# New England Solar and Battery Project

# Modification to development consent SSD-9255

Prepared for ACEN Australia Pty Ltd

October 2022

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ACEN Australia Pty Ltd

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October 2022

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Approved by

**Claire Burnes**
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10 October 2022

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# Executive Summary

ACEN Australia Pty Ltd (ACEN Australia) (formerly named UPC Renewables Australia Pty Ltd) has approval to develop the New England Solar and Battery Project; a significant grid-connected solar and battery energy storage system (BESS) project along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale, in the Uralla Shire local government area (LGA) (the project). The project is within the New England Renewable Energy Zone (REZ). The project was approved, subject to conditions, by the NSW Independent Planning Commission (IPC) on 9 March 2020 (SSD-9255).

The development footprint is the area within the project boundary on which infrastructure is proposed. As part of detailed design works, ACEN Australia has investigated the feasibility of construction on additional land adjacent to the development footprint for the northern and central array areas that may be suitable for solar development. It is noted that no new landholdings are being included in the development footprint as part of the proposed modification (ie the new land areas are owned by existing project landholders and are adjacent to the approved development footprint).

ACEN Australia is seeking to modify SSD-9255, pursuant to Section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to:

- amend the project boundary and development footprint;
- increase the project's energy storage capacity;
- increase the number of over-dimensional vehicle movements during construction, upgrading and decommissioning;
- increase the number of daily heavy vehicle movements during construction;
- increase the project's construction hours; and
- amend the schedule of land.

The NSW Department of Planning and Environment (DPE), Uralla Shire Council and key stakeholders have been consulted regarding the proposed modification to assist in identifying all of the relevant issues to be assessed. This modification report assesses the potential impacts from the proposed modification.

The proposed modification has been designed to avoid and minimise adverse biophysical, social and economic impacts where possible. The proposed modification will not result in significant environmental, social or economic impacts and this report has identified that any residual impacts can be appropriately managed or offset.

The proposed modification will have direct impacts on biodiversity primarily due to the clearing of native vegetation and loss of species habitat. A total of seven ecosystem credits are required to offset the residual impacts of the proposed modification. Offsets will be provided in accordance with the biodiversity offset framework.

There are two Aboriginal cultural heritage sites within the modification area. Both sites will be subject to surface collection. All other identified sites will be avoided.

The proposed increase to the project's energy storage capacity will not significantly change the project's amenity impacts and no additional management or mitigation measures are required.

The proposed increase in heavy and over-dimensional vehicle movements results in negligible change in impact to the local and regional road network and is able to be facilitated by the high standard of road and intersection upgrades ACEN Australia has delivered since the project was approved.

With the introduction of a work exclusion zone around the closest non-project related receptor (N1), the proposed out-of-hours construction activities are predicted to satisfy the relevant noise management levels at all assessment locations.

All aspects relating to environmental management will be undertaken in accordance with the project's environmental management strategy which governs the avoidance, minimisation and management of impacts during construction and ensures the responsibilities and accountabilities for environmental performance are clear.

The proposed modification is anticipated to result in minimal environmental impacts beyond those previously assessed and approved under SSD-9255. The project (as modified) will remain substantially the same development for which consent was originally granted. As such it is considered the modification can be approved pursuant to Section 4.55(2) of the EP&A Act.

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# 1 Introduction

ACEN Australia Pty Ltd (ACEN Australia) (formerly named UPC Renewables Australia Pty Ltd) has approval to develop the New England Solar and Battery Project; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale, in the Uralla Shire local government area (LGA) (the project) (Figure 1.1). The project was approved, subject to conditions, by the NSW Independent Planning Commission (IPC) on 9 March 2020 (SSD-9255).

The project is within the New England Renewable Energy Zone (REZ), which has been formally declared by the NSW Minister for Energy under Section 19(1) of the NSW *Electricity Infrastructure Investment Act 2020*. The New England region of NSW has been selected by the NSW Government for the development of the New England REZ due to its significant natural energy resources and has an intended network capacity of 8 gigawatts (GW).

ACEN Australia is seeking approval to amend the project boundary and development footprint to include additional land adjacent to the approved solar array areas. The proposed modification also includes an increase to the project's energy storage capacity, an increase in the number of over-dimensional vehicle movements permitted to access the site during construction, upgrading and decommissioning, an increase in the number of daily heavy vehicle movements and an increase in the project's construction hours.

This modification report has been prepared to support the application to modify SSD-9255.

## 1.1 Modification overview

ACEN Australia is seeking to modify SSD-9255, pursuant to Section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to:

- amend the project boundary and development footprint;
- increase the project's storage capacity from up to 200 MW (AC) by approximately 1,200 MW (AC) to approximately 1,400 MW (AC) (ie from up to 400 MWh to up to 2,800 MWh);
- allow for additional land that could be utilised for adding direct current (DC) solar PV capacity, without changing the solar component of the project's total generating capacity of 720 MW(AC);
- increase the number of over-dimensional vehicle movements during construction, upgrading and decommissioning from 15 to 30;
- increase the number of daily heavy vehicle movements during construction;
- increase the project's construction hours; and
- amend the schedule of land.

The modification area is considered suitable for solar development as it is in a heavily cleared agricultural landscape, connected to the approved development footprint and accessible using the approved vehicle access route. The additional substation/BESS footprint is within the approved development footprint and is close to the approved substation/BESS footprint. No feasible alternatives to the proposed modification have been identified (Section 7.2).

The proposed modification will not change the approved life of project operations.

The proposed modification is described in detail in Chapter 3.

### 1.1.1 Changes to project boundary and development footprint

The development footprint is the area within the project boundary on which infrastructure is proposed (Figure 1.1). As part of detailed design works, ACEN Australia has investigated the feasibility of construction on additional land adjacent to the development footprint for the northern and central array areas that may be suitable for solar development.

An area of 426 hectares (ha) was identified by ACEN Australia as potentially suitable for inclusion in the development footprint. During the preparation of this modification report, this area has been refined based on environmental constraints identification (namely areas of biodiversity value and items of Aboriginal cultural heritage significance), stakeholder engagement and consideration of the project infrastructure layout with the objective of maintaining an efficient project that avoids and minimises environmental impacts.

The modification area is shown on Figure 1.2 and encompasses an additional 127 ha across four parcels of land. All of this land is adjacent to existing areas within the approved development footprint. The modification area is currently primarily used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production.

### 1.1.2 Additional generation and storage capacity

Due to a shift in Australia's energy market needs, the accelerating retirement of large-scale coal fired power generation assets in NSW, the anticipated introduction of a capacity market mechanism, continuous improvements in BESS technology and associated capital cost reductions since the time of submitting the original development application, ACEN Australia proposes to increase the capacity of the on-site BESS. The additional capacity will allow the project to increase its energy storage potential, providing additional firming support and greater network system strength. The project will also be able to participate in the capacity market being contemplated at a national level by Energy Ministers through the Energy National Cabinet Reform Committee. To enable the proposed capacity increase, two additional parcels of land within the approved project boundary and development footprint will be used to house substation/BESS infrastructure, including battery-related grid connection assets (Figure 1.2). Both parcels of land are in the northern array and are immediately adjacent or close to the approved grid substation/BESS footprint.

As a result of the changes to the project boundary and development footprint, ACEN Australia is looking to optimise the project design to make use of the most constructible land areas. ACEN Australia may also use the land within the modification area to add additional capacity on the DC side of the solar plant, without changing the overall sent-out capacity of the project (ie 720 MW(AC)).

Subject to detailed design considerations, the modification area will be used to accommodate additional PV modules, without increasing the sent-out capacity. The additional PV modules will be used to change the electricity generation profile during the day, helping the project reach its maximum generation earlier in the day and maintaining this later in the day, without any change to the project's maximum output at any time. This will help deliver more energy when it is needed most by the market and consumers.

Depending on the configuration of the BESS, the additional DC-side solar generation capacity may also be used on-site to charge the additional BESS infrastructure without diverting solar plant output from the grid and thus help realise the project's energy storage potential.

### 1.1.3 Over-dimensional vehicle movements

Condition 1 of Schedule 3 of SSD-9255 restricts the number of over-dimensional and heavy vehicles that are generated by the project. ACEN Australia has identified that the approved maximum number of over-dimensional vehicle movements is not enough to facilitate the construction, upgrading and decommissioning of the project. ACEN Australia proposes to increase the number of over-dimensional vehicle movements by 15 (ie from 15 to 30).

### 1.1.4 Light and heavy vehicle movements

ACEN Australia has identified a need to increase the daily number of heavy vehicles during construction from 56 to 84 to support construction of the project in accordance with the project delivery schedule.

The project delivery schedule has been, and continues to be, impacted by both COVID-19 restrictions (including border closures, lockdowns and local case management) and inclement weather (including significant rainfall and flooding) resulting in extensions to construction timeframes. Increasing the daily number of heavy vehicles will accelerate construction timeframes by allowing for additional deliveries to site. This will enable concurrent work packages to operate across the development footprint and is expected to reduce the duration of the project's peak construction period.

The road upgrades ACEN Australia has delivered along Barleyfields Road and Big Ridge Road since the project was approved provide for a maximum capacity of up to 1,000 vehicles per day. Previous assessments forecast the daily volume of traffic, including local traffic and project-related traffic, as 971 along Barleyfields Road, and 671 along Big Ridge Road.

Project-related traffic was estimated to consist of 220 light vehicles and 56 heavy vehicles. To ensure that the overall level of daily traffic on Barleyfields Road remains at or below the capacity of 1,000 vehicles per day, daily light vehicles during construction will be reduced by 14 to account for the proposed increase in heavy vehicles. This will result in revised daily construction vehicles consisting of 206 light vehicles and 84 heavy vehicles.

### 1.1.5 Extension to construction hours

The project is being constructed in two stages. Stage 1 includes complete construction of the northern array area including the grid substation, while Stage 2 includes complete construction of the central array area and approved BESS infrastructure. Extending the project's construction hours will help to reduce the duration of peak construction periods associated with Stage 1 and Stage 2 and will allow ACEN Australia to efficiently utilise the project's existing construction workforce without increasing peak workforce numbers.

In accordance with Schedule 3, Condition 12 of SSD-9255, construction activities are currently limited to 7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm Saturday. It is proposed to increase construction hours to include 1 pm to 6 pm on Saturday afternoons. Activities that are inaudible at non-project related residences are also proposed to be undertaken outside of these times.

Examples of inaudible activities that may be carried out on-site include but may not be limited to PV module installation, bracket installation, rolling out cables, testing and commissioning, surveying and waste sorting.

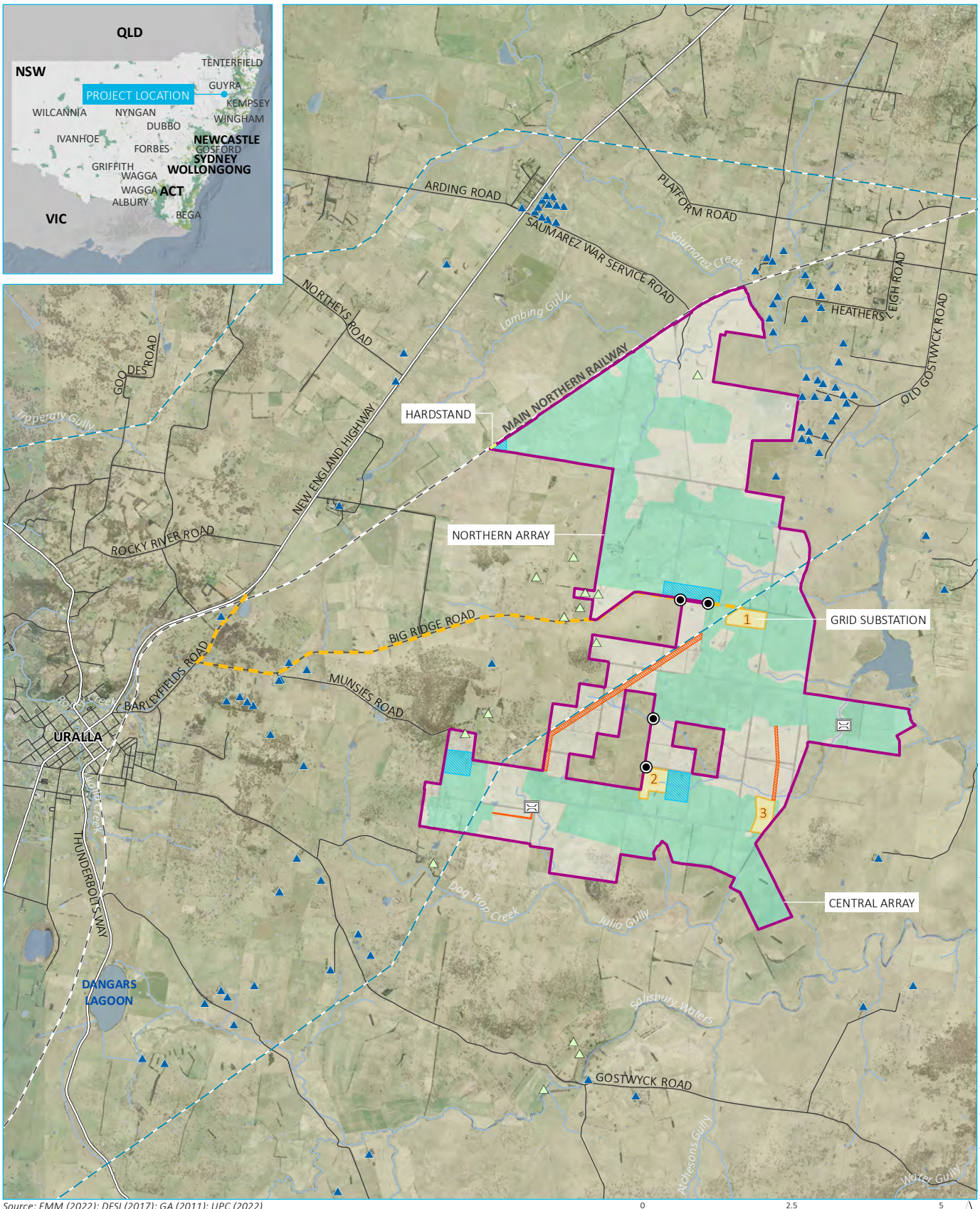
### 1.1.6 Changes to schedule of land

In addition to the changes to the project boundary and development footprint described in Section 1.1.1, amendments are required to the schedule of land to reflect the completion of the road upgrades ACEN Australia delivered along Barleyfields Road and Big Ridge Road and changes to cadastral boundaries within the project boundary.

## 1.2 Proponent

ACEN Australia (ACN 616 856 672) is the proponent for the modification. The relevant address is:

ACEN Australia Pty Ltd
Suite 2, Level 2, 13-17 Castray Esplanade
Hobart 7004 Tasmania




*Source: EMM (2022); DFSI (2017); GA (2011); UPC (2022)*

0 2.5 5 km

GDA 1994 MGA Zone 56

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KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

Sensitive receptors

- Project related
- Non-project related

- Project boundary *

Development footprint

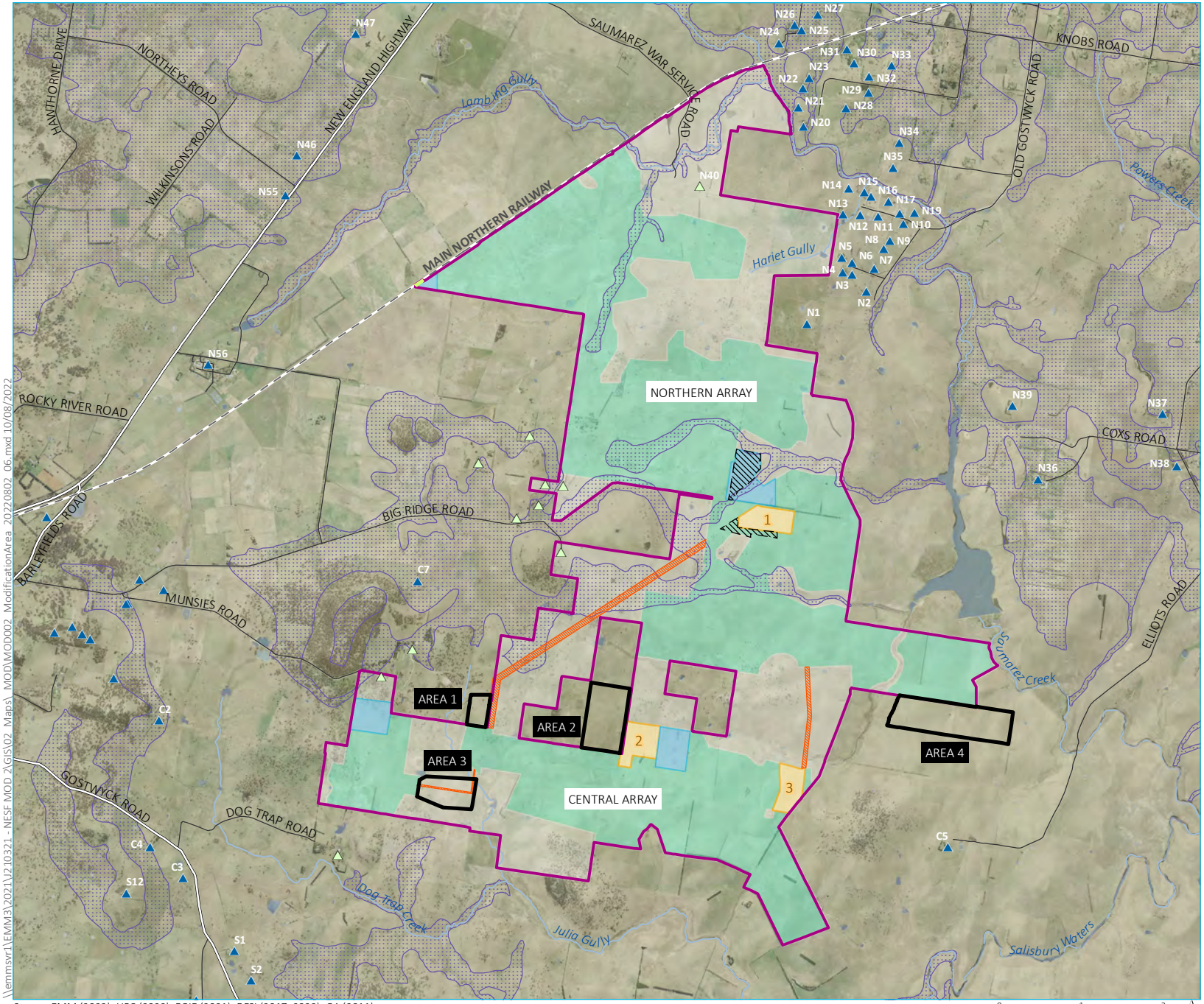
- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint (location number) **
- Hardstand in rail corridor
- Primary vehicle access route
- Potential creek crossing
- Proposed primary site access point

* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.
** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

# Location of New England Solar and Battery Project

New England Solar and Battery Project
Modification Report
Figure 1.1

EMM creating opportunities




KEY

- Project boundary *
- Modification area
- Additional substation/BESS footprint

Development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint **
- Hardstand in rail corridor

Sensitive receptors

- Project related
- Non-project related

Existing environment

- Rail line
- Major road
- Minor road
- Named watercourse
- Waterbody
- Biophysical Strategic Agricultural Land

* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

Modification area

Source: EMM (2022); UPC (2022); DPIE (2021); DFSI (2017, 2022); GA (2011)

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New England Solar and Battery Project
Modification Report
Figure 1.2

EMM creating opportunities

# 2 Strategic context

## 2.1 Site and surrounds

### 2.1.1 Regional context

The project will be developed within the Uralla Shire LGA. At its closest point, the project boundary is approximately 6 km east of the township of Uralla, and the northern array area starts approximately 8.6 km south of Armidale (Figure 1.1).

Uralla is the largest township in the Uralla Shire LGA, with a population of 2,728. It is also the Uralla Shire LGA's commercial and administrative centre. In addition to Uralla, a number of small villages also surround the two array areas, including Kellys Plains and Saumarez (north of the northern array area) and Gostwyck and Dangarsleigh (east and south of the central array area, respectively).

Major industries across Uralla, Tamworth and Armidale LGAs include beef-cattle farming, sheep farming, hospitals, teaching, administration and mining. Agriculture accounts for up to 50% of economic activity in some parts of Uralla Shire LGA, although Tamworth and Armidale LGAs have more diverse economies.

The project is in the New England REZ and there are a number of other renewable energy developments proposed in the vicinity of the project including Salisbury Solar Farm (proposed); Armidale BESS (proposed); Oxley Solar Farm (proposed); Metz Solar Farm (in construction); Thunderbolt Wind Farm (proposed); and Thunderbolt Solar Farm (proposed). The closest is Salisbury Solar Farm, which is approximately 2 km south of the central array area; however, the status of this project is not certain with SEARs issued for the project in 2019 and no subsequent assessment documentation published since that time.

### 2.1.2 Local context

The land in the development footprint is zoned RU1 Primary Production under the *Uralla Local Environmental Plan 2012 (*Uralla LEP) and is predominantly used for agricultural purposes. The project boundary encompasses 50 lots, the majority of which have been modified by historical land use practices and past disturbances associated with land clearing, cropping and intensive livestock grazing. Land uses surrounding the array areas are predominantly agricultural (ie livestock grazing). Cattle and sheep grazing for wool, breeding stock and meat dominate agricultural activities within the project boundary.

The landform pattern within and surrounding the development footprint can be described as a mix of low rolling hills and flatter areas that are frequently dissected by drainage networks and their adjacent flood plains, terraces and foot slopes. Elevation across the project boundary is variable at approximately 986–1,149 m.

There are 28 non-project related residences within 2 km of the development footprint, with 1 residence within 1 km of the development footprint (Figure 1.1).

### 2.1.3 Modification area

As outlined in Section 1.1, the modification area is approximately 127 ha and extends over four land parcels. The modification area is zoned RU1 Primary Production under the Uralla LEP and is freehold land owned by three of the existing project landholders. A revised schedule of lands for the project is provided in Appendix A.

The modification area will be accessed using the approved primary vehicle access route (ie New England Highway, Barleyfields Road (north) and Big Ridge Road). An internal road network will enable access from Big Ridge Road to the modification area during construction and operations.

The modification area is illustrated in Photograph 2.1 and Photograph 2.2.

**Photograph 2.1 View of modification area (Area 2)**

**Photograph 2.2 View of modification area (Area 3)**

## 2.2 Strategic planning framework

An overview of relevant policies, plans and strategies and how the project and the proposed modification align with these, is provided in Table 2.1.

**Table 2.1 Alignment with strategic planning framework**

| Plan, policy or strategy | Description | Alignment with strategic framework |
|---|---|---|
| **International context** | | |
| The Paris Agreement | The Paris Agreement is a legally binding international treaty on climate change adopted by 196 parties in 2015.<br>As a signatory to the agreement, the Australian Government has committed to reduce greenhouse gas emissions by 26%–28% on 2005 levels by 2030. | The project will contribute to meeting Australia's commitments under the Paris Agreement through annual greenhouse gas emissions reductions. Once operational, the project will contribute to annual greenhouse gas emission reductions in the order of 1–1.5 million tonnes per annum. This amount will be dependent on the electricity generating capacity of the project and the emissions intensity of the grid during the project's operations.<br>The proposed modification may help ACEN Australia to optimise the design, overbuild the DC-side of the PV plant and can hence improve the project's energy generation profile and in doing so would maximise potential greenhouse gas emission reductions. |

## Table 2.1 Alignment with strategic planning framework

| Plan, policy or strategy | Description | Alignment with strategic framework |
|---|---|---|
| **National context** | | |
| Large-scale Renewable Energy Target | The Australian Government Clean Energy Regulator administers the Large-scale Renewable Energy Target which incentivises investment in renewable energy power stations such as wind and solar farms.<br>The Large-scale Renewable Energy Target of 33,000 gigawatt hours of additional renewable electricity generation was met at the end of January 2021 (Clean Energy Regulator 2021).<br>The annual target will remain at 33,000 gigawatt hours until the scheme ends in 2030, notwithstanding, the Clean Energy Regulator expects large-scale renewable generation could reach up to 40,000 gigawatt hours by the end of 2021. | Once operational, the project is predicted to generate more than 2,000 gigawatt hours of electricity annually, which will make significant contributions towards meeting the Large-scale Renewable Energy Target in future years.<br>The proposed modification will provide ACEN Australia the option of optimising the project design and overbuilding the DC side of the PV plant which can improve the project's energy generation profile (as opposed to increasing its sent out capacity in MW). |
| *Integrated System Plan 2022* | The *Integrated System Plan 2022* (ISP) prepared by AEMO is a comprehensive roadmap for the NEM and is intended to guide the transformation of the NEM from fossil fuels to firmed renewables. | The project is within the New England REZ, which is identified within the ISP 2022.<br>The ISP 2022 notes that the New England REZ will install 5 GW by 2030, increasing to 10.4 GW by 2040 and is progressing under the NSW Electricity Infrastructure Roadmap.<br>The additional land areas proposed as part of the modification are adjacent to the site for an approved large-scale solar development and provide ACEN Australia the option of optimising the project design and overbuilding the DC side of the PV plant.<br>The additional storage capacity will allow the project to increase its energy storage potential, providing additional firming support and greater network system strength support. |
| Long-Term Emissions Reduction Plan | In 2021, the Australian Government (2021) released its Long-Term Emissions Reduction Plan to achieve net zero emissions by 2050. The Plan aims at reaching a net zero economy through a technology-based approach, whilst protecting relevant industries, regions and jobs. It is part of an overarching strategy for emission reduction, based on a technology-led approach, which encourages low emissions technology such as renewable energy generation and storage. | It is estimated that, once operational, the project will contribute to annual greenhouse gas emissions reductions in the order of 1–1.5 million tonnes per annum (Mtpa). This amount could increase as a result of the proposed modification.<br>The total greenhouse gas reduction potential of the project will be dependent on the electricity generating capacity of the project and the emissions intensity of the grid during the project's operations. |

## Table 2.1 Alignment with strategic planning framework

| Plan, policy or strategy | Description | Alignment with strategic framework |
|---|---|---|
| **State context** | | |
| *NSW Electricity Strategy 2019* | The NSW Electricity Strategy is the NSW Government's plan for a reliable, affordable and sustainable electricity future that supports a growing economy.<br>With four of NSW's five remaining coal-fired generators scheduled to close by 2035, starting with Liddell Power Station in 2023 (DPIE 2019), Eraring Power Station in 2025–2026 and Vales Point Power Station in 2028, the strategy outlines a reliable energy system which meets NSW's energy requirements and emission reduction targets.<br>The strategy and its enabling legislation the NSW *Electricity Infrastructure Investment Act 2020* supports the rolling out of REZs and the establishment of a Renewable Energy Zone body, (Energy Corporation of NSW) that will bring together investors and carry out early planning so benefits to local communities are maximised. | The project will contribute to the development of the New England REZ and assist in NSW's renewable energy generation and storage requirements, as well as the NSW Government's emissions reduction targets.<br>In order to enhance system reliability, utility-scale renewable energy generation must be complemented with storage. The proposed modification will increase the capacity of the on-site BESS, such that firm capacity can be provided on demand. For example, if fully built out, the BESS can be configured in a way that provides 4 hours of storage for a 700 MW solar farm.<br>The larger BESS also increases the project's contributions to system security and reliability through the provision of Frequency Control Ancillary Services and reactive power support. It will also enhance the project's capability to participate in the foreshadowed capacity market mechanism currently being considered by Energy Ministers for introduction in 2025. Expansion to 4 hours discharge capability will better match anticipated capacity market requirements for addressing lack of reserve (LOR) conditions.<br>The purpose of the BESS will not change as a result of the proposed modification; however, its capacity to support the network and the dispatchable capability of the project's energy generation profile will increase significantly. |
| *Net Zero Plan Stage 1: 2020–2030* | *Net Zero Plan Stage 1 2020–2030* (DPIE 2020a) outlines the NSW Government's plan to grow the economy and create jobs while helping the state to deliver a 35% cut in emissions compared to 2005 levels. | The project contributes to Priority 1 of the Plan: "Drive uptake of proven emissions reduction technologies that grow the economy, create new jobs or reduce the cost of living."<br>The New England REZ is also identified in the Plan as critical in replacing retiring coal fired generators in NSW.<br>The proposed modification will help ACEN Australia:<br>• optimise the project design and improve its energy generation profile;<br>• increase the project's storage capacity contributing to increased system security and reliability; and<br>• maximise potential greenhouse gas emission reductions from the project.<br>The proposed additional BESS infrastructure is likely to be built after the completion of Stage 1 and Stage 2 of construction and will extend the project's overall construction schedule therefore extending the project's construction workforce requirements. |

## Table 2.1 Alignment with strategic planning framework

| Plan, policy or strategy | Description | Alignment with strategic framework |
|---|---|---|
| **Local and regional context** | | |
| *New England North West Regional Plan 2036* | The intent of the *New England North West Regional Plan 2036* (DPE 2017) is to guide the NSW Government's land use planning priorities and decisions in the New England North West region to 2036.<br>One of the primary goals of the *New England North West Regional Plan 2036* is to diversify the region's economy. To achieve this goal, the plan identifies nine directions, one of which is to grow New England North West as the renewable energy hub of NSW.<br>The plan also establishes priorities for local councils within the New England North West Region to help achieve its overarching goals. One of the priorities identified for Uralla Shire Council is to investigate the potential for wind and solar production and encourage renewable energy opportunities. | The project will contribute to the diversification of the energy sector while strengthening the New England North West region's economy.<br>The proposed additional BESS infrastructure is likely to be built after the completion of Stage 1 and Stage 2 of construction and will extend the project's overall construction schedule therefore extending the project's construction workforce requirements.<br>This will prolong the project's direct and indirect economic benefits within local and regional economies. |
| *Uralla Shire Local Strategic Planning Statement 2021* | The *Uralla Shire Local Strategic Planning Statement* plans for the community's economic, social and environmental land use needs to 2040.<br>As identified within the statement, the Uralla Shire LGA is the prime location for the future generation of renewable energy and has been identified as one of the key renewable energy precincts in NSW under the *New England North West Regional Plan 2036*.<br>The continued growth of the renewable energy sector over the next 20 years presents opportunities for Uralla Shire LGA; however, this development needs to be managed to minimise adverse impacts on the local environment and agricultural productivity. | The project will contribute to Planning Priority 5.1 of the *Uralla Shire Local Strategic Planning Statement* (ie to support and manage rural landscapes) and will support the growth of the renewable energy sector within the Uralla Shire LGA. Where possible, the modification area has been sited to minimise impacts on:<br>• biodiversity;<br>• Aboriginal cultural and historical heritage;<br>• productive agricultural land; and<br>• neighbouring residents (including consideration of noise and visual amenity impacts).<br>The additional BESS footprints are within the approved project boundary and development footprint. Therefore, no impacts on biodiversity, Aboriginal cultural and historical heritage or productive agricultural land will occur (ie beyond those that have already been assessed and approved as part of SSD-9255). |

# 3 Proposed modification

## 3.1 Modification summary

A comparison between the approved project and the proposed modification is provided in Table 3.1 and an updated project description is provided in Appendix B.

**Table 3.1 Comparison of approved project and proposed modification**

| Element | Approved project | Proposed modification |
|---|---|---|
| Project boundary | Area of 3,362 ha as shown in Appendix 1 of SSD-9255. | 3,646 ha as shown on Figure 1.2. |
| Development footprint | Area of 2,060 ha as shown in Appendix 1 of SSD-9255. | 2,188 ha as shown on Figure 3.1. |
| Targeted capacity (solar) | 720 MW(AC) | No change to the sent-out capacity (AC).<br>The additional land may allow for an increase in the installed DC-side PV capacity, which allows for the generation profile to be improved, without increasing the total sent out capacity at the grid connection point.<br>To achieve this capacity, PV modules and associated infrastructure will be installed within the modification area (Figure 1.2). |
| Capital investment value | Estimated value of up to $768 million. | Estimated value of up to $1.268 billion. |
| PV modules | Based on a 720 MW (AC) facility, 30% oversizing and 400 W panels, it is anticipated that there will be approximately 2.4 million PV modules. | No change.<br>Note: Due to technology advancements, module outputs are increasing rapidly meaning that the total number of PV modules is unlikely to increase. |
| Power conversion units (PCUs) | Should the Ingeteam 5 MW PCU block be utilised, it is anticipated that there will be approximately 150 PCUs. | No change.<br>Note: Due to technology advancements and conservative estimates within the EIS, the total number of PCUs is unlikely to increase. |
| Targeted capacity (BESS) | 200 MW(AC) two-hour energy storage. | 1,400 MW(AC) two-hour energy storage or 700 MW(AC) four-hour energy storage.<br>To achieve this capacity, additional land within the approved project boundary and development footprint will be used to house BESS infrastructure (Figure 1.2). |
| Battery enclosure height | Small enclosure facility: 2.9 m<br>Cabinet facility: 2.3 m<br>Large buildings: 5.5 m | Small enclosure facility: 3.8 m<br>Cabinet facility: 3.8 m<br>Large buildings: 7.5 m |
| Grid connection | New cut-in and grid substation connected to Transgrid's 330 kV transmission line. | No change. |

## Table 3.1 Comparison of approved project and proposed modification

| Element | Approved project | Proposed modification |
|---|---|---|
| Construction duration | Construction of the project anticipated to take approximately 36 months from the commencement of site establishment works to commissioning of the two array areas. | Construction of the additional BESS infrastructure is anticipated to extend the overall duration of construction.<br>It is anticipated that the construction of the additional BESS infrastructure will be in stages and the duration will be dependent on the timing of the development of the New England REZ and associated infrastructure as well as the market need. |
| Construction staging | Stage 1 includes complete construction of the northern array area including the grid substation and is anticipated to take approximately 25 months to complete.<br>Stage 2 includes complete construction of the central array area and is anticipated to take approximately 20 months to complete. Stage 2 also includes the construction of the BESS, which is also anticipated to take approximately 20 months to complete.<br>Stage 2 will commence approximately 12 months after the commencement of site establishment works planned as part of Stage 1. | No change to Stage 1 and Stage 2; however, it is anticipated that the additional BESS infrastructure will be built in stages after the completion of Stage 2 (subject to the development of the New England REZ and associated infrastructure and market need). The timing of the additional BESS construction is also likely to be influenced by the staged retirement of coal-fired generation capacity in NSW.<br>The additional heavy vehicle movements and extended construction hours are likely to reduce the duration of the peak construction periods associated with Stage 1 and Stage 2. |
| Construction workforce | The project will require a peak construction workforce of up to 700 people. | No change.<br>The additional BESS stages that are contemplated post Stage 1 and Stage 2 of the solar farm will result in relatively smaller numbers of workers than the peak solar farm construction workforce. |
| Over-dimensional and heavy vehicle restrictions | The project will not generate more than:<br>• 56 heavy vehicle movements a day during construction, upgrading and decommissioning;<br>• 15 over-dimensional vehicle movements during construction, upgrading and decommissioning[1];<br>• 5 heavy vehicle movements a day during operations; or<br>• on the public road network. | The project will not generate more than:<br>• 84 heavy vehicle movements a day during construction, upgrading and decommissioning;<br>• 30 over-dimensional vehicle movements during construction, upgrading and decommissioning;<br>• 5 heavy vehicle movements a day during operations; or<br>• on the public road network. |
| Operational lifespan | The project will operate for in the order of 30 years. | No change. |
| Operations workforce | The project will require a workforce of up to 15 full-time equivalent personnel during operations. | No change. |
| Site access | All vehicles associated with the project must travel to and from the site via the New England Highway, Barleyfields Road (north), Big Ridge Road and two site access points off Big Ridge Road (Figure 1.1). | No change. |
| Decommissioning | Once the project reaches the end of its investment and operational life, project infrastructure will be decommissioned and the development footprint returned to its pre-existing land use, namely suitable for grazing of sheep and cattle, or another land use as agreed by the project owner and the landholder at that time. | No change. |

Notes: 1. Condition 1 of Schedule 3 of SSD-9255 was amended by the Planning Secretary on 28 January 2022 to increase the maximum number of over-dimensional vehicle movements during construction, upgrading and decommissioning from 6 to 15.

## 3.2 Changes to project boundary and development footprint

The project boundary and development footprint will be extended to accommodate the modification area (Figure 3.1). The additional lot and DPs that will be included in Appendix 2 of SSD-9255 and their land ownership status is provided in Table 3.2. The locations of the lot and DPs are provided on Figure 3.2.

**Table 3.2 Additions to the schedule of land**

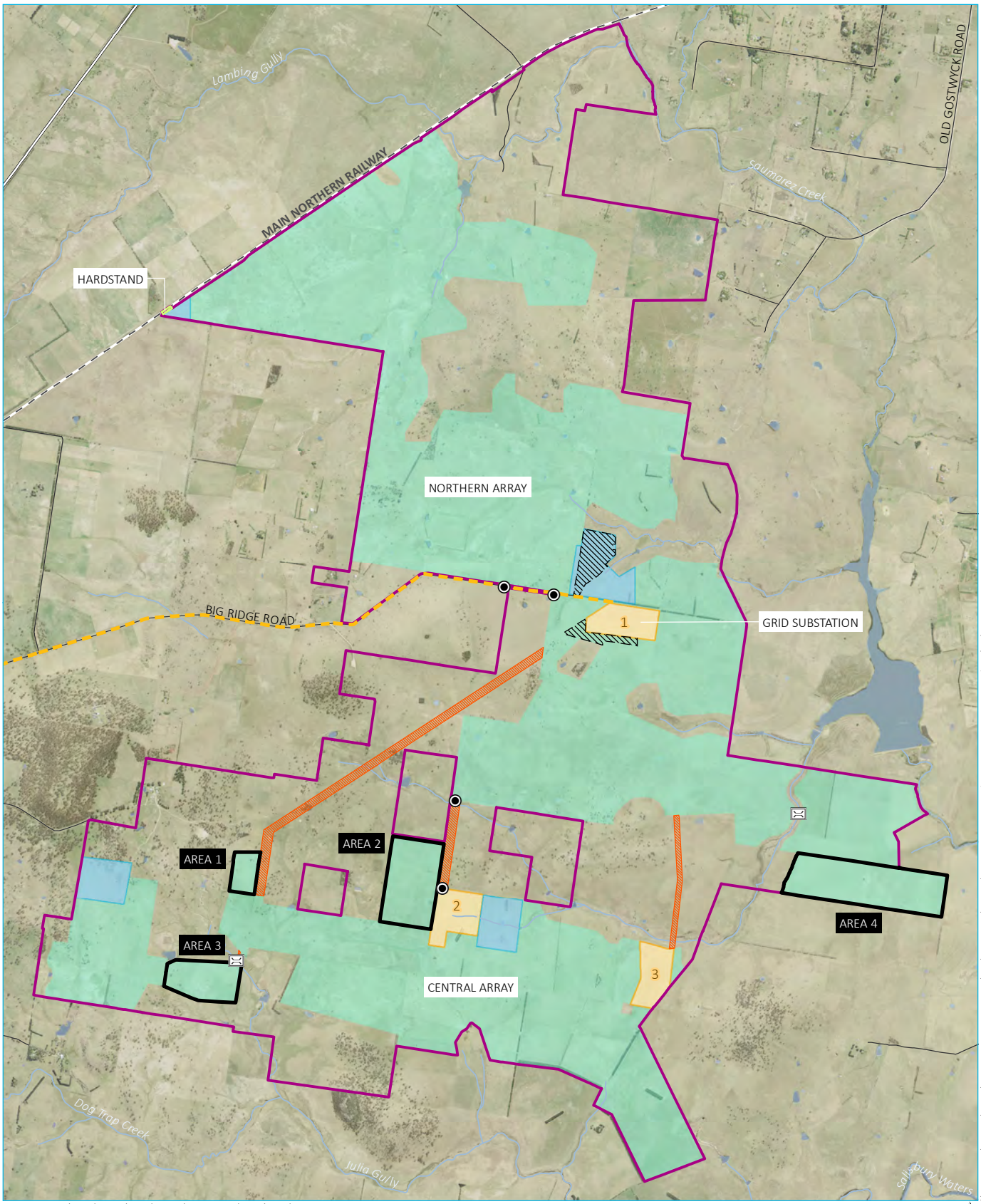
| Lot/DP | Modification area[1] | Land owner |
|---|---|---|
| 150/755827 | 1 | Private |
| 120/755827 | 2 | Private |
| 112/755827 | 2 | Private |
| 119/755827 | 2 | Private |
| 101/1262005 | 3[2] | Private |
| 36/755827 | 4 | Private |
| 2/127778 | 4 | Private |
| 1/319048 | 4 | Private |
| 5/1254486 | 4 | Private |
| 3/127777 | 4 | Private |

Notes: 1. Parcels of land that already form part of the approved schedule of land are not listed in Table 3.2.
2. Lot 101 of DP 1262005 replaces Lot 183 of DP 755827, which previously formed part of the approved schedule of land.

The land within the modification area will form part of the project boundary and development footprint and will predominantly be used to house photovoltaic (PV) modules, power conversion units (PCU) and the medium voltage cable reticulation network. Operations and maintenance infrastructure and internal roads may also be installed within the modification area.

The proposed modification will increase the extent of:

- the project boundary by approximately 284 ha to 3,646 ha (an increase of approximately 8.4%); and
- the development footprint by approximately 127 ha to 2,188 ha (an increase of approximately 6.2%).




Source: EMM (2022); UPC (2022); DFSI (2017, 2022); GA (2011)

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KEY

- Proposed project boundary *
- Modification area
- Additional substation/BESS footprint

Proposed development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint **
- Hardstand in rail corridor
- Primary vehicle access route
- Potential creek crossing
- Proposed primary site access point

Existing environment

- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

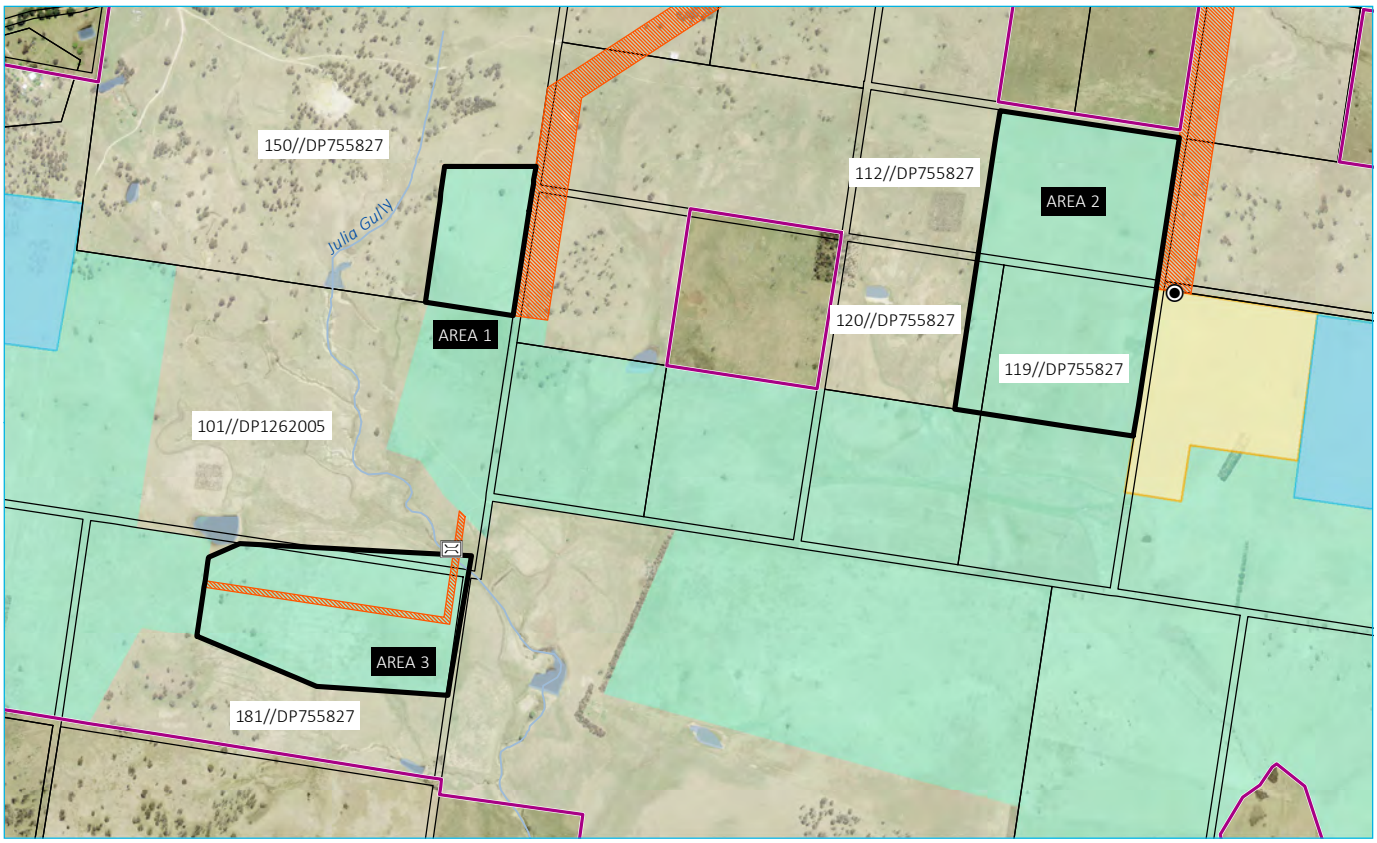
* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

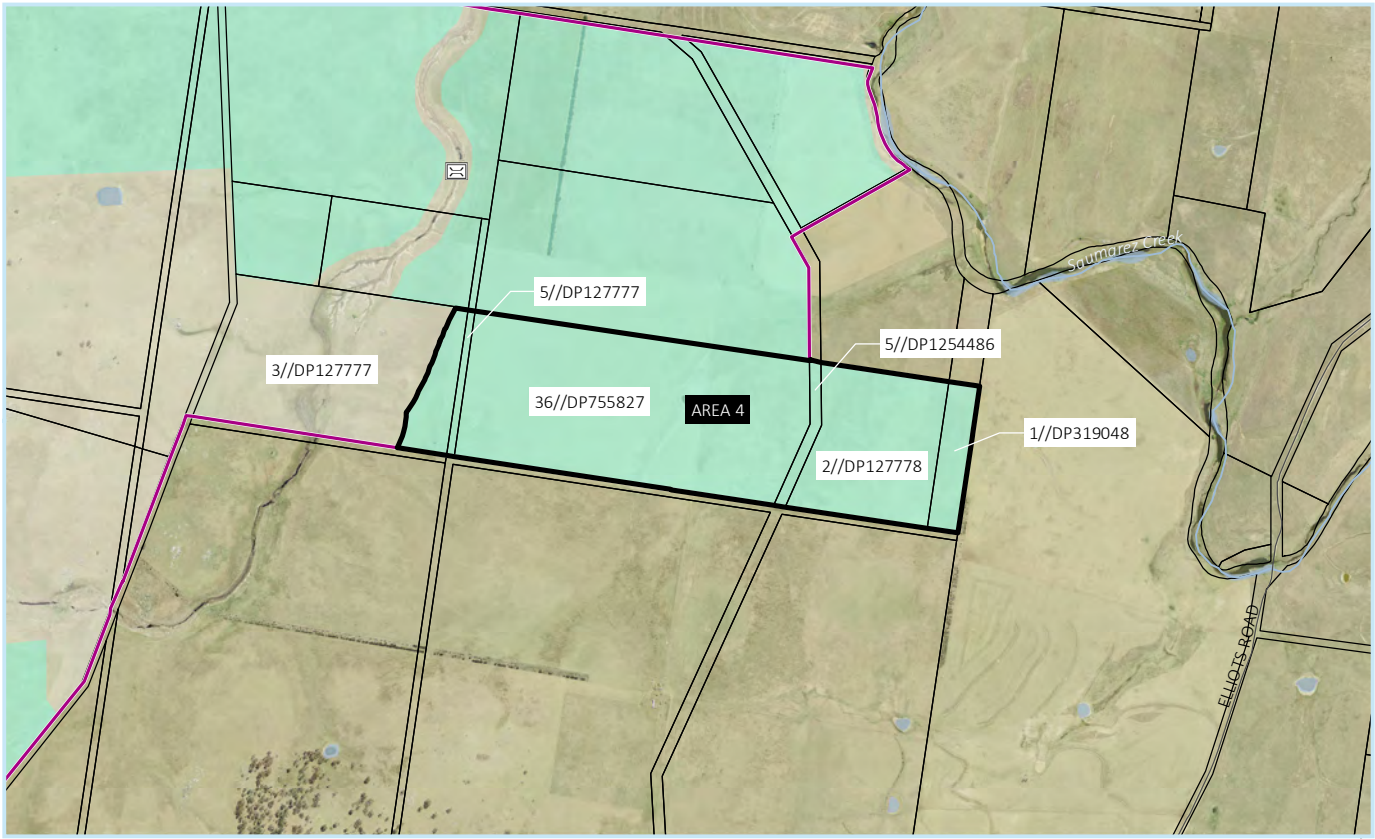
** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

# Proposed project boundary and development footprint

New England Solar and Battery Project
Modification Report
Figure 3.1

EMM creating opportunities




*Source: EMM (2022); UPC (2021); DFSI (2017, 2022); GA (2011)*

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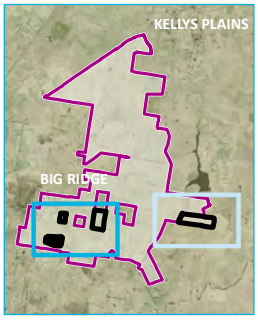


KEY

- Proposed project boundary
- Modification area

Proposed development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint
- Potential creek crossing
- Proposed primary site access point

Existing environment

- Minor road
- Named watercourse
- Waterbody
- Cadastral boundary

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# Additional land parcels within the modification area

New England Solar and Battery Project
Modification Report
Figure 3.2

EMM creating opportunities

## 3.3 Additional energy generation and storage capacity

As a result of the changes to the project boundary and development footprint, ACEN Australia also proposes to increase the electricity generating capacity of the project on the DC-side of the solar plant, that is the solar PV modules capacity, pre-conversion from DC to AC power using the inverters within the PCUs. There will be no change to the sent-out capacity at the grid connection point.

