Conclusion, Recommendations and Residual Risk

The Bushfire Impact Statement (BIS) has identified and assessed bushfire risk to the development (Solar Farm East, Solar Farm West, Infrastructure Compounds and the Transmission Line Route Options), including both bushfire emanating from the site and bushfire impacting the site from an external source.

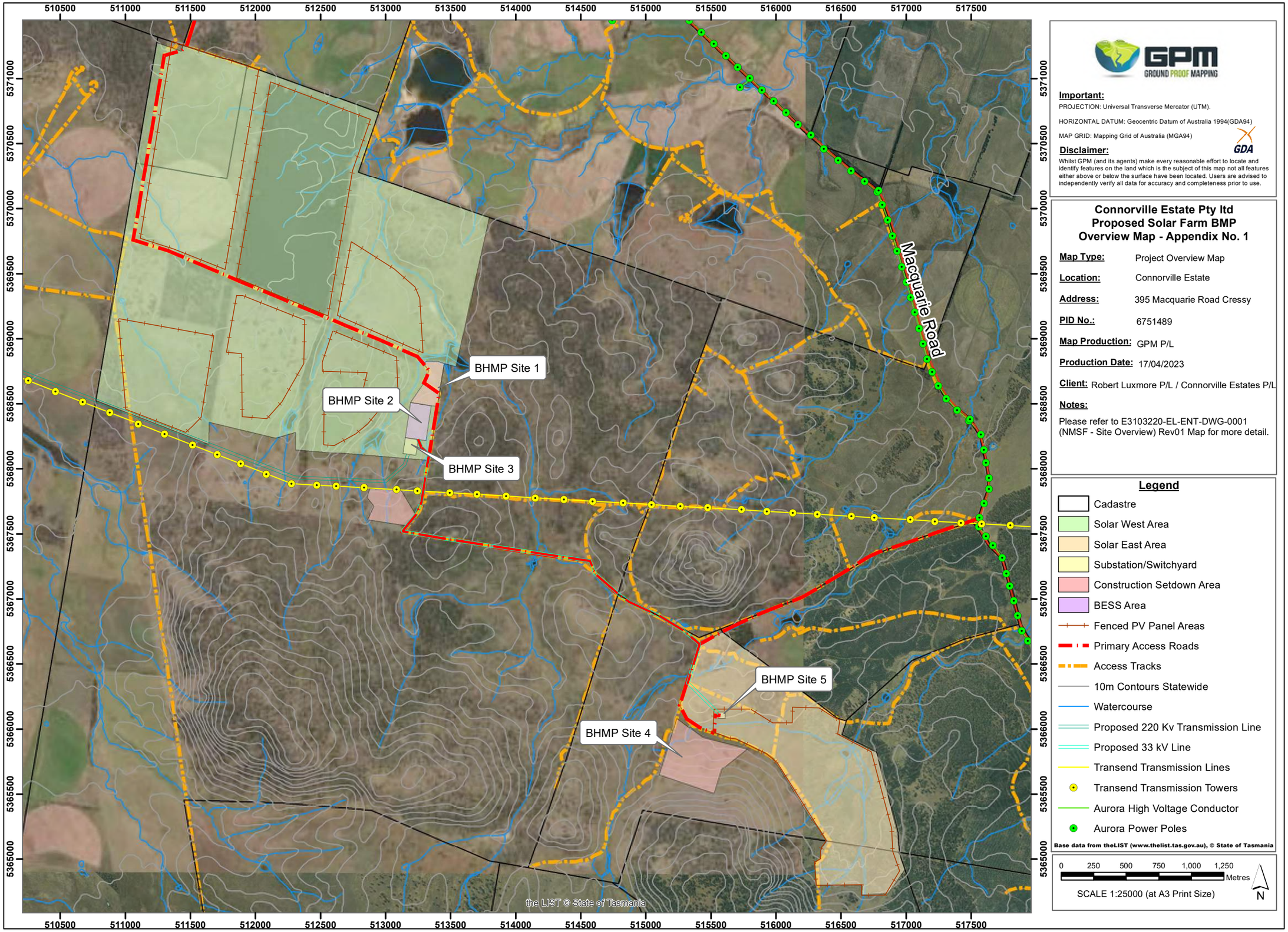
Whilst the site is shown as being in a Bushfire Prone Area and there is potential for bushfire threat, the overall risk is deemed low, especially if specific recommended measures are taken to mitigate the risk.

Recommended mitigation measures to moderate the risk to an acceptable level are listed below:

1. Implement all measures and strategies as listed in the Bushfire Mitigation Plan (BMP) specific to the facility location and design (hazard management areas, access, bushfire fighting water supply and firebreaks) for the entire development.
2. Implement all measures and strategies as listed in the BMP specific to the construction (vegetation & fuel management, machinery usage, fuel storage, semi-permanent office & storage buildings) and production phases.
3. As part of the BMP, provide a Bushfire Hazard Management Plan (BHMP) and more specifically a Hazard Management Area (HMA) for all identified hazardous uses, to meet the requirements Tasmanian Planning Scheme – Northern Midlands Local Provision Schedule 2022, and more specifically, C13.0 Bushfire-Prone Areas Code.
4. As part of the BMP, incorporate a Bushfire Emergency Management Strategy (BEMS) to ensure that the facility is prepared in the event of an unplanned fire, providing for safety of site personnel, emergency responders and the community. This will cover the construction and production phases. This BEMS will guide the formation of a Bushfire Emergency Plan (BEP) to be prepared at Building Approval stage.
5. Implement all recommended mitigation measures as defined in Table 5 of this BIS.
6. Apply fuel reduction planned burning to Conservation Covenants CPR7165, CPR5542 and CPR8717 to reduce fuel loads to the north and northwest of the development sites.

Any residual risk remaining, after ensuring that the above mitigation measures are implemented or undertaken, would be minimal. It should be noted that bushfire risk in this landscape situation cannot be fully reduced as vegetation still exists within and surrounding the site area. Further risk management should focus on the situation if a fire was to occur on site and how that is managed to reduce the impact.

GROUND PROOF MAPPING P/L
PO Box 1027 | Launceston | Tasmania| 7250
M 0487 476 479 | F 03 6334 0215 | E justin@groundproofmapping.com.au
www.groundproofmapping.com.au | ABN 75 159 326 735



GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.

Connorville Estate Pty ltd
Proposed Solar Farm BMP
Overview Map - Appendix No. 1

Map Type: Project Overview Map

Location: Connorville Estate

Address: 395 Macquarie Road Cressy

PID No.: 6751489

Map Production: GPM P/L

Production Date: 17/04/2023

Client: Robert Luxmore P/L / Connorville Estates P/L

Notes:

Please refer to E3103220-EL-ENT-DWG-0001 (NMSF - Site Overview) Rev01 Map for more detail.

Legend

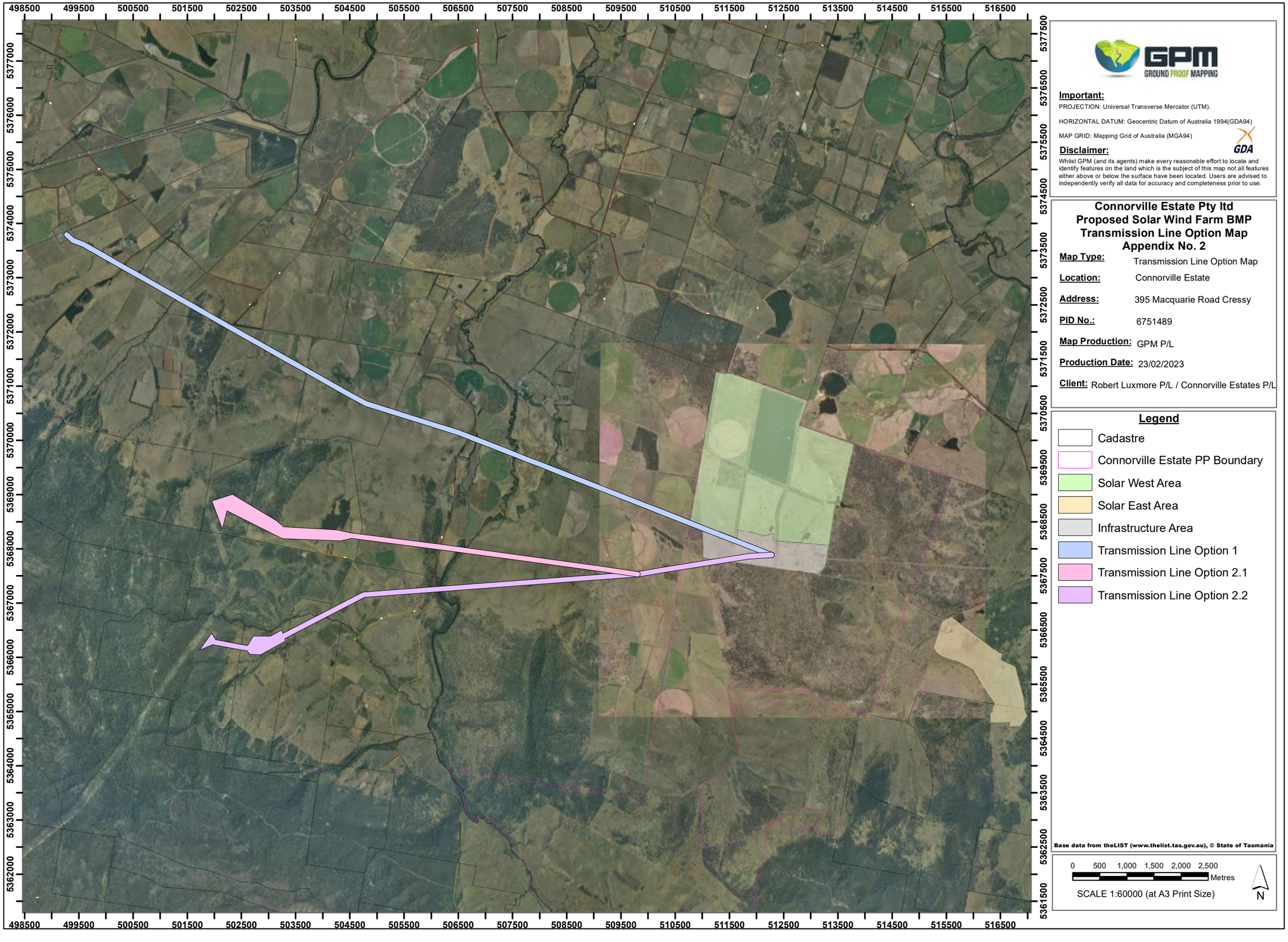
- Cadastre
- Solar West Area
- Solar East Area
- Substation/Switchyard
- Construction Setdown Area
- BESS Area
- Fenced PV Panel Areas
- Primary Access Roads
- Access Tracks
- 10m Contours Statewide
- Watercourse
- Proposed 220 Kv Transmission Line
- Proposed 33 kV Line
- Transend Transmission Lines
- Transend Transmission Towers
- Aurora High Voltage Conductor
- Aurora Power Poles

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

0 250 500 750 1,000 1,250 Metres

SCALE 1:25000 (at A3 Print Size)

N


498500 499500 500500 501500 502500 503500 504500 505500 506500 507500 508500 509500 510500 511500 512500 513500 514500 515500 516500
5377500 5376500 5375500 5374500 5373500 5372500 5371500 5370500 5369500 5368500 5367500 5366500 5365500 5364500 5363500 5362500 5361500
5377000 5376000 5375000 5374000 5373000 5372000 5371000 5370000 5369000 5368000 5367000 5366000 5365000 5364000 5363000 5362000
GPM
GROUND PROOF MAPPING
Important:
PROJECTION: Universal Transverse Mercator (UTM).
HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)
MAP GRID: Mapping Grid of Australia (MGA94)
GDA
Disclaimer:
Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.
Connorville Estate Pty ltd
Proposed Solar Wind Farm BMP
Transmission Line Option Map
Appendix No. 2
Map Type: Transmission Line Option Map
Location: Connorville Estate
Address: 395 Macquarie Road Cressy
PID No.: 6751489
Map Production: GPM P/L
Production Date: 23/02/2023
Client: Robert Luxmore P/L / Connorville Estates P/L
Legend
Cadastre
Connorville Estate PP Boundary
Solar West Area
Solar East Area
Infrastructure Area
Transmission Line Option 1
Transmission Line Option 2.1
Transmission Line Option 2.2
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
0 500 1,000 1,500 2,000 2,500
Metres
SCALE 1:60000 (at A3 Print Size)
N

Appendix No. 3

Bushfire Mitigation Plan (BMP)

Table of Contents

Table of Figures

Bushfire mitigation measures, identified through the BIS, will be specified in this BMP. The BMP addresses the facility location and design (hazard management areas, access, bushfire fighting water supply and firebreaks) for the entire development. The BMP also covers the construction (vegetation & fuel management, machinery usage, fuel storage, semi-permanent office & storage buildings) and production phases.

New and emerging renewable energy technology has outpaced the development of standards and guidance in relation to fire and emergency management. In the absence of any Tasmanian guidelines, the BMP will be based on the 'Design Guidelines and Model Requirements, Renewable Energy Facilities, CFA, V3.0, March 2022. Where there are higher standards for Tasmania as specified in the Tasmanian Planning Scheme - Northern Midlands Local Provision Schedule, C13.0 Bushfire-Prone Areas Code, then these have been defined as the minimum standard required.

Guidelines

The guidelines are designed to:

- Reduce the occurrence and consequences of fire at renewable energy facilities through risk-based design, and enable safe and effective emergency response through the provision of fire protection systems.
- Inform fire and risk management processes for all phases of a facility's lifespan, through the preparation of Risk Management Plans and Fire Management Plans by facility operators.
- Support operators to prepare Emergency Management Plans that effectively consider bushfire.
- Support the preparation of planning applications and their assessment by authorities.

Principles

The principles to be applied:

1. Effective identification and management of hazards and risks specific to the siting, infrastructure, layout, and operations at the facility.
2. Siting of renewable energy infrastructure so as to eliminate or reduce hazards to emergency responders.
3. Safe access for emergency responders in and around the facility, including to renewable energy and firefighting infrastructure.
4. Provision of adequate water supply and firefighting infrastructure to allow safe and effective emergency response.

5. Vegetation sited and managed so as to avoid increased bushfire and grassfire risk.
6. Prevention of fire ignition on-site.
7. Prevention of fire spread between site infrastructure (solar panel banks, wind turbines, battery containers/enclosures).
8. Prevention of external fire impacting and igniting site infrastructure.
9. Provision of accurate and current information for emergency responders during emergencies.
10. Effective emergency planning and management, specific to the site, infrastructure and operations.
11. Effective bushfire emergency planning and response, that prioritises absence of personnel on days of Severe and above Fire Danger Rating.

Bushfire Risk Management

Bushfire risk has been identified in the BIS and the measures to eliminate or reduce its occurrence and consequences are incorporated into the facility design and operations through this BMP. The BIS addresses issues such as, but not limited to the following:

- The hazards and risks at and to the facility and their proposed management.
- Any safety issues for firefighters responding to emergencies at the facility.
- Safe access to and within the facility for emergency vehicles and responders, including to key site infrastructure and fire protection systems.
- The adequacy of proposed fire detection and suppression systems (e.g., water supply) on-site.
- Natural and built infrastructure and on-site processes that may impact or delay effective emergency response.

Factors Influencing Facility Design

The following factors have been considered in the risk-based design of this plan as identified in the BIS:

Location and siting within the landscape. Is the site in a designated Bushfire Prone Area? Is there a risk of grassfire from neighbouring properties? Is there peat on the property? Is the site located near hazardous industry?

Layout. Does the proposed layout of the site impact fire risk? Is fire service infrastructure safely accessible? Are there hazards or infrastructure that may impact safe evacuation?

Fuel load and vegetation on-site. Does the prevalence, type, density or location of vegetation (including screening vegetation) impact fire risk?

Infrastructure - electrical, chemical, technological. Does the infrastructure on site contribute to fire risk, or potentially impede firefighting operations? Are dangerous goods stored on site?

Site activities and operations. What activities undertaken on-site contribute to fire risk? How is electricity infrastructure de-energised and isolated? How often is critical maintenance undertaken?

Site occupancy. Will the facility be occupied or unoccupied? Will there be vulnerable occupants?

Local weather conditions. What is the prevailing wind speed and direction? Rainfall during the year? Humidity and temperature during the Fire Danger Period?

Specific Fire Hazards Identified through the BIS

The following fire hazards have been identified for this proposed solar facility:

- Electrical hazards, such as panel/inverter electrical faults; power surges; lightning strikes; water ingress; retained DC electricity in solar panels after shut-down/isolation.
- Potential fire spread and limited emergency response due to proximity of panel banks to each other, on-site infrastructure and vegetation (including screening vegetation).
- Landscape hazards, such as bushfire/grassfire ignition from fire within the facility, or external ignition of site infrastructure.

And more specifically in relation to the battery storage system:

- Electrical hazards, such as battery faults; overcharging; rapid discharge; loss of remote monitoring systems; internal short circuits; overheating; water ingress; lightning strike (leading to thermal events/runaway).
- Chemical hazards, such as the inherent hazards of the stored dangerous goods; spills and leaks of transformer oil/diesel spills/leaks, refrigerant gas/coolant; chemical reactions from ignition.
- Potential fire spread due to proximity of batteries (and containers/enclosures) to each other, on-site infrastructure and vegetation (including screening vegetation).
- Mechanical damage to battery containers/enclosures due to vehicular impact.
- Landscape hazards, such as bushfire/grassfire ignition from fire within the facility, or external ignition of site infrastructure from embers, radiant heat and flame contact.

Facility Location

As identified in the BIS, the proposed development is in an area defined as being 'Bushfire Prone,' as per the Tasmanian Planning Scheme - Northern Midlands Local Provision Schedule. Such a development in a bushfire prone environment presents increased safety risks that may impact on effective firefighting operations. **The bushfire mitigation measures outlined in this BMP have considered this heightened risk by addressing the following:**

- The impact of any ignitions arising from the infrastructure (solar panels, wind turbines, battery energy storage systems, electrical infrastructure) on nearby communities, infrastructure and assets.
- The impact of bushfire on the infrastructure (e.g., ember attack, radiant heat impact, flame contact).
- Assessment of whether the proposal will lead to an increase in risk to adjacent land and how the proposal will reduce risks at the site to an acceptable level.

Emergency Vehicle Access

The aim is to provide adequate vehicle access to and within facilities of the site to:

a) allow safe access and egress for workers, fire fighters and emergency service personnel;
b) provide access to the bushfire-prone vegetation that enables both, the property to be defended when under bushfire attack, and for hazard management works to be undertaken;
c) are designed and constructed to allow for fire appliances to be manoeuvred;
d) provide access to water supplies for fire appliances; and
e) are designed to allow connectivity, and where needed, offering multiple evacuation points.

The following design and construction requirements apply:

a) Construction of a four (4) metre perimeter road within the perimeter fire break;
b) Must be of all-weather construction;
c) Load capacity of at least 20t, including for bridges and culverts;
d) Minimum carriageway width of 4m;
e) Minimum vertical clearance of 4m;
f) Minimum of horizontal clearance of 0.5m from the edge of the carriageway;
g) Cross falls of less than 3° (1:20 or 5%);
h) Dips less than 7° (1:8 or 12.5%) entry and exit angle;
i) Curves with a minimum inner radius of 10m;
j) Maximum gradient of 15° (1:3:5 or 28%) for sealed roads, and 10° (1:5:5 or 18%) for unsealed roads;
k) Terminate with a turning area for fire appliances provided by one of the following:
    I. a turning circle with a minimum outer radius of 10m or;
    II. an access road encircling any building;
    III. a hammerhead "T" or "Y" turning head 4m wide and 8m in length.
l) Where property access roads are 200m or greater, passing bays of 2m additional carriageway width and 20m in length are provided every 200m.
m) 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.
n) 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.

Firefighting Water Supply

In the event of a fire (structure fire, grassfire or bushfire), an adequate, accessible and reliable water supply for the purposes of firefighting is necessary to allow for the protection of life and property associated with the development. It is important that emergency responders and fire vehicles are able to access the site and undertake fire suppression in a safe, timely and effective manner and are not hindered in any way.

As the site is not in an area of reticulated water supply, a static water supply is required.

Firefighting Water Supply for Habitable Buildings

The following design and construction requirements apply to all habitable buildings:

As per Director's Determination – Requirements for Building in Bushfire-Prone Area, Table 3B, Requirements for Static Water Supply for Firefighting:

Element A: Distance between building area to be protected and water supply

Requirement: The following requirements apply:

a) The building area to be protected must be located within 90 metres of the water connection point of a static water supply; and
b) The distance must be measured as a hose lay, between the water connection point and the furthest part of the building area.

Element B: Static Water Supplies

Requirement: A static water supply:

a) May have a remotely located offtake connected to the static water supply;
b) May be a supply for combined use (firefighting and other uses) but the specified minimum quantity of firefighting water must be available at all times;
c) Must be a minimum of 10,000 litres per building area to be protected. This volume of water must not be used for any other purpose including firefighting sprinkler or spray systems;
d) Must be metal, concrete or lagged by non-combustible materials if above ground; and
e) If a tank can be located so it is shielded in all directions in compliance with Section 3.5 of AS 3959-2009, the tank may be constructed of any material provided that the lowest 400 mm of the tank exterior is protected by:
    i. metal;
    ii. non-combustible material; or
    iii. fibre-cement a minimum of 6 mm thickness.

Element C: Fittings, pipework and accessories (including stands and tank supports)

Requirement: Fittings and pipework associated with a water connection point for a static water supply must:

a) Have a minimum nominal internal diameter of 50mm;
b) Be fitted with a valve with a minimum nominal internal diameter of 50mm;
c) Be metal or lagged by non-combustible materials if above ground;
d) Where buried, have a minimum depth of 300mm (compliant with AS/NZS 3500.1-2003 Clause 5.23);
e) Provide a DIN or NEN standard forged Storz 65 mm coupling fitted with a suction washer for connection to firefighting equipment;
f) Ensure the coupling is accessible and available for connection at all times;
g) Ensure the coupling is fitted with a blank cap and securing chain (minimum 220 mm length);
h) Ensure underground tanks have either an opening at the top of not less than 250 mm diameter or a coupling compliant with this Table; and
i) Where a remote offtake is installed, ensure the offtake is in a position that is:
    i. Visible;
    ii. Accessible to allow connection by firefighting equipment;
    iii. At a working height of 450 – 600mm above ground level; and
    iv. Protected from possible damage, including damage by vehicles.

Element D: Signage for static water connections

Requirement: The firefighting water point for a static water supply must be identified by a sign permanently fixed to the exterior of the assembly in a visible location:

The sign must comply with the Tasmanian Fire Service Water Supply Signage Guideline, Version 1.0, February 2017, published by the Tasmania Fire Service.

Element E: Hardstand

Requirement: A hardstand area for fire appliances must be provided:

a) No more than three metres from the water connection point, measured as a hose lay (including the minimum water level in dams, swimming pools and the like);
b) No closer than six metres from the building area to be protected;
c) With a minimum width of three metres constructed to the same standard as the carriageway; and
d) Connected to the property access by a carriageway equivalent to the standard of the property access.

Firefighting Water for Solar Energy Facilities

The following are additional design and construction requirements that apply to the development site as a solar energy facility:

a) A minimum of at least 1 x 45,000 litre static water tank for every 100ha (e.g., for this ±500ha site, there is a requirement for a minimum of 5 x 45,000 litre static water tanks, over and above the minimum 10,000 litre per habitable building required).
b) Fire water must be provided to cover buildings, control rooms, substations and grid connections.
c) The static water tank(s) must be capable of being completely refilled automatically or manually within 24 hours.
d) Static water storage tanks must be located at all designated vehicle access points to the facility and must be positioned at least 10m from any infrastructure (solar panels, battery energy storage systems etc.
e) The road access and hardstand areas must be kept clear at all times.
f) An external water level indicator must be provided to the tank and be visible from the hardstand area.
g) Signage must be provided at the from entrance to the facility, indicating direction to the static water tank(s).
h) Additional fire protection systems or equipment required under any Australian Standards for dangerous goods must be provided as prescribed.

Firefighting Water for Solar Energy Facilities with Battery Energy Storage Systems

The following are additional design and construction requirements that apply to the development site as a solar energy facility with battery energy storage systems:

A fire protection system suitable for the risks and hazards must be provided. For battery energy storage systems, the water quantity must:

- Enable effective cooling of surrounding infrastructure.
- Account for reasonable duration of fire events based on the proposed battery chemistry.
- Account for local weather conditions and potential fire weather conditions.
- Provide for the safety of firefighters.

To achieve the above, the fire protection system must include at a minimum (considering where no reticulated water is available):

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.
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.
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.
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).
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).
vi. The fire water supply must comply with AS 2419.1-2005: Fire hydrant installations - Section 5: Water storage.

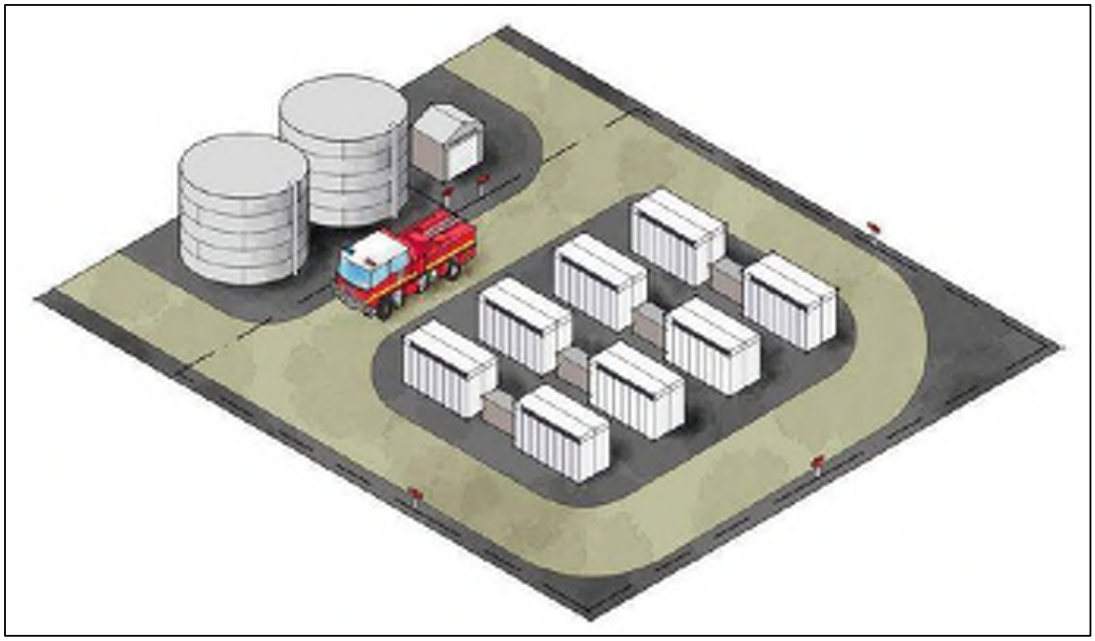


Figure 1: Indicative BESS layout.

Landscape Screening and Onsite Vegetation

All vegetation, proposed and existing has been considered for its potential to intensify and propagate fire within and away from the site.

Landscape screening may be utilised throughout parts and or all of the development site. It may be provided for screening in relation to visual amenity and to prevent visual glare from the facility. The design has of screening has considered potential increase in fire risk due to the type (species), density, height, location and overall width of the screening. The facility has been designed to ensure that the radiant heat flux (output) from vegetation does not create the potential for ignition of onsite infrastructure or other vegetation. This has been mitigated by through:

- Vegetation removal (where required and permitted).
- Separation from nearby infrastructure (e.g.; firebreaks).
- The provision of thermal barriers at nearby infrastructure.
- Thought should be given to low flammability landscaping species such as those listed in the "Fire Resisting Garden Plants" booklet produced by the Tasmania Fire Service (TFS).

Firebreaks

A fire break is a gap in fuel (vegetation) that reduces the potential for fire to enter or leave an area. Fire breaks may also be used for emergency vehicle access. **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 the fire breaks is to 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. Where screening or other vegetation is a width of 20m or less (open density as per AS 3959-2018), or 15m or less (closed density as per AS 3959-2018), a fire break of 10m may be appropriate to prevent radiant heat from vegetation fully involved in fire becoming an ignition source for on-site infrastructure. Outside of these parameters, separation must be at least the distance where radiant heat flux (output) from the vegetation does not create the potential for ignition of on-site infrastructure. Please refer to Appendix 4 - Fire Hazard & Risk Assessment 8039 FHRA 02 – BESS Area for Fire Engineering Report for heat flux calculation results.

The width of the vegetation includes any existing vegetation from neighbouring properties or road reserves abutting the proposed or existing vegetation for the renewable energy facility. Vegetation has been classified as per AS 3959-2018: Construction of buildings in bushfire-prone areas for the purposes of determining radiant heat flux (output).

Fire breaks will be:

- Non-combustible, constructed of concrete, mineral earth or non-combustible mulch such as crushed rock.
- Free of vegetation and obstructions at all times. No plant or equipment of any kind is to be stored in fire breaks.
- Established and maintained around the battery energy storage systems and related infrastructure.
- In addition to radiant heat flux (output) from vegetation, the width of fire breaks between vegetation and battery energy storage systems must be at least the distance where the radiant heat flux (output) from the battery energy storage system fully involved in fire does not create the potential for ignition of vegetation. Please refer to Appendix 4 - Fire Hazard & Risk Assessment 8039 FHRA 02 – BESS Area for Fire Engineering Report for heat flux calculation results.

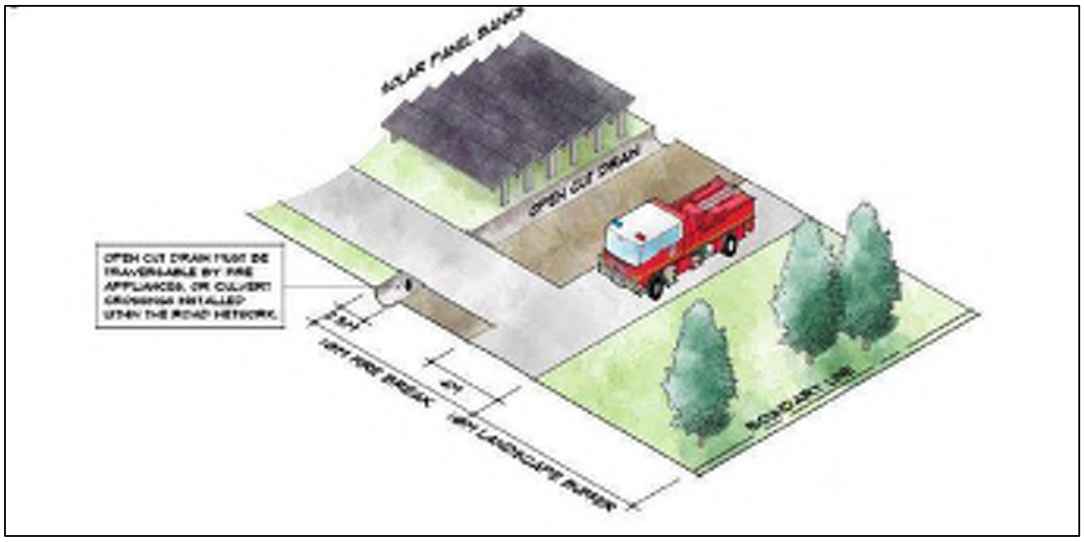


Figure 2: Indicative firebreak layout.

Design Specific Requirements for Solar Energy Facilities

Solar Panel Banks:

Adequate separation of solar panel banks facilitates safe and effective firefighting operations. Solar energy facilities are to have a minimum six (6) metre separation between solar panel banks.

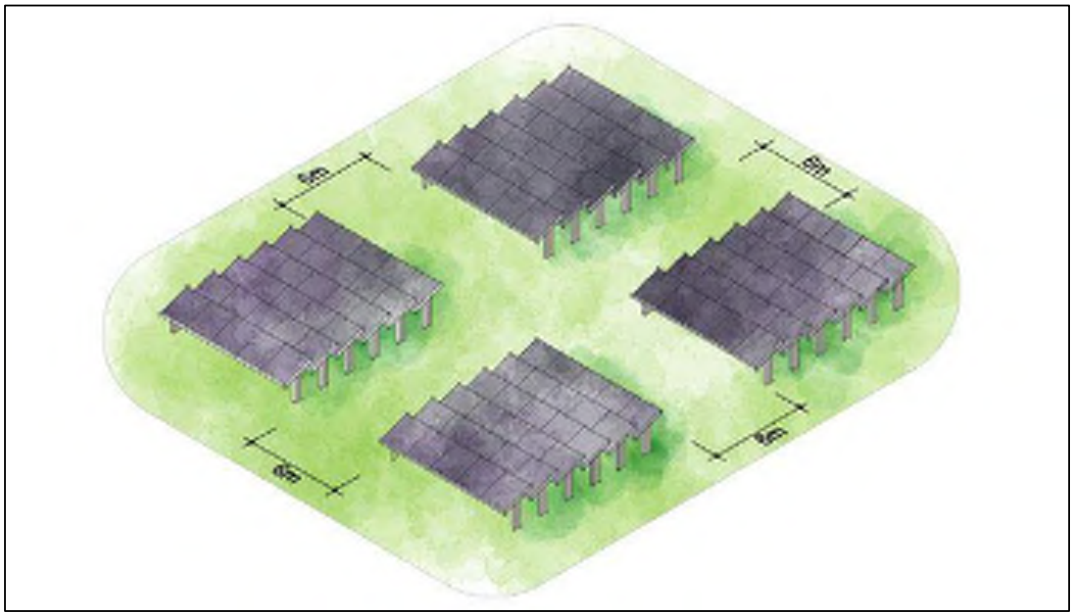


Figure 3: Indicative solar bank layout.

Battery Energy Storage Systems:

It is acknowledged that battery technologies are continually evolving, and that not all battery energy storage systems have the same level of fire risk. The following requirements are based on lithium battery chemistry.

Facilities with battery energy storage systems must be designed with an ultimate goal of fire prevention. Facility design can reduce the potential for ignition and the consequences of fire should it occur. Where a lithium-ion battery goes into thermal runaway, cooling surrounding infrastructure to prevent further spread may be the only safe response option available.

CFA recommends that consideration is to be given to the provision of non-combustible, floor-to-ceiling partition 'walls' (thermal barriers) between battery racks (stacked modules) within battery containers/enclosures. In the absence of a current Australian Standard pertaining to large scale battery energy storage system facilities, the current versions of UL 9540: Energy Storage System Requirements and FM Global Property Loss Prevention Data Sheet 5-33 (2020) Electrical Energy Storage Systems, should be used in the design and operation of battery energy storage systems, except, where varied by this BMP.

The design of the battery storage facility must incorporate:

a) A separation distance that prevents fire spread between battery containers/enclosures and:
   - Other battery containers/enclosures.
   - Onsite buildings.
   - Substations.
   - The site boundary.
   - Any other site buildings.
   - Vegetation.

   Separation must be at least the distance where the radiant heat flux (output) from a battery energy storage system container/enclosure fully involved in fire does not create the potential for ignition of these site elements. Please refer to Appendix 4 - Fire Hazard & Risk Assessment 8039 FHRA 02 – BESS Area for Fire Engineering Report for heat flux calculation results.

b) A fire break around the battery energy storage system and related infrastructure, of a width of no less than 10m, or greater, where determined in this Plan.

   Fire breaks must be non-combustible, constructed of concrete, mineral earth or non-combustible mulch such as crushed rock. The width must be calculated based on the ignition source being radiant heat of surrounding vegetation, including landscaping.

c) A layout of site infrastructure that:
   I. Considers the safety of emergency responders.
   II. Minimises the potential for grassfire and/or bushfire to impact the battery energy storage system.
   III. Minimises the potential for fires in battery containers/enclosures to impact onsite and offsite infrastructure.

Battery energy storage systems must be:

a) Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles).
b) Located so that the site entrance and any fire water tanks are not aligned to the prevailing wind direction (therefore least likely to be impacted by smoke in the event of fire at the battery energy storage system).
c) Provided with in-built detection and suppression systems. Where these systems are not provided, measures to effectively detect and/or suppress fires within containers.
d) Provided with suitable ember protection to prevent embers from penetrating battery containers/enclosures.
e) Provided with suitable access roads for emergency services vehicles, to and within the site, including to battery energy storage system(s) and fire service infrastructure.
f) Installed on a non-combustible surface such as concrete.
g) Provided with adequate ventilation.
h) Provided with impact protection to at least the equivalent of a W guardrail-type barrier, to prevent mechanical damage to battery containers/enclosures.
i) Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection.
j) Provided with spill containment that includes provision for management of fire water runoff.

CFA recommends that infrastructure is provided for the containment and management of fire water runoff from battery energy storage systems. Infrastructure may include bunding, sumps and/or purpose-built, impervious retention facilities. A fire water management plan may include the containment and disposal of contaminated fire water.

Battery Energy Storage System Compliance with the Tasmanian Planning Scheme - Northern Midlands Local Provision Schedule, and more specifically, C13.0 Bushfire-Prone Areas Code is required. From a Tasmanian Fire Service (TFS) perspective, battery storage is deemed as a 'hazardous use.' 'Hazardous use,' means a use where:

(a) hazardous chemicals of a manifest quantity are stored on a site; or
(b) explosives are stored on a site and where, classified as an explosives location or large explosives location as specified in the Explosives Act 2012.

