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BUSHFIRE RISK ASSESSMENT REPORT

FOR THE TARRONE BATTERY ENERGY STORAGE SYSTEM (BESS)

574 TARRONE NORTH ROAD,

TARRONE, VICTORIA

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BUSHFIRE RISK ASSESSMENT REPORT

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FOR THE TARRONE BATTERY ENERGY STORAGE SYSTEM (BESS)

574 TARRONE NORTH ROAD

TARRONE, VICTORIA

Assessment Number	Document	Preparation Date	Issue Date	Directors Approval
B233993	Draft	18.07.2023	03.08.2023	*A. Hawkins*
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EXECUTIVE SUMMARY

The proposed Tarrone Battery Energy Storage System (BESS) is located at 574 Tarrone North Road, Tarrone, Victoria.

Australian Bushfire Protection Planners Pty Limited has been commissioned by *Umwelt on behalf of Global Power Generation Australia Pty Ltd*, to prepare a Bushfire Risk Assessment that examines the level of bushfire risk to and from the Tarrone Battery Energy Storage System (BESS) and the protection measures required to mitigate the risk to the facility and the bushfire risk posed by the operation of the facility.

This bushfire risk assessment report will be submitted as part of the overall Planning Permit application to the Department of Transport and Planning.

The examination of the bushfire risk has found that the BESS site is exposed to the risk of bushfire from a fire event that occurs under winds from any direction and conducive temperature and humidity combinations.

Without appropriate levels of protection, these fire events are likely to over-run the site and present a risk to the equipment and personnel.

This report has examined the minimum level of protection required to reduce the likelihood of flame contact with the equipment. However, the risk of fire over-run remains.

This report has also examined the protection of the BESS from bushfires provided by the recommended widths of firebreaks to the perimeter of the Battery Storage Compound and the Substation and concludes that the provision of the bushfire protection measures will mitigate the likely threat of bushfire on the equipment.

Tony Hawkins, Master of Bushfire Protection
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Australian Bushfire Protection Planners Pty Limited

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SECTION 1 INTRODUCTION

1.1 Aim of this Report.

The aim of this report is to prepare an independent bushfire risk assessment that determines the level of bushfire risk and the protection measures required to mitigate the bushfire risk to the proposed Tarrone Battery Energy Storage System (BESS) located on 574 Tarrone North Road, Tarrone, Victoria.

This report also investigates the potential bushfire risk created by the operation of the BESS.

1.2 Objectives of the Report.

The objectives of the report are to:

- Identify the level of risk to the proposed BESS in accordance with best practice bushfire risk management, Australian Standard AS/NZS ISO 31000:2009 and the requirements of A.S. 3959 – 2018;
- Identify the potential for the BESS to cause a bushfire in the local area;
- Identify how levels of risk can be mitigated;
- Provide bushfire protection measures in accordance with the Victorian Country Fire Authority (CFA) Design Guidelines and Model Requirements for Renewable Energy Installations (CFA, 2022)
- Conduct an assessment of bushfire hazard consistent with the requirements of the Northern Grampians Planning Scheme 2024

The Bushfire Risk Assessment will be undertaken to assess the potential bushfire risk and identify those protection measures required to mitigate the risk.

This will include specific recommendations on fuel management, the location of Asset Protection Zones/Defendable Spaces and other measures that are deemed necessary to protect the BESS equipment against the impact of a bushfire event and the measures required to mitigate the risk to the adjoining landscape from a bushfire created by the operation of the BESS.

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1.3 Scope of Work.

The following is an outline of the scope of work undertaken in the assessment of bushfire risk to the proposed development:

- Identify and describe the study area environment;
- Establish the context of the bushfire risk to the BESS site;
- Identify measures that assist to reduce bushfire risk to the equipment;
- Identify measures required to be established to mitigate the risk from a bushfire created by the operation of the BESS equipment;
- Describe the implementation of the bushfire protection measures having regard to any site constraints.

1.4 Development Proposal.

The Proposal consists of a BESS with a storage capacity of up to 200 MWac / 400 MWh'. The purpose of the Project seeks to install battery storage capacity connecting to the existing Tarrone 500kV Terminal Station located to the west of the Project site. The proposal includes;

- A new 132kV bay comprising of up to 64 BESS modules to connect the proposed Tarrone BESS to the grid.

- Equipment located inside modular containers, except for two MV/132kV power transformers.

- An underground cable to connect the power transformers to the connection point east of the Tarrone Terminal Station, where Ryan Corner Wind Farm and Hawkesdale Wind Farm will connect.

This bushfire risk assessment report will be submitted as part of the overall Planning Permit application to the Department of Transport and Planning.

The BESS substation would be located in the western portion of the BESS site (7-A\PP2835) and connect to the existing Tarrone Terminal Station on the adjoining lot to the west.

The Proposal is expected to be operational by mid-2025 and have an operational life of at least 20 years.

During this period, operation, maintenance and monitoring of the Proposal would include the following activities:

- Servicing of the BESS and ancillary infrastructure, including inverters;

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- Maintenance of the site access road and electrical infrastructure, including the substation and cabling;
- Any ongoing environmental monitoring required in accordance with operational requirements and approval conditions; and
- Management of the bushfire protection measures.