ACEN Australia is currently working with its contractors to optimise the project design. The additional land areas proposed as part of the modification may be utilised to either:

- improve constructability (ie swapping less favourable land within the approved development footprint for land within the modification area); and/or
- add capacity on the DC-side of the PV system.

In future stages of the BESS, if approved, and depending on the way that the additional battery storage capacity is coupled to the connection assets, the additional DC-side generation capacity can be used on-site to charge the additional BESS infrastructure and help realise the project's energy storage potential.

SSD-9255 currently allows for the construction and operation of a BESS. Although not specified in the consent conditions, the *New England Solar Farm Environmental Impact Statement* (EIS) (EMM 2019a) and assessment documentation nominated a BESS capacity of up to 200 MW (AC) two-hour energy storage.

The specific design details for the BESS and their respective enclosure types were not confirmed as part of the EIS and assessment documentation; however, it was anticipated that the BESS for the project would consist of either one BESS facility at the grid substation or two BESS facilities (one at the grid substation and one at the internal solar array substation, should one be needed at the central array). Each of these footprints are identified in Figure 1.1.

ACEN Australia proposes to increase the capacity of the on-site BESS to 1,400 MW(AC) two-hour energy storage or 700 MW(AC) four-hour storage. The final design configuration of the BESS will be driven by market conditions at the time of construction and is partly linked to the retirement of dispatchable generation in the NSW energy mix (ie coal-fired generators). To enable the proposed capacity increase, two additional parcels of land within the approved project boundary and development footprint will be used to house BESS infrastructure (Figure 1.2). Both parcels of land are in the northern array and are close to the approved grid substation and BESS footprint.

Consistent with Section 2.3.4 of the EIS (EMM 2019a), the BESS will be housed within either a number of small enclosures/cabinets (ie containers or outdoor racks) or larger battery buildings (ie racks in dedicated use buildings). Based on an indicative design, it is anticipated that the height of the battery enclosures/cabinets will be approximately 3.8 m, whilst the height of the dedicated use buildings will be approximately 7.5 m.

These dimensions should be considered indicative only. Exact dimensions will be refined during detailed design. The additional BESS footprints presented on Figure 1.2 provide adequate flexibility for design and siting of the applicable BESS at each location.

The major components for each BESS will be generally aligned with the information presented in Section 2.3.4 of the EIS (EMM 2019a) and include:

- Batteries – the specific battery module manufacturer and model has not been selected; however, it will likely be a type of lithium-ion battery similar to the LG Chem Lithium Nickel Manganese Cobalt Oxide (NMC) 2-hour energy module or Tesla Powerpack 2-hour solution.
- Inverters – the inverters will likely be similar to those used within the array areas as part of the PCUs. An alternative arrangement may be required whereby the inverters would be positioned adjacent to the battery cabinets, with the transformers and switchgear separate to this.

- Transformers – within the BESSs, there will be two types of transformers, namely a low voltage to medium voltage transformer and a medium voltage to high voltage transformer. The configuration of the transformers will be subject to the type of batteries used and the BESS configuration.

- Heating ventilation air conditioning (HVACs) – one of three types of HVAC will likely be used as part of the BESS to maintain the batteries at a temperature that will optimise their lifetime and performance. This includes: small package units; large chillers or a liquid cooling system (should the battery cabinet configuration be installed).

- Fire protection – the shipping container/prefabricated switch room structures and large building BESS configurations will have active gas-based fire protection systems. Within each of the potential enclosures, there will be thermal sensors and smoke/gas detectors connected to a fire control panel. Note that the Tesla cabinet facilities would not have this feature as the inherent design minimises risk of a fire spreading from one cabinet to another.

The components described above will be similar for each of the BESS structures likely to be constructed as part of the project. As noted above, the specific design details for the BESS have not been confirmed and will not be known until the completion of the detailed design.

## 3.4 Over-dimensional vehicle movements

Condition 1 of Schedule 3 of SSD-9255 restricts the number of over-dimensional vehicles that are generated by the project. ACEN Australia has identified that the approved maximum number of over-dimensional vehicle movements is not enough to facilitate the construction, upgrading and decommissioning of the project.

Condition 1 of Schedule 3 of SSD-9255 was already amended by the Planning Secretary on 28 January 2022 to increase the maximum number of over-dimensional vehicle movements during construction, upgrading and decommissioning from 6 to 15.

ACEN Australia proposes to increase the number of over-dimensional vehicle movements by 15 (ie from 15 to 30). The proposed increase in the maximum number of over-dimensional vehicle movements will enable the delivery and removal of:

- major equipment associated with the grid substation;

- large civil plant; and

- prefabricated buildings.

The proposed increase in the maximum number of over-dimensional vehicle movements has been discussed with Transport for NSW (TfNSW) and Uralla Shire Council and no objections were raised. An assessment of the potential impacts of the proposed modification on the local and regional road network is provided in Table 6.14.

## 3.5 Light and heavy vehicle movements

Condition 1 of Schedule 3 of SSD-9255 restricts the number of daily heavy vehicles that are generated by the project. ACEN Australia proposes to increase the number of daily heavy vehicle movements by 32 (ie from 56 to 84) for the duration of construction.

As part of the preparation of the EIS (EMM 2019a) and *New England Solar Farm Amendment Report* (AR) (EMM 2019b), project-related traffic was estimated to consist of 220 light vehicles and 56 heavy vehicles per day.

To ensure that the overall level of daily traffic on Barleyfields Road remains at or below the design capacity of 1,000 vehicles per day, daily light vehicles during construction will be reduced by 14 to account for the proposed increase in heavy vehicles. This will result in revised daily construction vehicles consisting of 206 light vehicles and 84 heavy vehicles.

## 3.6 Extension to construction hours

In accordance with Schedule 3, Condition 12 of SSD-9255, construction activities are currently limited to 7.00 am to 6.00 pm Monday to Friday and 8.00 am to 1.00 pm Saturday. It is proposed to increase construction hours to include 1.00 pm to 6.00 pm on Saturday afternoons. Activities that are inaudible at non-project related residences are also proposed to be undertaken outside of these times.

## 3.7 Changes to schedule of land

In addition to the changes to the project boundary and development footprint described in Section 3.2, amendments are required to the schedule of land to reflect the completion of the road upgrades ACEN Australia delivered along Barleyfields Road and Big Ridge Road and changes to cadastral boundaries within the project boundary. Lot/DPs to be amended within the schedule of land and justification for this is provided in Table 3.3.

**Table 3.3 Amendments to schedule of land**

| Lot/DP | Amendment required | Justification |
|---|---|---|
| 7001/1072093 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 1/587246 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 3/109536 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 203/755814 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 1/1015933 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 1/1026550 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 207/755814 | Remove from schedule of land | Associated with road upgrades, which are now complete.<br>This lot has since been amalgamated into Lot 22 of DP 1286357, for which landowner's consent has been provided (refer below). |
| 216/755814 | Remove from schedule of land | Associated with road upgrades, which are now complete.<br>This lot has since been amalgamated into Lot 22 of DP 1286357, for which landowner's consent has been provided (refer below). |
| 170/755814 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 2/587246 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 204/755814 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 1/1005647 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 300/1036398 | Remove from schedule of land | Associated with road upgrades, which are now complete. |
| 206/755814 | Remove from schedule of land | Associated with road upgrades, which are now complete.<br>This lot has since been amalgamated into Lot 22 of DP 1286357, for which landowner's consent has been provided (refer below). |

**Table 3.3 Amendments to schedule of land**

| Lot/DP | Amendment required | Justification |
|---|---|---|
| 201/755814 | Remove from schedule of land | Associated with road upgrades, which are now complete.<br>This lot has since been amalgamated into Lot 22 of DP 1286357, for which landowner's consent has been provided (refer below). |
| 202/755814 | Remove from schedule of land | This lot has been amalgamated into Lot 22 of DP 1286357, for which landowner's consent has been provided (refer below). |
| 82/755814 | Remove from schedule of land | This lot has been amalgamated into Lot 22 of DP 1286357, for which landowner's consent has been provided (refer below). |
| 22/1286357 | Add to schedule of land | This recently formed lot partly encompasses land within the approved project boundary. Landowner's consent has been provided. |

## 3.8 Other amendments to the project (as approved by the Secretary)

In consultation with DPE, ACEN Australia has made the following amendments to the project outside of the modification process:

- Condition 1 of Schedule 3 of SSD-9255 was amended by the Planning Secretary on 28 January 2022 to increase the maximum number of over-dimensional vehicle movements during construction, upgrading and decommissioning from 6 to 15.
- Additional pre-construction works (including installation of fencing, a revised temporary site compound and additional access points for the substation, switchyard and operations and maintenance buildings) were approved by DPE on 18 June 2021. These works have been undertaken within the approved development footprint and did not result in any additional impacts beyond those already assessed and approved for the project. The temporary site compound is housed within the 'laydown area/site compound' shown in the northern array area on Figure 1.2.
- Condition 10 of Schedule 2 of SSD-9255 allows ACEN Australia to subdivide the land within the project boundary to create new allotments for the grid substation. As part of detailed design, ACEN Australia has amended the indicative subdivision location and therefore the subdivision plan in Appendix 3 of SSD-9255 needs to be updated. ACEN Australia submitted detailed subdivision plans to DPE on 31 May 2022.

Where relevant, these changes are acknowledged within this report.

## 3.9 Environmental management strategy

ACEN Australia has an established environmental management strategy (EMS), which provides the strategic framework for environmental management of the project's construction and ongoing operations. This EMS provides a framework to ensure the effective management of environmental issues and compliance with regulatory requirements for all activities and areas managed by ACEN Australia. It also provides a means for continued improvements in environmental performance.

A consolidated summary of the management measures that will be implemented during the construction and operation of the project is provided in Appendix C.

As part of the EMS, a comprehensive set of environmental management plans have been developed. These plans will be reviewed and updated, as necessary, to reflect the proposed modification.

## 3.10 Conditions of consent

The following amendments to SSD-9255 are required to reflect the proposed modification:

- Condition 1 of Schedule 3 of SSD-9255 – amend heavy vehicle movements during construction, upgrading and decommissioning from 56 to 84.
- Condition 1 of Schedule 3 of SSD-9255 – amend over-dimensional vehicle movements during construction, upgrading and decommissioning from 6 to 30.
- Condition 10 of Schedule 3 of SSD-9255 – amend ecosystem credit requirements to align with the additional credits triggered by the inclusion of the modification area in the development footprint.
- Condition 11 of Schedule 3 of SSD-9255 – amend on-site construction, upgrading and decommissioning hours to:

  a) 7.00 am to 6.00 pm Monday to Friday;

  b) 8.00 am to 6.00 pm Saturdays; and

  c) at no time on Sundays and NSW public holidays.

  The following construction activities may be undertaken outside these hours without the approval of the Secretary:

  - activities that are inaudible at non-project related residences;
  - the delivery of materials as requested by the NSW Police Force or other authorities for safety reasons; or
  - emergency work to avoid the loss of life, property and/or material harm to the environment.
- Appendix 1 (general layout of development) – amend project boundary and development footprint and include additional BESS footprint.
- Appendix 2 (schedule of land) – amendments to the schedule of land including:
  - addition of 10 land parcels associated with the modification area (Table 3.2);
  - removal of 15 land parcels associated with the completed road upgrades (Table 3.3);
  - removal of 2 land parcels associated with changes to cadastral boundaries within the project boundary (Table 3.3); and
  - addition of 1 land parcel associated with changes to cadastral boundaries within the project boundary (Table 3.3).
- Appendix 5 (Aboriginal heritage items) – addition of Aboriginal heritage items to Table 1 and Table 2 and update project boundary, development footprint (including additional BESS footprint) and sites on supporting figure.
- Appendix 6 (historic heritage items) – update project boundary, development footprint (including additional BESS footprint) and sites on supporting figure.

# 4 Statutory context

## 4.1 Introduction

This chapter describes the relevant Commonwealth and State legislation and regulatory framework under which the proposed modification will be assessed and determined.

## 4.2 Commonwealth legislation

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (formerly the Commonwealth Department of Agriculture, Water and the Environment (DAWE)). It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined as 'matters of national environmental significance' (MNES). If significant impacts are considered likely, and the action is deemed to be a 'controlled action', the proponent may be asked to provide further information about the proposal.

An assessment of the impacts of the project on MNES, considering cumulative impacts of the construction of the project and the proposed road upgrades was prepared as part of the preparation of the EIS (EMM 2019a) and AR (EMM 2019b). This included assessments of significance for entities which were either recorded or considered as having potential to occur, including:

- One Critically Endangered Ecologically Community (CEEC) – White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and derived native grassland.
- Two vulnerable plant species – Bluegrass (*Dicanthium setosum*) and Austral Toadflax (*Thesium austral*).
- Two critically endangered fauna species – Regent Honeyeater (*Anthochaera phrygia*) and Swift Parrot (*Lathamus discolor*).
- Two vulnerable fauna species – Painted Honeyeater (*Grantiella picta*) and Koala (*Phascolarctos cinereus*).
- Two migratory species – Fork-tailed Swift (*Apus pacificus*) and White-throated Needletail (*Hirundapus caudacutus*).

All assessments concluded that no significant impacts on threatened entities are predicted to result from the project and, subsequently, referral of the project to the Commonwealth Minister for the Environment for assessment was not required.

No threatened or migratory species are anticipated to occur within the modification area given a lack of suitable habitat. Plant community type (PCT) 510 can be aligned with White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and derived native grassland; however, the community within the modification area is considered too degraded and does not meet the listing. As such, the proposed modification will not have a significant impact on any MNES as listed in the EPBC Act and consequently has not been referred to DCCEEW.

## 4.3 NSW State legislation

### 4.3.1 NSW Environmental Planning and Assessment Act 1979

#### i Section 4.55(2) modification

The project was approved, subject to conditions, by the IPC on 9 March 2020 (SSD-9255). ACEN Australia is seeking to modify SSD-9255 under Section 4.55(2) of the EP&A Act. Compliance of the proposed modification with the requirements of Section 4.55(2) is summarised in Table 4.1.

**Table 4.1 Compliance with Section 4.55(2) requirements**

| Section 4.55 (2) requirements | Comment |
|---|---|
| It is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and | The proposed modification is consistent with the objectives of SSD-9255, being the construction and operation of a solar and BESS project.<br>A comparison between the project as approved originally and the project as proposed to be modified is provided in Table 3.1 and demonstrates that the modified project is materially the same as that which was originally approved.<br>The proposed modification:<br>• does not involve an additional and distinct use beyond what was contemplated by SSD-9255; and<br>• the assessment of environmental impacts in Chapter 6 demonstrates that:<br>– the proposed modification will not significantly change the project's impacts on the environment and has limited impacts to biodiversity, Aboriginal cultural heritage and historic heritage beyond those approved by SSD-9255;<br>– the proposed modification will not significantly change the project's impacts on non-project related residences and has limited amenity impacts (in terms of visual, traffic and construction and operational noise) beyond those approved by SSD-9255; and<br>– where required, additional management and mitigation measures have been proposed to address potential impacts.<br>SSD-9255 was granted in 2020, prior to the declaration of the New England REZ. The proposed modification will enable the project to increase its storage capacity, further contributing to the potential capacity of the New England REZ.<br>The revisions to the project boundary and development footprint (to include the modification area) represent an increase of 8.4% and 6.2%, respectively. As part of the preparation of this modification report, ACEN Australia has refined the modification area to minimise impacts on planted and remnant native vegetation, paddock trees and Aboriginal cultural heritage sites.<br>The additional BESS footprints are within the approved project boundary and development footprint and will maximise the energy storage potential of the project. No impacts on biodiversity, Aboriginal cultural and historical heritage or productive agricultural land will occur (ie beyond those that have already been assessed and approved as part of SSD-9255).<br>The road upgrades ACEN Australia delivered along the vehicle access route (ie Barleyfields Road and Big Ridge Road) provide for a capacity of up to 1,000 vehicles per day. The proposed increase in the number of heavy and over-dimensional vehicle movements can be made without exceeding this capacity and annual average daily traffic across the vehicle access route will remain within the intended design capacity of 1,000 vehicles.<br>The proposed additional heavy vehicle movements and extended construction hours will help to reduce the duration of peak construction periods associated with Stage 1 and Stage 2, reducing the project's impacts on local accommodation availability. |

### Table 4.1 Compliance with Section 4.55(2) requirements

| Section 4.55 (2) requirements | Comment |
|---|---|
| It has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and | ACEN Australia has consulted with NSW Department of Planning and Environment (DPE) as part of the preparation of this modification report. DPE confirmed the approval pathway for the modification is by way of Section 4.55(2) of the EP&A Act. Further consultation information is provided in Chapter 5. |
| It has notified the application in accordance with:<br>• the regulations, if the regulations so require, or<br>• a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and | Clause 106 of the NSW Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) relates to the notification requirements associated with Section 4.55(2) modifications for SSD.<br>Notice of the application must be published on DPE's website. DPE must also cause notice of the modification application to be given to each person who made a submission in relation to the original development application.<br>This modification report will be placed on public exhibition by DPE. |
| It has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be. | Any submissions made concerning the proposed modification will be reviewed by DPE and forwarded to ACEN Australia to consider and respond to (via a submissions report). |

#### ii Matters for consideration

Modification applications under Section 4.55(2) of Division 4.9 of the EP&A Act are required to take into consideration the relevant matters referred to in Section 4.15 of the EP&A Act which include:

(a) the provisions of:

(i) any environmental planning instrument, and

(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and

(iii) any development control plan, and

(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and

(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), and

(v) (Repealed)

that apply to the land to which the development application relates,

(b) the likely impacts of that development, including environmental impacts on both the natural and built environment, and social and economic impacts in the locality,

(c) the suitability of the site for the development,

(d) any submissions made in accordance with this Act or the regulations,

(e) the public interest.

Matters a (i) and (iv) have been addressed in the following sections of this chapter. Matters (b) to (e) are addressed in Chapters 6 and 7.

### 4.3.2 NSW Environmental Planning and Assessment Regulation 2021

In accordance with Clause 99 of the EP&A Regulation, this modification report has been prepared in the approved form, contains all of the information and documents required by the approved form, the EP&A Act and the EP&A Regulation and will be submitted on the NSW Planning Portal. As the project is SSD, this modification report also includes the particulars of the nature of the proposed modification (Chapter 3) and has regard to *State Significant Development Guidelines – Preparing a Modification Report* (DPIE 2021a).

Clause 100 of the EP&A Regulation states the required information a modification application under Section 4.55(2) of the EP&A Act must include. An outline of where this information has been addressed is provided in Table 4.2.

**Table 4.2 EP&A Regulation Clause 100 information requirements**

| Clause 100 information requirement | Where addressed |
|---|---|
| The name and address of the applicant. | Section 1.2 |
| A description of the development that will be carried out under the development consent. | Chapter 3 |
| The address and folio identifier of the land on which the development will be carried out. | Appendix A |
| Be lodged on the NSW planning portal. | This modification report will be lodged on the NSW planning portal. |
| Whether the modification is intended to—<br>(i) merely correct a minor error, misdescription or miscalculation; or<br>(ii) have another effect specified in the modification application. | Chapter 3 |
| A description of the expected impacts of the modification. | Chapter 6 |
| An undertaking that the modified development will remain substantially the same as the development originally approved. | Table 4.1 |
| For a modification application that is accompanied by a biodiversity development assessment report—the biodiversity credits information. | Section 6.1.3 |
| If the applicant is not the owner of the land—a statement that the owner consents to the making of the modification application. | Landowner's consent will be provided separately to this modification report. |
| Whether the modification application is being made to—<br>(i) the Court under the Act, Section 4.55; or<br>(ii) the consent authority under the Act, Section 4.56. | The consent authority for the modification application will be the Minister for Planning or the IPC. |

### 4.3.3 Other relevant NSW State legislation and planning instruments

An outline of other relevant NSW State legislation and planning instruments is provided in Table 4.3.

**Table 4.3 Other relevant NSW State legislation**

| NSW legislation | Comment |
|---|---|
| NSW *Protection of the Environment Operations Act 1997* (POEO Act) | The POEO Act is the principal NSW environmental protection legislation and is administered by the NSW Environment Protection Authority (EPA). Section 48 of the POEO Act requires an environment protection licence (EPL) to undertake scheduled activities at a premise. Scheduled activities are defined in Schedule 1 of the POEO Act. The project involves the generation of electricity from solar energy, which is not a scheduled activity and therefore an EPL is not required. |
| NSW *Rural Fires Act 1997* (RF Act) | The main objectives of the RF Act are to:<br>• prevent, mitigate and suppress bush and other fires in NSW;<br>• co-ordinate bushfire fighting and bushfire prevention throughout the State;<br>• protect people from injury or death and property from damage as a result of bushfires, and<br>• protect the environment.<br>Under Section 63 of the RF Act, owners and occupiers of land have a duty to take practicable steps to prevent the occurrence of bushfires on, and to minimise the danger of the spread of bushfires on or from, that land. The project will continue to be constructed and operated in a manner that minimises ignition risks and provides for asset protection consistent with relevant NSW Rural Fire Service (RFS) design guidelines. |

## Table 4.3 Other relevant NSW State legislation

| NSW legislation | Comment |
|---|---|
| NSW *Crown Lands Act 1989* (CL Act) | The CL Act sets out how Crown land is to be managed. In particular, specific use of Crown land generally needs to be authorised by a lease, licence or permit. Crown Land is responsible for administering the CL Act.<br>There are a number of Crown roads within the development footprint and project boundary, including within, and adjacent to, the modification area. Applications to close these roads have been lodged with Crown Land and ownership of these roads is in the process of being transferred from the State of NSW to the project landholders.<br>Crown Land provided landowner's consent for lodgement of this modification report on 26 July 2022. |
| NSW *Roads Act 1993* (Roads Act) | The Roads Act is administered by TfNSW, local government or NSW Land and Property Information (NSW LPI). TfNSW has jurisdiction over major roads, local government over minor roads and NSW LPI over Crown roads. The Roads Act sets out the rights of the public in regard to access to public roads.<br>Under Section 138 or Part 9, Division 3 of the Roads Act, a person must not undertake any works that impact on a road, including connecting a road (whether public or private) to a classified road, without approval of the relevant authority, being either TfNSW or local council, depending upon classification of the road.<br>The road upgrades ACEN Australia delivered along the vehicle access route (ie Barleyfields Road and Big Ridge Road) provide for a capacity of up to 1,000 vehicles per day. The proposed increase in the number of heavy and over-dimensional vehicle movements can be made without exceeding this capacity and annual average daily traffic across the vehicle access route will remain within the intended design capacity of 1,000 vehicles.<br>ACEN Australia currently holds LN 609354 under Section 152A of the Roads Act, which allows Crown roads within the project boundary to be used for electricity generation and supply. Should the proposed modification be approved, the licence will be amended as required. |
| NSW *Biodiversity Conservation Act 2016* (BC Act) | The BC Act establishes the regulatory framework for assessing and offsetting biodiversity impacts for proposed developments. Where development consent is granted, the consent authority may impose as a condition of consent, an obligation to retire a number and type of biodiversity credits determined under the *Biodiversity Assessment Method* (BAM) (DPIE 2020b).<br>Detailed ecological assessments have been undertaken by EMM in accordance with the BAM (Appendix D). Assessments have included mapping of native vegetation, collection of plot/transect data and targeted threatened species surveys.<br>The modification area is in a heavily cleared agricultural landscape dominated by cropped areas, exotic pasture and native pasture. Woodland areas within the modification area are minimal in extent, fragmented and highly disturbed. Measures to avoid and minimise impacts to vegetation were considered during the initial design stages of the modification, with the proposed modification area avoiding all planted and the majority of remnant woodland areas.<br>Impacts to native vegetation that require offsetting in accordance with the BAM are limited to 0.42 ha of poor condition PCT 510, which generates a total of seven ecosystem credits.<br>Based on both habitat assessments and field surveys, the modification area is not likely to be important habitat for threatened flora or fauna species and no species credits would be required to offset the proposed modification.<br>Further discussion of the potential impacts of the proposed modification on native vegetation and threatened species listed under the BC Act is provided in Section 6.1 and Appendix D. |
| NSW *National Parks and Wildlife Act 1974* (NPW Act) | The NPW Act provides for nature conservation in NSW including the conservation of places, objects and features of significance to Aboriginal people and protection of native flora and fauna. A person must not harm or desecrate an Aboriginal object or place without an Aboriginal heritage impact assessment under Section 90 of the NPW Act. However, a Section 90 permit is not required for SSD approvals by virtue of Section 4.41 of the EP&A Act.<br>The proposed modification has avoided impacts to Aboriginal heritage sites as far as practicable. Of the 18 Aboriginal sites (13 confirmed sites and 5 areas of potential archaeological deposit (PAD)) identified within the study area adopted as part of the Aboriginal cultural heritage assessment (ACHA), only two sites occur within the modification area and will be impacted (NE119 and NE20). Impacts to these sites will be managed as part of the *New England Solar Farm Aboriginal Heritage Management Plan* (AHMP).<br>Further discussion of the potential impacts to Aboriginal heritage sites resulting from the proposed modification are detailed in Section 6.2 and Appendix E. |

**Table 4.3 Other relevant NSW State legislation**

| NSW legislation | Comment |
|---|---|
| NSW *Heritage Act 1977* (Heritage Act) | The Heritage Act aims to protect and conserve the natural and cultural history of NSW, including scheduled heritage items, sites and relics. Approvals under Part 4 or an excavation permit under Section 139 of the Heritage Act are not required for SSD by virtue of Section 4.41 of the EP&A Act.<br>The proposed modification will not impact any items of State, National or World heritage significance identified on the State Heritage Register (SHR), Uralla LEP or Australian Heritage Database.<br>Fieldwork completed as part of the ACHA included surveys of the modification area for structures and relics. No relics or structures associated with historic uses of the land were identified within the modification area.<br>The *New England Solar Farm Historical Heritage Management Plan* (HHMP) will be updated to include reference to the modification area and the unanticipated finds protocol described in Chapter 3 of the HHMP will apply to the modification area.<br>Further discussion of the potential heritage impacts of the proposed modification are detailed in Section 6.3. |
| NSW *Biosecurity Act 2015* (BS Act) | The BS Act was developed in consultation with industry, community and State government regulators to ensure the development of a regulatory framework that will effectively respond to and manage biosecurity risks. The broad objectives of the BS Act are to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants by preventing their entry into NSW, quickly finding, containing and eradicating any new entries and effectively minimising the impacts of those pests, diseases, weeds and contaminants that cannot be eradicated through robust management arrangements.<br>The proposed modification may lead to a reduction in biosecurity (ie reduced pest and weed control) due to the temporary significant increase in vehicle movements to and from the modification area during construction. In addition, pest animals may also be encouraged by food sources from construction works and general disturbance.<br>During the construction and operational stages of the project, a number of land management and mitigation measures will be implemented to reduce the impact of the project on regional biosecurity. For example, vehicle movements will be restricted to the formed access tracks. If implemented, sheep grazing would also assist to manage weed levels within the array areas. Sheep grazing within the array areas would also maintain a multi-purpose land use throughout the life of the project.<br>Appropriate wash down facilities will be available to clean vehicles and equipment prior to arrival and when leaving the work areas. This mitigation measure will help manage the transfer of weeds and pathogens to and from the development footprint.<br>Each of the Lease Agreements with the project landholders contains reference to the BS Act and requires the solar farm operator to develop site-specific biosecurity measures to control biosecurity risk during the term of the lease. |
| NSW *Local Land Services Act 2013* (LLS Act) | The LLS Act established Local Land Services (LLS) who are responsible for the management and delivery of local land services in the social, economic and environmental interests of the State in accordance with any State priorities for local land services.<br>One of the objects of the LLS Act is to ensure the proper management of natural resources in the social, economic and environmental interests of the State, consistently with the principles of ecologically sustainable development (ESD). The four principles of ESD and the project's compatibility with each are considered in Chapter 7.<br>Resources within the modification area include land that is being used for agricultural production, and land which has biodiversity and cultural heritage value. This constitutes the 'natural resources', which must be properly managed, developed or conserved.<br>The modification area will be removed from agricultural use; however, land management practises will avoid or minimise impacts with adjoining land uses and ensure that land is not precluded from being returned to a productive agricultural use at the end of the operational stage of the project. |

## 4.4 Local environmental plans

The development footprint is zoned RU1 Primary Production under the Uralla LEP. The modification area is also zoned RU1 Primary Production (Figure 4.1).

Development for the purpose of electricity generation is prohibited in the RU1 Zone as it is not specified in item 2 or 3 of the Uralla LEP. Notwithstanding, Section 2.36(9) of *State Environmental Planning Policy (Transport and Infrastructure) 2021* states that:

> ...development for the purpose of a solar energy system may be carried out by any person with consent on any land.

Therefore, development for the purpose of a solar energy system may be carried out within the approved development footprint and modification area with development consent.

## 4.5 Strategic Regional Land Use Policy

The NSW Government's *Strategic Regional Land Use Policy* was introduced in September 2012 and sets out a range of initiatives to better balance growth in the mining industry with the need to protect agricultural land and water resources.

Biophysical strategic agricultural land (BSAL) is defined as land with high quality soil and water resources capable of sustaining high levels of productivity. A total of 2.8 million hectares of BSAL has been identified and mapped at a regional scale across NSW and includes land capable of sustaining high levels of productivity.

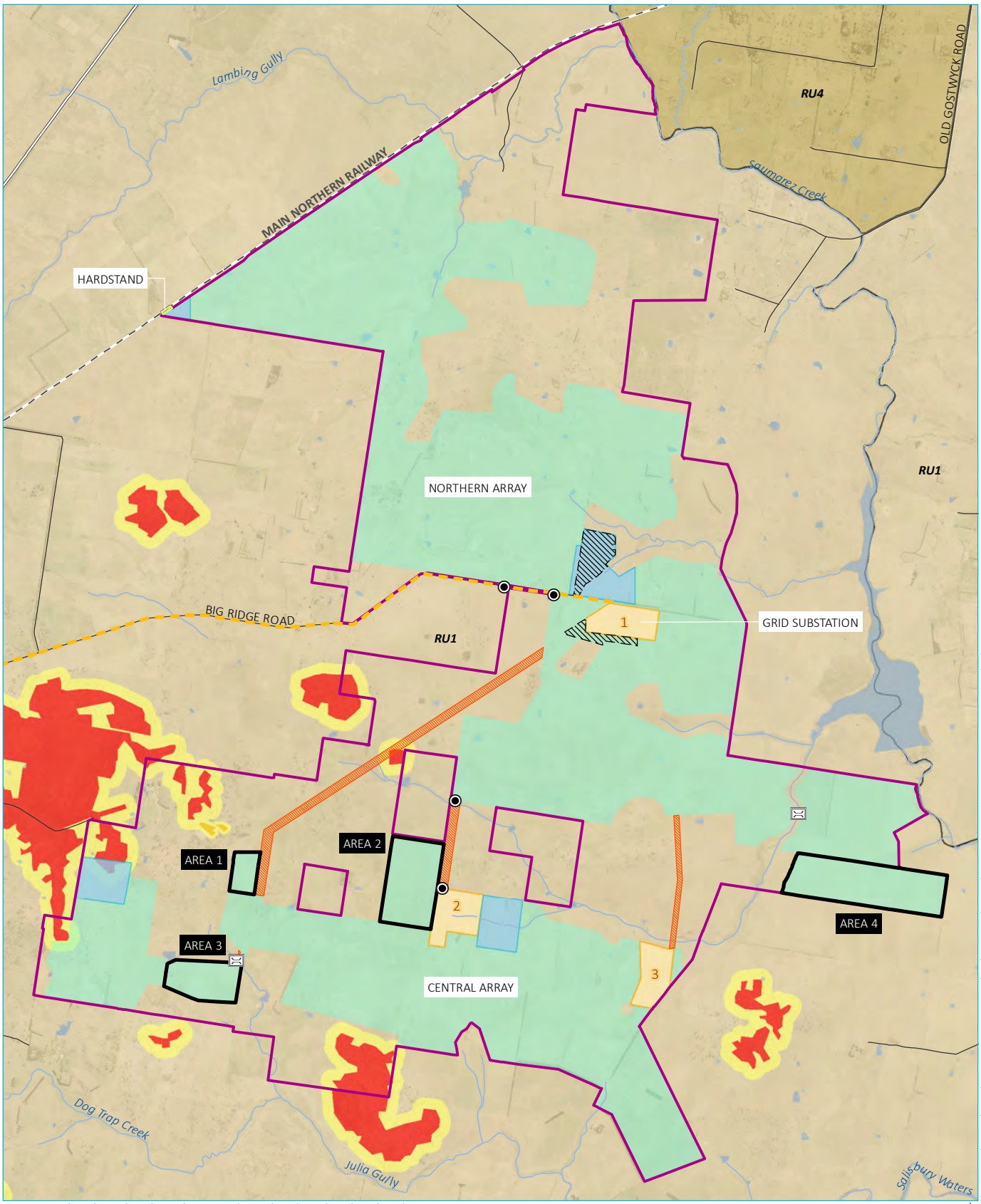
There is no BSAL within the modification area (Figure 1.2). The additional BESS footprint intercepts a total of 4.6 ha of BSAL; however, this land forms part of the approved project boundary and development footprint and will not increase the project's impacts on BSAL above those that have already been assessed and approved.

In 2021, NSW Department of Primary Industries released a preliminary State Significant Agricultural Land (SSAL) map for public exhibition. The purpose of this exercise is to identify the location of the best agricultural land in NSW in terms of both productivity and contributions to NSW's agricultural prosperity. Whilst it is acknowledged that this mapping is in an early draft stage, based on a review of the interactive mapping tool, part of the modification area (namely a proportion of Area 3) has been identified as SSAL.

The modification area is mapped as land and soil capability (LSC) classes 3, 4, 5 and 6 (Figure 4.2), including:

- 4.2 ha (3% of modification area) of LSC Class 3 (moderate limitations);
- 27.7 ha (22% of modification area) of LSC Class 4 (moderate to severe limitations);
- 91.6 ha (72% of modification area) of LSC Class 5 (severe limitations); and
- 3.8 ha (3% of modification area) of LSC Class 6 (very severe limitations).

All project landholders intend to continue with farming activities as the additional areas proposed to be occupied by project infrastructure as part of the proposed modification only account for a portion of their landholdings.




Source: EMM (2022); UPC (2022); DFSI (2017, 2022); DPIE (2021); RFS (2020); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

KEY

- Proposed project boundary *
- Modification area
- Additional substation/BESS footprint

Proposed development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint **
- Hardstand in rail corridor
- Primary vehicle access route
- Potential creek crossing
- Proposed primary site access point

Existing environment

- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

Bushfire prone land

- Vegetation Category 1
- Vegetation Category 2
- Vegetation Buffer

Land zoning

- RU1 | Primary Production
- RU4 | Primary Production Small Lots

* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

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# Land zones

New England Solar and Battery Project
Modification Report
Figure 4.1

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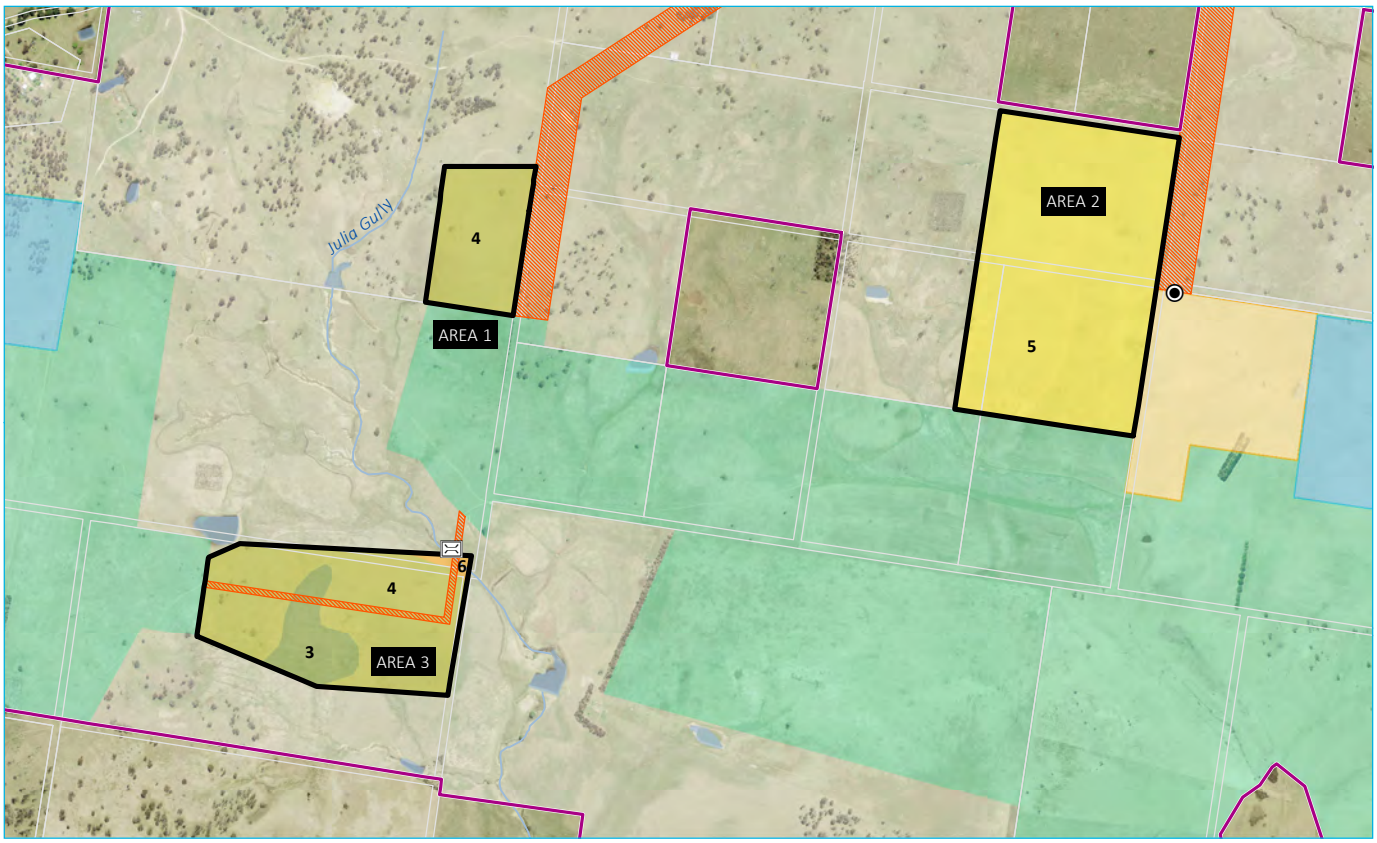
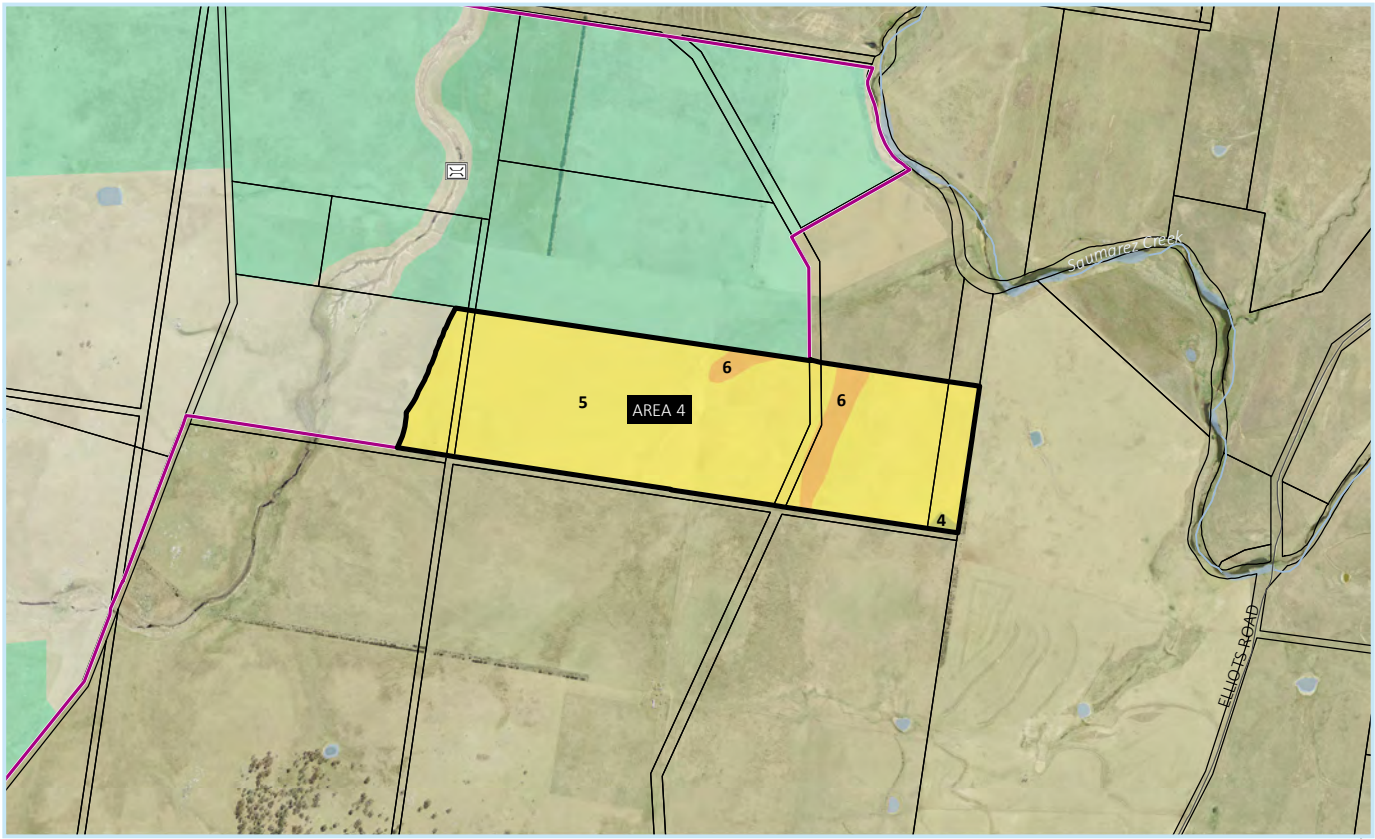


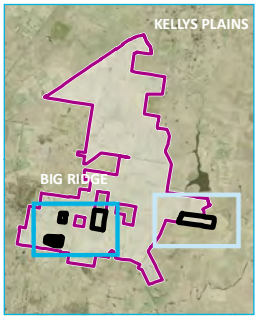




Source: EMM (2022); UPC (2021); DFSI (2017, 2022); DPE (2022); GA (2011)

0 0.5 1 km

GDA 1994 MGA Zone 56

N




KEY

- Proposed project boundary
- Modification area

Proposed development footprint

- Solar array
- Potential site access and electrical cabling
- Potential creek crossing
- Proposed primary site access point

Existing environment

- Minor road
- Named watercourse
- Waterbody
- Cadastral boundary

Land and soil capability (v4.5)

- 3 - Moderate limitations
- 4 - Moderate to severe limitations
- 5 - Severe limitations
- 6 - Very severe limitations

# Land and soil capability within the modification area

New England Solar and Battery Project
Modification Report
Figure 4.2

EMM creating opportunities

# 5 Engagement

Engagement for the proposed modification has been completed generally in accordance with the *Undertaking Engagement Guidelines for State Significant Projects* (DPIE 2021b).