The BIS illustrates compliance with the Tasmanian Planning Scheme – State Planning Provisions - C13.5 Hazardous uses and refers to the Objective, Acceptable Solutions and Performance Criteria for Hazardous Use.

The Bushfire Hazard Management Plans (BHMP's) illustrated below, defines the required setbacks from surrounding vegetation for the Battery Energy Storage System, solar west and solar east hazardous materials storage compounds and both the substation/switchyards, considering both CFA and Tasmanian Bushfire Prone Area Code requirements.

BHMP Site 1 – Solar West Area Construction Laydown Area (flammable liquid storage):

Please refer to Appendix 3.1 for BHMP.

Bushfire Attack Level (BAL) – Steps 1 to 5 Summary Results.

For calculations based on Tasmania's FDI of 50, please refer to Table 1 below for the development:

	North	East	South	West
Vegetation to 100m	Grassland	Woodland	Grassland	Grassland
Vegetation Classification	G	B	G	G
Slope	Downslope 0 - 5°	Downslope 0 - 5°	Level/Upslope	Downslope 0 - 5°
Current BAL	BAL FZ	BAL FZ	BAL FZ	BAL FZ
Proposed BAL	BAL 12.5	BAL 12.5	BAL 12.5	BAL 12.5
HMA for BAL 12.5	16m+	26m+	14m+	16m+

BHMP Site 2 – Battery Energy Storage Systems (BESS) Compound:

Please refer to Appendix 3.2 for BHMP.

Bushfire Attack Level (BAL) – Steps 1 to 5 Summary Results.

For calculations based on Tasmania's FDI of 50, please refer to Table 1 below for the development:

	North	East	South	West
Vegetation to 100m	Grassland	Woodland	Grassland	Grassland
Vegetation Classification	G	B	G	G
Slope	Downslope 0 - 5°	Level/Upslope	Level/Upslope	Downslope 0 - 5°
Current BAL	BAL FZ	BAL FZ	BAL FZ	BAL FZ
Proposed BAL	BAL 12.5	BAL 12.5	BAL 12.5	BAL 12.5
HMA for BAL 12.5	16m+	22m+	14m+	16m+

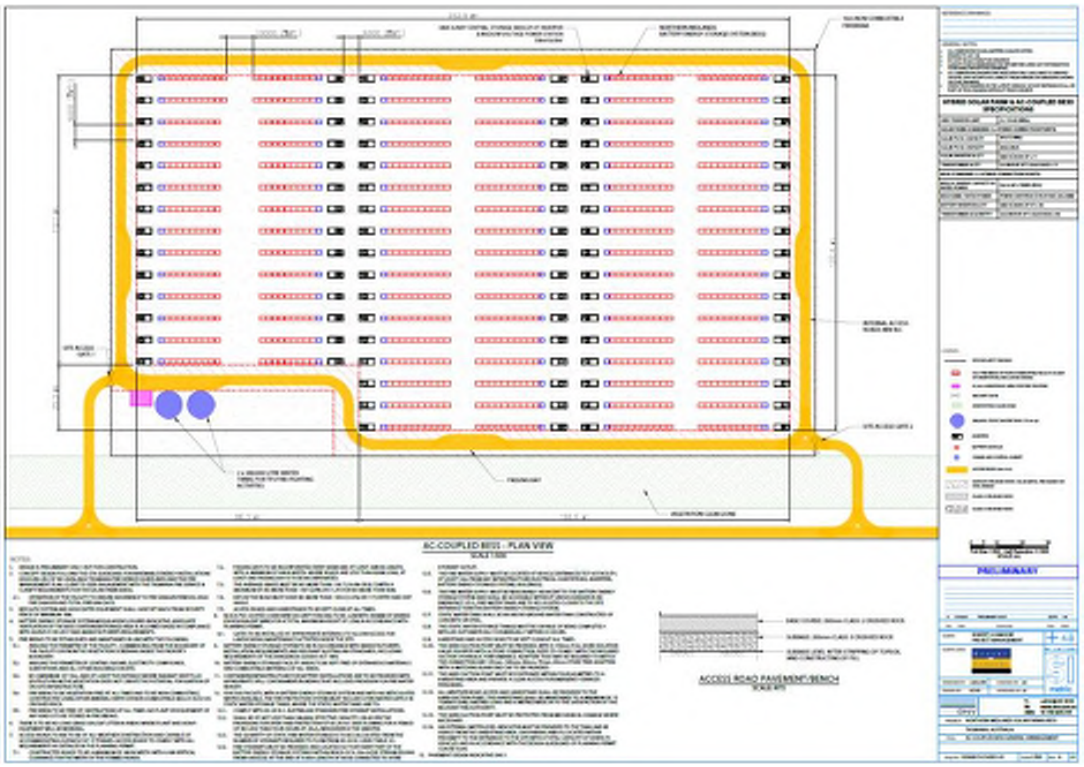


Figure 4: Site specific BESS layout.

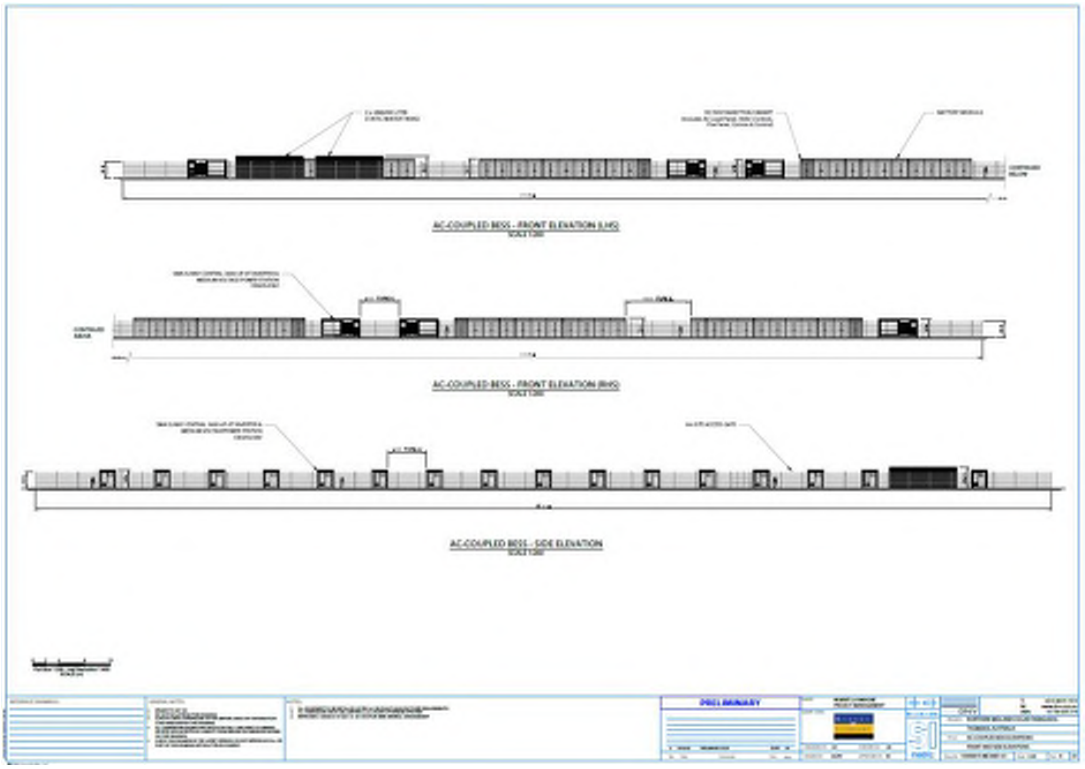


Figure 5: Site specific BESS elevations.

BHMP Site 3 – Main Substation & Switchyard Compound:

Please refer to Appendix 3.3 for BHMP.

Bushfire Attack Level (BAL) – Steps 1 to 5 Summary Results.

For calculations based on Tasmania's FDI of 50, please refer to Table 1 below for the development:

	North	East	South	West
Vegetation to 100m	Grassland	Grassland	Woodland	Grassland
Vegetation Classification	G	G	B	G
Slope	Downslope 0 - 5°	Level/Upslope	Level/Upslope	Downslope 0 - 5°
Current BAL	BAL FZ	BAL FZ	BAL FZ	BAL FZ
Proposed BAL	BAL 12.5	BAL 12.5	BAL 12.5	BAL 12.5
HMA for BAL 12.5	16m+	14m+	22m+	16m+

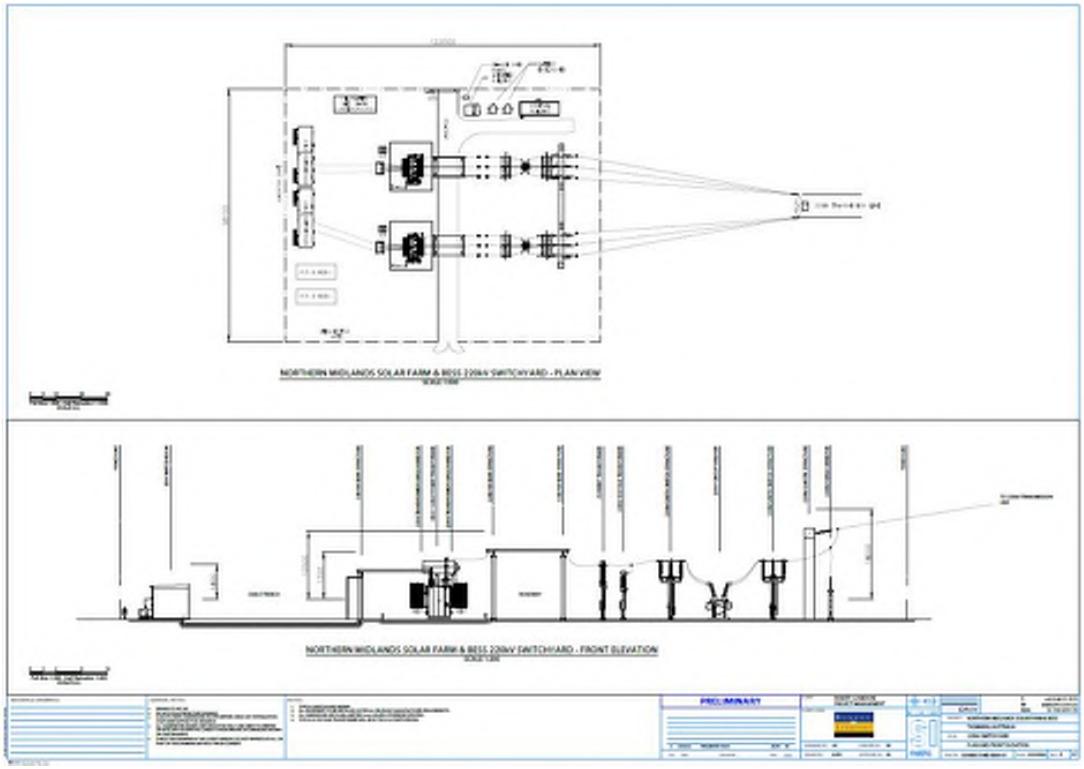


Figure 6: Site specific substation & switchyard layout.

BHMP Site 4 – Solar West Area Construction Laydown Area (flammable liquid storage):

Please refer to Appendix 3.4 for BHMP.

Bushfire Attack Level (BAL) – Steps 1 to 5 Summary Results.

For calculations based on Tasmania's FDI of 50, please refer to Table 1 below for the development:

	North	East	South	West
Vegetation to 100m	Grassland	Grassland	Grassland	Woodland
Vegetation Classification	G	G	G	G
Slope	Downslope 0 - 5°	Downslope 0 - 5°	Level/Upslope	Level/Upslope
Current BAL	BAL FZ	BAL FZ	BAL FZ	BAL FZ
Proposed BAL	BAL 12.5	BAL 12.5	BAL 12.5	BAL 12.5
HMA for BAL 12.5	16m+	16m+	14m+	22m+

BHMP Site 5 – Solar East Substation & Switchyard Compound:

Please refer to Appendix 3.5 for BHMP.

Bushfire Attack Level (BAL) – Steps 1 to 5 Summary Results.

For calculations based on Tasmania's FDI of 50, please refer to Table 1 below for the development:

	North	East	South	West
Vegetation to 100m	Grassland	Grassland	Grassland	Woodland
Vegetation Classification	G	G	G	B
Slope	Level/Upslope	Downslope 0 - 5°	Downslope 0 - 5°	Level/Upslope
Current BAL	BAL FZ	BAL FZ	BAL FZ	BAL FZ
Proposed BAL	BAL 12.5	BAL 12.5	BAL 12.5	BAL 12.5
HMA for BAL 12.5	14m+	16m+	16m+	22m+

Bushfire Emergency Plan (BEP)

As part of the compliance with the Tasmanian Planning Scheme – State Planning Provisions - C13.5.2 Hazardous Uses, a Bushfire Emergency Management Strategy (BEMS) has been developed. This BEMS will guide the formation of a Bushfire Emergency Plan (BEP) to be prepared at Building Approval stage.

Bushfire Emergency Management Strategy (BEMS)

This section broadly identifies the proposed emergency management arrangements that will be formed into a detailed Bushfire Emergency Plan (BEP), for the purposes of a planning permit for a Hazardous Use. It is based on risks identified in the Bushfire Impact Statement (BIS).

The purpose of this Bushfire Emergency Management Strategy (BEMS) is to demonstrate how risk to occupants will be managed to a tolerable level through contextualised emergency procedures. The emergency management strategy informs the more detailed Bushfire Emergency Plan (BEP), which is required at the building permit stage. Identified roles and responsibilities will be designated in the final BEP.

Identified Hazardous Use Buildings/Facilities

The following facilities of the proposed Agri Solar Farm meet the thresholds to be classed as a Hazardous Use under the Tasmanian Planning Scheme - Northern Midlands Local Provision Schedule, and more specifically, C13.0 Bushfire-Prone Areas Code.

- Battery Energy Storage Systems Containers/Enclosure Compound
- Hazardous Chemical Storage (e.g.; Fuel) Laydown Compounds x 2
- Main Solar Farm Substation/Switchyard
- East Solar Farm Substation/Switchyard

Emergency Management Structure

As part of the (BIS), a hazard identification risk assessment has been completed in line with the requirements in AS/NZS 4360:1999 Risk Management. The proponent has committed to work with local authorities and emergency services to develop an emergency management plan. The management objects for the site emergency management plan will be:

- Develop a plan that is simple in structure, easily understood, and user friendly;
- The plan would be held by all site staff and other responsible persons who may need to initiate a response;
- Dry runs of completed plans will be undertaken in mock scenarios to ensure functionality of the plan;
- A Fire Response Plan will be developed and integrated in the overarching Emergency Response Plan. The State Emergency Services (SES), Tasmania Fire Service (TFS), and local police may be engaged with to develop this and will be provided with a final copy of the plan.

Occupancy Characteristics

Construction Phase

Construction of the project is expected to take up to ±1.5 years to complete. During this time, there is expected to be ±986 FTE people employed to complete the works. Works will be occurring across the entire ±543 ha project site, so only some of the workers will be located at the Hazardous Use sites. Exact numbers will vary on a daily basis. It is reasonable to assume that there will consistently be people present at each of the Hazardous Use sites during construction, although at the refuelling station, this will only be for short periods while staff are refuelling vehicles and machinery.

Operational Phase

Once the project is operational, it is anticipated that up to ±27 FTE people will be employed on site to perform ongoing work and operational maintenance.

Building and/or Facilities Site Vulnerability and Site-Specific Protection Measures

These include the following:

- Battery Energy Storage Systems Containers/Enclosure Compound
- Hazardous Chemical Storage (e.g.; Fuel) Laydown Compounds x 2
- Main Solar Farm Substation/Switchyard
- East Solar Farm Substation/Switchyard

The Site Office (Construction Phase) will consist of a temporary building for office space, workshop and warehouse facilities (likely containers), parking space, and a laydown area for vehicles and machinery.

- There will be hazardous chemicals stored within these facilities that will potentially exceed prescribed manifest quantities, as described in Schedule 11 of the Work Health and Safety Regulations 2022. This will most likely be Category 2 flammable liquids.
- Sites are surrounded by bushfire-prone vegetation; thus, a Bushfire Hazard Management Area (HMA) must be developed in between both site boundaries and the adjacent bushfire-prone vegetation. The HMA setbacks are to comply with BAL 12.5 setback requirements. Furthermore, all land within the facilities must be managed in a low fuel state at all times.
- Sites will be accessed from one of the main property access routes via Macquarie Road on the project site, providing several directions for evacuation, if required.
- All buildings associated with development will be temporary structures. This means they may not be subject to bushfire specific measures. However, any structures that store hazardous materials will be signed and will be required to be compliant with Australian Standard AS 1940-1993 – The Storage and Handling of Flammable and Combustible Liquids and/or AS 3780-1994 - The Storage and Handling of Corrosive Substances. This will also dictate minimum setbacks of other buildings within the facility. It has also been made a requirement in the Bushfire Hazard Management Plan that any buildings at the hazardous use sites storing hazardous materials must be constructed to BAL 12.5 standards as a minimum.
- All hazardous materials will be stored in fenced off, bunded areas.

- Sufficient static water supply, at least 10,000L of water which is dedicated for bushfire fighting purposes within 90m as the hose lays of all areas of the facility, is required for each site. This may require multiple static water supply tanks in multiple locations and could either be stationary or mobile units.
- Any further specific management measures specified by Material Safety Data Sheets (MSDS) for all dangerous good will be followed.
- Any further specific management measures as outlined in the BMP.

Refuelling Stations (Construction Phase)

There will be dedicated refuelling site developed at the construction laydown compounds. All diesel and petrol for vehicles and machinery will be stored at this location.

- Petrol is a Category 2 flammable liquid and it is anticipated that more than 2,500L will be stored on site, which is greater than the Manifest Quantity prescribed in Schedule 11 of the Work Health and Safety Regulations 2022. While diesel is a Category 4 flammable liquid, it is anticipated to be stored at a level above the Manifest Quantity (100,000L).
- The hazardous materials will be signed and will be required to be compliant with Australian Standard AS 1940-1993 – The Storage and Handling of Flammable and Combustible Liquids. This will also dictate minimum setbacks of other buildings and uses from the facility.
- The refuelling facilities will be bunded and have a capacity to hold 1.5 times the amount of fuel located within the area.
- The site is surrounded by bushfire-prone vegetation; thus, a Bushfire Hazard Management Area (HMA) must be developed between the site boundary (site bunding) and the adjacent bushfire prone vegetation. The HMA setbacks are to comply with BAL 12.5 setback requirements. Furthermore, all land within land within the facilities must be managed in a low fuel state at all times.
- The site will be accessed from one of the main property access routes via Macquarie Road on the project site, providing several directions for evacuation, if required.
- Sufficient static water supply, at least 10,000L of water which is dedicated for bushfire fighting purposes within 90m as the hose lays of all areas of the facility, is required for each site. This may require multiple static water supply tanks in multiple locations and could either be stationary or mobile units.
- Any further specific management measures specified by Material Safety Data Sheets (MSDS) for all dangerous good will be followed.
- Any further specific management measures as outlined in the BMP.

Operational Phase (Hazardous Uses)

This includes the following:

- Battery Energy Storage Systems Containers/Enclosure Compound
- Hazardous Chemical Storage (e.g.; Fuel) Operations & Maintenance Compound
- Main Solar Farm Substation/Switchyard
- East Solar Farm Substation/Switchyard

The Main Solar Farm Operation and Maintenance Building will be the base of operations once the project is operational. All hazardous chemicals (hydrocarbons) will be stored at this site.

- Fuel for machinery and vehicles will be stored within the complex in a bunded area.
- Small volumes of oils, paints, solvents, disinfectants, and cleaning chemicals will be stored in a dedicated fenced and bunded area with suitable signage and ventilation within the complex.
- Bunded areas will be large enough to hold at least 1.5 times the materials stored within the areas.
- The hazardous materials will be signed and will be required to be compliant with Australian Standard AS 1940-1993 – The Storage and Handling of Flammable and Combustible Liquids. This will also dictate minimum setbacks of other buildings and uses from the facility.
- The site is surrounded by bushfire-prone vegetation; thus, a Bushfire Hazard Management Area (HMA) must be developed between the site boundary and the adjacent bushfire prone vegetation. The HMA setbacks are to comply with BAL 12.5 setback requirements. Furthermore, all land within the facility must be managed in a low fuel state at all times.
- The site will be accessed from one of the main property access routes via Macquarie Road on the project site, providing several directions for evacuation, if required.
- Sufficient static water supply, at least 10,000L of water which is dedicated for bushfire fighting purposes within 90m as the hose lays of all areas of the facility, is required for each site. This may require multiple static water supply tanks in multiple locations and could either be stationary or mobile units.
- Any further specific management measures specified by Material Safety Data Sheets (MSDS) for all dangerous good will be followed.
- Any further specific management measures as outlined in the BMP.

Possible Bushfire Scenarios/Risk Assessment

There is risk of bushfire occurring from all directions under ‘high’ and above fire danger ratings. There is a risk of local ignition occurring in adjacent vegetation, causing a fire that effect egress before any of the sites can be evacuated. Such an event also has the potential to carry ash embers and smoke across the site.

Under this scenario, occupants would need to shelter in place. It is anticipated that this would be less likely for the refuelling stations, as these sites will be used solely for refuelling and will not have staff permanently located on them. They will also be close to other facilities where there will be buildings that can be used for sheltering in place if required.

There is also a risk of the area being subject to a larger-scale bushfire across the whole project site. Under this scenario, the site would ideally be evacuated or would not be occupied if there was prior knowledge of the bushfire in the area.

Complementary Bushfire Protection Strategies

As contained in this report.

Preparations Prior To Bushfire Season

- Maintain the Hazard Management Area; grass to be mown to under 100mm in height and kept green when water supply allows.
- All access is clear and usable.
- Static water supply is accessible.
- Fire equipment such as extinguishers, pumps, hoses, and mobile fire units are current and serviceable.
- Roofs and gutters are kept clear of leaves.
- The defendable space between the hazardous uses, associated infrastructure, and bushfire-prone vegetation is maintained in a low fuel state.
- Visual inspection of buildings to be undertaken to ensure there are no obvious issues that would undermine the buildings performance during a bushfire event (e.g., screens are in place over windows, windows are intact, weather seals are in place, no gaps in cladding have opened up).
- Any further specific management measures as outlined in the BMP.

Primary Actions

There is some risk that a localised fire could occur. In this event, the logistics of moving the occupants away from the sites in a timely manner would likely be prohibitive. However, because the sites have adequate separation between the hazardous use and the bushfire-prone vegetation, as well as access and water supply to allow fire services to access the likely front of the fire, it is considered reasonable that in a localised event the primary action should be to 'shelter in place'. Key procedures in this situation would be:

1. Advise TFS (000) that people are sheltering in place.
2. Staff who are trained in firefighting attempt to suppress ignition before it becomes a large fire while waiting for TFS to arrive.
3. Ensure head counts have been conducted and all occupants that are on site have been accounted for.
4. Take shelter within the Main Solar Farm Operation and Maintenance Building.
5. Monitor the building interior for outbreaks of fire within and extinguish if possible.
6. Construction site offices will be temporary buildings without a BAL rating, so extra measures, including placing soaking towels where there are gaps that may allow embers in (e.g., under doors), will need to be undertaken.
7. Ensure people can exit the building if it catches on fire.

Secondary Action

In the event of a major bushfire event in the area, it is considered likely that there will be time to evacuate the building. In this event the following actions should occur.

1. Monitor the watch and act bushfire alerts for the area and liaise with TFS as needed to ensure evacuation occurs as early as possible.
2. Have all occupants proceed to the designated evacuation point.
3. Ensure all occupants are accounted for.
4. Evacuate to a designated safe place. The most logical safe is? This point is accessible from all hazardous use sites.

Pre-Emptive Procedures

1. Keep across forecast weather conditions during bushfire season, especially extreme and catastrophic fire conditions. In these situations, potentially consider closing the site.
2. Place occupants on alert if there are existing fires nearby and consider evacuating early or closing the site if there is even a small risk.

The responsibility of the various Emergency Management Plan actions will be determined through consultation with the proponent as the Emergency Management Plan for the entire development is developed.

Battery Energy Storage System Safety and Protective Systems

CFA recommends that battery energy storage systems are equipped with the following elements:

- **Battery management/monitoring systems** for monitoring the state of battery systems to ensure safe operation.
- **Detection systems** for smoke, heat (thermal), fire and toxic gas (off-gassing) within battery containers.
- **Suppression systems** for fire within battery containers.
- **Systems to prevent heat/fire spread** within battery containers (such as thermal barriers, shut-down separators, isolation systems, cooling systems).
- **Systems to prevent explosion** within battery containers (such as ventilation, pressure relief and exhaust systems).
- **Warning and alarm systems** within the battery containers, and/or the facility, to enable early warning for faults, operation of the battery energy storage system above 'normal'/safe parameters, smoke, off-gassing, and fire.

Facility Construction and Commissioning

The construction of facilities comes with additional risks, including fire risks. During the construction phase, CFA's expectation is that a risk management process is undertaken to effectively identify risks and develop and implement appropriate and effective controls.

CFA recommends the following risk controls for the construction of facilities. This is not an exhaustive list and must be supplementary to the outcomes of the site-specific risk management process and any relevant requirements under legislation.

Fire Detection and Suppression Systems:

a) Install and commission fire detection and suppression systems for the facility at the earliest possible stage of construction.
b) Provide first-aid firefighting equipment, such as fire extinguishers (and where possible, portable fire hose reels), appropriate to the identified emergency scenarios, at all construction portables/buildings onsite, in the vicinity of all construction activities, and in site-based vehicles.
c) Provide the required fire protection equipment for any storages of dangerous goods as per the relevant Australian Standards.

Fire Risk Management:

a) Obtain appropriate permits (if applicable) for work during the Fire Danger Period, and ensure that any conditions on permits are adhered to.
b) Adhere to restrictions on Total Fire Ban or days of high fire danger according to the TFS website.
c) During the Fire Danger Period, ensure vehicle operators are instructed to remain on tracks and are not permitted to drive through paddocks.
d) Restrict smoking to prescribed areas and provide suitable ash and butt disposal facilities.
e) Provide remotely-accessible site/system security monitoring at the facility.
f) Machinery operations should be subject to the TFS Machinery Operations Guideline, A Basis for Safe Work in Dry Vegetation, TFS 2020, 200211, V2/2020, May 2021.

Personnel Training:

a) Provide training for personnel in the use of onsite first aid, firefighting equipment, and responsibilities during emergencies.
b) Ensure personnel are familiar with the BEMS and BEP.

Emergency Management:

Emergency management planning is addressed in the BEMS and BEP.

Occupational Health and Safety:

CFA recommends the development of safe work procedures for the facility, encompassing but not limited to:

a) Electricity and chemical management.
b) Vegetation management.
c) Site security.
d) Ignition source control, including hot works.
e) Infrastructure, equipment and vehicle maintenance.
f) Emergency management.

Facility Operation

Vegetation and Fuel Management:

The effective management of vegetation and fuel can reduce both the risk of fire entering your facility, and the consequences of fire. All renewable energy facilities that are constructed within the Bushfire Management Overlay or a Bushfire Prone Area must maintain the vegetation to the prescriptions listed within this BMP and the BHMP.

Additionally, facility operators must undertake the following measures during the Fire Danger Period:

a) Machinery operations should be subject to the TFS Machinery Operations Guideline, A Basis for Safe Work in Dry Vegetation, TFS 2020, 200211, V2/2020, May 2021.
b) Adhere to restrictions on Total Fire Ban or days of high fire danger according to the TFS website.
c) Long grass and/or deep leaf litter must not be present in areas where heavy equipment and machinery will be working, during construction or operational phases.
d) Must have grass maintained to <100mm under solar panels at all times.

e) Ensure that solar facilities subject to Agri Solar (grazing underneath the panels) are meeting the point (d) above, and if not, alternative vegetation management practices are implemented prior to and for the duration of the Fire Danger Period, to achieve this outcome.
f) Containers/enclosures and infrastructure for battery energy storage systems must be maintained to be clear of vegetation, including grass for a minimum of 10m on all sides.
g) Vegetation management within any electric line easement is to be such that falling trees would not impact the transmission lines, towers and associated infrastructure.

Additionally, facility operators must undertake the following maintenance measures during the Fire Danger Period:

a) Ensuring that facility infrastructure, equipment and vehicles are maintained in safe, effective working order contributes to efficiency, reliability and importantly, fire safety.
b) Inspection, maintenance and any required repair activities must be conducted for all infrastructure, equipment and vehicles at the facility. Maintenance must be in line with any relevant Australian Standards and the manufacturer's requirements.
c) A procedure, including a schedule and relevant personnel accountabilities, must be developed in relation to the inspection and maintenance of all infrastructure, equipment and vehicles.
d) Any activities that involve flame cutting, grinding, welding or soldering (hot works) must be performed under a 'hot work permit' system or equivalent job safety hazard or risk management process.
e) Battery energy storage systems, including the battery management system and any associated safety systems, must be regularly serviced to the manufacturer's specifications.
f) A procedure, including a schedule and relevant personnel accountabilities, must be developed in relation to the inspection of battery energy storage systems.
g) Battery energy storage systems are to be regularly inspected for:
    I. Any signs of mechanical damage to the external containers/enclosures.
    II. Any accumulation of combustible materials (including leaf litter) in or within 10m of any battery energy storage systems and related infrastructure.
    III. Ensure that any identified issues are immediately rectified.

<u>Dangerous Goods Storage and Handling:</u>

a) Signage and labelling compliant with the Dangerous Goods (Storage and Handling) Regulations 2012 and the relevant Australian Standards must be provided at the site entrance, dangerous goods storage locations, and storage tanks where applicable.
b) Appropriate material for the clean-up of dangerous goods spills and leaks (including absorbent, neutralisers, tools, disposal containers and personal protective equipment) must be provided and available on-site.
c) Training must be provided for site personnel on the hazards, safe use and emergency response for spills, leaks and fire involving dangerous goods.
d) All dangerous goods stored on-site must have a current Safety Data Sheet (SDS). Safety Data Sheets must be provided within the facility's Emergency Information Book(s), in the Emergency Information Container(s).
e) The requirements of the dangerous goods legislative framework, and all relevant Australian Standards must be complied with for all facilities, including facilities with battery energy storage systems.

Facility and System Monitoring:

Appropriate monitoring for facility infrastructure must be provided, to ensure that any shorts, faults or equipment failures with the potential to ignite or propagate fire are rapidly identified and controlled, and any fire is notified to 000 immediately.

For battery energy storage systems, appropriate monitoring and intervention measures must be provided to ensure that the following are rapidly identified and notified to 000 immediately:

- Any shorts, faults, temperature increases above normal parameters (e.g., precursor to thermal events/runaway).
- Equipment failures with the potential to ignite or propagate fire.
- Off-gassing, smoke or fire.

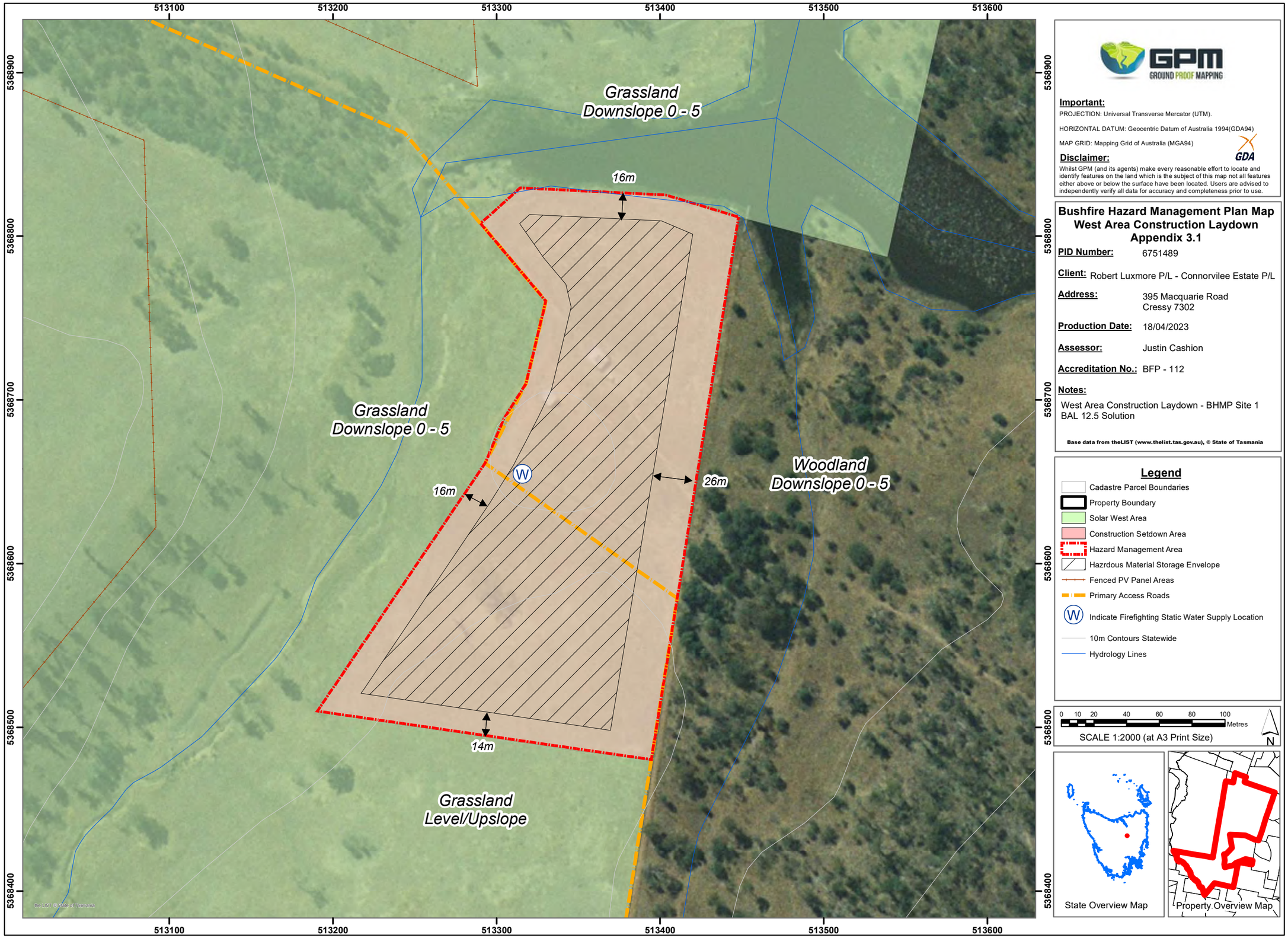
The provision for direct alarm monitoring to the local TFS brigade for battery energy storage system automatic detection systems should be considered.

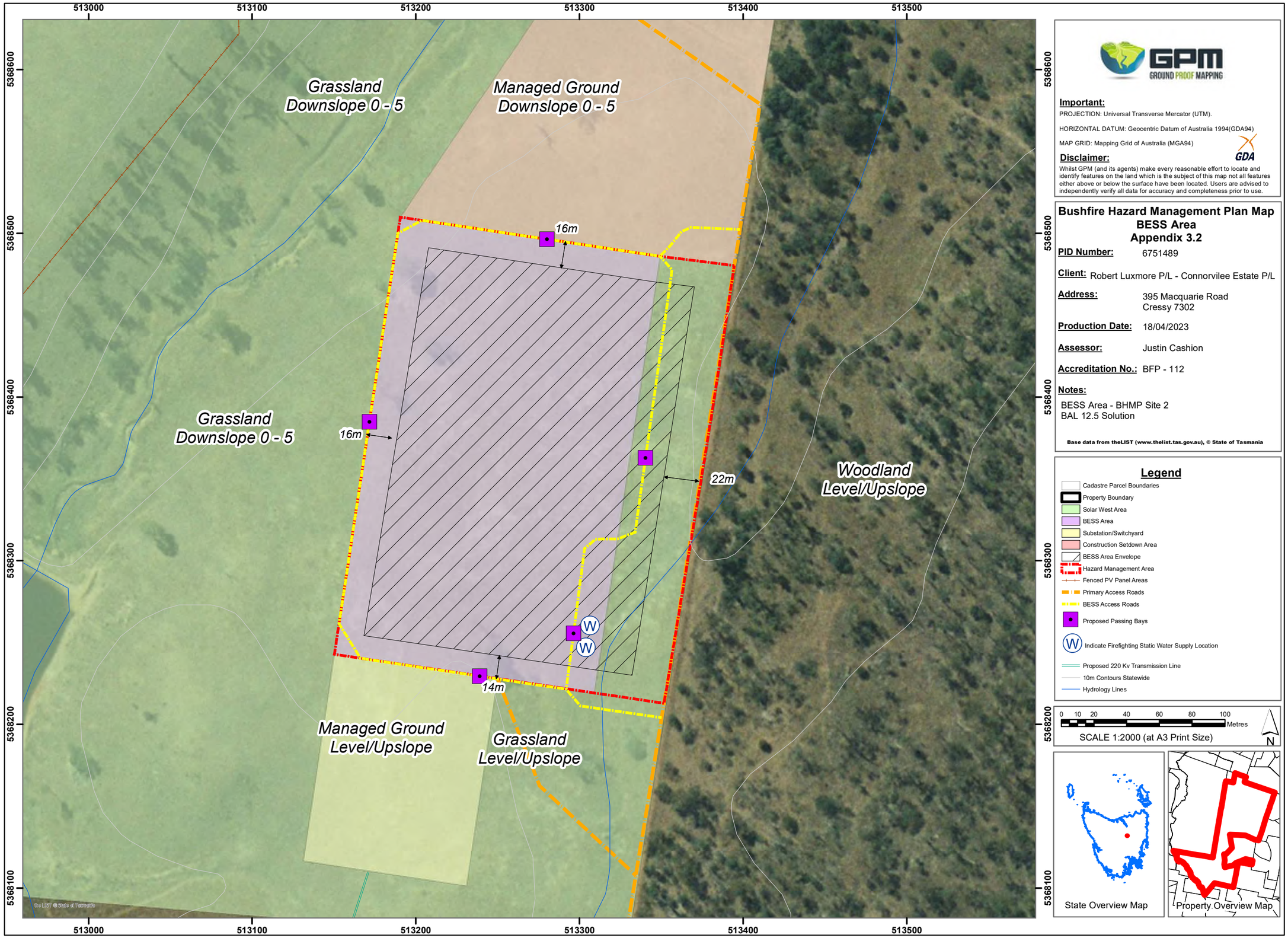
Risk Management Review:

While there is no legislative obligation for operators of existing renewable energy facilities to implement the design advice in this guideline retrospectively, fire risk must be effectively managed to meet obligations for providing a safe workplace under the OHS Act.