Concept plans are shown in Figures 1 and 2.

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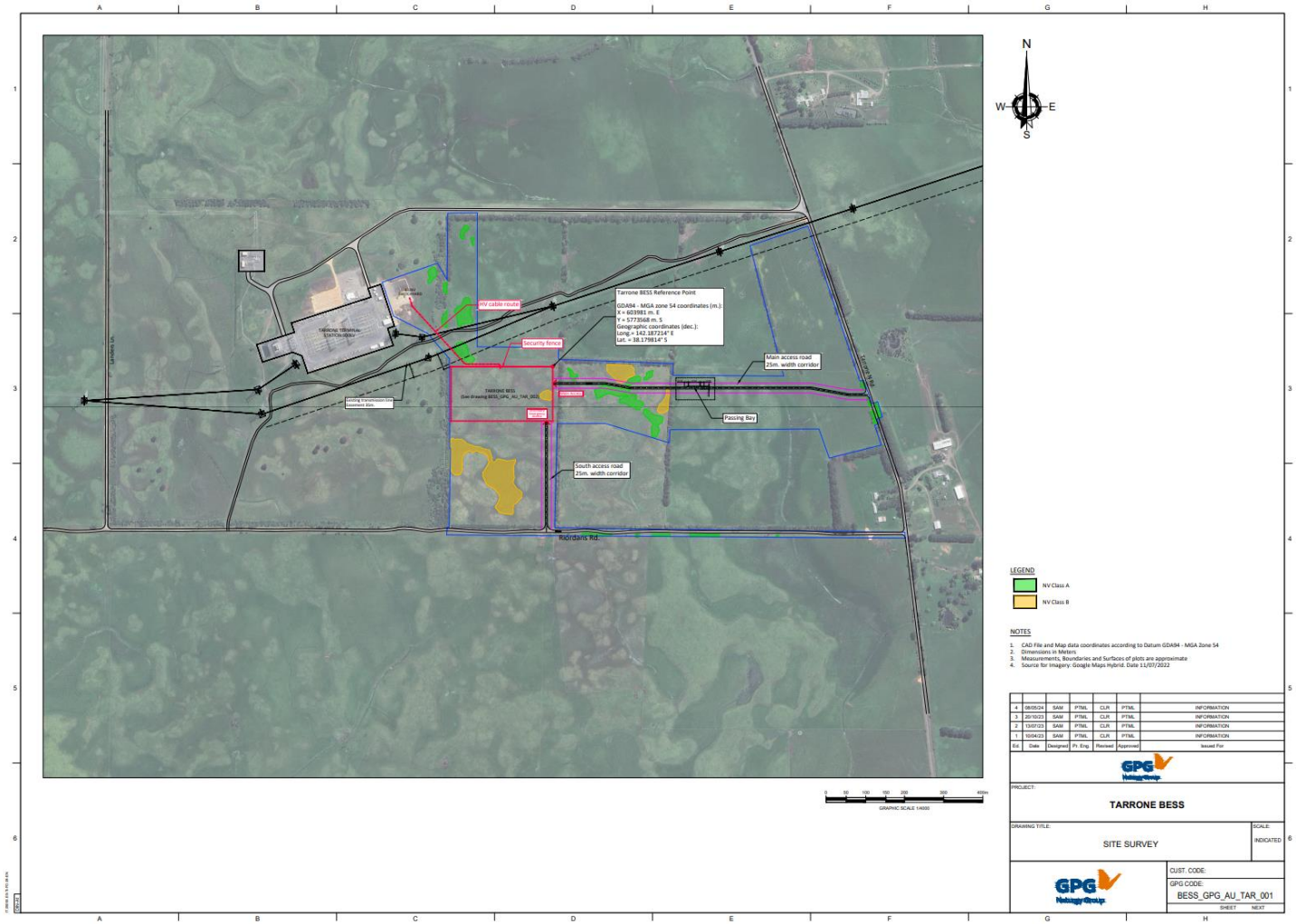

Figure 1: Construction and Operational Proposal Location and Site Context. (Source: GPG)