## 5.1 NSW Department of Planning and Environment

ACEN Australia wrote to DPE on 4 August 2021 to introduce the proposed modification and seek advice regarding the assessment pathway and scope of this modification report. DPE responded on 10 September 2021 to confirm the assessment scope and nominated application under Section 4.55(2) of the EP&A Act as the appropriate approval pathway. A copy of this correspondence is provided in Appendix F. Feedback provided by DPE and how this has been addressed is summarised in Table 5.1.

**Table 5.1 Feedback from DPE and how it has been addressed**

| Matter raised | Response |
|---|---|
| DPE nominated that the application will be assessed as a Section 4.55(2) application under the EP&A Act. | The approval pathway for the modification is nominated and described in Section 4.3.1 of this modification report. |
| DPE were generally satisfied with the issues identified in the letter (dated 4 August 2021). In addition to these matters, DPE requested:<br>• a detailed justification for the proposed modification;<br>• a summary of the environmental, social and economic benefits and impacts associated with the proposed modification; and<br>• a summary of the visual and noise impacts previously assessed and approved, and any changes in these impacts resulting from the expanded footprint. | A detailed justification for the proposed modification is provided in Section 7.1, including a summary of the intended benefits.<br>The environmental, social and economic impacts of the proposed modification, including potential visual amenity and noise impacts, are considered in Chapter 6. |

ACEN Australia wrote to DPE on 17 February 2022 to discuss their proposal to increase the project's energy storage capacity by including additional BESS footprints within the approved project boundary and development footprint. DPE responded on 4 March 2022 and requested that the project's hazards and risk assessment be updated to reflect the proposed modification. DPE also requested that the updated assessment:

- Consider the most recent standards and codes (such as, not limited to, NFPA 855, AS 5139, IEC 62897, UL 9540, FM Global DS 5-33 and UL 9540A test reports when establishing separation distances).
- Consider the scenarios and findings from the reports on the 2021 Victorian Big Battery fire, including fire propagation to the top-side of adjacent BESS sub-units (containers, modules, etc).
- Demonstrate that the separation distances between the BESS and on-site or off-site receptors and the separation distances between BESS sub-units (containers, modules, etc) prevent fire propagation.
- Verify that the areas designated for BESS are sufficient taking into account separation distances between BESS sub-units.
- Demonstrate that the fire risks from BESS can comply with *Hazardous Industry Advisory Paper No. 4 – Risk Criteria for Land Use Safety Planning* (DoP 2011a).

- An assessment of potential hazards and risks including but not limited to bushfires, land contamination, spontaneous ignition, electromagnetic fields or proposed grid connection infrastructure against the *Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields* (ICNIRP 1998).

ACEN Australia continued to engage with DPE during the preparation of this modification report, including updates on timing, assessment outcomes and changes to modification elements (eg increased heavy vehicles and construction hours).

## 5.2 Uralla Shire Council

ACEN Australia continues to engage with Uralla Shire Council on a regular basis. A meeting was held with the Director of Infrastructure from Uralla Shire Council on 24 June 2022 to introduce the proposed modification and notify them that a modification report will be submitted to DPE. On 21 July 2022, an additional meeting was held with the General Manager, Mayor and Manager of Development and Planning to provide an overview of the proposed modification. ACEN Australia also briefed the Councillors on 9 August 2022. No objections were raised and no specific feedback on the proposed modification has been received to date.

Targeted engagement has also been undertaken by ACEN Australia and its contractors in relation to the proposed heavy and over-dimensional vehicle increases. No objections have been raised to date.

Uralla Shire Council has advised ACEN Australia that all ongoing consultation for the project will need to meet the requirements of their community engagement plan. It was acknowledged that consultation to date has generally been in line with the requirements of this plan; however, further feedback on this may be provided as part of their submission on this modification application.

## 5.3 Biodiversity, Conservation and Science Directorate

As part of the preparation of the BDAR (Appendix E) a letter was sent to DPE's Biodiversity, Conservation and Science Directorate (BCS) on 30 September 2021, which introduced the proposed modification and requested input on field survey methodology and assessment approaches for targeted flora surveys of Bluegrass (*Dichanthium setosum*) and Hawkweed (*Picris evae*).

BCS responded on 13 October 2021 and requested that the targeted flora survey methodology for the BDAR align with current NSW survey guidelines under the BAM (DPIE 2020b).

ACEN Australia and EMM will continue to consult with relevant assessment officers at BCS as part of the preparation of the biodiversity offset strategy. All unavoidable impacts will be offset in accordance with NSW Government policy.

## 5.4 Transport for NSW

ACEN Australia and its contractors have engaged with TfNSW in relation to the proposed heavy and over-dimensional vehicle increases (Appendix F). No objections have been raised to date.

## 5.5 Crown Land

A representative from ACEN Australia spoke with Crown Land to introduce the proposed modification and notify them that a modification report will be submitted to DPE. A landowner's consent application was submitted to Crown Land and landowner's consent for lodgement of this modification report was provided on 26 July 2022.

## 5.6 Aboriginal stakeholders

Aboriginal stakeholders were identified and consulted in accordance with *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010). A detailed description of consultation is presented in Appendix E.

## 5.7 Private landholders

ACEN Australia provided letters to residents along the primary vehicle access route (ie Barleyfields Road (north) and Big Ridge Road) on 15 July 2022 to introduce the proposed modification (namely the proposed heavy vehicle increase) and notify them that a modification report will be submitted to DPE (Appendix F).

Additional engagement was undertaken on 25 July 2022 with select residents who raised concerns about the potential impact of the additional heavy vehicle movements along Big Ridge Road. Residents were advised that road safety will continue to be managed through the approved *Traffic Management Plan* (SMEC 2021a), which includes measures to schedule traffic to avoid convoy lengths or platooning on roads and a driver Code of Conduct, which addresses travelling speed and consideration of other road users. Monthly dilapidation surveys of Barleyfields Road (north) and Big Ridge Road will also be completed to monitor for any road degradation during construction and road repair works will be completed as required.

ACEN Australia met with the landowner of N1 on 15 August 2022 to discuss the project and the proposed modification. The landowner expressed concerns about amenity impacts currently experienced during ongoing construction (including noise, dust, light and visual amenity impacts from both the residence and broader property). Concerns were raised about the proposed extended construction hours on Saturday afternoons. As discussed in Section 6.5, construction noise levels at N1 are expected to satisfy the relevant noise management level (NML) during daytime out-of-hours construction works (ie 1.00 pm to 6.00 pm Saturday afternoons) if a 600 m buffer (ie work exclusion area) is maintained around N1 during these times. No specific concerns about other elements of the proposed modification were raised.

ACEN Australia also sent a letter to the landowner of C5 on 1 February 2022 and 19 August 2022 to introduce the proposed modification and offer an opportunity to discuss the modification in further detail; however, no response has been provided to date.

## 5.8 Community engagement materials

To provide an opportunity for the local community to find out more about the project and engage with the project team, ACEN Australia launched the New England Solar web page, community information line and email account in April 2018. The project web page remains active and in February 2019, ACEN Australia also created a dedicated Facebook page for the project, which remains active. The aim of the Facebook page is to provide an open two-way channel for the community to share information or ask questions about the project, as well as renewable energy in general. The page has over 500 followers and posts are made weekly providing information on the project and the renewable energy industry.

Both Facebook and the web page have been used to provide information on the proposed modification to a wide audience, as well as helping to answer questions and hear the community's comments. Community members have been able to ask questions and make comments on the proposed modification via the Facebook page both in private and public forums.

Community drop-in sessions were also held on 8 February 2022 and 21 July 2022 at ACEN Australia's Uralla office. The sessions were advertised via Facebook, the project web page and the Uralla Wordsworth. Attendees at the drop-in sessions were interested in finding out more about the project and potential employment opportunities. Two attendees expressed concerns about the proposed increase in heavy vehicle movements travelling along Big Ridge Road. Additional consultation with these attendees has been coordinated between ACEN Australia and its contractors.

Updates will be provided via the Uralla Wordsworth, project web page and project Facebook regarding the submission of the modification application and exhibition period. The updates will summarise the details of the modification as well as providing links for the public to review the documentation.

# 6 Assessment of impacts

This section addresses the potential impacts of the proposed modification.

## 6.1 Biodiversity

### 6.1.1 Overview

A biodiversity development assessment report (BDAR) (Appendix D) has been prepared by EMM to assess any potential biodiversity impacts resulting from the proposed modification.

The BDAR has been prepared in accordance with the following legislation and guidance:

- EPBC Act;
- NSW *Biodiversity Conservation Act 2016* (BC Act);
- NSW *Biosecurity Act 2015*; and
- *Biodiversity Assessment Method* (BAM) (DPIE 2020b).

Impacts on biodiversity within a small corridor of Area 3 have previously been assessed and approved as part of the BDAR for the project (EMM 2018a). Therefore, this area has been excluded from offset calculations as part of the proposed modification. The term 'disturbance area' has been used within the BDAR to describe the area over which direct impacts will occur and offsets could be triggered.

The two additional parcels of land proposed to house BESS infrastructure are within the approved project boundary and development footprint. Impacts on biodiversity within the additional BESS footprint have previously been assessed and approved as part of the BDAR for the project (EMM 2018a) and did not require further assessment.

### 6.1.2 Existing environment

#### i Landscape features

##### a Bioregions

The modification area is within the New England Tableland Interim Biogeographic Regionalisation for Australia (IBRA) and the Armidale Plateau subregion.

##### b Watercourses

The modification area is part of the Macleay catchment. The only perennial watercourse within proximity of the modification area is Saumarez Creek, a fifth order stream, approximately 300 m north-east of Area 4. Refinements to the modification area have excluded higher order steams (ie fourth order watercourses and above).

The modification area includes:

- six first order streams;
- one second order stream; and
- one third order stream.

Watercourses within the modification area are ephemeral and highly modified and, in many cases, indiscernible.

### c Areas of geological significance

The modification area does not contain karst, caves, crevices, cliffs or other areas of geological significance.

## ii Native vegetation

### a Overview

Approximately 278 ha of native vegetation occurs within a 1,500 m buffer of the modification area. The percentage native vegetation cover within this area is approximately 8.49%.

Vegetation within proximity of the modification area is highly fragmented, with native vegetation often occurring in isolated patches surrounded by a matrix of agricultural land.

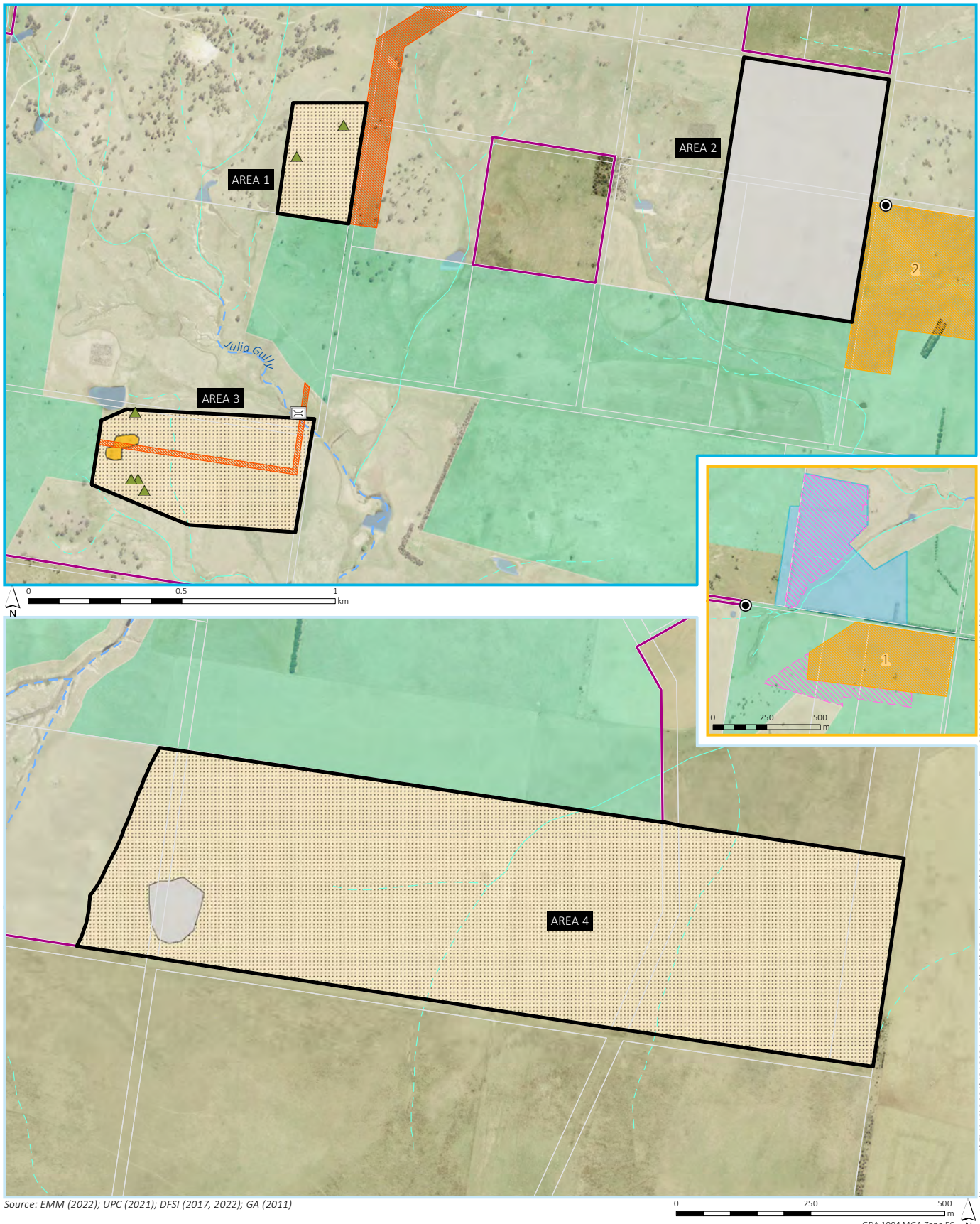
### b Plant community types

One PCT and three vegetation zones were identified within the disturbance area. These are presented in Table 6.1 and shown in Figure 6.1.

**Table 6.1 Vegetation zones mapped within the disturbance area**

| Vegetation zone | Plant community type (PCT) | Condition | Total area (ha) | Vegetation integrity score | Area of potential impact (ha) |
|---|---|---|---|---|---|
| 1 | 510 – Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion | Poor | 0.42 | 25.1 | 0.42 |
| 2 | | Pasture | 86.31 | 6.7 | 86.31 |
| 3 | N/A | Exotic vegetation[1] | 39.25 | - | 39.25 |

1. Exotic vegetation was mapped in areas where exotic species were clearly dominant, with few to no native species present.




Source: EMM (2022); UPC (2021); DFSI (2017, 2022); GA (2011)

0 250 500 m

GDA 1994 MGA Zone 56

N

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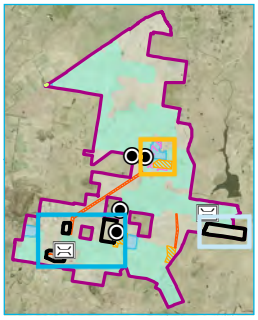

KEY

- Proposed project boundary
- Modification area
- Additional substation/BESS footprint

Approved development footprint

- Solar array
- Hardstand in rail corridor
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint
- Proposed primary site access point
- Potential creek crossing

Existing environment

- Minor road
- Cadastral boundary
- Waterbody
- Scattered tree
- Exotic grassland

PCT 510 | Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

- Poor (requiring offset)
- Pasture

Strahler stream order

- 1st order
- 2nd order
- 3rd order

# Vegetation zones and paddock trees

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Modification Report
Figure 6.1

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#### iii Habitat assessment

A habitat assessment was undertaken at the same time as the vegetation mapping to identify potential fauna habitat within the modification area, including:

- habitat trees including large hollow-bearing trees;
- availability of flowering shrubs and feed tree species;
- waterway condition; and
- quantity of ground litter and logs.

The habitat assessment identified that the majority of the modification area is highly disturbed, only supporting fauna species which are able to persist in highly modified agricultural landscapes.

#### iv Threatened species

A search of DCCEEW's Protected Matters Search Tool (PMST) for MNES, including threatened species likely to occur within the modification area was performed as part of the BDAR.

An assessment of habitat constraints for threatened species was undertaken to indicate the likelihood of threatened species being present. Three threatened species were excluded from further assessment due to the absence of suitable habitat components within the modification area.

The following key species were identified as having the potential to be present in the modification area:

- Bluegrass (Dichanthium setosum);
- Northern Blue Box (Eucalyptus magnificata);
- Narrow-leaved Black Peppermint (Eucalyptus nicholii); and
- Hawkweed (Picris evae).

Targeted flora surveys were undertaken to identify the presence or absence of these key species in the modification area. None of the key species were detected, either incidentally or during targeted surveys.

### 6.1.3 Impact assessment

#### i Potential direct and indirect impacts

The proposed modification may result in direct and indirect impacts on biodiversity:

- direct impacts:
  - loss of native vegetation; and
  - loss and degradation of native flora and fauna habitat;
- indirect impacts:
  - erosion and sedimentation;
  - weed introduction and spread;

- increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat or changes in behaviour; and
- night-time lighting resulting in disturbance of fauna species and changes in occupancy or behaviour.

#### ii Serious and irreversible impacts

White Box Yellow Box Blakely's Red Gum Woodland, a threatened ecological community (TEC), is considered a potential candidate to meet the serious and irreversible impacts (SAII) principle. The assessment for SAII is provided in Chapter 6 of Appendix D.

White Box Yellow Box Blakely's Red Gum Woodland was recorded within the modification area; however, the vegetation is highly disturbed, fragmented and small in size (0.42 ha). Therefore, it is anticipated that no SAII will occur.

The cumulative impact of the proposed modification and the approved project (including a previously approved modification) is considered negligible given the small increase (0.42 ha) of White Box Yellow Box Blakely's Red Gum Woodland clearance required to facilitate the proposed modification.

#### iii Impacts requiring offsets

Direct impacts on 0.42 ha of PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510_poor) will require offsets.

#### a Ecosystem credits

A total of seven ecosystem credits are required to offset the residual impacts of the proposed modification on 0.42 ha of PCT 510_poor. These credit requirements will be satisfied in accordance with the NSW Biodiversity Offset Scheme through retiring credits, based on like-for-like rules where possible.

#### b Species credits

No species credits are required.

#### iv Matters of national environmental significance

No threatened species, migratory species or TECs, as listed under the EPBC Act, were recorded within the modification area. As such no significant impacts to MNES will occur and referral of the proposed modification to the Commonwealth Minister for Environment is not required.

Whilst it is acknowledged that PCT 510_poor has the potential to be aligned with the critically endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community, the mapped woodland within the modification area is considered too degraded and is no longer a viable part of the ecological community and therefore does not meeting the Commonwealth listing.

There will be no cumulative impacts on MNES as a result of the proposed modification.

### 6.1.4 Management and mitigation

The project's impacts on biodiversity are managed through the implementation of the *New England Solar Farm – Biodiversity Management Plan* (BMP). The BMP will be updated to include reference to the modification area.

Julia Gully, a third order stream in the north-east corner of Area 3, is highly ephemeral with a poorly defined channel and occasional, small shallow pools during wet periods. Nonetheless, a 30 m buffer from each edge of the channel will be maintained to minimise potential impacts on downstream water quality and erosion.

### 6.1.5 Conclusion

The modification area is in a heavily cleared agricultural landscape dominated by cropped areas, exotic pasture and native pasture. Woodland areas within the modification area are minimal, fragmented and highly disturbed. Based on both habitat assessments and field surveys, the modification area is not likely to be important habitat for threatened flora or fauna species.

One native vegetation zone, PCT 510_pasture, is dominant across the modification area. This grassland is highly modified and is below the vegetation integrity score threshold, therefore offsets are not required. A total of 0.42 ha of PCT 510_poor will be cleared as a result of the proposed modification. A total of seven ecosystem credits are required to offset the impacts of the proposed modification on native vegetation.

Residual impacts on biodiversity will be managed through the implementation of the BMP, which will be updated to include reference to the modification area.

## 6.2 Aboriginal cultural heritage

### 6.2.1 Overview

An ACHA was completed by EMM (Appendix E) in accordance with the relevant guidelines.

Consultation with the registered Aboriginal parties (RAPs) regarding the project have been ongoing since 2018. The following RAPs were consulted regarding the proposed modification in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010):

- Armidale Local Aboriginal Land Council;
- Nunawanna Aboriginal Corporation;
- Armidale and New England Gumbaynggirr Descendants;
- Les Townsend;
- Iwatta Aboriginal Corporation (formerly Steven Ahoy Consultants);
- Culturally Aware Aboriginal Heritage Consultancy;
- Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants;
- Aaron Broad; and
- Nganyawana Clan Group.

A copy of the draft ACHA was provided to the RAPs for review; however, no comments were provided.

The study area adopted for the ACHA is the broader investigation area that was the subject of archaeological survey (Figure 6.2). Through an iterative design process, the study area was refined to the modification area to avoid Aboriginal cultural heritage sites and biodiversity constraints.

The two additional parcels of land proposed to house BESS infrastructure are within the approved project boundary and development footprint. Impacts on Aboriginal cultural heritage within the additional BESS footprint have previously been assessed and approved as part of the ACHA for the project (EMM 2018b) and did not require further assessment.

### 6.2.2 Existing environment

The modification area is within the Armidale Plateau subregion of the New England Tablelands IBRA bioregion. This subregion is characterised by an undulating to hilly plateau at an elevation of approximately 1,100 m. Local geology is considerably diverse, as the basalt flows not only outcrop frequently, but have also eroded and exposed underlying sedimentary layers. The resulting landscape is a myriad of outcropping materials including basalt, granite, silcrete, chert, jasper, greywacke and ironstone, primarily exposed on eroded landforms.

The modification area includes the Gostwyck, Bald Knob, Ironstone and Fairfield Variant A soil landscapes. In general, topsoils are typically very shallow and often rocky on crests. This provides significant limitations for such soils to retain cultural material. Land within the modification area generally drains east and south-east into Saumarez Creek (fifth order) and Salisbury Waters (sixth order). The modification area is dispersed across a landscape that features multiple tributaries to these primary water resources.

The modification area has been modified by historical land use practices and past disturbances associated with land clearing, manual and machine rock-picking, cropping and intensive livestock grazing.

There are 106 sites registered in the Aboriginal Heritage Information Management System (AHIMS) within an approximately 21 km by 11 km area surrounding the study area (Table 6.2). Of these sites, the majority (77%) were recorded within the project boundary as part of previous Aboriginal cultural heritage assessments completed for the project. There is a previously recorded isolated artefact site, NE20 (AHIMS 21-4-0215), within Area 3 (Figure 6.2).

**Table 6.2 AHIMS sites by site feature**

| Site feature | Number of sites |
|---|---|
| Open artefact site | 60 |
| Open artefact site; potential archaeological deposit (PAD) | 17 |
| Modified tree | 16 |
| Grinding groove | 5 |
| Grinding groove; open artefact site | 4 |
| PAD | 2 |
| Water hole; open artefact site | 1 |
| Quarry; open artefact site | 1 |
| **Total** | 106 |

### 6.2.3 Assessment criteria

#### i Predictive model

A predictive model was used to consider the archaeological pattern of the local and regional area and the environmental context of the study area. A summary of the landscape characteristics and subsequent level of archaeological sensitivity in the study area is provided in Table 5.1 of Appendix E. Within the landscape:

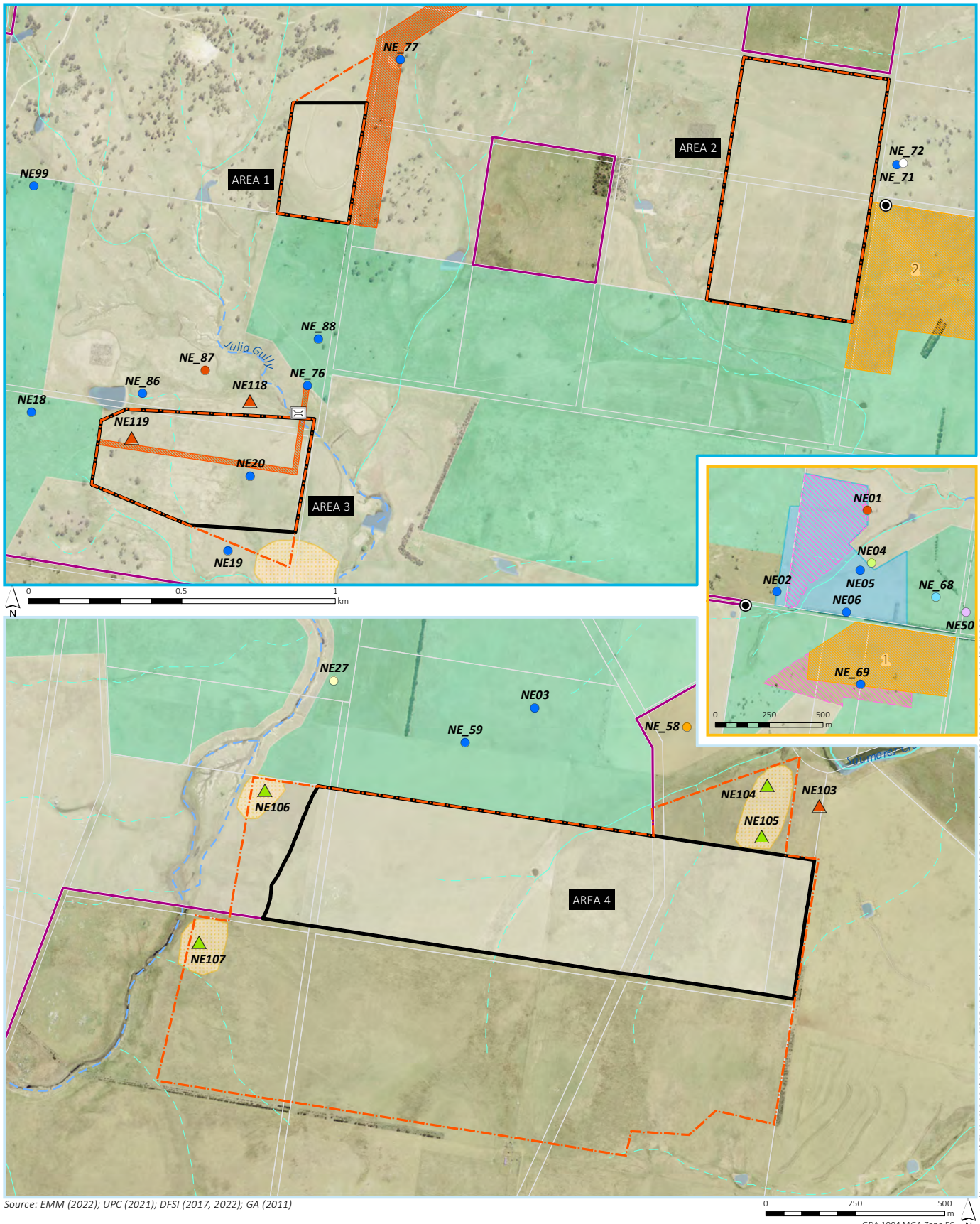
- proximity to higher order watercourses presents a higher potential for PAD and subsurface archaeological material;
- isolated trees and tree clusters, if mature and native, have potential to feature Aboriginal scarring or carving; and
- crests and spurs may feature outcropping silcrete pavements and boulders with potential for grinding groove or quarry sites.

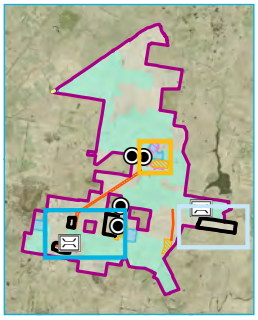
#### ii Survey strategy

Surveys of the study area were undertaken from 25–29 October 2021 and were attended by two archaeologists and members of the RAPs, with a total of five people per day. The study area was surveyed on foot and the survey effort comprised 18 walking transects. Despite greater density grass coverage than previous surveys undertaken for the project, outcropping stone material was still highly visible. All mature trees within the study area were inspected for the presence of Aboriginal scarring or carving.

### 6.2.4 Impact assessment

The survey team identified 12 Aboriginal sites, including 3 isolated artefacts, 4 Aboriginal scarred trees and 5 open artefact scatters, and 5 areas of PAD within the study area (Figure 6.2).



KEY

Modification area
Proposed project boundary
Additional substation/BESS footprint
Study area adopted for the ACHA

Approved development footprint
Solar array
Hardstand in rail corridor
Potential site access and electrical cabling
Potential laydown area/site compound
Potential substation/BESS footprint
Proposed primary site access point
Potential creek crossing

Existing environment
Minor road
Cadastral boundary
Waterbody

Strahler stream order
1st order
2nd order
3rd order

AHIMS (by site type)
Artefact scatter, PAD
Artefact scatter, confirmed deposit, PAD
Artefact scatter
Grinding groove
Grinding groove, artefact scatter, PAD
Isolated find
Isolated find, PAD
Scarred tree

Survey results
Site type
Artefact scatter
Isolated artefact
PAD area

# Aboriginal cultural heritage field survey results and AHIMS sites

New England Solar and Battery Project
Modification Report
Figure 6.2

EMM
creating opportunities

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After a number of Aboriginal sites and areas of archaeological potential were identified during the surveys, the extent of the modification area was refined. Refinements to the modification area included:

- significant reductions to the extent of Area 4 to exclude land within 200 m of Saumarez Creek and one if its primary tributaries, avoiding four PAD areas (NE104, NE105, NE106 and NE107);
- removal of an additional land parcel from the modification area, avoiding nine sites (NE108, NE109, NE110, NE111, NE112, NE113, NE114, NE115 and NE116), including four Aboriginal scar trees; and
- reductions to the extent of Area 3 to avoid one PAD area (NE117) within 200 m of Julia Gully.

The significant refinements to the modification area will ensure that a substantial local archaeological resource remains within the broader landscape.

Only two sites are within the modification area and will be impacted by the proposed modification:

- NE119, an artefact scatter consisting of chert and quartz flakes, in Area 3; and
- NE20 (21-4-0215), an isolated artefact, in Area 3.

Ground disturbance activities that have the potential to disturb Aboriginal objects within the modification area are:

- installation of PV modules;
- trenching for underground cabling;
- clearing for internal access tracks and PCU placement; and
- installation of new internal roads or access tracks.

### 6.2.5 Management and mitigation

Aboriginal cultural heritage values within the project boundary are currently subject to management under the AHMP. The AHMP will be updated to incorporate the modification area.

The two sites, NE119 and NE20, within the modification area will be subject to surface collection. Surface collection will be completed by the project archaeologist and RAP representatives and will be undertaken prior to any ground disturbance in the vicinity of the two sites.

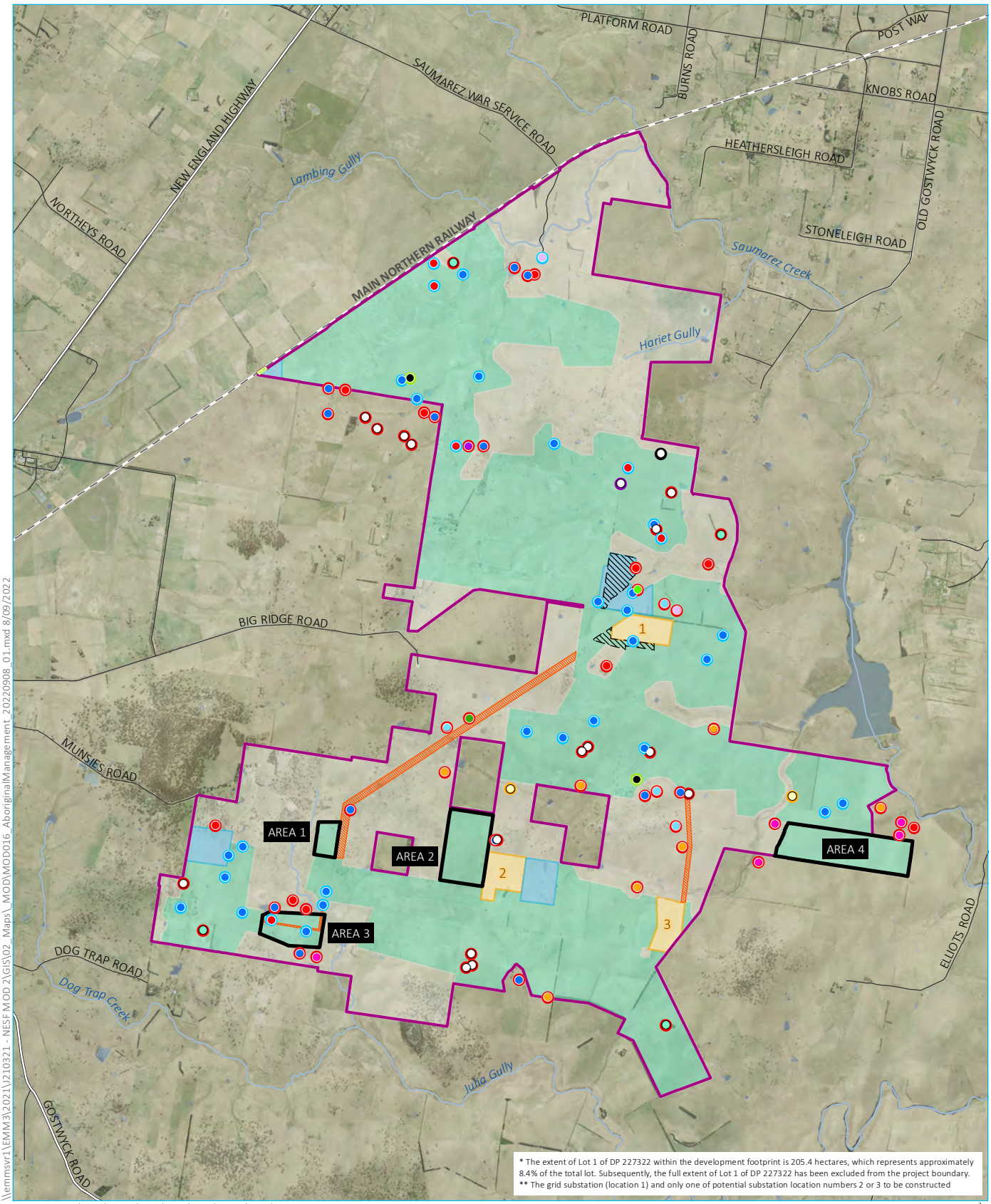
All other identified sites will be avoided. Passive management will apply to the Aboriginal sites identified for avoidance on land within the proposed project boundary but over 20 m from the proposed development footprint. While no fencing, signage or active land management measures are proposed for these sites, their locations will be kept on the project's Aboriginal cultural heritage database for persons working on or visiting the project boundary. Their presence in the landscape will be demarcated by at least one high visibility peg, stake or other marker to alert persons to their location. These locations will be marked by the project archaeologist and at least one RAP representative. These measures will apply to NE106, NE118 and NE117.

The remaining sites and PAD areas are outside of the proposed project boundary and will remain in situ on private land. ACEN Australia will liaise with relevant landholders where Aboriginal sites have been recorded on their land and communicate that Aboriginal objects are protected by law and must not be impacted.

A summary of Aboriginal cultural heritage sites within the proposed project boundary and the proposed management measures is provided in Figure 6.3.

### 6.2.6 Conclusion

There are two Aboriginal cultural heritage sites within the modification area. Both sites will be subject to surface collection. All other identified sites will be avoided. The AHMP will be updated to incorporate the modification area. Management and mitigation strategies and methodologies to protect Aboriginal sites will continue to be implemented in accordance with the AHMP.

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* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.
** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

*Source: EMM (2022); DFSI (2017); GA (2011); UPC (2022)*

0 1 2 km

GDA 1994 MGA Zone 56

N

KEY

- Proposed project boundary *
- Modification area
- Additional substation/ BESS footprint

Development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/ site compound
- Potential substation/ BESS footprint **
- Hardstand in rail corridor

Existing environment

- Rail line
- Major road
- Minor road
- Named watercourse
- Waterbody

Management measure

- Avoidance
- Avoid significant area
- Surface collection
- Salvage: remove and relocate
- No management required
- Unmitigated impact (tree has collapsed)

Site type

- Potential archaeological deposit (PAD)
- Artefact scatter
- Artefact scatter, PAD
- Artefact scatter, confirmed deposit, PAD
- Grinding groove
- Grinding groove, PAD
- Grinding groove, artefact scatter, PAD
- Isolated find
- Isolated find, PAD
- Isolated find, confirmed deposit, PAD
- Quarry, artefact scatter, PAD
- Scarred tree
- Not an Aboriginal scar tree

# Aboriginal cultural heritage management and mitigation measures - overview

New England Solar and Battery Project
Modification Report
Figure 6.3

EMM creating opportunities

## 6.3 Historical heritage

### 6.3.1 Overview

A historical heritage assessment (HHA) and statement of heritage impact (SoHI) was prepared for the EIS by EMM (2018c). In accordance with Condition 19 of Schedule 3 of SSD-9255, the HHMP was also prepared. As part of the preparation of this modification report, the results of the HHA and SoHI have been reviewed. Fieldwork completed as part of the ACHA included surveys of the modification area for structures and relics. This section provides an overview of the results of the additional surveys and provides recommendations that should be considered prior to construction within the modification area.

The two additional parcels of land proposed to house BESS infrastructure are within the approved project boundary and development footprint. Impacts on historical heritage within the additional BESS footprint have previously been assessed and approved as part of the HHA (EMM 2018c) for the project and did not require further assessment.

### 6.3.2 Existing environment

The modification area is in a region that has a rich Aboriginal past and historically was claimed by squatters who raised Merino sheep for both domestic and international markets. The region remains largely pastoral and is serviced by Uralla and Armidale.

Early settlers established runs in the local area. The early historic sizes of the squatting runs have been significantly reduced in some cases, but the economic use remains the same for many. Pastoral technology has been upgraded and older structures have either been updated, fallen into ruin or have been demolished. Later twentieth century cold-climate plantings have added another element that has become characteristic of the New England Tablelands. The result is a palimpsest of pre-colonial and post-colonial uses that are visible in the landscape and exist as archaeological sites and ruins.

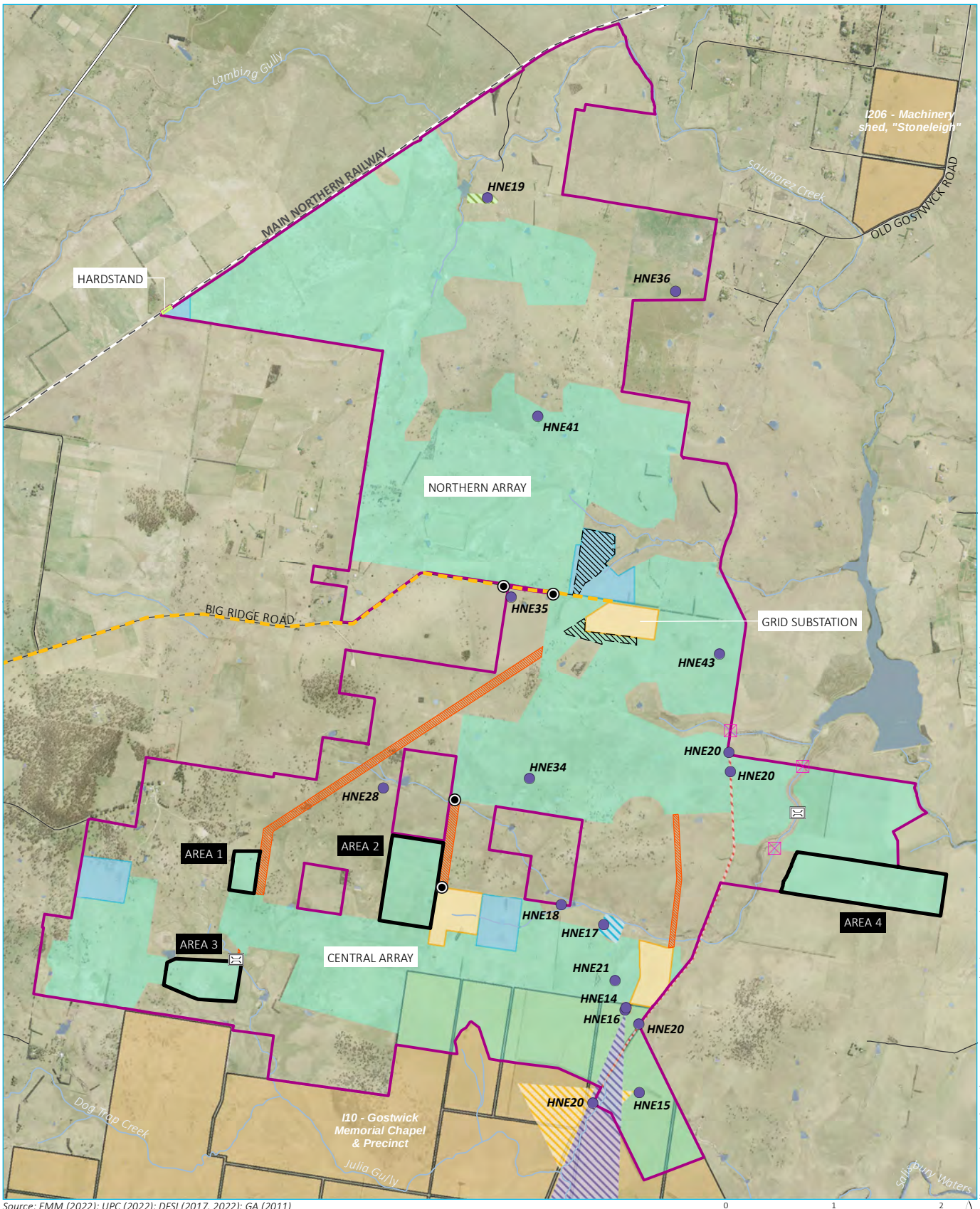
The modification area encompasses a small part of a much larger area that has cultural significance for its historical use as squatting and then pastoral runs. Field assessment as part of the HHA confirmed that relics and significant structures exist within the approved project boundary and surrounds; however, refinements of the development footprint in response to stakeholder engagement and environmental constraints identification, including historical heritage, avoided the majority of known sites and items identified during previous field surveys.

Historical items within the proposed project boundary and surrounds are shown on Figure 6.4. The closest known historic items to the modification area are:

- HNE28 – house at Spring Camp, which is approximately 450 m north of Area 2; and
- HNE20 – Old Gostwyck Road, which is approximately 350 m west of Area 4.

HNE28 is the remains of a house with a sandstock brick chimney. It was marked as Spring Camp on a plan from 1867. It is potentially of local significance and contributes to the cultural landscape and significance of Gostwyck Station.

HNE20 reflects the alignment of Old Gostwyck Road. It is visible as a farm track in some places and not visible in others. It is likely that it was never highly constructed and survives only as an ephemeral track. HNE20 does not reach the threshold for local or State significance.




Source: EMM (2022); UPC (2022); DFSI (2017, 2022); GA (2011)

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KEY

- Proposed project boundary
- Modification area
- Additional substation/BESS footprint

Proposed development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint
- Hardstand in rail corridor
- Primary vehicle access route
- Indicative location of security fencing across third order watercourse
- Proposed primary site access point
- Potential creek crossing

Existing environment

- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

LEP heritage listing

- Item - General

Indicative site boundary

- HNE15
- HNE16
- HNE17
- HNE19
- HNE20
- Historic heritage survey item

# Historic items in the proposed project boundary and surrounds

New England Solar and Battery Project
Modification Report
Figure 6.4

EMM creating opportunities

Uralla Shire Council lists a number of historic items on Schedule 5 (environmental heritage) of the Uralla LEP. Gostwyck Memorial Chapel and Precinct (I10) is the closest site to the modification area (approximately 100 m south of Area 3). The Uralla LEP listing for Gostwyck Memorial Chapel and Precinct (I10) encompasses the entirety of Lot 1 of DP 227322, which aligns with the modern extent of Gostwyck Station (Figure 6.4).

### 6.3.3 Impact assessment

Fieldwork completed as part of the ACHA included surveys of the modification area for structures and relics. The surveys were conducted by archaeologists experienced in Aboriginal and historical heritage field assessment. Whilst the primary aim of the survey was to identify Aboriginal archaeological sites and/or Aboriginal places, archaeologists also spent time investigating the historical heritage potential of the modification area.

No relics or structures associated with historic uses of the land were identified within the modification area.

### 6.3.4 Management and mitigation

No additional active or passive protection measures are required to manage the impact of the proposed modification on historic items. Construction and operation activities will be restricted to identified work areas and access tracks and deviations will not be permitted.

The HHMP will be updated to include reference to the modification area and the unanticipated finds protocol described in Chapter 3 of the HHMP will apply to the modification area. The protocol provides guidance to construction personnel should works uncover objects and fabric that may be significant.

### 6.3.5 Conclusion

The proposed management and mitigation measures will effectively manage the risks of impacts, on historic items, from construction and operational activities associated with the proposed modification.

## 6.4 Visual

### 6.4.1 Overview

A visual impact assessment (VIA) was prepared for the EIS by EMM (2019c). The results presented in the VIA have been reassessed to account for the proposed modification. The assessment focused on viewpoints with potential to experience an increase in visible project infrastructure due to the introduction of the modification area to the project boundary and development footprint and additional energy storage capacity.

### 6.4.2 Existing environment

The modification area is in a semi-rural setting, with the wider region characterised by large grazing properties, small-scale farm businesses, natural areas, scattered rural dwellings, villages and towns (including Uralla, Kellys Plains, and Armidale) and major transport infrastructure including the Main Northern Railway and New England Highway. The landform pattern within and surrounding the modification area can be described as a mix of low rolling hills and flatter areas that are frequently dissected by drainage networks and their adjacent flood plains, terraces and foot slopes.

The majority of the land surrounding the modification area is zoned RU1 primary production under the Uralla LEP. The proposed modification will not change the distance between the project and the closest sensitive land use zones. Land uses surrounding the array areas are predominantly agricultural (ie livestock grazing). Cattle and sheep grazing for wool, breeding stock and meat dominate agricultural activities within the modification area.

The closest non-project related dwelling to the modification area is C5, approximately 1.3 km south of Area 4 at its closest point. This is an approximately 400 m reduction in the distance between C5 and the project. The distance between C7 and Area 1 is approximately 1.5 km, which is the same as the distance between the development footprint for the central array area and this dwelling. The proposed modification will not change the distance between the project and any other non-project related dwellings.

No listed scenic or significant vistas near the modification area have been identified.

### 6.4.3 Impact assessment

#### i Visual elements of the proposed modification

#### a Site selection and project refinement

The site selection and refinement process for the modification area considered a range of factors, including the placement of infrastructure to minimise the visual impact on landholders and other sensitive receptors. The modification area is adjacent to the approved development footprint and, with the exception of Area 4, does not reduce the distance between the project and the closest non-project related dwellings.

As part of the preparation of this modification application, the extent of Area 4 reduced from approximately 150 ha to 57 ha (a reduction of 62%). This has increased the distance between C5 and the modification area and reduced the potential visible extent of project infrastructure from Viewpoint 11.