It is recommended that facility operators:

- Review the BIS, to ensure that all hazards and risks are identified and effectively managed. This must incorporate an assessment of the existing fire protection systems and equipment and their adequacy for the facility.
- Review this BMP, to ensure that all of the activities to eliminate or reduce the potential for ignition and consequences of fire.
- Review the BEMS and BEP, to ensure that it accurately captures the emergency arrangements on-site.
- Arrange for the above documents to be peer reviewed by a suitably qualified, independent third party.


513100
513200
513300
513400
513500
513600
5368900
5368800
5368700
5368600
5368500
5368400
Grassland
Downslope 0 - 5
16m
Grassland
Downslope 0 - 5
W
16m
26m
Woodland
Downslope 0 - 5
14m
Grassland
Level/Upslope
GPM
GROUND PROOF MAPPING
Important:
PROJECTION: Universal Transverse Mercator (UTM).
HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)
MAP GRID: Mapping Grid of Australia (MGA94)
GDA
Disclaimer:
Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.
Bushfire Hazard Management Plan Map
West Area Construction Laydown
Appendix 3.1
PID Number: 6751489
Client: Robert Luxmore P/L - Connorvilee Estate P/L
Address: 395 Macquarie Road
Cressy 7302
Production Date: 18/04/2023
Assessor: Justin Cashion
Accreditation No.: BFP - 112
Notes:
West Area Construction Laydown - BHMP Site 1
BAL 12.5 Solution
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Legend
Cadastre Parcel Boundaries
Property Boundary
Solar West Area
Construction Setdown Area
Hazard Management Area
Hazrdous Material Storage Envelope
Fenced PV Panel Areas
Primary Access Roads
W
Indicate Firefighting Static Water Supply Location
10m Contours Statewide
Hydrology Lines
0 10 20 40 60 80 100
Metres
SCALE 1:2000 (at A3 Print Size)
N
State Overview Map
Property Overview Map



GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.

Bushfire Hazard Management Plan Map
BESS Area
Appendix 3.2

PID Number: 6751489

Client: Robert Luxmore P/L - Connorvilee Estate P/L

Address: 395 Macquarie Road
Cressy 7302

Production Date: 18/04/2023

Assessor: Justin Cashion

Accreditation No.: BFP - 112

Notes:

BESS Area - BHMP Site 2
BAL 12.5 Solution

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

Legend

- Cadastre Parcel Boundaries
- Property Boundary
- Solar West Area
- BESS Area
- Substation/Switchyard
- Construction Setdown Area
- BESS Area Envelope
- Hazard Management Area
- Fenced PV Panel Areas
- Primary Access Roads
- BESS Access Roads
- Proposed Passing Bays
- W Indicate Firefighting Static Water Supply Location
- Proposed 220 Kv Transmission Line
- 10m Contours Statewide
- Hydrology Lines

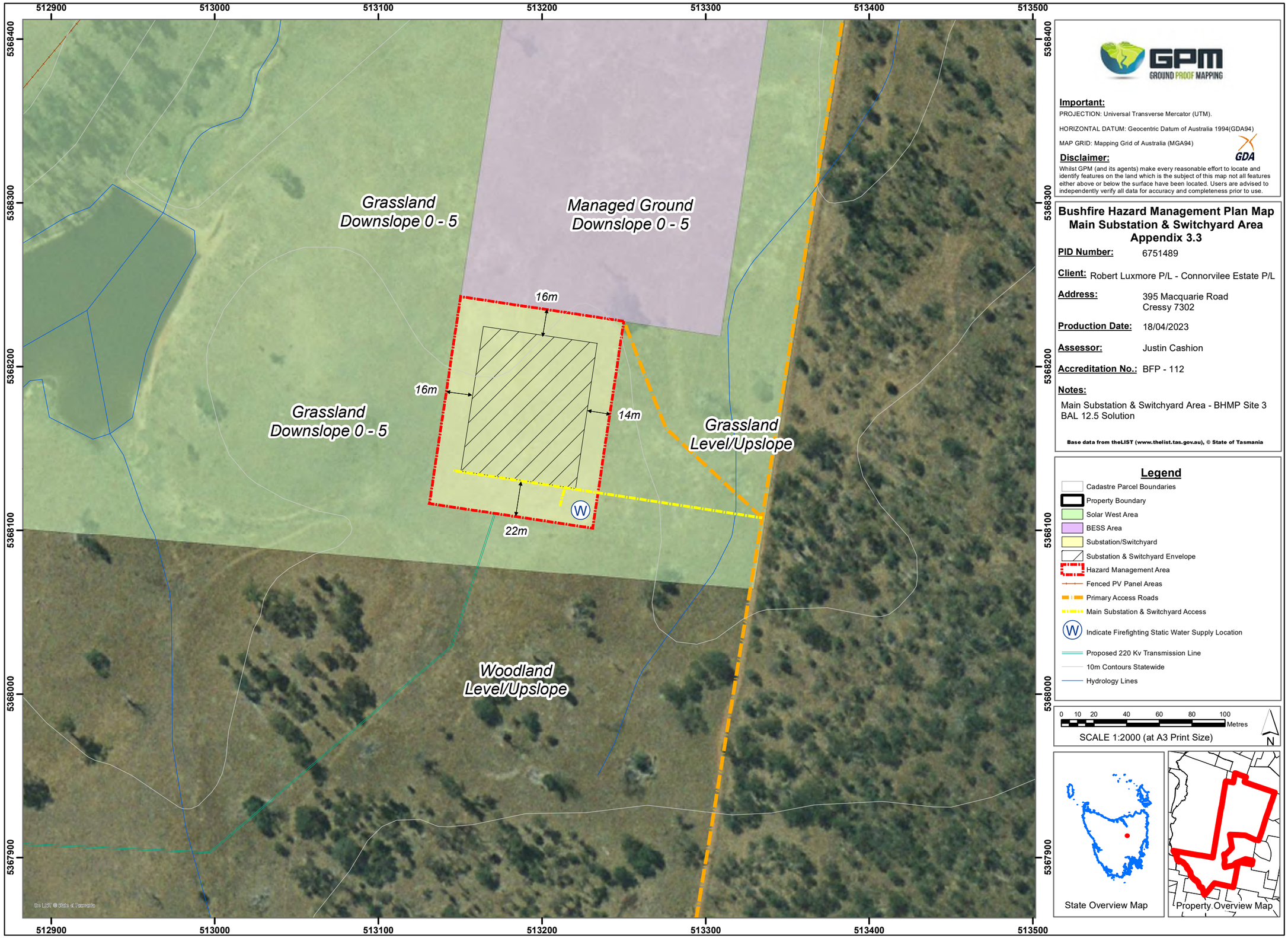
0 10 20 40 60 80 100 Metres

SCALE 1:2000 (at A3 Print Size)

N

State Overview Map

Property Overview Map



GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.

Bushfire Hazard Management Plan Map Main Substation & Switchyard Area Appendix 3.3

PID Number: 6751489

Client: Robert Luxmore P/L - Connorvilee Estate P/L

Address: 395 Macquarie Road
Cressy 7302

Production Date: 18/04/2023

Assessor: Justin Cashion

Accreditation No.: BFP - 112

Notes:

Main Substation & Switchyard Area - BHMP Site 3
BAL 12.5 Solution

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

Legend

- Cadastre Parcel Boundaries
- Property Boundary
- Solar West Area
- BESS Area
- Substation/Switchyard
- Substation & Switchyard Envelope
- Hazard Management Area
- Fenced PV Panel Areas
- Primary Access Roads
- Main Substation & Switchyard Access
- (W) Indicate Firefighting Static Water Supply Location
- Proposed 220 Kv Transmission Line
- 10m Contours Statewide
- Hydrology Lines

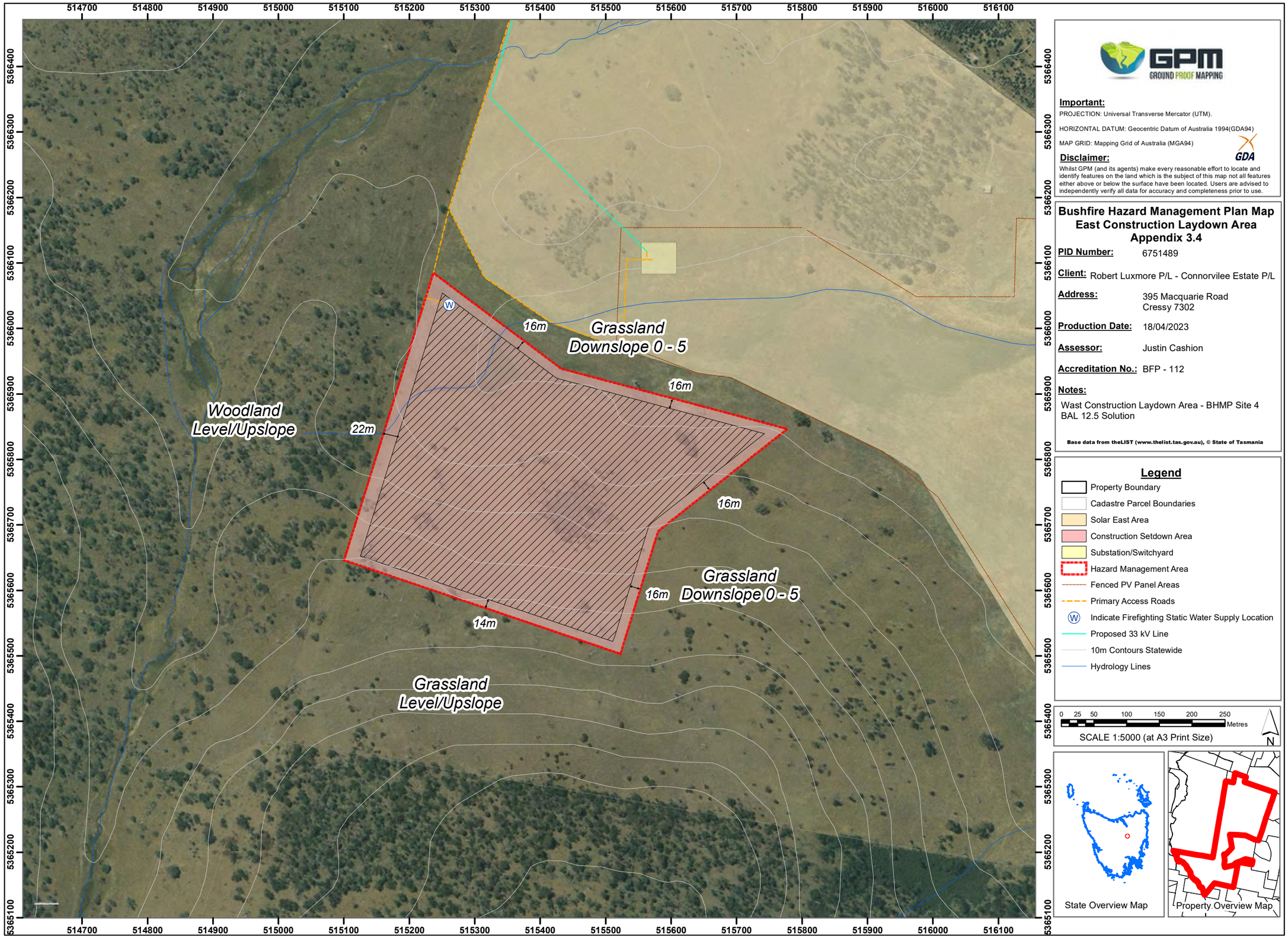
0 10 20 40 60 80 100 Metres

SCALE 1:2000 (at A3 Print Size)

N

State Overview Map

Property Overview Map



GPM GROUND PROOF MAPPING

Important:

PROJECTION: Universal Transverse Mercator (UTM).

HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)

MAP GRID: Mapping Grid of Australia (MGA94)

GDA

Disclaimer:

Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.

Bushfire Hazard Management Plan Map
East Construction Laydown Area
Appendix 3.4

PID Number: 6751489

Client: Robert Luxmore P/L - Connorvilee Estate P/L

Address: 395 Macquarie Road
Cressy 7302

Production Date: 18/04/2023

Assessor: Justin Cashion

Accreditation No.: BFP - 112

Notes:

Wast Construction Laydown Area - BHMP Site 4
BAL 12.5 Solution

Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania

Legend

- Property Boundary
- Cadastre Parcel Boundaries
- Solar East Area
- Construction Setdown Area
- Substation/Switchyard
- Hazard Management Area
- Fenced PV Panel Areas
- Primary Access Roads
- Ⓦ Indicate Firefighting Static Water Supply Location
- Proposed 33 kV Line
- 10m Contours Statewide
- Hydrology Lines

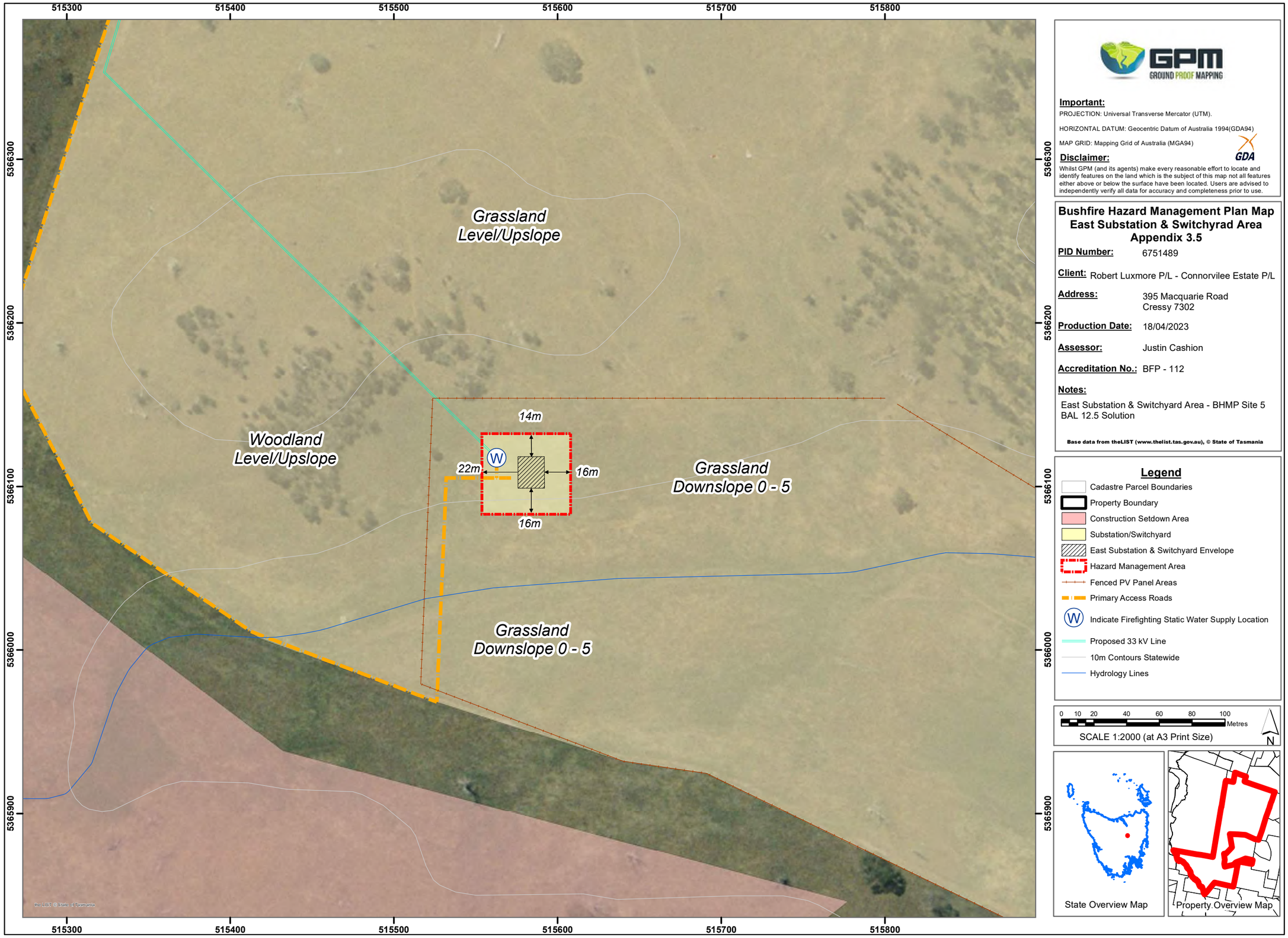
0 25 50 100 150 200 250 Metres

SCALE 1:5000 (at A3 Print Size)

N

State Overview Map

Property Overview Map


515300
515400
515500
515600
515700
515800
5366300
5366200
5366100
5366000
5365900
Grassland
Level/Upslope
Woodland
Level/Upslope
Grassland
Downslope 0 - 5
Grassland
Downslope 0 - 5
14m
22m
16m
16m
W
GPM
GROUND PROOF MAPPING
Important:
PROJECTION: Universal Transverse Mercator (UTM).
HORIZONTAL DATUM: Geocentric Datum of Australia 1994(GDA94)
MAP GRID: Mapping Grid of Australia (MGA94)
GDA
Disclaimer:
Whilst GPM (and its agents) make every reasonable effort to locate and identify features on the land which is the subject of this map not all features either above or below the surface have been located. Users are advised to independently verify all data for accuracy and completeness prior to use.
Bushfire Hazard Management Plan Map
East Substation & Switchyrad Area
Appendix 3.5
PID Number: 6751489
Client: Robert Luxmore P/L - Connorvilee Estate P/L
Address: 395 Macquarie Road
Cressy 7302
Production Date: 18/04/2023
Assessor: Justin Cashion
Accreditation No.: BFP - 112
Notes:
East Substation & Switchyard Area - BHMP Site 5
BAL 12.5 Solution
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Legend
Cadastre Parcel Boundaries
Property Boundary
Construction Setdown Area
Substation/Switchyard
East Substation & Switchyard Envelope
Hazard Management Area
Fenced PV Panel Areas
Primary Access Roads
Indicate Firefighting Static Water Supply Location
Proposed 33 kV Line
10m Contours Statewide
Hydrology Lines
0 10 20 40 60 80 100
Metres
SCALE 1:2000 (at A3 Print Size)
N
State Overview Map
Property Overview Map

NJMdesign
consulting engineers
Mechanical • Electrical • Fire Protection • Fire Safety • Hydraulics • Lifts • ESD

Fire Hazard and Risk Assessment

Northern Midlands Solar Farm (NMSF) and Battery Energy Storage System (BESS)

NJMdesign
consulting engineers
Mechanical • Electrical • Fire Protection • Fire Safety • Hydraulics • Lifts • ESD

Project Name: Northern Midlands Solar Farm (NMSF) and Battery Energy Storage System (BESS)

Project Number: 8039

Report Name: Fire Hazard and Risk Assessment

Client: Connorville Estates

Revision	Issue Date	Document Control			
01	18 April 2023	Issue:	Fire Hazard and Risk Assessment (FHRA)		
			Written by:	Reviewed by:	Approved by:
		Name:	Javier Piedrahita PE0003748	Ian Moore PE0003103	Javier Piedrahita PE0003748
02	21 April 2023	Issue:	FHRA – Stakeholder comments incorporated		
			Written by:	Reviewed by:	Approved by:
		Name:	Javier Piedrahita PE0003748	Ian Moore PE0003103	Javier Piedrahita PE0003748

NJM Design (Vic) Pty Ltd.
ABN: 53 633 847 775
L18, 350 Queen Street
Melbourne VIC 3000
www.njmdesign.com.au
Tel: (03) 9600 4400
Email: mail@njmdesign.com.au

Mechanical
Electrical
Fire Protection
Fire Safety
Hydraulics
Lifts
ESD

NJMdesign
consulting engineers
Mechanical • Electrical • Fire Protection • Fire Safety • Hydraulics • Lifts • ESD

TABLE OF CONTENTS

NJMdesign
consulting engineers
Mechanical • Electrical • Fire Protection • Fire Safety • Hydraulics • Lifts • ESD

1 EXECUTIVE SUMMARY

1.1 GENERAL

NJM Design has been engaged by Connoville Estates Pty Ltd c/- Robert Luxmoore Pty. Ltd. to undertake a fire hazard and risk assessment regarding the risk of fire spread to and from the surrounding vegetation of the west area of the Northern Midlands Solar Farm (NMSF) and Battery Energy Storage System (BESS) located at Tasmania Cressy, 7302.

The objective of this report is to identify primary fire risks associated with the implementation and function, location, proposed fire systems and fire brigade intervention of the BESS units regarding the surrounding vegetation.

In particular the scope of work is to:

a. Provide a risk review consistent with fire risk assessment techniques for Hazardous industry planning.
b. Quantify severity of fires including heat radiation level at various distances from BESS and transformer fires and durations of the fire.
c. Recommend mitigation measures if required.

A review of the below standards and reports as they relate to fire safety has also been undertaken:

a. AS3959-2018 has been reviewed to assess the bushfire hazard.

1.2 CONCLUSIONS

Based on the results of the assessment it is concluded that:

1. The design of the BESS units is acceptable and covers all fire initiation and fire spread risks to an acceptable level.
2. Based on the AS5139 Risk Methodology the risk of a fire would be considered Very Low, given that the consequence is Minor and the likelihood is very low.
3. Fire spread to adjacent allotments (i.e., conservation covenant area) would not be predicted to occur.

It is considered that the design and layout of the BESS provides an acceptable level of fire safety to personnel, fire brigade and adjacent properties.

1.3 FIRE ENGINEERING REQUIREMENTS

As part of the risk assessment, the following recommendations are to be implemented to satisfy the objectives of the relevant authorities and the client.

1. A firebreak of at least 10m wide must be designed and maintained between the BESS area and the conservation covenant area as shown in Appendix A.

Refer to Appendix A for overall floor plans layout and main Fire Engineering Requirements.

2 SCOPE

2.1 GENERAL

A review of the design to relevant standards has been undertaken as well as a comparative risk assessment to existing power utility infrastructure and industrial facilities in the same setting.

An assessment of the likelihood of ignition and fire spread from a BESS unit and the transformers was undertaken. This assessment included the investigation of the likely heat release rate (HRR) of a fire and its impact on the adjoining allotment that is a Conservation covenant area.

It is beyond the scope of this fire risk assessment to assess the likely spread at ground level of firefighting water run-off. This would be a consideration of detailed design in due course.

NJM Design makes all reasonable efforts to incorporate practical and advanced fire protection concepts into its advice. The extent to which this advice is carried out affects the probability of fire safety. It should be recognised, however, that fire protection is not an exact science. No amount of advice can, therefore, guarantee freedom from either ignition or fire damage.

The implementation of the findings of this report is the responsibility of others, including but not limited to:

- Development of drawings and specifications.
- The installation of hardware and construction system.
- The operation and maintenance of those systems.

2.2 BASIS OF THE STUDY

The development of the study was based on the following information:

- PV Concept Layout (Final) West area, revision 2, dated on 10/03/2023.
- AC-Coupled BESS General arrangement, revision B, dated on 20/04/2023.
- 220kV Switchyard plan, revision B, dated on 19/04/2023.

3 RISK ASSESSMENT METHODOLOGY

3.1 INTRODUCTION

This Fire Hazard and Risk Assessment formulates part of an integrated assessment process for safety assurance of development proposals, which are potentially hazardous. The assessment is based on the methodology outlined in the Hazardous Industry Advisory Papers (HIPAPS).

The process is shown diagrammatically in Figure 1.

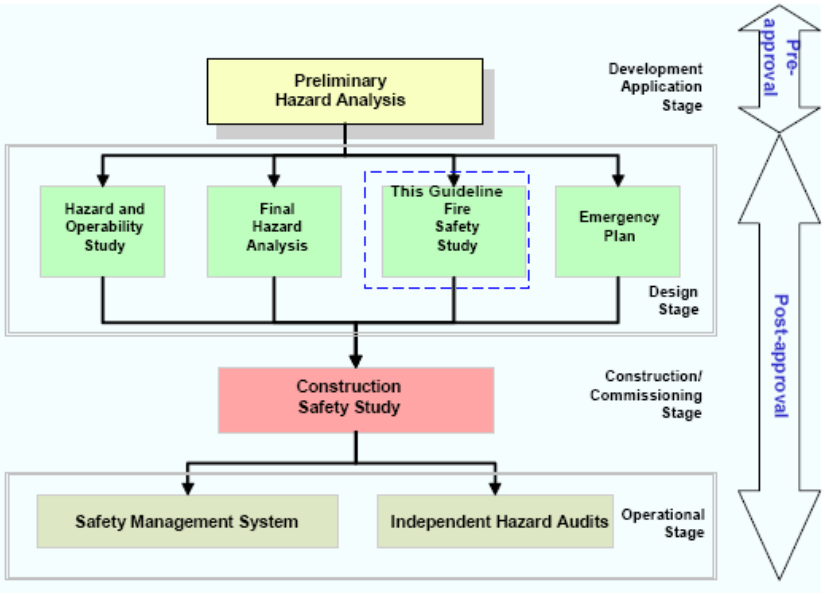


Figure 1: The Hazards-Related Assessment Process

Several Hazardous Industry Advisory Papers (HIPAPS) have been published to assist stakeholders in implementing the process, i.e.:

- No. 1 - Industry Emergency Planning Guidelines.
- No. 2 - Fire Safety Study Guidelines.
- No. 3 - Environmental Risk Impact Assessment Guidelines.
- No. 4 - Risk Criteria for Land Use Planning.
- No. 5 - Hazard Audit Guidelines.
- No. 6 - Guidelines for Hazard Analysis.
- No. 7 - Construction Safety Studies.
- No. 8 - HAZOP Guidelines.
- No. 9 - Safety Management System Guidelines.
- No. 10 - Land Use Safety Planning (Consultation Draft).

The studies detailed in the HIPAP papers involve case-specific hazard analyses and design of fire safety arrangements to meet those hazards. The approach is particularly important where significant quantities of hazardous materials as is the case with BESS units involved.

3.2 RISK MANAGEMENT

The hazards identified as part of this assessment have been assessed using the below risk criteria and ranking based on past HIPAP studies and industry practices undertaken by the author.

The effectiveness of the existing controls was rated using the following criteria (Table 1).

Table 1: Risk Control Effectiveness

Level	Descriptor	Control Rating Guidance Description
1	Excellent	The system is effective in mitigating the risk. Systems and processes exist to manage the risk and management accountability is assigned. The systems and processes are well documented and understood by staff. Regular monitoring and review indicate high compliance with the process.
2	Good	Systems and processes exist which manage the risk. Some improvement opportunities have been identified but not yet actioned. Formal documentation exists for key systems and processes in place to manage the risk that is reasonably understood by staff.
3	Fair	Systems and processes exist which partially mitigates the risk. Some formal documentation exists, and staff have a basic understanding of systems and processes in place to manage the risk.
4	Poor	The system and process for managing the risk has been subject to major change or is in the process of being implemented and its effectiveness cannot be confirmed. Some informal documentation exists; however, staff are not aware or do not understand systems or processes to manage the risk.
5	Unsatisfactory	No system or process exists to manage the risk.

The following table was used to rate the likelihood of different risks occurring (Table 3) that has been extracted from Appendix G of AS5139:

Table 2: Example likelihood of occurrence rating

Likelihood rating	Definition of likelihood of occurrence rating
Almost certain	Probability of occurrence: greater than 90 %
	Expected to occur whenever system is accessed or operated
	The event is expected to occur in most circumstances
Likely	Probability of occurrence: 60 % – 89 %
	Expected to occur when system is accessed or operated under typical circumstances
	There is a strong possibility the event may occur
Possible	Probability of occurrence: 40 % – 59 %
	Expected to occur in unusual instances when the system is access or operated
	The event may occur at some time
Unlikely	Probability of occurrence: 20 % – 39 %
	Expected to occur in unusual instanced for non-standard access or non-standard operation
	Not expected to occur, but there is a slight possibility it may occur at some time
Rare	Probability of occurrence: 1 % – 19 %
	Highly unlikely to occur in any instance related to coming in contact with the system or associated systems
	Highly unlikely, but it may occur in exceptional circumstances, but probably never will

3.3 CONSEQUENCE RATING

The following table was used to rate the consequence of different risks occurring (Table 3).

The consequence for each risk was considered in relation to its cumulative effect in the period under review.

Table 3: Consequence rating Appendix G AS5139

Table G.1 — Typical risk consequence table

Consequence/ impact category	Consequence/impact rating definitions				
	Catastrophic	Major	Moderate	Minor	Insignificant
Health and safety	Any fatality of staff, contractor or public	Non-recoverable occupational illness or permanent injury	Injury or illness requiring medical treatment by a doctor	Injury requiring first aid	No or minor injury
		Injury or illness requiring admission to hospital	Dangerous/reportable electrical incident	Circumstances that lead to a near miss	
Environmental	High, long term or widespread impact (spill, emission, or habitat disturbance) to sensitive environment	Substantial impact — large spill or emission requiring Emergency Services attendance	Moderate impact — Spill or emission not contained on site with clean up needed	Minor cleanup/rectification — spill or emission not contained on site	Small spill or emission that has no impact on site or installation
	Environmental agency response with significant fine	Recovery of environment likely but not necessarily to pre-incident state	Death or destruction of protected flora or fauna	Environment expected to fully recover to pre-incident state	Clean up requires no special equipment and has no potential impact
	Long term recovery of environment to pre-incident state not likely	Any spill into sensitive area (wet tropics, fish habitat, potable water supply)	Environment likely to recover to pre-incident state in short to medium term	Environmental nuisance (short-term impact) caused by noise, dust, odour, fumes, light	
Legal and regulatory	Breach of licences, legislation or regulations leading to prosecution	Breach of legislation or regulations leading to: (a) contravention notice from authorities; or (b) court order; or (c) fine over $1000	Breach of legislation, regulations leading to: (a) warning notice; or (b) fine of up to $1000; or (c) enforceable undertakings	Breach of legislation regulations, policies or guidelines leading to an administrative resolution	No issues
Asset impact	Equipment destruction, repair not possible, asset repair greater than original cost of works	Equipment damage repaired at a cost of between 50 % and 100 % of original cost of works	Equipment damage repaired at a cost of between 15 % and 50 % of original cost of works	Equipment damage repaired at a cost of between 2 % and 15 % of original cost of works	Simple equipment damage with no or same day repair at a cost of less than 2 % of original cost of works

3.4 RISK CRITERIA

The likelihood and consequences of a risk occurring were used to determine the risk rating of either catastrophic, major, moderate, minor or insignificant. The matrix below was used to provide a visual method of categorising risks based on their risk rating.

To determine the risk rating, the Likelihood rating is added (+) to the Consequence rating. The addition of the two numbers produces a continuum number that is a number from 2 through to 10. (Table 4).

Table 4: Risk matrix rating

Consequence (how serious)	Likelihood (how often)				
	Rare	Unlikely	Possible	Likely	Almost certain
Catastrophic	Medium	High	High	Extreme	Extreme
Major	Medium	Medium	High	High	Extreme
Moderate	Low	Medium	Medium	High	High
Minor	Very low	Low	Medium	Medium	Medium
Insignificant	Very low	Very low	Low	Medium	Medium

The risk treatment options, which are available for the treatment of risks, are based on five main concepts:

Table 5: Risk Treatments

Avoid:	Do not proceed with the activities that create the risk.	
Treat:	Find and implement measures that ensure the risk is monitored and mitigated. Control involves reducing the likelihood and/or consequence.	
	Change the likelihood:	Reduce the likelihood of an adverse event occurring through preventative measures. E.g., Training, Awareness, Procedures, Asset Management.
	Change the Consequences:	Reduce the size of the losses associated with undertaking an activity. E.g., Emergency response, Contingency and Disaster recovery plans.
Share:	Risks are shared with suppliers, business partners or other organisations Not considered applicable for the subject facility.	
Transfer:	Risk or part of a risk is transferred to another party. Even though the risk may have been transferred, it should be noted that it still exists. Not considered applicable for the subject facility.	
Retain:	Retention of a risk, primarily where no other options exist, or it is not commercially feasible to treat it in any other way. Only really acceptable for Low to Medium risks	

3.5 FIRE SPREAD ACCEPTANCE CRITERIA

Table B.3 of IEEE Std 979-2012 [1] gives some typical examples of the amount of radiant heat necessary to ignite common materials precent in power stations.

Table B.3—Radiant heat flux level and damage

Impact of radiant heat flux	Heat flux (kW/m²)
Sufficient to cause damage to process equipment	37.5
Equipment failure	35
Damage to unprotected metal	30
Spontaneous ignition of wood	25
Cable insulation degrades	20
Pilot ignition of wood	12.5
Plastic melts	12.5
Pain threshold reached after 8 s Second-degree burns after 20 s	9.5
Possible failure of ceramic bushings	5
Skin burns	5

Figure 2: Typical radiant heat flux intensities-based IEEE Std 979-2012 [1]

The assessment methodology requires that a fire will not cause a received heat flux (q_r) in excess of the critical heat flux (q_{cr}) on the allotment boundary.

Given the above standard, the heat flux of 12.5kW/m^2 will be selected as the critical value for the adjoining allotment, the conservation covenant area.

Acceptance will be demonstrated if $q_r < q_{cr}$.

4 BESS FACILITY DESCRIPTION

4.1 LOCATION

The Northern Midlands Solar Farm (NMSF) and Battery Energy Storage System (BESS) located at Tasmania Cressy, 7302, as shown below (Figure 3).

Figure 3: Site Location

The NMSF and BESS will have 2 transformers, a BESS arrangement in the west area (i.e., pink coloured area in Figure 4 below) and 2 x 288,333 litres water tanks that are surrounded by Conservation covenant areas to the east and multiple Photovoltaic (PV) trackers and other equipment on the other sides (refer to Appendix A).

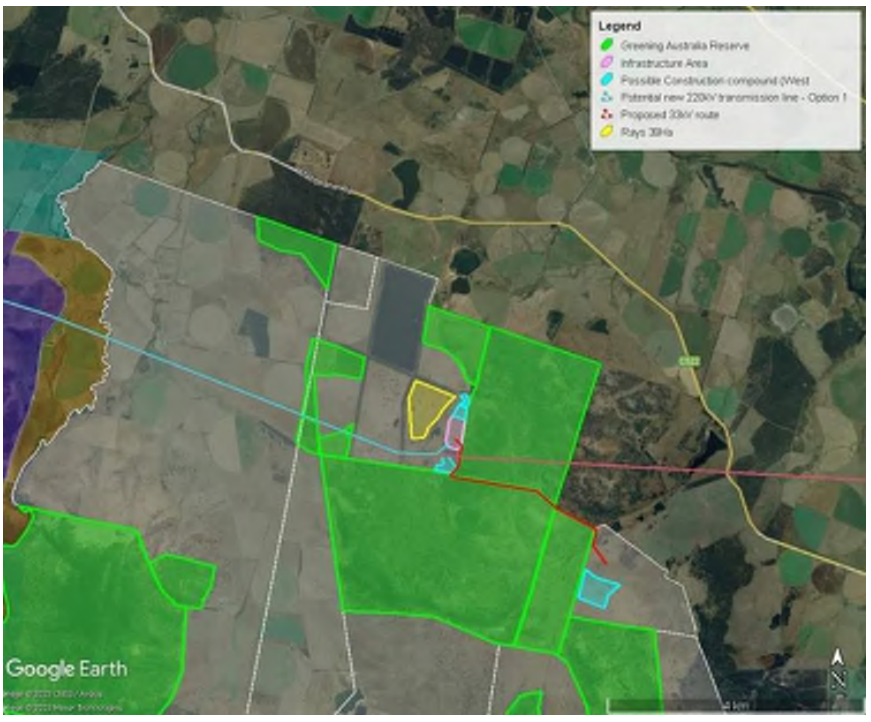


Figure 4: Subject site and Conservation area

NJMdesign
consulting engineers
Mechanical • Electrical • Fire Protection • Fire Safety • Hydraulics • Lifts • ESD

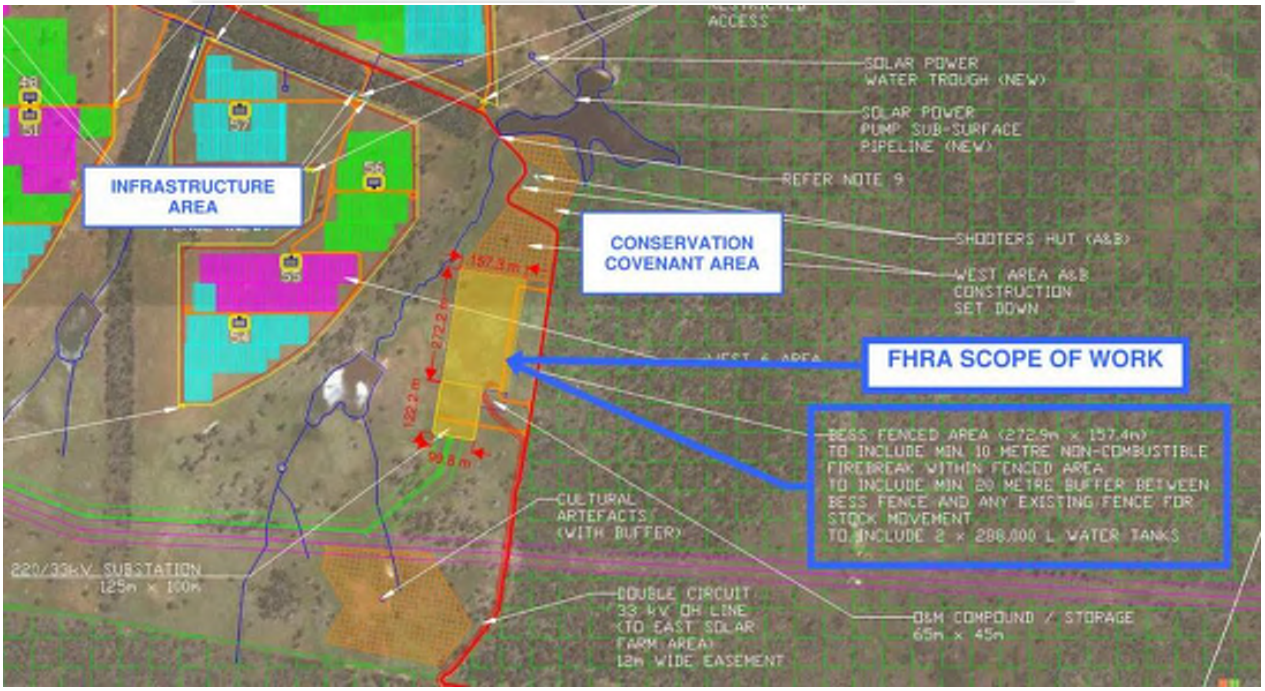


Figure 5: Subject site and surrounding areas

4.2 CRESSY WEATHER CONDITIONS

The closest weather station to the NMSF and BESS site is the Cressy Research station. In accordance with the available data, the average weather conditions are the following:

- The maximum average temperature es 17.2°C.
- The mean relative humidity is 75%.
- Wind statistics (Figure 6): The average speed of the wind is 11km/hr (3.1m/s), and the wind from the west towards the Conservation Covenant area occurs 3.2% of the time, with a speed of between 20km/hr and 30km/hr. The strongest wind comes from the northwest with a speed of 22km/hr (6.1m/s) approximately.

