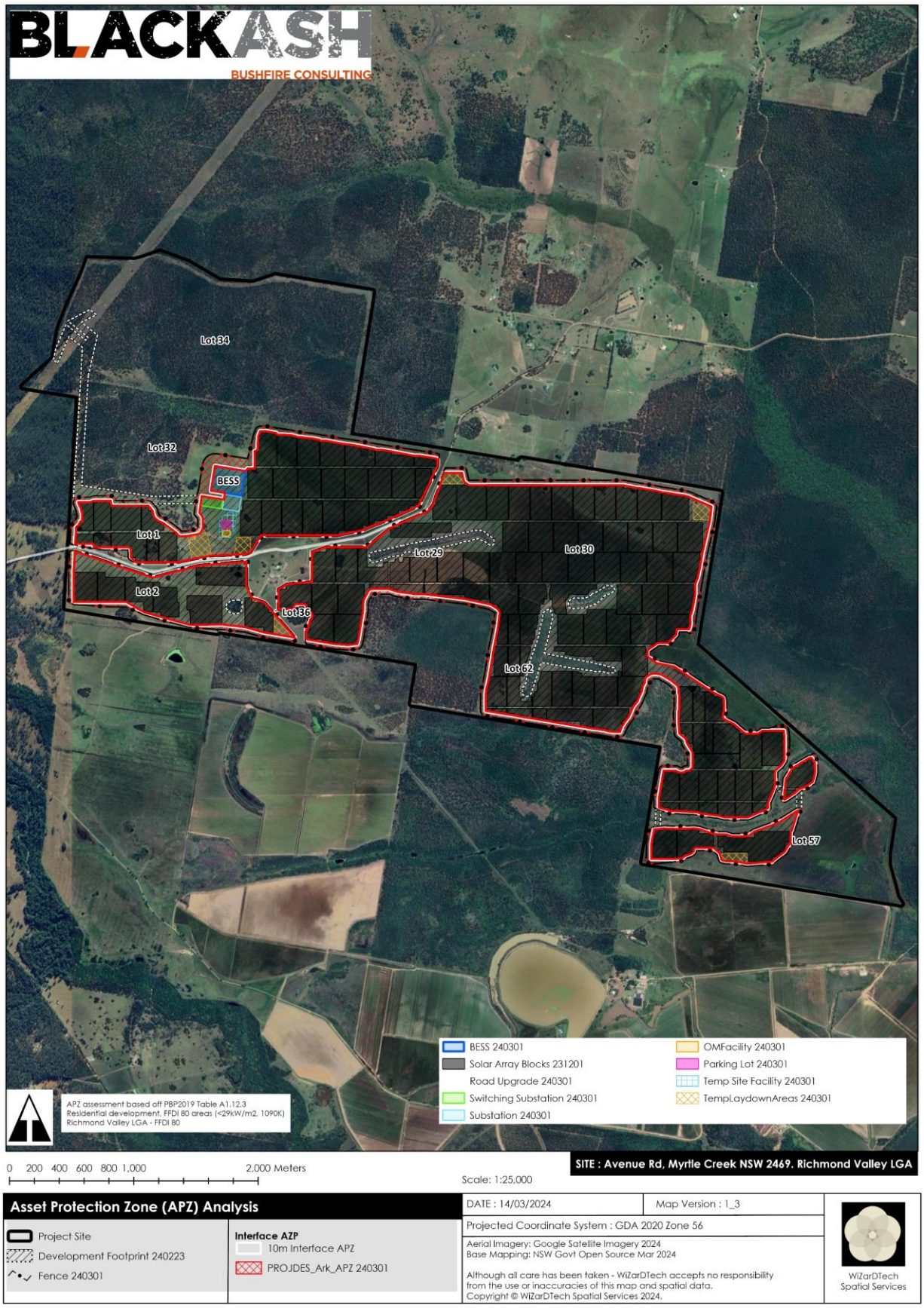

Figure 24: APZ summary map

Figure 25: APZ map around critical infrastructure (note: transmission corridor to west of switching substation will also be maintained to APZ standards)

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Ongoing risk management and water supply

The Project provides a significant opportunity to enable both the Static Water Supply (SWS) program and the development of the Community Protection Plan (CPP). This is part of the Ark Energy commitment to address further management issues and ongoing improvements as part of developing the Fire Safety Study and Bushfire Emergency Management and Operations plan, consulting both the local community and the fire agencies as part of future development stages.

The SWS is designed to pre-identify sources of firefighting water, provide RFS compliant fittings and ensure access to the supply. This recognises that firefighting tactics and effectiveness is limited in large part by the availability of water supply. This is of particular importance in isolated rural areas as RFS Category 1 tankers carry only 3000 litres, and smaller units considerably less. The ability to quickly refill is critical, particularly when undertaking property protection. The Project will be required to maintain multiple water supplies onsite that will be established in compliance with RFS requirements. Such supplies will be available to firefighters protecting local property, particularly in Ellangowan and Myrtle Creek localities, and as noted previously such supplies are also beneficial in the case of house fires.

CPP are an RFS initiative to improve understanding of relative risk in a local area and how to prepare for it. As a significant landholder and employer, Ark Energy would be part of the process of developing and updating this as the Project develops. Consideration of creating a potential Neighbourhood Safer Place onsite, vegetation maintenance equipment present on site, improved bushfire surveillance, provision of firefighting water supplies, improved communication (telecommunication improvements related to the Project), potentially the construction and operation of a suitable community bushfire refuge for staff and local residents, and first attack firefighting response from the solar farm staff are all elements that may be incorporated into future CPP planning.

7. Emergency management

The Project initially involves clearing and construction of the site, and then ongoing operation and maintenance works. The key document produced will be a Bushfire Emergency Management and Operations Plan (BEMOP) as part of the Fire Safety Study required at the next stage.

A Bushfire Emergency Response Plan (BERP) will also be prepared for the Project that provides clarity and protection for staff and visitors during a bushfire incident that includes:

- Addressing foreseeable on-site and off-site fire events
- Confirmation of acceptable access and emergency access provisions
- Evacuation triggers and protocols (evacuate or shelter in place)
- Confirmation of water supplies and accessibility and any other response/protection measures
- Suppression response strategies and tactics, including aerial suppression options/management
- Clearly state work health safety risks and procedures to be followed by fire-fighters, including
    - Personal protective clothing
    - Minimum level of respiratory protection
    - Minimum evacuation zone distances
    - Any other risk control measures required to be followed by fire-fighters
- Identify stakeholders (emergency response agencies, contractors, neighbours)

Contact will be made with the Bush Fire Management Committee to establish emergency management procedures with relevant authorities for the safety hazards presented by the site. Ultimately this will form part of the overall emergency management planning for the site and surrounds, preferably including incorporation into any CPP developed for the local area and well developed Pre-Incident Plans established with local combat agencies. It is expected given the relatively isolated location and bushfire history Ark Energy will establish onsite first response firefighting capability including suitable vehicles, equipment and training for use by the staff.

The Project as a gesture of good will and community support may have the opportunity to provide upgrades to the local RFS stations in consultation with the BFMC and RFS District staff. with provision of equipment such as water tanks.

Figure 26 shows the location of the various RFS stations within an approximate 60 minute response time. It is acknowledged that RFS resources may be unavailable due to high levels of bushfire activity, however this demonstrates there are significant RFS resources potentially able to be deployed, and likely to be available for local scale fires. There are additional NSW Fire and Rescue resources in surrounding larger towns including Casino.