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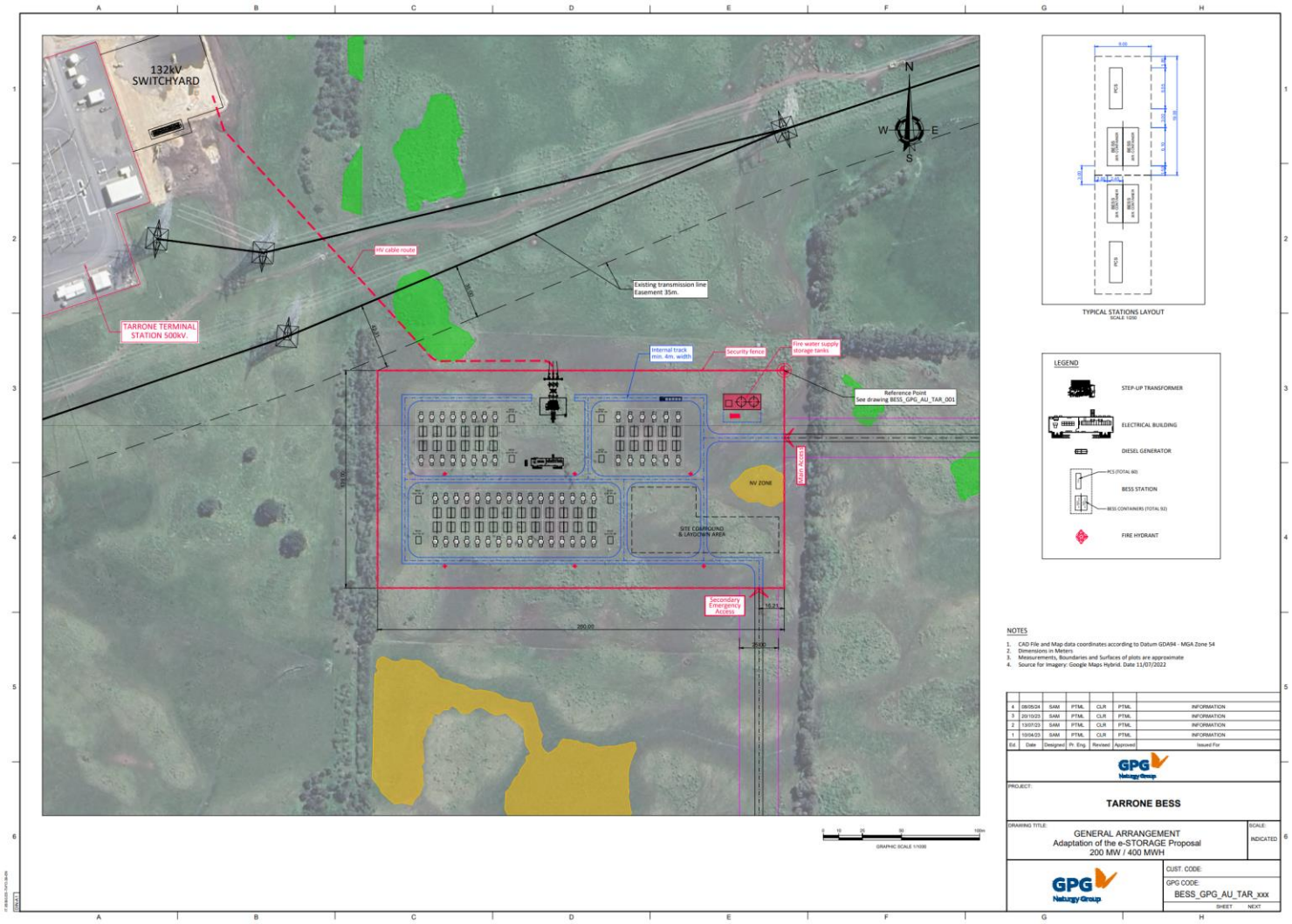

Figure 2: Tarrone Battery Energy Storage System Concept Plan – (Source: GPG)

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SECTION 2 DESCRIPTION OF THE BUSHFIRE RISK STUDY AREA

2.1 Bushfire Risk Study Area.

For the purpose of examining the potential bushfire risk to the Proposal Area a study area (2 km radius) has been established. Figure 3 provides a graphical representation of the BESS study area examined in this report.

Figure 3:Bushfire Risk Study Area.

2.2 Site Assessment.

A desktop review of the Proposal Area and surrounding development was completed for the preparation of this report. Site photos and other site related data have been supplied.

2.3 Existing Land Use.

The Proposal Area contains vacant agricultural grazing land.

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2.4 Adjoining Land Use.

The Proposal Area is bounded by Tarrone North Road to the east, Riordans Road to the south, an unnamed road to the north and the Tarrone Terminal Station to the west.

Adjoining properties contain agricultural land, isolated rural residential dwellings and associated buildings, and the Tarrone Terminal Station.

2.5 Bushfire Prone Areas.

The proposed BESS site is located within a designated Bushfire Prone Area.

Figure 4 provides an extract from the Vic Plan Bushfire Prone Areas Map which identifies the BESS site and adjoining land as containing bushfire prone vegetation.