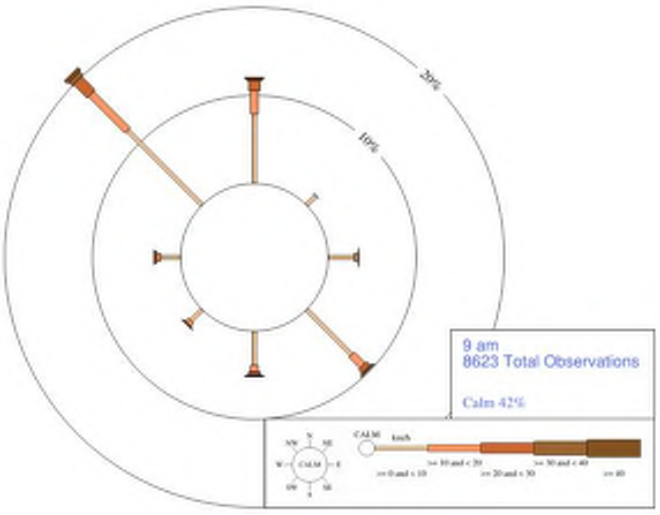


Figure 6: Wind Rose from Cressy Research weather station.

4.3 FACILITY LAYOUT

The NMSF and BESS facility is as presented in the plans in Appendix A. The main equipment part of the new facility is the following:

- BESS units.
- 33kV/220kV power transformers.
- 2 x 288,333 litres water tanks.

As part of the layout and safety measures, there are 10m wide firebreaks, and the facility will be enclosed within a security fence.

4.4 FIRE BRIGADE

The closest fire brigade station is Cressy Fire Station, located at 22.80km away (Figure 7), and access the subject site from the west by Connorville Road.

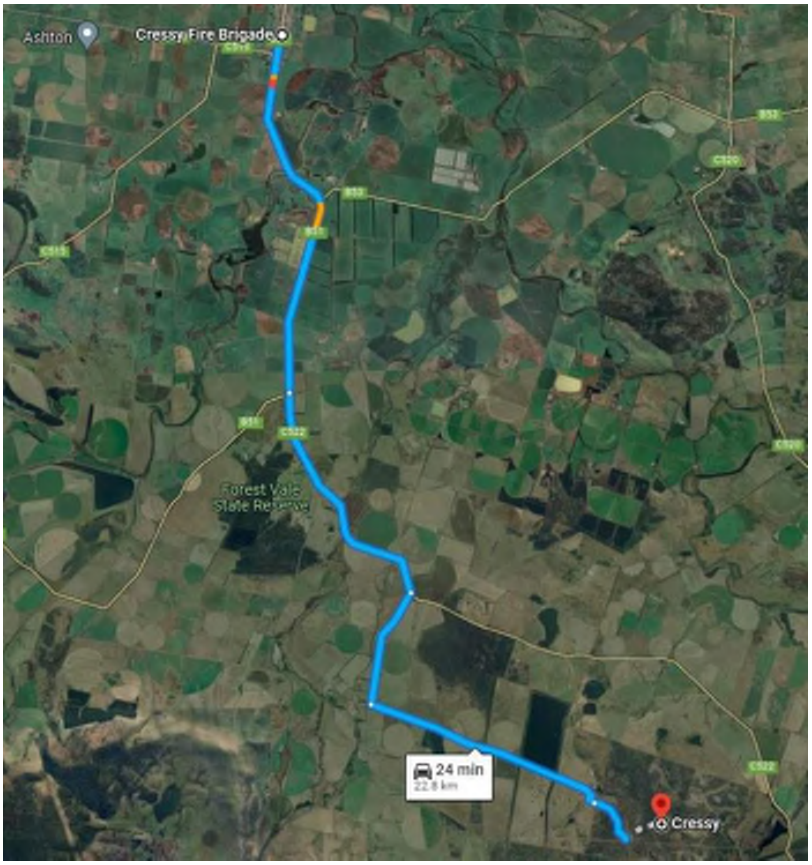


Figure 7: Cressy Fire Station

5 FIRE HAZARDS

The subject NMSF and BESS facility will comprise a number equipment that have a risk of fire ignition, and hence a risk of fire and spread to the boundary or adjoining equipment.

The main fire hazards are given by the following equipment:

- Battery storage arrays.
- 220 kV HV Substation.

Furthermore, given the location of the development, the risk of a bushfire will also be addressed.

The following section will explain past events and findings regarding the above fire risks.

5.1 BATTERY HAZARDS

One of the main hazards associated with the use of lithium batteries for energy storage is overheating and thermal runaway resulting in a fire. Cell thermal runaway refers to rapid self-heating of a cell derived from the exothermic chemical reaction of the highly oxidizing positive electrode and the highly reducing negative electrode; it can occur with batteries of almost any chemistry.

Lithium-ion batteries contain highly energetic materials and combustible materials (i.e., electrode, separator, electrolyte and organic solvents). If they are subject to overcharging, short circuit, extrusion, collision and exposed in fire, this can trigger thermal runaway and lead to a fire and explosion.

The combustion process of batteries could be summarized into the following stages: heating to ignition, violent ejecting or explosion, stable burning, and weakening and extinguishment. Both the state of charge and incident heat flux have significant impact on the combustion behaviour of the battery. The battery with high charge presents a fierce combustion process and higher surface temperature than the others, especially when imposed with a high external heat flux.

5.1.1 Past BESS Fires

In order to obtain an understanding of the hazards associated with BESS facilities a summary of past fires is presented below including the Moorabool Fire.

5.1.1.1 Victorian Big Battery fire

The Energy Safe Victoria (ESV) “Statement of Technical Findings - Fire at the Victorian Big Battery” provides a summary of the key findings into the fire.

On 30 July 2021, the Victorian Big Battery (VBB) experienced a fire that involved two Battery units during commissioning.

The root cause of the fire was found to be a leak within the cooling system that caused a short circuit that led to a fire in an electronic component. This resulted in heating that led to a thermal runaway and fire in an adjacent battery compartment within one unit, which spread to an adjacent second unit.

The contributing factors into the fire were reported to be:

- The supervisory control and data acquisition (SCADA) system took 24 hours to ‘map’ to the control system and provide full data functionality and oversight to operators. The unit that caught fire had been in service for 13 hours before being switched into an off-line mode when it was no longer required as part of the commissioning process. This prevented the receipt of alarms at the control facility.
- A key lock was operated correctly to switch the unit to off-line service mode (which was no longer required for ongoing commissioning), but this caused:

- Telemetry systems for monitoring the condition of the (now out of service) unit to shut down and so remove visibility of the developing event.
- The battery cooling system to shut down.
- The battery protection system to shut down, including the high voltage controller (HVC) that could have operated a pyrotechnic fuse to disconnect the faulty battery unit.

The lesson learnt from the fire were reported to be:

- Each cooling system is to be fully functionally, and pressure tested when installed on site and before it is put into service.
- Each cooling system in its entirety is to be physically inspected for leaks after it has been functionally, and pressure tested on site.
- The SCADA system has been modified such that it now 'maps' in one hour and this is to be verified before power flow is enabled to ensure real-time data is available to operators.
- A new 'battery module isolation loss' alarm has been added to the firmware; this modification also automatically removes the battery module from service until the alarm is investigated.
- Changes have been made to the procedure for the usage of the key lock during commissioning and operation to ensure the telemetry system is operational.
- The high voltage controller (HVC) that operates the pyrotechnic fuse remains in service when the key lock is isolated.

The over pressure vents in the roof of the units involved in the VBB fire were seen as the main fire propagation method and a weakness in the fire spread prevention. (The effect of vents on possible fire spread scenarios versus the consequence of an overpressure event if they were not installed will be assessed as part of the detailed assessment of the final unit design).

The wind conditions at the time of the VBB fire were 37 – 56km/hr which based on the wind data for the Cressy location would only occur approximately 6% of the time, i.e., a probability of 0.07.

It was recommended in the report that one of the hardware mitigation measures is the installation of newly designed, thermally insulated steel vent shields within the thermal roof of all units.

The fire did not spread beyond the two units and no members of the public or emergency services were indicated to have suffered significant injuries.

5.1.1.2 S&C Electric Lithium-Ion ESS fire in Wisconsin

The fire occurred in the S&C Electric facility in 2016. Within this facility, energy storage systems are designed, assembled, and operated before being deployed. The fire was initially assumed to have initiated with the lithium-ion batteries, however, the investigation later determined that the fire started in the battery manufacturer's DC power and control compartment – not the batteries themselves. The DC power and control unit that started the fire was part of a larger system that was being assembled – therefore the safety features normally integrated into an ESS were not yet installed in this particular fire event.

The units at the proposed site will be fully functional at the time of delivery and installed and commissioned at the time of installation including safety systems.

5.1.2 Thermal Runaway / Fire within a battery

One of the reasons lithium-ion cell thermal runaway reactions can be very energetic is these cells have very high-energy densities compared to other cell chemistries. The other reason that lithium-ion cell thermal runaway reactions can be very energetic is because these cells contain flammable electrolyte, and thus, not only do they store electrical energy in the form of chemical potential energy, but they also store appreciable chemical energy (especially compared to cells with water-based electrolytes) in the form of combustible materials.

Self-heating of lithium-ion graphitic anodes in the presence of electrolyte initiates at temperatures in the 70 to 90°C. Thus, if a cell is brought to this initiating temperature in an adiabatic environment, it will eventually self-heat to the point thermal runaway initiates. For a typical 100% charged cell brought to its self-heating temperature, thermal runaway will occur after approximately two days if the cell is well-insulated. Should initial temperature be higher, time to thermal runaway will be shorter. For example, if a typical lithium-ion cell is placed into an oven at more than 150°C (300°F), such that separator melting occurs, additional heating due to shorting between electrodes will occur and cell thermal runaway will initiate within minutes. However, if heat is allowed to escape, time to thermal runaway may be longer, or the cell may never achieve thermal runaway.

Measurement of cell case temperatures during thermal runaway experiments have been performed by laboratories such as UL. For fully charged cells, these temperatures can reach in excess of 600°C case temperatures. The temperature rise is driven by reactions of the electrodes with electrolyte and release of stored energy. Some cathode materials will decompose and may change their crystalline structure which may result in the release of small quantities of oxygen that can participate in reactions internal to the cell (e.g., oxidation of the aluminium current collector).

This fact has led to a misconception that lithium-ion cells burn vigorously because they “produce their own oxygen.” This idea is incorrect. No significant amount of oxygen is found in cell vent gases.[1] Any internal production of oxygen will affect cell internal reactivity, cell internal temperature, and cell case temperature, but plays no measurable role in the flammability of vent gases.

5.1.2.1 Research and Testing of Lithium-Ion Batteries and BESS

Full-scale testing of a large, containerized lithium-ion battery energy storage system has yet to be conducted. However, other testing has been conducted to provide insight into the fire hazards associated with lithium-ion battery energy storage systems. A few of the larger-scale testing and research reports will be summarized below:

- FPRF/Exponent Hazard Assessment of Lithium-Ion Battery Energy Storage Systems.
- FAA Fire Hazards of Lithium-Ion Batteries – testing of pallet load of lithium-ion batteries in an aircraft cargo hold.
- DNV GL/Con-Edison Considerations for ESS Fire Safety.

5.1.2.1.1 FPRF/Exponent Hazard Assessment of Lithium-Ion Battery ESS

Exponent Inc. and the NFPA’s Fire Protection Research Foundation conducted a full-scale fire test of a Tesla Powerpack – 100kWh lithium-ion BESS at 100% SOC[2]. Two tests were conducted, one with an external ignition source of 400 kW and another with an internal ignition by heater cartridges. The internal test set individual cells into thermal runaway to simulate an internal failure, and the external test led the internal cells into failure through heat exposure.

The results of the external ignition test determined the following:

- A fire in the Powerpack resulted in internal temperatures exceeding 1,093°C.
- External temperatures reached 232°C.
- Flames were observed coming out of the exhaust vent and out of the BESS front door.
- Flames several feet high were observed from the exhaust vent of the Powerpack.

[1] Lithium-Ion Batteries Hazard and Use Assessment, Final Report, Celina Mikolajczak, PE, Michael Kahn, PhD, Kevin White, PhD ,Richard Thomas Long, PE, Exponent Failure Analysis Associates, Inc., July 2011 National Fire Protection Association, Fire Protection Research Foundation.
[2] Blum, A. F., & Long, Jr., R. T. (2016). Hazard Assessment of Lithium-Ion Battery Energy Storage Systems. Quincy: National Fire Protection Association

- Heat flux of approximately 25kW/m^2 measured 1.8m from front of BESS.
- All batteries and electronics of the BESS were damaged.

The internal ignition test gave the following results:

- A fire in the Powerpack resulted in internal temperatures exceeding 1,093°C.
- Temperatures at pods below the initiator pod showed temperature ranges between 26 and 82°C.
- External temperatures reached 21°C.
- Initiator pod was damaged, but other cells were not damaged.

5.1.2.1.2 US FAA-Style Flammability Assessment of Lithium-Ion Cells and Battery Packs in Aircraft Cargo Holds

The exponent conducted flame attack tests on single prismatic batteries and prismatic battery packs inside a cargo hold [3]. The result of this testing provides insight into battery behaviour under fire conditions as well as temperature profiles of the fire events.

Key findings from these small-scale tests include the following:

- Frequent battery case rupture events were observed in the prismatic battery back testing.
- Direct flame impingement on small, unpackaged quantities of prismatic battery packs can lead to thermal runaway of individual cells and venting of gases. The vent gases are generally ignited by the pre-existing flame, increasing the total heat flux produced by the fire.
- Testing of 4 cell li-ion battery packs produced ceiling temperatures between 400°C and 600°C.

5.1.2.1.3 FAA Energetics of Lithium-Ion Battery Failure

The Federal Aviation Administration (FAA) has worked to quantify the hazard of lithium-ion batteries under a fire event since a fleet of the Boeing 787 Dreamliner were grounded as a result of hazards associated with LIB fires. In addition to the fire events, large numbers of lithium-ion batteries are being shipped as cargo on aircraft. Although the failure of a single cell is a low probability event (1/1,000,000), the large quantity of batteries on aircraft and the severe impact of an event on the survivability of the aircraft make the risk a safety concern to the passengers.[4]

To analyse the hazard of lithium-ion batteries undergoing a thermal runaway event in an aircraft, a pallet load of 18650 cylindrical batteries were forced into thermal runaway within a cargo hold of an aircraft. This test showed that all of the batteries became involved in the fire. This testing provided data regarding lithium-ion battery fires and heat release rate curves providing insight into the growth function of a fire involving multiple packs of lithium-ion batteries. This study is applicable to quantifying a fire event in a ESS due to the number of batteries in a confined compartment.

The results indicated the heat release rate per battery cell was approximately 5kW.

[3] Mikolajczak, C. (2005). US FAA-Style Flammability Assessment of Lithium-Ion Cells and Battery Packs in Aircraft Cargo Holds. Exponent. Menlo Park: Exponent.
[4]] Lyon, R. E., Walters, R. N., Crowley, S., & Quintiere, J. G. (2015). Fire Hazards of Lithium-Ion Batteries. Federal Aviation Administration. Atlantic City: Federal Aviation Administration.

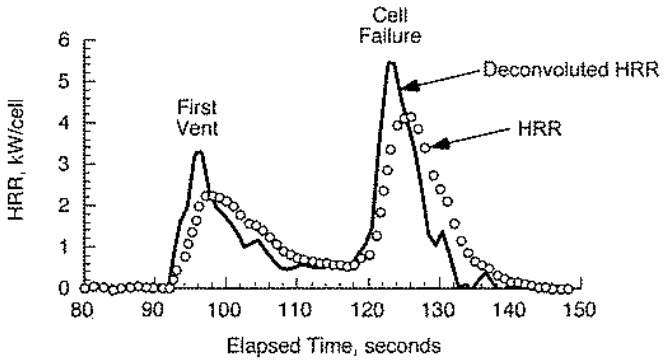


Figure 2. Lithium-ion cell failure at 70% SOC exposed to 50 kW/m^2 irradiance in fire calorimeter; points are data from standard method; solid line is data corrected for instrument response

Figure 8: Results of a single group of batteries

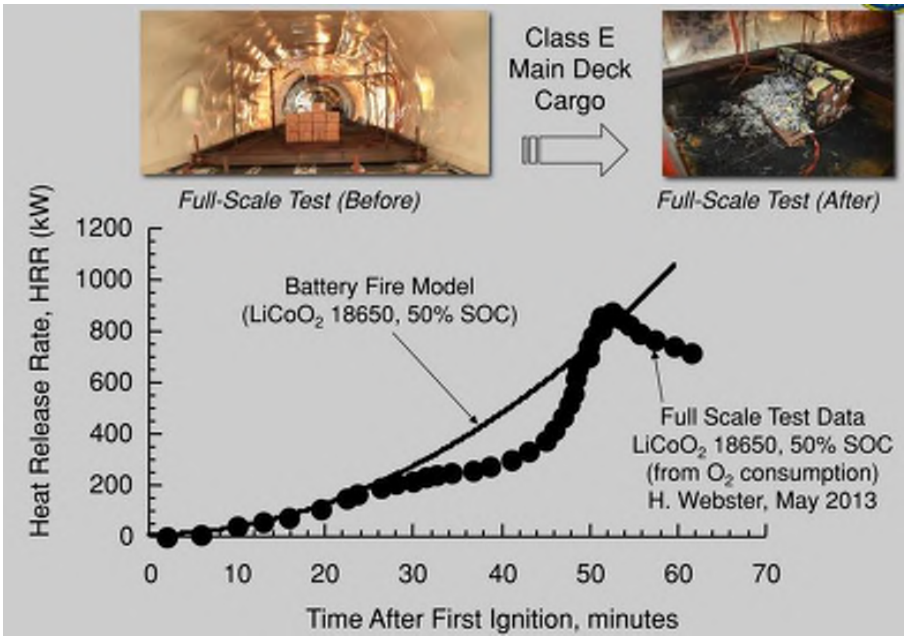


Figure 9: Results of full-scale tests on 18650 batteries

The peak heat release rate is approximately 1MW.

5.1.2.1.4 DNV GL Considerations for ESS Fire Safety

DNV GL and Rescue Methods were contracted by Con-Edison Power and the New York State Energy Research and Development Authority (NYSERDA) to address a series of frequently asked questions regarding BESS Fire Safety[5]. This work included testing of lithium-ion batteries of various chemistries as individual cells and battery modules. The individual cells were exposed to a 4-kW radiant heat source until they vented inside DNV GL's Large Battery Destructive Testing Chamber. For the module testing, modules between 7.5 and 55 kWh were ignited inside a partially closed metal container by direct flame impingement from a propane torch. The module testing provided data concerning the effect of oxygen, toxicity, and heat release rate of the fire.

[5] DNV GL. (2017). Considerations for ESS Fire Safety. Dublin: DNV GL

A few key findings from this testing are discussed below:

- Batteries are more volatile at higher states of charge (SOC).
- Mass loss rate is proportional to SOC. Average mass loss rate: 18% mass loss over 41.7 min.
- If flames are visible and temperature is rising, the ESS is likely to have multiple batteries and/or modules involved in the fire. Rising temperatures within the ESS is an indication of increasing risk.
- The batteries themselves emit flammable gases.
- Recommended Ventilation Rate Correlation of 0.095 - 0.15 l/s/Wh.
- HRR produced variable results. The range was between 2.5 – 80 kW/kg, depending on volume of gases, duration of release, rate of ignition, and gaseous mixture.
- Partially burned systems can continuously emit flammable gases as long as the cells retain their heat – even if the fire has been extinguished.

5.1.2.2 Rate of Heat Release

The Rate of Heat Release for the battery units is dependent on the state of charge as well as the size of the batteries and the incident heat flux.

It was reported in "Fire behaviour of lithium-ion battery with different states of charge induced by high incident heat fluxes", by Zhi Wang that the peak heat release rate of a battery unit is approximately 700kW/m^2 to 1050kW/m^2 and an average of approximately 150 – 200kW/m^2.

Note these are individual small batteries and not part of a BESS unit and the area is the surface area of the batteries. Based on the size of the units in the VBB fire as reported by the ESV investigation (7.5m x 1.6m x 2.5m) and assuming the front and the top of the unit (are burning based on the location of the ventilation, the heat release rate is predicted to be 4.5MW to 6MW.

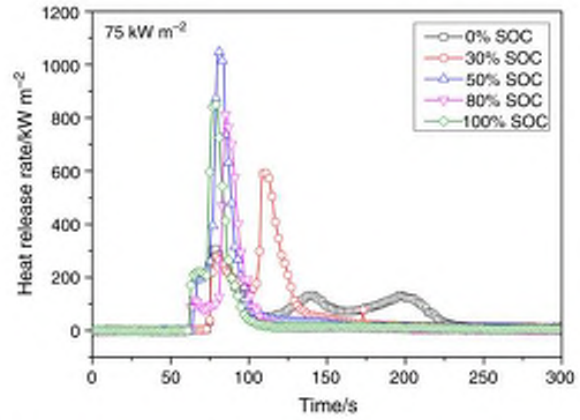


Fig. 7 Heat release rate of batteries at different SOCs under an incident heat flux of 75 kW m^{-2}

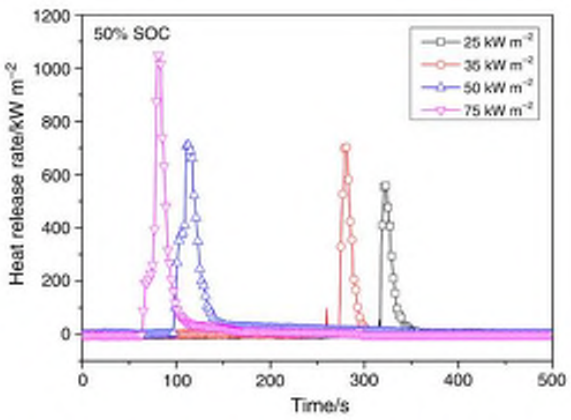


Fig. 8 Heat release rate of batteries with 50% SOC under different incident heat fluxes

Figure 10: Tested heat release rates for Lithium-ion batteries

Based on the above review it is considered that each unit of the subject site will have an average heat release rate of approximately 6.2MW, considering that each units' dimensions are 2.44m x 1.72m x 3.23m (i.e., superficial area of 31m^2) (see Appendix A) and an average of 200kW/m^2.

6 RISK ASSESSMENT

6.1 LIKELIHOOD

In the Article “Burning concern: Energy storage industry battles battery fires”, in the S&P Global market Intelligence website, 24 May 2019 it was reported by Ken Boyce, a principal engineer at product safety certification, testing and advisory firm UL LLC that: "In general, it's a very safe technology. Lithium-ion battery cells fail at a rate of only around one in every 12 million”. This is the rate of $8x\ 10^{-8}$ per year.

From May 2, 2020, to Jan. 22, 2021, 21 ESS many fires were reported across Korea from 1490 systems installed. This is a rate of 1.4%, i.e., Rare based on table 2 from Appendix G of AS5139 above.

The likelihood of a fire is therefore considered to be Rare.

Accordingly, the risk of a fire would be rated as Very Low.

6.2 CONSEQUENCE: BATTERY FIRE

The consequence of a fire in a BESS unit will be modelled and assessed as part of the fire engineering report.

It will be demonstrated that given the fire separation to the conservation covenant area, fire spread is not predicted to occur at a greater level than that for a NCC compliant building (Note this is based on units similar to those in the VBB fire and further assessment might be required once the final units design is known).

The National Institute of Standards and Technology (NIST) has been developing Fire Dynamics Simulator (FDS), to predict fire spread in a structure. Over the past few years, it has also been used to predict smoke and hot gas plume behaviour produced by outdoor fires. FDS is well documented and is widely used by fire protection engineers around the world. The model is being extended to include fire spread from structure to structure and generalizing FDS to include a means to predict fire spread in both continuous and discrete natural fuels.

Fire Dynamics Simulator (FDS) is a computational fluid dynamics (CFD) model of fire-driven fluid flow. The software solves numerically a form of the Navier-Stokes equations appropriate for low-speed, thermally-driven flow with an emphasis on smoke and heat transport from fires.

The fire growth and spread were modelled using the National Institute of Standards and Technology (NIST) Fire Dynamics Simulator (FDS) software package and Smokeview which is used to view the results.

The BESS units consist of a modular design, complete with pre-integrated energy segments (Figure 11) containing batteries, thermal management equipment, and essential safety systems.

As described in section 5.1.2.2, in accordance to Zhi Wang’s report and the dimensions of the battery storage, if a storage unit is on fire, it will achieve an average heat release rate of approximately 6.2MW.

A flashover fire within an energy segment (i.e., battery storage unit) has been modelled in accordance with layout shown in Appendix A.

Each energy segment has varied compartments. The main 3 compartments for this assessment are the batteries stored within the lower compartment, 2 x forced air HVAC (Heating, Ventilation, and Air Conditioning) units on top, and a cable tray at the back next to the HVACs units that collects all the AC and comms cables from the BESS units (Figure 11: Battery storage unit.).

The HVAC units have an air intake grid at the top and an exhaust on the roof of the energy segment. Given a fire, the air ducts/grids between these compartments will allow fire and smoke to spread throughout the energy segment without restriction due to their buoyant nature. Other possible holes/connection between inner compartments will be assumed to be part of the air conditioning system as a conservative measure for modelling purposes.

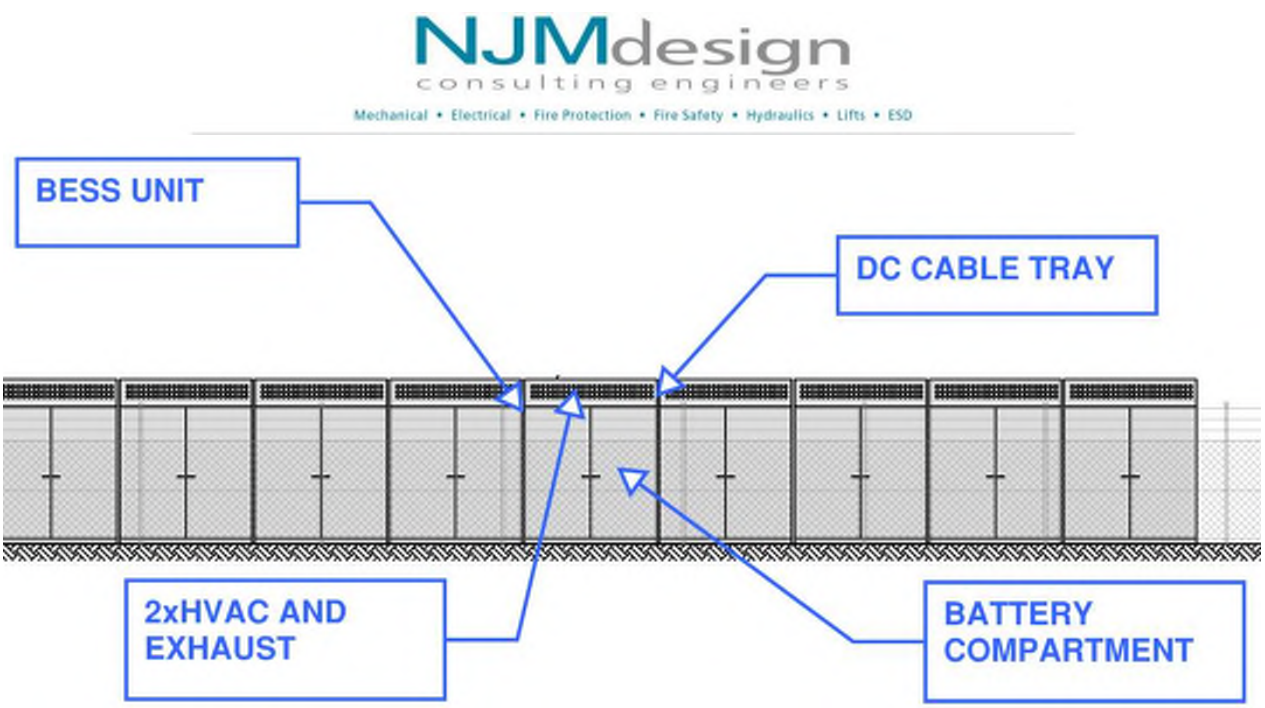


Figure 11: Battery storage unit.

The model and the scenario described above (shown in Figure 12), demonstrated that a fire within a BESS unit is not expected to spread to an adjoining BESS unit or the conservation covenant area.

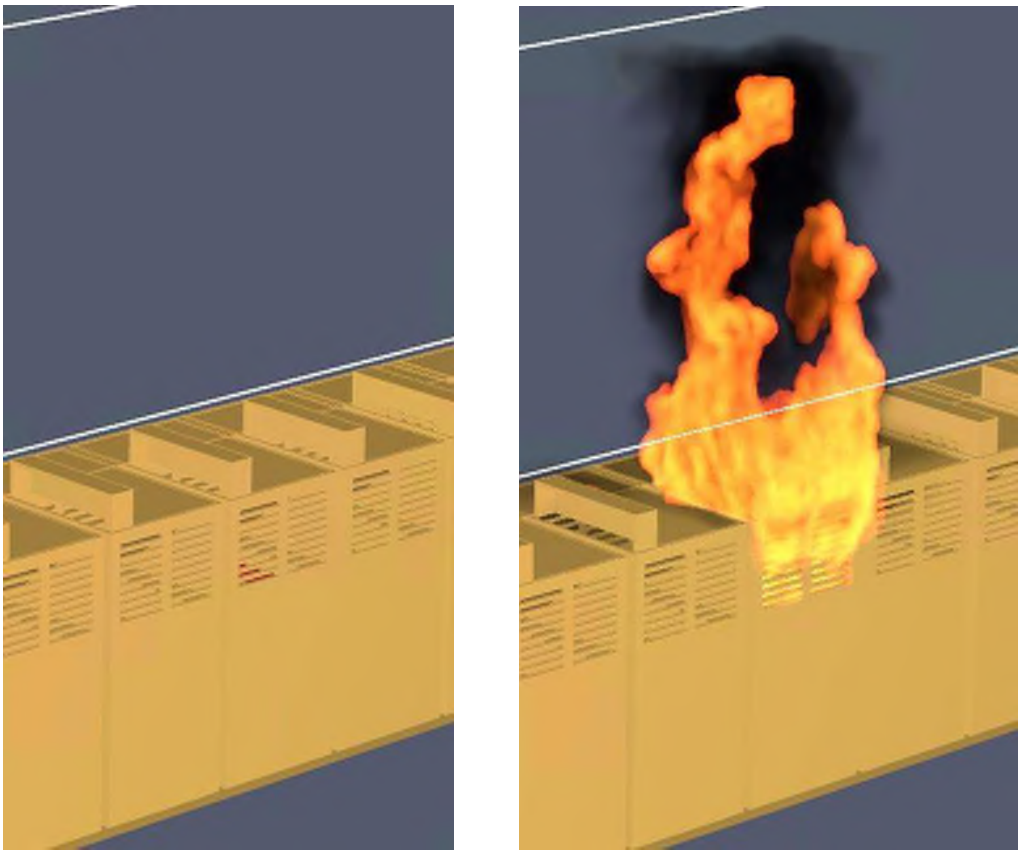


Figure 12: Fire within a BESS unit.

When flashover occurs, flames and smoke will vent mainly through the grids of the HVAC system on top of the BESS unit. The heat flux levels surpasses the critical value for piloted ignition of wood (i.e., 12.5kW/m^2) within 2.7m away from the BESS unit (Figure 13), hence fire spread to the conservation area or opposite BESS units rows is not expected to occur, considering that they are located to 30m and 6m respectively.

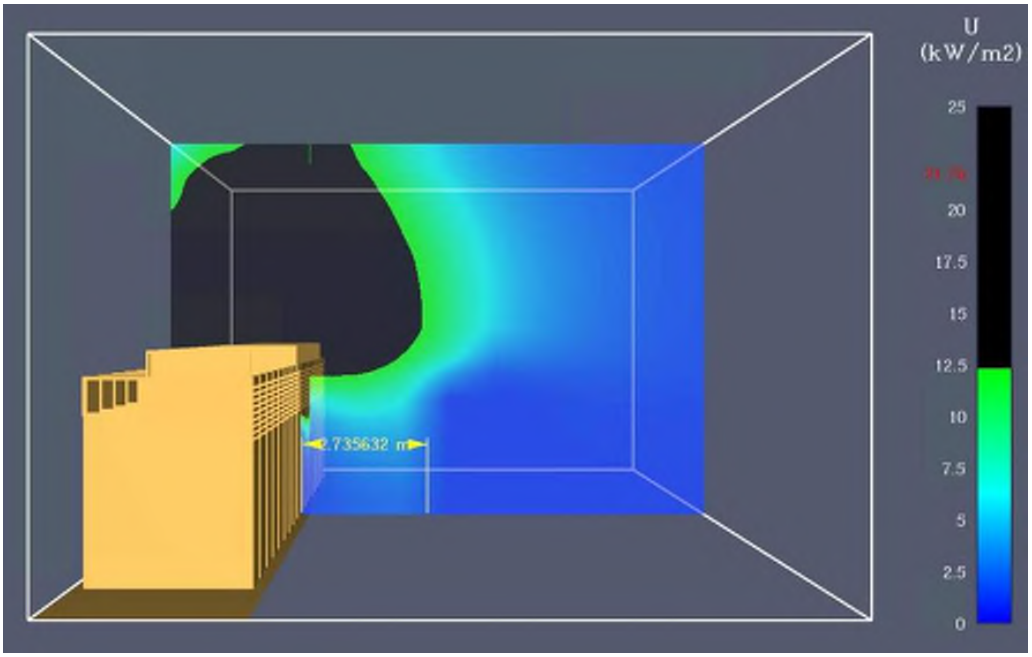


Figure 13: Heat flux from a BESS unit (lateral view).

The above results however are subject to a flashover fire. Given the provision of a smoke and/or heat detection system in conjunction with a temperature monitoring system, it is expected the detection of a fire, or the detection of the battery thermal runaway, which will shut down the BESS unit as part of the fire safety system. A signal is sent so staff will proceed with the required maintenance procedures to stop the thermal runaway of the battery and prevent a potential fire and smoke spread.

6.3 BUSHFIRE ATTACK LEVEL (BAL) ASSESSMENT

The following BAL review has been performed in accordance with AS3959-2018, using the 6 step Simplified Procedure (Method 1) in Section 2.

The adjoining conservation covenant area is located on the east side to not less than 3m away from the NMSF and BESS west area.

Figure 14: Vegetation in the adjoining conservation covenant area.

(1) ***FDI Classification:***

In accordance with AS3959-2018 Table 2.1, Tasmania has a Fire Danger Index (FDI) of 50.

(2) ***Vegetation classification:***

The vegetation classification has been done with the use of Google Earth Pro, where pictures and elevations of the existing terrain are shown.