One of the key criteria considered during the selection of the additional BESS footprints has been proximity to rural dwellings. The additional BESS footprints have been considered as part of the revised viewshed analyses for Viewpoint 5 (Figure 6.6), Viewpoint 11 (Figure 6.7) and Viewpoint 22 (Figure 6.8). Based on the outcomes of the revised viewshed analyses, field investigations and a review of aerial imagery, in the majority of cases, it is anticipated that views of this infrastructure will be at least partially screened from all non-project related rural dwellings. This is primarily due to undulation and remnant vegetation in the landscape combined with distance to the additional BESS footprints.

#### b Construction

The modification area is relatively flat, reducing the need for heavy earthworks. Some civil works will be required to prepare the modification area for construction and for certain project infrastructure such as the laying of any underground cabling. In addition, grading around lower order streams and drainage channels within the modification area may also be required in order to manage erosion during construction.

Following site preparation, construction within the modification area will align with the description of construction activities provided in the EIS (EMM 2019a) and will typically include the following activities:

- drive or screw piles;
- install mounting structures and tracker tubes;
- secure PV modules to tracker tubes;
- install MV and HV cables;
- install PCUs; and
- test and commission project infrastructure.

A level pad is required to house BESS infrastructure and therefore levelling may be required in isolated areas within the additional BESS footprints.

### c Project infrastructure

The exact number of PV modules and PCUs will be confirmed during detailed design. Rows of PV modules within the modification area will be aligned in a north-south direction and spaced 5–8 m apart.

The height of the PV modules at their maximum tilt angle (typically up to 60 degrees) will be up to 4 m. Additional site-specific clearance of up to around 300 mm may be required to avoid flooding risk or to improve access for sheep to graze underneath the PV modules. It should be noted that this is a highly conservative assumption.

The PCU dimensions will be determined during detailed design; however, it is anticipated that each PCU will be approximately 8 m in length by 2.6 m wide by 2.7 m high.

MV electrical cables will connect the modification area to the substations and will be installed underground.

Perimeter fencing and the project's internal access road network will extend into the modification area.

It is anticipated that the BESSs will be housed within either a number of small enclosures/cabinets or larger battery buildings. Regardless of the housing selected during the detailed design stage of the BESS, this infrastructure will be designed to integrate with existing elements in the landscape wherever possible, having regard to form, height and colour. Should they be required, the large building type of enclosures will be similar in appearance to the large agricultural sheds, which currently exist in the landscape within the array areas and their surrounds.

No additional substations are required to facilitate the proposed modification.

### ii Assessed viewpoints

A total of 22 viewpoints were considered as part of the VIA (Figure 6.5). Of these viewpoints, the addition of the modification area to the development footprint has the potential to change the extent of project infrastructure visible from viewpoints 11 and 22. A revised viewshed analysis has also been undertaken from Viewpoint 5 (Figure 6.6) to assess whether there will be a significant change in visual impacts from this viewpoint as a result of the proposed additional BESS infrastructure.

### iii Construction impacts

During construction, the landscape within the modification area will undergo physical changes through the installation of project infrastructure. This infrastructure will add new features to the visual landscape within the modification area.

As a result of the proposed modification, the number of non-project related residences within 2 km of the development footprint will not change and will remain at 28. Of these residences, uninterrupted views of the modification area are unlikely. Motorists travelling along the local road network (namely Elliots Road) may experience distant views of the modification area during construction. It is assumed the focus of these motorists will be in line with their direction of travel along the affected road corridors.

Due to their temporary nature, site establishment works and construction activities within the modification area and additional BESS footprint are considered unlikely to have any significant visual impacts on passing motorists or nearby receptors greater than those during operation. Subsequently, management measures are not proposed to mitigate visual impacts during construction.

### iv Operation impacts

As part of the VIA (EMM 2019c), a viewshed analysis of the dominant project infrastructure (ie PV modules at a height of 4.3 m) was undertaken to determine potential visibility of project infrastructure at viewpoint locations. This analysis was generated using a digital elevation model (DEM) and digital surface model (DSM). The viewshed analysis is used to determine the visibility of project infrastructure from the relevant viewpoints, and the use of the DSM allows the shielding effect of built structures and vegetation to be considered. The results of the viewshed analysis for the project were included in Appendix A of the VIA (EMM 2019c).

Existing viewshed analysis figures for Viewpoint 5, Viewpoint 11 and Viewpoint 22 have been updated to demonstrate the change in the extent of project infrastructure likely to be visible from these viewpoints as a result of the proposed modification. As identified by the 5 m contours presented on the viewshed analysis figures, the landform pattern surrounding the modification area can be described as a mix of low rolling hills. The results of the visual impact assessment for these three viewpoints are included in:

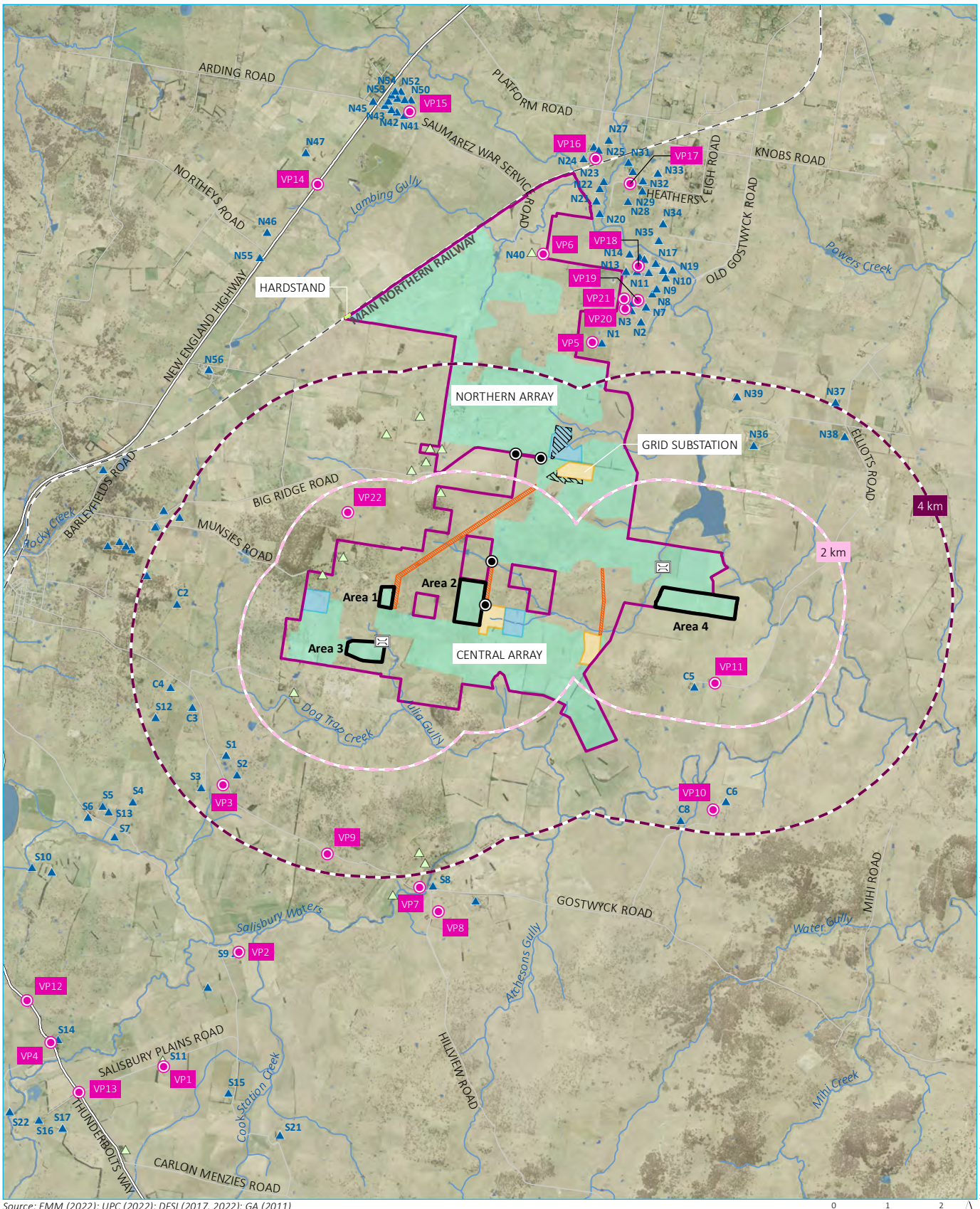
- Table 6.3 and Figure 6.6 (Viewpoint 5);
- Table 6.4 and Figure 6.7 (Viewpoint 11); and
- Table 6.5 and Figure 6.8 (Viewpoint 22).

### v Reflectivity and glare

The potential impacts of reflectivity on receptors from PV modules are commonly referred to as ‘glint’ and ‘glare’. The receptors considered are primarily dwellings within proximity of the development footprint and motorists travelling along the local and regional road network. Glint refers to shorter period and more intense levels of exposure, while glare refers to sustained or continuous periods of exposure to excessive brightness, but at a reduced level of intensity (Morelli 2014). The amount of glint and glare produced by a PV module is variable and is dependent on the angle of the PV modules, with lower angles producing less glint and glare (Morelli 2014).

The PV modules within the modification area will rotate from east to west during the day, tracking the sun’s movement, so glint and glare viewed from a particular receptor will only be temporary, if and when it occurs. Glint and glare will only be possible when direct sunlight shines on the PV modules, ie at a time when sensitive receivers are also likely to be experiencing direct sunlight which will be a significantly brighter source of light than reflection from PV modules.

Further, undulation in the landscape, favourable topography, screening in the form of existing remnant vegetation (including wind breaks) and/or landscaping completely removes or disrupts views towards the PV modules within the modification area from dwellings within proximity of the modification area. Therefore, impacts from glint or glare are not expected to be significant.




Source: EMM (2022); UPC (2022); DFSI (2017, 2022); GA (2011)

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KEY

- Proposed project boundary
- Modification area
- Additional substation/BESS footprint

Proposed development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint
- Hardstand in rail corridor
- Potential creek crossing
- Proposed primary site access point

Existing environment

- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

Sensitive receptors

- Project-related
- Non-project related

- Viewpoint location

Distance from modification area

- 2 km
- 4 km

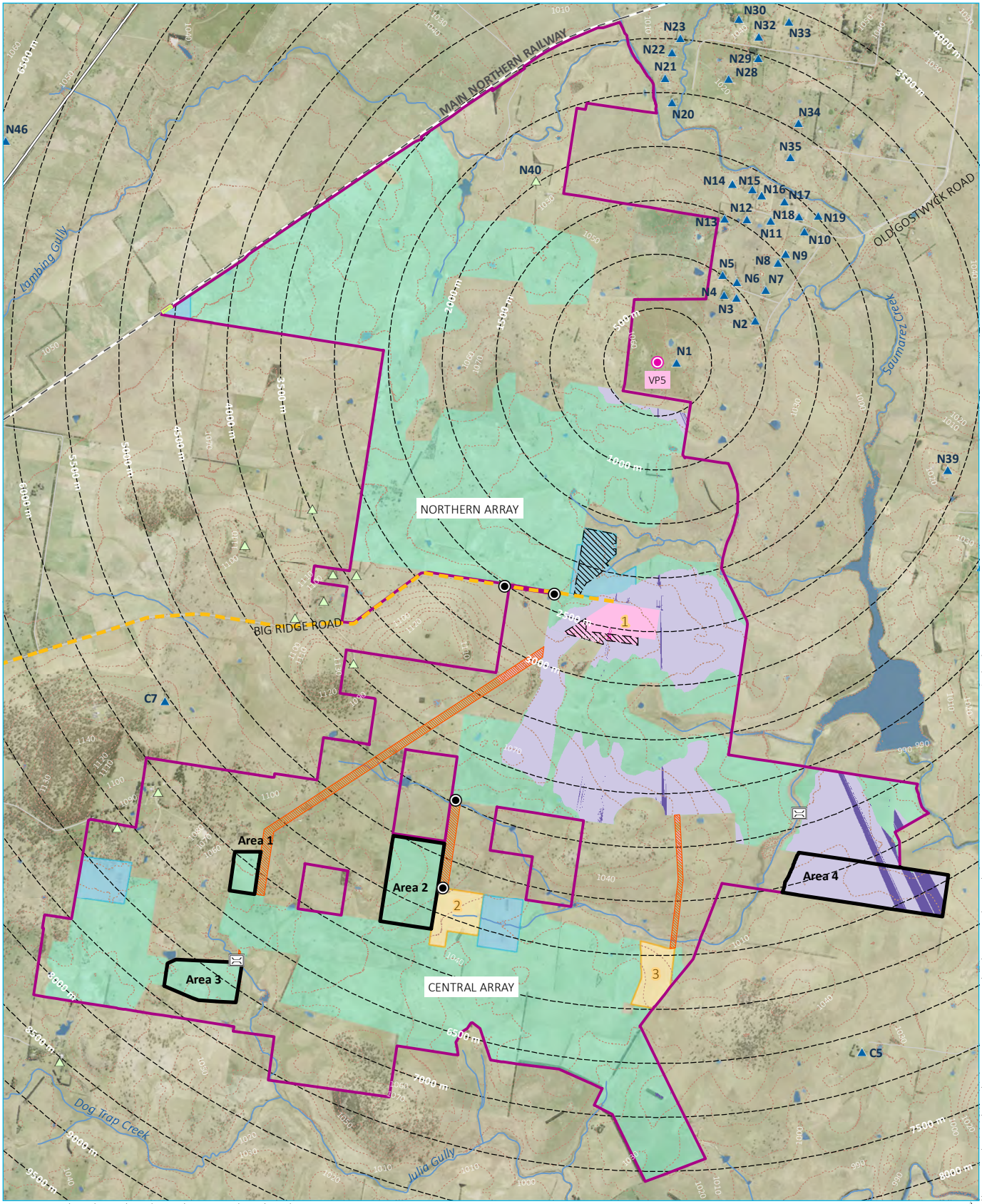
# Viewpoint locations and receptors

New England Solar and Battery Project
Modification Report
Figure 6.5

EMM creating opportunities

## Table 6.3 Viewpoint 5 – dwelling on Old Gostwyck Road north-east of the development footprint for the northern array area

| | |
|---|---|
| **Viewpoint details** | This viewpoint is within proximity of the closest rural residential property to the development footprint (N1). The closest part of the development footprint from N1 is approximately 450 m south of N1. The closest part of the modification area from N1 is approximately 4.6 km south of N1.<br>The elevation at Viewpoint 5 is approximately 1,054 m, whilst the elevation at the closest part of the development footprint is approximately 1,049 m. |
| **View type and context** | Immediate views from this location represent a typical rural setting with a large expanse of cleared, agricultural land. Other features visible from this location include scattered remnant vegetation, farm dams, farm sheds and agricultural infrastructure.<br>The results of a site inspection at this location indicate that the dominant views from within this dwelling are to the west, north-west and north. |
| **Visibility baseline assessment** | As the closest non-project related residence to the development footprint and the additional BESS footprint, the viewshed analysis for Viewpoint 5 has been updated to demonstrate the extent of project infrastructure likely to be visible from this viewpoint as a result of the proposed modification.<br>The results of the viewshed analysis indicate project infrastructure within the northern and central array areas will be visible from this location (Figure 6.6). As illustrated within Figure 6.6, shielding features in the landscape (namely planted and remnant vegetation) have the potential to partially screen the extent of project infrastructure visible from this viewpoint.<br>As shown on Figure 6.6, at a modelled height of 7.5 m (considered a worst-case scenario), infrastructure within the additional BESS footprint is not expected to be visible within a distance of approximately 2.5 km from N1. The closest visible project infrastructure within the modification area at a modelled height of 4.3 m (considered a worst-case scenario) is not expected to be visible within a distance of approximately 4.7 km from N1. |
| **Magnitude of change** | **Moderate** – as a result of its close proximity to the development footprint for the northern array area, N1 will be exposed to views of project infrastructure. Although shielding features in the landscape have been identified, views of project infrastructure from this viewpoint to the south will be possible during the operation of the project.<br>The project infrastructure will add new features to the visual landscape at this location, which will result in a moderate degree of contrast to the surrounding rural setting, for views to the south.<br>The moderate magnitude of change assigned to this viewpoint relates to views from N1 looking south towards the development footprint for the northern array area. As noted previously, this is not the primary view from N1.<br>Based on the separation distance between N1 and visible infrastructure within the additional BESS footprint and modification area, it is considered that the proposed modification will not change the magnitude of change from this viewpoint and visual impacts will not be greater than those that have already been assessed and approved as part of SSD-9255.<br>**The proposed modification has not changed the magnitude of change from this viewpoint.** |
| **Visual sensitivity** | **Moderate** – due to the presence of a rural dwelling. |
| **Evaluation of significance** | **Moderate** – there will be a moderate visual impact from this viewpoint looking south.<br>Visual impacts from this viewpoint looking south will continue throughout the life of the project.<br>**The proposed modification has not changed the evaluation of significance from this viewpoint.** |
| **Additional mitigation** | In accordance with Condition 7 of Schedule 3 of SSD-9255, within 3 years of commencement of construction, the owner of N1 may request in writing that ACEN Australia plant a vegetation screen to minimise the visual impacts of the northern array on the N1 property.<br>**No additional mitigation measures are warranted based on the evaluation of significance for the proposed modification.** |




Source: EMM (2022); UPC (2022); DFSI (2017, 2022); GA (2011)

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N

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## KEY

- Proposed project boundary
- Modification area
- Additional substation/BESS footprint

Proposed development footprint
- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint
- Hardstand in rail corridor
- Primary vehicle access route
- Proposed primary site access point
- Potential creek crossing

Existing environment
- Rail line
- Main road
- Local road
- Topographic contour (10 m increment)
- Watercourse/drainage line
- Waterbody

Sensitive receptors
- Project-related
- Non-project related

Visual impact assessment
- Viewpoint location
- Viewpoint buffer (500 m increments)

PV modules (assumed 4.3 m height)
- Visible infrastructure - accounting for shielding features in the landscape (eg vegetation)
- Visible infrastructure - bare earth surface

Battery energy storage system (assumed 7.5 m height)
- Visible infrastructure - accounting for shielding features in the landscape (eg vegetation)
- Visible infrastructure - bare earth surface

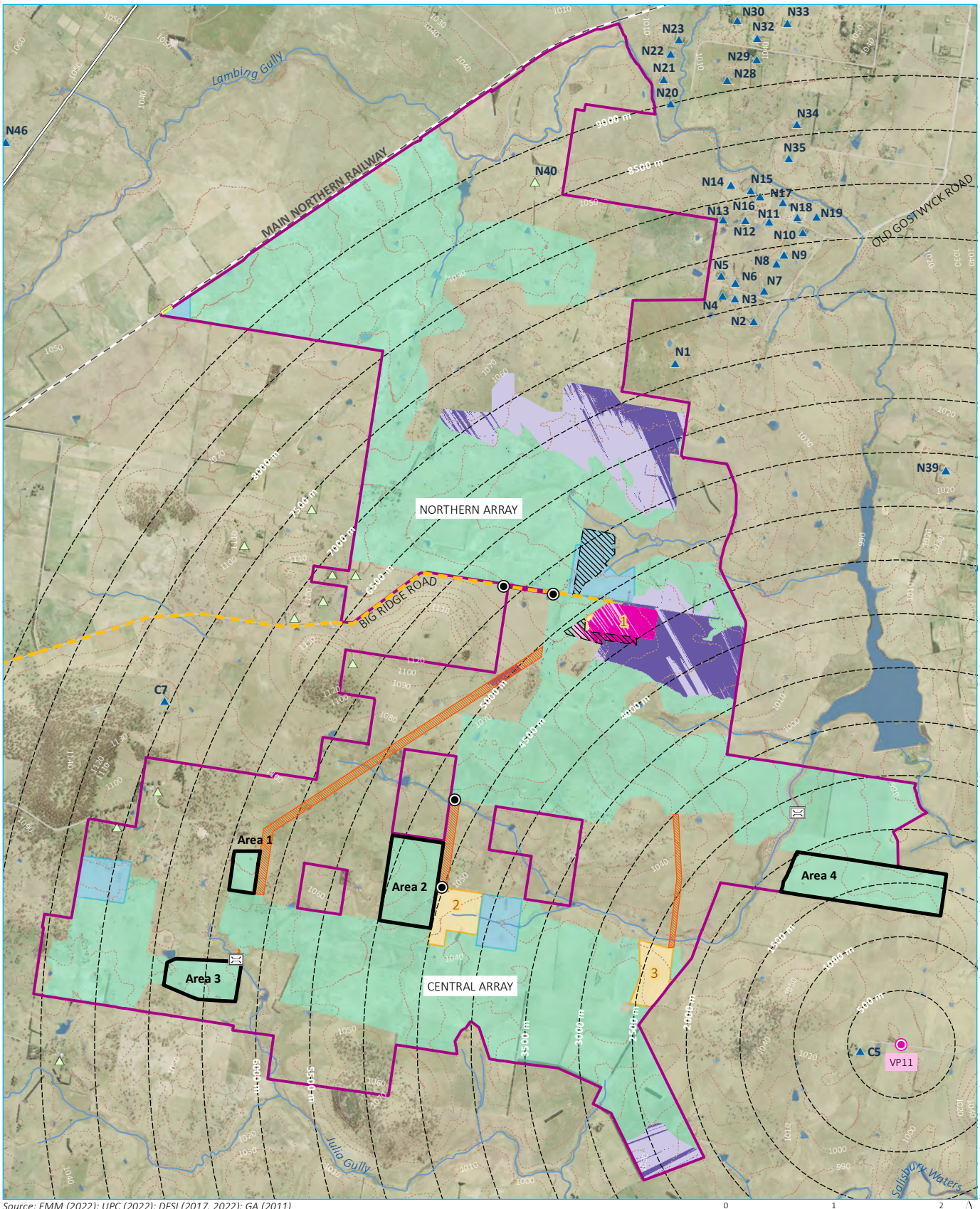
# Viewshed analysis – Viewpoint 5

New England Solar and Battery Project
Modification Report
Figure 6.6

EMM creating opportunities

### Table 6.4 Viewpoint 11 – Elliots Road and dwelling east of the development footprint for the central array area and south of the modification area

| | |
|---|---|
| **Viewpoint details** | This viewpoint is close to the end of Elliots Road looking south-west towards the development footprint for the central array area and north to the modification area (Area 4).<br>This viewpoint is approximately 380 m east of a dwelling (C5). C5 is approximately 1.7 km north-east of the development footprint for the central array area and 1.3 km south of the modification area.<br>The elevation at Viewpoint 11 is 1,030 m, whilst the elevation at the closest part of the development footprint is approximately 1,019 m. |
| **View type and context** | Views from this location represent a typical rural setting characterised by cleared agricultural land, low rolling hills, planted wind breaks and remnant vegetation. Other features in the landscape at this location include Salisbury Waters, Essential Energy's 66 kV sub-transmission line and supporting structures, farm dams and agricultural infrastructure.<br>A review of aerial imagery and the results of site investigations indicate that there is vegetation present around C5. This vegetation would act to screen views of project infrastructure within the development footprint for the central array area and the modification area. |
| **Visibility baseline assessment** | The results of the viewshed analysis indicate project infrastructure within the northern and central array areas will be visible from this location; however, project infrastructure within the modification area will not be visible (Figure 6.7). As illustrated within Figure 6.7, shielding features in the landscape (namely planted and remnant vegetation) have the potential to partially screen the extent of project infrastructure visible from this viewpoint.<br>Based on the results presented in Figure 6.7, infrastructure within the additional BESS footprint may also be visible from this viewpoint; however, the distance to the additional BESS footprint and approved substation and BESS footprint from this viewpoint is approximately 4.5 km.<br>A review of aerial imagery and the results of the viewshed analysis presented in Figure 6.7 indicate that planted and remnant vegetation and undulation in the landscape will partially screen the extent of project infrastructure visible from Viewpoint 11. |
| **Magnitude of change** | **Low** – the distance to the development footprint from this location will limit the scale of change and degree of contrast for views from this location.<br>Shielding features in the landscape (including remnant vegetation) will also reduce the extent of project infrastructure visible from this viewpoint during the operation of the project.<br>Project infrastructure will not be the primary view from this viewpoint for motorists travelling along Elliots Road, as it is assumed the focus of motorists will be in line with their direction of travel along Elliots Road.<br>**The proposed modification has not changed the magnitude of change from this viewpoint.** |
| **Visual sensitivity** | **Moderate** – due to the presence of a rural dwelling. |
| **Evaluation of significance** | **Slight/moderate** – there would not be a significant impact from this viewpoint.<br>Visual impacts from this viewpoint will continue throughout the life of the project.<br>**The proposed modification has not changed the evaluation of significance from this viewpoint.** |
| **Additional mitigation** | No additional mitigation measures are warranted based on the evaluation of significance. |




Source: EMM (2022); UPC (2022); DFSI (2017, 2022); GA (2011)

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## KEY

- Proposed project boundary
- Modification area
- Additional substation/BESS footprint

Proposed development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint
- Hardstand in rail corridor
- Primary vehicle access route
- Proposed primary site access point
- Potential creek crossing

Existing environment

- Rail line
- Main road
- Local road
- Topographic contour (10 m increment)
- Watercourse/drainage line
- Waterbody

Sensitive receptors

- Project-related
- Non-project related

Visual impact assessment

- Viewpoint location
- Viewpoint buffer (500 m increments)

PV modules (assumed 4.3 m height)

- Visible infrastructure - accounting for shielding features in the landscape (eg vegetation)
- Visible infrastructure - bare earth surface

Battery energy storage system (assumed 7.5 m height)

- Visible infrastructure - accounting for shielding features in the landscape (eg vegetation)
- Visible infrastructure - bare earth surface

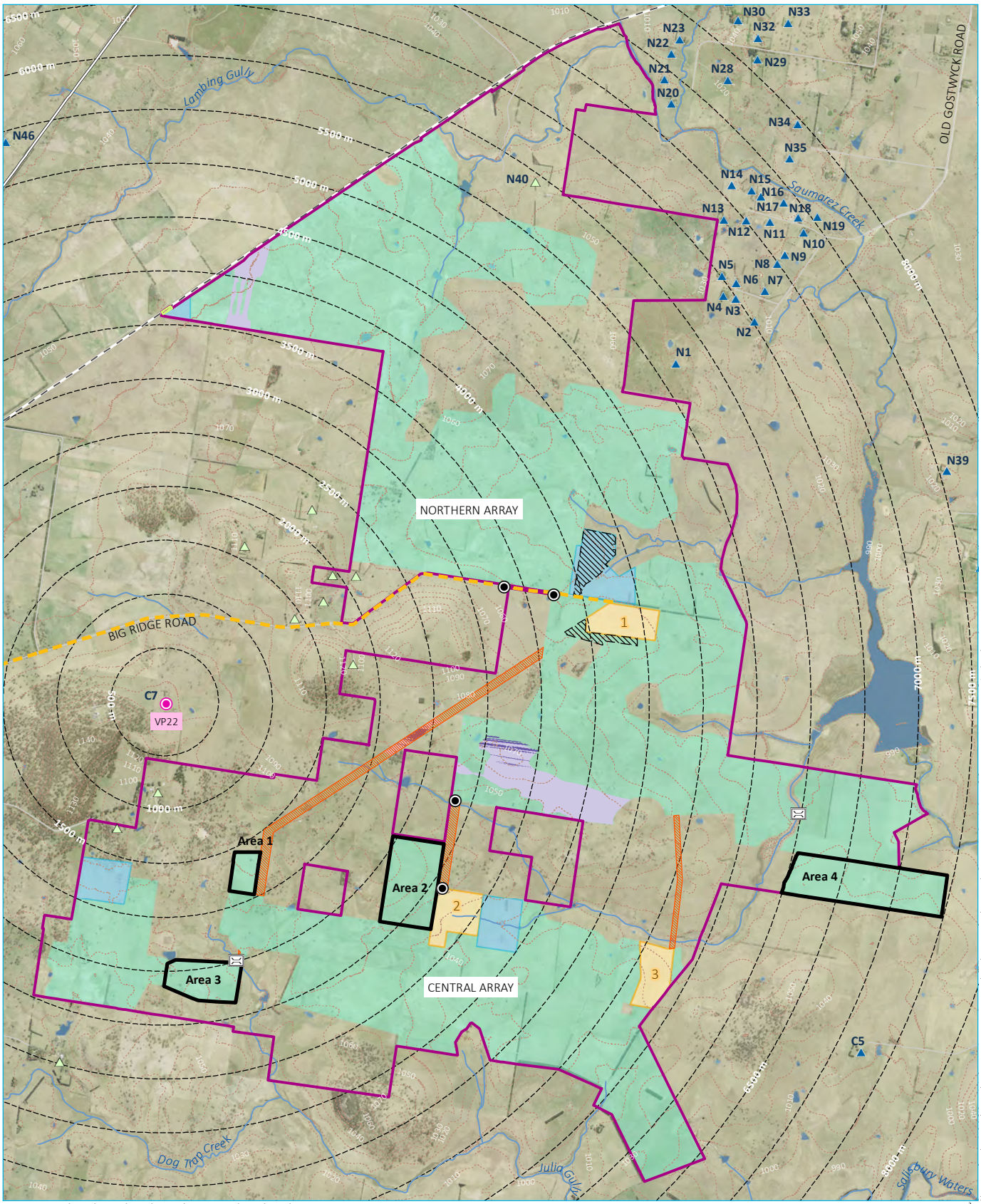
# Viewshed analysis – Viewpoint 11

New England Solar and Battery Project
Modification Report
Figure 6.7

EMM creating opportunities

### Table 6.5 Viewpoint 22 – dwelling on Big Ridge Road north of the development footprint for the central array area

| | |
|---|---|
| **Viewpoint details** | This viewpoint is within proximity of a private rural residential property north of the development footprint for the central array area (C7). At its closest point, the development footprint for the central array area is approximately 1.5 km south of C7. At its closest point, the development footprint for the northern array area is approximately 2.1 km north-east of C7.<br>The elevation at Viewpoint 22 is 1,103 m, whilst the elevation at the closest part of the development footprint is approximately 1,076 m. |
| **View type and context** | Immediate views from this location represent a typical rural residential setting with a combination of planted and remnant vegetation surrounded by a large expanse of cleared, agricultural land. Other features visible from this location include TransGrid's 330 kV transmission line and agricultural infrastructure. |
| **Visibility baseline assessment** | The results of the viewshed analysis indicate project infrastructure within the central array area will not be visible from this viewpoint. Project infrastructure within the northern array area may be partially visible from this location (Figure 6.8) at a distance of more than 2.5 km. As illustrated within Figure 6.8, shielding features in the landscape are likely to effectively screen the extent of project infrastructure visible from this viewpoint.<br>Based on the results presented in Figure 6.8, infrastructure within the additional BESS footprint will not be visible from this viewpoint.<br>Based on the results of a site inspection, it is anticipated that the distant views of project infrastructure from this location will be interrupted by scattered vegetation within the landscape between C7 and the development footprint for the northern array area. TransGrid's 330 kV transmission line and supporting infrastructure will also interrupt views of project infrastructure from C7.<br>It is noted that TransGrid's 330 kV transmission line is located at a distance of approximately 1.5 km from C7 (at its closest point) and project infrastructure (if visible) will be further from C7 than this existing infrastructure. |
| **Magnitude of change** | **Low** – the distance to the development footprint from this location will limit the scale of change and degree of contrast for views from this location.<br>Shielding features in the landscape (including remnant vegetation) will also reduce the extent of project infrastructure visible from this viewpoint during the operation of the project.<br>**The proposed modification has not changed the magnitude of change from this viewpoint.** |
| **Visual sensitivity** | **Moderate** – due to the presence of a rural dwelling. |
| **Evaluation of significance** | **Slight/moderate** – there would not be a significant impact from this viewpoint.<br>Visual impacts from this viewpoint will continue throughout the life of the project.<br>**The proposed modification has not changed the evaluation of significance from this viewpoint.** |
| **Additional mitigation** | No additional mitigation measures are warranted based on the evaluation of significance. |




Source: EMM (2022); UPC (2022); DFSI (2017, 2022); GA (2011)

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## KEY

- Proposed project boundary
- Modification area
- Additional substation/BESS footprint

Proposed development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint
- Hardstand in rail corridor
- Primary vehicle access route
- Proposed primary site access point
- Potential creek crossing

Existing environment

- Rail line
- Main road
- Local road
- Topographic contour (10 m increment)
- Watercourse/drainage line
- Waterbody

Sensitive receptors

- Project-related
- Non-project related

Visual impact assessment

- Viewpoint location
- Viewpoint buffer (500 m increments)

PV modules (assumed 4.3 m height)

- Visible infrastructure - accounting for shielding features in the landscape (eg vegetation)
- Visible infrastructure - bare earth surface

Battery energy storage system (assumed 7.5 m height)

- Visible infrastructure - accounting for shielding features in the landscape (eg vegetation) - *not visible under modelled conditions*
- Visible infrastructure - bare earth surface - *not visible under modelled conditions*

# Viewshed analysis – Viewpoint 22

New England Solar and Battery Project
Modification Report
Figure 6.8

EMM creating opportunities

### vi Summary of visual assessment

The summary of the results of the analysis of visual impacts for each of the 22 viewpoints considered as part of the VIA has been updated in recognition of the proposed modification (Table 6.6).

**Table 6.6 Summary of results of visual impacts at each viewpoint**

| Viewpoint | Distance to closest array area | Closest array area | Representative receptors | Elevation at viewpoint (a) and closest development footprint (b) | Residential or public | Project infrastructure visible based on viewshed analysis | Magnitude of change | Visual sensitivity | Evaluation of significance | Significant impact | Additional mitigation proposed | Change in level of impact from proposed modification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Viewpoint 1 | 7.8 km | Central | S11 | (a) 1,031 m<br>(b) 1,044 m | Residential | No | Negligible | Moderate | Slight | No | No | No |
| Viewpoint 2 | 5.5 km | Central | S9 | (a) 1,008 m<br>(b) 1,044 m | Residential | No | Negligible | Moderate | Slight | No | No | No |
| Viewpoint 3 | 2.9 km | Central | S3; S1; S2 | (a) 1,051 m<br>(b) 1,044 m | Residential | No | Negligible | Moderate | Slight | No | No | No |
| Viewpoint 4 | 8.2 km | Central | S14 | (a) 1,028 m<br>(b) 1,044 m | Residential | No | Negligible | Moderate | Slight | No | No | No |
| Viewpoint 5 | 450 m | Northern | N1 | (a) 1,054 m<br>(b) 1,049 m | Residential | Yes | Moderate | Moderate | Moderate | No | Yes** | No |
| Viewpoint 6 | 380 m | Northern | N40* | (a) 1,027 m<br>(b) 1,034 m | Residential | Yes | Moderate | Moderate | Moderate | No | No | No |
| Viewpoint 7 | 3.8 km | Central | Uralla LEP listing I10<br>S8 | (a) 993 m<br>(b) 1,044 m | Public | Yes | Negligible | High | Slight | No | No | No |
| Viewpoint 8 | 4 km | Central | Uralla LEP listing I11<br>Motorists | (a) 1,005 m<br>(b) 1,026 m | Public | Yes | Negligible | High | Slight | No | No | No |
| Viewpoint 9 | 3.5 km | Central | Motorists | (a) 1,056 m<br>(b) 1,048 m | Public | No | Negligible | Low | Negligible | No | No | No |

**Table 6.6 Summary of results of visual impacts at each viewpoint**

| Viewpoint | Distance to closest array area | Closest array area | Representative receptors | Elevation at viewpoint (a) and closest development footprint (b) | Residential or public | Project infrastructure visible based on viewshed analysis | Magnitude of change | Visual sensitivity | Evaluation of significance | Significant impact | Additional mitigation proposed | Change in level of impact from proposed modification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Viewpoint 10 | 2.2 km | Central | C6; C8<br>Motorists | (a) 1,002 m<br>(b) 1,010 m | Public | Yes | Low | Moderate | Slight/ moderate | No | No | No |
| Viewpoint 11 | 1.3 km | Modification area (Area 4) | C5<br>Motorists | (a) 1,030 m<br>(b) 1,019 m | Public | Yes | Low | Moderate | Slight/ moderate | No | No | No |
| Viewpoint 12 | 8 km | Central | Motorists | (a) 1,071 m<br>(b) 1,044 m | Public | No | Negligible | Low | Negligible | No | No | No |
| Viewpoint 13 | 8.9 km | Central | Motorists<br>Uralla LEP listing I14<br>S17; S19; S20; S22 | (a) 1,011 m<br>(b) 1,044 m | Public<br>Residential | No | Negligible | High | Slight | No | No | No |
| Viewpoint 14 | 2.3 km | Northern | Motorists | (a) 1,047 m<br>(b) 1,049 m | Residential | Yes | Low | Low | Slight | No | No | No |
| Viewpoint 15 | 2.4 km | Northern | N41; N42; N43; N44<br>Motorists | (a) 1,023 m<br>(b) 1,015 m | Residential | Yes | Low | Moderate | Slight/ moderate | No | No | No |
| Viewpoint 16 | 2.5 km | Northern | N24; N25; N26; N27 | (a) 1,015 m<br>(b) 1,046 m | Public | Yes | Low | Moderate | Slight/ moderate | No | No | No |

**Table 6.6 Summary of results of visual impacts at each viewpoint**

| Viewpoint | Distance to closest array area | Closest array area | Representative receptors | Elevation at viewpoint (a) and closest development footprint (b) | Residential or public | Project infrastructure visible based on viewshed analysis | Magnitude of change | Visual sensitivity | Evaluation of significance | Significant impact | Additional mitigation proposed | Change in level of impact from proposed modification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Viewpoint 17 | 2.2 km | Northern | N20; N21; N22; N23; N28; N29; N30; N31; N32; N33 | (a) 1,040 m<br>(b) 1,046 m | Public | Yes | Low | Moderate | Slight/ moderate | No | No | No |
| Viewpoint 18 | 1.4 km | Northern | N10; N11; N12; N13; N14; N15; N16; N17; N18; N19 | (a) 1,008 m<br>(b) 1,046 m | Public | No | Negligible | Moderate | Slight | No | No | No |
| Viewpoint 19 | 1.1 km | Northern | N2; N3; N4; N5; N6; N7 | (a) 1,014 m<br>(b) 1,036 m | Public | No | Negligible | Moderate | Slight | No | No | No |
| Viewpoint 20 | 1 km | Northern | N4 | (a) 1,038 m<br>(b) 1,036 m | Residential | Yes | Low | Moderate | Slight/ moderate | No | No | No |
| Viewpoint 21 | 1.2 km | Northern | N5 | (a) 1,033 m<br>(b) 1,045 m | Residential | Yes | Low | Moderate | Slight/ moderate | No | No | No |
| Viewpoint 22 | 1.5 km | Central Modification area (Area 2) | C7 | (a) 1,103 m<br>(b) 1,076 m | Residential | Yes | Low | Moderate | Slight/ moderate | No | No | No |

Notes: *Rural dwelling owned by one of the project landholders that is currently leased to a member of the local community.
**In accordance with Condition 7 of Schedule 3 of SSD-9255, within 3 years of commencement of construction, the owner of N1 may request in writing that ACEN Australia plant a vegetation screen to minimise the visual impacts of the northern array on the N1 property.

### 6.4.4 Management and mitigation

Development of the project design has included and will continue to include general measures to reduce the degree of contrast between project infrastructure and the surrounding rural landscape, having regard to the form, scale, height, colour and texture of materials incorporated as part of the project.

As noted within the VIA, where possible, suitable colours will be chosen for project infrastructure to minimise visual impacts. All external lighting will be installed as low intensity lighting (except where required for safety or emergency purposes) and will comply with AS/NZS 4282:2019 – *Control of Obtrusive Effects of Outdoor Lighting*. In addition, all external lighting will not shine above the horizontal.

In accordance with Condition 7 of Schedule 3 of SSD-9255, within 3 years of commencement of construction, the owner of N1 may request in writing that ACEN Australia plant a vegetation screen to minimise the visual impacts of the northern array on the N1 property. It is anticipated that planting will commence in Q4, 2022. Once implemented, it is anticipated that this vegetation screen will also help to screen distant views of project infrastructure within the additional BESS footprint and modification area.

No additional mitigation measures are warranted based on the revised evaluation of significance for Viewpoint 11 or Viewpoint 22.

### 6.4.5 Conclusion

Representative viewpoints have been reassessed to demonstrate the potential visual impacts of the proposed modification. Due to existing mature vegetation, variable elevation and undulation in the landscape, and the height of the dominant project infrastructure, namely the PV modules, infrastructure within the modification area will be relatively shielded from view at the majority of viewpoints.

Based on the separation distance between N1 and visible infrastructure within the additional BESS footprint and modification area, it is considered that the proposed modification will not change the magnitude of change from this viewpoint and visual impacts will not be greater than those that have already been assessed and approved as part of SSD-9255.

The proposed modification will reduce the distance between C5 and the closest project infrastructure to approximately 1.3 km; however, it is not anticipated to result in any difference in the magnitude of change experienced from this dwelling due to undulation in the landscape between C5 and the modification area.

Based on field investigations and a review of aerial imagery, it is anticipated that views of the additional BESS infrastructure will be at least partially screened from all non-project related rural dwellings. Where possible, suitable colours will be chosen for project infrastructure to minimise visual impacts, including BESS housing. These buildings and materials will be designed to blend in with the local rural/farming landscape and will not be dissimilar to existing farm sheds and agricultural infrastructure in the area surrounding the project.

The proposed modification is not anticipated to have any significant adverse visual impacts on the locality.

## 6.5 Noise and vibration

### 6.5.1 Overview

A noise and vibration impact assessment (NVIA) was prepared for the EIS by EMM (2018d). The results presented in the NVIA have been reassessed to account for the proposed modification (including the modification area, additional BESS infrastructure, additional heavy vehicle movements and additional construction hours). The assessment focused on N1 and C5 and was prepared with reference to the methods outlined in the *Noise Policy for Industry* (NPfI) (EPA 2017) and the *Interim Construction Noise Guideline* (ICNG) (DECC 2009).

### 6.5.2 Existing environment

#### i Ambient noise

Given the site context and surrounding agricultural land uses, existing ambient noise levels at assessment locations (ie residences) are considered likely to be dominated by rural noise sources and some road traffic noise. Consistent with the NVIA for the EIS, the rating background noise levels (RBLs) are expected to be relatively low and therefore the NPfI (EPA 2017) minimum RBLs of 35 dB and 30 dB have been adopted for this assessment for the daytime and evening/night-time periods, respectively.

#### ii Assessment locations

The NVIA prepared as part of the EIS (EMM 2018d) assessed the project's potential noise and vibration impacts at 67 assessment locations. As a result of the proposed modification, the development footprint will move closer to assessment location C5 (Figure 1.2). In addition, N1 will be the closest assessment location to the additional BESS footprint (Figure 1.2). Therefore, C5 and N1 have been the focus of this assessment.

If compliance with relevant construction and operational noise criteria can be demonstrated at N1 and C5, then compliance can be assumed at other assessment locations further away from the additional BESS footprint and modification area.

#### iii Existing noise criteria

There are no existing noise criteria outlined in the development consent. The only conditions related to noise are Conditions 12 and 13 of Schedule 3 of SSD-9255, which state:

> **12 Construction, Upgrading and Decommissioning Hours**
>
> Unless the Secretary agrees otherwise, the Applicant may only undertake construction, upgrading or decommissioning activities on site between:
>
> (a) 7 am to 6 pm Monday to Friday;
>
> (b) 8 am to 1 pm Saturdays; and
>
> (c) at no time on Sundays and NSW public holidays.
>
> The following construction, upgrading or decommissioning activities may be undertaken outside these hours without the approval of the Secretary:
>
> - the delivery of materials as requested by the NSW Police Force or other authorities for safety reasons; or
> - emergency work to avoid the loss of life, property and/or material harm to the environment.
>
> **13 Noise**
>
> The Applicant must minimise the noise generated by any construction, upgrading or decommissioning activities on site in accordance with the best practice requirements outlined in the Interim Construction Noise Guideline (DECC 2009), or its latest version.

### 6.5.3 Assessment criteria

#### i Construction noise criteria

The construction noise management levels (NMLs) for this assessment have been based on the adopted NPfI minimum daytime RBL of 35 dB in accordance with the ICNG (DECC 2009). The NMLs are shown in Table 6.7 and are the same as those adopted in the original NVIA.

**Table 6.7 Project construction residential NMLs**

| Assessment location | ICNG hours | Period[2] | Adopted RBL, dB(A) | NML, $L_{Aeq,15\ minute}$ |
|---|---|---|---|---|
| C5<br>N1 | Standard hours[1] | Day | 35 | 45<br>75 (highly affected) |
| | Out-of-hours | Day | 35 | 40 |

Notes: 1. Standard hours as per the ICNG are Monday to Friday from 7.00 am to 6.00 pm, Saturday from 8.00 am to 1.00 pm, no work on Sundays and public holidays.

2. NPfI periods are day: 7.00 am to 6.00 pm Monday to Saturday; 8.00 am to 6.00 pm Sundays and public holidays; evening: 6.00 pm to 10.00 pm; night: 10.00 pm to 7.00 am Monday to Saturday; 10.00 pm to 8.00 am Sundays and public holidays.

#### ii Operational noise criteria

The NPfI provides a methodology for the assessment of noise from industrial sites. As per the NPfI, project noise trigger levels (PNTLs) are the more stringent of either the project intrusive or amenity noise levels. The project intrusive noise levels, recommended amenity noise levels and PNTLs are provided in Table 6.8 and are the same as those adopted in the original NVIA.

**Table 6.8 Project noise trigger levels, $L_{Aeq,15min}$**

| Assessment location | Intrusive noise level, $L_{Aeq,15\ minute}$, dB | | | Amenity noise level, $L_{Aeq,period}$, dB | | | PNTL, $L_{Aeq,15min}$, dB | | |
|---|---|---|---|---|---|---|---|---|---|
| | Day[1] | Evening[1] | Night[1] | Day[1] | Evening[1] | Night[1] | Day[1] | Evening[1] | Night[1] |
| C5<br>N1 | 40 | 35 | 35 | 48 | 43 | 38 | 40 | 35 | 35 |

Notes: 1. Day: 7.00 am to 6.00 pm Monday to Saturday; 8.00 am to 6.00 pm Sundays and public holidays; evening: 6.00 pm to 10.00 pm; night: 10.00 pm to 7.00 am Monday to Saturday; 10.00 pm to 8.00 am Sundays and public holidays.

#### iii Vibration

The potential construction vibration impacts were assessed based on the use of typical vibration intensive equipment. Safe working distances for typical items of vibration intensive plant are listed in Table 6.9. The safe working distances are quoted for both 'cosmetic damage' (refer to British Standard BS 7385) and 'human comfort' (refer to British Standard BS 6472-1).