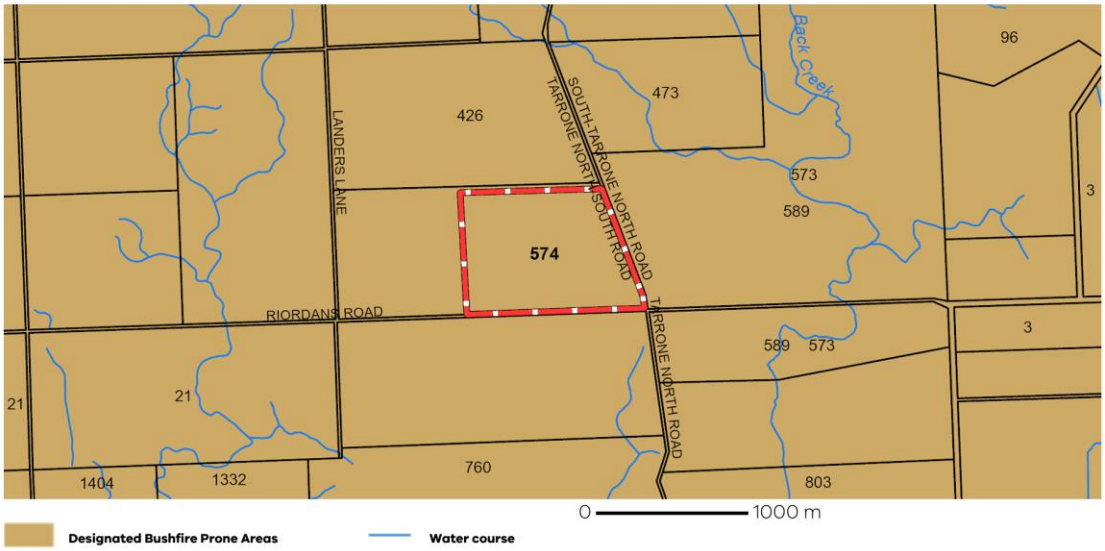

Figure 4: Extract from the Bushfire Prone Areas Map (Source: VicPlan)

2.6 Topography.

The land within the Proposal Area falls to the south at approximately 1 degree or less.

The land to the north west of the Proposal Area rises slightly.

The land to the east of the Proposal Area falls to the east at less than 5 degrees.

The land to the south of the Proposal Area falls to the south at approximately 1 degree or less.

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The land to the west of the Proposal Area rises to the west at approximately 1 degree or less.

Figure 5: Contour Plan – (Source Elvis Lidar.)

2.7 Vegetation within the Proposal Area.

The BESS site contains a mixture of native and exotic grassland reflecting its prior use as agricultural grazing land.

The existing vegetation is described in the Flora and Fauna assessment prepared *Nature Advisory* (Report number 14144.32 v1.0 dated August 2023) as:

Vegetation in the study area primarily consisted of introduced pasture grasses and broad-leaf weeds. The broader property was surrounded by planted windrows of native trees and shrubs. Areas supporting native vegetation were primarily restricted to the wet depressions or stony rises, although drier flatter land along the adjoining reserves of Tarrone Nth Road and Riordans Road also supported native vegetation.
The wet depressions supported wetland species typical of Plains Grassy Wetland, such as Spike Sedge, Rush, Australian Sweet-grass, Common Blown-grass and Common Tussock-grass.
The stony rises supported Stony Knoll Shrubland and were characterised by the presence of Weeping Grass and Austral Bracken. Other native species included wallaby and spear grasses, Kidney Weed and Sheep's Burr.
The adjoining reserves of Tarrone Nth Road and Riordans Road supported highly modified examples of Plains Grassy Woodland, characterised by a canopy of Blackwood and Black Wattle over an understorey of introduced pasture grasses.

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Existing paddock areas are bordered by tree plantings, presumably to provide windbreaks. This type of vegetation is classified as ”Low threat vegetation” by the definitions provided by Section 2.2.3.2 of the Australian Standard AS3959 – 2018. As such, this vegetation is not considered as part of the bushfire threat assessment.

It should be noted however, that should this vegetation increase in size, particularly width, as a result of changed land use practices, or if additional plantings are provided, they should not exceed the limits prescribed by the definitions of low threat vegetation unless consideration is given to the potentially increased bushfire threat.

No significant flora or fauna are shown as mapped on the site.

2.8 Vegetation on land adjoining the Proposal Area.

Vegetation on adjoining land is similar and consistent with the proposed site.

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SECTION 3 BUSHFIRE RISK ASSESSMENT – TARRONE BATTERY ENERGY STORAGE SYSTEM (BESS)

3.1 Introduction.

The Australian Standard AS/NZS ISO 31000:2009 and the Emergency Management Australia (EMA) emergency risk management process provide the framework for establishing the context, analysis, evaluation, treatment, monitoring and communication of risk.

Risk has two elements: likelihood, the chances of a bushfire occurring and consequence, the impact of a bushfire when it occurs.

Bushfire risk is defined as the chance of a bushfire occurring that will have harmful consequences to human communities and the environment. Bushfire risk is usually assessed through consideration of the likelihood of ignition and consequences of a bushfire occurring. Risk reduction can be achieved by reducing the likelihood of a bushfire, the opportunity for a bushfire to spread or the consequence of a bushfire (on natural and built assets).

Bushfire management should have a clear objective to reduce both the likelihood of bushfires and reduce the negative impacts of bushfires. It should also consider the costs, inconvenience and dangers of measures taken to reduce the risk of bushfires.

The consequences of bushfire management activities and the failure to implement programs also need to be considered. A range of factors influence bushfire risk – these include:

- The likelihood of human and natural fire ignitions, as influenced by time, space and demographics;
- The potential spread and severity of a bushfire, as determined by fuel, topography and weather conditions;
- The proximity of assets vulnerable to bushfire fuels, and likely bushfire paths; and
- The vulnerability of assets including natural assets, or their capacity to cope with, and recover from bushfire.

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3.2 Risk Assessment.

An assessment of bushfire risk must firstly define the problem.