The following vegetation classification has been identified:

- Group B Woodland: Woodland 05 and Low woodland 07.
- Group G Grassland: Open tussock 23, Sparse open herbfield 28.

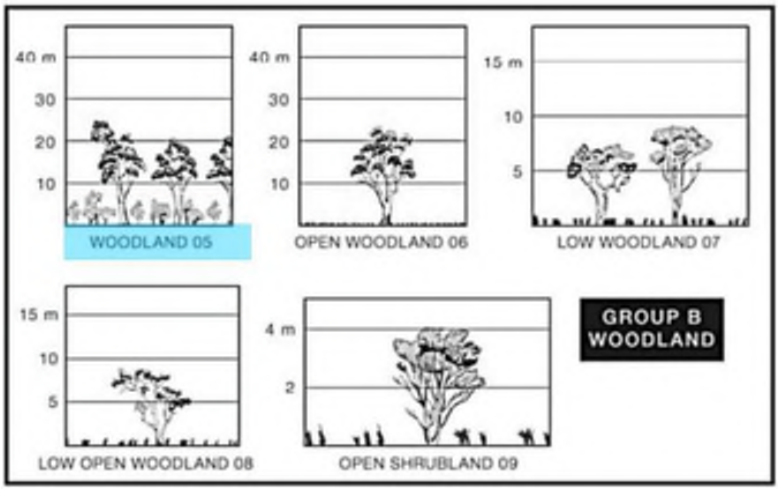


Figure 15: Vegetation classification Group B.

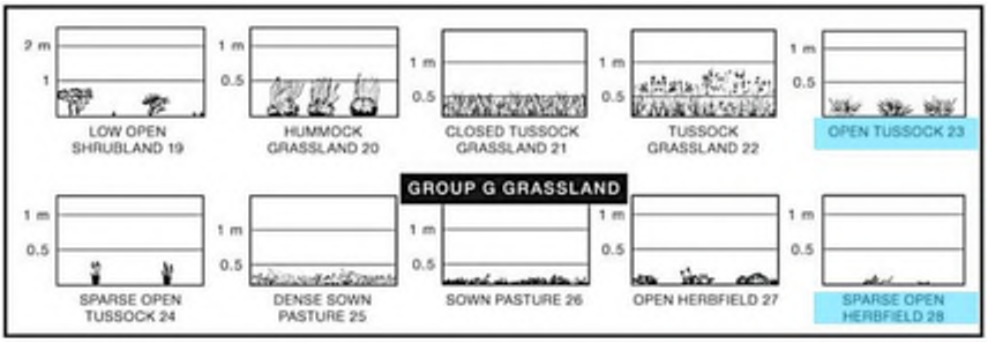


Figure 16: Vegetation classification Group G.

(3) ***Distance of site from the vegetation:***

The conservation covenant area is located to not less than 30m from the BESS arrangement, and to not less than 77m from the transformers.

(4) ***Effective slope:***

The conservation covenant area slope is 4 degrees upslope (see figure below).

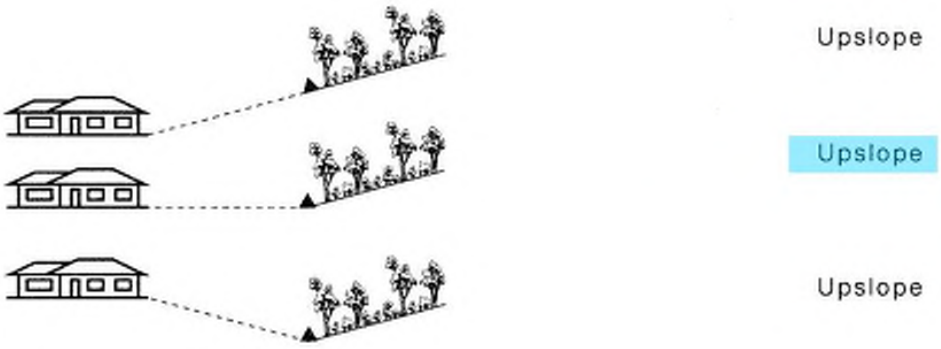


Figure 17: Vegetation slope.

(5) ***BAL Determination:***

In accordance with AS3959-2018, Section 2.2.6, the BAL for each one of the vegetation classifications is as follows:

- Group B Woodland: BAL-12.5.
- Group G Grassland: BAL-12.5.

Vegetation classification	Bushfire Attack Levels (BALs)				
	BAL—FZ	BAL—40	BAL—29	BAL—19	BAL—12.5
	Distance (m) of the site from the predominant vegetation class				
	All upslopes and flat land (0 degrees)				
A. Forest	<12	12–<16	16–<23	23–<32	32–<100
B. Woodland	<7	7–<10	10–<15	15–<22	22–<100
C. Shrubland	<10	10–<13	13–<19	19–<27	27–<100
D. Scrub	<7	7–<9	9–<13	13–<19	19–<100
E. Mallee/Mulga	<6	6–<8	8–<12	12–<17	17–<100
F. Rainforest	<5	5–<6	6–<9	9–<14	14–<100
G. Tussock moorland	<7	7–<9	9–<14	14–<20	20–<100

Figure 18: BAL for each vegetation group.

Therefore the bushfire hazard classification is BAL-12.5, where the risk of fire is due to embers attack and the heat flux exposure threshold is 12.5kW/m^2.

(6) ***Construction provisions:***

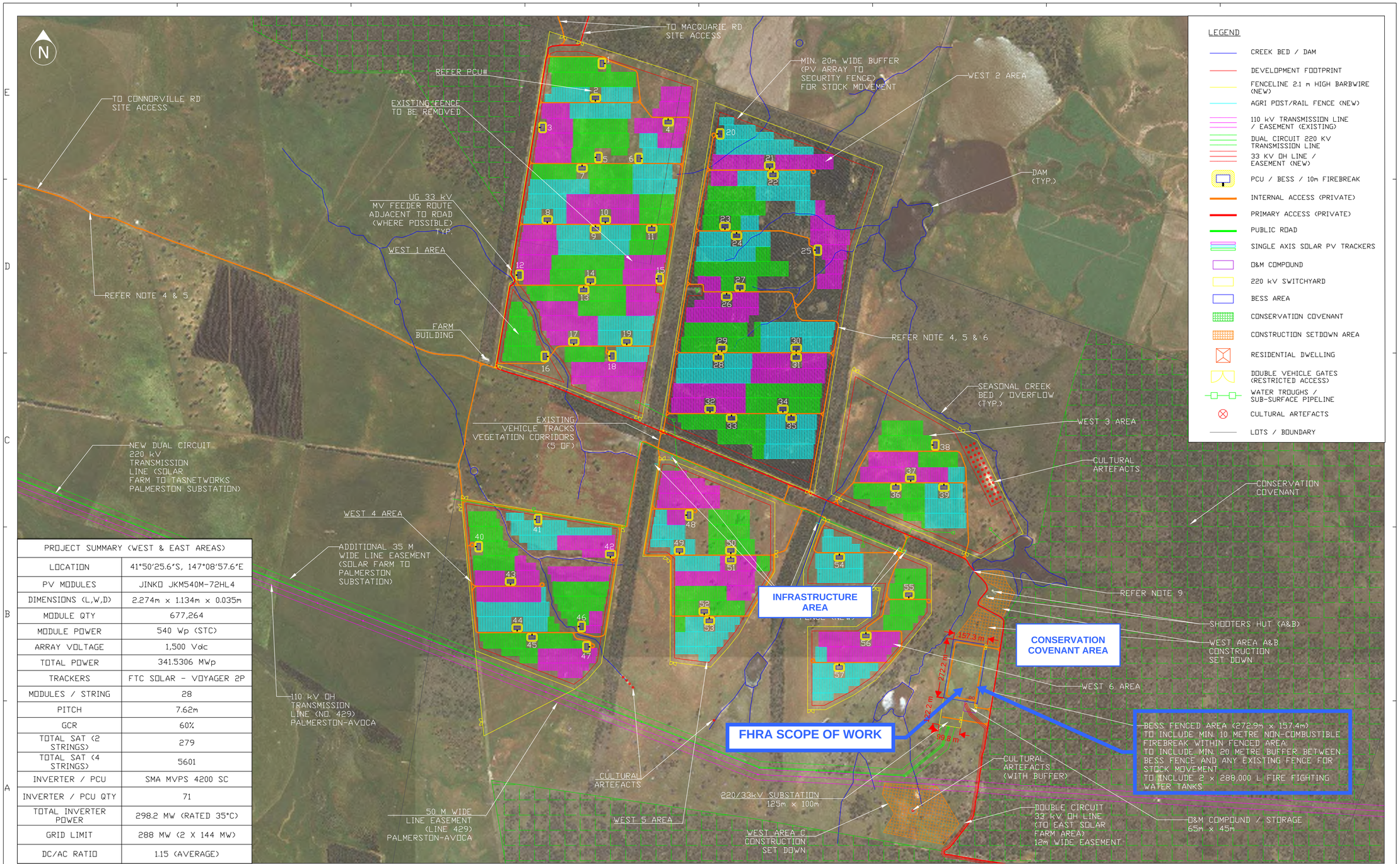
Given the above, AS3959-2018 provides the construction requirements to mitigate the BAL-12.5 fire risk hazards (refer to Appendix B).

However, it is recognized that at this stage, in accordance with the Appendix A, there are no buildings located at 30m from the conservation covenant area. The closest equipment are the BESS units, which are provided with metal enclosures, which are non-combustible in accordance with the AS3959 requirements.

NJMdesign
consulting engineers
Mechanical • Electrical • Fire Protection • Fire Safety • Hydraulics • Lifts • ESD

Appendix A. PROPOSED FACILITY LAYOUT

ENTURA IS A BUSINESS OF HYDRO-ELECTRIC CORPORATION ABN 48 072 377 158



PROJECT SUMMARY (WEST & EAST AREAS)	
LOCATION	41°50'25.6"S, 147°08'57.6"E
PV MODULES	JINKO JKM540M-72HL4
DIMENSIONS (L,W,D)	2.274m x 1.134m x 0.035m
MODULE QTY	677,264
MODULE POWER	540 Wp (STC)
ARRAY VOLTAGE	1,500 Vdc
TOTAL POWER	341.5306 MWp
TRACKERS	FTC SOLAR - VOYAGER 2P
MODULES / STRING	28
PITCH	7.62m
GCR	60%
TOTAL SAT (2 STRINGS)	279
TOTAL SAT (4 STRINGS)	5601
INVERTER / PCU	SMA MVPS 4200 SC
INVERTER / PCU QTY	71
TOTAL INVERTER POWER	298.2 MW (RATED 35°C)
GRID LIMIT	288 MW (2 X 144 MW)
DC/AC RATIO	1.15 (AVERAGE)

NOTES

1. NOT FOR CONSTRUCTION. CONCEPT DESIGN ONLY
2. PV TRACKER DESIGN BASED AS PER FTC SOLAR (SUNDAT-LAYOUT-REV_D)
3. DESIGN ADHERES TO BUSH FIRE MITIGATION PLAN (APPENDIX 2)
4. INTERNAL ACCESS ROADS (OTHER THAN PRIMARY ACCESS ROUTES) SHALL BE:
   - ALL WEATHER ACCESS
   - 4 METERS WIDE WITH;
   - PASSING BAYS PLACED EVERY 200 METERS TO PROVIDE TWO-WAY ACCESS.
   - PASSING BAYS TO BE 20 METERS LONG AND EXTEND THE WIDTH OF THE ROAD OUT TO 5.5 METERS IN THESE LOCATIONS.
   - PASSING BAYS TO EXTEND IN THE DIRECTION AWAY FROM SENSITIVE VEGETATION
5. GRADE OF INTERNAL ACCESS ROADS MUST NOT EXCEED A GRADE OF 1:6.5 (15.4%) AND THAT RATE OF CHANGE OF GRADE MUST NOT EXCEED 1:16 (6.25%) AS SPECIFIED IN AS 2890.1
6. CORNERS, BENDS AND TURNING CIRCLES ON INTERNAL ACCESS ROADS SHOULD CONSIDER AN ARTICULATED VEHICLE WITH A MINIMUM TURNING RADIUS NOT EXCEEDING 12.5 METERS (NOT LESS THAN) AS SPECIFIED IN AS2890.1
7. INTERSECTION TO MAIN PUBLIC ROAD SHALL CONSIDER A SWEPT PATH ANALYSIS USING LARGEST VEHICLE ACCESSING SITE OR A MIN. 10 METER WIDE ACCESS PLUS MIN. 10 METER WIDE EXIT SEPARATED BY MIN 1.5 METER MEDIAN AS PER AS2890.2 OFF STREET COMMERCIAL VEHICLE FACILITIES.
8. ROUTE FROM SITE PRIMARY ACCESS POINTS TO SUBSTATION TO CONSIDER ROAD WIDTH OF 5.5 METERS AND MIN. TURNING RADIUS ALONG ROUTE MUST NOT EXCEED 12.5 METRES (NOT LESS THAN) AS SPECIFIED IN AS2890.1
9. PRIMARY ACCESS ROUTES MUST BE CAPABLE TO TAKE THE LOAD OF AN OVERSIZE & OVERMASS (OSOM) VEHICLE, CLASS 1, CARRYING A MAX. LOAD OF 100 TONNES

NO PART OF THIS DRAWING MAY BE STORED IN A RETRIEVAL SYSTEM OR TRANSMITTED BY ANY MEANS WITHOUT THE PRIOR PERMISSION OF ENTURA

ALTERATIONS

DRAWN	JM
CHECKED	DS
DESIGNED	JM
CHECKED	DS
APPROVED	
DATE	10.03.23
CLIENT APP'D	
DATE	

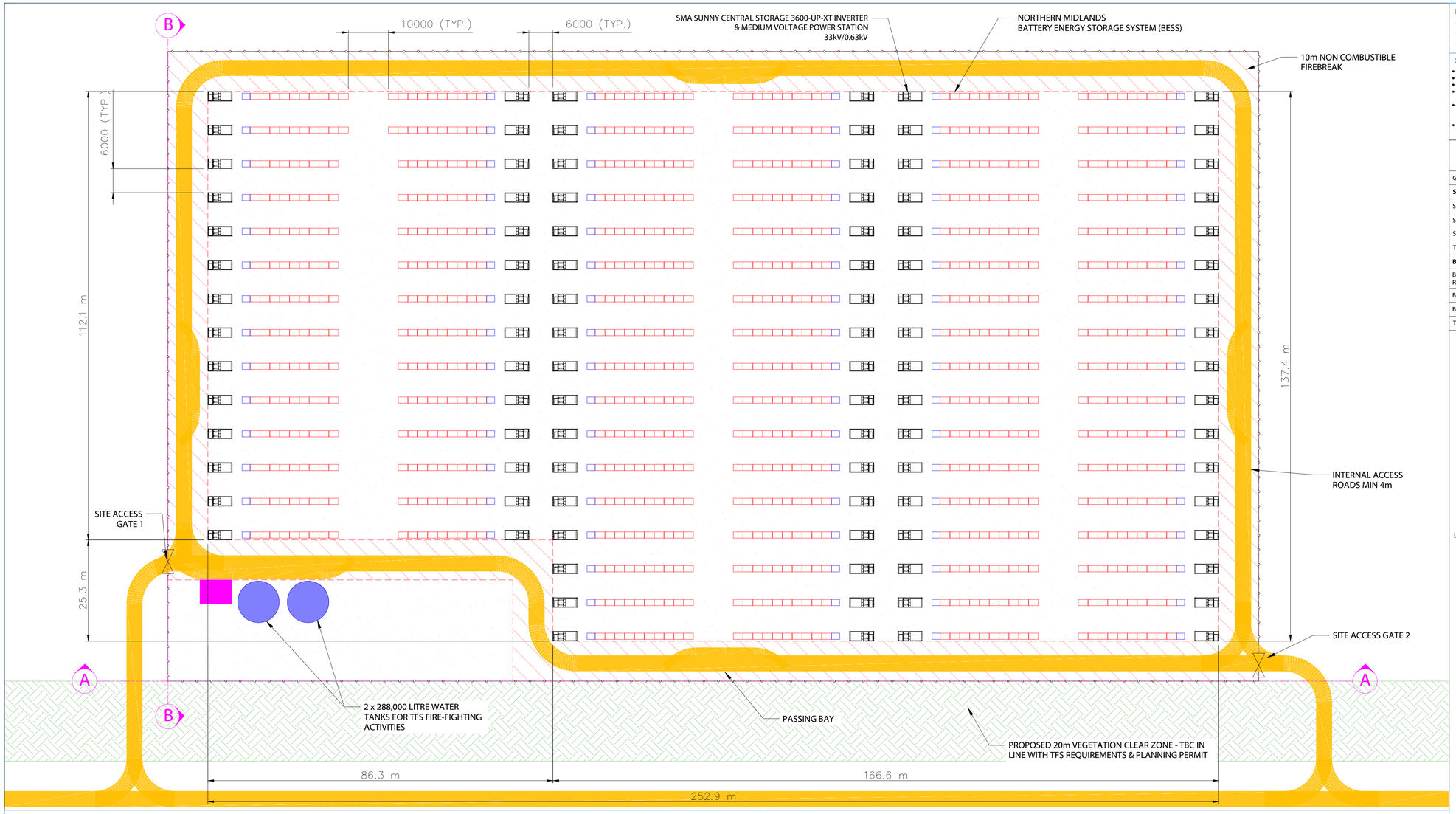
entura
WE OWN. WE OPERATE. WE CONSULT.
Level 25, 500 Collins St, Melbourne
Victoria, 3000, AUSTRALIA
Ph: 03 8628 9700 Fax: 03 8628 9764
www.entura.com.au
© COPYRIGHT 2022

CLIENT: CONNORVILLE ESTATES PTY LTD ENGAGEMENT No: E310322

TITLE: NORTHERN MIDLANDS SOLAR FARM
PV CONCEPT LAYOUT (FINAL)
WEST AREA

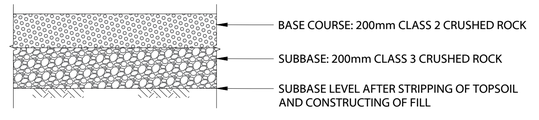
SCALE: 1:7500
SIZE: A1
DRG No: E3103220-EL-ENT-DWG-0003
SHT.
REV: 2

FILENAME: C:\USERS\MUMFORDJ\ONEDRIVE - HYDRO TASMANIA\DESKTOP\CONNORVILLE SF.DWG



AC-COUPLED BESS - PLAN VIEW

SCALE 1:500



ACCESS ROAD PAVEMENT/BENCH

SCALE: NTS

NOTES:

1. DESIGN IS PRELIMINARY ONLY. NOT FOR CONSTRUCTION.
2. CONCEPT DESIGN FOLLOWS THE CFA GUIDELINES FOR RENEWABLE ENERGY INSTALLATIONS (2022) (IN LIEU OF NO AVAILABLE TASMAINA FIRE SERVICE GUIDELINES) AND THE FIRE MANAGEMENT PLAN. CLIENT TO SEEK ENGAGEMENT WITH THE TASMANIA FIRE SERVICE & CLARIFY REQUIREMENTS FOR THE SOLAR FARM & BESS.
   - 2.1. OPERATION OF THE FACILITY TO ENSURE ADHERENCE TO FIRE DANGER PERIODS, HIGH FIRE DANGER AND TOTAL FIRE BAN DAYS.
3. BESS & PV SYSTEM AND ASSOCIATED EQUIPMENT SHALL HAVE SET-BACK FROM SECURITY FENCE OF MINIMUM 10M.
4. BATTERY ENERGY STORAGE SYSTEM MODULAR ENCLOSURES INDICATIVE. ADEQUATE VENTILATION OF THE BESS CONTAINER/STORAGE AREA IS ALLOWED BASED IN COMPLIANCE WITH AS/NZS 5139-2017 AND MANUFACTURER'S REQUIREMENTS.
5. FIRE BREAKS TO BE ESTABLISHED AND MAINTAINED IN LINE WITH THE FOLOWING:
   - 5.1. AROUND THE PERIMETRE OF THE FACILITY , COMMENCING FROM THE BOUNDARY OF THE FACILITY OR FROM THE VEGETATION SCREENING INSIDE THE PROPERTY BOUNDARY.
   - 5.2. AROUND THE PERIMETER OF CONTROL ROOMS, ELECTRICITY COMPOUNDS, SUBSTATIONS AND ALL OTHER BUILDINGS ON-SITE.
   - 5.3. 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.
   - 5.4. FIRE BREAK TO BE VEGETATION FREE AT ALL TIMES AND TO BE NON-COMBUSTIBLE, CONSTRUCTED USING EITHER MINERAL EARTH OR NON-COMBUSTIBLE MULCH SUCH AS CRUSHED ROCK.
   - 5.5. FIRE BREAK TO BE FREE OF OBSTRUCTIONS AT ALL TIMES. NO PLANT OR EQUIPMENT OF ANY KIND IS TO BE STORED IN FIRE BREAKS.
6. THERE IS TO BE NO LONG GRASS OR LEAF LITTER IN AREAS WHERE PLANT AND HEAVY EQUIPMENT WILL BE WORKING.
7. ACCESS ROADS TO ARE TO BE OF ALL-WEATHER CONSTRUCTION AND CAPABLE OF ACCOMMODATING A VEHICLE OF 15 TONNES. ACCESS ROADS TO COMPLY WITH ALL REQUIREMENTS AS DETAILED IN THE PLANNING PERMIT.
   - 7.1. CONSTRUCTED ROADS TO BE A MINIMUM OF 4M IN WIDTH WITH A 4M VERTICAL CLEARANCE FOR THE WIDTH OF THE FORMED ROADS.
   - 7.2. PASSING BAYS TO BE INCORPORATED EVERY 600M AND AT LEAST 20M IN LENGTH, WITH A MINIMUM OF 6M IN WIDTH. WHERE ROADS ARE LESS THAN 600M LONG, AT LEAST ONE PASSING BAY IS TO BE INCORPORATED.
   - 7.3. THE AVERAGE GRADE MUST 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 50M.
   - 7.4. DIPS IN THE ROAD MUST HAVE NO MORE THAN 1 IN 8 (12.5% OR 7.1°) ENTRY AND EXIT ANGLE.
   - 7.5. ACCESS ROADS AND HARDSTANDS TO BE KEPT CLEAR AT ALL TIMES.
   - 7.6. CORNERS, BENDS AND TURNING CIRCLES ON INTERNAL ACCESS ROADS SHOULD CONSIDER AN ARTICULATED VEHICLE WITH A MINIMUM TURNING RADIUS NOT EXCEEDING 12.5m (NOT BE LESS THAN) AS SPECIFIED IN AS 2890.1.
   - 7.7. A SWEPT PATH ANALYSIS IS TO BE COMPLETED AT A LATER PHASE OF THE DESIGN USING THE LARGEST VEHICLE ACCESSING THE SITE.
8. BLACK PVC COATED CHAIN WIRE SECURITY FENCING TO BE 2.2M WITH 300MM OF BARBED (OR EQUIVALENT WIRE) FOR A TOTAL MAXIMUM HEIGHT OF 2.5M, IN ACCORDANCE WITH PLANNING PERMIT.
   - 8.1. GATES TO BE INSTALLED AT APPROPRIATE INTERVALS TO ALLOW ACCESS FOR LANDSCAPING MAINTENANCE ACTIVITIES INSIDE THE SITE.
9. BATTERY ENERGY STORAGE SYSTEM TO BE IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION REQUIREMENTS AND RELEVANT AUSTRALIAN STANDARDS, INCLUDING REQUIREMENTS OF THE DANGEROUS GOODS ACT 1985.
10. BATTERY ENERGY STORAGE FACILITY AREAS TO BE KEPT FREE OF EXTRANEOUS MATERIALS AND COMBUSTIBLE MATERIALS OF ALL KINDS.
11. CONTAINERS/INFRASTRUCTURE FOR BATTERY INSTALLATIONS ARE TO BE PROVIDED WITH APPROPRIATE SPILL CONTAINMENT/BUNDING THAT INCLUDES PROVISION FOR FIRE WATER RUNOFF.
12. FOR THIS FACILITY, WITH A BATTERY ENERGY STORAGE SYSTEM AND WITH NO RETICULATED WATER AVAILABLE, THE FIRE PROTECTION SYSTEM MUST INCLUDE A FIRE WATER SUPPLY IN STATIC WATER STORAGE TANKS, WHERE THE STATIC WATER TANKS ARE TO:
   - 12.1. COMPLY WITH AS 2419.1. AUSTRALIAN STANDARD FIRE HYDRANT INSTALLATIONS.
   - 12.2. SHALL BE OF NOT LESS THAN 288,000L EFFECTIVE CAPACITY, 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.
   - 12.3. 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.
   - 12.4. 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.
   - 12.5. THE FIRE WATER SUPPLY MUST BE LOCATED AT VEHICLE ENTRANCES TOT HE FACILITY, AT LEAST 10m FROM ANY INFRASTRUCTURE (ELECTRICAL SUBSTATIONS, INVERTERS, BATTERY ENERGY STORAGE SYSTEMS, BUILDINGS).
   - 12.6. 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 THAN THE BATTERY ENERGY STORAGE SYSTEM.
   - 12.7. STATIC WATER TANK SHALL BE AN ABOVE-GROUND WATER TANK CONSTRUCTED OF CONCRETE OR STEEL.
   - 12.8. THE STATIC WATER STORAGE TANK(S) MUST BE CAPABLE OF BEING COMPLETELY REFILLED AUTOMATICALLY OR MANUALLY WITHIN 24 HOURS.
   - 12.9. HARDSTAND AND ACCESS ROAD TO BE KEPT CLEAR AT ALL TIMES.
   - 12.10. THE HARD-SUCTION POINT MUST BE PROVIDED, WITH A 150mm FULL BORE ISOLATION VALVE EQUIPPED WITH A STORZ CONNECTION, SIZED TO COMPLY WITH THE REQUIRED SUCTION HYDRAULIC PERFORMANCE. ADAPTERS THAT MAY BE REQUIRED TO MATCH THE CONNECTION ARE 125mm, 100mm, 90mm, 75mm, 65mm STORZ TREE ADAPTERS WITH A MATCHING BLANK END CAP TO BE PROVIDED.
   - 12.11. THE HARD SUCTION POINT MUST BE POSITIONED WITHIN FOUR (4) METRES TO A HARDSTAND AREA AND PROVIDE A CLEAR ACCESS FOR EMERGENCY SERVICES PERSONNEL.
   - 12.12. ALL-WEATHER ROAD ACCESS AND HARDSTAND SHALL BE PROVIDED TO THE HARD-SUCTION POINT. THE HARDSTAND SHALL BE MAINTAINED TO A MINIMUM OF 15 TONNES GVM, 8 METRES LONG AND 6 METRES WIDE OR TO THE SATISFACTION OF THE RELEVANT FIRE AUTHORITY.
   - 12.13. THE HARD-SUCTION POINT MUST BE PROTECTED FROM MECHANICAL DAMAGE WHERE NECESSARY.
   - 12.14. AN EXTERNAL WATER LEVEL INDICATOR MUST BE PROVIDED TO THE TANK AND BE VISIVLE FROM THE HARDSTAND AREA. CAR PARKING AREA IS LOCATED WITHIN PROXIMITY TO THE ENTRANCES TO THE SITE WITH A TOTAL CAPACITY OF SEVEN (7) VEHICLES AND IN ACCORDANCE WITH THE DESIGN GUIDELINES OF PLANNING PERMIT CLAUSE 52.06.
13. PAVEMENT DESIGN INDICATIVE ONLY.
14. PLEASE REFER TO 10390815-AUME-TN-01-A AU PE TTECHNICAL NOTE (NORTHERN MIDLANDS BESS).

REFERENCE DRAWINGS:

GENERAL NOTES:

- ALL DIMENSIONS IN MILLIMETERS (UNLESS NOTED)
- DRAWN TO AS1100
- DO NOT SCALE FROM THIS DRAWING
- ALWAYS CHECK DIMENSIONS ON SITE BEFORE USING ANY INFORMATION CONTAINED WITHIN THIS DRAWING.
- ALL DIMENSIONS SHOWN ARE INDICATIVE ONLY AND NEED TO VERIFIED ON-SITE. DNV ACCEPTS NO LIABILITY FROM ERRORS OR OMISSIONS SHOWN ON THIS DRAWING.
- CHECK THIS DRAWING IN THE LATEST VERSION. DO NOT REPRODUCE ALL OR PART OF THIS DRAWING WITHOUT PRIOR CONSENT.

HYBRID SOLAR FARM & AC-COUPLED BESS SPECIFICATIONS

GRID TRANSFER LIMIT	2 x 144.00 MWac
SOLAR FARM (COMBINED 2 x HYBRID CONNECTION POINTS)	
SOLAR PV DC CAPACITY	341.53 MWp
SOLAR PV AC CAPACITY	298.2 MVA
SOLAR INVERTER & QTY	SMA SC4200-UP x 71
TRANSFORMER & QTY	4.4 MVA @ 25°C (0.63/33kV) x 71
BESS (COMBINED 2 x HYBRID CONNECTION POINTS)	
BESS DC ENERGY CAPACITY @ RATED POWER	Up to 691.7 MWh [BOL]
BESS NAME / RATED POWER	POWIN CENTIPEDE STACK750E 354.9 MW
BATTERY INVERTER & QTY	SMA SC3600-UP-XT x 96
TRANSFORMER & QUANTITY	3.62 MVA @ 25°C (0.63/33kV) x 96

LEGEND:

- SITE SECURITY FENCING
- 10m FIRE BREAK OF NON-COMBUSTIBLE MULCH (CLEAR OF VEGETATION, INCLUDING GRASS)
- 8 x 6m HARDSTAND AREA FOR FIRE FIGHTING
- SECURITY GATE
- VEGETATION CLEAR ZONE
- 288,000L STATIC WATER TANK (10.4m ⌀)
- INVERTER
- BATTERY MODULE
- COMMS AND CONTROL CABINET
- ACCESS ROAD (min 4m)
- SURFACE CRUSHED ROCK / BLUE METAL TBD BASED ON CIVIL DESIGN
- CLASS 2 CRUSHED ROCK
- CLASS 3 CRUSHED ROCK

0 5 10 20 30
Full Size 1:500 ; Half Reduction 1:1000
SCALE (m)

PRELIMINARY

Rev	Date	Comments	Dwn	Chkd
B	20/04/23	PRELIMINARY ISSUE	LW	RC
A	07/03/23	PRELIMINARY ISSUE	GC/PD	LW

CLIENT: ROBERT LUXMOORE PROJECT MANAGEMENT

CLIENT LOGO: ROBERT LUXMOORE Project Management

THIRD ANGLE PROJECTION

DESIGNED BY: L.WALKER | CHECKED BY: LW
DRAWN BY: GC/PD | APPROVED BY: LB

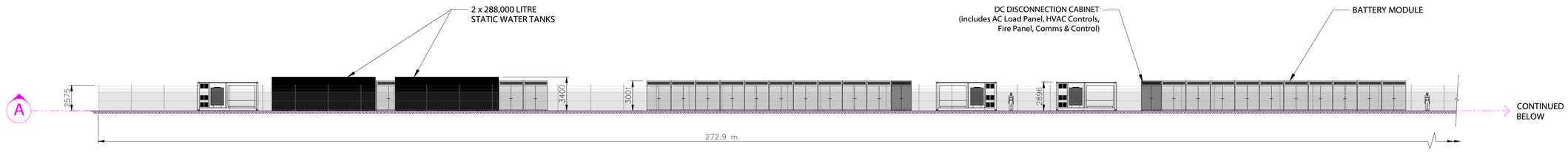
metric

DNV
T: +613 8615 1515
W: www.dnv.com.au
ABN: 14 154 635 319

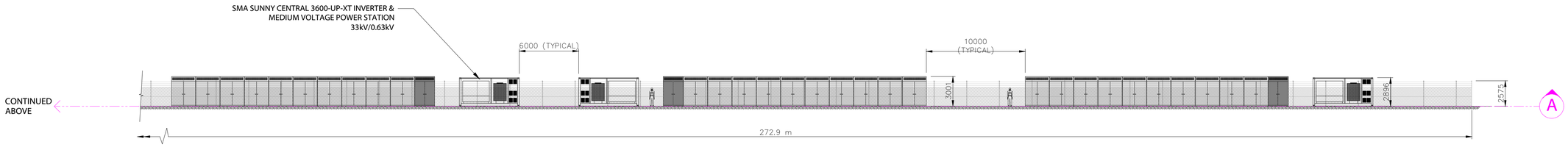
PROJECT: NORTHERN MIDLANDS SOLAR FARM & BESS
TASMANIA, AUSTRALIA

TITLE: AC-COUPLED BESS GENERAL ARRANGEMENT

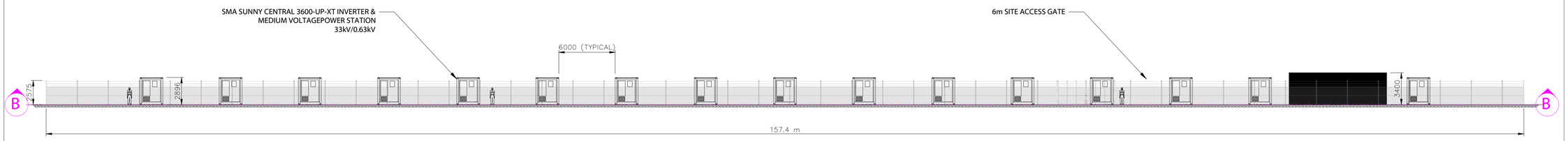
Dwg No: 10390815-CI-0001-01 | Scale:1:500 | Rev: B | A1



AC-COUPLED BESS - FRONT ELEVATION (LHS)
SCALE 1:200



AC-COUPLED BESS - FRONT ELEVATION (RHS)
SCALE 1:200



AC-COUPLED BESS - SIDE ELEVATION
SCALE 1:200

0 2 4 8 12
Full Size 1:200 ; Half Reduction 1:400
SCALE (m)

REFERENCE DRAWINGS:

GENERAL NOTES:
- DRAWN TO AS1100
- DO NOT SCALE FROM THIS DRAWING
- ALWAYS CHECK DIMENSIONS ON SITE BEFORE USING ANY INFORMATION CONTAINED WITHIN THIS DRAWING.
- ALL DIMENSIONS SHOWN ARE INDICATIVE ONLY AND NEED TO VERIFIED ON-SITE, DNV ACCEPTS NO LIABILITY FROM ERRORS OR OMISSIONS SHOWN ON THIS DRAWING.
- CHECK THIS DRAWING IN THE LATEST VERSION. DO NOT REPRODUCE ALL OR PART OF THIS DRAWING WITHOUT PRIOR CONSENT.

NOTES:
1. ALL EQUIPMENT TO BE INSTALLED AS PER ALL RELEVANT MANUFACTURER REQUIREMENTS.
2. ALL DIMENSIONS ARE IN MILLIMETERS (mm) UNLESS OTHERWISE SPECIFIED.
3. REFER DWG. 10390815-CI-0001-01 AC-COUPLED BESS GENERAL ARRANGEMENT.
4. PLEASE REFER TO 10390815-AUME-TN-01-A AU PE TTECHNICAL NOTE (NORTHERN MIDLANDS BESS).