### Table 6.9 Recommended safe working distances for vibration intensive plant

| Plant item[1] | Rating/description | Minimum safe working distance | |
|---|---|---|---|
| | | Cosmetic damage (BS 7385) | Human response (BS 6472) |
| Vibratory roller | <50 kN (typically 1–2 tonnes) | 5 m | 15 to 20 m |
| | <100 kN (typically 2–4 tonnes) | 6 m | 20 m |
| | <200 kN (typically 4–6 tonnes) | 12 m | 40 m |
| | <300 kN (typically 7–13 tonnes) | 15 m | 100 m |
| | >300 kN (typically 13–18 tonnes) | 20 m | 100 m |
| | >300 kN (>18 tonnes) | 25 m | 100 m |
| Small hydraulic hammer | (300 kg – 5 to 12 tonne excavator) | 2 m | 7 m |
| Medium hydraulic hammer | (900 kg – 12 to 18 tonne excavator) | 7 m | 23 m |
| Large hydraulic hammer | (1,600 kg – 18 to 34 tonne excavator) | 22 m | 73 m |
| Vibratory pile driver | Sheet piles | 2 m to 20 m | 20 m |
| Pile boring | ≤800 mm | 2 m (nominal) | N/A |
| Jackhammer | Hand held | 1 m (nominal) | Avoid contact with structure |

Source: Transport Infrastructure Development Corporation Construction 2007, *Construction Noise Strategy (Rail Projects)*.

#### iv Road traffic noise

The principal guidance for assessing the impact of road traffic noise on assessment locations is the *Road Noise Policy* (DECCW 2011). The sections of the New England Highway within proximity of the development footprint are classified as 'freeway/arterial road and sub-arterial roads', while Barleyfields Road and Big Ridge Road are classified as 'local roads'.

The road noise assessment criteria for these road categories (as per Table 3 of the RNP (DECCW 2011)) are provided in Table 6.10. It should be noted that such criteria apply to permanent situations and it is therefore conservative to apply these criteria to the construction activities proposed as part of the project.

**Table 6.10 Road traffic noise assessment criteria for residential land uses**

| Road category | Type of project/development | Assessment criteria, dB(A) | |
|---|---|---|---|
| | | Day (7.00 am to 10.00 pm) | Night (10.00 pm to 7.00 am) |
| Freeway/arterial /sub-arterial roads | Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments. | $L_{Aeq,15\ hour}$ 60 (external) | $L_{Aeq,9\ hour}$ 55 (external) |
| Local roads | Existing residences affected by additional traffic on existing local roads generated by land use developments. | $L_{Aeq,1\ hour}$ 55 (external) | $L_{Aeq,1\ hour}$ 50 (external) |

### 6.5.4 Impact assessment

#### i Construction noise assessment

As discussed in Section 1.1.5, ACEN Australia has identified a need to increase the project's construction hours in order to efficiently utilise the project's construction workforce. It is proposed to increase construction hours to include 1 pm to 6 pm on Saturday afternoons. On-site construction hours will include:

- 7.00 am to 6.00 pm Monday to Friday;
- 8.00 am to 6.00 pm Saturdays; and
- at no time on Sundays and NSW public holidays.

Activities that are inaudible at non-project related residences are also proposed to be undertaken outside of these times; however, have not been considered further as part of the construction noise assessment.

Construction within the modification area will comprise the installation of PV modules and associated infrastructure. Site preparation will be the starting phase of the construction works. The need for heavy civil works such as grading/levelling and compaction will be minimised as flat land areas, which are already mostly cleared of vegetation, have been selected for inclusion in the modification area. Grading around lower order streams and drainage channels may also be required in order to manage erosion during construction.

Based on the noise modelling results from the NVIA, the site preparation works have the most potential for noise impacts given the number of plant to be used, their emission levels, duration and locations of other construction activities, and therefore have been the focus for this assessment. Noise from other construction activities will result in off-site noise levels that are below those from site preparation works. Predicted construction noise levels for the site preparation works are presented in Table 6.11.

**Table 6.11 Predicted $L_{Aeq,15\ minute}$ construction noise levels**

| Assessment location | ICNG standard hours | Period[1] | Predicted noise level, dB | | NML, dB |
|---|---|---|---|---|---|
| | | | NVIA (EMM 2018d) | Proposed modification | |
| C5 | Standard hours | Day | <35 $L_{Aeq,15\ minute}$ | <35 $L_{Aeq,15\ minute}$ | 45 $L_{Aeq,15\ minute}$ |
| | Out-of-hours | Day | <35 $L_{Aeq,15\ minute}$ | 38 $L_{Aeq,15\ minute}$ | 40 $L_{Aeq,15\ minute}$ |
| N1 | Standard hours | Day | 45 $L_{Aeq,15\ minute}$ | 45 $L_{Aeq,15\ minute}$ | 45 $L_{Aeq,15\ minute}$ |
| | Out-of-hours | Day | 40 $L_{Aeq,15\ minute}$[2] | 40 $L_{Aeq,15\ minute}$[2] | 40 $L_{Aeq,15\ minute}$ |

Notes: 1. Standard hours: Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm and no construction work on Sundays or public holidays.

2. Assumes a 600 m buffer (ie work exclusion area) will be maintained around N1 during out-of-hours periods.

As shown in Table 6.11, construction noise levels at C5 and N1 are predicted to satisfy the recommended NML during ICNG standard construction hours.

Construction noise levels at C5 are predicted to satisfy the relevant NML during daytime out-of-hours construction works (ie 1.00 pm to 6.00 pm Saturday afternoons).

Construction noise levels at N1 are expected to satisfy the relevant NML during daytime out-of-hours construction works (ie 1.00 pm to 6.00 pm Saturday afternoons) if a 600 m buffer (ie work exclusion area) is maintained around N1 during these times.

### ii Operational noise assessment

As part of the NVIA (EMM 2018d), noise sources considered during project operations included inverters with integrated transformers, tracker motors (PV modules), substation transformers, BESS components and light vehicles. It is noted that noise from the inverters with integrated transformers can be tonal in nature and therefore a 5 dB penalty has been applied to the predicted noise contributions from this source in accordance with Table C.1 of the NPfI (EPA 2017).

Since the completion of the NVIA (EMM 2018d), sound power levels associated with potential BESS infrastructure have changed. As part of the operational noise assessment for the proposed modification, the following BESS options have been assessed within the additional BESS footprint:

- Option 1 – Containerised BESS infrastructure.
- Option 2 – Outdoor battery rack.
- Option 3 – Indoor battery racks in dedicated use buildings.

The containerised BESS infrastructure is considered the worst-case option from an acoustics perspective (based on the sound power levels per unit) and formed the basis of the revised operational noise assessment.

Predicted operational noise levels from the NVIA and for the proposed modification are compared with the relevant PNTLs for C5 and N1 in Table 6.12.

### Table 6.12 Predicted $L_{Aeq,15\ minute}$ operational noise levels

| Assessment location | Period[1] | Predicted noise level, dB | | PNTL, dB |
|---|---|---|---|---|
| | | NVIA (EMM 2018d) | Proposed modification | |
| C5 | Day | <40 $L_{Aeq,15\ minute}$ | <40 $L_{Aeq,15\ minute}$ | 40 $L_{Aeq,15\ minute}$ |
| | Evening | <35 $L_{Aeq,15\ minute}$ | <35 $L_{Aeq,15\ minute}$ | 35 $L_{Aeq,15\ minute}$ |
| | Night | <35 $L_{Aeq,15\ minute}$ | <35 $L_{Aeq,15\ minute}$ | 35 $L_{Aeq,15\ minute}$ |
| N1 | Day | <40 $L_{Aeq,15\ minute}$ | <40 $L_{Aeq,15\ minute}$ | 40 $L_{Aeq,15\ minute}$ |
| | Evening | <35 $L_{Aeq,15\ minute}$ | <35 $L_{Aeq,15\ minute}$ | 35 $L_{Aeq,15\ minute}$ |
| | Night | <35 $L_{Aeq,15\ minute}$ | <35 $L_{Aeq,15\ minute}$ | 35 $L_{Aeq,15\ minute}$ |

Notes: 1. Day: 7.00 am to 6.00 pm Monday to Saturday; 8.00 am to 6.00 pm Sundays and public holidays; evening: 6.00 pm to 10.00 pm; night: 10.00 pm to 7.00 am Monday to Saturday; 10.00 pm to 8.00 pm Sundays and public holidays.

Operational noise levels are predicted to satisfy the recommended PNTLs at C5 and N1 during the day, evening and night-time periods (including the introduction of containerised BESS infrastructure within the additional BESS footprint). As Option 1 is predicted to comply with the relevant criteria, Options 2 and 3 are also expected to comply.

Operational noise levels from the project are not expected to change as a result of the proposed modification.

#### iii Vibration

The majority of vibration-generating activities associated with construction will utilise a roller and a piling drill rig. Given that the distance between the modification area and assessment location C5 (approximately 1.3 km) still greatly exceeds the minimum safe working distances for cosmetic damage and human comfort, no vibration impacts are predicted to occur at assessment location C5 throughout project construction.

Further, given that the development footprint will not move closer to N1 as a result of the proposed modification, no additional vibration impacts are predicted to occur at N1 during construction.

#### iv Construction road traffic noise

As discussed in Section 3.5, the proposed modification includes an increase in the volume of heavy vehicles accessing the site along the primary vehicle access route (ie New England Highway, Barleyfields Road (north) and Big Ridge Road) during construction. The proposed daily road traffic volumes along this route are:

- up to 206 light vehicles per day; and
- up to 84 heavy vehicles per day.

As a result of the proposed modification, negligible increases to the road traffic noise level predictions outlined in the original NVIA are anticipated at the most affected receivers on Big Ridge Road and Barleyfields Road (north). Given the negligible increases, in the order of 0–1 dB, the road traffic noise level predictions outlined in the original NVIA remain appropriate for the assessment of construction traffic.

It is of note that the road traffic noise predictions are based on light and heavy vehicle movements during the peak construction period and hence this assessment of road traffic noise is considered to be highly conservative. Further, the application of RNP criteria to construction scenarios is highly conservative given the RNP is designed for permanent scenarios and not temporary impacts resulting from construction activities.

### 6.5.5 Management and mitigation

A 600 m buffer (ie work exclusion area) will be maintained around N1 during daytime out-of-hours construction works (ie 1.00 pm to 6.00 pm Saturday afternoons). With the application of this additional mitigation measure, no additional noise or vibration impacts are expected to result from the proposed modification. Therefore, the noise mitigation and management measures proposed in the original NVIA (EMM 2018d) remain appropriate.

Construction noise and vibration is currently managed in accordance with *New England Solar Farm – Construction Noise and Vibration Management Plan (Stage 1)* (SMEC 2021b). The site-specific noise and vibration mitigation and management measures outlined in this management plan will continue to be applied.

### 6.5.6 Conclusion

The proposed modification is predicted to result in negligible changes to previously assessed construction and operational noise emissions. Construction noise levels at C5 and N1 are predicted to satisfy the recommended NMLs during ICNG standard construction hours and daytime out-of-hours periods (assuming a 600 m buffer is maintained around N1). Operational noise levels at C5 and N1 are predicted to satisfy the recommended PNTLs during the day, evening and night-time periods.

Given compliance with the relevant criteria has been demonstrated at C5 and N1, the noise and vibration predictions at all other assessment locations considered as part of the NVIA (EMM 2018d) are not anticipated to change as a result of the proposed modification.

## 6.6 Transport

### 6.6.1 Overview

SCT Consulting (2019) prepared a *Traffic and Transport Impact Assessment* to support the development application for the project. SCT Consulting has subsequently prepared two technical advisory notes to assess the potential impacts of the proposed increase in over-dimensional and heavy vehicle movements (Appendix G).

### 6.6.2 Over-dimensional vehicle movements

As discussed in Section 3.4, ACEN Australia proposes to increase the number of over-dimensional vehicle movements by 15 (ie from 15 to 30). As part of the EIS (EMM 2019a) and AR (EMM 2019b), it was assumed that over-dimensional vehicles would only be required for the transportation of three power transformers, with all other plant and equipment requiring standard heavy vehicles. As a result of further work undertaken during detailed design, ACEN Australia estimates that over-dimensional vehicles will be required throughout construction, operation and decommissioning to transport:

- replacements of damaged, failed transformers, significant components and related equipment;
- BESS infrastructure (including civil works plant, components and related equipment); and
- replacements of large indivisible items during operations and decommissioning (if required).

SCT Consulting prepared a technical advisory note to assess the potential impacts of the additional over-dimensional vehicle movements on the local and regional road network, including a mid-block capacity assessment and assessment of intersection performance (Appendix G).

The additional over-dimensional vehicle movements are not predicted to change the mid-block capacity or intersection performance of roads along the vehicle access route and impacts will be consistent with previously assessed and approved impacts under SSD-9255.

### 6.6.3 Heavy vehicle movements

As discussed in Section 3.5, ACEN Australia has identified a need to increase the daily number of heavy vehicles during construction from 56 to 84 to support construction of the project in accordance with the project delivery schedule.

The project delivery schedule has been, and continues to be, impacted by both COVID-19 restrictions (including border closures, lockdowns and local case management) and inclement weather (including significant rainfall and flooding) resulting in extensions to construction timeframes. Increasing the daily number of heavy vehicles will accelerate construction timeframes by allowing for additional deliveries to site. This will enable concurrent work packages to operate across the development footprint and is expected to reduce the duration of the project's peak construction period.

SCT Consulting prepared a technical advisory note to assess the potential impacts of the additional heavy vehicle movements on the local and regional road network, including a mid-block capacity assessment, assessment of intersection performance and consideration of road safety (Appendix G).

The additional heavy vehicle movements are not predicted to change the mid-block capacity or intersection performance of roads along the vehicle access route. The increase in daily heavy vehicle movements will have a negligible impact on the performance of the New England Highway and Barleyfields Road (North) intersection, which will continue to operate at the highest level of performance (LoS A). The proposed increase in heavy vehicles can also be accommodated within existing spare capacity along the vehicle access route.

### 6.6.4 Cumulative impacts

The project is within the New England REZ, which contains multiple renewable energy generation and storage projects. Of these, Salisbury Solar Farm is the closest to the project (approximately 2 km); however, the status of this project is unknown with SEARs issued for the project in 2019 and no subsequent assessment documentation published since that time. Subsequently, no construction activities are currently being undertaken for this project and no cumulative traffic impacts are anticipated to occur.

Metz Solar Farm is currently under construction. The site for Metz Solar Farm is 18 km east of Armidale and continued construction is not expected to have a discernible impact on the township of Uralla or the local haulage route used by New England Solar and Battery Project construction vehicles.

All remaining projects within the New England REZ remain in 'proposed' form. Should these projects be constructed, the only road anticipated to experience cumulative impacts under a concurrent construction scenario with the New England Solar and Battery Project is the New England Highway.

Construction vehicles for the project can satisfactorily use local roads to access the development footprint. This has been ensured through intersection and road corridor upgrades undertaken across the haulage route prior to construction commencing. The other projects proposed within the New England REZ are not expected to require access to Barleyfields Road or Big Ridge Road and therefore will not result in cumulative traffic impacts on the local road network.

### 6.6.5 Management and mitigation

The requirements of SSD-9255, as they relate to traffic, are considered to remain relevant to the modified project and will ensure the traffic associated with the construction and operation of the project is appropriately managed.

Road safety will continue to be managed through the approved *Traffic Management Plan* (SMEC 2021a), which includes measures to schedule traffic to avoid convoy lengths or platooning on roads and a driver Code of Conduct, which addresses travelling speed and consideration of other road users. Monthly dilapidation surveys of Barleyfields Road (north) and Big Ridge Road will also be completed to monitor for any road degradation during construction and road repair works will be completed as required.

No additional mitigation measures are required.

### 6.6.6 Conclusion

The proposed modification will not change the vehicle access route and will not significantly change the project's impacts on the local and regional road network.

The road upgrades ACEN Australia delivered along the vehicle access route (ie Barleyfields Road and Big Ridge Road) provide for a capacity of up to 1,000 vehicles per day. The proposed increase in the number of heavy and over-dimensional vehicle movements can be made without exceeding this capacity and annual average daily traffic across the vehicle access route will remain within the intended design capacity of 1,000 vehicles.

## 6.7 Hazards and risks

### 6.7.1 Overview

A revised preliminary hazard analysis (PHA) (Appendix H) has been prepared by Sherpa Consulting to address DPE's assessment requirements relating to the proposed additional BESS infrastructure (Section 5.1).

The PHA was completed following the methodology specified in *Hazardous Industry Planning Advisory Paper No. 6 Hazard Analysis* (DoP 2011b), the *Multi-Level Risk Assessment* Guideline (DoP 2011c) and *Hazardous Industry Planning Advisory Paper No. 4 Risk Criteria for Land Use Safety Planning* (DoP 2011a).

### 6.7.2 Hazard identification

Hazard Identification (HAZID) aims to identify all reasonably foreseeable hazards and risk events associated with project infrastructure and proposed operations and define the relevant prevention and mitigation controls through a systematic and structured approach.

For each identified hazard, the following factors were considered:

- event – the mechanism by which the hazard potential is realised;
- causes – the potential ways in which the event could arise;
- consequences – the outcome or impact of the event; and
- controls – any existing aspects of the design which prevent and/or mitigate against the event and resulting consequences.

The following factors were considered to identify the hazards:

- project infrastructure;
- type of equipment;
- hazardous materials present;
- proposed operation and maintenance activities; and
- external factors.

The identified hazards and events for the proposed additional BESS infrastructure are summarised in Table 6.13.

**Table 6.13 Identified hazards and events**

| Hazard | Event |
|---|---|
| Electrical | Exposure to voltage |
| Arc flash | Release of energy |
| Fire | Infrastructure fire |
| Chemical | Release of hazardous materials |
| Explosive gas | Generation of explosive gas |
| Reaction | Battery thermal runaway |
| Electric and magnetic fields (EMF) | Exposure to EMF |
| External factors | Unauthorised access/trespasser, bushfire, lightning storm and water ingress (rain and flood) |

A Hazard Register was then developed to outline all the identified hazard events to ensure that the appropriate planned controls are in place. The outcomes of the risk analysis are summarised as follows:

- **Consequence**: The worst-case consequence for the identified events is a BESS fire and/or explosion event. The assessment found that for all events the consequence impacts are not expected to have significant off-site impacts. This was assessed based on the proposed location of the additional BESS (ie rural area) and separation distance between the additional substation/BESS footprint and non-project related sensitive receptors.

- **Likelihood**: The highest likelihood rating for the identified events is 'unlikely' (ie not expected to occur, but there is a slight possibility it may occur at some time).

- **Risk analysis**: A total of 12 hazardous events were identified. The breakdown of these events according to their risk ratings are as follows:

  - 'Medium' risk event: 1.

    This event relates to unauthorised person access to the proposed additional substation/BESS footprints resulting in vandalism or asset damage to project infrastructure, with no significant off-site impacts expected. A severity rating of 'major' was assigned to account for the trespasser potentially injuring themselves in the act. The assessment noted that the controls for this event are well understood and the likelihood was rated as 'unlikely'.

  - 'Very low' risk events: 11.

    Most of these events relate to fire and/or explosion events, with no significant off-site impacts expected (ie more likely to affect on-site employees). The assessment identified proposed prevention controls to reduce the likelihood of these fire events and mitigation controls to contain the fires to minimise potential for escalated events. Based on the identified controls, the highest likelihood for these events was rated as 'unlikely'.

- **Risk assessment:** All identified events are not expected to have significant off-site impacts. Based on the risk acceptance criteria, the risk profile for the proposed additional BESS is considered to be tolerable.

### 6.7.3 Electromagnetic fields

EMF created by infrastructure associated with the proposed modification will not exceed the ICNIRP (1998) occupational exposure reference levels. As the strengths of EMF attenuate rapidly with distance, the PHA determined that the ICNIRP (1998) reference level for exposure to the general public will not be exceeded and impact to the general public in surrounding land uses will be negligible.

### 6.7.4 Battery energy storage system separation distances

The PHA has considered all recent standards and codes and the suitability of separation distances between additional BESS infrastructure and on-site or off-site receptors and the separation distances between BESS sub-units. The PHA has also considered whether the proposed additional BESS capacity can be housed within the proposed additional BESS footprints accounting for necessary separation distances between the BESS sub-units (racks, modules, enclosures, etc) to ensure that a fire from a sub-unit does not propagate to other sub-units.

The PHA concluded that the proposed additional substation/BESS footprints are sufficient to accommodate the proposed additional BESS units for all three enclosure options (ie small enclosures/cabinets/larger battery buildings) and account for the required separation distances between the BESS sub-units and asset protection zones (APZs) (where required). The conceptual layouts considered as part of the PHA include clearances between the sub-units that meet the minimum and/or recommended separation distances specified by the manufacturer to minimise risks of fire propagation.

### 6.7.5 Management and mitigation

The additional substation/BESS infrastructure will be within a secure area with fencing and cameras and warning signs will be provided. On-site security protocols will also be developed.

As part of detailed design and construction of the additional BESS infrastructure, ACEN Australia will ensure that:

- BESS units are certified to UL 9540A and installed in accordance with the manufacturer's instructions for best practice to mitigate fire propagation;
- manufacturers provide a deflagration hazard study in accordance with UL 9540 or include explosion control measures such as passive safe ventilation of flammable gases under pressure;
- a minimum one-hour fire rating is achieved for a containerised BESS;
- investigation reports on the Victorian Big Battery Fire are reviewed and relevant findings are implemented; and
- for indoor BESS infrastructure installed within a purpose-built structure, the following will be considered:
    - compartmentalisation;
    - occupancy and means of egress;
    - fire barriers;
    - exhaust and ventilation system;
    - sprinkler system and required water volume;
    - containment system for the expected fire protection system discharge; and

- requirements of the National Construction Code and relevant Australian standards and codes (eg fire rating of materials and fire detection systems).

### 6.7.6 Conclusion

A PHA was completed to identify the hazards and assess the risks associated with the proposed operation of the additional BESS infrastructure to determine risk acceptability from a land use safety planning perspective. For all identified events associated with the proposed operation of the additional BESS infrastructure, the resulting consequences are not expected to have significant off-site impacts.

The PHA concluded that the proposed additional substation/BESS footprints are sufficient to accommodate the proposed additional BESS units for all three enclosure options and account for the required separation distances between the BESS sub-units and APZs (where required).

## 6.8 Other environmental aspects

An assessment of other environmental aspects as a result of the proposed modification is provided in Table 6.14.

**Table 6.14 Potential impacts of the proposed modification**

| Environmental consideration | Impact assessment |
|---|---|
| Land | There is no BSAL within the modification area (Figure 1.2). The additional BESS footprint intercepts a total of 4.6 ha of BSAL; however, this land forms part of the approved project boundary and development footprint and will not increase the project's impacts on BSAL above those that have already been assessed and approved.<br>Resources within the modification area include land that is being used for agricultural production, and land which has biodiversity and cultural heritage values. This constitutes the 'natural resources', which must be properly managed, developed or conserved.<br>The modification area will be removed from agricultural use; however, land management practises will avoid or minimise impacts with adjoining land uses and ensure that land is not precluded from being returned to a productive agricultural use at the end of the operational stage of the project. Further, land excluded from the modification area and approved development footprint will remain available for agricultural use.<br>As noted in Appendix B of the AR (EMM 2019b), the project will adopt a two-level hierarchical system for erosion and sediment control management and mitigation, consisting of a soil and water management plan (SWMP) supported by a set of progressive erosion and sediment control plans (ESCPs). A similar system will be implemented during the proposed road upgrades as required.<br>No additional mitigation measures are required. |
| Water | The modification area has been adequately considered as part of the surface water assessment undertaken in support of the EIS. Subsequently, no additional assessment is required as part of the proposed modification.<br>The proposed modification will not result in any significant changes to the project's water use. Additional water may be required to assist with firefighting within the additional BESS footprint. The amount of water required will be confirmed as part of detailed design of the additional BESS infrastructure.<br>Julia Gully, a third order stream in the north-east corner of Area 3, is highly ephemeral with a poorly defined channel and occasional, small shallow pools during wet periods. Nonetheless, a 30 m buffer from each edge of the channel will be maintained to minimise potential impacts on downstream water quality and erosion.<br>As noted in Appendix B of the AR (EMM 2019b), the project will adopt a two-level hierarchical system for erosion and sediment control management and mitigation, consisting of a SWMP supported by a set of progressive ESCPs.<br>No additional mitigation measures are required. |

## Table 6.14 Potential impacts of the proposed modification

| Environmental consideration | Impact assessment |
|---|---|
| Bushfire | The proposed modification will not result in any significant changes to the bushfire risks associated with the construction and operation of the project.<br>The bushfire management and mitigation measures outlined in the EIS, AR and SSD-9255 are considered sufficient to address the potential impacts of the modification.<br>No additional mitigation measures are required. |
| Socio-economic | The proposed modification will not change the life of project operations or construction and operational workforce requirements. The proposed modification is consistent with the objectives of the project's approval, being the construction and operation of a solar farm.<br>During construction, regional residents will be employed preferentially where they have the required skills and experience and are able to demonstrate a cultural fit with the organisation. In addition, non-labour inputs will be sourced locally where local producers can be cost and quality competitive.<br>The proposed additional BESS infrastructure is likely to be built after the completion of Stage 1 and Stage 2 of construction and will extend the project's overall construction schedule therefore extending the project's construction workforce requirements.<br>ACEN Australia will continue to maintain open lines of communication with the local community for the duration of the project. No additional mitigation measures are required. |
| Air quality | The proposed modification will not result in significant additional construction activities than those previously assessed and approved under SSD-9255 and is unlikely to contribute to additional air quality impacts within the surrounding area.<br>Consistent with Condition 14 of Schedule 3 of SSD-9255, ACEN Australia will minimise dust generated by the project. Any air quality impacts will be minimised and managed through measures outlined in Appendix C.<br>No additional mitigation measures are required. |
| Waste management | The proposed modification will not generate any additional waste than that outlined in the EIS or AR.<br>All waste generated by the project will be minimised and managed through the implementation of a waste management plan, as outlined in the EIS and AR.<br>No additional mitigation measures are required. |
| Cumulative impacts | As discussed in Section 2.1.1, the project is in the New England REZ and there are a number of other renewable energy developments proposed in the vicinity of the project including Salisbury Solar Farm (proposed); Armidale BESS (proposed); Oxley Solar Farm (proposed); Metz Solar Farm (approved); and Thunderbolt Solar Farm (proposed). The closest is Salisbury Solar Farm, which is approximately 2 km south of the central array area at its closest point.<br>The proposed modification will not reduce the distance between the project and any other proposed renewable energy developments. Further, the proposed modification will not result in significant additional construction activities than those previously assessed and approved under SSD-9255 and is therefore unlikely to contribute to additional cumulative impacts within the surrounding area.<br>Any cumulative impacts contributed to by the project will be managed through the implementation of the management and mitigation measures outlined in Appendix C.<br>No additional mitigation measures are required. |

# 7 Justification of modified project

A description of the need and justification for the proposed modification is provided below with regard to biophysical, social and economic factors; the principles of ESD; and the consistency of the proposed modification with the objects of the EP&A Act.

## 7.1 Justification

The construction and operation of the project is consistent with Commonwealth and NSW Government strategic planning and policy objectives, initiatives and regional plans, AEMO's priorities in planning for the future energy mix, as well as international agreements to which Australia is a signatory. The project, as approved, will support the Commonwealth and NSW governments to achieve their respective renewable energy and greenhouse gas emission reduction targets and will contribute to increased energy security through valuable contributions to a more diverse energy mix.

The proposed modification, if approved, will increase the project's energy storage capability, further contributing to the ability of the New England REZ to meet the needs of NSW electricity consumers over the next decade as the existing coal-fired generation fleet retires. The proposed modification will also significantly increase the project's potential to participate in a capacity market, should one be established as a result of the current work being undertaken by the Energy Security Board.

The proposed increase in the project's storage capacity can be achieved without significantly changing the project's impacts on non-project related residences and has limited amenity impacts (in terms of visual, traffic and construction and operational noise) beyond those approved by SSD-9255. The significant increase in the project's storage capacity is justified as:

- The declaration of the New England REZ has increased interest in the New England region for new renewable energy generation projects with approximately 8 GW of generation anticipated to be constructed by 2040. This amount of generation needs to be supported by considerable storage and the proposed increase in the project's storage capacity will support the integration of new renewable projects into the NEM.

- TransGrid's existing Armidale to Tamworth 330 kV transmission line 85, which passes through the development footprint, is already congested at times and this is anticipated to worsen over time until the New England REZ transmission link is constructed. The proposed increase in the project's storage capacity will help further relieve congestion in the network, providing greater access for other renewable projects.

- The proposed additional storage will help deliver the dispatchable capacity necessary to maintain reliable supply in an electricity grid that will be increasingly dominated by renewable generation due to the accelerated retirement of coal-fired generation capacity. The additional storage also aligns with the ISP (AEMO 2022), which acknowledges that significant investment in the NEM is needed to treble the firming capacity that can respond to a dispatch signal, which includes utility-scale batteries. By 2050, without coal, the ISP (AEMO 2022) estimates that the NEM will require 46 GW/640 GWh of dispatchable storage capacity. As coal capacity retires, it needs to be replaced, and the proposed additional storage will assist further this transition period.

The assessment of environmental impacts in Chapter 6 demonstrates that:

- the proposed modification will not significantly change the project's impacts on the environment and has limited impacts to biodiversity, Aboriginal cultural heritage and historic heritage beyond those approved by SSD-9255; and

- the proposed modification will not significantly change the project's impacts on non-project related residences and has limited amenity impacts (in terms of visual and construction and operational noise) beyond those approved by SSD-9255.

The proposed modification will not change the vehicle access route and will not significantly change the project's impacts on the local and regional road network. The proposed increase in the number of heavy and over-dimensional vehicle movements can be made without exceeding the capacity of the road network and will remain within the intended design capacity of the upgraded sections of Barleyfields Road (north) and Big Ridge Road.

The proposed additional heavy vehicle movements and extended construction hours will help to reduce the duration of peak construction periods associated with Stage 1 and Stage 2, reducing the project's impacts on local accommodation availability.

## 7.2 Alternatives

This modification report examines the potential impacts that may result from the proposed modification. The assessment of environmental issues has been multi-disciplinary and involved consultation with DPE and other key stakeholders (including Uralla Shire Council, BCS, RAPs and private landholders).

The modification area is considered suitable for solar development as it is in a heavily cleared agricultural landscape, connected to the approved development footprint and accessible using the approved vehicle access route. As part of the preparation of this modification report, ACEN Australia has refined the modification area to minimise impacts on planted and remnant native vegetation, paddock trees and Aboriginal cultural heritage sites.

The additional BESS footprint is within the approved development footprint and is close to the approved BESS and grid substation. The additional BESS footprints are within the approved project boundary and development footprint and therefore no impacts on biodiversity, Aboriginal cultural and historical heritage or productive agricultural land will occur (ie beyond those that have already been assessed and approved as part of SSD-9255).

The proposed modification will not result in significant environmental, social or economic impacts and the modification report has identified that any residual impacts can be appropriately managed or offset.

No feasible alternatives to the proposed modification have been identified. Should the proposed modification not proceed (ie the 'do nothing' scenario), the potential benefits described within this modification report will not be realised. In addition, it will be more difficult in the short-term for the Commonwealth and NSW Government to achieve their respective renewable energy and GHG emission reduction targets.

## 7.3 Modification benefits

The proposed modification will increase the project's role in achieving the energy generation and storage objectives of the New England REZ. The proposed additional energy storage capacity, if realised, also has potential to increase ACEN Australia's financial contributions to the local community through the Community Benefit Sharing Initiative (CBSI). ACEN Australia has committed to funding the program by providing $250 a year for every MW of power generating capacity installed at the project over its operational life.

As part of the project, there will be economic investment and employment benefits both locally and regionally and a realised opportunity for renewable energy generation, while minimising potential environmental and social impacts. A suite of design, mitigation and management measures are proposed to avoid, minimise and manage the biophysical, social and economic impacts of the project.

## 7.4 Ecologically sustainable development

The principles of ESD, for the purposes of the EP&A Act, are provided in Clause 7(4) of Schedule 2 of the EP&A Regulation. The four principles of ESD are:

- Precautionary principle – the precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- Inter-generational equity – the principle of inter-generational equity is that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- Conservation of biological diversity and maintenance of ecological integrity – the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.
- Improved valuation and pricing of environmental resources – improved valuation, pricing and incentive mechanisms should be promoted.

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained facilitating improved quality of life, now and into the future. ACEN Australia is committed to the principles of ESD and understands that biophysical, social and economic objectives are interdependent.

The proposed modification is an alteration to an approved development with no environmental impact. Where impacts are unavoidable, appropriate management measures (including offsets) have been identified to mitigate any residual impacts.

### 7.4.1 Precautionary principle

This modification report has enabled an understanding of the potential impacts of the proposed modification on biophysical, social and economic factors. The proposed modification will not result in significant biophysical, social or economic impacts and any residual impacts can be appropriately managed (or offset) in accordance with the relevant conditions of SSD-9255. Additional safeguards to manage the potential impacts of the proposed modification have been proposed and include:

- a 30 m buffer from each edge of the channel of Julia Gully will be maintained to minimise potential impacts on downstream water quality and erosion;
- a 600 m buffer (ie work exclusion area) will be maintained around N1 during daytime out-of-hours construction works (ie 1 pm to 6 pm Saturday afternoons);
- monthly dilapidation surveys of Barleyfields Road (north) and Big Ridge Road will be completed to monitor for any road degradation during construction (as a result of the proposed heavy vehicle increase) and road repair works will be completed as required; and
- commitments specific to the design, construction and operation of the proposed additional BESS infrastructure to manage potential hazards and risks to on-site and off-site receptors.

No additional safeguards are warranted to monitor, mitigate and/or manage the potential impacts or residual impacts.

### 7.4.2 Inter-generational equity

The project and proposed modification are consistent with the principle of inter-generational equity. The proposed modification will further contribute to the sustainable transition of electricity generation and storage in NSW to a more reliable, more affordable and cleaner energy future. Once decommissioned, the land within the modification area and additional BESS footprint can be rehabilitated to its current use if required thereby allowing for either continuation of renewable energy generation and storage or a return to agricultural production, both of which would provide benefits for future generations.

### 7.4.3 Conservation of biological diversity and maintenance of ecological integrity

The potential environmental impacts of the proposed modification are detailed in this modification report. The proposed modification is not expected to cause any significant impacts to threatened species or endangered ecological communities.

A total of seven ecosystem credits are required to offset the residual impacts of the proposed modification. Offsets will be provided in accordance with the biodiversity offset framework.

Residual impacts on biodiversity will be managed through the implementation of the BMP, which includes measures such as pre-clearance surveys and standard erosion and sediment control and biosecurity management procedures.

### 7.4.4 Improved valuation and pricing of environmental resources

The proposed modification is an alteration to an approved development. The proposed modification is anticipated to result in minimal environmental impacts beyond those previously assessed and approved under SSD-9255. Once operational, PV modules within the modification area and infrastructure within the additional BESS footprint will contribute to the sustainable transition of electricity generation and storage in NSW to a more reliable, more affordable and cleaner energy future.

## 7.5 Conclusion

All aspects relating to environmental management will continue to be undertaken in accordance with SSD-9255.

The project's environmental management strategy (Condition 1 of Schedule 4 of SSD-9255) governs the avoidance, minimisation and management of impacts during the construction and ongoing operation of the project and establishes clear responsibilities and accountabilities for environmental performance. The strategy will continue to be implemented and will encompass the activities proposed as part of this modification.

The proposed modification has been designed to avoid and minimise adverse biophysical, social and economic impacts, where possible and is not anticipated to significantly change previously assessed and approved impacts under SSD-9255.

The proposed modification is consistent with the relevant objects of the EP&A Act and the principles of ESD and will not significantly change the nature of the project originally approved.

# Abbreviations

| | |
|---|---|
| AC | alternating current |
| ACEN Australia | ACEN Australia Pty Ltd |
| ACHA | Aboriginal cultural heritage assessment |
| AEMO | Australian Energy Market Operator |
| AHIMS | Aboriginal Heritage Information Management System |
| AHMP | Aboriginal heritage management plan |
| APZ | asset protection zone |
| BAM | biodiversity assessment method |
| BC Act | NSW *Biodiversity Conservation Act 2016* |
| BDAR | biodiversity development assessment report |
| BESS | battery and energy storage system |
| BSAL | biophysical strategic agricultural land |
| CBSI | community benefit sharing initiative |
| CEEC | critically endangered ecological community |
| CEMP | construction environmental management plan |
| CL Act | NSW *Crown Land Act 1989* |
| DA | development application |
| DAWE | Commonwealth Department of Agriculture, Water and Environment |
| DC | direct current |
| DPE | NSW Department of Planning and Environment |
| DPI | NSW Department of Primary Industries |
| EIS | environmental impact statement |
| EMM | EMM Consulting Pty Limited |
| EMP | environmental management plan |
| EP&A Act | NSW *Environmental Planning and Assessment Act 1979* |
| EP&A Regulation | NSW Environmental Planning and Assessment Regulation 2000 |
| EPBC Act | Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* |
| ERP | emergency response plan |
| ESC | erosion and sediment control |
| ESD | ecologically sustainable development |
| ETL | electricity transmission line |
| FMP | fire management plan |

| | |
|---|---|
| FTE | full-time equivalent |
| ha | hectares |
| Heritage Act | NSW *Heritage Act 1977* |
| HHA | historic heritage assessment |
| HHMP | historic heritage management plan |
| HV | high voltage |
| HVAC | heating ventilation air conditioning |
| IBRA | Interim Biogeographic Regionalisation for Australia |
| ICNG | Interim Construction Noise Guideline |
| km | kilometre |
| LGA | local government area |
| LUCRA | land use conflict risk assessment |
| MNES | matters of national environmental significance |
| Mtpa | million tonnes per annum |
| MV | medium voltage |
| MW | megawatt |
| MWh | megawatt hours |
| NEM | National Electricity Market |
| NMLs | noise management levels |
| NPfI | *Noise Policy for Industry* |
| NPW Act | *NSW National Parks and Wildlife Act 1974* |
| NSW | New South Wales |
| NVIA | noise and vibration impact assessment |
| OEMP | operational environmental management plan |
| O&M | operations and maintenance |
| PADs | potential archaeological deposits |
| PBP | Planning for Bushfire Protection |
| PCT | plant community type |
| PCU | power conversion unit |
| PHA | preliminary hazard analysis |
| PMST | Protected Matters Search Tool |
| PV | photovoltaic |
| RAP | registered Aboriginal party |
| RBL | rating background noise level |

| | |
|---|---|
| REZ | renewable energy zone |
| RF Act | NSW *Rural Fires Act 1997* |
| RFS | NSW Rural Fire Service |
| RNP | Road Noise Policy |
| SCADA | supervisory control and data acquisition |
| SHR | State Heritage Register |
| SoHI | statement of heritage impact |
| SSD | State significant development |
| SRLUP | NSW Strategic Regional Land Use Policy |
| SWA | surface water assessment |
| TEC | threatened ecological community |
| TfNSW | Transport for NSW |
| TIA | traffic impact assessment |
| TMP | traffic management plan |
| Uralla LEP | *Uralla Local Environmental Plan 2012* |
| VIA | visual impact assessment |
| WM Act | NSW *Water Management Act 2000* |
| WMP | waste management plan |

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# Appendix A
## Schedule of land

EMM
creating opportunities

## Table A.1 Schedule of land

| Lot | Deposited plan (DP) | Lot | Deposited plan (DP) |
|---|---|---|---|
| 2 | DP567937 | 4 | DP172594 |
| 154 | DP755827 | B | DP172594 |
| 79 | DP755814 | 78 | DP755814 |
| 109 | DP755827 | 84 | DP755814 |
| 108 | DP755827 | 83 | DP755814 |
| 89 | DP755827 | 80 | DP755814 |
| 103 | DP755827 | 181 | DP755827 (Area 3) |
| 101 | DP755827 | 182 | DP755827 |
| 102 | DP755827 | 97 | DP755827 |
| 90 | DP755827 | 2 | DP127777 |
| 113 | DP755827 | 1 | DP127777 |
| 91 | DP755827 | 39 | DP755827 |
| 111 | DP755827 | 38 | DP755827 |
| 110 | DP755827 | 5 | DP127777 (Area 4) |
| 93 | DP755827 | 1 | DP405515 |
| 92 | DP755827 | 37 | DP755827 |
| 98 | DP755827 | 296 | DP755827 |
| 122 | DP755827 | 221 | DP755814 |
| 123 | DP755827 | 2 | DP174053 |
| 125 | DP755827 | 1 | DP227322 |
| 124 | DP755827 | 8 | DP173619 |
| 126 | DP755827 | 6 | DP172594 |
| 150 | DP755827 (Area 1) | 21 | DP1167870 |
| 120 | DP755827 (Area 2) | 23 | DP1171290 |
| 101 | DP1262005 (Area 3) | 24 | DP1171290 |
| 2 | DP127778 (Area 4) | 3 | DP127777 (Area 4) |
| 36 | DP755827 (Area 4) | 119 | DP755827 (Area 2) |
| 5 | DP1254486 (Area 4) | 112 | DP755827 (Area 2) |
| 22 | DP1286357 | 1 | DP319048 (Area 4) |

Notes: Grey highlight indicates lots within the modification area.

# Appendix B
## Updated project description

EMM
creating opportunities

## B.1 Overview

The project involves the development, construction and operation of a solar PV electricity generation facility and BESS, which consists of PV modules, batteries, inverters, transformers and associated infrastructure.

The development footprint on Figure B.1 incorporates the land required for:

- the two solar array areas (northern and central);
- a single internal solar array substation (central array) and a single grid substation (northern array);
- associated BESS(s);
- operations and maintenance (O&M) infrastructure, including:
    - O&M buildings (namely meeting facilities, a temperature-controlled spare parts storage facility, supervisory control and data acquisition (SCADA) facilities, a workshop and associated infrastructure); and
    - car parking facilities;
- connection infrastructure between the two array areas (including underground or overhead cabling); and
- a new internal road network to enable access from surrounding local roads to the two array areas during construction and operations.

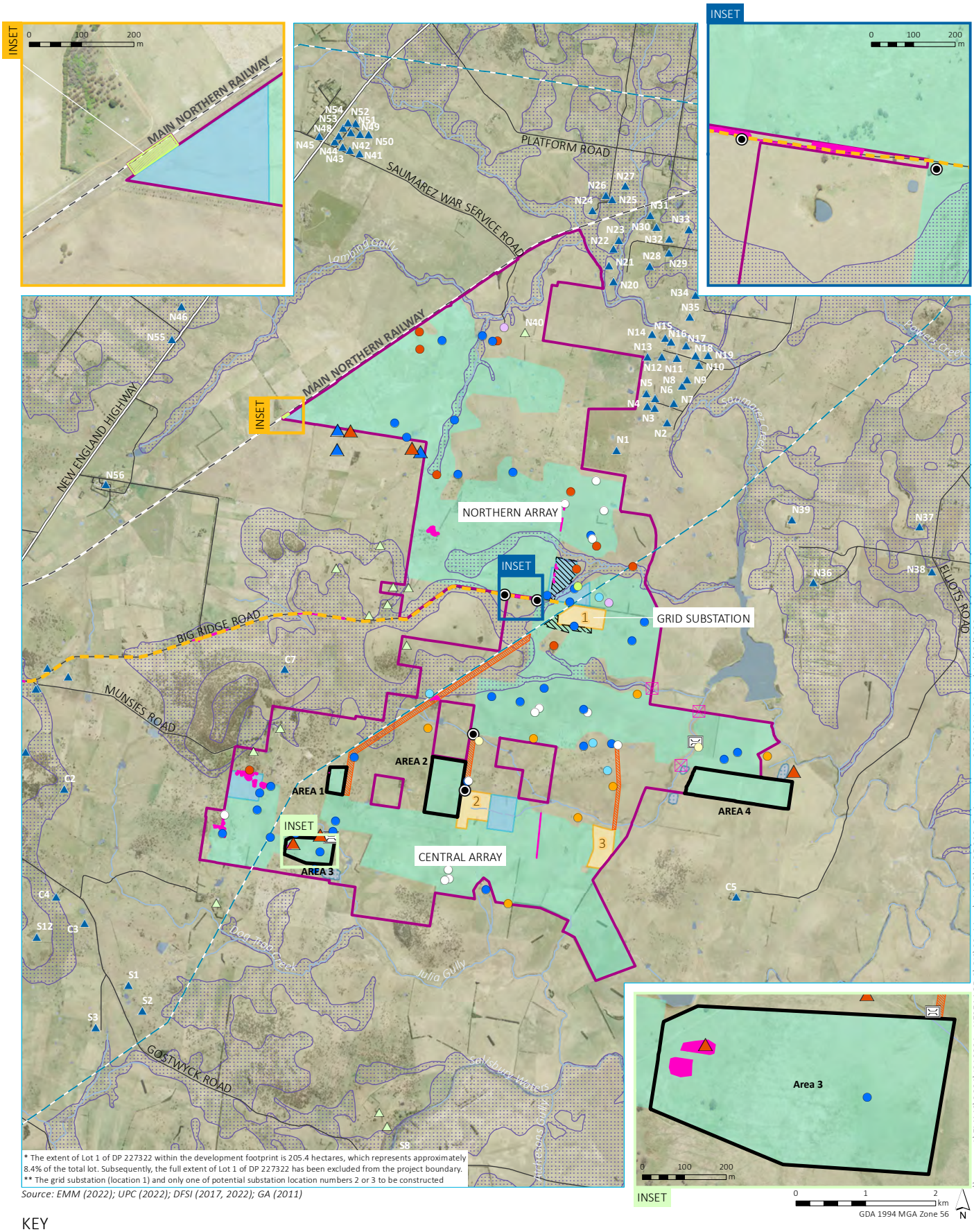
In addition, security fencing and creek crossings (should they be required) will be placed within the project boundary.

The project will have a targeted 'sent out' electricity generating capacity of up to 720 MW (AC) and up to 1,400 MW (AC) two-hour energy storage which may be configured as 700 MW four-hour energy storage. The final number of PV modules within the two array areas will be dependent on detailed design, availability and commercial considerations at the time of construction.

Electricity generated by the project will be injected into the grid via a new cut-in and grid substation connected to TransGrid's 330 kV transmission line that traverses the northern and central array areas.

The grid substation will be constructed in the northern array (referred to as Location 1 on Figure B.1). The solar array substation within the central array will be constructed in one of two potential locations (referred to as locations 2 and 3 on Figure B.1). It is possible that, following detailed design, the solar array substation within the central array area could be highly reduced in size and complexity or the need for it eliminated altogether, if, for example no intermediate transformation is needed. If this occurs, some of or all of the parcels of land identified as locations 2 and 3 on Figure B.1 will be utilised for PV modules and ancillary infrastructure.

The exact location of the electrical cabling to connect the northern and central array areas will be determined as part of detailed design; however, it will be restricted to the three corridors presented in Figure B.1. Electrical cabling within the three corridors may be buried underground or require the construction of new overhead electricity transmission lines (ETLs).