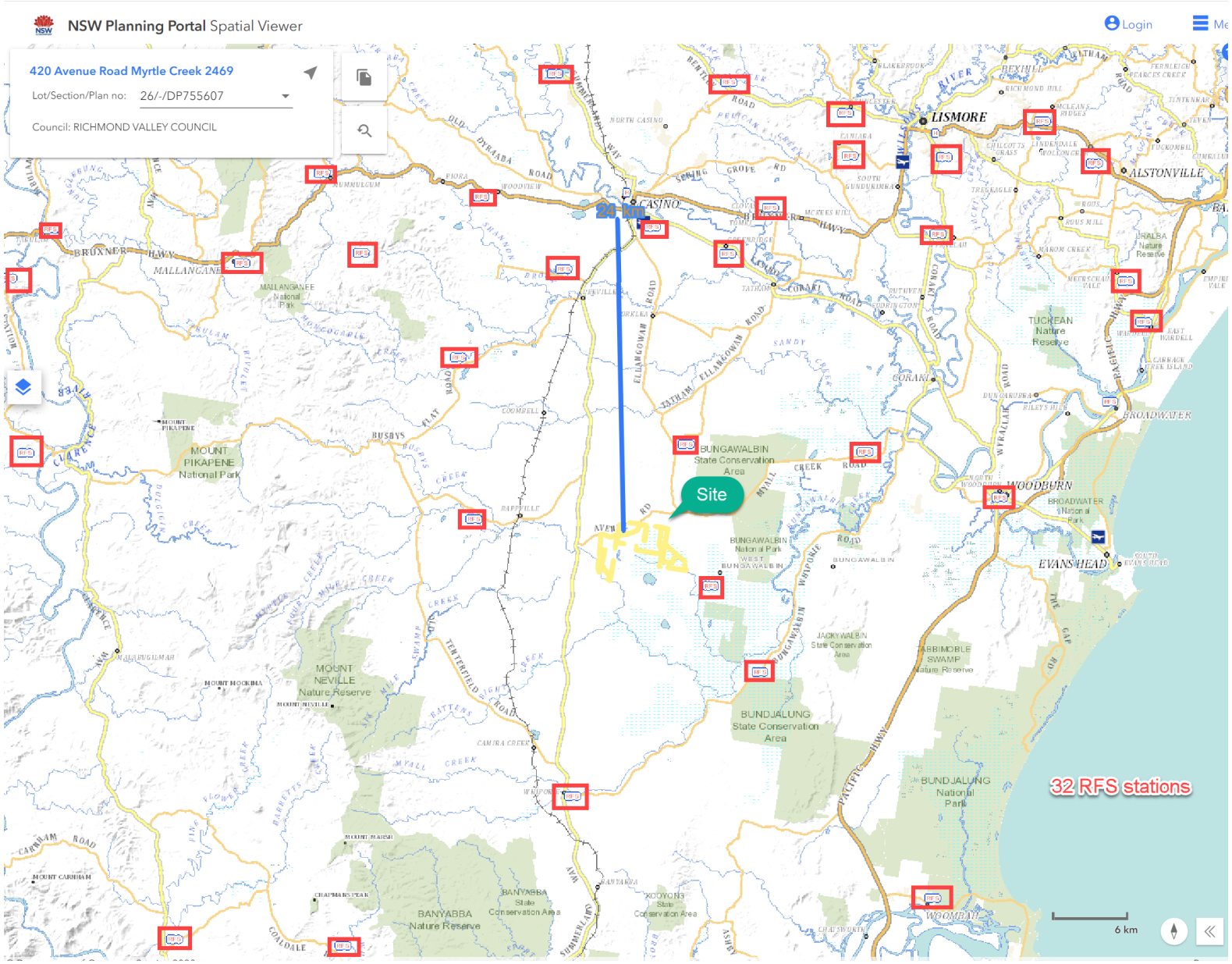

Figure 2615: Location of RFS stations within approximate 60 minute response time

As discussed above, there is a very strong role for business fire planning, emergency management planning, specific bushfire planning, evacuation planning and links to various operational and development consent plans. All plans and administrative controls generally should be well understood by the workforce and communicated to both the district RFS office and to local brigades.

With a significant permanent number of staff and contractors working onsite there is a very strong opportunity to cross train these people for firefighting roles. Many of the skills are transferable and practical and they will know and understand the site better than most over time. Given the scale of the investment proposed it appears to be of significant direct benefit to purchase and maintain a minimum firefighting capability to be based out of the Operations and Maintenance facility at the Project. In addition, there is value in discussing integration and interoperability arrangements with RFS, Forestry Corporation NSW and NPWS to manage not just the site but surrounding areas for improved overall fire management. There is a significant opportunity to embed staff into the local BFMC and future Incident Management Teams to ensure the most effective responses and understanding around new critical infrastructure.

During both construction and ongoing operations there is value in exploring shared use of additional earthmoving equipment, water carts and other plant should bushfires occur in the local areas.

There is a significant opportunity to develop a program to take advantage of the improved telecommunication infrastructure that comes with the cabling and telemetry required to manage the Project. This may include co-location of radio network infrastructure, new mobile telephony opportunities and updated mapping for both forest management and fire management. Discussions regarding live streamed weather data from monitoring stations is a quick win, as is any ability to share new technology such as drones and remote sensing cameras able to identify and locate ignitions quickly and inform duty staff and combat agencies.

The potential solar farm construction and ongoing operations can significantly improve overall bushfire management of the surrounding forests.

The location of such a large area of continuously actively managed land also presents opportunities to provide the equivalent of an RFS "Neighbourhood Safer Place" (NSP) within the central area of the site directly accessed by Avenue Road. Currently the RFS NSP located closest to the project site are at Whiporie (23km to the south) and Casino (36km to the north) with both routes traversing large areas of forested land. The viability of such a site for use is somewhat unclear due to concerns over air quality arising from a bushfire impact on the infrastructure, however this remains a potential safer place based on radiant heat reduction. Given the likelihood that some form of bunker or refuge building with

sufficient tenability will need to be provided for staff who may have to shelter onsite, it may be possible to work collaboratively to establish a community refuge instead (or in addition to).

The very significant investment on the site and provision of managed lands also provides an opportunity to locate significant water supplies that can be readily accessed by firefighters for use in managing bushfire that may occur on site or in the surrounding area. As part of the overall community benefit these water supplies could also be available in the event there is a house fire or shed fire in the local area not associated with a bushfire. It is understood Avenue Road will also be upgraded and sealed as part of the project.

8. Suitability of the Project site

This Bushfire Threat Assessment has demonstrated that the Project has considered and responded to the requirements of PBP. The bushfire risk has been considered with a preliminary analysis focus to draw out issues for further investigation during the detailed design phases to come.

Whilst there is no imperative to consider the requirements of Chapter 4 of PBP – Strategic Planning, this does provide another methodology to check the Project against. There is no subdivision or additional residential component, so the goal is to meet the aim and objectives of PBP, and the requirements of Chapter 8 – Other Development. This requires a very broad consideration of fire runs, slopes, fire behaviour, bushfire attack into the site and locational factors.

Whilst there is every possibility of severe fire behaviour occurring at this site over a predicted 30 year asset life, the risk to life can largely be mitigated relatively simply through good project planning requirements as discussed above, and good ongoing emergency management planning for the site. Other concerns such as importance to the grid, significance of asset damage and recovery costs are effectively an exercise in setting the organisational risk appetite for Ark Energy.

This section assesses the broad principles outlined within PBP (p. 34) which are at Table 5 and the consideration of exclusion of development as required within PBP (p. 34) at Table 6.