PRELIMINARY

Rev	Date	Comments	Dwn	Chkd
B	20/04/23	PRELIMINARY ISSUE	LW	RC
A	07/03/23	PRELIMINARY ISSUE	GC/PD	LW

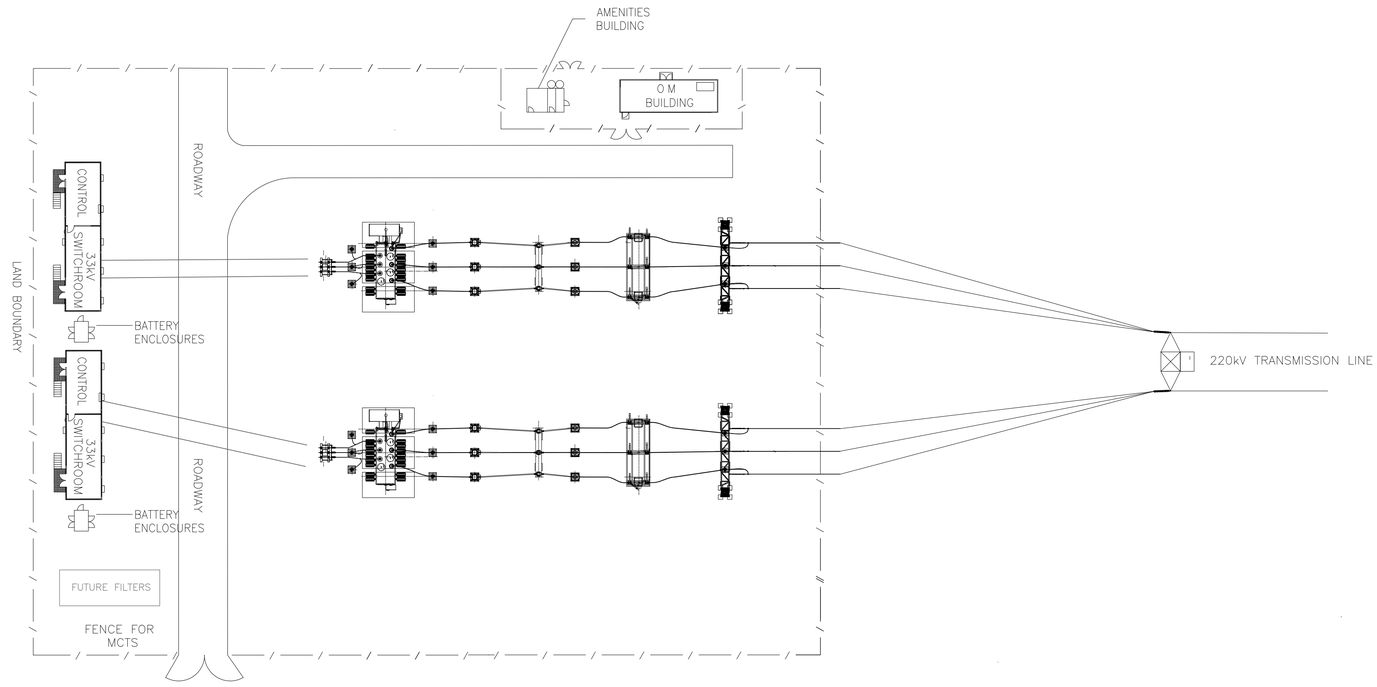
CLIENT: ROBERT LUXMOORE PROJECT MANAGEMENT
CLIENT LOGO:
DESIGNED BY: LW CHECKED BY: LW
DRAWN BY: GC/PD APPROVED BY: RC

THIRD ANGLE PROJECTION
SI metric

DNV
T: +613 8615 1515
W: www.dnv.com.au
ABN: 14 154 635 319

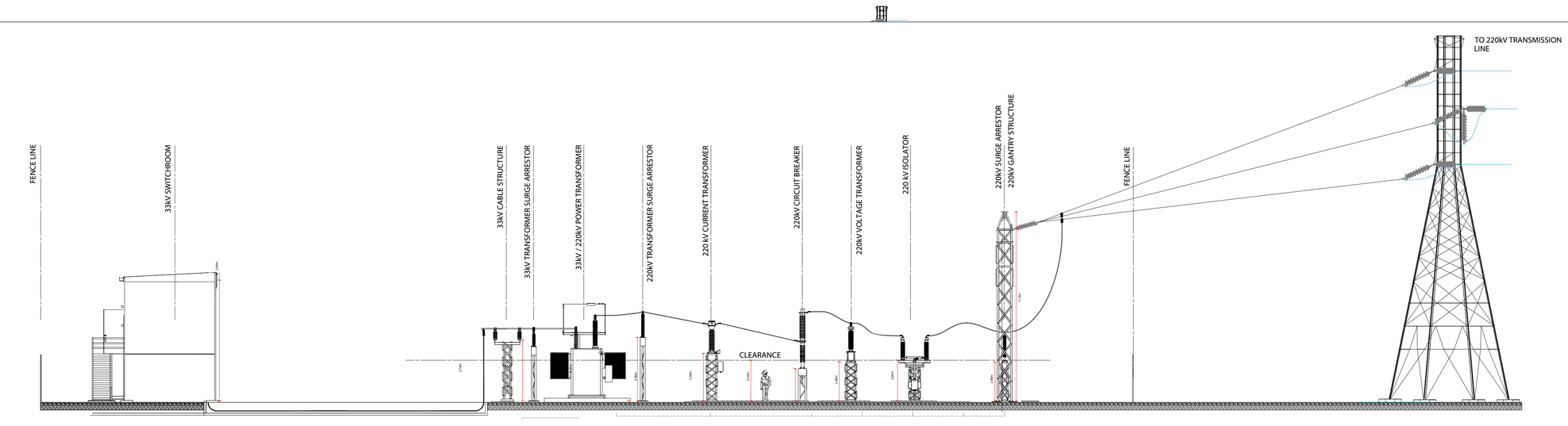
PROJECT: NORTHERN MIDLANDS SOLAR FARM & BESS
TASMANIA, AUSTRALIA
TITLE: AC-COUPLED BESS ELEVATIONS
FRONT AND SIDE ELEVATIONS
Dwg No: 10390815-ME-0001-01 Scale: 1:200 Rev: B A1

© DNV Australia Pty. Ltd.



NORTHERN MIDLANDS SOLAR FARM & BESS 220kV SWITCHYARD - PLAN VIEW
SCALE 1:500

0 5 10 20 30
Full Size 1:500 ; Half Reduction 1:1000
SCALE (m)



NORTHERN MIDLANDS SOLAR FARM & BESS 220kV SWITCHYARD - FRONT ELEVATION
SCALE 1:200

0 2 4 8 12
Full Size 1:200 ; Half Reduction 1:400
SCALE (m)

REFERENCE DRAWINGS:

GENERAL NOTES:

- DRAWN TO AS1100
- DO NOT SCALE FROM THIS DRAWING
- ALWAYS CHECK DIMENSIONS ON SITE BEFORE USING ANY INFORMATION CONTAINED WITHIN THIS DRAWING.
- ALL DIMENSIONS SHOWN ARE INDICATIVE ONLY AND NEED TO VERIFIED ON-SITE, DNV ACCEPTS NO LIABILITY FROM ERRORS OR OMISSIONS SHOWN ON THIS DRAWING.
- CHECK THIS DRAWING IN THE LATEST VERSION. DO NOT REPRODUCE ALL OR PART OF THIS DRAWING WITHOUT PRIOR CONSENT.

NOTES:

1. CONCEPT DESIGN ONLY.TYPICAL SWITCHYARD SHOWN.
2. INSTALLATION TO COMPLY WITH AS 2067. CLEARANCES SHOWN INDICATIVE AS PART OF THE DEVELOPMENT APPROVAL PACKAGE.
3. ALL EQUIPMENT TO BE INSTALLED AS PER ALL RELEVANT MANUFACTURER REQUIREMENTS.
4. ALL DIMENSIONS ARE IN METERS (M) UNLESS OTHERWISE SPECIFIED.
5. THE 33 kV VOLTAGE TRANSFORMER WILL BE IN THE 33 kV SWITCHROOM.

PRELIMINARY

Rev	Date	Comments	Dwn	Chkd
B	19/04/23	UPDATED ISSUE	RE	CM
A	07/03/23	PRELIMINARY ISSUE	GC/PD	RE

CLIENT: ROBERT LUXMOORE PROJECT MANAGEMENT

CLIENT LOGO: ROBERT LUXMOORE Project Management

DESIGNED BY: RE CHECKED BY: CM

DRAWN BY: JH/PD APPROVED BY: RE

THIRD ANGLE PROJECTION

DNV

T: +613 8615 1515
W: www.dnv.com.au
ABN: 14 154 635 319

PROJECT: NORTHERN MIDLANDS SOLAR FARM & BESS
TASMANIA, AUSTRALIA
TITLE: 220kV SWITCHYARD
PLAN AND FRONT ELEVATION
Dwg No: 10390815-ME-0004-01 Scale: AS SHOWN Rev: B A1

© DNV Australia Pty. Ltd.

NJMdesign
consulting engineers
Mechanical • Electrical • Fire Protection • Fire Safety • Hydraulics • Lifts • ESD

Appendix B. AS3959: CONSTRUCTION REQUIREMENTS

BAL – AS3959 – Construction Requirements

	BAL – LOW	BAL – 12.5	BAL – 19	BAL – 29	BAL – 40	BAL – FZ
SUBFLOOR SUPPORTS	No special construction requirements	No special construction requirements	No special construction requirements	Enclosure by external wall or by steel, bronze or aluminium mesh, non-combustible supports where the subfloor is unenclosed, naturally fire resistant timber stumps or posts on 75mm metal stirrups	If enclosed by external wall refer below 'External Walls' section in table or non-combustible subfloor supports or tested for bushfire resistance to AS1530.8.1	Subfloor supports – enclosure by external wall or non-combustible with an FRL of 30/-/- or be tested for bushfire resistance to AS1530.8.2
FLOORS	No special construction requirements	No special construction requirements	No special construction requirements	Concrete slab on ground, enclosure by external wall, metal mesh as above or flooring less than 400mm above ground level to be non-combustible, naturally fire resistant timber or protected on the underside with sarking or mineral wool insulation	Concrete slab on ground, enclosed by external wall or protection of underside with non-combustible material such as fibre cement sheet or be non-combustible or be tested for bushfire resistance to AS1530.8.1	Concrete slab on ground or enclosure by external wall or an FRL of 30/30/30 or protection of underside with 30 minute incipient spread of fire system or to be tested for bushfire resistance to AS1530.8.2
EXTERNAL WALLS	No special construction requirements	As for BAL–19	External walls – Parts less than 400m above ground or decks etc to be of non-combustible material, 6mm fibre cement clad or bushfire resistant/naturally fire resistant timber	Non-combustible material (masonry, brick veneer, mud brick, aerated concrete, concrete), timber framed, steel framed walls sarked on the outside and clad with 6mm fibre content sheeting or steel sheeting or bushfire resisting timber	Non-combustible material (masonry, brick veneer, mud brick, aerated concrete, concrete), timber framed, steel framed walls sarked on the outside and clad with 9mm fibre content sheeting or steel sheeting or be tested for bushfire resistance to AS1530.8.1	Non-combustible material (masonry, brick veneer, mud brick, aerated concrete, concrete) with minimum thickness of 90mm or an FRL of -/30/30 when tested from outside or be tested for bushfire resistance to AS1530.8.2
EXTERNAL WINDOWS	No special construction requirements	As for BAL-19 except that 4mm Grade A safety glass can be used in place of 5 mm toughened glass	Protected by bushfire shutter, completely screened with steel, bronze or aluminium mesh or 5mm toughened glass or glass blocks within 400mm of ground, deck etc. Openable portion metal screened with frame of metal or metal reinforced PVC-U or bushfire resisting timber	Protected by bushfire shutter, completely screened with steel, bronze or aluminium mesh or 5mm toughened glass or glass with openable portion metal screened and frame of metal or metal reinforced PVC-U or bushfire resisting timber and portion within 400mm of ground level screened.	Protected by bushfire shutter or 5mm toughened glass. Openable portion screened with steel or bronze mesh.	Protected by bushfire shutter or FRL of -/30/- and openable portion screened with steel or bronze mesh or be tested for bushfire resistance to AS1530.8.2

	BAL – LOW	BAL – 12.5	BAL – 19	BAL – 29	BAL – 40	BAL – FZ
EXTERNAL DOORS	No special construction requirements	As for BAL-19 except that door framing can be naturally fire resistant (high density) timber	Protected by bushfire shutter, or screened with steel bronze or aluminium mesh or glazed with 5mm toughened glass, non-combustible or 35mm solid timber for 400mm above threshold, metal or bushfire resisting timber framed for 400mm above ground, decking, etc tight fitting with weather strips at base.	Protected by bushfire shutter, or screened with steel bronze or aluminium mesh or non-combustible or 35mm solid timber for 400mm above threshold. Metal or bushfire resisting timber framed tight fitting with weather strips at base.	Protected by bushfire shutter, non-combustible or 35mm solid timber, metal framed tight-fitting with weather strips at base	Protected by bushfire shutter or tight-fitting with weather strips at base and an FRL or -/30/-
ROOFS	No special construction requirements	As for BAL-19	Non-combustible covering. Roof/wall junction sealed. Openings fitted with non-combustible ember guards. Roof to be fully sarked.	Non-combustible covering. Roof/wall junction sealed. Openings fitted with non-combustible ember guards. Roof to be fully sarked.	Non-combustible covering. Roof/wall junction sealed. Openings fitter with non-combustible ember guards. Roof to be fully sarked and no roof mounted evaporative coolers	Roof with FRL of 30/30/30 or tested for bushfire resistance to AS1530.8.2. Roof/wall junction sealed. Openings fitted with non-combustible ember guards. No roof mounted evaporative coolers
VERANDAHS DECKS ETC	No special construction requirements	As for BAL-19	Enclosed sub-floor space – no special required for materials except within 400mm of gound. No special requirements for supports or framing. Decking to be non combustible or bushfire resistant within 300mm horizontally and 400mm vertically from a glazed element.	Enclosed sub –floor space or non-combustible or bushfire resistant timber supports. Decking to be non-combustible	Enclosed sub-floor space or non-combustible supports. Decking to be non-combustible	Enclosed sub-floor space or non-combustible supports. Decking to have no gaps and be non-combustible

A

Dwelling Assessment

DWELLING ASSESSMENT TABLE (within five (5) kilometres of the Project)

I.D	STREET NAME & COORDINATES	ELEVATION	DISTANCE TO PROJECT	VISUAL ASSESSMENT (based on an aerial analysis and zone of influence (ZVI) study)		Dwelling Visual Impact Rating: Distance	Views	Direction	Visibility	Scale	Contrast	Duration	Mitigation	VISUAL IMPACT RATING (without mitigation)	MITIGATION MEASURES (refer to Section 11)	VISUAL IMPACT RATING (with mitigation)
11	Lake River Road 41°48'51.11"S 147° 4'55.26"E	170 m	4.30 km	Based on topography alone, the Project will be partially visible (between 25% - 50%). However, vegetation surrounding the dwelling will screen views of the Solar Farm and will not be visible from the dwelling. The proposed transmission line will have a low visual impact as it is in the same alignment as the existing transmission line which forms part of the existing landscape character.	**H** **M** **L** **N**									**LOW**	N/A	**N/A**
12	Connorville Road 41°48'50.11"S 147° 5'32.32"E	171 m	3.50 km	Based on topography alone, the Project will be partially visible (between 25% - 50%). However, vegetation surrounding the dwelling will screen views of the Solar Farm and will not be visible from the dwelling.	**H** **M** **L** **N**									**NIL**	N/A	**N/A**
14	Lake River Road 41°49'26.00"S 147° 4'49.52"E	174 m	4.30 km	Based on topography alone, the Project will be partially visible (between 25% - 50%). However, vegetation surrounding the dwelling will screen views of the Solar Farm and will not be visible from the dwelling. The proposed transmission line will have a low visual impact as it is in the same alignment as the existing transmission line which forms part of the existing landscape character.	**H** **M** **L** **N**									**LOW**	N/A	**N/A**
15	Connorville Road 41°49'29.09"S 147° 6'7.32"E	173 m	2.50 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). However, vegetation surrounding the dwelling will screen views of the Solar Farm and will not be visible from the dwelling. The proposed transmission line will have a low visual impact as it is in the same alignment as the existing transmission line which forms part of the existing landscape character.	**H** **M** **L** **N**									**LOW**	N/A	**N/A**
16	Connorville Road 41°49'18.51"S 147° 6'6.56"E	172 m	2.60 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). However, the Project will not be visible as vegetation between the receptor and the Project will screen views. The proposed transmission line will have a low visual impact as it is in the same alignment as the existing transmission line which forms part of the existing landscape character.	**H** **M** **L** **N**									**LOW**	N/A	**N/A**
17	Connorville Road 41°49'16.10"S 147° 6'8.75"E	172 m	2.60 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). However, the Project will not be visible as vegetation between the receptor and the Project will screen views. The proposed transmission line will have a low visual impact as it is in the same alignment as the existing transmission line which forms part of the existing landscape character.	**H** **M** **L** **N**									**LOW**	N/A	**N/A**
18	Connorville Road 41°50'27.01"S 147° 6'41.28"E	189 m	1.80 km	Based on topography alone, the Project will be partially visible (between 25% - 50%). However, the Project will not be visible as vegetation between the receptor and the Project will screen views. The proposed transmission line will have a low visual impact as it is in the same alignment as the existing transmission line which forms part of the existing landscape character.	**H** **M** **L** **N**									**LOW**	N/A	**N/A**

Appendix A - Dwelling Assessment

DWELLING ASSESSMENT TABLE (within five (5) kilometres of the Project)

I.D	STREET NAME & COORDINATES	ELEVATION	DISTANCE TO PROJECT	VISUAL ASSESSMENT (based on an aerial analysis and zone of influence (ZVI) study)		Dwelling Visual Impact Rating: Distance	Views	Direction	Visibility	Scale	Contrast	Duration	Mitigation	VISUAL IMPACT RATING (without mitigation)	MITIGATION MEASURES (refer to Section 11)	VISUAL IMPACT RATING (with mitigation)
22	Connorville Road 41°51'41.27"S 147° 6'54.39"E	205 m	3.20 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). However, the Project will not be visible as vegetation between the receptor and the Project will screen views.	**H** **M** **L** **N**								●	**NIL**	N/A	**N/A**
25	Macquarie Road 41°47'32.35"S 147° 6'27.56"E	162 m	3.20 km	As shown on the ZVI, the Solar Farm will not be visible from this dwelling.	**H** **M** **L** **N**								●	**NIL**	N/A	**N/A**
26	Macquarie Road 41°47'25.22"S 147° 6'26.33"E	158 m	3.30 km	As shown on the ZVI, the Solar Farm will not be visible from this dwelling.	**H** **M** **L** **N**								●	**NIL**	N/A	**N/A**
27	Macquarie Road 41°47'15.32"S 147° 6'45.40"E	157 m	3.20 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). The Project is located to the southeast of the St Mark's Anglican Church, with the church orientated to the south. Due to the distance and vegetation between the receptor and the Project, the Project will not be visible from this location.	**H** **M** **L** **N**								●	**NIL**	N/A	**N/A**
28	Delmont Road 41°46'24.09"S 147° 6'51.64"E	152 m	4.50 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). The Project is located to the southeast of the dwelling, with the dwelling orientated to the northeast. The Project will not be visible due to the distance and vegetation between the receptor and the Project.	**H** **M** **L** **N**								●	**NIL**	N/A	**N/A**
35	Macquarie Settlement Road 41°47'18.00"S 147°11'11.77"E	153 m	4.00 km	As shown on the ZVI, the Solar Farm will not be visible from this dwelling.	**H** **M** **L** **N**								●	**NIL**	N/A	**N/A**
36	Macquarie Settlement Road 41°47'22.42"S 147°11'3.79"E	155 m	3.80 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). The Project is located to the southwest of the dwelling, with the dwelling orientated to the northeast. The Project will not be visible due to the distance and the vegetation between the receptor and the Project.	**H** **M** **L** **N**								●	**NIL**	N/A	**N/A**

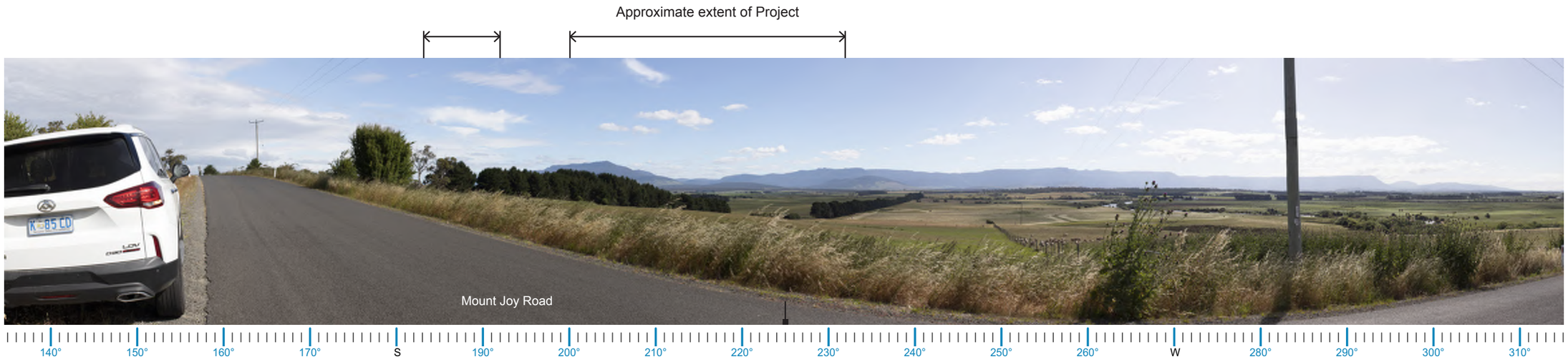
DWELLING ASSESSMENT TABLE (within five (5) kilometres of the Project)

I.D	STREET NAME & COORDINATES	ELEVATION	DISTANCE TO PROJECT	VISUAL ASSESSMENT (based on an aerial analysis and zone of influence (ZVI) study)		Dwelling Visual Impact Rating: Distance	Views	Direction	Visibility	Scale	Contrast	Duration	Mitigation	VISUAL IMPACT RATING (without mitigation)	MITIGATION MEASURES (refer to Section 11)	VISUAL IMPACT RATING (with mitigation)
37	Macquarie Road 41°48'19.00"S 147° 9'22.66"E	184 m	1.10 km	Based on topography alone, the Project will be partially visible (between 50% - 75%). However, the Project will not be visible as vegetation between the receptor and the Project will screen views.	H M L N								●	**NIL**	N/A	**N/A**
38	Macquarie Road 41°48'30.15"S 147°10'48.46"E	157 m	2.20 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). However, the Project will not be visible due to the distance and the vegetation between the receptor and the Project will screen views.	H M L N								●	**NIL**	N/A	**N/A**
39	Macquarie Settlement Road 41°47'58.40"S 147°11'40.78"E	161 m	3.80 km	Based on topography alone, the Project will be partially visible (between 25% - 50%). However, the Project will not be visible due to the distance and the vegetation between the receptor and the Project will screen views.	H M L N								●	**NIL**	N/A	**N/A**
41	Macquarie Road 41°51'17.28"S 147°14'33.18"E	164 m	3.40 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). However, the Project will not be visible due to the distance and the vegetation between the receptor and the Project will screen views.	H M L N								●	**NIL**	N/A	**N/A**
42	Barton Road 41°51'10.37"S 147°14'50.17"E	164 m	3.80 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). However, the Project will not be visible due to the distance and the vegetation between the receptor and the Project will screen views.	H M L N								●	**NIL**	N/A	**N/A**
43	Macquarie Road 41°51'17.98"S 147°14'13.09"E	165 m	2.90 km	Based on topography alone, the Project will be very partially visible (between 1% - 25%). However, the Project will not be visible due to the distance and the vegetation between the receptor and the Project will screen views.	H M L N								●	**NIL**	N/A	**N/A**
44	Rothbury Road 41°51'41.46"S 147°13'58.02"E	170 m	2.40 km	As shown on the ZVI, the Solar Farm will not be visible from this dwelling.	H M L N								●	**NIL**	N/A	**N/A**

B

Viewpoint Analysis

VP01 Mount Joy Road, Cressy



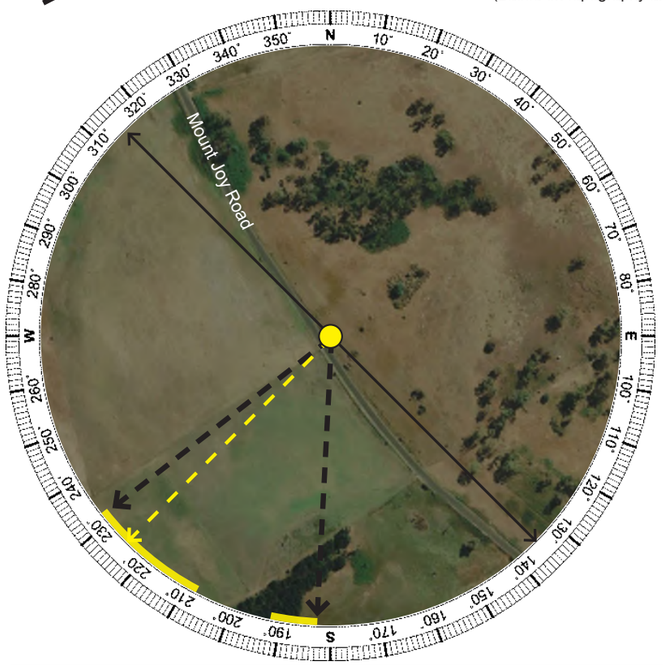
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP01

Viewpoint Summary:	
Location:	Elevation:
Mount Joy Road, Cressy	184 m
Coordinates:	Distance to Project:
41°46'0.60"S 147°12'46.27"E	7.28 km
Viewing Direction:	Landscape Character Zone:
Southwest	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
LOW	
Visual Impact:	
MODERATE	

Existing Landscape Character Description:

This viewpoint was taken along Mount Joy Road looking southwest towards the Great Western Tiers (GWT) scenic protection area and the Project. The terrain is characterised as gently undulating, with relatively flat pastures between the viewpoint and the GWT. Views to the southwest are open, with select views filtered by dense buffer planting aligning pastures. Views to the south are contained by the terrain. Macquarie River is visible to the west, with the land in this region primarily utilised for agricultural practices including irrigated pastures, grazing and cropping.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

Potential Visual Impact:

Due to the elevated position of the viewpoint, there is the potential to have filtered views of the solar farm and associated infrastructure. The proportion of the view affected however is low as the Project will be indiscernible due to the distance of the viewpoint, with majority of the views filtered by established vegetation.

The visual magnitude is **LOW** resulting in a **MODERATE** visual impact rating.

Aerial Image Source: Google Earth (02/2021)

VP02 Barton Road, Campbell Town

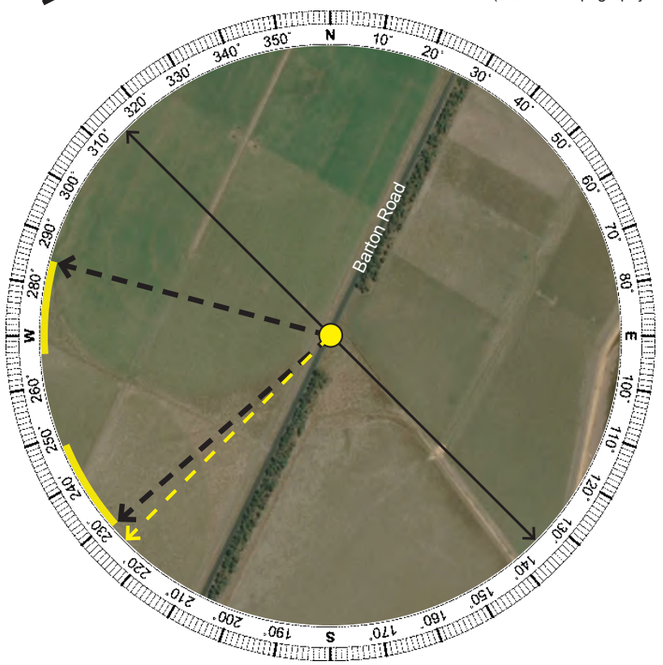
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP02

Viewpoint Summary:	
Location:	Elevation:
Barton Road, Campbell Town	160 m
Coordinates:	Distance to Project:
41°50'1.86"S 147°15'18.49"E	5.25 km
Viewing Direction:	Landscape Character Zone:
Southwest	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Existing Landscape Character Description:

This viewpoint was taken along Barton Road looking southwest towards the Great Western Tiers (GWT) scenic protection area and the Project. The terrain is characterised as relatively flat with the surrounding land being utilised for agricultural practices including grazing and cropping. Views of the GWT are expansive due to the terrain. Views towards the Project are open, with select views filtered by vegetation in the midground of this viewpoint. Existing electrical infrastructure forms part of the landscape character.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

Potential Visual Impact:

From this location, the Project will not be visible due to the terrain and vegetation limiting clear views.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

Aerial Image Source: Google Earth (02/2021)

VP03 Macquarie Road, Campbell Town

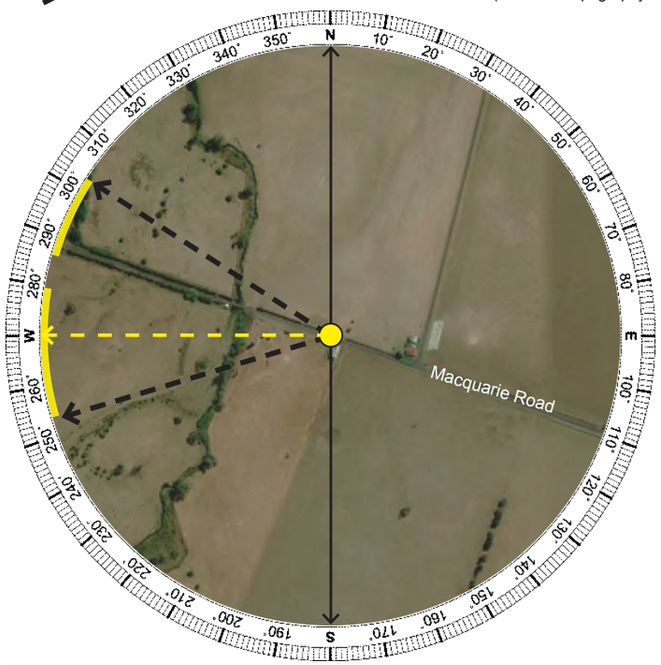
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP03

Viewpoint Summary:	
Location:	Elevation:
Macquarie Road, Campbell Town	167 m
Coordinates:	Distance to Project:
41°51'35.91"S 147°14'43.70"E	3.50 km
Viewing Direction:	Landscape Character Zone:
West	LCZ04 - Farming & Pastures
Visual Sensitivity:	
MODERATE	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

The viewpoint was taken near Barton Fire Station along Macquarie Road looking west towards the Great Western Tiers (GWT) scenic protection area and the Project. A small local cemetery is visible in the midground of the viewpoint, located close to the Isis River. Views towards the Project are filtered by vegetation along Isis River and aligning Macquarie Road. The terrain is characterised as relatively flat in this localised area. The surrounding land is being used for agricultural practices including grazing and cropping. Electrical infrastructure is visible aligning Macquarie Road.

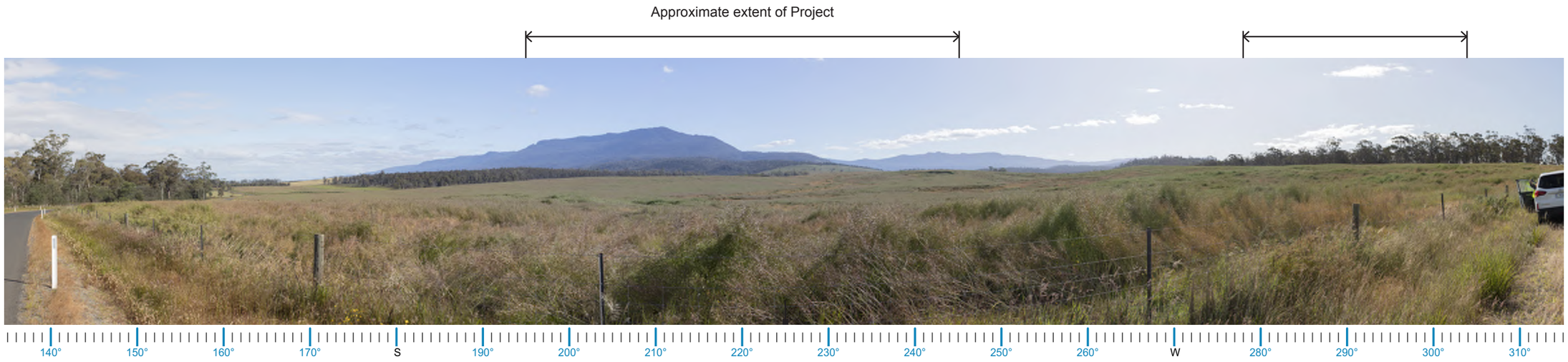
The visual sensitivity of this viewpoint has been rated as **MODERATE**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

Potential Visual Impact:

From this location, the Project will not be visible due to the terrain and vegetation limiting clear views.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP04 Macquarie Road, Campbell Town



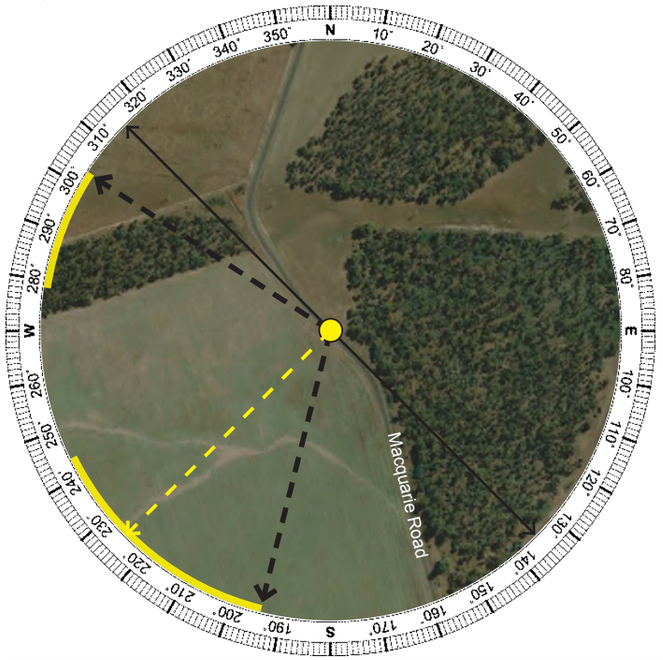
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP04

Viewpoint Summary:	
Location:	Elevation:
Macquarie Road, Campbell Town	180 m
Coordinates:	Distance to Project:
41°50'42.63"S 147°12'45.47"E	1.75 km
Viewing Direction:	Landscape Character Zone:
Southwest	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Macquarie Road looking southwest towards the Great Western Tiers (GWT) scenic protection area and the Project. The terrain is characterised as undulating in this localised area. Views to the southwest are open, with select views filtered by dense vegetation in nearby reserves. Outside the reserves, the surrounding land is primarily utilised for agricultural practices including grazing and cropping.

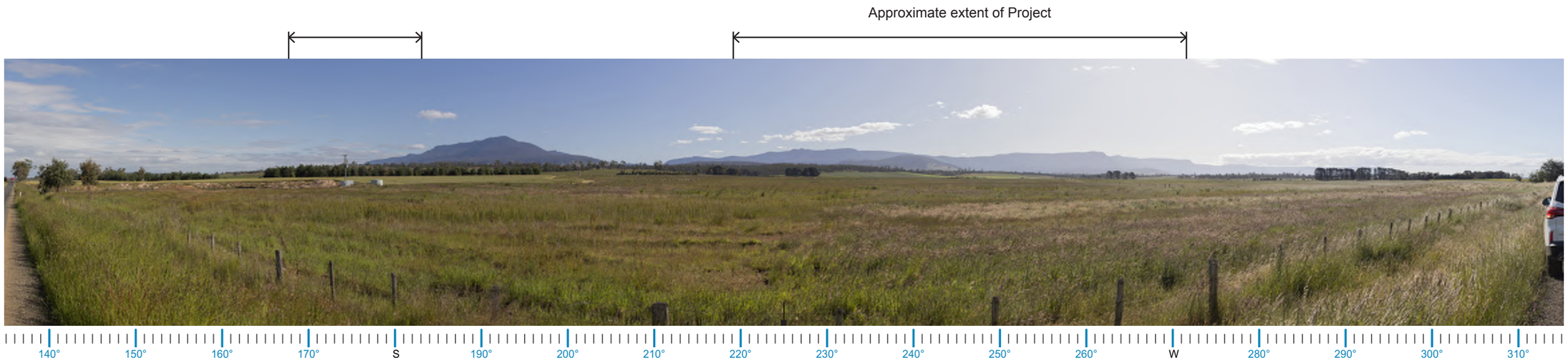
The visual sensitivity of this viewpoint has been rated as **HIGH**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

Potential Visual Impact:

From this location, the Project will not be visible due to the terrain and vegetation limiting clear views.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP05 Macquarie Road, Cressy



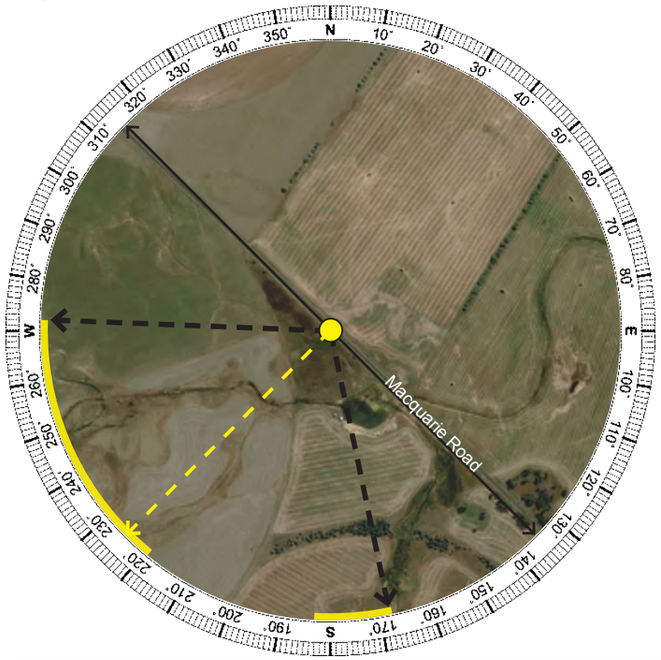
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP05

Viewpoint Summary:	
Location:	Elevation:
Macquarie Road, Cressy	151 m
Coordinates:	Distance to Project:
41°48'43.08"S 147°11'20.45"E	2.90 km
Viewing Direction:	Landscape Character Zone:
Southwest	LCZ04 - Farming & Pastures
Visual Sensitivity:	
MODERATE	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Macquarie Road, looking southwest towards the Great Western Tiers (GWT) scenic protection area and the Project. The terrain is characterised in this localised area as relatively flat with the surrounding land primarily utilised for agricultural practices including grazing and cropping. Views towards the Project are open yet contained to the southwest by undulations and dense vegetation in the far midground of this viewpoint.