This involves the identification of the nature and scope of issues to be addressed and defining the possible boundaries for the assessment *(Emergency Risk Management – Applications Guide. (EMA Echo Press, 2000), and* AS/NZS ISO 31000:2009*).*

For the purpose of analysing fire risks that might emerge in the area surrounding the proposed site, a dangerous and damaging fire has the potential to occur when the following conditions prevail:

- Continuous available fuel – fuel at moisture content sufficiently low to enable rapid combustion, arising from drought effects or the maturing and drying, of grasslands;

- Exposure of vulnerable assets. The 'catchment' for such fires may be within several hundred metres or many (60-70) kilometres from the asset/s;

- A combination of weather conditions that generate a forest or grass fire danger index of Very High or greater

- A fire in the landscape which is not effectively suppressed.

The assessment of the risk to the development site identified that the BESS site will be exposed to the risk of fire paths from any direction.

The assessment has determined that the bushfire risk to the BESS site is present with fire likely to over-run the site in the absence of mitigation actions.

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SECTION 4 BUSHFIRE PROTECTION ASSESSMENT – TARRONE BATTERY ENERGY STORAGE SYSTEM (BESS)

4.1 Fire Breaks (asset protection zones) to the BESS

The Country Fire Authority document; "*Design Guidelines and Model Requirements - Renewable Energy Facilities*" (CFA, Version 3 March 2022) provides standard considerations and measures in relation to fire safety, risk and emergency management to be considered when designing, constructing and operating new renewable energy facilities, and upgrading existing facilities.

The requirements for firebreaks (asset protection zones) for BESS facilities are designed to reduce the potential for fire to enter or leave a BESS site.

The CFA document specific model requirements are detailed;

> *A fire break must be established and maintained around:*
> *a) The perimeter of the facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary.*
> *b) The perimeter of control rooms, electricity compounds, substations and all other buildings onsite.*

The width of fire breaks must be a minimum of 10m, and at least the distance where radiant heat flux (output) from the vegetation does not create the potential for ignition of on-site infrastructure.

The minimum firebreak width should be considered after calculations of the radiant heat impact of ignited surrounding vegetation has been considered.

Consideration should also be given to the potential for burning ember attack on equipment can start fires and damage equipment.

To enable the assessment and calculation of radiant heat impact from surrounding vegetation, three factors are determined;

1. The predominant bushfire prone vegetation community within 100 metres of the buildings and equipment;

2. The effective slope of the land under the bushfire prone vegetation; and
3. The Fire Danger Index for the site.

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Note:
The predominant bushfire prone vegetation is vegetation which will cause the most significant bushfire behaviour.

The Vegetation Map records the vegetation community on the land to the south, north and northeast, within 100 metres of the BESS site as native grassland.

The topography of the land to the north and west of the BESS site rises to the north and west at less than 5 degrees.

The topography of the land to the east and south of the BESS site falls to the east and south at less than 5 degrees

The Fire Danger Index (FDI) for the site is 100.

Table 1: Determination of width of the Flame Zone/Defendable Space Widths from Table 2.4 of A.S. 3959 – 2018.

Aspect	Gradient	Vegetation Classification	Fire Danger Index	Flame Zone Widths	Recommended BAL29 Firebreak Width
North	0-5 degrees upslope	Grassland	100	< 6m	9 - <13m
East	5-10 degrees downslope	Grassland	100	< 7m	10 - <15m
South	5-10 degrees downslope	Grassland	100	< 7m	10 - <15m
West	5-10 degrees upslope	Grassland	100	< 6m	9 - <13m

It is recommended that the maintained firebreak area exceed the minimum 10m distance described in the CFA document and extend to the perimeter of the site boundary as shown in Figure 6.

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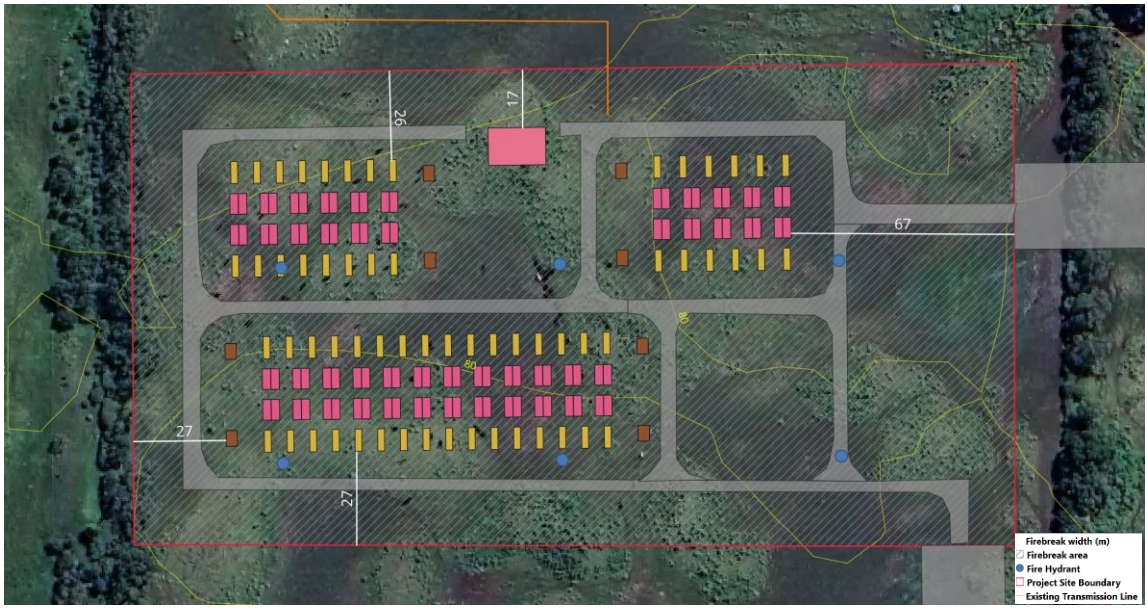

Figure 6: Firebreak area.