Table 5 Strategic Principles

Principle within PBP	Comment	Compliance
ensuring land is suitable for development in the context of bushfire risk	The Project can mitigate the very high bushfire risk associated with the site through good planning and a suite of measures as discussed above. The Project can meet the aim and objectives of PBP.	**Yes**
ensuring new development on BPL will comply with PBP	The Project meets the aim and objectives of PBP, and can meet the specific requirements of section 8.3.5. There are acceptable solutions for access, landscaping, water provision and emergency management arrangements.	**Yes**
minimising reliance on performance-based solutions	The Project can mitigate the very high bushfire risk associated with the site through good planning and a suite of measures as discussed above. The Project can meet the aim and objectives of PBP.	**Yes**

Principle within PBP	Comment	Compliance
providing adequate infrastructure associated with emergency evacuation and firefighting operations	The required road network will meet and exceed the minimum requirements of PBP. There are excellent opportunities to provide substantial water supplies to fit the requirements. Evacuation is unlikely to be critical component as EM & EP will limit staff and visitors onsite on elevated fire weather days unless engaged in critical work or firefighting, and a safe refuge will be established on site.	**Yes**
facilitating appropriate ongoing land management practices	The future development will not burden or change the existing obligations or management actions of neighbours. The nature of the development and development consent conditions will ensure ongoing land management will be maintained. These can be detailed at development application stage.	**Yes**

Table 6 Exclusion of Development

Principle within PBP	Comment	Compliance
the development area is exposed to a high bush fire risk and should be avoided	The landscape bushfire risk is very high, however the nature of the Project means there is no residential component and bushfire life risk on elevated fire weather days will be managed through the EM&EP. The new development will be able to comply with the aim and objectives of PBP, and the risk has been managed to the appropriate level required by PBP.	**Yes**
the development is likely to be difficult to evacuate during a bush fire due to its siting in the landscape, access limitations, fire history and/or size and scale	The landscape bushfire risk is very high, however the nature of the Project means there is no additional residential component and bushfire life risk on elevated fire weather days will be managed through the EM&OP and provision of a refuge on site. Road upgrades will significantly improve access and ongoing fire management of the wider area (more effective ignition response) The new	**Yes**

Principle within PBP	Comment	Compliance
	development will be able to comply with the aim and objectives of PBP, and the risk has been managed to the appropriate level required by PBP.	
the development will adversely effect other bush fire protection strategies or place existing development at increased risk	The Project does not seek or rely on the provision of off-site APZs or other BPM. The development will not burden or change the existing obligations or management actions of neighbours. The development will provide a positive impact to adjoining neighbours by permanently reducing risk levels for fires up to a Fire Behaviour Index (FBI) of approximately 50 through much improved access, firefighting strength, and water supplies.	**Yes**
the development is within an area of high bushfire risk where density of existing development may cause evacuation issues for both existing and new occupants	The landscape bushfire risk is very high, however the nature of the Project means there is no additional residential component and bushfire life risk on elevated fire weather days will be managed through the EM&OP and onsite refuge. Road upgrades will significantly improve access and ongoing fire management of the wider area (more effective ignition response) The new development will be able to comply with the aim and objectives of PBP, and the risk can been managed to the appropriate level required by PBP.	**Yes**
the development has environmental constraints to the area which cannot be overcome	The environmental constraints have been considered and assessed separately. The final Project layout will be able to manage all environmental constraints.	**Yes**

9. Conclusion

This report is a Bushfire Threat Assessment that addresses the potential impacts associated with bushfire risk and provides the required planning information for the construction and operation of the Project.

This Bushfire Threat Assessment has been completed for the proposed solar farm development taking into account the requirements of PBP and the additional potential guidance to be developed, in accordance with the SEARs issued for the Project. The Project is within Bushfire Prone Land and bushfire risk is a key consideration for the Project. The report has undertaken a landscape scale bushfire risk assessment and site-specific risk assessment. There is no cumulative impact on bushfire risk if other solar farms are developed to similar standards, other than a larger area of managed land.

The report demonstrates that the Project design has taken a substantially higher standard than is required with respect to the key considerations around BAL and provision of APZ. The Project meets and exceeds the NSW APZ requirements under PBP and has considered electricity transmission industry standards to demonstrate how impacts from bushfire can be mitigated, and conversely these measures provide very significant mitigation against any fire occurring onsite spreading to surrounding areas.

Key to the sustainable operation of the site as a solar farm and BESS is developing a collaborative relationship with the Northern Rivers Bush Fire Management Committee and local RFS staff and brigades.

Appropriate measures can be developed to mitigate the bushfire risks from and to the site and will be further refined during the detailed design phases to come. The site is suitable for the development and operation of a solar farm and BESS.

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10. Appendices

Bushfire risk context

Bushfires are a normal part of the Australian landscape, and due to climate change, are predicted to become more severe, more frequent and an increasingly common part of life in eastern Australia. Climate change modelling predicts increasing frequency and severity of fire events correlating with altered rainfall and drought patterns and increasing numbers of severe and intense heat events. As the dryness of more areas increases beyond levels historically considered 'normal', the footprint of areas with a propensity to burn are likely to increase.

Not all bushfires lead to loss of life or damage to assets. Bushfires of low to moderate intensity often pose little threat to life, property and community assets. Fire agencies are very successful at extinguishing low to moderate intensity fires before they lead to injury or death. However, bushfires that burn during dangerous conditions have a much higher risk of leading to loss of life and property and causing significant injuries and environmental impact. The risk is greatest when fire occurs on hot, dry windy days, and where ignition occurs in heavy fuels, and in steep terrain. These conditions present fire that can spread rapidly, crown in forests, produce powerful convection columns and create extensive spot fires ahead of the fire front. This often makes their control impossible until weather conditions moderate.

When fires reach a certain intensity, they are beyond the capacity of firefighting resources to suppress. Firefighting resources are allocated where they will be most effective at protecting lives, not necessarily where property losses are most likely. Firefighting resources are also unlikely to be allocated to property infrastructure and community assets that cannot be defended safely. The Project is in a remote area and may not be actively defended by fire fighters.

Radiant heat is the primary cause of death or serious injury in a bushfire, and this can impact people at the site or travelling to or from the site. In addition, wind conditions can cause branches and trees to fall and block access roads, making driving hazardous. Smoke and embers will make driving hazardous.

Fires burning under extreme conditions can behave erratically and with intensity well above what has been assessed in this report. This report takes a balanced approach to considering bushfire risk and has assumed a credible worst case fire scenario burning up to FBI 80, which is the maximum identified for the Richmond Valley LGA. It is possible that fires could burn through the area and impact the site and surrounds with significantly higher FBI. The risk-based approach used in this assessment is that provided by PBP with a credible worst-case scenario of FBI 80 or a 1:50 year bushfire event. Additional redundancy will be considered by Ark Energy during further design phases.

PBP Methodology to determine APZ for RVSF

The general starting point is to balance the use of APZ setbacks to reduce radiant heat, with increased construction standards. The additional BPM then concentrates on managing bushfire spread onsite and facilitating safe and effective emergency management. For a solar farm and BESS this needs to be informed by additional information on the effects of bushfires of varying intensities on individual arrays, the BESS, substation and associated infrastructure. The protection of assets from wildfires by being provided with an APZ of the required size to reach a specific Bushfire Attack Level (BAL) represented by radiant heat and flame length needs further consideration.

It is clear that bushfire modelling developed for typical low rise buildings is not entirely suitable to make well informed judgements on solar farm response to bushfire or individual component failure, and therefore what may ultimately provide the best suite of measures to reduce risk. It is noted that research continues within industry and emergency services to improve understanding. In the meantime, the existing standards provide an excellent surrogate for suitable APZ measures and provide a baseline to analysing radiant heat loads. It is noted that PBP simply requires a minimum 10m APZ (p.77) and that:

> *"Essential equipment should be designed and housed in such a way as to minimise the impact of bushfires on the capabilities of the infrastructure during bushfire emergencies. It should also be designed and maintained so that it will not serve as a bushfire risk to surrounding bush."*

A conservative approach is to adopt the BAL-29 standard for radiant heat that is used as the base standard for the development of new residential subdivisions see Figure 27. The Richmond Valley LGA is part of the Far North Coast Fire Weather District and the relevant Fire Behaviour Index (FBI) required by PBP is FBI 80. Relevant slopes at the site are all either upslope or within the 0-5 degree downslope range and there is a variety of forest, grassland and wetland vegetation affecting the Project.