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* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.
** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

*Source: EMM (2022); UPC (2022); DFSI (2017, 2022); GA (2011)*

## KEY

- Proposed project boundary *
- Modification area
- Additional substation/BESS footprint

Proposed development footprint
- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint **
- Hardstand in rail corridor
- Primary vehicle access route
- Proposed primary site access point
- Potential creek crossing
- Indicative location of security fencing across third order watercourse

Existing environment
- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody
- Biophysical Strategic Agricultural Land
- PCT requiring offset

Sensitive receptors
- Project-related
- Non-project related

AHIMS (by site type)
- Artefact scatter, PAD
- Artefact scatter, confirmed deposit, PAD
- Artefact scatter
- Grinding groove
- Grinding groove, artefact scatter, PAD
- Isolated find
- Isolated find, PAD
- Scarred tree

Site survey (EMM)
- Artefact scatter
- Isolated artefact
- PAD area

# Project layout

New England Solar and Battery Project
Modification Report
Figure B.1

EMM creating opportunities

## B.2 Site description

The project will be developed within the Uralla Shire LGA. At its closest point, the project boundary is approximately 6 km east of the township of Uralla, and the northern array area starts approximately 8.6 km south of Armidale.

The project boundary for the development footprint, consisting of the full extent of the involved landholder lots, encompasses a total area of approximately 3,646 ha. The project boundary intersects land legally described and identified in Table B.1. Based on the current design and lease agreements between ACEN Australia and the project landholders, no subdivision is proposed on the lots identified within Table B.1, with the exception of land required for the grid substation.

A number of Crown roads are in the project boundary, which are currently either subject to closure or will be closed as required in consultation with the NSW Crown Lands.

**Table B.1 Schedule of land**

| Lot | Deposited plan (DP) | Lot | Deposited plan (DP) |
|---|---|---|---|
| 2 | DP567937 | 4 | DP172594 |
| 154 | DP755827 | B | DP172594 |
| 79 | DP755814 | 78 | DP755814 |
| 109 | DP755827 | 84 | DP755814 |
| 108 | DP755827 | 83 | DP755814 |
| 89 | DP755827 | 80 | DP755814 |
| 103 | DP755827 | 181 | DP755827 (Area 3) |
| 101 | DP755827 | 182 | DP755827 |
| 102 | DP755827 | 97 | DP755827 |
| 90 | DP755827 | 2 | DP127777 |
| 113 | DP755827 | 1 | DP127777 |
| 91 | DP755827 | 39 | DP755827 |
| 111 | DP755827 | 38 | DP755827 |
| 110 | DP755827 | 5 | DP127777 (Area 4) |
| 93 | DP755827 | 1 | DP405515 |
| 92 | DP755827 | 37 | DP755827 |
| 98 | DP755827 | 296 | DP755827 |
| 122 | DP755827 | 221 | DP755814 |
| 123 | DP755827 | 2 | DP174053 |
| 125 | DP755827 | 1 | DP227322 |
| 124 | DP755827 | 8 | DP173619 |
| 126 | DP755827 | 6 | DP172594 |

## Table B.1 Schedule of land

| Lot | Deposited plan (DP) | Lot | Deposited plan (DP) |
|---|---|---|---|
| 150 | DP755827 (Area 1) | 21 | DP1167870 |
| 120 | DP755827 (Area 2) | 23 | DP1171290 |
| 101 | DP1262005 (Area 3) | 24 | DP1171290 |
| 2 | DP127778 (Area 4) | 119 | DP755827 (Area 2) |
| 36 | DP755827 (Area 4) | 112 | DP755827 (Area 2) |
| 5 | DP1254486 (Area 4) | 1 | DP319048 (Area 4) |
| 22 | DP1286357 | 3 | DP127777 (Area 4) |

Notes: Grey highlight indicates lots within the modification area.

The development footprint is the area within the project boundary on which infrastructure will be located (with the exception of areas of avoidance identified in the EIS, AR, modification report and supporting technical assessments). The development footprint encompasses a total area of 2,188 ha. Within the development footprint, approximately 1,060 ha will be required for the rows of PV modules. The remaining area is associated with power conversion units (PCUs), space between the rows, internal access tracks and associated infrastructure (including substations and BESSs). The development footprint also includes land required for connection infrastructure between the two array areas as well as land required for new internal roads to enable access to the two array areas from the surrounding road network. Subject to detailed design and consultation with the project landholders, security fencing and creek crossings may be required on land outside of the development footprint, but within the project boundary.

The land within the project boundary is zoned RU1 Primary Production under the Uralla LEP (Figure 4.1). The project boundary encompasses 76 lots, the majority of which have been modified by historical land use practices and past disturbances associated with land clearing, cropping and intensive livestock grazing. The properties within the project boundary are currently primarily used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production.

A very small part of the land within the development footprint is mapped bushfire prone by Uralla Shire Council (Figure 4.1).

An alternative configuration for the solar PV infrastructure may be considered for the project, although considered far less likely, namely a fixed tilt system, with the rows aligned east-west and the PV modules facing north. However, it is noted that single axis tracking is considered more likely due to the recent fall in technology costs and the superior energy yield associated with this technology. As part of detailed design, ACEN Australia may consider installing a section of the solar arrays using fixed tilt technology in consideration of the interaction between the solar PV generating capacity of the project, the sizing of the BESS and daytime electricity pricing.

The PV modules will be supported on mounting frames consisting of vertical posts ('piles') and horizontal rails ('tracking tubes'). Rows of piles will be driven or screwed into the ground, depending on the geotechnical conditions, and the supporting racking framework will be mounted on top. Pre-drilling and/or cementing of foundations will be avoided if allowed by the geotechnical conditions.

The height of the PV modules at their maximum tilt angle (typically up to 60 degrees) will be up to 4 m. Additional site-specific clearance of up to around 300 mm may be required to avoid flooding risk or to improve access for sheep to graze underneath the PV modules. If installed at this height, the leading edge of each PV module may be up to 1.2 m from the ground. This would enable sheep to graze fully unimpeded underneath the PV module rows and is common practice as part of the latest bifacial PV module technology (which benefits from a higher ground clearance).

It should be noted that this is a highly conservative assumption, which is based on the PV module configuration illustrated in Option A of Plate 2.1. This configuration involves either four PV modules in landscape orientation or two modules in portrait orientation. The more typical configuration using single axis tracking technology is currently a single PV module mounted on the tracker tube in portrait (refer to Photograph 2.1 and Option B of Plate 2.1). Should this configuration be selected, the height of the PV modules at their maximum tilt angle would likely be closer to 2-3 m, which includes consideration of additional clearance to allow for sheep grazing.

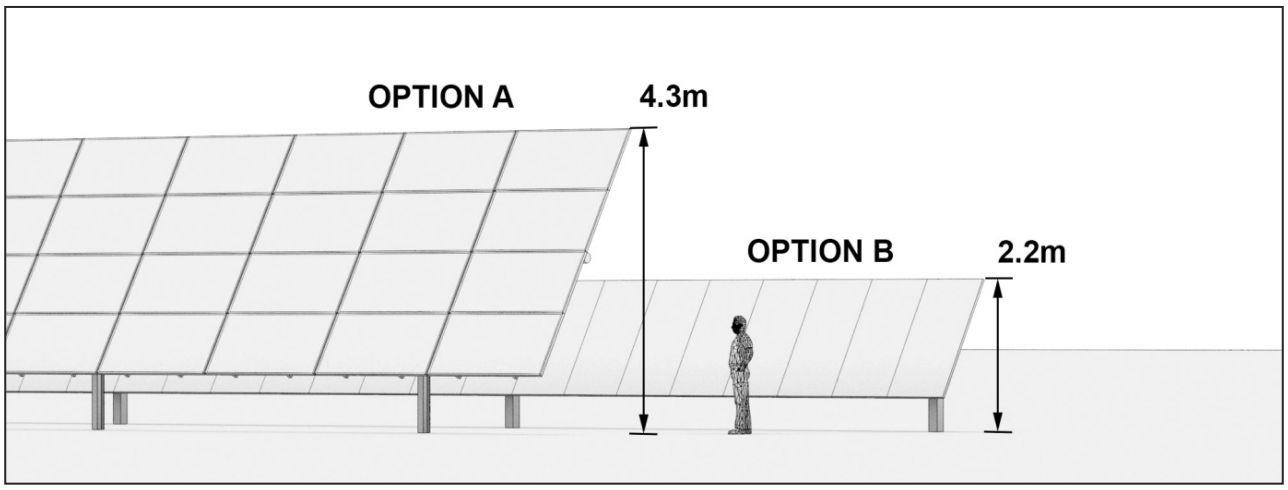


**Plate B.1 Example of PV module configurations under consideration for the project**

DC cables will connect the PV modules to the PCUs.

The PCUs consist of three key components, namely inverter(s), transformer(s) and a ring main unit. The purpose of each PCU is to convert the direct current (DC) electricity generated by the PV modules into alternating current (AC) form, compatible with the electricity network. PCUs also increase the voltage of the electricity to 11-33 kV. The exact dimensions of the PCUs will be determined during detailed design; however, it is anticipated that each PCU will be approximately 8 m in length by 2.6 m wide by 2.7 m high. Photograph 2.2 has been provided as an example of what the PCUs and inverters may look like within the development footprint for the array areas. The exact model used will be determined as part of detailed design.


**Photograph B.2 Containerised inverter solution with PV module rows**

Source: Ingeteam (2015)

A medium voltage (MV) cable reticulation network will be required to transport the electricity around each of the arrays. If underground, cables of either 11 kV, 22 kV or 33 kV will be installed at a depth of at least 600 mm and will be designed and fitted in accordance with relevant Australian industry standards. Electricity from the MV cable network will be stepped up to high voltage (HV) at either the solar array substation (if required) or the grid connection substation.

New transmission lines, with anticipated voltage of 132 kV, may be required to transport electricity from the solar array substation to the grid substation and will traverse the solar array areas. The exact route of the transmission lines within the solar array areas has not yet been determined and will be dependent on the final location selected for the solar array substation (should it be required).

### B.3.2 Solar array substations

As noted in Section B.1, a solar array substation may be required in the central array to step the MV up to HV. Two parcels of land that form part of Lot 8 of DP 173619 are currently under consideration for the placement of the solar array substation within the central array. The indicative locations for the solar array substation are provided in Figure B.1. A larger footprint than what will likely be required has been provided at each location to allow for flexibility for placement of this infrastructure during the detailed design stage of the project (should it be required). Subject to detailed design, PV modules and ancillary infrastructure may also be placed within the substation/BESS footprints identified on Figure B.1.

### B.3.3 Collector network and grid substation

As part of the ongoing detailed design of the infrastructure layout within the development footprint, it may be necessary to utilise either underground or overhead cabling (or a combination of the two) to connect the two array areas. Use of overhead 33 kV conductors to connect the central array to the grid substation will remove the need for intermediate transformation at the central array. Overhead conductors are more cost effective and experience less electrical losses due to the cooling effect of the air as well as involving less surface disturbance.

Indicative alignments for each of the electrical cabling corridors that may extend between the northern and central array areas are presented in Figure B.1. The exact route of the electrical cabling within the two solar array areas has not yet been determined so this is not shown in the figure. This will be determined during the detailed design stage of the project.

If overhead transmission lines are utilised, the design, height and style of the structures required to support them will be determined during the detailed design stage of the project; however, it is unlikely that the height of the structures will exceed 45 m consistent with Australian standards. Based on preliminary designs, single concrete, wood, or steel poles are anticipated rather than steel lattice towers. The easement required for the overhead transmission lines would be dependent on the type of structure selected but is likely to be approximately 45 m in width. The distance between each structure would also be dependent on the type of structure selected. Where possible, structures would avoid identified constraints on the land parcels between the two array areas. Complete clearance of vegetation within each of the proposed easements may be required.

The grid substation will be adjacent to TransGrid's 330 kV transmission line, which traverses the northern and central array areas (Figure B.1). At the grid substation, the electricity generated by the two solar arrays will be stepped up to 330 kV and injected into the electricity grid via an existing TransGrid 330 kV transmission line. The grid substation will be within the indicative area of 10 ha that is shown on Figure B.1 and will require a pad area of approximately 4 ha. The indicative area provided on Figure B.1 covers part of the following lots:

- Lot B of DP 172594;
- Lot 83 of DP 755814; and
- Lot 84 of DP 755814.

The exact dimensions of the grid substation will be refined during the detailed design stage of the project and in consultation with TransGrid. The exact location of the grid substation will be confirmed prior to the commencement of construction.

The land on which the grid substation is constructed is likely to require subdivision as this is a typical requirement of TransGrid, the likely owner/operator of the cut-in section of the yard. At the end of the operational life of the grid substation, the infrastructure on the subdivided lot will be decommissioned and the lot will be reconsolidated back into the residual lot.

All land surrounding the development footprint is zoned RU1 Primary Production under the Uralla LEP, with associated minimum lot sizes of 200 ha. The subdivision of the lot(s) that are selected for the grid substation may result in a lot size that is less than the minimum lot size under the Uralla LEP. Notwithstanding, in accordance with the provisions of Section 4.38 of the EP&A Act, the proposed subdivision will be permissible subject to the approval of the Minister for Planning or their delegate. The proposed subdivision will be the subject of ongoing discussion with Uralla Shire Council, DPE and the project landholders.

### B.3.4 Battery and energy storage system

The purpose of the BESS will be to support the network, introduce a dispatchable capability to the project's energy generation profile and allow for revenue diversification.

The BESS will be adjacent to one or more substations within the development footprint and will be housed within either a number of small enclosures/cabinets or larger battery buildings. The specific design details for the BESS and their respective enclosure types have not been confirmed; however, it is anticipated that the BESS for the project will consist of either one BESS facility at the grid substation or two BESS facilities (ie one at the grid substation and one at the internal solar array substation, should one be needed at the central array).

The small enclosures will likely be either modified shipping containers, pre-fabricated switch room structures or smaller outdoor rated cabinets. The modified shipping containers and prefabricated switch rooms will likely be mounted on concrete footings, while the cabinets will be mounted on several concrete slabs. The large buildings will be similar in appearance and construction to agricultural sheds prevalent across the project boundary.

Based on an indicative design, it is anticipated that the height of the battery enclosures/cabinets will be approximately 3.8 m, whilst the height of the dedicated use buildings will be approximately 7.5 m. These dimensions should be considered indicative only. Exact dimensions will be refined during the detailed design stage of the project. Each of the footprints presented on Figure B.1 provide adequate flexibility for design and siting of the applicable BESS at each location.

The major components for each BESS include:

- Batteries – the specific battery module manufacturer and model has not been selected; however, it will likely be a type of lithium ion battery similar to the LG Chem Lithium Nickel Manganese Cobalt Oxide (NMC) 2-hour energy module or Tesla Powerpack 2 hour solution.

- Inverters – the inverters will likely be similar to those used within the array areas as part of the PCUs. An alternative arrangement may be required whereby the inverters would be positioned adjacent to the battery cabinets, with the transformers and switchgear separate to this.

- Transformers – within the BESSs, there will be two types of transformer, namely a LV to MV transformer and a MV to HV transformer. The configuration of the transformers will be subject to the type of batteries used and the BESS configuration.

- Heating ventilation air conditioning (HVACs) – one of three types of HVAC will likely be used as part of the BESS to maintain the batteries at a temperature that will optimise their lifetime and performance. This includes small package units; large chillers or a liquid cooling system (should the battery cabinet configuration be installed).

- Fire protection – the shipping container/pre-fabricated switch room structures and large building BESS configurations will have active gas-based fire protection systems. Within each of the potential enclosures, there will be thermal sensors and smoke/gas detectors connected to a fire control panel. Note that the Tesla cabinet facilities would not have this feature as the inherent design minimises risk of a fire spreading from one cabinet to another.

The components described above will be similar for each of the BESS structures likely to be constructed as part of the project. As noted above, the specific design details for the BESS have not been confirmed and will not be known until the completion of the detailed design stage of the project.

### B.3.5 Supporting infrastructure

In addition to the infrastructure described above, the project will also require:

- one or more O&M buildings (namely meeting facilities, a temperature-controlled spare parts storage facility, SCADA facilities, a workshop and associated infrastructure);
- a number of new internal roads to enable access to the array areas from Big Ridge Road (Figure B.1);
- emergency access points to enable access to the array areas from the surrounding road network in the case of an emergency (eg fire or flood);
- parking and internal access roads/tracks within the array areas to allow for construction and ongoing maintenance; and
- fencing and landscaping around the solar arrays, substations and BESSs.

O&M buildings and associated infrastructure will likely be constructed within the footprints nominated for the substations and BESSs; however, their exact location will be determined during detailed design (Figure B.1). The locations for the emergency access points will be identified as part of the project's emergency response plan (ERP) during detailed design.

Temporary infrastructure during the construction stage of the project including laydown and storage areas and a site compound are also likely to be required in each of the solar array areas. Laydown areas will likely be in close proximity to the primary site access points and will be placed away from environmentally sensitive areas, where possible. Indicative locations for laydown areas and site compounds within each of the array areas are provided on Figure B.1.

Chain-link (or mesh) security fencing will be installed within the project boundary to a height of up to 2.4 m high. The specific location of the security fencing will be determined in consultation with the contractors selected for the construction of the project and project landholders. Fencing will restrict public access to the development footprint. Where possible, fencing will be positioned to minimise disruption to ongoing agricultural operations on land adjacent to the development footprint.

## B.4 Construction

### B.4.1 Site preparation

The need for heavy civil works such as grading/levelling and compaction will be minimised as much as practicable, as the flattest land areas within the array areas, which are already mostly cleared of vegetation, have been selected. Civil works will be required to prepare the array areas, which includes installing fencing, internal access tracks, and minor earth works (such as for installation of underground electrical cabling). It is anticipated that some cutting and filling may be required in undulating areas within the development footprint; however, this will be avoided where practicable.

Some heavier earth moving will likely be required for certain project infrastructure (eg substations and BESSs) in those instances where a level pad is necessary. In addition, grading around lower order streams and drainage channels within the three array areas may also be required in order to manage erosion during construction.

As part of site establishment works, management measures will be implemented to mitigate potential impacts on the environment and receptors within close proximity of the development footprint. Where required, additional or improved drainage channels, sediment control ponds and dust control measures will be implemented. Further, laydown areas and waste handling, fuel and chemical storage areas will be strategically placed to minimise potential environmental impacts during the construction stage of the project.

Site establishment works and preparation for construction may include:

- the establishment of a temporary construction site compound in a fenced-off area within the development footprint including:
    - a site office;
    - containers for storage;
    - workshops;
    - parking areas; and
    - temporary laydown areas;
- construction of access tracks and installation of boundary fencing;
- site survey to confirm infrastructure positioning and placement; and
- ongoing geotechnical investigations to confirm the ground conditions.

### B.4.2 Construction activities

Upon completion of the site establishment and pre-construction activities described above, construction activities will typically be rolled out as follows:

- drive or screw piles;
- install mounting structures and tracker tubes;
- secure PV modules to tracker tubes;
- installation of DC cabling, MV and HV cables (either underground or overhead);
- installation of PCUs;
- complete substation augmentation;
- establishment of the BESS compound; and
- test and commission project infrastructure.

### B.4.3 Construction plant and equipment

The plant and equipment required for the construction of the project will include:

- earthmoving machinery and equipment for site preparation;
- cable trenching and laying equipment;
- pile-driving equipment;
- assisted material handling equipment (forklifts and cranes);

- machinery and equipment for connection infrastructure establishment and installation of battery and energy storage devices; and
- water trucks for dust suppression.

### B.4.4 Delivery of construction materials and infrastructure

Construction materials and infrastructure may be transported to the array areas via road. Heavy vehicles up to 26 m in length will require access to the array areas. Construction materials and infrastructure delivered to the array areas will include:

- PV modules;
- piles;
- tracking tubes and associated tracker equipment (eg motors, bearings, drivetrains, etc);
- electrical infrastructure including cabling and PCUs;
- construction and permanent O&M buildings and associated infrastructure; and
- earthworks and lifting machinery and equipment.

Over-dimensional vehicle movements should be limited to a total of 30 vehicles to enable the transport of:

- 33 kV/132 kV transformers (if required);
- 33 kV/132 kV/330 kV transformers;
- replacements of damaged or failed transformers, significant components and related equipment;
- BESS components;
- civil works plant, components and related equipment; and
- replacements of large indivisible items during operations and decommissioning (if required).

The maximum estimated length of the over-dimensional vehicles is estimated to be up to 120 m. Decommissioning will require the same number of over-dimensional vehicles. No over-dimensional vehicle movements are anticipated during operations.

As part of ongoing design, ACEN Australia has also been considering the potential use of the Main Northern Railway line for delivery of construction materials and project infrastructure. The use of the Main Northern Railway line for deliveries to the northern array area has been the subject of consultation with John Holland Country Regional Network (JHR), Transport for NSW (TfNSW) and DPE. Additional information in relation to this activity is provided below. It should be noted that the final decision by ACEN Australia on whether the Main Northern Railway line will be used for delivery of construction materials and infrastructure will depend on a number of factors, including:

- timing and logistics;
- sequencing of works;

- cost and safety considerations; and
- engineering, procurement and construction (EPC) contractor acceptance of this alternative to using the road network.

### i Location of train unloading and associated works

The proposed location of the train unloading includes works within:

- Part of Lot 221 of DP 755814 (within the development footprint for the northern array area) – this area will be used as a temporary laydown area during construction, primarily for the short-term storage of shipping containers (or similar).
- Part of Lot 2 of DP 982376 (outside of the development footprint within the rail corridor) – a temporary hardstand will be constructed in this area to facilitate safe and efficient use of a mobile forklift, reach stacker or similar during unloading activities.

A larger footprint than what will likely be required has been provided at each location to allow for flexibility for placement of this infrastructure during the detailed design stage of the project. The exact dimensions for the temporary hardstand will be refined during the detailed design stage of the project and in consultation with JHR and TfNSW.

ACEN Australia proposes to unload the trains using specific container unloading equipment such as a mobile forklift or reach stacker. The equipment will unload the train within the temporary hardstand area and transport the shipping containers (or similar) to the temporary laydown area within the development footprint for the northern array area. During unloading, the train will likely shunt along the track to allow for safe and efficient unloading from the full length of the temporary hardstand (approximately 100 m). This will allow ACEN Australia to unload approximately four containers with each train movement.

The existing level of the rail corridor, Main Northern Railway line and development footprint for the northern array is quite flat through the relevant area and it is anticipated that minimal ground disturbance will be required. The level crossing visible in Figure 2.3 and Photograph 2.5 (refer EIS) only services the property on which the northern array is located, subsequently, there will be no impacts on the users of the level crossing.

Construction materials and infrastructure delivered to the temporary laydown area will then be relocated to other areas within the development footprint using internal access roads.

All light and heavy vehicles that require access to the temporary laydown area (within the development footprint for the northern array area) and the temporary hardstand (adjacent to the Main Northern Railway line and within the rail corridor) will travel to these areas from the primary site access point for the northern array area (off Big Ridge Road) using the project's internal access roads. This includes heavy vehicles transporting gravel (or similar) to the two areas during site establishment works, as well as deliveries of construction plant and equipment. It is anticipated that this equipment will already be available on-site as it will be the same equipment that will be used during the construction of the project's internal access roads.

The location for an emergency access point will be identified as part of the project's emergency response plan (ERP) during detailed design.

**Photograph B.3** **General condition of Lot 2 of DP 982376 at the proposed laydown area – looking south (outside of the development footprint and project boundary)**

**Photograph B.4** **General condition of Lot 2 of DP 982376 at the proposed laydown area – looking north (outside of the development footprint and project boundary)**

The shipping containers (or similar) will likely have a height of approximately 2.9 m. The equipment proposed for use during train unloading have limited vertical reach. Subsequently, the maximum height of infrastructure within the laydown area during the unloading activities will be approximately 8.7 m.

As noted above, the containers will only be stored within the temporary laydown area on-site for a short duration, before being unloaded or transferred elsewhere within the development footprint. Once emptied, the shipping containers (or similar) will be removed off-site during subsequent train movements.

At the completion of construction, PV modules and ancillary infrastructure may be placed within the laydown area. The temporary hardstand within the rail corridor will be decommissioned and rehabilitated in consultation with JHR and TfNSW.

### ii Origins, timing, frequency and duration

It is anticipated that it will take approximately 4 hours to unload each train and that an average of 2 trains per week may be used for the delivery of construction materials and infrastructure.

The trains will likely originate at Port Botany in Sydney and will need to stable in Armidale to allow for passenger services to pass. The train from Sydney to Armidale passes the northern array area at approximately 8.50 am. The return train to Sydney passes the northern array area at approximately 5.20 pm. Therefore, ACEN Australia proposes to unload the train during the day between these two train services.

As part of consultation with JHR, the potential to unload at night was discussed as this would allow a longer window between passenger trains; however, this is currently not the preferred approach as it would require the use of temporary lighting plant at both the hardstand and laydown areas.

#### iii Consultation and approval process

ACEN Australia has been engaging with JHR and TfNSW in relation to the proposed use of the rail line.

To allow for the development of the hardstand and unloading operations (ie activities outside of the development footprint), a licence from TfNSW is required. As noted during consultation with DPE, this is a separate approval process and will be undertaken in consultation with JHR and TfNSW.

As the agent/operator, JHR has provided an informal briefing to TfNSW to introduce the project and the proposed activities and it's been confirmed that the proposed unloading activities are operationally viable with sufficient siding resources available along the relevant sections of the Main Northern Railway line.

ACEN Australia will commence the application process directly with JHR (who handle the administrative part of the process) and TfNSW (who will be the approval authority and distribute the licence).

### B.4.5 Construction staging, duration and hours

Construction of the project is still anticipated to take approximately 36 months from the commencement of site establishment works to commissioning of the two array areas. It is anticipated that the project will be constructed in two stages.

Stage 1 will include complete construction of the northern array area including the grid substation and is anticipated to take approximately 25 months to complete.

Stage 2 will include complete construction of the central array area and is anticipated to take approximately 20 months to complete. Stage 2 also includes the construction of the BESS, which is also anticipated to take approximately 20 months to complete.

Stage 2 will commence approximately 12 months after the commencement of site establishment works planned as part of Stage 1.

As noted within the EIS, the exact timing of each stage, including the commencement of Stage 1, the commencement of Stage 2, and the subsequent duration of the overlap between the two stages will be determined during the contracting, detailed design and financing stage of the project following project approval. Similarly, the overall duration of the project's construction will also be confirmed at this time once the preferred EPC contractor is selected and the detailed construction schedule is confirmed. The timeframes are indicative only and reflect a conservative upper limit of potential impacts from the project.

The construction of the additional BESS infrastructure is anticipated to extend the duration of construction. It is anticipated that the construction of the additional BESS infrastructure will be in stages and the duration will be dependent on the timing of the development of the New England REZ and associated infrastructure.

Unless the Secretary agrees otherwise, ACEN Australia will only undertake construction, upgrading or decommissioning activities on-site between:

- 7.00 am to 6.00 pm Monday to Friday;
- 8.00 am to 6.00 pm Saturdays; and
- at no time on Sundays and NSW public holidays.

The following construction, upgrading or decommissioning activities may be undertaken outside these hours without the approval of the Secretary:

- activities that are inaudible at non-project related residences;
- the delivery of materials as requested by the NSW Police Force or other authorities for safety reasons; or
- emergency work to avoid the loss of life, property and/or material harm to the environment.

Examples of inaudible activities that may be carried out on-site include, PV module installation, bracket installation, rolling out cables, testing and commissioning, surveying and waste sorting.

### B.4.6 Construction workforce

The project will require a peak construction workforce of up to 700 people.

As part of Stage 1, a peak workforce of approximately 350 people may be required on-site. It is anticipated that the average construction workforce throughout the 25-month construction period for Stage 1 will be approximately 180 people.

As part of Stage 2, a peak workforce of approximately 650 people may be required on-site. It is anticipated that the average construction workforce throughout the 20-month construction period for Stage 2 will be approximately 290 people. Stage 2 includes the complete construction of the central array area, as well as the BESS.

The origins of the project's peak construction workforce may include:

- Uralla Shire LGA – approximately 10% of the project's construction workforce;
- Tamworth LGA – approximately 20% of the project's construction workforce; and
- Armidale LGA - approximately 20% of the project's construction workforce.

During construction, there will be a preference for employment of local and regional residents where they are able to demonstrate relevant skills and experience and a cultural fit with ACEN Australia and the EPC contractor.

The remaining 50% of the project's peak construction workforce are anticipated to originate from outside of these LGAs.

## B.5 Services

The project may require connections to the electricity, telecommunications, water and sewer networks. During construction, electricity requirements will be met by backup generators.

## B.6 Operation

The operational lifespan of the project will be in the order of 30 years, unless the facility is re-powered at the end of the PV modules' technical life. The PV modules typically come with a performance warranty for 25 years from the manufacturer. The decision to re-power the plant will depend on the economics of solar PV technology and energy market conditions at that time. Should the PV modules be replaced during operations, the lifespan of the project may extend to up to 50 years. Throughout operations, a workforce of up to 15 FTEs will be required.

It is anticipated that the facility will require regular maintenance throughout its operational life. This will include the following ongoing tasks:

- site maintenance including:
  - vegetation maintenance;
  - weed and pest management;
  - fence and access road management;
  - upgrading drainage channels; and
  - landscaping;
- infrastructure maintenance including:
  - panel cleaning;
  - panel, inverter and tracker system repair (if required);
  - inverter replacement (within every 7–10 years); and
  - equipment, cabling, substation and communications system inspection and maintenance.

Regular light vehicle access will be required throughout operations. Heavy vehicles may be required occasionally for replacing larger components of project infrastructure including inverters, transformers or components of the BESS. Highly technical O&M activities will typically be undertaken by specialist subcontractors and/or equipment manufacturers whereas routine activities such as fencing maintenance and vegetation management is likely to be offered to local contractors wherever available.

ACEN Australia is currently in discussions with a number of the landholders to enable sheep grazing to resume on portions of the array areas following the completion of the construction of the project. A detailed protocol will be developed to ensure biosecurity is maintained and that grazing does not impact on the safe and efficient operation of the project or result in injury to farm workers, stock or O&M staff.

To ensure the optimal electricity production output for the project is maintained, the PV modules may need to be washed periodically to remove dirt, dust and other matter. Water for panel cleaning will be transported to the array areas via water trucks. Washing will not require any detergent or cleaning agents.

The operational workforce will also be responsible for ongoing security monitoring of the array areas and project infrastructure. Perimeter security cameras may be utilised to assist with monitoring the array areas.

## B.7 Decommissioning

Once the project reaches the end of its investment and operational life, the project infrastructure will be decommissioned and the development footprint returned to its pre-existing land use, namely suitable for grazing of sheep and cattle, or another land use as agreed by the project owner and the landholder at that time.

Project decommissioning will require disturbance of the development footprint during the removal of equipment. A significant number of FTEs, including both staff and contractors, and vehicle movements will be required during the decommissioning stage of the project.

Any underground cabling below 500 mm will remain in-situ following project decommissioning.

ACEN Australia will attempt to recycle all dismantled and decommissioned infrastructure and equipment, where possible. Structures and equipment that cannot be recycled will be disposed of at an approved waste management facility.

## B.8 Environmental management

An environmental management strategy (EMS) will be implemented to provide the strategic framework for environmental management of the project. The strategy will:

- incorporate a project environmental management plan (EMP), all other required plans, protocols, management and mitigation measures proposed in the EIS, AR and modification report;
- identify all relevant statutory approvals;
- establish roles, responsibility, authority and accountability of all key personnel involved in the environmental management of the project;
- establish procedures for consulting with the local community and relevant agencies about the operation and environmental performance of the development; and
- establish procedures for handling of complaints, disputes, non-compliances and emergency response.

Appendix C of this report provides a consolidated summary of the management measures that will be implemented during the construction and operation of the project to manage, mitigate and/or monitor potential impacts identified within the EIS, AR and modification reports.