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After consideration of the potential fire impact upon the facility, the relatively isolated location which precludes immediate response from emergency services and the potential impact of the facility on surrounding vegetation in the event of fire, it is recommended that no vegetation should be permitted within the security fenced area of the site.

The surface area within the fenced security area, not including areas of constructed assets or roadways, should be maintained with a gravel surface to a depth that ensures vegetation growth is minimised or eliminated.

In addition to the potential for a vegetation fire to impact the BESS, consideration must be given for the potential for the impact of a fire emanating from the BESS to ignite surrounding vegetation.

Fire engineering data regarding the expected radiant heat flux emitted by the BESS if fully involved in fire and under the conditions of functioning inbuilt passive fire protection should be considered to ensure that sufficient clearance is provided between the BESS and surrounding vegetation.

4.2 Provision of Bushfire Mitigation Measures other than Defendable Space setbacks to the equipment.

Exposed cables should be shielded with a non-combustible collar to a height of 400mm above ground or pavement level.

The installation of ‘knock-down’ fire extinguishment equipment such as CO2 or Dry Chemical dousing system should be considered to mitigate the risk of cabinet-to-cabinet fire spread.

Although not mandatory, it is recommended that construction of buildings within the site be to the minimum standard of BAL 29 as per the requirements of the Australian Standard AS3959 – 2018.

4.3 Provision of Bushfire Mitigation Measures to the Transmission Line from the BESS Substation.

The Proposal includes an underground 132 kV transmission line connecting the Project to the Tarrone Terminal Station with an approximate length of 200 metres. Specifically, the transmission line will extend from the Project transformers within the BESS site to a new 132kV switchyard to be constructed at the Tarrone Terminal Station located to the northwest of the BESS site.

From a fire mitigation perspective, underground cabling is preferred. If aerial cabling is used, the cables should be insulated.

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There is no requirement to provide a Defendable Space to the transmission line (overhead or underground). The vegetation beneath an aerial supply shall be maintained to provide clearance to the conductors.

Clearance from aerial transmission lines to vegetation shall be compliant with the requirements of *Electricity Safety (Electric Line Clearance) Regulations 2020.*

4.4 Access for Fire-fighting Operations.

All access roads shall provide satisfactory access for emergency services.

Emergency vehicle access to and within the facility should allow unobstructed access to battery energy storage systems, substations, and fire service Infrastructure (hydrants).

The proposed internal access arrangements are shown in Figure 7.

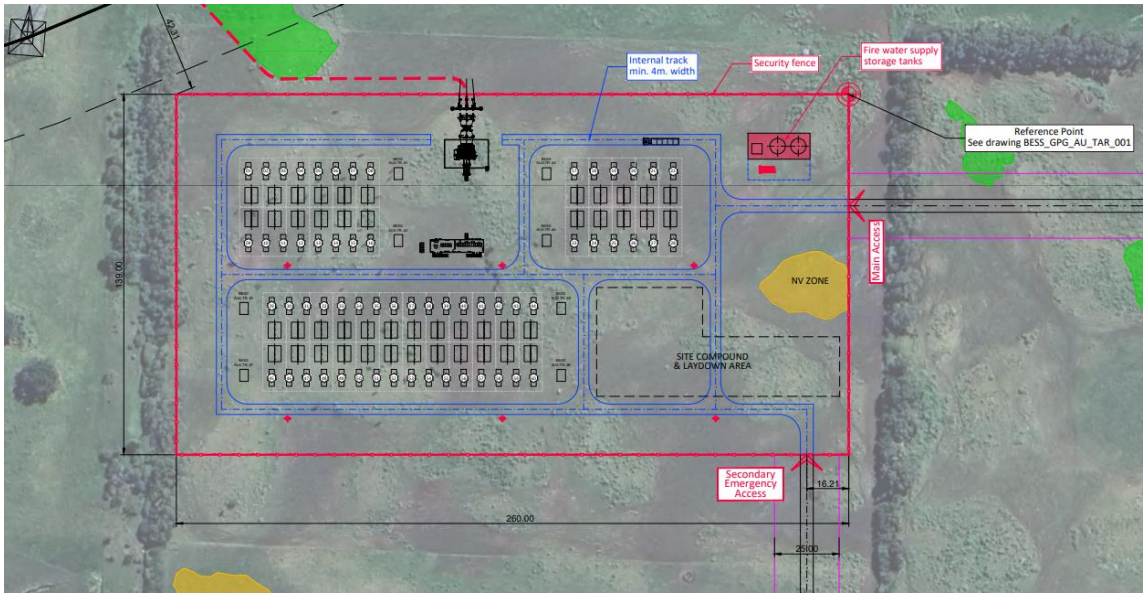

Figure 7: Proposed Access

The proposed external access arrangements are shown in Figure 8.