Table A1.12.3

Minimum distances for APZs – residential development, FFDI 80 areas (≤29kW/m², 1090K)

KEITH VEGETATION FORMATION	EFFECTIVE SLOPE				
	Up slopes and flat	>0°-5°	>5°-10°	>10°-15°	>15°-20°
	Distance (m) from the asset to the predominant vegetation formation				
Rainforest	9	12	15	20	25
Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	20	25	31	39	48
Grassy and Semi-Arid Woodland (including Mallee)	11	13	17	21	27
Forested Wetland (excluding Coastal Swamp Forest)	8	10	13	17	22
Tall Heath	16	18	20	22	25
Short Heath	9	10	12	13	15
Arid-Shrublands (acacia and chenopod)	6	7	8	9	10
Freshwater Wetlands	5	6	6	7	8
Grassland	10	11	12	14	16

Figure 27: APZ in relation to the standard BAL-29 calculation for residential development (PBP p. 90)

It is also noted that all buildings on site need to comply with the National Construction Code 2023 (NCC) and this may also include particular fire safety standards for particular classes of buildings.

Further work with original equipment manufacturers and Ark Energy will be needed as the design process continues to determine their risk appetite for what is acceptable based on all relevant considerations including materials & vulnerability of various components; impacts of different design fires; and what is a reasonable level of acceptable component failure in the scheme of commercial operation and ability to repair components etc need to be determined.

The key is to ensure the suite of BPM are designed to work with understanding of the site. This refers implicitly to a focus on firefighting capability as well, and in particular that access and water supplies are adequate to facilitate any firefighting. This will all be incorporated into the Fire Safety Study and the Bushfire Emergency Management and Operations Plan that will be developed during future stages of Project development. Ark Energy has committed to further consultation with the agencies and community during preparation of these management plans. Figure 28 presents the particular requirements of the RFS from PBP (p. 77).

Contemporary practice for large scale renewable projects in relatively isolated situations suggests it will be important to ensure there is some onsite firefighting capability provided at the facility. The purpose of this will be to ensure a quick initial response to any fire that originates on site through an electrical fault or other human activity or natural occurrence such as lightning. This in concert with the capability of the site to incorporate fire detection components for the equipment and for bushfires in the area will assist in limiting any small ignition on most days and reducing impacts, and assist reducing community concerns of the siting and operation of the solar farm.

8.3.5 Wind and solar farms

Wind and solar farms require special consideration and should be provided with adequate clearances to combustible vegetation as well as firefighting access and water.

The following should be provided for wind and solar farms:

- a minimum 10m APZ for the structures and associated buildings/infrastructure; and
- the APZ must be maintained to the standard of an IPA for the life of the development.

Infrastructure for the purposes of requiring APZ excludes:

- road access to the site; and
- power or other services to the site and associated fencing.

Essential equipment should be designed and housed in such a way as to minimise the impact of bush fires on the capabilities of the infrastructure during bush fire emergencies. It should also be designed and maintained so that it will not serve as a bush fire risk to surrounding bush.

A Bush Fire Emergency Management and Operations Plan should identify all relevant risks and mitigation measures associated with the construction and operation of the wind or solar farm. This should include:

- detailed measures to prevent or mitigate fires igniting;
- work that should not be carried out during total fire bans;
- availability of fire-suppression equipment, access and water;
- storage and maintenance of fuels and other flammable materials;
- notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, proposed to be carried out during a bush-fire fire danger period to ensure weather conditions are appropriate; and
- appropriate bush fire emergency management planning.

It is important to be aware of operations that may be carried out on days of Total Fire Ban and any prohibited activities or exemptions that are notified by the Commissioner of the NSW RFS under the RF Act s.99.

Figure 28: Excerpt from PBP for wind and solar farms specific controls (p. 77)

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Standards for Asset Protection Zones NSW Rural Fire Service (2006)

This document provides standards for the establishment and maintenance of APZs and is consistent with Appendix 4 of PBP.

Preliminary APZ as identified in this document require further consideration and refinement in the ongoing detailed planning and design phase for this Project. The tolerable risk of radiant heat at the assets will be determined by Ark Energy and relevant initial APZ are detailed below. Subsequent mitigation strategies depending on the vulnerability, will then be put into place. The actual location of heat-sensitive components within the development would not be confirmed until detailed design. Critical to the effectiveness of the APZ are the methods and scheduling used to maintain the APZ for the life of the Project. The Project design using a single axis tracking system mounted at 2.5m will facilitate vegetation (grass) management, which may consist of a mixture of grazing and/or mechanical works.

Guide for Bush Fire Prone Land Mapping (2015)

The identification of BPL in NSW is required under the EP&A Act. It is the responsibility of local government to prepare the Bushfire Prone Land Map (BPLM) for the local government area. The RFS Commissioner certifies the BPL according to guidance provided by NSW RFS (2015). BPL assessments are based on allocation of the vegetation present into one of three broad categories, as shown in Figure 29. The Site is affected by Category 1 and Category 3 vegetation, however once developed the entire site within the security fencing (and 2m outside) will be 'managed land'. The BPL Map is shown as Figure 7 in the report.

Once the development has been completed the BPL should be updated to reflect the new situation with extensive areas (approximately 842 ha) meeting the standard of 'managed land'. It is also noted that development that is more than 100m from Category 1 vegetation and more than 30m from Category 2 & 3 vegetation is not considered bushfire prone under the current regulatory framework of PBP, *National Construction Code 2022* (NCC) or *Australian Standard AS 3959:2018 Construction of buildings in bushfire-prone areas* (AS3959). This is referred to as BAL-Low and no specific construction requirements are needed.

Vegetation Category 1

Vegetation Category 1 is considered to be the highest risk for bush fire. It is represented as red on the bush fire prone land map and will be given a 100m buffer. This vegetation category has the highest combustibility and likelihood of forming fully developed fires including heavy ember production. Vegetation Category 1 consists of:

- Areas of forest, woodlands, heaths (tall and short), forested wetlands and timber plantations.

Vegetation Category 2

Vegetation Category 2 is considered to be a lower bush fire risk than Category 1 and Category 3 but higher than the excluded areas. It is represented as light orange on a bush fire prone land map and will be given a 30 metre buffer. This vegetation category has lower combustibility and/or limited potential fire size due to the vegetation area shape and size, land geography and management practices. Vegetation Category 2 consists of:

- Rainforests.
- Lower risk vegetation parcels. These vegetation parcels represent a lower bush fire risk to surrounding development and consist of:
  - Remnant vegetation;
  - Land with ongoing land management practices that actively reduces bush fire risk. These areas must be subject to a plan of management or similar that demonstrates that the risk of bush fire is offset by strategies that reduce bush fire risk; AND include:
    - Discrete urban reserve/s;
    - Parcels that are isolated from larger uninterrupted tracts of vegetation and known fire paths;
    - Shapes and topographies which do not permit significant upslope fire runs towards development;
    - Suitable access and adequate infrastructure to support suppression by firefighters;
    - Vegetation that represents a lower likelihood of ignitions because the vegetation is surrounded by development in such a way that an ignition in any part of the vegetation has a higher likelihood of detection.

Vegetation Category 3

Vegetation Category 3 is considered to be medium bush fire risk vegetation. It is higher in bush fire risk than category 2 (and the excluded areas) but lower than Category 1. It is represented as dark orange on a Bush Fire Prone Land map and will be given a 30 metre buffer. This category consists of:

- Grasslands, freshwater wetlands, semi-arid woodlands, alpine complex and arid shrublands.

7.1.2 Exclusions

Vegetation excluded from being mapped as bush fire prone includes:

- Single areas of vegetation less than 1 hectare in area and greater than 100 metres separation from other areas of Category 1, 2 or 3 vegetation;
- Multiple areas of vegetation less than 0.25 hectares in area and not within 30 metres of each other;
- Strips of vegetation less than 20 metres in width, regardless of length and not within 20 metres of other areas of Category 1, 2 or 3 vegetation;
- Areas of “managed grassland” including grassland on, but not limited to, recreational areas, commercial/industrial land, residential land, airports/airstrips, maintained public reserves and parklands, commercial nurseries and the like;

Figure 29: Excerpt from RFS Guide for Bush Fire Prone Land Mapping (2015)

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ISSC 20 – Guideline for the Management of Activities Within Electricity Easements and Close to Electricity Infrastructure (September 2012)

The proposed solar farm is required to comply with *ISSC 20 - Guideline for the Management of Activities Within Electricity Easements and Close to Electricity Infrastructure* (ISSC, 2012) which was written to protect public safety and electricity assets and by offering guidance on the management of activities in electricity easements including the consideration of access and safety aspects associated with the operation and maintenance, repair, replacement, upgrade or renewal of electricity infrastructure on property, whilst being mindful of the property owner's rights to maximise use and enjoyment of the land.