The visual sensitivity of this viewpoint has been rated as **MODERATE**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

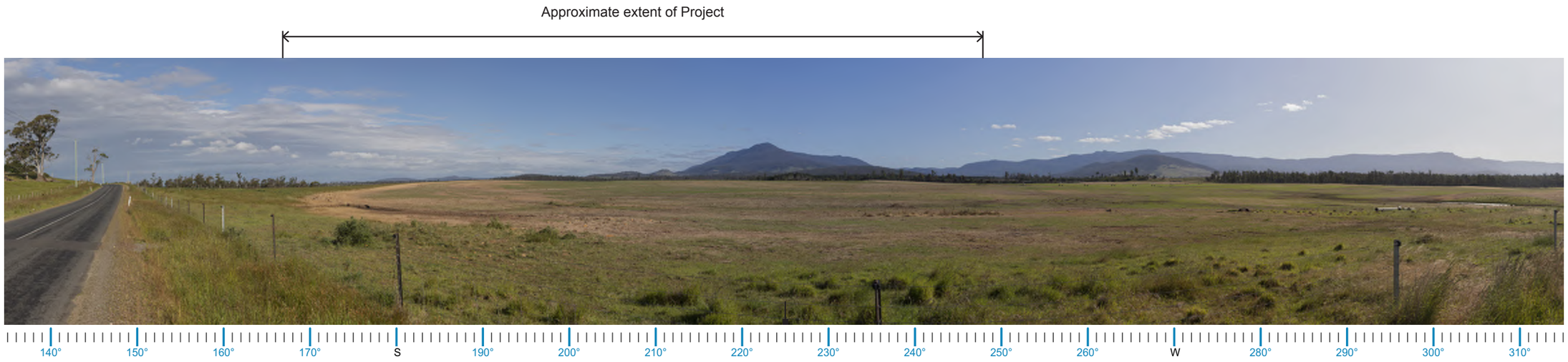
Potential Visual Impact:

From this location, the Project extent to the south will not be visible due the terrain.

Based on topography alone, the Project extent to the southwest will be partially visible, however, will be heavily filtered by vegetation resulting in a negligible to nil impact on the proportion of view affected.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP06 Macquarie Road, Cressy



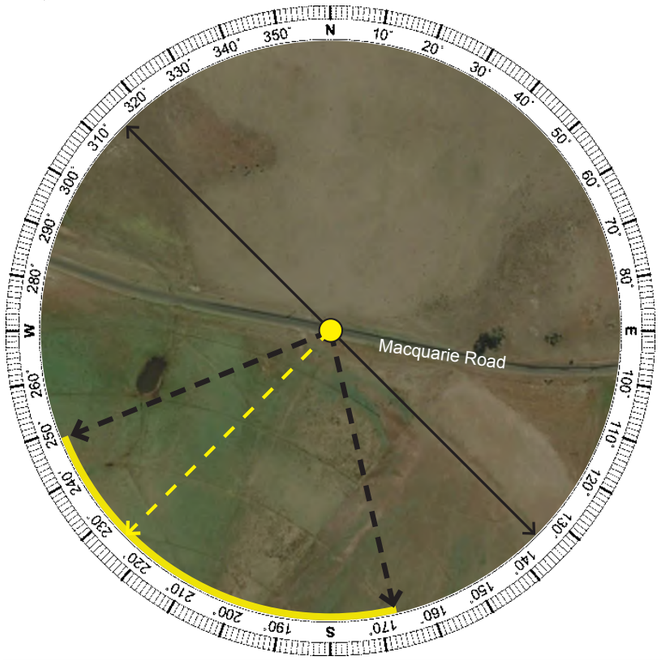
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP06

Viewpoint Summary:	
Location:	Elevation:
Macquarie Road, Cressy	174 m
Coordinates:	Distance to Project:
41°48'20.95"S 147° 9'9.33"E	0.95 km
Viewing Direction:	Landscape Character Zone:
Southwest	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Macquarie Road, looking southwest towards the Great Western Tiers (GWT) scenic protection area and the Project. Views of the GWT are expansive due to the relatively flat terrain. The surrounding land is being utilised for agricultural practices including grazing and cropping. Dense vegetation is visible in the midground of the viewpoint.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain and vegetation.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the northwest in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible due to the distance of the viewpoint.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP07 Macquarie Road, Cressy

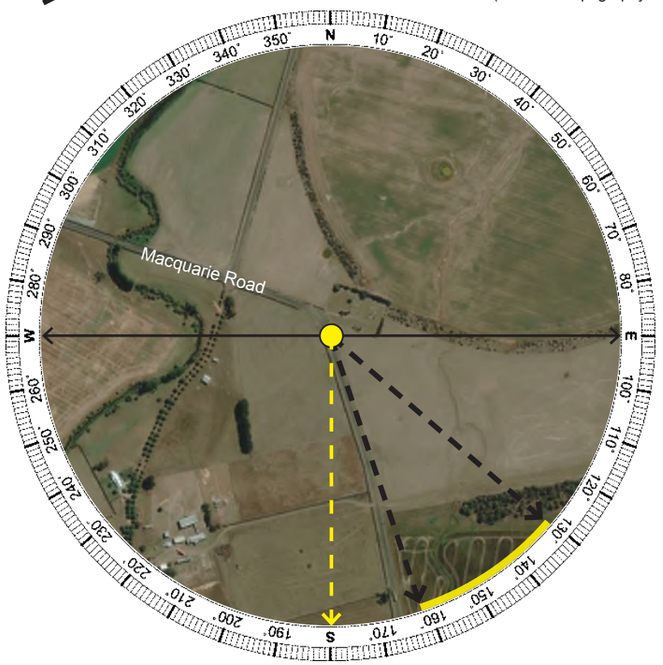
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP07

Viewpoint Summary:	
Location:	Elevation:
Macquarie Road, Cressy	158 m
Coordinates:	Distance to Project:
41°47'16.39"S 147° 6'42.71"E	3.25 km
Viewing Direction:	Landscape Character Zone:
South	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Macquarie Road, near St Mark's Anglican Church, a building of heritage significance under the Northern Midlands LPS. The terrain is relatively flat in this localised area, with open views to the Great Western Tiers (GWT) scenic protection area to the south. The surrounding land is primarily being utilised for agricultural practices including grazing and cropping. Buffer planting is visible in the midground of the viewpoint aligning individual pastures and Macquarie Road. Electrical infrastructure is visible within this landscape.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

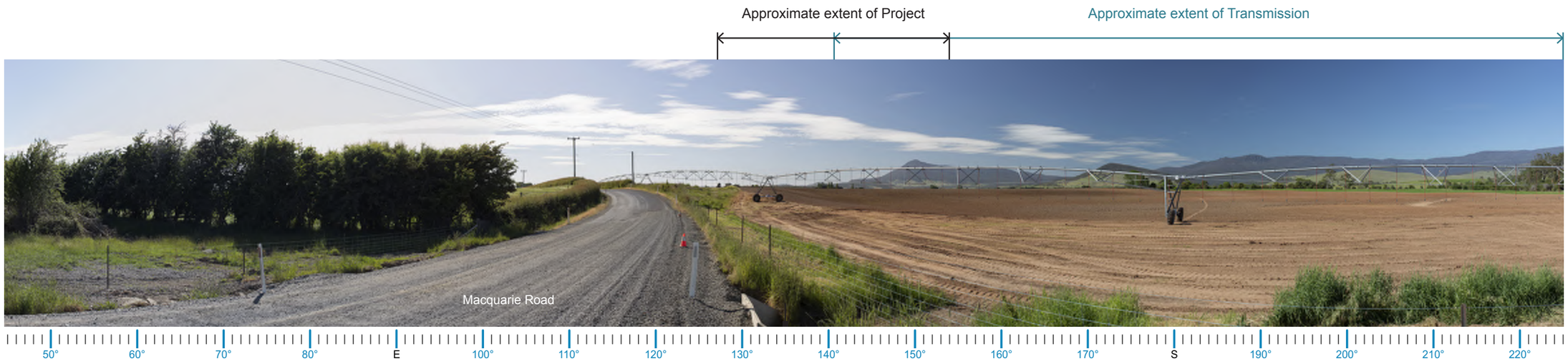
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the west in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible due to the distance of the viewpoint.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP08 Macquarie Road, Cressy



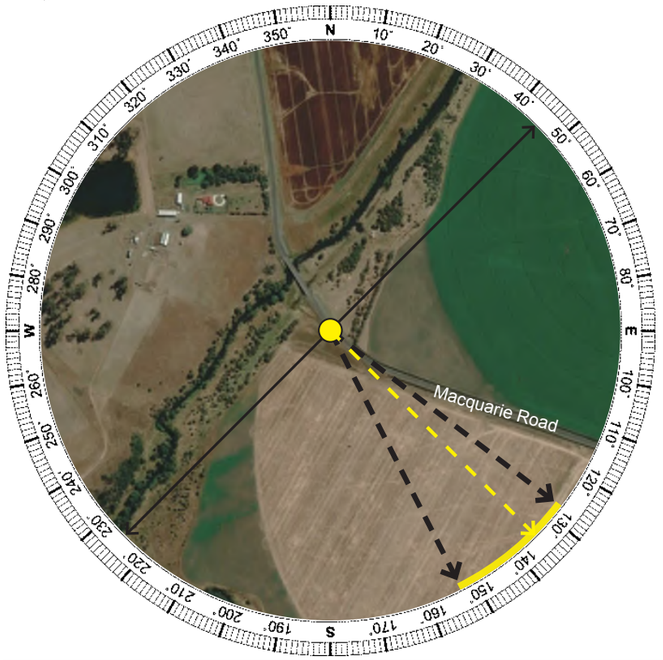
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP08

Viewpoint Summary:	
Location:	Elevation:
Macquarie Road, Cressy	155 m
Coordinates:	Distance to Project:
41°47'1.99"S 147° 5'53.17"E	4.35 km
Viewing Direction:	Landscape Character Zone:
Southeast	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Macquarie Road. The terrain is gently undulating in this localised area, with open views to the Great Western Tiers (GWT) scenic protection area to the southeast. The surrounding land is primarily being utilised for agricultural practices including irrigated pastures, grazing and cropping. Dense vegetation is visible aligning Macquarie Road and running along Lake River to the south. Electrical infrastructure is visible within this landscape.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

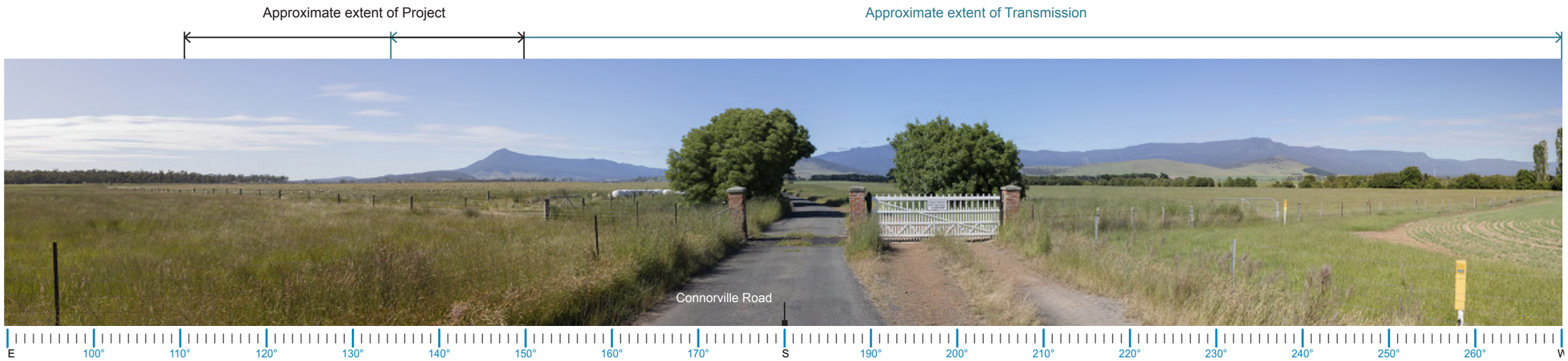
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the southwest in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible due to the distance of the viewpoint.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP09 Connorville Road, Cressy



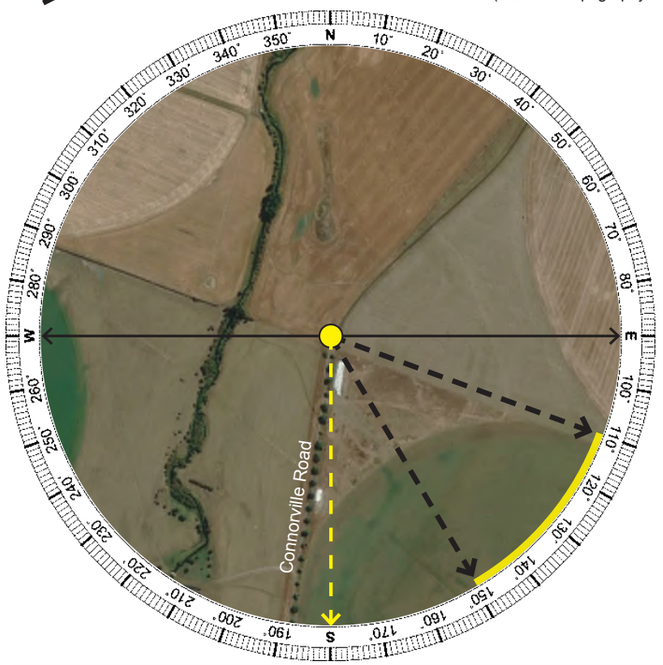
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP09

Viewpoint Summary:	
Location:	Elevation:
Connorville Road, Cressy	160 m
Coordinates:	Distance to Project:
41°48'7.32"S 147° 6'23.30"E	2.65 km
Viewing Direction:	Landscape Character Zone:
South	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Connorville Road before the road enters private property. The terrain is gently undulating in this localised area, with open views to the Great Western Tiers (GWT) scenic protection area to the southeast and southwest. The surrounding land is primarily being utilised for agricultural practices including irrigated pastures, grazing and cropping. Dense vegetation is visible to the east and running along Lake River to the south. Electrical infrastructure is visible within this landscape in the midground of this viewpoint.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

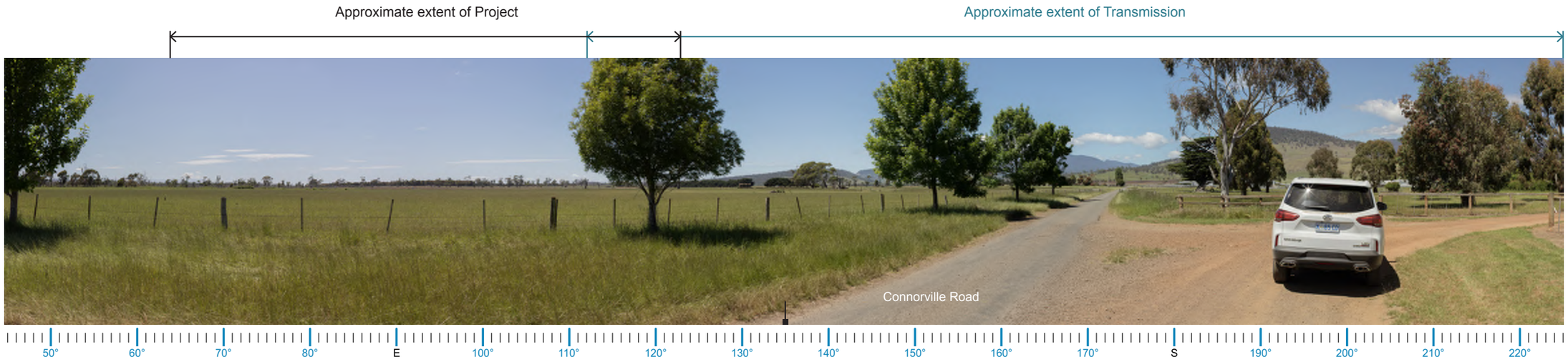
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the west in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible due to the distance of the viewpoint.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP10 Connorville Road, Cressy



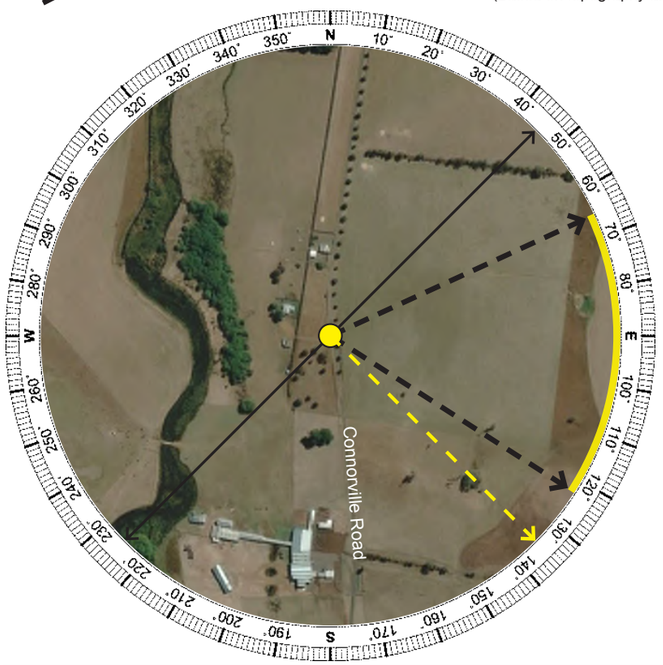
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP10

Viewpoint Summary:	
Location:	Elevation:
Connorville Road, Cressy	173 m
Coordinates:	Distance to Project:
41°49'19.68"S 147° 6'8.81"E	2.50 km (Solar Farm) 0.50 km (Transmission)
Viewing Direction:	Landscape Character Zone:
Southeast	LCZ04 - Farming & Pastures
Visual Sensitivity:	
LOW	
Visual Magnitude:	
LOW	
Visual Impact:	
LOW	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Connorville Road, within private property. The terrain is relatively flat with the surrounding land being used for agricultural activities including grazing and cropping. Select views towards the Project are open, with majority of views, including towards the Great Western Tiers (GWT) scenic protection area filtered by scattered vegetation dotted around Connorville Road.

The visual sensitivity of this viewpoint has been rated as **LOW**, due to the location of the viewpoint on a low use road.

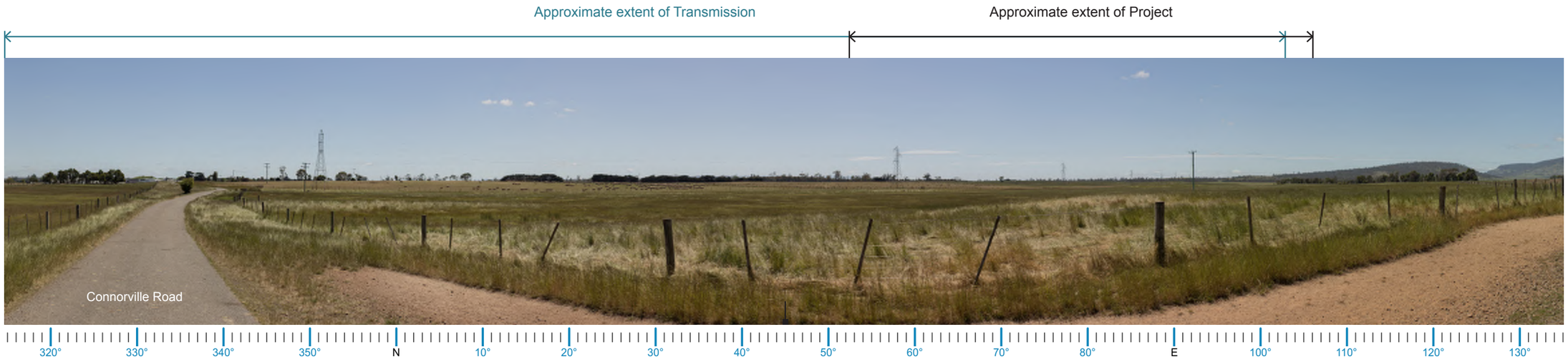
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain and vegetation limiting clear views.

The associated infrastructure, specifically the proposed transmission will be filtered from this location running to the southwest in the same alignment as the existing transmission line. The proportion of the view affected however is low as the Project will be indiscernible with the existing infrastructure present.

The visual magnitude is **LOW** resulting in a **LOW** visual impact rating.

VP11 Connorville Road, Cressy



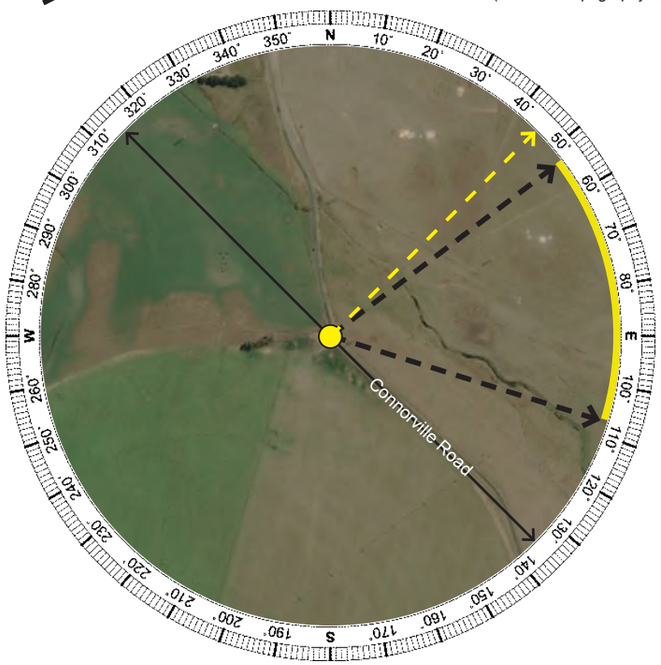
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP11

Viewpoint Summary:	
Location:	Elevation:
Connorville Road, Cressy	171 m
Coordinates:	Distance to Project:
41°49'46.40"S 147° 6'14.18"E	2.36 km (Solar Farm) 0.09 km (Transmission)
Viewing Direction:	Landscape Character Zone:
East	LCZ04 - Farming & Pastures
Visual Sensitivity:	
LOW	
Visual Magnitude:	
LOW	
Visual Impact:	
LOW	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Connorville Road, within private property. The terrain is gently undulating with open views towards the Project. The surrounding land being used for agricultural practices including grazing and cropping. Dense vegetation is visible in the midground and dotted throughout the adjoining pastures. The existing transmission line is a key landscape feature due to the flat terrain.

The visual sensitivity of this viewpoint has been rated as **LOW**, due to the location of the viewpoint on a low use road.

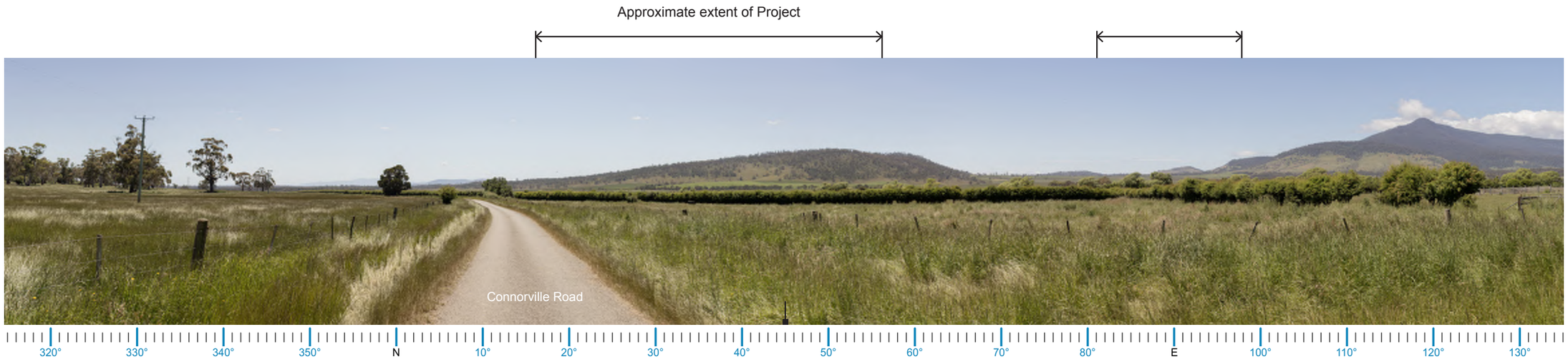
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain and vegetation limiting clear views.

The associated infrastructure, specifically the proposed transmission will be fully visible from this location running to the northwest in the same alignment as the existing transmission line, however, is compatible with existing infrastructure located in this area.

The visual magnitude is **LOW** resulting in a **LOW** visual impact rating.

VP12 Connorville Road, Cressy



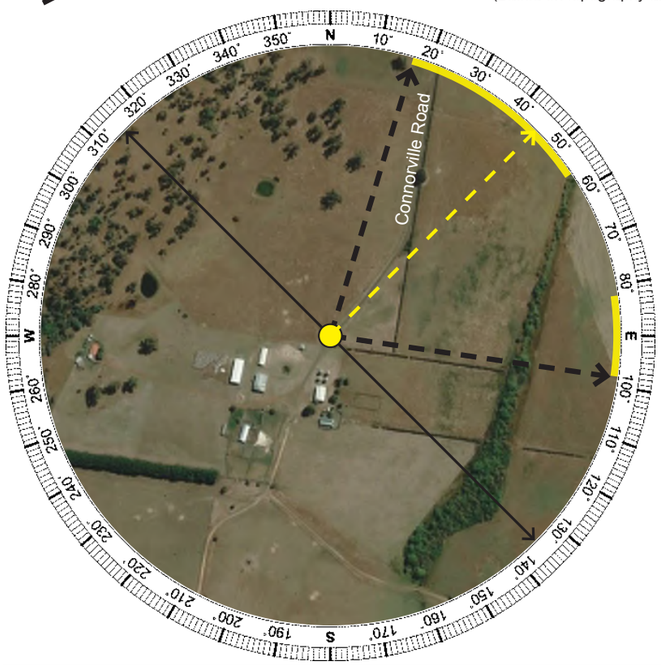
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP12

Viewpoint Summary:	
Location:	Elevation:
Connorville Road, Cressy	201 m
Coordinates:	Distance to Project:
41°51'38.38"S 147° 6'59.51"E	3.05 km (Solar Farm) 2.94 km (Transmission)
Viewing Direction:	Landscape Character Zone:
Northeast	LCZ04 - Farming & Pastures
Visual Sensitivity:	
LOW	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Connorville Road, within private property. The terrain is gently undulating with filtered views towards the Project, with the surrounding land being utilised for agricultural practices including grazing and cropping. Dense vegetation is visible within adjoining pastures.

The visual sensitivity of this viewpoint has been rated as **LOW**, due to the location of the viewpoint on a low use road.

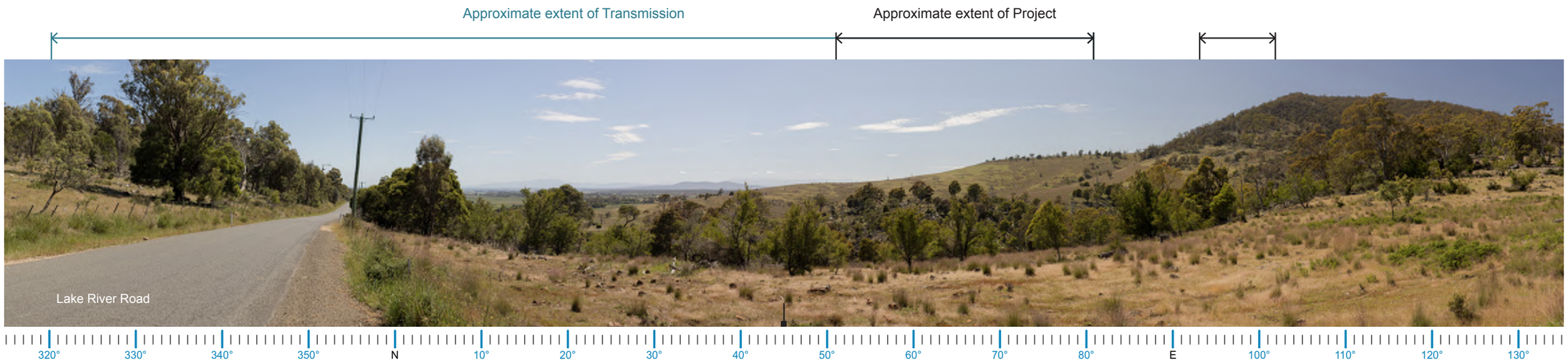
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain and vegetation limiting clear views.

The associated infrastructure, specifically the proposed transmission will be filtered from this location running to the northwest in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible with the existing infrastructure.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP13 Lake River Road, Cressy



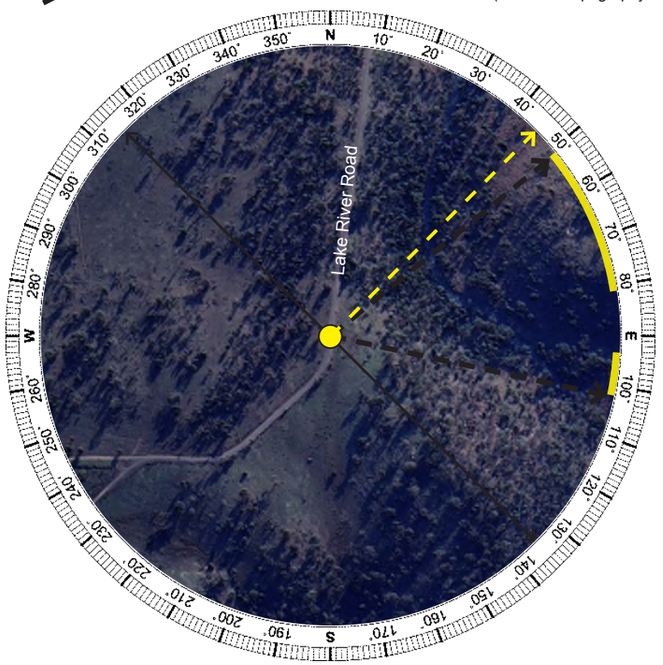
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP13

Viewpoint Summary:	
Location:	Elevation:
Lake River Road, Cressy	239 m
Coordinates:	Distance to Project:
41°50'54.20"S 147° 4'20.53"E	5.20 km (Solar Farm) 3.00 km (Transmission)
Viewing Direction:	Landscape Character Zone:
Northeast	LCZ01 - Great Western Tiers & Undulations
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Lake River Road, on the edge of the Great Western Tiers (GWT) scenic protection area. The terrain is undulating in this localised area containing views towards the Project to the east. Dense vegetation is visible along the undulations.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to viewpoint being taken within the GWT scenic protection area and along a low use road.

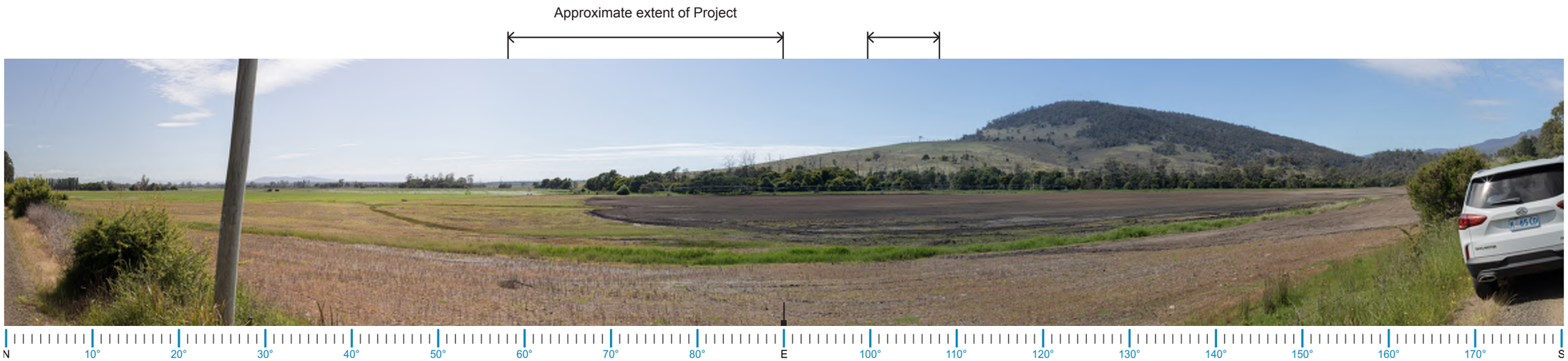
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the northwest in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible due to the distance of the viewpoint.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP14 Lake River Road, Cressy



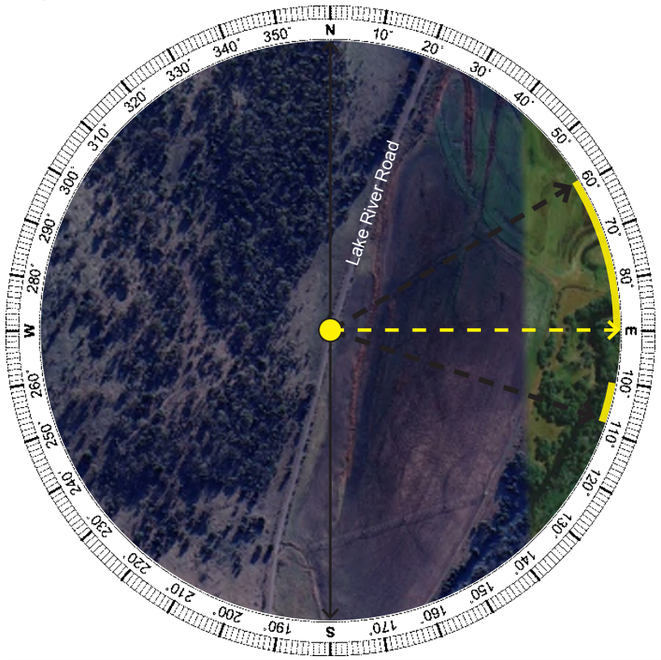
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP14

Viewpoint Summary:	
Location:	Elevation:
Lake River Road, Cressy	187 m
Coordinates:	Distance to Project:
41°50'18.82"S 147° 4'28.07"E	4.85 km (Solar Farm) 1.90 km (Transmission)
Viewing Direction:	Landscape Character Zone:
East	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Lake River Road. The terrain is gently undulations, with partial views of the Great Western Tiers (GWT) scenic protection area. Outside the banks of the Lake River, the surrounding land is being primarily utilised for agricultural practices including irrigated pastures, grazing and cropping.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to partial views of the GWT scenic protection area and Lake River.

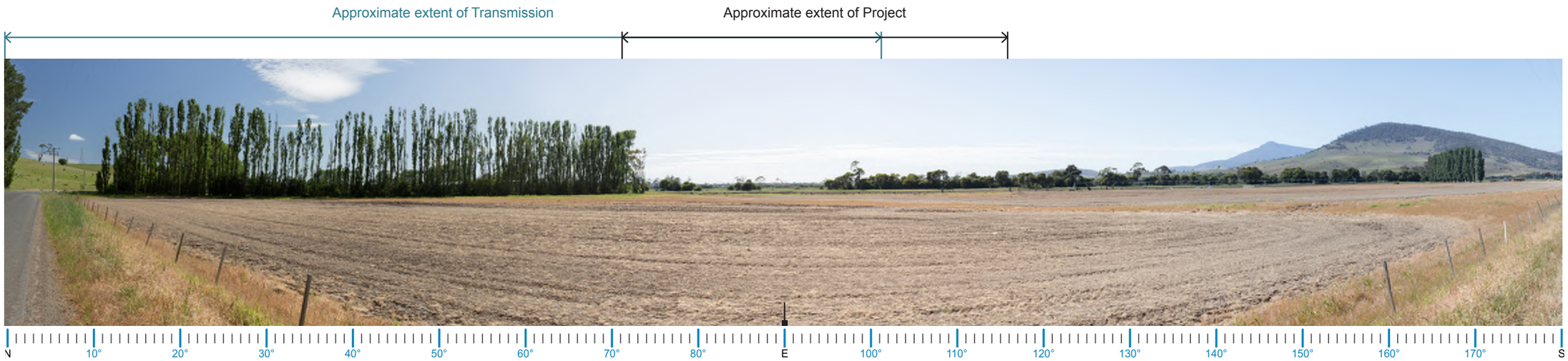
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the north in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible due to the distance of the viewpoint.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP15 Lake River Road, Cressy



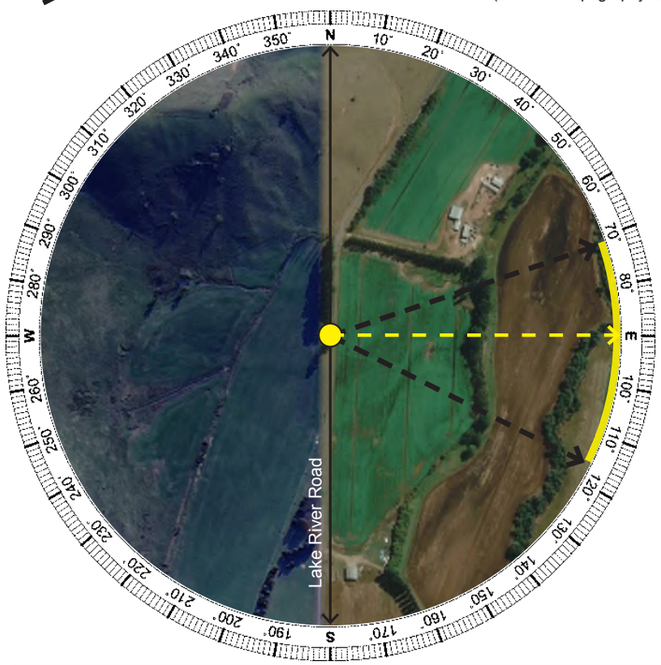
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP15

Viewpoint Summary:	
Location:	Elevation:
Lake River Road, Cressy	176 m
Coordinates:	Distance to Project:
41°49'32.46"S 147° 4'40.32"E	4.50 km (Solar Farm) 0.45 km (Transmission)
Viewing Direction:	Landscape Character Zone:
East	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
LOW	
Visual Impact:	
MODERATE	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Lake River Road. The terrain is gently undulating with partial views of the Great Western Tiers (GWT) scenic protection area. Outside the banks of the Lake River, the surrounding land is being primarily utilised for agricultural practices including irrigated pastures, grazing and cropping. Vegetation filter views towards the Project.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to partial views of the GWT scenic protection area and Lake River.