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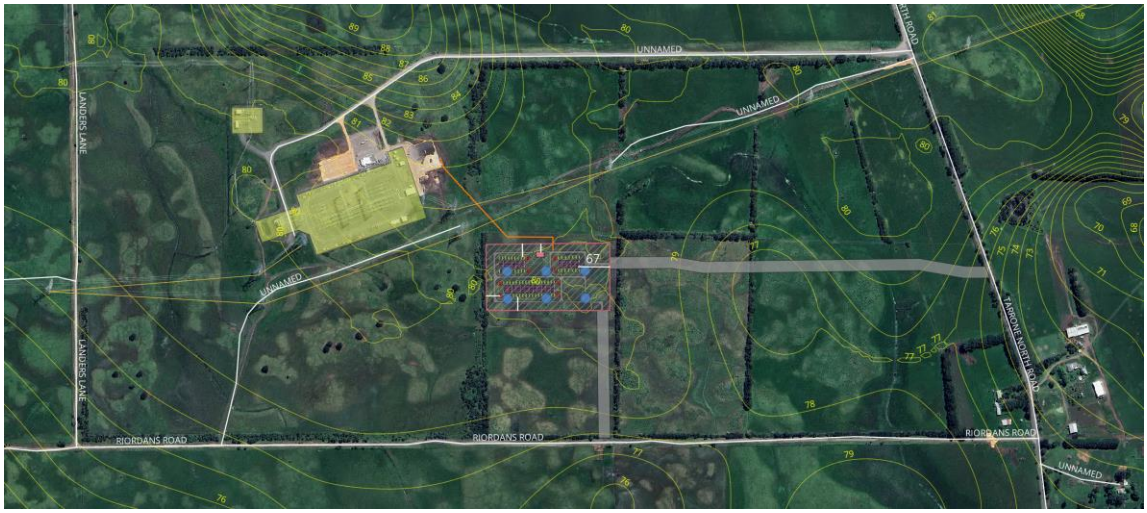

Figure 8: Proposed Access

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Main access is via an 800m long (approx.) roadway to Tarrone North Road. The proposed access travels through relatively low threat grassland on a 25m wide corridor.

Secondary emergency access is via a 200m (approx.) roadway to Riordans Road. The proposed access travels through relatively low threat grassland on a 25m wide corridor.

It is understood that the final designation of main and secondary access is to be determined as part of the proposal approval process. The above access provisions are compliant and suitable for either use.

The CFA document requirements for access and the proposal compliance are as follows in Table 2;

Table 2: Access requirements and proposal compliance

CFA Requirement	Proposal Compliance
Water access points must be clearly identifiable and unobstructed to ensure efficient access	Can be achieved (Recommendation)
Construction of a four (4) metre perimeter road within the perimeter fire break.	Complies
Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes.	Can be achieved (Recommendation)
Constructed roads should be a minimum of four (4) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface.	Complies
The average grade should be no more than 1 in 7 (14.4% or 8.1°) with a maximum of no more than 1 in 5 (20% or 11.3°) for no more than fifty (50) metres.	Complies
Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.	Can be achieved (Recommendation)
Roads must incorporate passing bays at least every 600 metres, which must be at least twenty (20) metres long and have a minimum trafficable width of six (6) metres.	Can be achieved (Recommendation)

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Where roads are less than 600 metres long, at least one passing bay must be incorporated.	
Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, and battery energy storage systems and related infrastructure.	Complies
The provision of at least two (2) but preferably more access points to the facility, to ensure safe and efficient access to and egress from areas that may be impacted or involved in fire. The number of access points must be informed through a risk management process.	Complies

4.5 Water Supplies for Fire Fighting Operations.

A fire protection system suitable for the risks and hazards at the facility must be provided.

From the CFA document the requirements for battery energy storage systems, the water supply quantity must meet the requirements shown in Table 3, which indicates proposal compliance.

Table 3: Water Supply requirements and compliance.

CFA Requirement	Proposal Compliance
Enable effective cooling of surrounding infrastructure.	Can be achieved.
Account for reasonable duration of fire events based on the proposed battery chemistry	Can be achieved. Minimum water storage capacity to be determined by fire engineering report.
Account for local weather conditions and potential fire weather conditions.	Complies
Provide for the safety of firefighters.	Complies
A fire protection system suitable for the risks and hazards at the facility must be provided. For battery energy storage systems, the water supply quantity must:	
The fire protection system must be designed in line with the requirements of AS 2419.1-2005: Fire hydrant installations, Section	Can be achieved (Recommendation)