Lighting of fires, including planned or prescribed burns, is a controlled activity under ISSC 20 and is subject to consultation and negotiation with the network operator.

Department of Planning and Environment – Large-Scale Solar Energy Guideline (August 2022)

The proposed Richmond Valley Solar Farm is required to comply with the *Large-Scale Solar Energy Guideline* (2022). Development consent for a large-scale solar energy development will typically be subject to a range of conditions for managing and mitigating the impacts of the development, including but not limited to:

- Visual impact mitigation, such as landscaped screening at affected dwellings;
- Road upgrades, site access and maintenance requirements;
- Stormwater management, erosion and sediment control and flood mitigation works;
- Biodiversity management and mitigation measures;
- Heritage protection measures;
- Obligations to manage risks associated with bushfire and dangerous goods;
- Decommissioning and rehabilitation of the site including performance objectives; and
- Requirements for the minimisation and management of waste.

If development consent is granted for a large-scale solar energy development, the conditions of consent will continue to apply to the Project and the land on which it is located throughout its construction and operational life as well as during decommissioning and rehabilitation phases.

Detailed BAL mapping

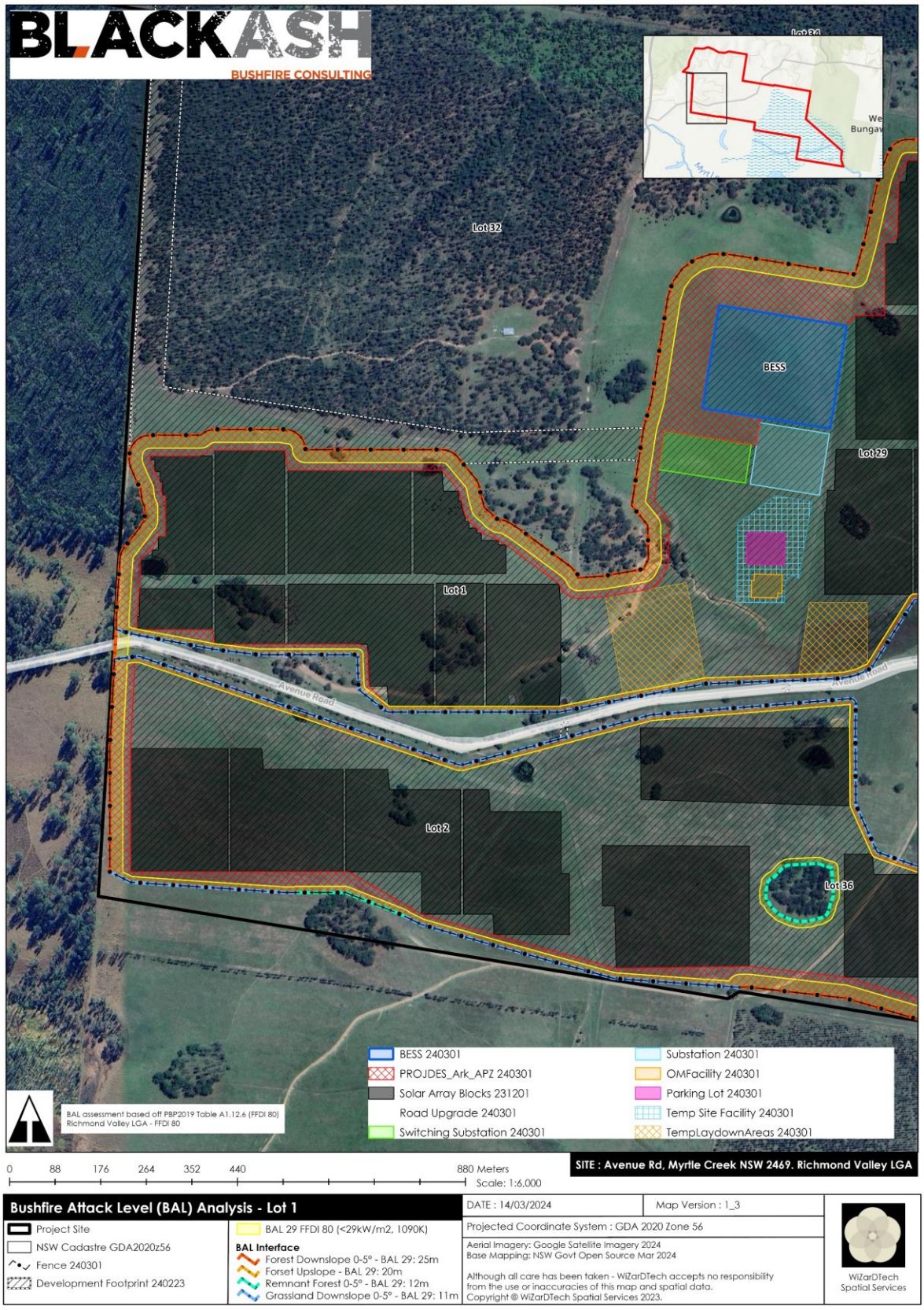

Figure 30: BAL map centred on Lot 1

Figure 3116: BAL map centred on Lot 29

Figure 32: BAL map centred on Lot 30

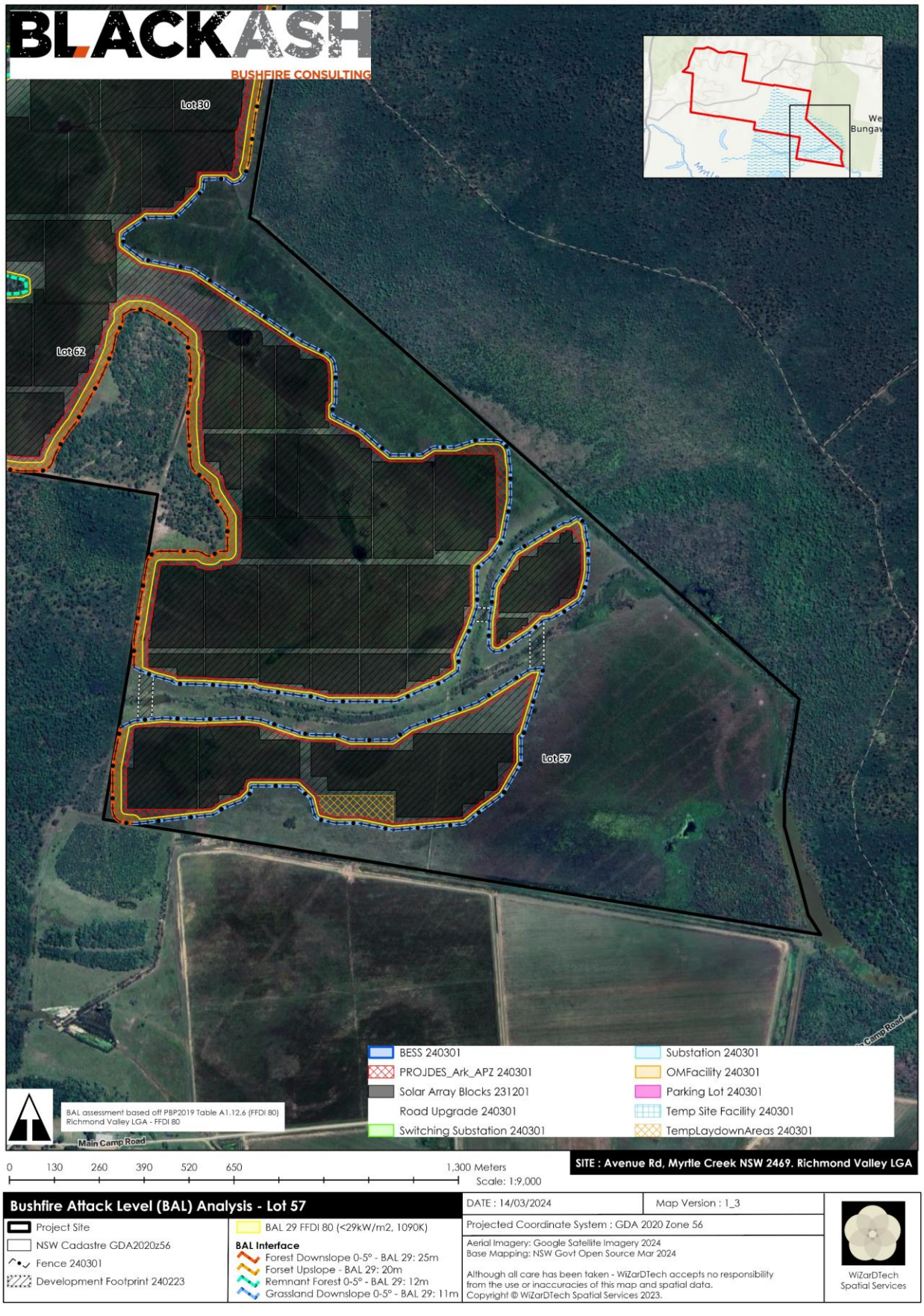

Figure 33: BAL map centred on Lot 57

Detailed APZ Mapping

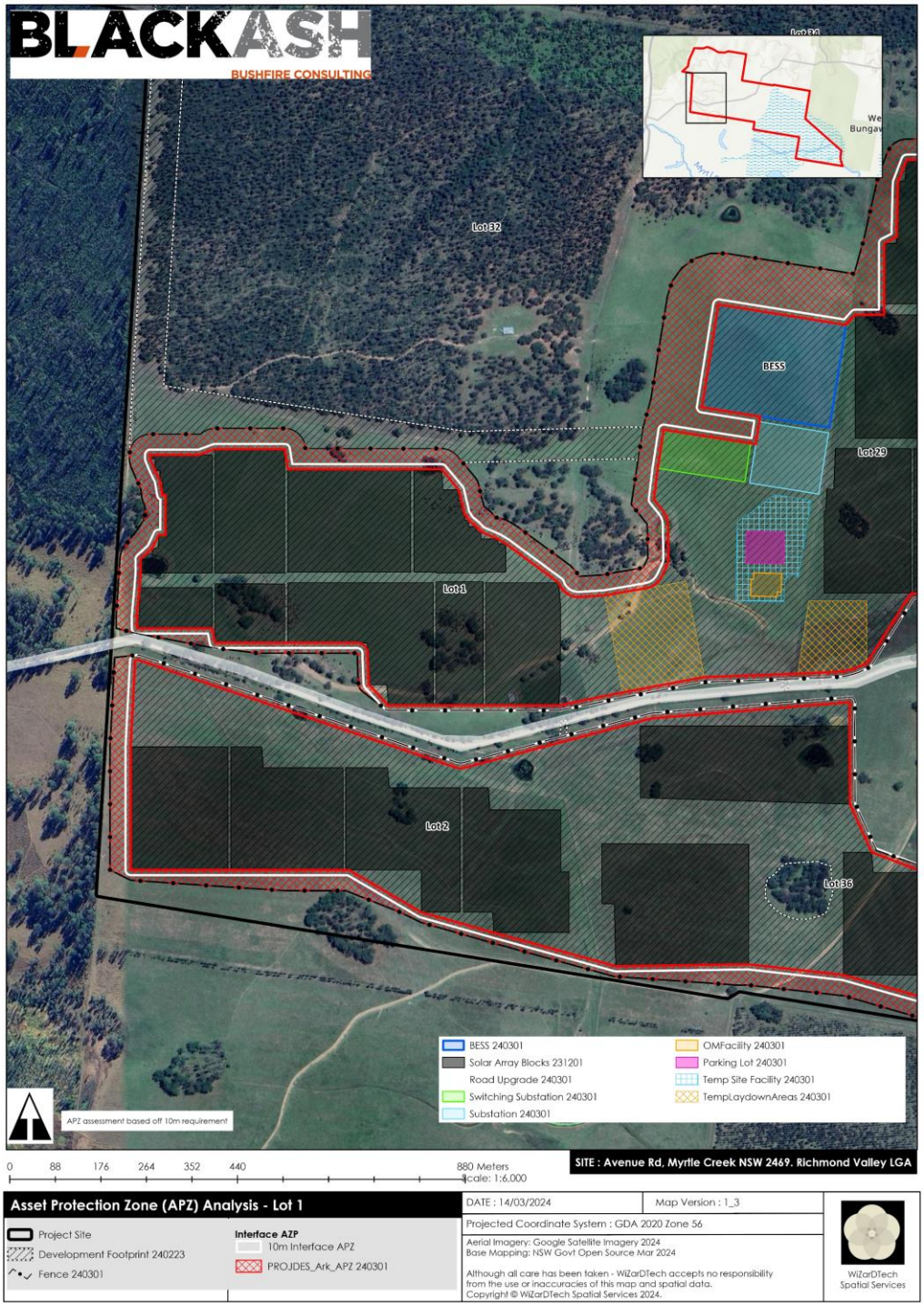

Figure 34: APZ map centred on Lot 1

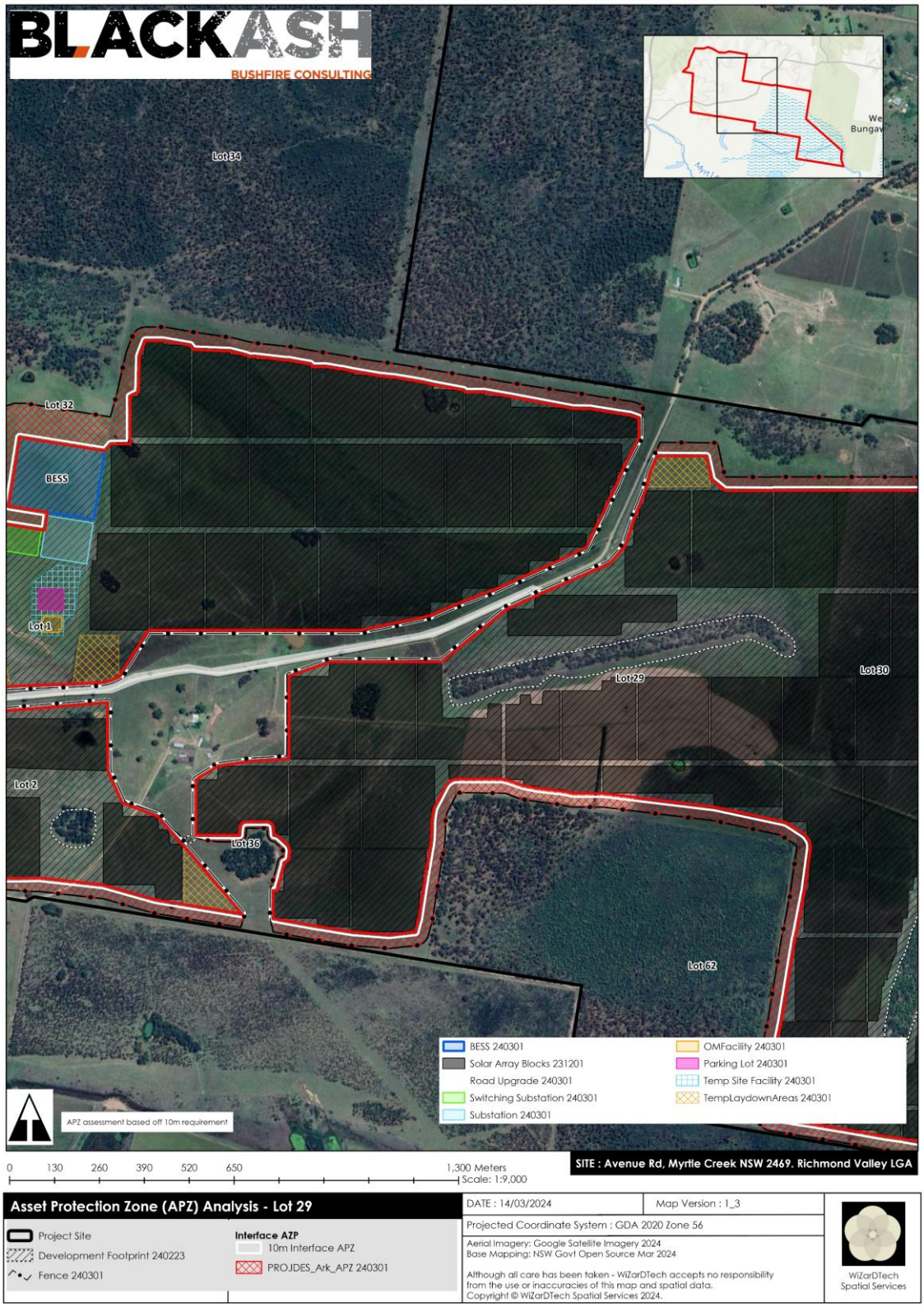

Figure 35: APZ map centred on Lot 29

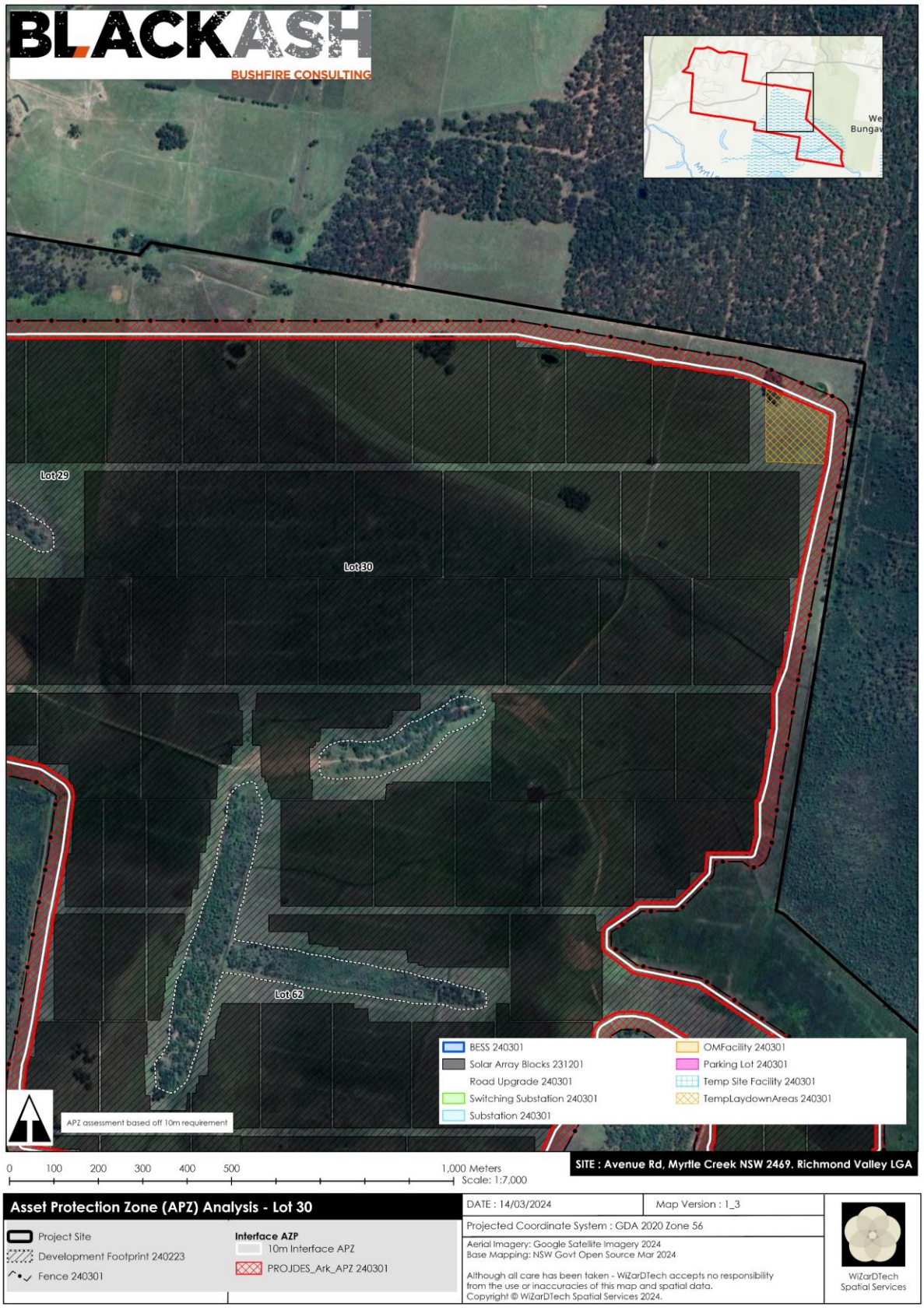

Figure 36: APZ map centred on Lot 30

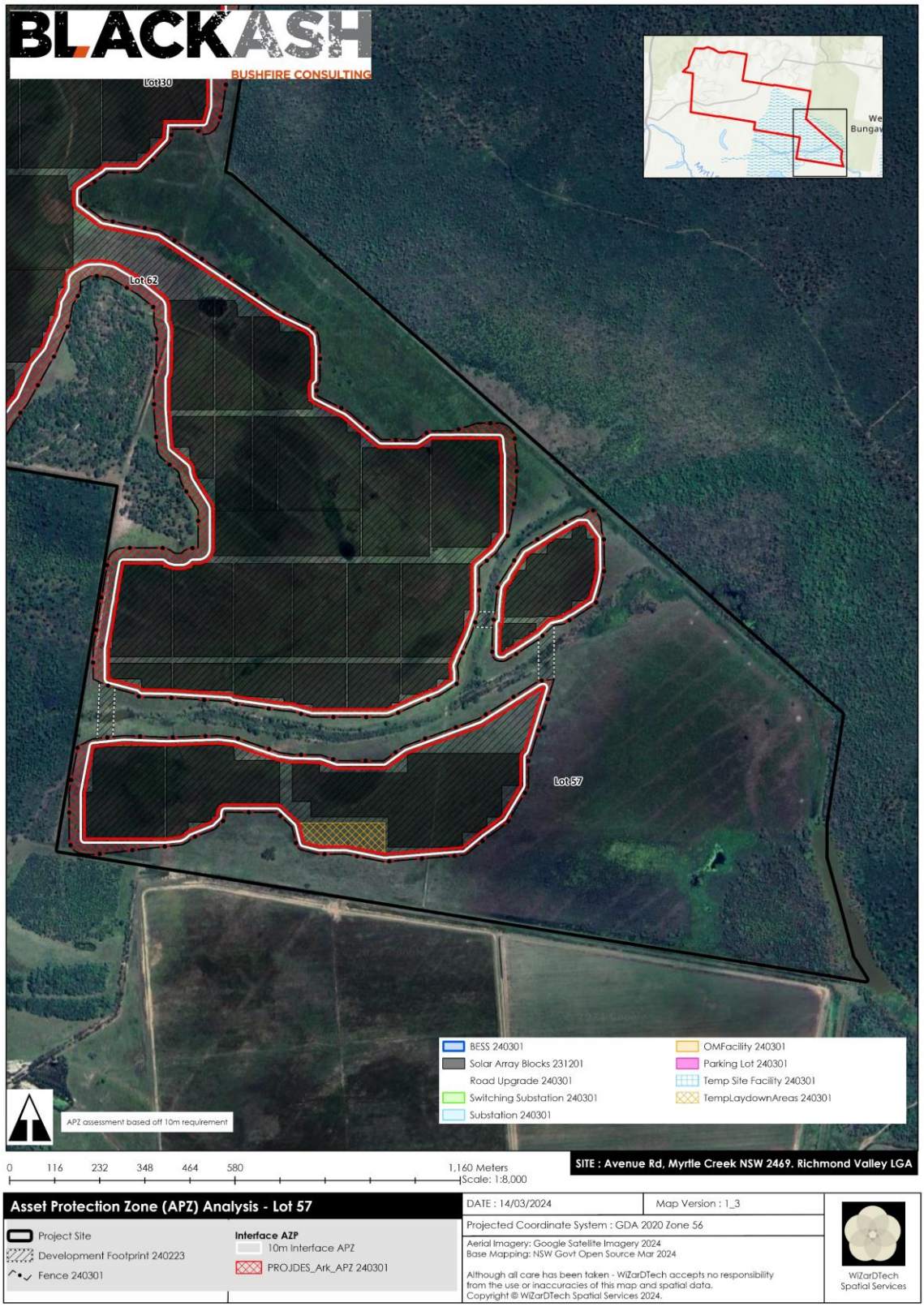

Figure 37: APZ map centred on Lot 57

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Credentials

This assessment has been prepared by David Lemcke and Lew Short from Blackash Bushfire Consulting. Current Curriculum Vitae are at Appendix 2.

Dave Lemcke is a Senior Planner & Bushfire Specialist with over 25 years experience in local government as a planner, emergency manager and bushland manager. Dave is an active senior RFS volunteer, with over 20 years in the service (15 years as an officer), with incident management experience at local level and he has held multiple brigade executive roles. Dave holds numerous qualifications including a Master of Environmental Planning and Advanced Diploma of Public Safety (Emergency Management).