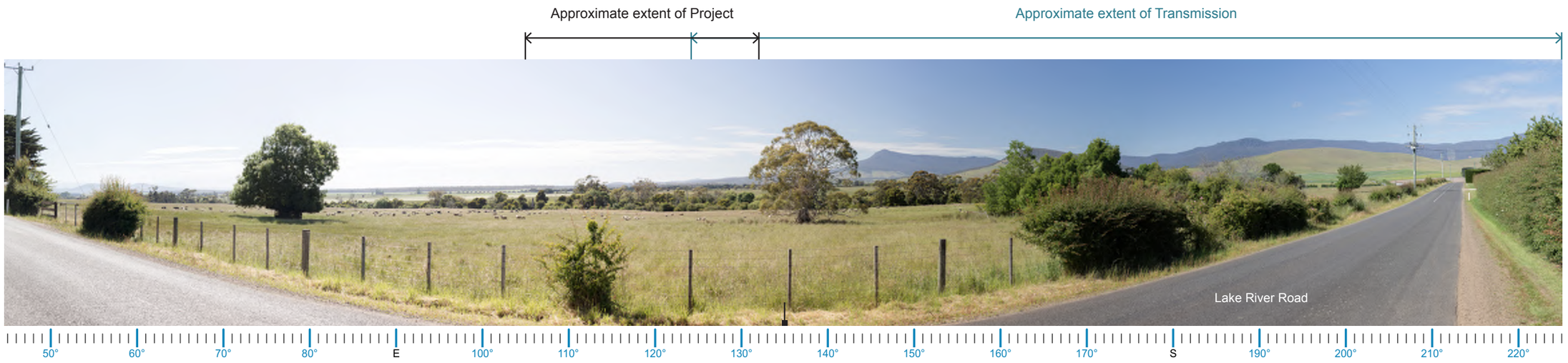
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain and vegetation limiting clear views.

The associated infrastructure, specifically the proposed transmission will be filtered from this location running to the north in the same alignment as the existing transmission line. The proportion of the view affected however is low as the Project will be indiscernible with the existing infrastructure.

The visual magnitude is **LOW** resulting in a **MODERATE** visual impact rating.

VP16 Lake River Road, Cressy



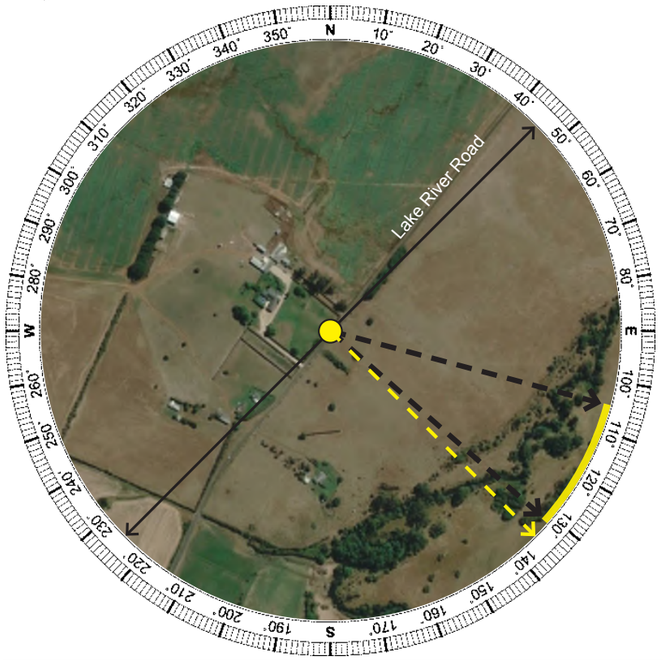
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP16

Viewpoint Summary:	
Location:	Elevation:
Lake River Road, Cressy	179 m
Coordinates:	Distance to Project:
41°47'56.84"S 147° 4'43.87"E	4.90 km
Viewing Direction:	Landscape Character Zone:
Southeast	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
LOW	
Visual Impact:	
MODERATE	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Lake River Road. The terrain is gently undulations, with partial views of the Great Western Tiers (GWT) scenic protection area. Outside the banks of the Lake River, the surrounding land is being primarily utilised for agricultural practices including irrigated pastures, grazing and cropping. Vegetation filter views towards the Project.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to partial views of the GWT scenic protection area and Lake River.

Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain and vegetation limiting clear views.

The associated infrastructure, specifically the proposed transmission will be filtered from this location running to the southwest in the same alignment as the existing transmission line. The proportion of the view affected however is low as the Project will be indiscernible with the existing infrastructure.

The visual magnitude is **LOW** resulting in a **MODERATE** visual impact rating.

VP17 Poatina Road, Cressy

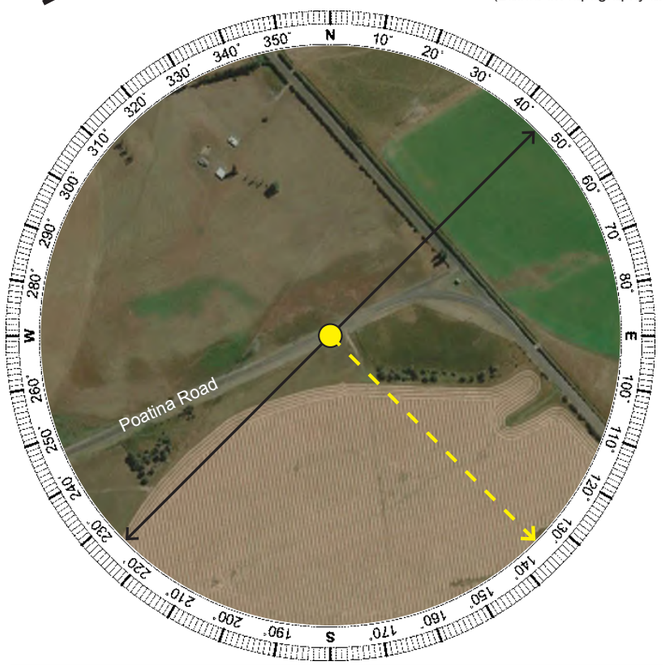
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP17

Viewpoint Summary:	
Location:	Elevation:
Poatina Road, Cressy	171 m
Coordinates:	Distance to Project:
41°46'38.92"S 146°59'48.40"E	1.15 km (Transmission)
Viewing Direction:	Landscape Character Zone:
Southeast	LCZ04 - Farming & Pastures
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
LOW	
Visual Impact:	
MODERATE	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken along Poatina Road, looking towards Palmerston Substation and the Great Western Tiers (GWT) scenic protection area to the southeast. The terrain is relatively flat in this localised area, with the surrounding land being used for energy distribution and agricultural practices. Views are open towards the GWT.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

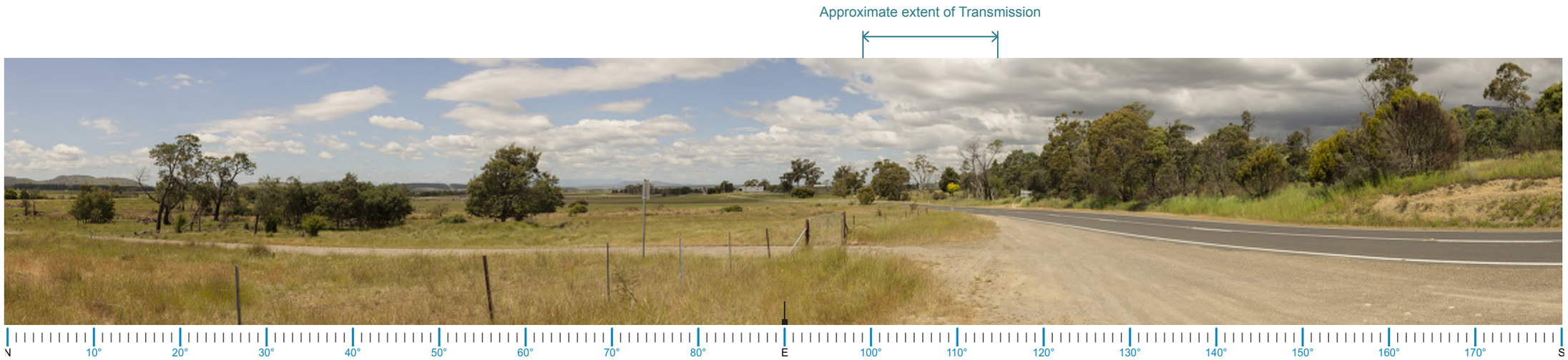
Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain and vegetation limiting clear views.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the Palmerston Substation in the same alignment as the existing transmission line. The change to the landscape character will be minimal as the proposed transmission line is compatible with the existing infrastructure in the area, and will be difficult to distinguish the Project.

The visual magnitude is **LOW** resulting in a **MODERATE** visual impact rating.

VP18 Poatina Road, Poatina



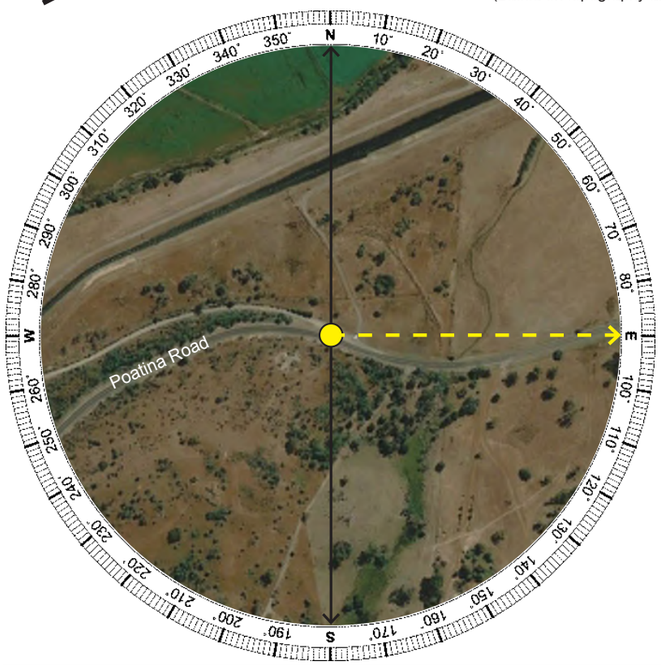
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP18

Viewpoint Summary:	
Location:	Elevation:
Poatina Road, Poatina	207 m
Coordinates:	Distance to Project:
41°47'2.06"S 146°57'52.30"E	2.14 km (Transmission)
Viewing Direction:	Landscape Character Zone:
East	LCZ04 - Farming & Pastures
Visual Sensitivity:	
LOW	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Existing Landscape Character Description:

This viewpoint was taken along Poatina Road. The terrain is characterised as gently undulating with the surrounding land being used for housing and agricultural practices. Dense vegetation along Poatina Road filter views towards the Project to the east.

The visual sensitivity of this viewpoint has been rated as **LOW**, due to the location of the viewpoint on a low use road.

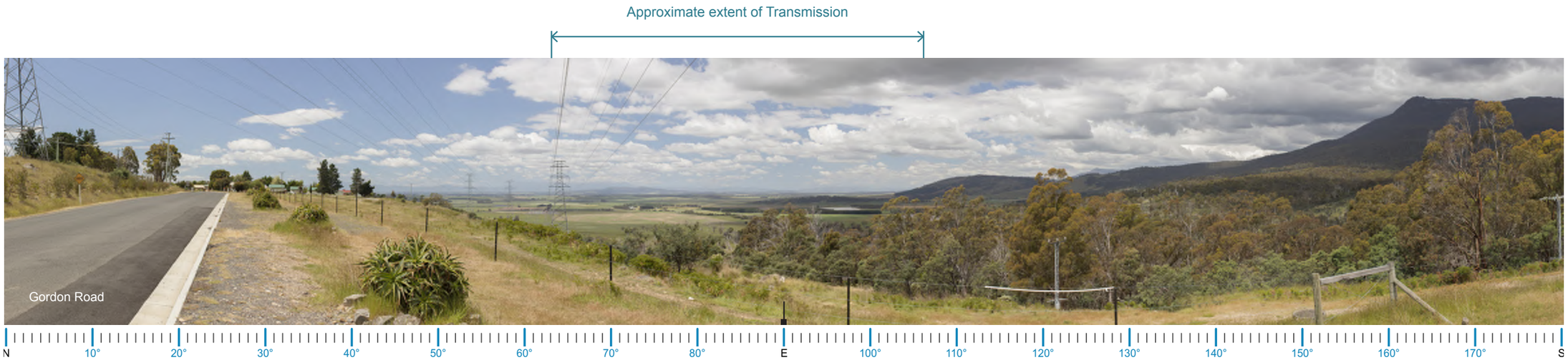
Potential Visual Impact:

From this location, the Project will not be visible due to the terrain and vegetation limiting clear views.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

Aerial Image Source: Google Earth (02/2021)

VP19 Gordon Road, Poatina



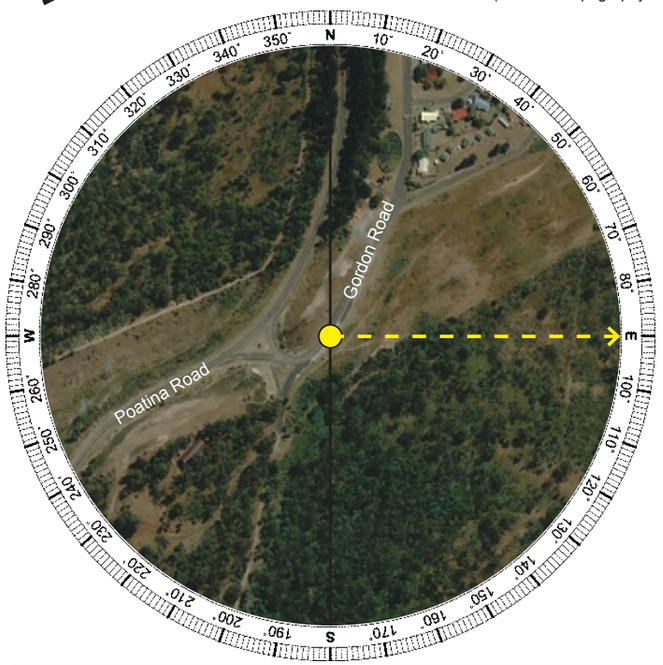
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP19

Viewpoint Summary:	
Location:	Elevation:
Gordon Road, Poatina	317 m
Coordinates:	Distance to Project:
41°47'57.69"S 146°57'30.10"E	2.91 km (Transmission)
Viewing Direction:	Landscape Character Zone:
East	LCZ01 - Great Western Tiers & Undulations
Visual Sensitivity:	
MODERATE	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken from Gordon Road, looking east towards the Palmerston Substation at the base of the Great Western Tiers (GWT) scenic protection area. The terrain is characterised as undulating, Views are expansive to the east due to the elevated viewpoint with dense vegetation visible along the undulations.

The visual sensitivity of this viewpoint has been rated as **MODERATE**, due to direct views of the GWT scenic protection area in combination with the location of the viewpoint on a low use road.

Potential Visual Impact:

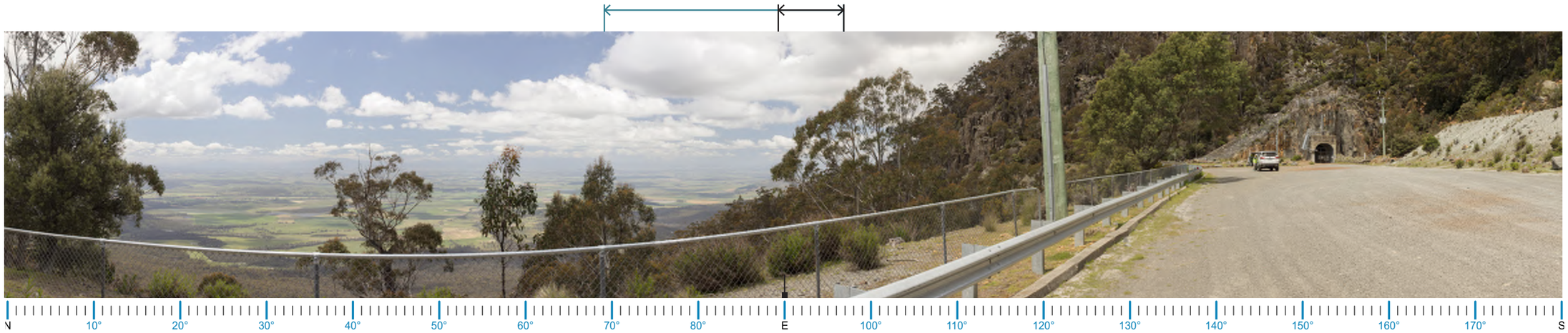
From this location, the Solar Farm will not be visible due to the terrain.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the east in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible due to the distance of the viewpoint.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

VP20 Poatina Road Lookout, Poatina

Approximate extent of Transmission Approximate extent of Project



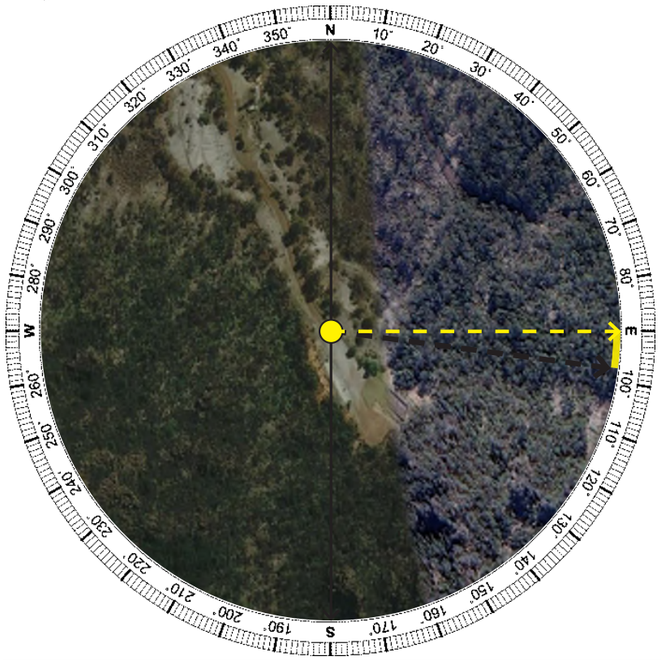
LEGEND

Viewing direction and centre of panorama

Extent of panorama

Direction of Project

Extent of visible Project (Solar Farm) (Based on topography alone)



VIEWPOINT VP20

Viewpoint Summary:	
Location:	Elevation:
Poatina Road Lookout, Poatina	956 m
Coordinates:	Distance to Project:
41°48'55.05"S 146°53'22.57"E	8.90 km (Transmission)
Viewing Direction:	Landscape Character Zone:
East	LCZ01 - Great Western Tiers & Undulations
Visual Sensitivity:	
HIGH	
Visual Magnitude:	
NIL	
Visual Impact:	
NIL	

Aerial Image Source: Google Earth (02/2021)

Existing Landscape Character Description:

This viewpoint was taken at Poatina Road Lookout, a recreation area near the Poatina Power Station. Due to the elevated position of the viewpoint, views from this location are expansive to the northeast. The terrain is characterised as undulating, with the escarpment consisting of rock formations and dense vegetation. Infrastructure associated with energy production is visible from this location, including hydroelectricity energy generation infrastructure.

The visual sensitivity of this viewpoint has been rated as **HIGH**, due to the location of the viewpoint at the Poatina Lookout within the Great Western Tiers (GWT) scenic protection area.

Potential Visual Impact:

From this location, the Solar Farm will not be visible due to the terrain containing views to the east.

The associated infrastructure, specifically the proposed transmission will be partially visible from this location running to the northeast towards Palmerston Substation in the same alignment as the existing transmission line. The proportion of the view affected however is negligible to nil as the Project will be indiscernible due to the elevated position and distance of the viewpoint.

The visual magnitude is **NIL** resulting in a **NIL** visual impact rating.

C

Photomontages & Wireframe Diagrams

Rev A 03.03.23

Public Photomontages:

PM01: VP01

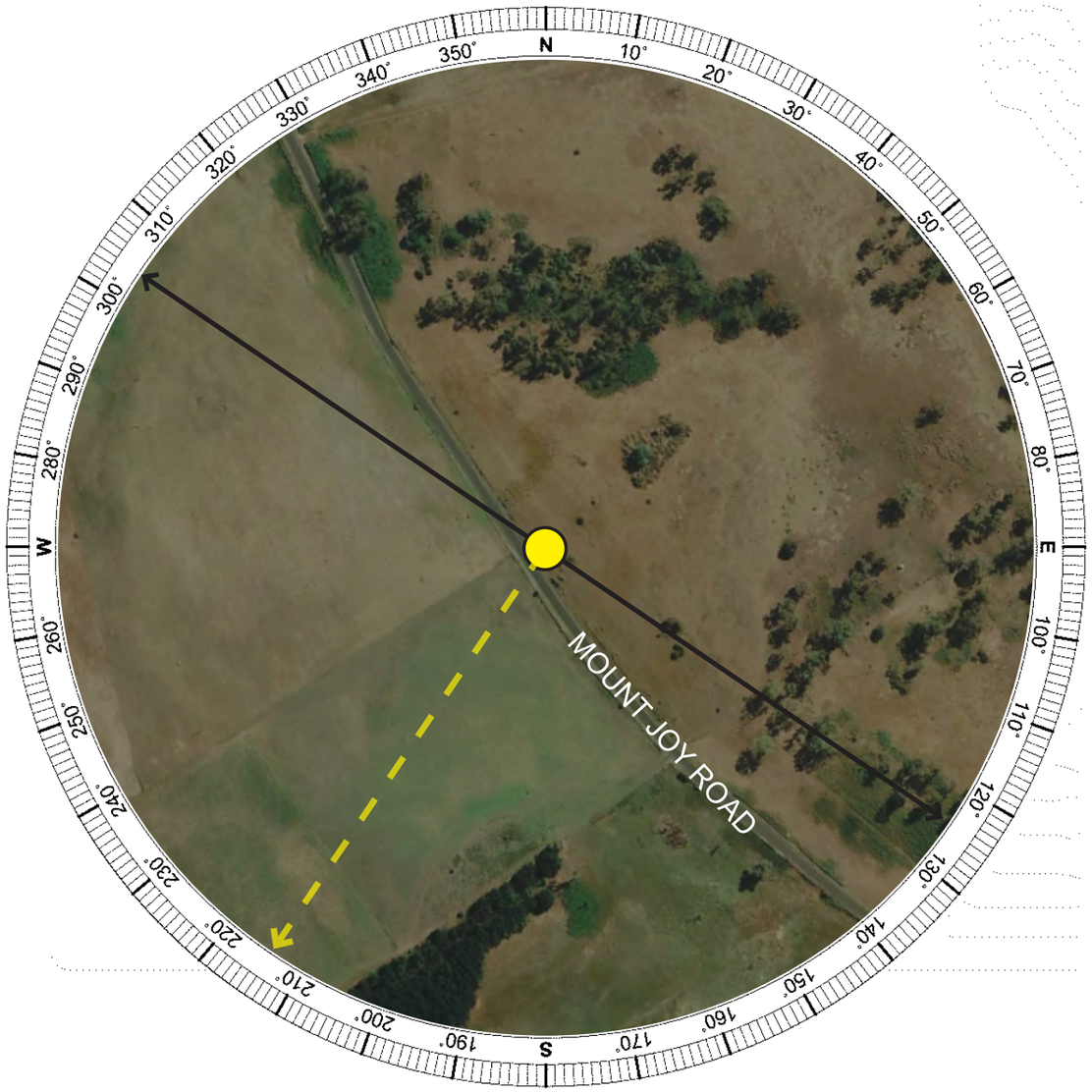
PM02: VP10

PM03: VP15

PM04: VP17

PM05: VP19

Photomontage 01 Viewpoint VP01



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2021)

Photomontage 01

Location:

Mount Joy Road, Cressy

Photograph Date and Time:

6th December 2022 4:36pm

Coordinates:

41°46'01.05"S 147°12'46.87"E

Distance to Project:

7.28 km

Viewing Direction:

Southwest

Elevation:

185 m

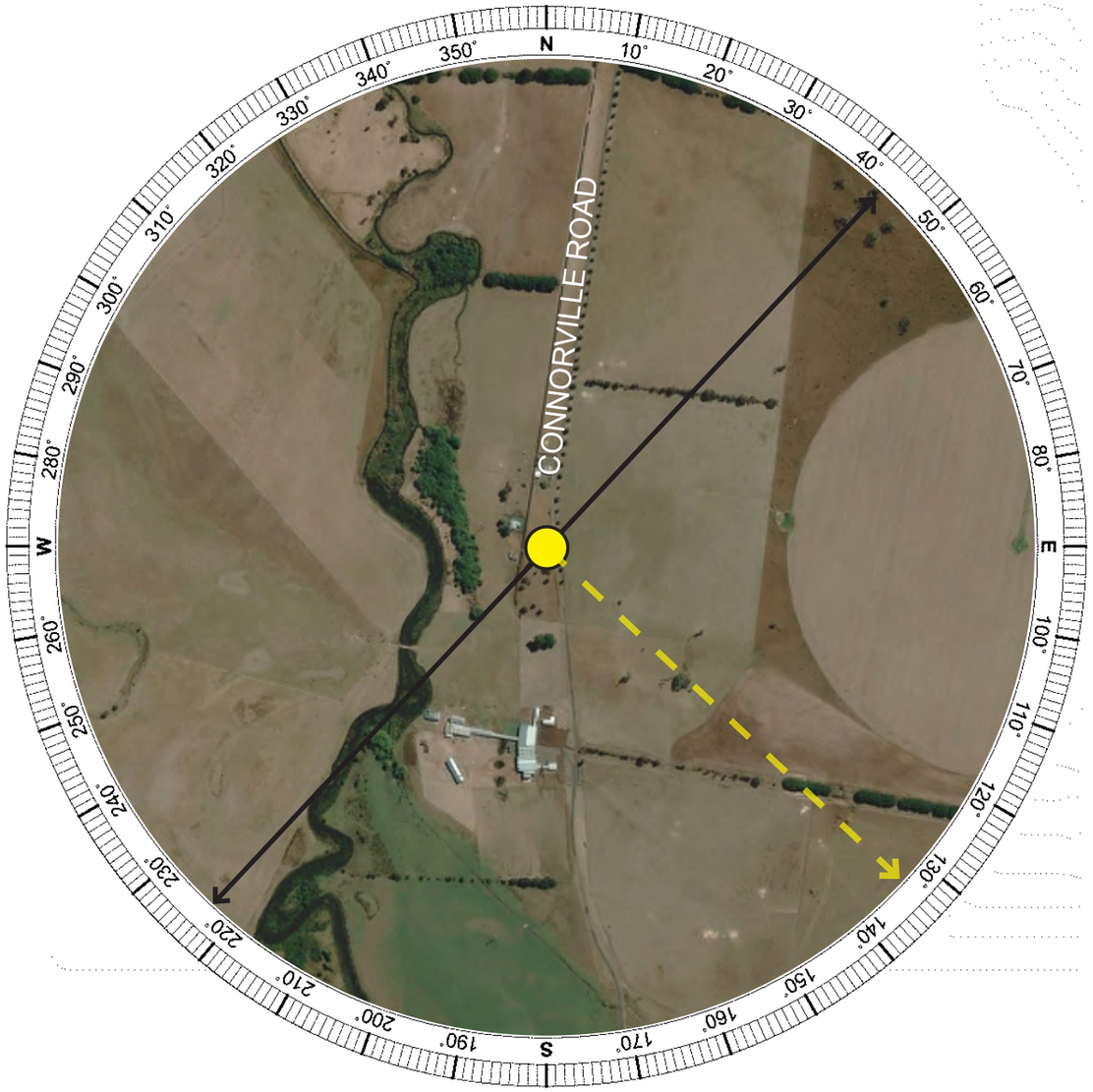
Representative Dwelling/s:

Photomontage 01 Viewpoint VP01

Existing View | 180º Baseline Panorama

Proposed View | 180º Photomontage

Photomontage 02 Viewpoint VP10



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2021)

Photomontage 02

Location:

Connorville Road, Cressy

Photograph Date and Time:

7th December 2022 11:29am

Coordinates:

41°49'19.68"S 147° 6'8.81"E

Distance to Project:

2.50 km (Solar Farm) - 0.50 km (Transmission)

Viewing Direction:

Southeast

Elevation:

172 m

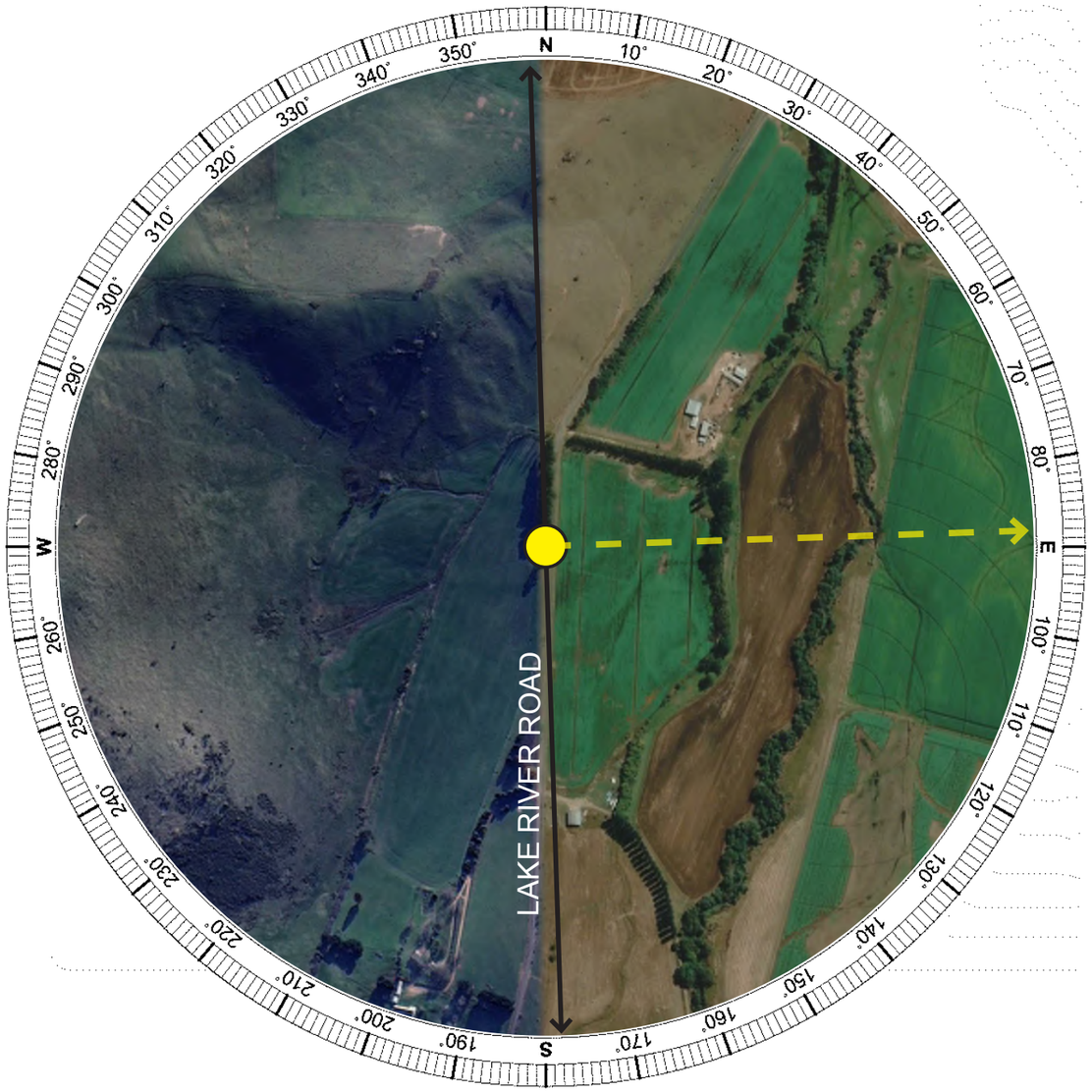
Representative Dwelling/s:

Photomontage 02 Viewpoint VP10

Existing View | 180º Baseline Panorama

Proposed View | 180º Photomontage

Photomontage 03 Viewpoint VP15



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2021)

Photomontage 03

Location:

Lake River Road, Cressy

Photograph Date and Time:

7th December 2022 09:59am

Coordinates:

41°49'32.46"S 147° 4'40.32"E

Distance to Project:

4.50 km (Solar Farm) - 0.45 km (Transmission)

Viewing Direction:

East

Elevation:

176 m

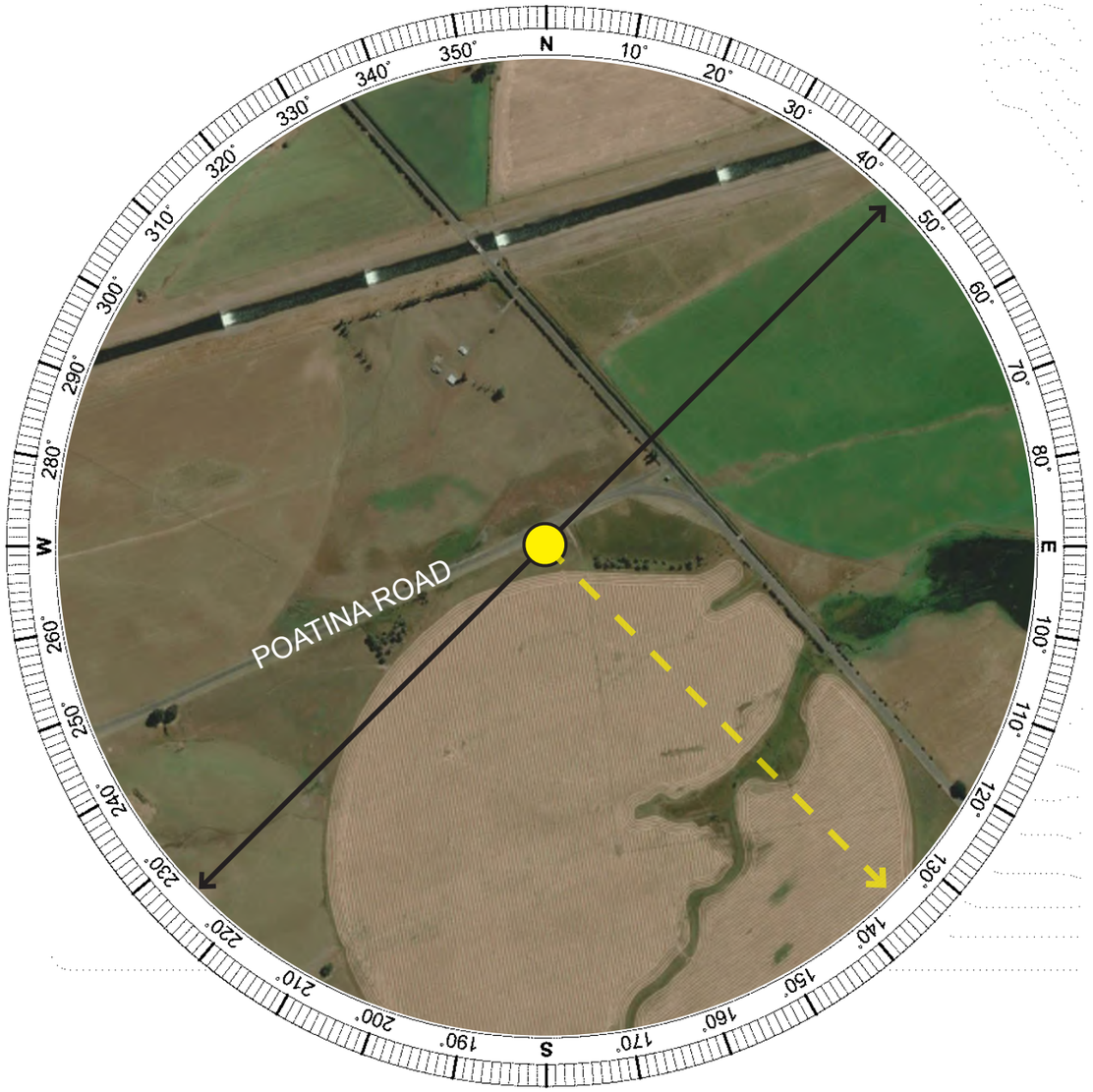
Representative Dwelling/s:

Photomontage 03 Viewpoint VP15

Existing View | 180º Baseline Panorama

Proposed View | 180º Photomontage

Photomontage 04 Viewpoint VP17



Aerial Image - Photomontage Location (Aerial Image Source: Google Earth 2021)

Photomontage 04

Location:

Poatina Road, Cressy

Photograph Date and Time:

7th December 2022 2:39pm

Coordinates:

41°46'38.92"S 146°59'48.40"E

Distance to Project:

1.15 km (Transmission)

Viewing Direction:

Southeast

Elevation:

171 m

Representative Dwelling/s:

Photomontage 04 Viewpoint VP17

Existing View | 180º Baseline Panorama

Proposed View | 180º Photomontage