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3.3: Open Yard Protection, in consultation with CFA.	
The fire protection system must be designed in line with the requirements of AS 2419.1-2005: Fire hydrant installations, Section 3.3: Open Yard Protection, in consultation with CFA.	Can be achieved (Recommendation)
For the purposes of determining system requirements, the 'area' referenced within AS 2419.1 may be considered that of the battery installation, including the fire break around the battery infrastructure, rather than the entire area of the yard or site. *Where no reticulated water is available, a fire water supply in static storage tanks, where the fire protection system must include at a minimum:*	
i. The fire water supply must be of a quantity no less than 288,000L or as per the provisions for Open Yard Protection of AS 2419.1-2005 flowing for a period of no less than four hours at 20L/s, whichever is the greater.	Can be achieved (Recommendation)
ii. The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from AS 2419.1-2005, Table 3.3. (E.g., For battery installations with an aggregate area of over 27,000m2, 4 hydrant outlets are required to operate at 10L/s for four hours, which equates to a minimum static water supply of 576kL.)	Can be achieved (Recommendation)
iii. Fire hydrants must be provided and located so that every part of the battery energy storage system is within reach of a 10m hose stream issuing from a nozzle at the end of a 60m length of hose connected to a fire hydrant outlet.	Can be achieved (Recommendation)

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	iv. The fire water supply must be located at vehicle entrances to the facility, at least 10m from any infrastructure (electrical substations, inverters, battery energy storage systems, buildings).	Can be achieved (Recommendation)
	v. The fire water supply must be reasonably adjacent to the battery energy storage system and shall be accessible without undue danger in an emergency. (E.g., Fire water tanks are to be located closer to the site entrance that the battery energy storage system).	Can be achieved (Recommendation)
	vi. The fire water supply must comply with AS 2419.1-2005: Fire hydrant installations - Section 5: Water storage.	Can be achieved (Recommendation)

The BESS site is not connected to a reticulated mains water supply.

A layby parking area for fire appliances will be provided adjacent to the water supply tanks.

Each tank shall be maintained full and resupplied immediately after use.

4.6 Occupation of the BESS during Total Fire Ban Days.

A risk assessment should be undertaken regarding the presence of staff and visitors on site on days of declared Total Fire Ban Days and/or when fire danger ratings are elevated, Advice from emergency services regarding early evacuation, shelter in place or egress from site should be monitored and implemented.

No ‘hot works’ should be undertaken on Total Fire Ban Days without a full risk assessment and the approval of the CFA.

If emergency work is required to be undertaken during extreme/catastrophic fire danger weather, all works should be carried out with notification to, and the approval of the CFA and with adherence to any conditions that they may impose.

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4.7 Fire protection measures required for Construction and Decommissioning works.

The use of heavy earthmoving equipment and works that include grinding/welding shall not take place during declared Total Fire Ban days without a full risk assessment and the approval of the CFA.

The bushfire risk to personnel and equipment will remain during the construction and decommissioning works.

It is recommended that once the detail design is completed the head contractor shall include the management of bushfire risk in the Construction Management Plan (CMP), Decommissioning Plan (DP), Evacuation Plan (EP) and Operations Plan (OP).

It is also recommended that, during the construction and decommissioning works periods, the contractor shall provide a suitable fire response Tanker Trailer and portable fire extinguishers on all construction vehicles.

4.8 Bushfire Emergency Evacuation Plan (BEEP).

The operator of the facility should prepare and submit to the CFA a Bushfire Emergency Evacuation Plan (BEEP) for the site for comment.

The BEEP will identify appropriate procedures for occupants to follow in the event of a bushfire and it to contain the following minimum requirements:

- Name and address of facility;
- Contact details (including phone number);
- Number of employees/occupants;
- Primary Action (evacuate or shelter)
- Details of location or address of Primary Action;
- Details of location or address of back-up/pre-emptive procedures;
- Procedure for Primary Action and back-up actions;
- Assembly point(s) and transportation arrangements (evacuation only);
- Action statements 9before, during and after a bushfire);
- Site layout of the facility;
- Attachments including occupant/employee listing.

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SECTION 5 CONCLUSION – TARRONE BATTERY ENERGY STORAGE SYSTEM (BESS) 574 TARRONE NORTH ROAD, TARRONE, VICTORIA

The proposed Tarrone Battery Energy Storage System (BESS) on 574 Tarrone North Road, Tarrone, Victoria.

Australian Bushfire Protection Planners Pty Limited has been commissioned by *Umwelt (Australia) Pty Ltd on behalf of Global Power Generation Australia Pty Ltd* to prepare a Bushfire Risk Assessment that examines the level of bushfire risk to and from the Tarrone Battery Energy Storage System (BESS) and the protection measures required to mitigate the risk to the facility and the bushfire risk posed by the operation of the facility.

This bushfire risk assessment report will be submitted as part of the overall Planning Permit application to the Department of Transport and Planning.

The examination of the bushfire risk has found that the BESS site is exposed to the risk of bushfire from a fire event that occurs under winds from any direction and conducive temperature and humidity combinations.

Without appropriate levels of protection, these fire events are likely to over-run the site and present a risk to the equipment and personnel.

This report has examined the minimum level of protection required to reduce the likelihood of flame contact with the equipment. However, the risk of fire over-run remains.

This report has also examined the protection of the BESS from bushfires provided by the recommended widths of firebreaks to the perimeter of the Battery Storage Compound and the Substation and concludes that the provision of the bushfire protection measures will mitigate the likely threat of bushfire on the equipment.

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