Lew Short is the Principal at Blackash Bushfire Consulting (FPAA BPAD-A Certified Practitioner No. BPD-PA-16373) who is recognised by the RFS as qualified in bushfire risk assessment and has been accredited by the Fire Protection Association of Australia as a Level 3 BPAD qualified consultant. A site inspection has been completed.

Lew established and led the Community Resilience Group for the RFS. His areas of responsibility included land use planning, community engagement, education, vulnerable communities, bunkers, Neighbourhood Safer Places, business systems and projects, social media, integrated risk management and environmental management. He was responsible for the establishment, management and leadership of the development assessment function for the RFS at a State level where he was responsible for the assessment of over 80,000 development applications in Bushfire Prone Areas.

Lew holds several qualifications including undergraduate and post graduate level in environmental management and specialising in bushfire management. Lew is an active Crew Leader with Ku-ring-gai Rural Fire Brigade and has significant operational experience.

Both Lew and David are experts in the bushfire field and can interpret and apply legislation, policy and bushfire requirements while drawing on extensive professional expertise and operational experience.

Curriculum vitae

BLACKASH
BUSHFIRE CONSULTING

Curriculum Vitae

Lew Short
Director BlackAsh Bushfire Consulting
T: 0419 203 853 E: lew.short@blackash.com.au

Summary
Lew is an experienced leader in the government and emergency sector. He has an intimate knowledge of the workings of government and how emergency service organisations operate. He is not only a technical expert but a practitioner who has deep industry knowledge.

Lew has extensive experience providing national leadership undertaking bushfire hazard and risk assessments and compliance with the various State and Territory legislation. Lew's technical expertise is in bushfire consequence management, risk assessment and mitigation, specifically the planning and design of new developments in high bushfire risk areas to comply with legislative and planning requirements.

Lew has completed bushfire planning of Department of Defense assets including Beecroft Weapons Range, the Future Fuels Project, Riverina redevelopment across three bases, Holsworthy base and HMAS Albatross.