# Appendix C

## Updated mitigation measures table

EMM
creating opportunities

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| Biodiversity | A biodiversity management plan (BMP) will be prepared as part of the project's construction environmental management plan (CEMP) prior to commencement of on-site construction works and will include advice regarding the effective implementation of each of the biodiversity management and mitigation measures listed in Table 6.1 of the EIS BDAR, including:<br>• avoid and minimise clearing impacts to PCTs, where possible;<br>• clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development footprint;<br>• appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed;<br>• identify the location of any 'No Go Zones' in site inductions;<br>• limit removal of trees (including dead trees) to that required within the development footprint in support of the installation of project infrastructure;<br>• a clearing procedure will be implemented during the clearing of the development footprint, as follows:<br>– preclearance surveys will be completed to determine if any nesting birds are present; and<br>– a suitably trained fauna handler will be present during hollow-bearing tree (including dead hollow-bearing trees) clearing to rescue and relocate displaced fauna if found on-site;<br>• installation of appropriate exclusion fencing around trees and woodland to be retained within the development footprint whilst construction is occurring;<br>• the radius of TPZ is calculated for each tree by multiplying its DBH by 12 in accordance with AS 4970-2009 Protection of trees on development sites;<br>• appropriate education should be provided to site personnel in site inductions regarding the purpose of exclusion fencing or no go zones;<br>• speed limits within the development footprint will be limited to 40 km/hr and stated in the CEMP and OEMP;<br>• source controls, such as mulching, matting and sediment fences, will be utilised where appropriate;<br>• an ESC plan will be prepared in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) prior to construction;<br>• disturbed areas will be stabilised and rehabilitated as soon as possible to reduce the exposure period;<br>• a specific creek crossing sub-plan will be included as part of the CEMP; and<br>• all creek crossings are to comply with the *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI 2003).<br>The BMP will include an unexpected finds protocol for threatened species, which will include advice and photographs of key species with the potential to occur within the development footprint. The unexpected finds protocol will outline the following actions if a threatened species or suspected threatened species is found during construction or operation of the project:<br>• stop work within the vicinity of the species;<br>• cordon of the area in question with an appropriate buffer;<br>• inform the management team;<br>• seek advice from an ecologist or species expert to confirm identification; and<br>• if a threatened species is confirmed, consult with the relevant agencies to determine appropriate management, mitigation measures and additional approvals (if required).<br>Additional measures to avoid and minimise indirect impacts will be outlined in the CEMP and OEMP and will include:<br>• appropriate wash down facilities will be available to clean vehicles and equipment prior to arrival and when leaving site. In particular, ensure soils and seed material isn't transferred in accordance with the measures outlined in the CEMP; and<br>• lighting to comply with AS/NZS 4282:2019 – *Control of Obtrusive Effects of Outdoor Lighting*.<br>Julia Gully, a third order stream in the north-east corner of Area 3, is highly ephemeral with a poorly defined channel and occasional, small shallow pools during wet periods. Nonetheless, a 30 m buffer from each edge of the channel will be maintained to minimise potential impacts on downstream water quality and erosion. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| Aboriginal cultural heritage | An Aboriginal Heritage Management Plan (AHMP) will be developed in consultation with DPE, the RAPs and HeritageNSW. It will provide details of:<br>• all Aboriginal sites identified during the archaeological investigation for the project;<br>• management measures and their progress towards completion;<br>• measures to ensure ongoing consultation and involvement of project RAPs;<br>• RAP access arrangements for a selection of significant sites for educational purposes;<br>• protocols for newly identified sites;<br>• protocols for educating staff and contractors of their obligations relating to Aboriginal cultural heritage values through a site induction process;<br>• protocols for suspected human skeletal materials;<br>• protocols for the ongoing care of salvaged Aboriginal objects within a keeping place; and<br>• provisions for review and updates of the AHMP.<br>The AHMP will be prepared after project approval, and in addition to the points above, will address all relevant conditions of approval.<br>Aboriginal sites identified as part of archaeological investigations will be managed in accordance with the management strategies presented in Table 7.3 of the ACHA Addendum (refer Appendix E of the AR) and Section 6.2.5 of this report.<br>Generally, sites designated for avoidance within the development footprint or within 20 m of the development footprint will be avoided with protection during the construction phase of the project to avoid inadvertent impacts. This may involve the installation of treated timber poles (or similar) painted with high visibility paint around the visible extent of the sites and/or the PAD areas prior to construction. Unless specified otherwise for individual sites, a construction buffer of at least 20 m will be applied to the demarcated boundaries of avoided sites. A suitably qualified archaeologist accompanied by a RAP representative will demarcate site locations and where the poles should be erected.<br>A construction buffer of at least 100 m will be applied to the site boundaries of NE09 and NE68 (also meaning at least a 50 m buffer from the PAD boundary that extends beyond the physical site contents). The boundaries of these sites will also be demarcated prior to construction.<br>A semi-permanent or permanent boundary fence will be erected around site NE09 to protect it from livestock or other accidental damage. ACEN Australia will explore opportunities to employ RAPs for vegetation, weed and pest management of NE09 after fencing is erected. The details of fencing and maintenance will be discussed as part of consultation with the RAPs during the preparation of the AHMP.<br>All sites identified within the ETL options surveyed as part of the EIS ACHA will be avoided during detailed design.<br>Sites that occur over 20 m from the development footprint will be passively avoided without protection.<br>All surface artefact sites (artefact scatters and isolated finds) impacted by the project will be collected. The collection will be undertaken by qualified archaeologists and RAP representatives in accordance with the methodology provided in Section 9.2.4 of the EIS ACHA.<br>The ACHA details the special procedures to be followed as part of the management of Aboriginal cultural heritage, including:<br>Aboriginal keeping place – RAPs have nominated that the recovered objects be kept at the Armidale and Region Aboriginal Cultural Centre and Keeping Place. ACEN Australia are committed to working with the RAPs to accommodate the requests for storage and curation of collected objects. It is noted that the final locations for specific objects and details of curation, storage, display and interpretation of recovered objects will be developed and resolved during consultation with the RAPs as part of the preparation of the AHMP.<br>RAP site access arrangements – subject to further discussion on protocols, RAP access arrangements for a selection of significant sites (including NE09 and NE68) for educational purposes will be detailed within the AHMP.<br>Aboriginal ancestral remains – In the event that known or suspected human remains are encountered during the project's construction, the procedure detailed in the AHMP will be followed as soon as the suspected remains are discovered. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| | Discovery of new Aboriginal sites – in the event of discovery of new Aboriginal sites within the development footprint, the procedure detailed in the AHMP will be followed. Newly identified sites that are not at risk of impact (ie over 50 m from the approved development footprint) will be avoided through passive protection. In the event that newly identified sites will be impacted by the construction of the project and cannot be avoided, they will be managed in a manner commensurate with their assessed significance.<br>The felled and sawn in half Aboriginal scar tree, NE49, will be salvaged prior to project construction and placed in an Aboriginal keeping place as discussed in Section 9.3.1 of the EIS ACHA. The project's AHMP will detail the methods for salvage, curation and presentation of the tree. The 13 standing Aboriginal scar trees discussed in the ACHA amendment report will be avoided and will receive the same general avoidance methods as described in in Section 9.2.3 of the EIS ACHA. However, they may require additional management to address their long-term preservation given that most examples are on highly deteriorated trees. The project's AHMP will detail long-term preservation options for the trees in consultation with RAPs, the project archaeologist and HeritageNSW. The duration of ACEN Australia's management commitments for the trees would be limited to the estimated<br>25–30 years of the project's operation prior to decommissioning. Note that Aboriginal scar tree NE35 is no longer within the development footprint and therefore ACEN Australia will not employ long-term preservation measures for this site. |
| Historic heritage | Following project approval and prior to any work commencing, a historic heritage management plan (HHMP) will be prepared to guide the conservation of heritage items, unexpected finds and human remains including skeletal material, for the duration of the project. The relevant measures in the HHMP will be incorporated into the project CEMP and OEMP to avoid accidental impacts during the construction and operation of the project. The HHMP will include the management measures in this document and identify the minimum locations for photographic archival recording.<br>Where construction and operation activities are within 10 m of identified items with heritage values, all efforts will be made to avoid impacts; this includes active protection of items through the use of high visibility rope, flags or sturdy bollards and total exclusion zones for construction activities and placement of infrastructure.<br>If moveable heritage is found in the development footprint during project construction it will be protected by re-locating it to another area of the property in consultation with the landholder. Moveable heritage includes items such as farm machinery and water tanks and stands. Details on identification and actions will be included in the HHMP.<br>Prior to any changes to the landscape and specific heritage items that may result from project activities, a digital photographic archival record will be prepared. The digital photographic record will be prepared in accordance with the Heritage Manual guidelines, *Photographic Recording Of Heritage Items Using Film or Digital Capture* (Heritage Office 2006).<br>The discovery of human remains including skeletal material will halt work in a 10 m radius and the remains will not be tampered with. Personnel with the appropriate level of authority will contact the police and the coroner for investigation, which may include the involvement of OEH and advice from a physical anthropologist. A detailed protocol will be developed for the HHMP.<br>Tree line wind breaks will be retained where practicable (for example, where they are located to the south of PV module rows, so that they do not create shading issues).<br>An unanticipated finds protocol will be refined in the HHMP to provide guidance to construction personnel should works uncover objects and fabric that may indicate relics. Work will stop if objects such as bonded bricks, timber or stones appearing in formation indicating a wall or floor for instance are found, or if soil with artefacts concentrations, is excavated. A detailed materiality threshold will be determined prior to construction as part of the HHMP and staff involved in excavation work will be informed about how to apply it. The unanticipated finds protocol will include actions such as:<br>• if the find meets the materiality threshold defined in the HHMP, work will immediately but temporarily cease within 5 m of the find and the site supervisor or appropriate responsible person will be informed;<br>• an archaeologist will be contacted to assess the find, where relevant, and determine if it is clearly a relic or has moderate to high potential to be a relic (this may require additional research);<br>• if the find is determined to be a relic, a s146 (of the Heritage Act) is to be forwarded to the Heritage Council who will be consulted on the appropriate management measure; and<br>• if the find is assessed and is not a relic, work inside the area that was made a no-go area can re-commence.<br>Appropriate management measures range from do nothing to archaeological excavation. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| Land | As part of the CEMP, a soil and water management plan (SWMP) will be prepared prior to commencement of on-site construction works in consultation with Uralla Shire Council and DPE Water as required and will incorporate all soil and water related commitments outlined this table.<br><br>The SWMP will provide detailed background information, erosion hazards assessments including erosion hazard mapping and soil loss calculations for all disturbed areas, overall draining, erosion and sediment control approach, design standards and management strategies and approach for progressive rehabilitation and stabilisation of disturbed land.<br><br>The SWMP will set out the framework for preparation and implementation of an erosion and sediment control plan (ESCP), which will be prepared in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) and will include:<br><br>• a set of progressive erosion and sediment control plans (ESCPs) for each section of the construction site. Where particular sensitivities or erosion risks are identified, ESCPs may be used in conjunction with site or activity specific ESCPs or similar to provide more detailed site-specific mitigation measures;<br>• erosion and sediment controls (ESCs) will be installed, with priority given to sloped areas and areas adjacent to drainage lines;<br>• all construction and operational activities will be planned and carried out to ensure that damage to soil and vegetation outside the area designated for clearing (ie the development footprint) is minimised;<br>• where practicable, consideration will be given to the timing of disturbance and vegetation clearing ahead of project activities to ensure disturbed areas are exposed for the shortest possible time;<br>• where practicable, ACEN Australia will minimise the disturbance of soils (especially subsoil) or stockpiles at times immediately following significant rainfall events (eg 25 mm in 24 hours);<br>• disturbed areas will be stabilised and progressively rehabilitated as quickly as possible; and<br>• ameliorants (such as gypsum and fertiliser) will be applied at recommended rates during construction and as part of decommissioning and rehabilitation activities (in consultation with project landholders) and will assist with erosion management.<br><br>Where temporary crossings of watercourses are necessary to provide construction access over these features, temporary stabilised crossings may be utilised.<br><br>The project's CEMP and OEMP will include weed management protocols, such as measures for the identification, management and ongoing monitoring of weeds on-site.<br><br>If pest control is considered necessary, it will generally involve a routine baiting program in consultation with the project landholders and neighbouring landholders. Other control methods such as shooting or trapping may also be used if deemed necessary or appropriate.<br><br>A project decommissioning and rehabilitation plan will be prepared prior to the end of the project's operational life and will feature rehabilitation objectives and strategies for returning the development footprint to agricultural production or alternative uses as has been agreed with the project landholders. As part of the decommissioning and rehabilitation, ACEN Australia would remove any underground cabling within 0-500 mm of the ground surface, and will attempt to reuse, resell or recycle all dismantled and decommissioned infrastructure and equipment, where possible. Structures and equipment that cannot be reused or recycled will be disposed of at an approved waste management facility.<br><br>The CEMP will incorporate the following measure to address concerns raised by surrounding landholders in relation to security during construction:<br><br>• a zero tolerance policy on theft will be implemented on-site throughout the project's construction period;<br>• criminal background checks on all staff, contractors, sub-trades and security guards will be performed;<br>• surrounding landholders, project landholders and law enforcement will be provided with the primary contractor's contact information;<br>• surveillance cameras and signs will be implemented to deter vandalism and theft;<br>• the temporary construction site compound will be established in a fenced-off area within the development footprint; and<br>• chain mesh security fencing will be installed within the project boundary around the perimeter of the array areas to control access. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| Visual | Landscaping to mitigate views of project infrastructure at Viewpoint 5 will be considered in consultation with the property owner of N1.<br>Where possible, suitable colours will be chosen for project infrastructure to minimise visual impacts. Buildings and materials will be designed to blend in with the local rural/farming landscape and will not be dissimilar to existing farm sheds and agricultural infrastructure in the area surrounding the two arrays.<br>All external lighting will be installed as low intensity lighting (except where required for safety or emergency purposes) and will comply with AS/NZS 4282:2019 – *Control of Obtrusive Effects of Outdoor Lighting*. |
| Noise | The following measures are recommended to be implemented during construction works with the aim of minimising impacts and reducing construction noise levels below the relevant goals:<br>• a letter box drop for residences in close proximity of the proposed works to inform residents of planned construction activities, time periods and expected durations, potential impacts and proposed mitigation measures;<br>• minimise the number of plant items operating concurrently when in close proximity to surrounding receivers;<br>• planning deliveries and access to occur quietly and efficiently and organising parking only within designated areas away from nearby receivers (where possible); and<br>• appropriate respite periods to be implemented after high noise and vibration-generating activities are carried out in continuous blocks.<br>Universal works practices during construction will include:<br>• regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration;<br>• regular identification of noisy activities and adoption of improvement techniques;<br>• developing locations for parking of vehicles to minimise noise;<br>• minimising the movement of materials and plant and unnecessary metal-on-metal contact;<br>• minimising truck movements; and<br>• scheduling respite periods for intensive works including consultation with potentially affected neighbours.<br>Additional measures for plant and equipment will include:<br>• choosing quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks;<br>• operating plant and equipment in the quietest and most efficient manner; and<br>• regularly inspecting and maintaining plant and equipment to minimise noise and vibration level increases and to ensure that all noise and vibration reduction devices are operating effectively.<br>Additional measures for work scheduling include:<br>• scheduling high noise-generating work to coincide with less sensitive periods, where possible (for example, where residents in close proximity could be expected to be at work);<br>• undertaking risk assessment of potential noise impacts on surrounding residential receivers if plant and equipment quantities are proposed to vary significantly from those assumed in Table 6.1 of Appendix J of the EIS; and<br>• optimising the number of deliveries to site by amalgamating loads where possible.<br>A 600 m buffer (ie work exclusion area) will be maintained around N1 during daytime out-of-hours construction works (ie 1.00 pm to 6.00 pm Saturday afternoons). |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| Transport | A TMP and Driver Code of Conduct will be prepared prior to commencement of on-site construction works and in consultation with Uralla Shire Council and TfNSW. The TMP will include the following requirements:<br>• a dilapidation survey to be conducted to assess condition of the proposed vehicle routes;<br>• concept designs for recommended intersection improvement works for the following intersections, including assessment of sight distances, swept path analysis and access treatment arrangements:<br>• New England Highway/Barleyfields Road (primarily for vehicles turning right onto Barleyfields Road);<br>• Barleyfields Road/Big Ridge Road;<br>• details of traffic management treatments and traffic control plans (TCPs) as required, which will include consideration of regulatory signs and devices that require endorsement of the Local Traffic Committee and Council approval;<br>• consideration of measures to limit the impact on school bus routes and safety initiatives for transport through residential areas and/or school zones, which will include avoidance of peak hour and school bus times for the project's construction material deliveries and other heavy vehicle movements, whenever possible;<br>• a map of the primary access routes highlighting critical locations;<br>• the framework for handling/approval of exceptions (for emergency or other unforeseen circumstances) to the exclusion of heavy vehicles utilising the Barleyfields Road (south) intersection via Wood Street to access Big Ridge Road during construction of the array areas;<br>• safety initiatives for transport through residential areas and/or school zones;<br>• consideration for coordination of construction traffic with seasonal agricultural haulage;<br>• an induction process for vehicle operators and regular toolbox meetings;<br>• a complaint resolution and disciplinary procedure; and<br>• community consultation measures for the peak construction period.<br>Potential seasonal/campaign-based agricultural transport activities will be identified during further consultation with project landholders and nearby landholders and any required mitigation measures (eg temporary alternate construction vehicle access routes and/or revisions to construction scheduling) will be identified in consultation with landholders and included in the TMP.<br>Potential stock crossing locations will be identified through further consultation with project-related and nearby landholders and any required mitigation measures (eg direct line of communications between landholder and site construction manager and/or temporary traffic control at stock movement locations) will be identified in consultation with landholders and included in the TMP.<br>ACEN Australia is also mindful of the safety of drivers at level crossings in the Uralla Shire LGA and, subsequently, additional TfNSW tips and safety guidelines will be included in the Driver Code of Conduct as part of the TMP.<br>Temporary traffic control will be considered at the level crossing at Barleyfields Road (north) during peak construction and reference to this level crossing will be included in driver inductions and the Driver Code of Conduct.<br>Access to the rail corridor is not anticipated as required and would only be undertaken in accordance with the written permission of TfNSW.<br>In addition to the identified primary site access points, emergency access points may be required and will be identified as part the project's ERP in consultation with JHR and TfNSW.<br>Temporary traffic control arrangements may be required at the proposed primary access intersections during the peak stages of construction traffic activity and/or on days when deliveries by over-dimensional vehicles are required for the delivery of larger construction items such as transformers. These will be delivered under permit and in consultation with TfNSW and Uralla Shire Council. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| | The following road and intersection improvement works, which will be confirmed in consultation with TfNSW and Uralla Shire Council, are proposed to maintain the safety of the road network and to accommodate the swept paths of the largest trucks that are proposed to require access to the array areas:<br>• New England Highway/Barleyfields Road (north) requires left and right turn traffic lanes (CHR/CHL), particularly during periods of peak construction activity; and<br>• Consider implementation of temporary traffic control at the Barleyfields Road level crossing, particularly during the peak construction period.<br>ACEN Australia will be required to lodge a Section 138 Certificate (Work on Public Lands) for approval before any future road work for intersection improvements can be carried out.<br>Consideration will be given to temporary travel speed reduction and regular watering of the unsealed section of Big Ridge Road. ACEN Australia may consider speed limits, dust suppression with water spraying or localised treatment of the road with dust suppression polymers adjacent to residential properties along this road.<br>During construction, a road maintenance program will be implemented for the affected local roads near the development footprint for the array areas. The program will be based around bi-monthly route inspections of all the affected roads and may include items such as:<br>• regrading of the road surface to repair potholes and road corrugations at regular intervals and in response to identified serviceability and safety concerns; and<br>• a commitment by ACEN Australia to restore the road surfaces to their pre-construction condition at the completion of construction.<br>The road maintenance program will be prepared in consultation with Uralla Shire Council and its effectiveness will be reviewed during the construction period.<br>The CEMP and OEMP to be prepared for the project will be prepared in consultation with TfNSW (or its agent) to ensure that any potential impacts or risks on the rail corridor during construction, operation or decommissioning are identified and appropriate mitigation measures put in place to adequately manage the identified risks.<br>Boundary fences within the northern array area adjacent to the rail corridor will be installed and remain installed during construction and operation of the facility in accordance with John Holland Rails (JHR's) engineering standards, and suitable protection arrangements will be put in place for construction of the boundary fence adjacent to the rail corridor.<br>Any requirement for work access to the rail corridor would only be undertaken following assessment and endorsement by JHR for the proposed access and would be undertaken in accordance with the relevant JHR rules and procedures.<br>Prior to commencement of on-site construction work, ACEN Australia will consult with TfNSW to confirm requirements for further assessment of the Barleyfields Road active level crossing in consideration of the Australian Level Crossing Assessment Model.<br>Monthly dilapidation surveys of Barleyfields Road (north) and Big Ridge Road will also be completed to monitor for any road degradation during construction (as a result of the proposed heavy vehicle increase) and road repair works will be completed as required. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| Water | Watercourse crossing plans consistent with NOW (2012b) and DPI (2003) detailing the design of proposed crossings of any higher order stream (ie 3rd order and above) will be prepared in consultation with DPE Water prior to commencement of construction.<br>Placement of PV modules and ancillary infrastructure (ie footings and pilings) within 1st and 2nd order streams will be minimised to the extent practicable.<br>Watercourse crossings of 1st and 2nd order streams for internal access tracks and electrical cabling will be minimised to the extent practicable.<br>Implementation of ESC measures in accordance with Landcom (2004). Proposed measures will be considered further and formalised as part of detailed design and documented in the CEMP.<br>Progressive revegetation or stabilisation of disturbed areas to minimise exposed soils to the extent possible.<br>Implementation of procedures for hazardous material storage and spill management to be prepared and documented within the CEMP.<br>Construction site planning to consider flood risk and locate temporary site works, compounds, storage areas and plant/equipment away from flood prone areas where practicable.<br>Detailed design and placement of key project infrastructure (eg substations and BESSs) will consider location-specific flood levels when setting floor levels and flood protection levels and will avoid flood prone areas where practicable.<br>Water contained within existing farm dams to be removed will be used for non-potable construction purposes, in accordance with harvestable rights provisions, to minimise use of imported water where practicable.<br>Appropriate potable water supply will be identified in the CEMP in consultation with NSW Health and will satisfy the requirements of the NSW *Public Health Act 2010*.<br>Monitoring of watercourse and vegetated riparian zone (VRZ) condition for all retained watercourses (that meet the definition of 'waterfront' land in accordance with the NSW *Water Management Act 2000*) where these run through or immediately adjacent to the development footprint will be undertaken, with maintenance undertaken as required to minimise scouring and erosion and ensure waterway health and stability.<br>Monitoring and maintenance of ground cover vegetation and other stabilised surfaces throughout operation to limit erosion and transport of sediment to watercourses.<br>Implementation of procedures for hazardous material storage and spill management to be prepared and documented within the OEMP. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| Hazards and risks | An emergency response plan (ERP) will be prepared for the project and will incorporate all relevant safety procedures and normative management recommendations detailed in the relevant acts, regulations and Australian Standards. The ERP will be prepared to address Fire & Rescue NSW recommendations and as a minimum (but not necessarily limited to) will:<br>• include the requirements for pre-bushfire season and continual fire awareness of staff and contractors;<br>• include the requirements for immediate notification to the local RFS and FRNSW of accidental ignition of surrounding grassland;<br>• include the mechanisms for notification of neighbouring landholders and the community more generally of accidental ignition of surrounding grassland leading to bushfire that may impact upon them;<br>• detail the appropriate risk control measures that would need to be implemented in order to safely mitigate potential risks to the health and safety of fire fighters and other first responders;<br>• detail measures including the PPE required to be worn, the minimum level of respiratory protection required, minimum evacuation zone distances and a safe method of shutting down and isolating the PV system (either in its entirety or partially, as determined by risk assessment);<br>• identify the circumstances under which different evacuation types are to be implemented, in response to a bushfire or fire emergency;<br>• include a mechanism for the early relocation of staff in the event of a bushfire in the locality;<br>• contain detailed plans of all Emergency Assembly Areas including 'on-site' and 'off-site' arrangements;<br>• include requirements for appropriate on-site refuge area signage and communications;<br>• contain details of infrastructure layout within the two array areas that show all relevant information (ie access points, fences, locked gates, water supply, areas of electrical hazard);<br>• include transportation arrangements (eg number of vehicles required), designated assembly points and time required to have transportation available;<br>• identify the specific structure and role of emergency control on-site (eg fire wardens);<br>• include the requirements for training in preparation for response to an emergency;<br>• include the requirements for clarifying a safe egress route and an understanding of the extent/spread of local fires before allowing the evacuating persons to leave the site;<br>• include the requirements for egress and communication in the scenario that persons are leaving the project as emergency services are attending;<br>• include details on appropriate egress routes from the different array areas;<br>• consider emergency access/egress arrangements in the scenario that a fully loaded fire fighting vehicle cannot cross the proposed creek crossings proposed for access into parts of the two array areas;<br>• include mechanisms for communication with RFS, FRNSW and neighbouring communities on suitable egress routes and an understanding of the impacts that the egress of high numbers of project staff may have on the local road network and the local community's ability to safely egress from the locality; and<br>• two copies of the ERP are to be stored in a prominent 'Emergency Information Cabinet' which is in a position directly adjacent to each of the main entry points for the two array areas.<br>The hazards and risks assessment prepared by Sherpa Consulting for the EIS also provides recommendations that should be considered during preparation of the ERP. Where applicable, the ERP should be developed to be consistent with the requirements and approach of:<br>• *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan* (RFS 2014); and<br>• AS 3745-2010 *Planning for emergencies in facilities*.<br>The additional substation/BESS infrastructure will be within a secure area with fencing and cameras and warning signs will be provided. On-site security protocols will also be developed. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| | As part of detailed design and construction of the additional BESS infrastructure, ACEN Australia will ensure that:<br>• BESS units are certified to UL 9540A and installed in accordance with the manufacturer's instructions for best practice to mitigate fire propagation;<br>• manufacturers provide a deflagration hazard study in accordance with UL 9540 or include explosion control measures such as passive safe ventilation of flammable gases under pressure;<br>• a minimum one-hour fire rating is achieved for a containerised BESS;<br>• investigation reports on the Victorian Big Battery Fire are reviewed and relevant findings are implemented; and<br>• for indoor BESS infrastructure installed within a purpose-built structure, the following will be considered:<br>– compartmentalisation;<br>– occupancy and means of egress;<br>– fire barriers;<br>– exhaust and ventilation system;<br>– sprinkler system and required water volume;<br>– containment system for the expected fire protection system discharge; and<br>– requirements of the National Construction Code and relevant Australian standards and codes (eg fire rating of materials and fire detection systems). |
| Bushfire | A minimum 10 m defendable space should be provided around the perimeter of each solar array area and around substations, BESSs and O&M infrastructure that permits unobstructed fire vehicle access and is maintained to the standard of an IPA. This will be in the form of mown or grazed grass or similar suitable ground cover. As a guide, grass within an IPA should be kept to no more than 100 mm in height, with leaves and vegetation debris removed (RFS 2018).<br>The fuel load within the development footprint will be monitored and mechanically slashed, sprayed or grazed in liaison with project landholders to reduce the risk of grass fires starting within the development footprint and ensure that fires originating from outside the development footprint do not intensify as a consequence of entering the development footprint.<br>The primary site access points will be from Big Ridge Road. Emergency access points may also be required and will be identified as part of the project's ERP in consultation with relevant agencies, including Fire & Rescue NSW and TfNSW/JHR. The primary site access points, emergency access points and project roads will comprise of a combination of sealed and unsealed roads, detailed design of which will consider:<br>• minimum carriageway width of 4 m;<br>• the capacity for fire fighting vehicles to pass by;<br>• avoiding grades greater than 15 degrees (°) if sealed and 10° if unsealed;<br>• minimum vertical clearance of 4 m to any overhanging obstructions, including tree branches;<br>• will not have a cross fall of more than 10°;<br>• the capacity to carry a fully loaded fire fighting vehicle (which may be up to 28 tonne);<br>• appropriate drainage and erosion controls; and<br>• all weather access is provided.<br>A Fire Management Plan (FMP) will be developed in consultation with the New England Fire Control Centre.<br>The FMP for the project will detail the specifications and maintenance of dedicated fire water sources to assist in fire suppression, as well as the appropriate vegetation management procedures (in relation to the ETL corridors) to prevent fires igniting during the construction, operation and decommissioning of the project.<br>The FMP for the project will include the provisions for diesel generators and associated fuel storage tanks to be designed, housed and maintained so as not serve as an unacceptable risk to surrounding grassland and the provisions for specific measures and procedures to prevent ignition of grassland from hot works or from vehicles driving over long grass.<br>Each building will have fully compliant fire safety systems. In addition, they will be constructed and routinely serviced to comply with the specific requirements, as relevant to each building. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| | Specific management actions will be undertaken to ensure suitable bushfire preparedness is undertaken as part of the project and ahead of the bushfire season, as well as specific procedures to limit the risk of ignition of surrounding grassland resulting from the project, including:<br>• maintenance of buildings, roads, fuel levels and water supply;<br>• appropriate work procedures, so as to limit the potential of ignition of surrounding grassland;<br>• monitoring and review of the FMP to maintain its effectiveness; and<br>• maintenance of fire awareness through inductions, briefings, pre bushfire season drills, formal meetings, standard operating procedures and ongoing monitoring. |
| Social | Shuttle bus services, operated by or on behalf of ACEN Australia, between the array areas and Uralla, and between Uralla and other centres for worker accommodation such as Armidale and Tamworth may be provided for the construction workforce subject to demand.<br>ACEN Australia proposes to procure goods and services, as far as possible, from local businesses.<br>A publicly accessible feedback system will be created, utilising a website facility and telephone hotline, for any feedback, positive or negative, to be registered. This will be supported by a policy and mechanism by which any legitimate grievance can be investigated and resolved.<br>A construction workforce management plan (CWMP), or similar, will be prepared, which will likely include (but not be limited to):<br>• local workforce numbers and locations;<br>• transient workforce accommodation locations;<br>• consultation mechanisms with Uralla Shire Council, Armidale Regional Council and Tamworth Regional Council to avert pressure on local resources and ensure a reasonable approach to planning transient worker housing;<br>• consultation frameworks with local providers to ensure fairness, open communication and forward planning, and grievance mechanisms;<br>• plans for medical and other needs to ensure appropriate spread of workforce needs across all local resources and to avoid heavy pressure on a small number of local GPs;<br>• a Code of Conduct for the project's workers (particularly to avoid anti-social behaviour at peak construction times); and<br>• how the CWMP will be managed and audited. |
| Economic | Employment of regional residents preferentially where they have the required skills and experience and are able to demonstrate a cultural fit with the organisation.<br>Participating, as appropriate, in business group meetings, events or programs in the regional community.<br>Locally source non-labour inputs to production where local producers can be cost and quality competitive, to support local industries. |
| Air quality | Water trucks will be used during construction for dust suppression along internal, unsealed access roads and disturbed areas.<br>Vehicle movements will be minimised where possible.<br>All vehicles, plant and equipment will be cleaned and washed regularly.<br>All vehicles, plant and equipment will be regularly inspected and maintained to ensure that they are operating efficiently.<br>Regular maintenance of unsealed access roads will be undertaken to minimise wheel generated dust.<br>Dust suppression requirements during construction will take into consideration weather and the likelihood of extended dry periods which could exacerbate impacts. |

## Table C.1 Summary of management and mitigation measures

| Key issue | Proposed management and mitigation measures |
|---|---|
| Waste management | All waste will be managed in accordance with the NSW *Protection of the Environment Operations Act 1997*, the NSW *Waste Avoidance and Resource Recovery Act 2001* and the following hierarchy, which is listed in order of preference:<br>• reduce waste production;<br>• recover resources; and<br>• dispose of waste appropriately.<br>All wastes produced by the project will be classified, stored and handled in accordance with the *Waste Classification Guidelines – Part 1: Classifying Waste*.<br>A detailed WMP will be prepared prior to commencement of construction in consultation with Uralla Shire Council as required. This plan will identify waste management measures to ensure that waste is effectively managed in accordance with relevant legislative requirements and guidelines, and will include consideration of the following:<br>• measures to reduce the types and volumes of waste generated during construction;<br>• measures to maximise reuse and recycling and reduce the volume of waste generated by the project and subsequently disposed of at licensed waste management facilities;<br>• a breakdown of anticipated waste streams and volumes;<br>• evidence of consultation with Uralla Shire Council, neighbouring councils and licensed waste management facilities to confirm the capacity of nearby facilities, their availability to accept/manage the project's waste, along with any requirements (including waste separation requirements or comingling limitations for example);<br>• on-site waste management measures in line with relevant guidelines; and<br>• commitments around disposal of project assets at the completion of operations. |
| Cumulative impacts | Preparation of a CWMP.<br>Development and implementation of a community engagement framework as part of the project's stakeholder engagement strategy. |
| Environmental management | ACEN Australia will prepare and implement an environmental management strategy (EMS) to govern the avoidance, minimisation and management of impacts during the construction and ongoing operation of the project and will be set out to ensure the responsibilities and accountabilities for environmental performance are clear. The strategy will:<br>• incorporate project environmental management plans for both construction (CEMP) and operational (OEMP) phases, all other required plans, protocols, management and mitigation measures proposed in environmental assessment and approval documentation. This table provides a consolidated summary of the specific management measures that will be implemented for each of the key environmental aspects considered as part of the EIS, AR and subsequent modification applications as part of the EMP and its associated sub-plans;<br>• identify all relevant statutory approvals;<br>• establish roles, responsibility, authority and accountability of all key personnel involved in the environmental management of the project;<br>• establish procedures for consulting with the local community and relevant agencies about the operation and environmental performance of the project; and<br>• establish procedures for handling of complaints, disputes, non-compliances and emergency response.<br>The EMS will be prepared in consultation with Uralla Shire Council as required, and to the satisfaction of the Secretary of DPE. |

# Appendix D

## Biodiversity development assessment report

EMM
creating opportunities

# New England Solar and Battery Project

## Biodiversity Development Assessment Report

Prepared for ACEN Australia Pty Ltd

August 2022

# New England Solar and Battery Project

## Biodiversity Development Assessment Report

ACEN Australia Pty Ltd

J210321 RP1

August 2022

| Version | Date | Prepared by | Approved by | Comments |
|---|---|---|---|---|
| V1 Draft | 1 March 2022 | Eugene Dodd | Cecilia Phu | |
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Approved by

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19 August 2022

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# 1 Introduction

## 1.1 Overview

ACEN Australia Pty Ltd (ACEN Australia) (formerly named UPC Renewables Australia Pty Ltd) has approval to develop the New England Solar and Battery Project. This is a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale, in the Uralla Shire local government area (LGA) (the project) (Figure 1.1). The project was approved, subject to conditions, by the NSW Independent Planning Commission (IPC) on 9 March 2020 (SSD-9255).

The development footprint is the area within the project boundary on which infrastructure is proposed (Figure 1.2). As part of detailed design works, ACEN Australia has investigated the feasibility of construction on additional land adjacent to the development footprint for the northern and central array areas that may be suitable for solar development. It is noted that no new landholdings are being included in the development footprint as part of the proposed modification (ie the new land areas are owned by existing project landholders and are adjacent to the approved development footprint).

ACEN Australia is seeking to modify SSD-9255, pursuant to Section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to:

- amend the project boundary and development footprint;
- increase the project's energy storage capacity;
- increase the number of over-dimensional vehicle movements during construction, upgrading and decommissioning;
- increase the number of daily heavy vehicle movements during construction; and
- increase the project's construction hours.

EMM Consulting Pty Limited (EMM) has been engaged by ACEN Australia to prepare a modification report for the proposed modification. This biodiversity development assessment report (BDAR) provides an assessment of the potential biodiversity impacts associated with the proposed modification, including an assessment by an accredited assessor (BAAS17009) in accordance with the Biodiversity Assessment Method (BAM) (DPIE 2020a).

## 1.2 Background

The project is currently being constructed on land within the Uralla Shire LGA. The land in the development footprint is zoned RU1 Primary Production under the Uralla Local Environmental Plan 2012 (Uralla LEP) and is predominantly used for agricultural purposes. The landform pattern within and surrounding the development footprint can be described as a mix of low rolling hills and flatter areas that are frequently dissected by drainage networks and their adjacent flood plains, terraces and foot slopes.

An area of 426 hectares (ha) was identified by ACEN Australia as potentially suitable for inclusion in the development footprint. During the preparation of the modification application, this area has been refined based on environmental constraints identification (namely areas of biodiversity value and items of Aboriginal cultural heritage significance), stakeholder engagement and consideration of the project infrastructure layout with the objective of maintaining an efficient project that avoids and minimises environmental impacts.

## 1.3 Proposed modification

ACEN Australia proposes to modify SSD-9255 to:

- amend the project boundary and development footprint;
- increase the project's storage capacity from up to 200 MW (AC) by approximately 1,200 MW (AC) to approximately 1,400 MW (AC);
- allow for additional land that could be utilised for adding direct current (DC) solar PV capacity, without changing the solar component of the project's total generating capacity of 720 MW(AC);
- increase the number of over-dimensional vehicle movements during construction, upgrading and decommissioning;
- increase the number of daily heavy vehicle movements during construction; and
- increase the project's construction hours.

The modification area is shown on Figure 1.2 and encompasses an additional 127 ha across four parcels of land. All of this land is adjacent to existing areas within the approved development footprint. The modification area is currently primarily used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production.

The land within the modification area will form part of the project boundary and development footprint and will predominantly be used to house photovoltaic (PV) modules, power control units and the medium voltage cable reticulation network. Operations and maintenance infrastructure and internal roads may also be installed within the modification area.

The additional substation/BESS footprint (Figure 1.2) is within the approved development footprint and therefore has not been considered further as part of this assessment.

The other components of the proposed modification are not anticipated to significantly change previously assessed and approved impacts to biodiversity under SSD-9255.

The proposed modification will not change the approved life of project operations.

## 1.4 Assessment guidelines and requirements

This BDAR has been prepared to accompany the modification report with the specific objectives to:

- describe biodiversity values within the modification area;
- assess the likelihood that threatened species and communities (threatened biodiversity) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) could occur in the modification area;
- document the strategies implemented to avoid and/or minimise impacts on biodiversity;
- assess residual biodiversity impacts, after avoidance and minimisation strategies have been implemented; and
- provide environmental safeguards to mitigate biodiversity impacts during construction and operation.

## 1.5 Engagement

### 1.5.1 NSW Department of Planning and Environment

ACEN Australia wrote to the NSW Department of Planning and Environment (DPE) on 4 August 2021 to introduce the proposed modification and seek advice regarding the assessment pathway and scope of the modification report and technical assessments, including the preparation of a BDAR.

DPE responded on 10 September 2021 to confirm the assessment scope and nominated application under Section 4.55(2) of the EP&A Act as the appropriate approval pathway. A copy of this correspondence is summarised in Table 5.1 of the modification report (EMM 2022).

### 1.5.2 Biodiversity, Conservation and Science Directorate

As part of the preparation of this BDAR a letter was sent to DPE's Biodiversity, Conservation and Science Directorate (BCS) on 30 September 2021, which introduced the proposed modification and requested input on field survey methodology and assessment approaches for targeted flora surveys of Bluegrass (*Dichanthium setosum*) and Hawkweed (*Picris evae*).

BCS responded on 13 October 2021 and requested that the targeted flora survey methodology for the BDAR align with the current survey guidelines under the BAM (DPIE 2020b).

## 1.6 Terminology

The following terms are used to describe within this assessment:

- **Project boundary**: the full extent of the involved landholder lots.
- **Development footprint**: the area within the project boundary on which infrastructure will be located.
- **Modification area**: the additional land that forms the subject of this assessment and that is proposed for inclusion in the project boundary and development footprint. It comprises four areas: Area 1, 2, 3 and 4.
- **Buffer area**: 1,500 m buffer of the modification area.
- **Proposed project boundary**: the full extent of the involved landholder lots (including the modification area).
- **Study area**: this refers to the broader investigation area that was the subject of field surveys. Through an iterative design process, the study area was refined to the modification area to avoid Aboriginal cultural heritage sites and biodiversity constraints. Details of avoidance and project refinements are provided in Section 6.3.
- **Disturbance area:** A small corridor within Area 3 of the modification area has previously been assessed as part of the BDAR for the main project (EMM 2018). Therefore, this area has been excluded from offset calculations. The term 'disturbance area' has been used to describe the area over which direct impacts will occur and offsets could be triggered.

## 1.7 Publications, databases and other relevant reports

In order to provide context for the modification area, information about flora and fauna species, populations, communities and habitats from the locality (generally within 10 km) was obtained from the following databases:

- BioNet Atlas of NSW Wildlife for previous threatened species records;
- Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES) likely to occur within the modification area; and
- NSW Plant Community Types (PCTs), as held within the BioNet Vegetation Classification database.

A number of biodiversity assessments have been completed for the project to date. These documents have been reviewed and referred to throughout this report, including:

- *New England Solar Farm Biodiversity Development Assessment Report* (EMM 2018) – this is referred to throughout this report as the 'main project BDAR'.
- *New England Solar Farm Amendment Report* (EMM 2019a) – this report provided commentary on the reduction in biodiversity impacts as a result of project refinements.
- *New England Solar Farm Biodiversity Development Assessment Report Addendum* (EMM 2019b) – this report assessed the biodiversity impacts associated with road widenings work necessary for project access.

## 1.8 Spatial data

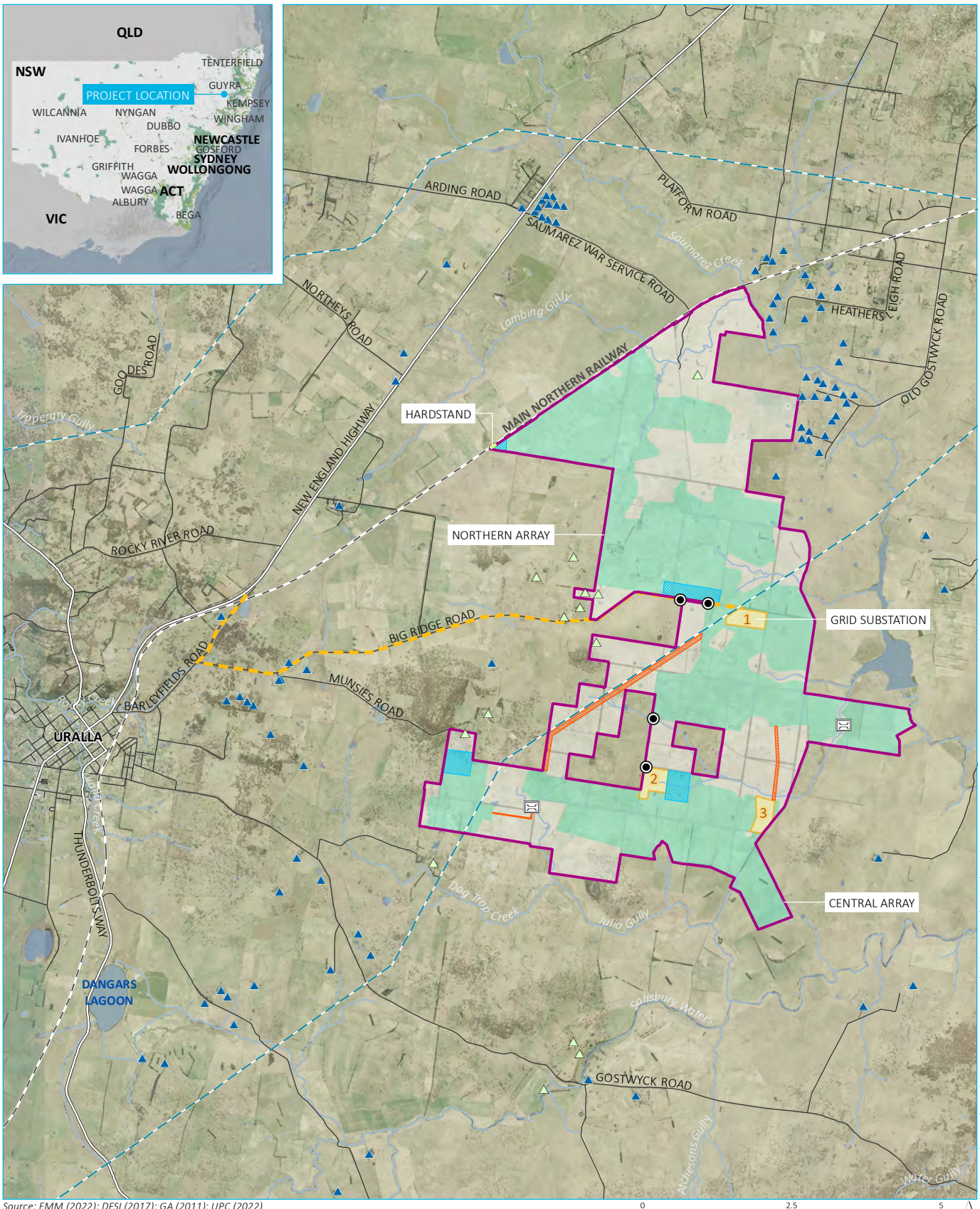
Spatial data for the modification area and study area were provided by ACEN Australia. Base map data was obtained from NSW DFSI databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from the NSW Department of Industry (2018) Hydro line spatial data.

The following spatial datasets were utilised during the development of this report:

- *Vegetation Map for the Northern Rivers CMA VIS_ID 524* (DPIE 2010);
- *Soil landscapes from Espade* (DPIE 2022);
- *Mitchell Landscapes Version V3.1* (OEH 2016);
- *Interim Biogeographic Regionalisation of Australia* (IBRA) Version 7 (DSEWPC 2013);
- *Directory of Important Wetlands* (DECC 2010); and
- SEPP 14 Coastal Wetlands (DPI 2006).

Mapping undertaken during the site assessment was conducted using a hand-held GPS unit, mobile tablet computer and aerial photo interpretation. Mapping has been produced using a Geographic Information System (GIS; ArcGIS 10.5).

Spatial data relevant to this BDAR will be provided to DPE following lodgement of the BDAR.




*Source: EMM (2022); DFSI (2017); GA (2011); UPC (2022)*

0 2.5 5 km

GDA 1994 MGA Zone 56

N

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KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

Sensitive receptors

- Project related
- Non-project related

- Project boundary *

Development footprint

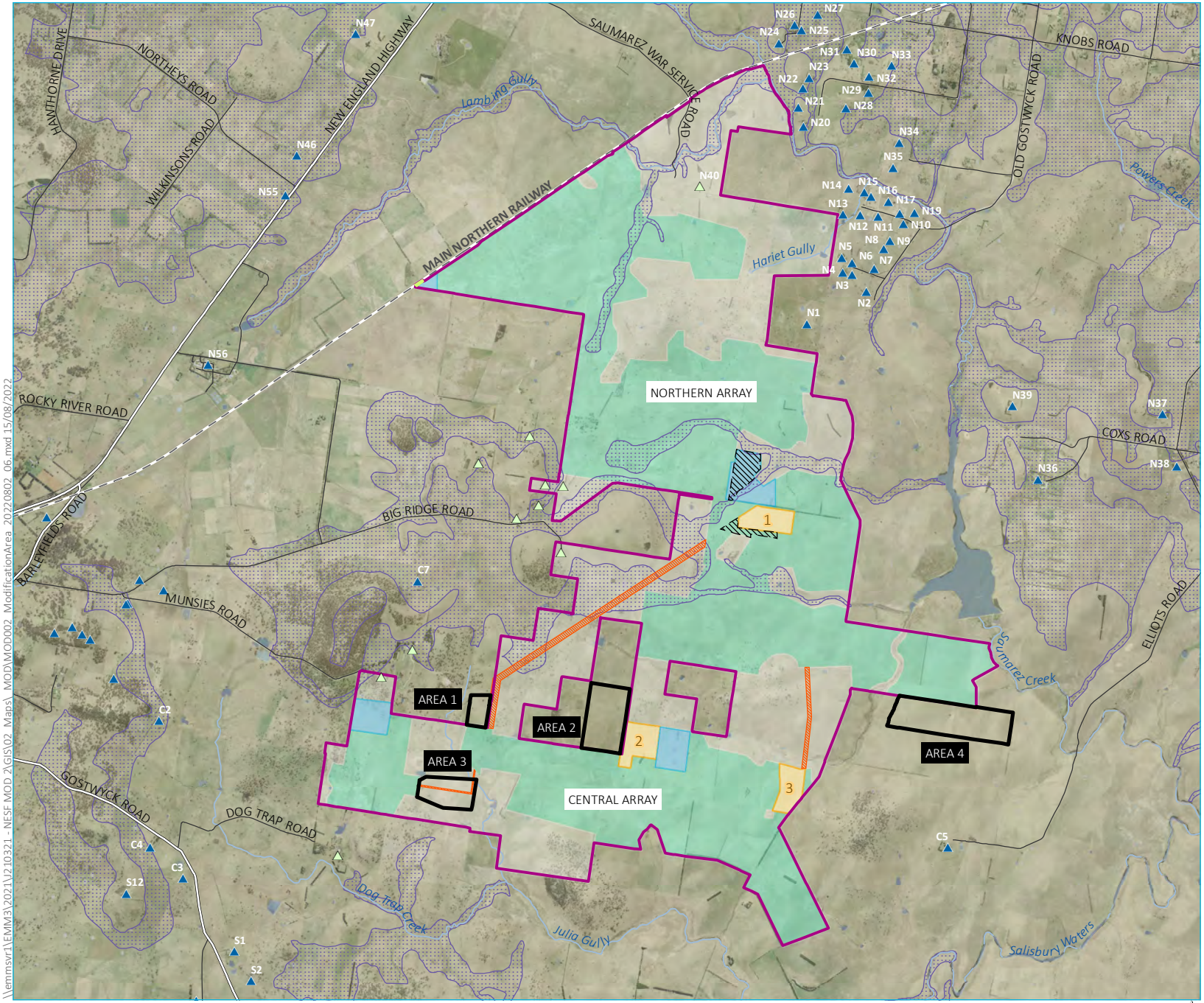
- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint (location number) **
- Hardstand in rail corridor
- Primary vehicle access route
- Potential creek crossing
- Proposed primary site access point

* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.
** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

## Regional context

New England Solar and Battery Project
Biodiversity Development Assessment Report
Figure 1.1

EMM creating opportunities




KEY

- Project boundary *
- Modification area
- Additional substation/BESS footprint

Development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint **
- Hardstand in rail corridor

Sensitive receptors

- Project related
- Non-project related

Existing environment

- Rail line
- Major road
- Minor road
- Named watercourse
- Waterbody
- Biophysical Strategic Agricultural Land

* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

Modification area

Source: EMM (2022); UPC (2022); DPIE (2021); DFSI (2017, 2022); GA (2011)

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New England Solar and Battery Project
Biodiversity Development Assessment Report
Figure 1.2

EMM creating opportunities

# 2 Legislative context

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

## 2.1 Commonwealth

### 2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as MNES under the EPBC Act. These are:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have a significant impact on a MNES is to be referred to DCCEEW for determination as to whether or not it is a controlled action. If deemed a controlled action the project is assessed under the EPBC Act and a decision made as to whether or not to grant approval.

The modification area does not contain any MNES under the EPBC act, therefore no significant impacts are anticipated. An assessment of the proposed modification against the EPBC Act is provided in Section 7.1.

## 2.2 State

### 2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by DPE.

The EP&A Act provides the overarching structure for planning in NSW; however, is supported by other statutory environmental planning instruments (EPIs) including State Environmental Planning Policies (SEPPs). EPIs relevant to the natural environment are outlined further below.

#### i State Environmental Planning Policy (State and Regional Development) 2011

The project is State Significant Development (SSD-9255) as defined in Clause 9 of Schedule 5 of State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP).

#### ii State Environmental Planning Policy (Koala Habitat Protection) 2020 and 2021

State Environmental Planning Policy (Koala Habitat Protection) 2020 (Koala SEPP 2020) and State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP 2021) together aim to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. In nine metropolitan Sydney LGAs and the Central Coast LGA, Koala SEPP 2021 applies to all land use zones. Outside of these areas Koala SEPP 2020 continues to apply to all land zoned RU1, RU2, and RU3.

The Koala SEPP 2020 applies to the modification area given that the land is zoned RU1 Primary Production under the Uralla LEP.

As the project is SSD, consideration of Koala SEPP 2020 is not required; however, consideration of the proposed modification's potential impacts on koala has been provided in Section 7.2.1.

### 2.2.2 Biodiversity Conservation Act 2016

The BC Act is the legislation responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations and ecological communities. The BC Act, together with the Biodiversity Conservation Regulation 2017 (BC Regulation), established the Biodiversity Offsets Scheme (BOS).

The BOS includes establishment of the BAM (DPIE 2020a) for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM is to assess the impact of actions on threatened species and threatened ecological communities, and their habitats and determine offset requirements. For SSD, use of the BAM is mandatory, unless a BDAR waiver is granted.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land in order to:

- identify the biodiversity values on land subject to the proposed development (in this case, the modification area);
- determine the impacts of a proposed development, following all measures to avoid, minimise and mitigate impacts; and
- quantify and describe the biodiversity credits required to offset the residual impacts of the proposed development on biodiversity values.

This BDAR has been undertaken in accordance with the requirements of the BAM.

### 2.2.3 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) contains provisions for the conservation of fish stocks, key fish habitat, biodiversity, threatened species, populations and ecological communities. It regulates the conservation of fish, vegetation and some aquatic macroinvertebrates and the development and sharing of the fishery resources of NSW for present and future generations. The FM Act lists threatened species, populations and ecological communities, key threatening processes (KTPs) and declared critical habitat. Assessment guidelines to determine whether a significant impact is expected are detailed in section 220ZZ and 220ZZA of the FM Act.

Another objective of the FM Act is to conserve key fish habitat (KFH). These are defined as aquatic habitats that are important to the sustainability of recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. KFH is defined in Section 3.2.1 and Section 3.2.2 of the *Policy and Guidelines for Fish Conservation and Management* (DPI 2013).

The impact of the on threatened aquatic species, populations, communities, habitats and KFH have been assessed in Section 5.1.

### 2.2.4 Biosecurity Act 2015

The primary objective of the NSW *Biosecurity Act 2015* is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The Biosecurity Act stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about;
- applies to all land within NSW and all waters within the limits of the State; and
- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

The provisions of the Biosecurity Act are discussed further in Section 7.3.

### 2.2.5 Water Management Act 2000

Division 6 of the NSW *Water Management Act 2000* (WM Act) requires consideration of controlled activities (ie activities within 40 m of riparian land) and aquifer interference activities. The NSW Aquifer Interference Policy (OEH 2012) requires an assessment of potential impacts on groundwater users, including groundwater dependent ecosystems. Impacts on riparian land are considered in Section 7.4 of this report.

# Stage 1 – Biodiversity assessment

# 3 Landscape features

## 3.1 Landscape features

The landscape features described in the following sections are shown on Figure 3.1 and Figure 3.2.

### 3.1.1 Bioregions and landscapes

The modification area is within the New England Tableland IBRA region and the Armidale Plateau subregion.

The buffer area occurs across three BioNet NSW Landscapes (formerly Mitchell Landscapes) – Figure 3.1, namely; As the majority of the buffer area is in the Moonbi – Walcha Granites BioNet NSW Landscape, this was the landscape used in this assessment (Figure 3.1).

**Table 3.1 NSW landscapes within buffer area and assessment area**

| NSW landscapes within buffer area | Area within development area |
|---|---|
| Uralla Basalts and Sands | 0 |
| Moonbi – Walcha Granites | 84.65 |
| Niangala Plateau and Slopes | 41.33 |

### 3.1.2 Rivers, streams, estuaries and wetlands

The modification area is part of the Macleay catchment. The source of the Macleay River is in the Northern Tablelands east of the modification area at the confluence of the Gara River, Salisbury Waters and Bakers Creek, and flows south-east through a coastal floodplain where it meets the Pacific Ocean. The landform pattern within and surrounding the modification area can be described as low rolling hills that are frequently dissected by drainage networks and their adjacent flood plains, terraces and foot slopes. The only perennial watercourse within proximity of the modification area is Saumarez Creek (fifth order stream), approximately 300 m north-east of Area 4 (Figure 3.1).

Refinements to the modification area have excluded higher order steams (ie fourth order watercourses and above). Most watercourses within the modification area are ephemeral and are highly modified and in many cases indiscernible owing to multiple dams and retention banks. The largest watercourse (Julia Gully on Figure 3.2) is a third order stream, in the north-east corner of Area 3. This watercourse is highly ephemeral with a poorly defined channel and occasional small shallow pools during wet periods. Vegetation is largely limited to terrestrial grasses and forbs, reflecting its location in pasture. A few more mesic species such as rushes (*Juncus* sp.), occur in the lowest-lying areas.

Riparian buffers have been applied to each of the watercourses within the modification area in accordance with the BAM (Figure 3.2) with all these buffer areas occurring in pasture.

No wetlands occur within the modification area, with the closest wetland, Dangars Lagoon (Figure 1.1), occurring approximately 7 km south-west of Area 3. Dangars Lagoon is listed on the *Directory of Important Wetlands in Australia* (DIWA).

The modification area and broader buffer area do not contain any nationally important wetlands, local wetlands or important wetlands listed on the NSW Wetlands layer (DECC 2010).

### 3.1.3 Connectivity

The modification area exists within an over-cleared landscape surrounded by agricultural land. Treed areas are limited to small patches and there are no landscape level connectivity features present within the modification area or adjacent to it. There is also a lack of significant geological features, such as ridgelines, valleys and large watercourses that may be used as flight corridors for migratory species across the modification area.

Dangars Lagoon provides wetland habitat for a number of wetland species, and birds may fly over the modification area in order to access this wetland habitat; however, these movements are anticipated to be infrequent and dispersed across the landscape, rather than concentrated within the modification area or broader project boundary.

The modification area is within the riparian buffer of:

- six 1st order streams;
- one 2nd order stream; and
- one 3rd order stream.

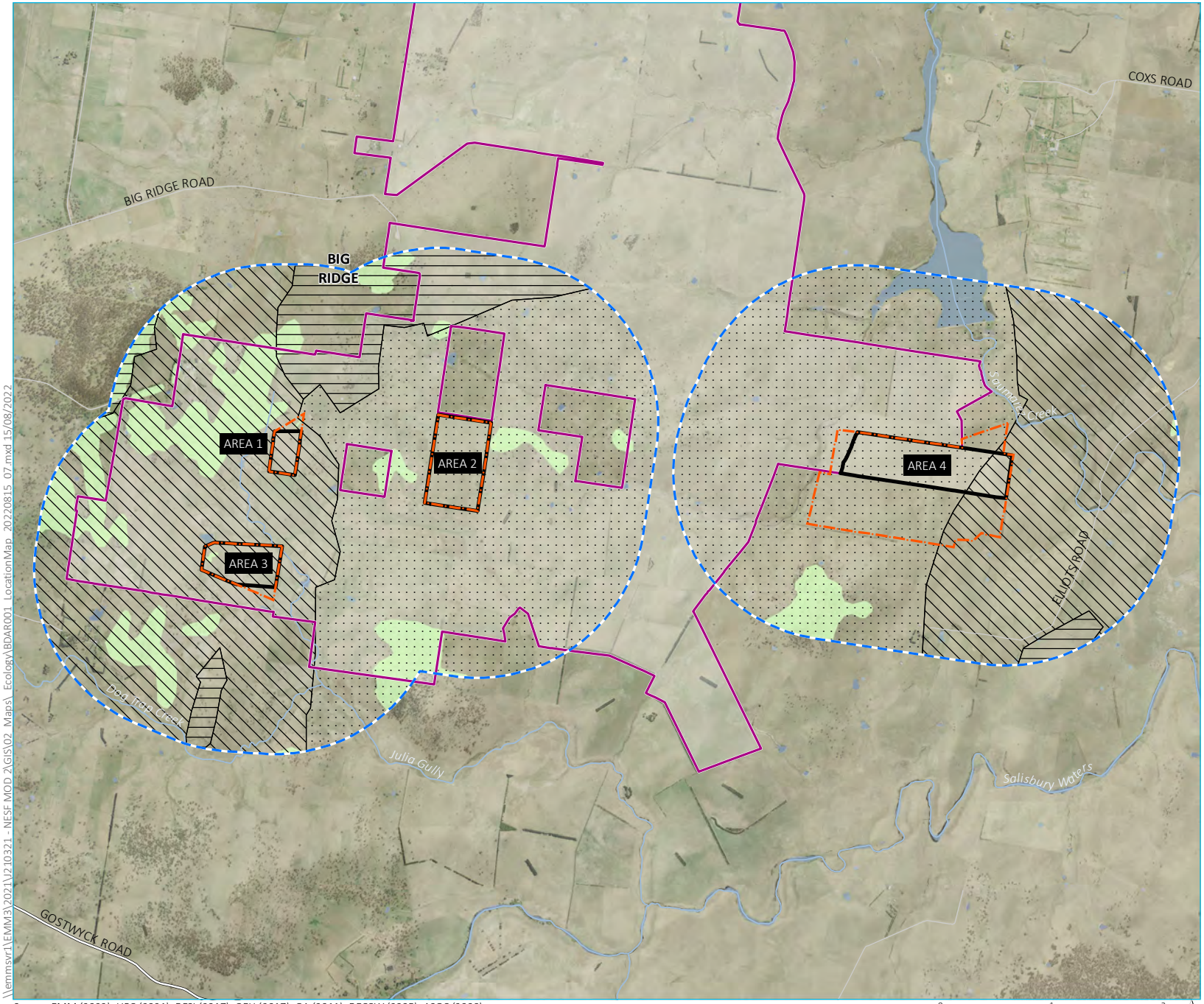
Whilst these will be impacted by the proposed modification, they do not offer any connectivity value given that they are cleared of woody and riparian vegetation, ephemeral in nature and often indiscernible at a landscape perspective.