Blackash provides a range of services in support of the Department of Defence. We are able to provide a full suite of bushfire services including assistance in determining bushfire risk and tolerable levels of risk at infrastructure and assets and the bushfire requirements within the Manual of Fire Protection Engineering (MFPE). Blackash have provided bushfire prone land analysis and Bushfire Attack Level determination to inform risk and building costs estimates and specialist support for design teams.

Lew has completed bushfire risk assessments and reports for a range of sensitive critical infrastructure projects including telecommunications, power, water and energy provision. He has worked with some of Australia's leading organisations including NSW Rural Fire Service, Country Fire Authority, Emergency Management Victoria, Lend Lease, Mirvac, NSW and Victorian State and Local Governments.

Lew has a deep operational understanding of how fire works in the Australian landscape. He has multifaceted insight into how governments respond to this threat.

Areas of Expertise

- Bushfire risk management assessment
- Performance based assessment and alternative solutions
- Bushfire Management Plans
- Landuse planning & consequence management
- Bushfire planning, design & construction requirements in accordance with National Standards
- Bushfire Prone Mapping, hazard mapping and risk assessments
- Australian Standard AS3959 Construction of Buildings in Bushfire Prone Areas
- Evacuation planning and implementation
- Technical and Strategic advice

Security Clearance: Negative Vet 1

Qualifications / Accreditation

BPAD Level 3 Accredited Practitioner
Fire Protection Association of Australia

Graduate Diploma of Bush Fire Design
University of Western Sydney,

Graduate Certificate of Applied Management
Australian Institute of Police Management

Graduate Certificate of Management Macquarie
Graduate School of Management Macquarie University

Bachelor of Arts, Resource and Environmental Management
Macquarie University

BLACKASH
BUSHFIRE CONSULTING

Curriculum Vitae

David Lemcke
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Summary

David is an experienced bushfire, planning and land management professional with over 20 years in local government and now working as a private sector bushfire consultant. He has undertaken a wide range of development assessment and strategic planning projects in both regulatory and proponent roles. He was Central Coast Council's bushfire subject matter expert for over 15 years, including representation in the Land & Environment Court and numerous working groups. He has a deep understanding of contemporary, practical bushfire management from a range of perspectives due to decades of experience as a public land manager and a Rural Fire Service (RFS) volunteer, and now applies this expertise with a range of clients across the private and public sectors.

David has served as Council's staff representative on the Wyong and Central Coast Bushfire Management Committees since 2007 and was instrumental in developing and contributing to emergency management planning including preparation of Bush Fire Risk Management Plans, Fire Access & Fire Trail Plan, developing local policy and pre-incident planning, and delivering community engagement.

From 2010 he was the program manager for the Wyong Shire Council and then Central Coast Council (CCC) bushfire program. These programs won several awards, sponsored research and were renowned for innovation and improvement of local government bushfire management. The CCC program included management of over 220 fire trails, management of 275 mechanical Asset Protection Zones, Hazard Reduction burning, access management, environmental protection and community engagement using both contractors and internal staff teams.

David has been active in policy development at State level, being the Local Government NSW representative on numerous RFS policy committees including the Review of the Bushfire Environmental Assessment Code and delivering numerous conference presentations.

David is an active senior RFS volunteer, with over 20 years in the service, having been a field officer for 13 years, with incident management experience at local level and currently undergoing Group Officer training.

Areas of Expertise

- Rezoning and strategic bushfire studies
- Residential, commercial and industrial development assessment
- Infrastructure vulnerability and consequence management
- Bushfire planning, design & construction requirements in accordance with National Standards
- Bushfire Management Plans for large and small scale holdings
- Evacuation planning and implementation
- Technical and strategic advice

Qualifications

Graduate Diploma of Bush Fire Planning & Design
Western Sydney University, 2022 – current

Advanced Diploma of Public Safety (Emergency Management)
Australian Emergency Management Institute, 2015

Diploma of Management
Management Consultancy International, 2012

Master of Environmental Planning
Macquarie University, 2005

Graduate Diploma Urban & Regional Planning
University of New England, 2000

Certificate 2 Bush Regeneration
Blue Mountains TAFE, 2000

Bachelor of Arts (Geography)
University of New England, 1998

Rural Fire Service
Various foundational, technical, specialist and incident management qualifications
2002 - current