### 3.1.4 Areas of geological significance and soil hazard features

The modification area and buffer area do not contain karst, caves, crevices, cliffs or other areas of geological significance. No acid sulfate soil risk, salinity hazards or asbestos potential mapped areas occur within the modification area and buffer area.

### 3.1.5 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value, as declared by the Minister, within the modification area or buffer area.





KEY

- Proposed project boundary
- Modification area
- Study area
- 1,500 m buffer (off modification area)
- Native vegetation cover

Existing environment

- Major road
- Minor road
- Named watercourse
- Waterbody

Mitchell landscape (v3.1)

- Moonbi - Walcha Granites
- Niangala Plateau and Slopes
- Uralla Basalts and Sands

Source: EMM (2022); UPC (2021); DFSI (2017); OEH (2017); GA (2011); DECCW (2005); ASGC (2006)

0 1 2 km

GDA 1994 MGA Zone 56

N

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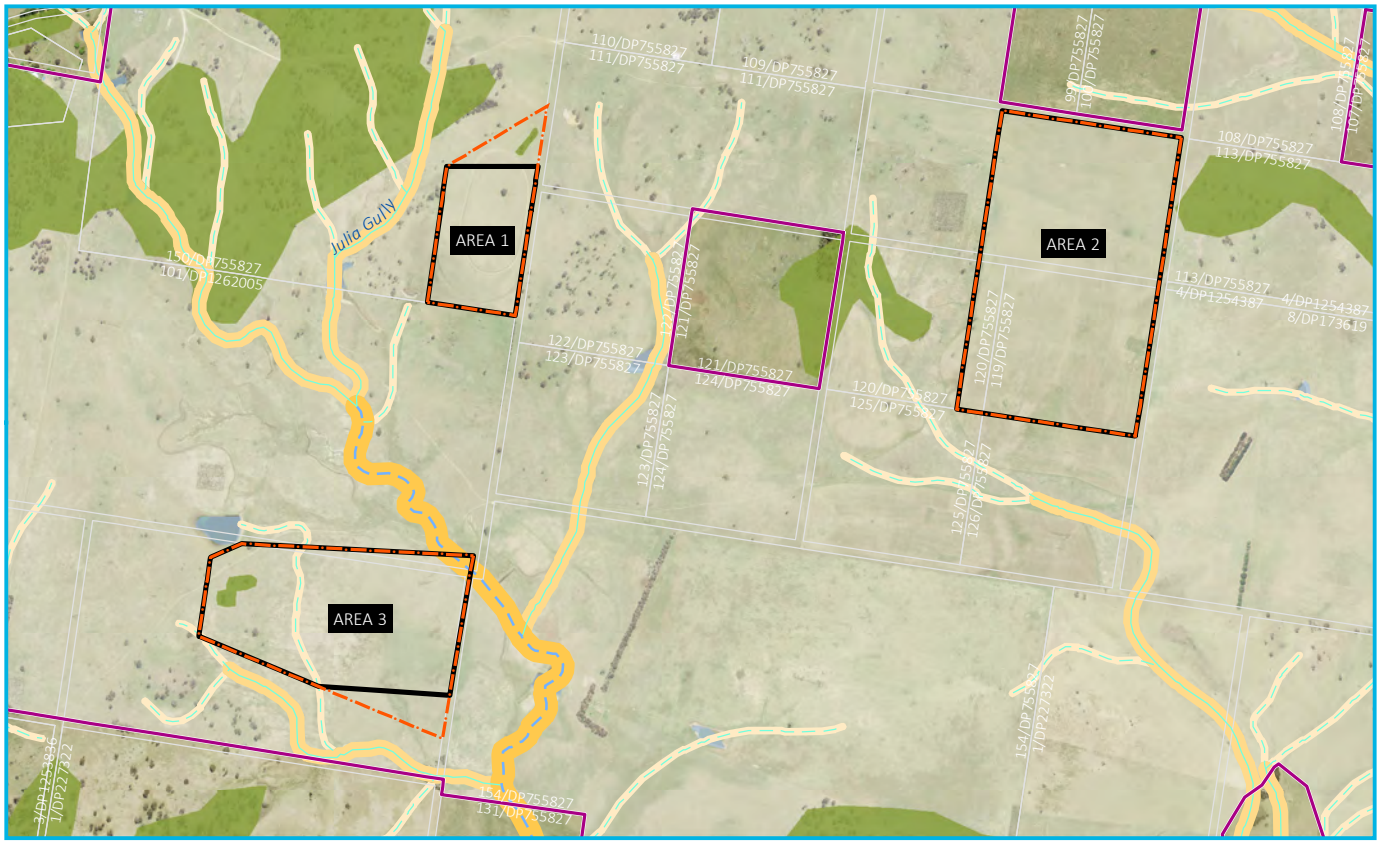
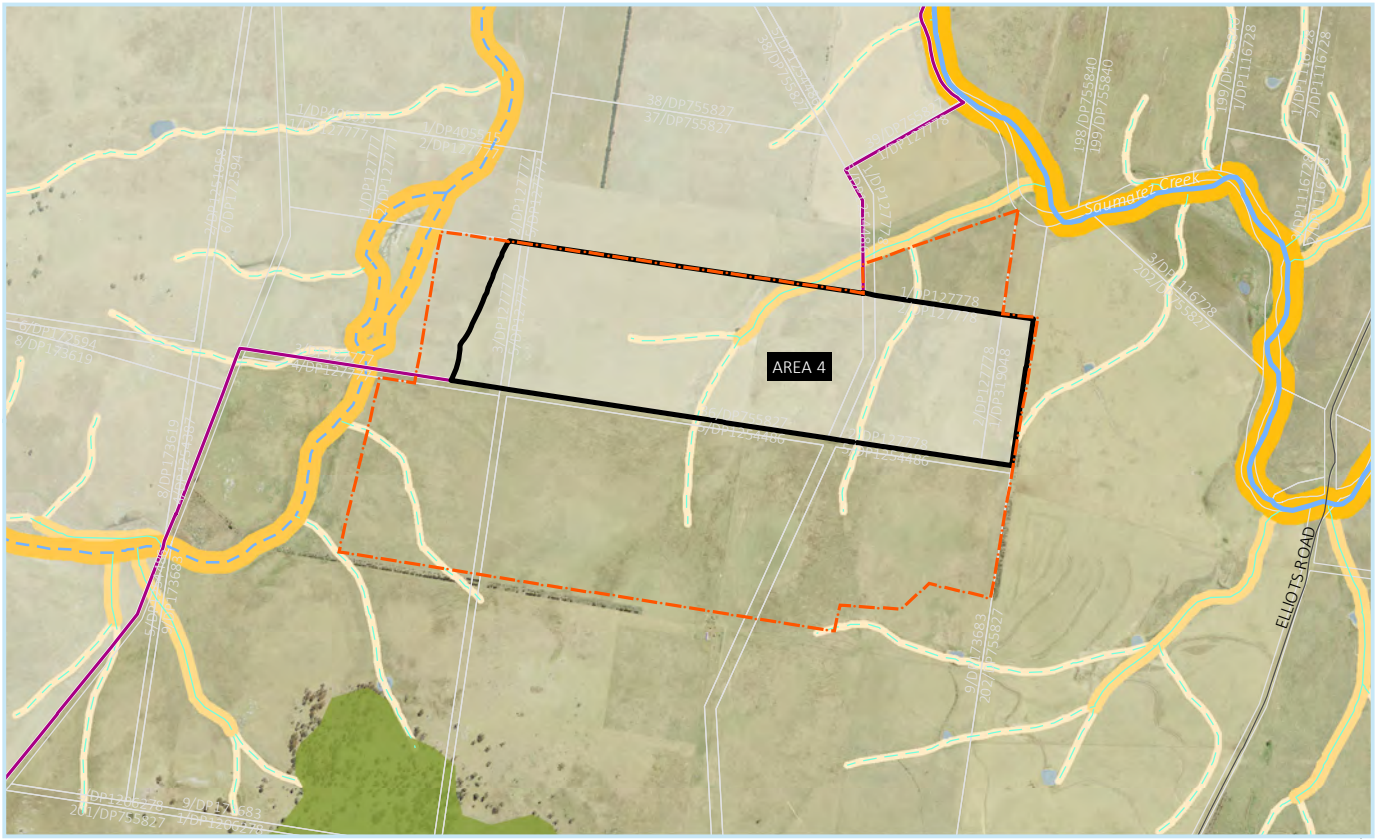
Location map

New England Solar and Battery Project
Biodiversity Development Assessment Report
Figure 3.1

EMM creating opportunities




*Source: EMM (2022); UPC (2021); DFSI (2017, 2022); OEH (2017); DPI (2015); GA (2011); DECCW (2005); ASGC (2006)*

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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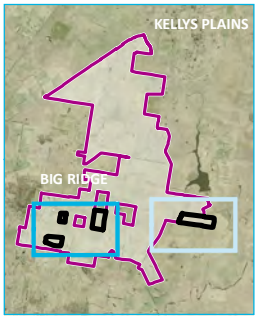



KEY

- Proposed project boundary
- Modification area
- Study area
- Minor road
- Cadastral boundary
- Native vegetation cover
- Waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 5th order

Riparian buffer

- 10 m
- 20 m
- 30 m
- 40 m

Site map

New England Solar and Battery Project
Biodiversity Development Assessment Report
Figure 3.2

EMM
creating opportunities

# 4 Native vegetation

## 4.1 Background review

The main project BDAR (EMM 2018) included vegetation mapping, with PCTs stratified into vegetation zones based on condition. The modification area is contiguous with the original project with the same involved landholders and land management practices. The vegetation zones, area, impacted and the vegetation integrity score (condition) are provided inTable 4.1.

**Table 4.1 Main project – vegetation zones**

| PCT/vegetation | Vegetation zone name | Area (ha) | Vegetation integrity score |
|---|---|---|---|
| 510-Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion* | 510_woodland | 36.0 | 11* |
| 510-Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion* | 510_pasture | 985.1 | 13.6* |
| 510-Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion | 510_planted | 9.57 | 49.3 |
| 1174-Silvertop Stringybark open forest of the New England Tableland Bioregion | 1174_woodland | 5.7 | 24 |

*Indicates where vegetation integrity score was below the threshold for offsetting under the BAM.
Source: EMM (2018).

A review of regional vegetation mapping was also undertaken to inform the site investigation. No PCT mapping was available. Two native vegetation communities were identified within the buffer area in the Northern River Catchment Management Authority Native Vegetation Mapping (VIS map 524):

- Broad-leaved Stringybark;
- New England Stringybark – Peppermint; and
- Yellow Box-Blakely's Red Gum, Yellow Box-Broad-leaved Stringybark.

The mapping is not comprehensive and does not assign to PCT level; with previous vegetation mapping and vegetation plots conducted by the project representing a more detailed and reliable data set.

## 4.2 Methods

### 4.2.1 Detailed vegetation mapping and habitat assessment

An assessment of the study area was undertaken from 11 to 13 May 2021. This preliminary assessment included detailed vegetation mapping, habitat assessments and five BAM plots. The study area was traversed on foot and by vehicle, with vegetation mapped and aligned with PCTs. PCTs were stratified into vegetation zones based on broad condition state using the definitions in Table 4.2. Vegetation was mapped in the field using GPS-enabled tablet computers using Collector for ArcGIS™.

**Table 4.2 Definitions used in delineation of vegetation zones**

| Condition class | Description |
|---|---|
| Poor | Tree stratum present, but understorey vegetation degraded due to weeds and pastoral use. |
| Pasture | These areas were cleared of canopy vegetation apart from occasional scattered trees. They are used for pasture and dominated by a low diversity of exotic and native grasses. |

### 4.2.2 Vegetation integrity assessment

Following the stratification of vegetation zones within the study area, native vegetation integrity was assessed using data obtained via a series of plots, as per the methodology outlined in Section 4.2.1, 4.3.3 and 4.3.4 of the BAM (DPIE 2020a). Plot data was collected from the study area from 11 to 13 May 2021 (five plots) and from 10 to 13 November 2021 (five plots). At each plot location the following was undertaken:

- one 20 x 20 m plot, for assessment of composition and structure; and
- one 20 x 50 m plot for assessment of function, including a series of five 1 x 1 m plots to assess average leaf litter cover.

The assessment of composition and structure, based on a 20 x 20 m plot, recorded species name, stratum, growth form, cover and abundance rating for each species present within the plot. Cover (foliage cover) was estimated for all species rooted in or overhanging the plot, and recorded using decimals (if less than 1%, rounded to whole number (1–5%) or estimated to the nearest 5% (5–100%)). Abundance was counted (up to 20) and estimated above 20, and recorded using the following intervals: 1, 2, 3, 4, 5, 10, 20, 50, 100, 500, 1,000, 1,500, 2,000 etc.

The assessment of function recorded the number of large trees, the presence of tree stem size class, tree regeneration, number of trees with hollows and length of fallen logs, as well as leaf litter cover within the 20 x 50 m plot and five 1 x 1 m subplots.

The minimum number of plots and transects per vegetation zone was determined using Table 3 of the BAM (DPIE 2020a). A total of ten plots were undertaken as part of the fieldwork; however, due to refinements to the modification area, only six of these plots are shown on Figure 4.1 and are within the study area and near the modification area. Datasheets for these six plots are provided in Appendix A while compiled plot data is provided in Appendix B.

Surveys for flora and vegetation communities were completed under the authority of Scientific License (SL100409). A list of flora species was compiled for each plot and PCT. Records of all flora species will be submitted to BCS for incorporation into the Atlas of NSW Wildlife.

### 4.2.3 Scattered trees

Scattered paddock trees were assessed in accordance with Appendix B of the BAM (DPIE 2020a), concurrently with the vegetation mapping in May 2021.

Given that regulatory maps for Category 1 and Category 2 land are yet to be produced, native trees were included within the paddock tree assessment if:

- they were outside of mapped woodland zones; and
- the ground cover was cropped or exotic grassland.

All paddock trees were assigned to the most likely PCT based on the tree species, landscape position and the surrounding mapped PCTs. Assigning a PCT enabled the determination of the large tree benchmark, used to calculate the category of paddock tree. Paddock trees were assessed across the entire study area over a period of four days in May 2021.

## 4.3 Results

### 4.3.1 Vegetation description

The properties within the study area are currently used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production. Native vegetation is highly modified by both historical and ongoing management practices including clearance of the original vegetation type, cropping, livestock grazing, addition of fertilisers, ploughing and weed invasion. No vegetation within the modification area is considered intact.

Native remnant canopy vegetation is limited to scattered trees and small patches of woodland with an entirely cleared midstorey. The ground cover is heavily grazed, typically with a high coverage of exotic grasses. Canopy dieback is highly prominent across the landscape; in many cases more dead than living trees are present. No recruitment of canopy species was observed.

A large portion of the modification area is native pasture (Figure 4.1), the majority of which no longer reflects the species composition of the community from which it was derived. Grazing-tolerant grass species and, in some cases, sown fodder species, dominate. Forb diversity and coverage is very low. Exotic grassland is also present where exotic grasses and forbs dominate with few native species.

A single PCT was recorded within the modification area (Table 4.3).

**Table 4.3 Plant community types within the modification area**

| Plant community type | Vegetation formation | Vegetation class | Percentage cleared | Disturbance area (ha) |
|---|---|---|---|---|
| 510 – Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion | Grassy Woodlands | New England Grassy Woodlands | 79 | 86.31 |

### 4.3.2 Vegetation zones

Each of the PCTs identified within the modification area were stratified into vegetation zones based on broad condition state, as per the method outlined in Section 4.2.2. PCTs were allocated a condition class as per the descriptions in Table 4.2. This process identified three vegetation zones, including one exotic zone (Table 4.4).

### Table 4.4 Vegetation zone, broad condition state and area

| Vegetation zone | Plant community type | Condition | Area (ha) |
|---|---|---|---|
| 1 | 510 – Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion | Poor | 0.42 |
| 2 | 510 – Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion | Pasture | 86.31 |
| 3 | N/A | Exotic grassland | 39.25 |
| **Total** | | | **125.98** |

#### i Native vegetation

Descriptions of each vegetation zone are provided in Table 4.5 with their locations shown on Figure 4.1.

### Table 4.5 Vegetation zone description – zones 1 and 2

| **Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510)** | |
|---|---|
| PCT | 510 |
| Common name | Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion |
| Condition class and extent | Vegetation zone 1 (poor): 0.42 ha<br>Vegetation zone 2 (pasture): 86.31 ha<br>Total: 86.73 ha |
| Survey effort | Six plots/transects within the study area (Figure 4.1):<br>Vegetation zone 1 (poor): Five plots (2,3,4,5 & 7); and<br>Vegetation zone 2 (pasture): One plot (6). |
| Description | This community is the most prevalent across the modification area and is highly modified, used for grazing of livestock including cattle and sheep.<br>**Zone 1 – 510_pasture** (Photograph 4.1)<br>The majority of the modification area comprises pasture. The ground cover is typically a mixture of native and exotic grasses, with the composition variable due to the land management intensity and the timeframe since significant intervention. Judging from both observed management practices and discussions with landholders, agricultural practices were highly variable and ranged from minimal intervention, to ploughing, sowing of pasture grasses and improvement with fertilisers. Whilst these management practices have created a somewhat variable species composition, the zone is characterised by the dominance of a small number of native grass species, low native forb diversity and high grazing pressure.<br>The most prevalent native grasses are cosmopolitan species, with low palatability to stock such as Slender Rat's Tail Grass (*Sporobolus creber*) and Red Grass (*Bothriochloa macra*), and Windmill Grass (*Chloris truncata*). A low diversity of native forbs is present and usually limited to a low number of individuals and coverage. Species recorded include Native Geranium (*Geranium solanderi*), Yellow Wood Sorrel (*Oxalis perennans*) and Bear's Ear (*Cymbonotus lawsonianus*)<br>Exotic grasses are common and highly abundant; species include Squirrel Tail Fescue (*Vulpia bromoides*), Prairie Grass (*Bromus catharticus*), Goosegrass (*Eleusine tristachya*) and Soft Lovegrass (*Eragrostis 18ilosa*). Exotic forbs were dominated by various *Trifolium* species with other species Narrow-leaved Plantain (*Plantago lanceolata*) and Cudweed (*Gamochaeta americana*). |

## Table 4.5 Vegetation zone description – zones 1 and 2

| Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510) | |
|---|---|
| | **Zone 2 – 510_poor** (Photograph 4.2)<br>Canopy species are either limited to scattered trees (six in the modification area) or one small patch of woodland of 0.42 ha with five trees present (Area 3). The most dominant canopy species are Blakely's Red Gum (*Eucalyptus blakelyi*) and Rough-barked Apple (*Angophora floribunda*). All of the trees present are mature with no regeneration of canopy species. The ground cover in the woodland area (510_poor) is of poorer condition than surrounding pasture, due to livestock utilising the shelter provided by the limited number of living trees. This has resulted in increased grazing pressure, nutrient enrichment (through droppings) and increased weed prevalence. Surrounding land use (mostly pasture) and associated edge impacts contribute even further to the existing condition of this zone. |
| Characteristic species used for identification of PCT | PCT 510 is typically dominated by Rough-barked Apple, Yellow Box and/or Blakely's Red Gum according to the vegetation description in the BioNet Vegetation Classification. All of these species are present within the modification area or surrounding continuous landscape (in the case of Yellow Box), with Rough-barked Apple and Blakely's Red Gum highly dominant. In addition, Ribbon Gum (*E. viminalis*) and Apple Box (*Eucalyptus bridgesiana*) are characteristic species of the PCT and were recorded as scattered trees within proximity to mapped areas of PCT 510. It is likely that these areas were once part of continuous woodland.<br>It is considered that the canopy species recorded are consistent with those characteristic of PCT 510. No midstorey species exist within the zone owing to historical clearance and ongoing pastoral land use.<br>Only one ground cover species characteristic of the PCT, Spiny-headed Matt Rush (*Lomandra longifolia*) was recorded. This species is common in other similar grassy woodlands and therefore are not particularly useful in confirming the PCT. The lack of characteristic groundcover species is likely a result of pasture modification and improvement and grazing pressure, rather than a contraindication of the PCT. The floristically diverse understorey typically present in this PCT was absent due to the high levels of disturbance. Instead, there is an increase prevalence of exotic species and high coverage of a few native grazing-tolerant grasses, such as Slender Rat's Tail Grass (*Sporobolus creber*). |
| Justification of evidence used to identify the PCT | PCT 510 occurs on undulating areas at intermediate to high altitudes, which is consistent with the study area, at approximately 1,000 m elevation with gently sloping or flat topography. The modification area occurs within the New England Tablelands IBRA bioregion, in which this PCT is known to occur.<br>The PCT occupies deep, relatively fertile soils on a number of different geologies, but mainly sedimentary rocks and basalt. Site observations indicate that the PCT occurs on fairly deep soils, with limited rock outcropping present. Soil types within the modification area include both sedimentary and basalt-derived soils, providing further justification of the accuracy of this PCT.<br>PCT 510 was also identified as the dominant community within the main project BDAR (EMM 2018). |
| Estimate of percent cleared value of PCT | 79% |
| Threatened ecological communities (TECs) | <u>Commonwealth EPBC Act:</u><br>The community zone was assessed against the potentially aligned White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Critically Endangered Ecological Community (CEEC) (EPBC Act Policy Statement 3.5 – White box – yellow box – Blakely's red gum grassy woodlands and derived native grasslands (Department of the Environment and Heritage (DEH 2006)).<br>**Zone 1 PCT 510_poor – not listed**<br>Under the Commonwealth listing advice where canopy species are present (PCT 510_poor) without a substantially native understorey, these areas are considered degraded and are no longer a viable part of the ecological community. Although some native species may remain, the native understorey is effectively irretrievable. In order for an area to be included in the listed ecological community, a patch must have a predominantly native understorey, which is not the case for this zone.<br>**Zone 1 PCT 510_pasture – not listed**<br>This vegetation zone does not meet the condition thresholds in the Commonwealth listing advice, as there is insufficient forb diversity to be considered the derived native grassland (DNG) variant. These areas are considered degraded and are no longer a viable part of the ecological community (DEH 2006). |

### Table 4.5 Vegetation zone description – zones 1 and 2

| Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510) | |
|---|---|
| | NSW BC Act:<br>White Box Yellow Box Blakely's Red Gum Woodland Critically Endangered Ecological Community (CEEC).<br>**Zone 1 PCT 510_poor – listed**<br>This PCT is directly aligned with the CEEC and, in contrast to the Commonwealth listing, the NSW guidelines (NPWS Undated) specifically includes highly disturbed sites, where few native species are present. This is providing that vegetation, either understorey, or overstorey, or both, would under appropriate management, respond through natural regeneration. In the case of this zone, exclusion of livestock would likely result in regeneration of the canopy species to some extent. Therefore, this zone is considered to form part of the CEEC under the BC Act.<br>**Zone 1 PCT 510_pasture – not listed**<br>Whilst the BC Act listing does not preclude highly disturbed sites, it must respond to natural regeneration. In the case of this zone, the species composition and soil characteristics have been irrevocably changed owing to ongoing and historical pastoral use. The pasture no longer has any resemblance to the PCT or DNG; therefore this zone is not considered to form part of the CEEC under the BC Act. |
| Patch size | PCT 510_poor is limited to Area 3 with a patch size of 1.83 ha, inclusive of connected areas outside the modification area. Patch size of 1.83 ha falls into the lowest patch size category (<5 ha).<br>PCT 510_pasture is prevalent and connected across much of the buffer area, therefore the maximum patch size category (101 ha) has been assumed for this assessment. |
| Vegetation integrity Score (VIS) | Vegetation zone 1 (PCT 510_poor): 25.1<br>Vegetation zone 2 (PCT 510_pasture): 6.7<br>The VIS score for Zone 1 (25.1) is above threshold and will require offsets; however, the relatively low score is reflective of a highly disturbed community.<br>The VIS for Zone 2 (6.7) is below threshold for offsetting, reflecting the low condition of the grassland. |

**Photograph 4.1** **Vegetation zone 2: PCT 510_pasture (Plot 2)**

**Photograph 4.2** **Vegetation zone 1: PCT 510_poor (Plot 6)**

### ii Percentage native vegetation cover

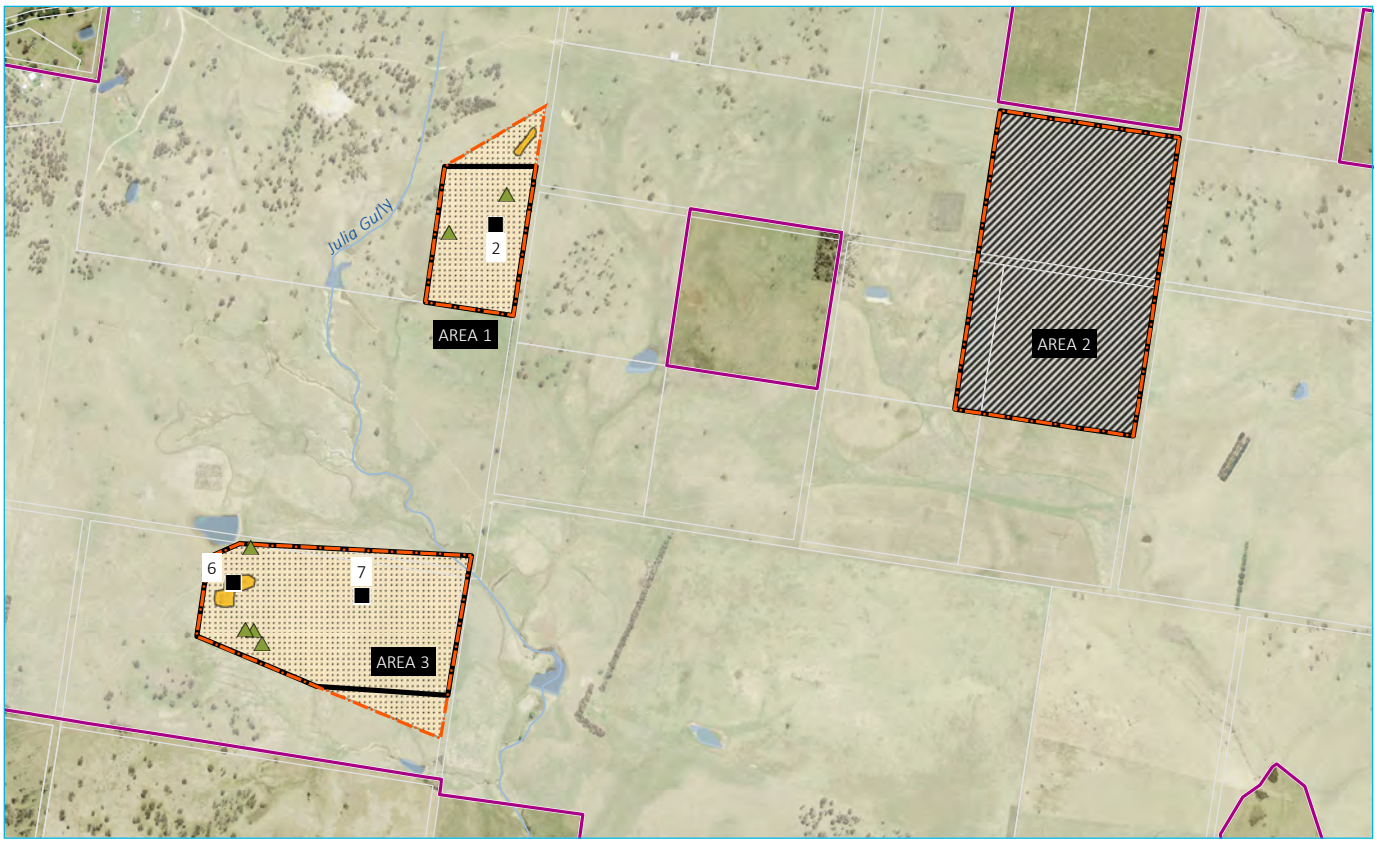
Mapping of native vegetation within the buffer area was undertaken using *Northern River Catchment Management Authority Native Vegetation Mapping* (DPE 2010). Vegetation proximal to the modification area is highly fragmented, with native vegetation often occurring in isolated patches surrounded by a matrix of agricultural land. This is also consistent with the remaining vegetation within and adjoining the modification area.

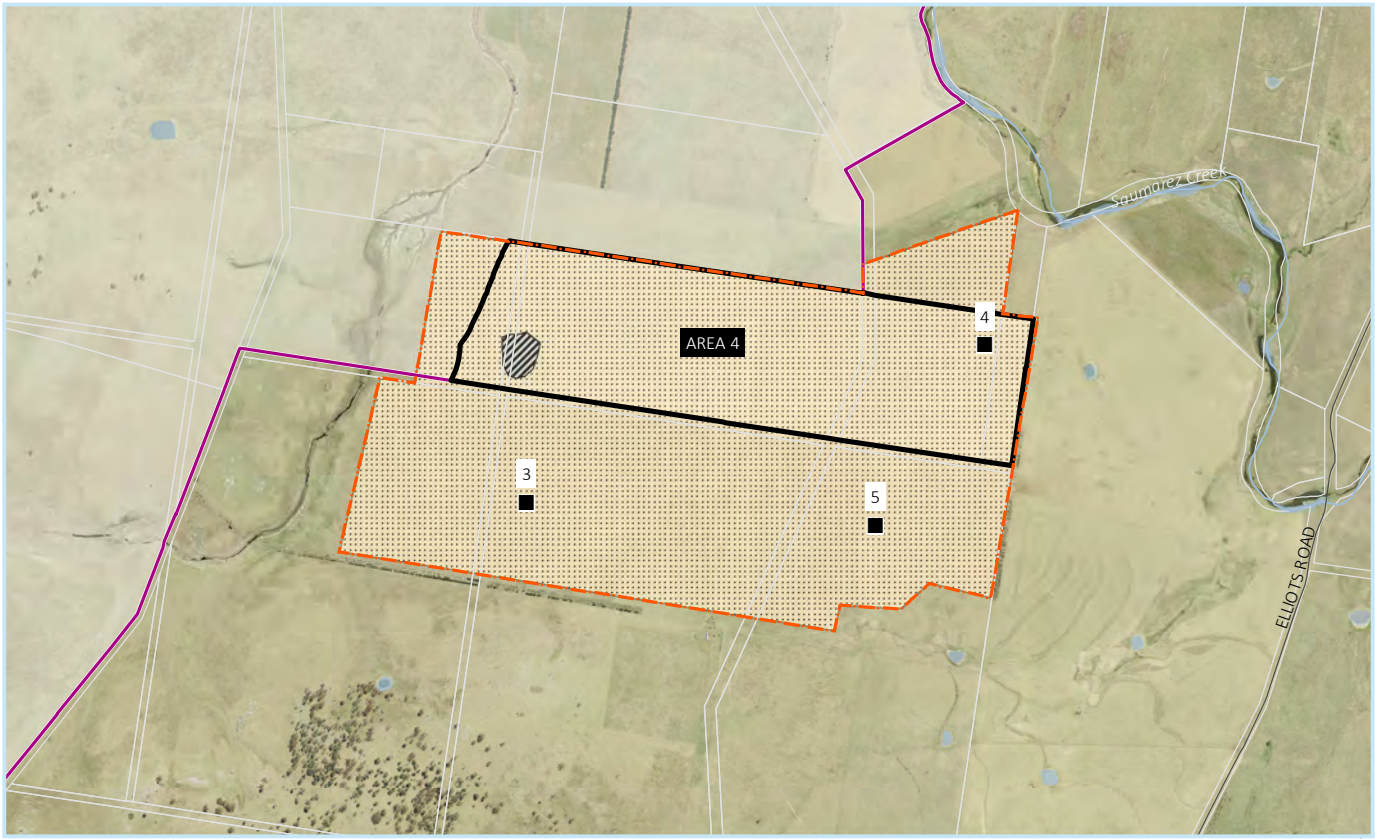
A total of 277.86 ha of native vegetation was recorded within the buffer area (3,274.64 ha), therefore the percentage native cover is 8.49%. This amount is within the second BAM vegetation percentage cover category (0–<10%).

### iii Exotic vegetation

Exotic vegetation was mapped in areas where exotic species were clearly dominant, with few to no native species present (Photograph 4.3). Exotic grassland areas are dominated by Clover species (*Trifolium spp.*), Perennial Ryegrass (*Lolium perenne*), Saffron Thistle (*Carthamus lanatus*) and Sweet Vernal Grass (*Anthoxanthum odoratum*). Areas mapped as exotic grassland were not considered to offer potential habitat for threatened flora or fauna and biodiversity value is considered negligible, with no further assessment required.

**Photograph 4.3 Exotic grassland within the modification area**



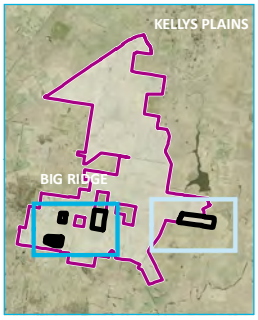




*Source: EMM (2022); UPC (2021); DFSI (2017, 2022); GA (2011)*

0 0.5 1 km

GDA 1994 MGA Zone 56

N




KEY

- Proposed project boundary
- Study area
- Modification area

Existing environment

- Minor road
- Named watercourse
- Waterbody
- Cadastral boundary
- Scattered tree
- Plot location
- Exotic grassland

PCT 510 | Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

- Poor
- Pasture

# Plant community types, plot/transect locations and scattered trees

New England Solar and Battery Project
Biodiversity Development Assessment Report
Figure 4.1

EMM creating opportunities

\\emmsvr1\EMM3\2021\P210321 - NESF MOD 2\GIS\02_Maps_Ecology\BDAR003_PCTs_20220815_07.mxd 15/08/2022

### 4.3.3 Scattered trees

Six scattered trees exist within zone 2 (PCT 510_pasture) (Figure 4.1) and are assessed below in accordance with Appendix B of the BAM, which includes species listed in the tree growth form group that:

a) Have a percent foliage cover that is less than 25% of the benchmark for tree cover for the most likely plant community type and are on category 2-regulated land and surrounded by category 1-exempt land on the Native Vegetation Regulatory Map under the Local Land Services Act (LLS Act 2013).

The Native Vegetation Regulatory Map was checked on 7 February 2022; however, no mapping was available for the study area. In the absence of a published Native Vegetation Regulatory Map, the definitions of category 1 or category 2 lands under the LLS Act are applied to the modification area.

Whilst the trees have a percentage foliage cover below 25% of the benchmark for PCT 510, the land within the modification area is not considered Category 2 regulated land under the LLS Act; the vegetation was cleared prior to 1990 and only contains grasslands of low conservation value, rather than medium conservation value. The grassland quality is described in Section 4.2.3 and is demonstrated by a VIS of 6.7, which is below the threshold required for offsetting. The grassland best fits the Category 1 classification; therefore, the scattered trees do not meet this criteria.

b) Have a DBH of greater than or equal to 5 cm and are located more than 50 m away from any living tree that is greater than or equal to 5 cm DBH, and the land between the scattered trees is comprised of vegetation that are all ground cover species on the widely cultivated native species list, or exotic species or human-made surfaces or bare ground.

All 17 trees meet the DBH and spacing requirements; however, the land between the trees is grassland comprising native and exotic species. This requirement is not satisfied given that the groundcover is neither widely cultivated native species, exotic species, human-made surfaces, nor bare ground.

c) Are three or fewer trees that have a DBH of greater than or equal to 5 cm and are within a distance of 50 m of each other, that in turn, are greater than 50 m away from the nearest living tree that is greater than or equal to 5 cm DBH, and the land between the scattered trees is comprised of vegetation that are all ground cover species on the widely cultivated native species list, or exotic species or human-made surfaces or bare ground.

All 17 trees meet the DBH and spacing requirements; however, the land between the trees is grassland comprising native and exotic species. This requirement is not satisfied, given that the groundcover is neither widely cultivated native species, exotic species, human-made surfaces, nor bare ground.

Given that the scattered trees in the disturbance area do not meet the criteria listed above, they cannot be assessed as part of the streamline assessment, rather they are incorporated as part of the assessment of PCT 510_pasture. As the VIS for PCT 510_pasture is 6.7 and below threshold for offsetting, no offsets are required for potential impacts to the six scattered trees within Zone 2.

# 5 Threatened species

## 5.1 Threatened species habitat description

Concurrent with the vegetation mapping, a habitat assessment was undertaken seeking to identify the following fauna habitat features within the modification area:

- habitat trees including large hollow-bearing trees;
- availability of flowering shrubs and feed tree species;
- waterway condition;
- quantity of ground litter and logs; and
- searches for indirect evidence of fauna.

This habitat assessment identified that the majority of the modification area is highly disturbed, only supporting fauna species which are able to persist in highly modified agricultural landscapes.

The grassland (both native and exotic) and cropped areas have low habitat value, primarily providing foraging habitat for seed eating and insectivorous birds including Red-rumped Parrot (*Psephotus haematonotus*), Australasian Pipit (*Anthus novaeseelandiae*) and the exotic European Starling (*Sturnus vulgaris*). Predatory birds observed included the Australian Kestrel (*Falco cenchroides*) and Brown Falcon (*Falco berigora*).

Habitat resources within remnant woodland areas of the modification area are largely limited to the trees themselves given the highly grazed understorey, the absence of any midstorey species and lack of functional leaf litter. Woody debris including fallen limbs and trees was occasionally present due to tree dieback; however, the lack of any other supporting habitat features, such as dense tussock grasses and shrubs means that the understorey habitat is considered very poor and unlikely to support many species except those most disturbance tolerant.

Owing to the very poor connectivity and condition of woodland patches, birds were the main taxa observed utilising the remaining trees present and these were limited to medium to large species. No small woodland birds were observed, likely due to the scarcity of resources, low habitat complexity and competitive exclusion from Noisy Miner, which was fairly abundant.

Scattered trees within the modification area provide similar fauna habitat to the remnant woodland albeit with further gaps between the trees. There is little functional difference given that both habitat types are very poorly connected and provide the same resources, largely limited to the trees themselves.

Aquatic habitat within the modification area is minimal with refinements to the modification area excluding fourth order watercourses and above. The largest watercourse is a third order stream, in the north-east corner of Area 3. This watercourse is highly ephemeral with a poorly defined channel and occasional small shallow pools during wet periods. Fish are absent and it is unlikely to be important for any frog species, with only the cosmopolitan species Eastern Common Froglet (*Crinia signifera*) recorded (orally).

No Key Fish habitat is mapped within the modification area, nor are any threatened aquatic species distributions mapped.

## 5.2 Ecosystem credit species

Ecosystem credit species are threatened species that can be reliably predicted to use an area of land based on habitat surrogates. For the purposes of the BAM (DPIE 2020a), ecosystem credit species are deemed to be offset through the habitat surrogates (PCTs) in which they occur.

Ecosystem credit species lists are generated by the BAM calculator (BAMC) based on the percentage vegetation cover in the buffer areas, PCTs present in the modification area and their condition. Ecosystem credit species are considered in Table 5.1.

**Table 5.1 Assessment of ecosystem credit species within the modification area**

| Scientific name | Common name | Justification for exclusion |
|---|---|---|
| *Anthochaera phrygia* | Regent Honeyeater (Foraging) | Excluded from PCT 510_pasture as no suitable foraging habitat is present. |
| *Artamus cyanopterus cyanopterus* | Dusky Woodswallow | Excluded from PCT 510_pasture as no suitable foraging habitat is present. |
| *Calyptorhynchus lathami* | Glossy Black-Cockatoo (Foraging) | Excluded. Due to absence of habitat constraint: "Presence of *Allocasuarina* and *Casuarina* species". |
| *Chalinolobus nigrogriseus* | Hoary Wattled Bat | Excluded from PCT 510_pasture as no suitable foraging habitat is present. |
| *Chthonicola sagittata* | Speckled Warbler | Excluded from PCT 510_pasture as no woodland habitat present. |
| *Climacteris picumnus victoriae* | Brown Treecreeper | Excluded from PCT 510_pasture as no woodland habitat present. |
| *Dasyurus maculatus* | Spotted-tailed Quoll | Excluded from all habitat/vegetation types as habitat structure required is absent and connectivity is very poor. |
| *Glossopsitta pusilla* | Little Lorikeet | Excluded from PCT 510_pasture as no woodland habitat present. |
| *Haliaeetus leucogaster* | White-bellied Sea-Eagle (Foraging) | Excluded. Due to absence of habitat constraint: "Within 1 km of rivers, lakes, large dams or creeks, wetlands and coastlines". |
| *Hirundapus caudacutus* | White-throated Needletail | Not excluded. |
| *Lathamus discolor* | Swift Parrot (foraging) | Excluded from PCT 510_pasture as no woodland habitat present. |
| *Melanodryas cucullata cucullata* | Hooded Robin | Excluded from PCT 510_pasture as no woodland habitat present. |
| *Miniopterus orianae oceanensis (Foraging)* | Large Bent-winged Bat | Excluded from PCT 510_pasture as no woodland habitat present. |
| *Petroica boodang* | Scarlet Robin | Excluded from PCT 510_pasture as no woodland foraging habitat present. |
| *Petroica phoenicea* | Flame Robin | Excluded from PCT 510_pasture as no woodland foraging habitat present. |
| *Phascolarctos cinereus* | Koala (foraging) | Excluded from PCT 510_pasture as no woodland foraging habitat present. |
| *Pteropus poliocephalus* | Grey-headed Flying-fox | Excluded from PCT 510_pasture as no woodland foraging habitat present. |
| *Stagonopleura guttata* | Diamond Firetail | Excluded from PCT 510_pasture as no woodland foraging habitat present. |

## 5.3 Species credit species

### 5.3.1 Candidate species assessment

In accordance with Step 3 (Section 5.2.3 of BAM (DPIE 2020a)), a field assessment of habitat constraints and microhabitats was undertaken in the field to determine the suitability of habitat within the modification area for:

- predicted species (ecosystem credit species associated with recorded PCTs, predicted by the BAMC);
- candidate species (species credit species associated with specific geographic and landscape feature constraints); and
- species predicted to occur by the PMST.

Candidate species predicted by the BAMC are shown in Table 5.2. An assessment of the geographic and landscape constraints has been provided for each species, with a justification provided where species have been excluded, in accordance with Steps 1 to 3 (Section 5.2.1 to 5.2.3) of the BAM.

## Table 5.2 Candidate threatened species assessment

| Step 1 – Identify threatened species for assessment | | Step 2 – Assessment of habitat constraints and vagrant species | | Step 3 – Identify candidate species for further assessment | |
|---|---|---|---|---|---|
| **Common name** | **Scientific name** | **Habitat/ geographic constraints** | **Constraint present in modification area** | **Vagrant species?** | **Candidate species (yes/no) and rationale** |
| **Flora** | | | | | |
| Barrington Tops Ant Orchid | *Chiloglottis platyptera* | N/A | N/A | N/A | No.<br>Grows in moist areas in tall open eucalypt forest with a grassy understorey, and also around rainforest edges. Found along the eastern edge of the New England Tablelands, from Ben Halls Gap to east of Tenterfield, and also in the Barrington Tops area. It generally occurs in rich brown loam soils.<br>No suitable habitat exists within the modification area given that mesic rich brown loam soils are absent from the modification area. The degraded woodland and pastural uses of the modification area precludes this species from occurring. |
| Bluegrass | *Dichanthium setosum* | N/A | N/A | N/A | Yes.<br>Bluegrass occurs on heavy basaltic black soils and red-brown loams with clay subsoil. It is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Given this species can occur in disturbed areas and suitable soil types are present, this species has the potential to occur within the modification area. |
| Small Snake Orchid | *Diuris pedunculata* | N/A | N/A | N/A | No.<br>The Small Snake Orchid grows on grassy slopes or flats. Often on peaty soils in moist areas and also on shale and trap soils, on fine granite, and among boulders. The modification area is highly disturbed, with a poor diversity of forb species. The Small Snake Orchid is susceptible to grazing and with the high grazing pressure within the modification area the species is unlikely to occur. |
| Northern Blue Box | *Eucalyptus magnificata* | N/A | N/A | N/A | Yes.<br>Grassy open forest or woodland on shallow, sandy or loamy soils. Occurs on moderately hilly sites and at the edge of gorges, usually at altitudes from 900–1,050 m. Known in NSW from only a few widely separate populations on the New England Tablelands, around Hillgrove east of Armidale and in the Glen Innes and Tenterfield region, where they occur individually or in small populations. This species cannot be excluded based on habitat basis alone. |

## Table 5.2 Candidate threatened species assessment

| Step 1 – Identify threatened species for assessment | | Step 2 – Assessment of habitat constraints and vagrant species | | Step 3 – Identify candidate species for further assessment | |
|---|---|---|---|---|---|
| **Common name** | **Scientific name** | **Habitat/ geographic constraints** | **Constraint present in modification area** | **Vagrant species?** | **Candidate species (yes/no) and rationale** |
| Narrow-leaved Black Peppermint | *Eucalyptus nicholii* | N/A | N/A | N/A | Yes.<br>This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or meta-sedimentary rock. This species cannot be excluded based on habitat basis alone. |
| Hawkweed | *Picris evae* | N/A | N/A | N/A | Yes.<br>Where collected, the species abundance has been rare, locally occasional, and locally frequent. All recent collections appear to come from modified habitats such as weedy roadside vegetation and paddocks. Its main habitat is open Eucalypt forest including a canopy of *Eucalyptus melliodora, E. crebra, E. populnea, E. albens, Angophora subvelutina, Allocasuarina torulosa*, and/or *Casuarina cunninghamiana* with a *Dichanthium* grassy understory. Soils are black, dark grey or red-brown (specified as shallow, stony soil over basalt for one collection) and reddish clay-loam or medium clay soils. The flowering and fruiting period is mainly October to January, with a few plants collected in flower or fruit until May. This species cannot be excluded based on habitat basis alone. |
| Silky Swainson-pea | *Swainsona sericea* | N/A | N/A | N/A | No.<br>Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes, sometimes in association with cypress-pines *Callitris* spp. This species is not anticipated to occur given highly degraded nature of the groundcover and very poor forb diversity, largely due to pasture modification and heavy grazing. |

## Table 5.2 Candidate threatened species assessment

| Step 1 – Identify threatened species for assessment | | Step 2 – Assessment of habitat constraints and vagrant species | | Step 3 – Identify candidate species for further assessment | |
|---|---|---|---|---|---|
| **Common name** | **Scientific name** | **Habitat/ geographic constraints** | **Constraint present in modification area** | **Vagrant species?** | **Candidate species (yes/no) and rationale** |
| Austral Toadflax | *Thesium australe* | N/A | N/A | N/A | No.<br>Austral Toadflax occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast, often in association with Kangaroo Grass (*Themeda australis*). This species is a root parasite that takes water and some nutrients from other plants, especially Kangaroo Grass. This species is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands region. This species is not anticipated to occur given highly degraded nature of the groundcover, largely due to pasture modification and heavy grazing. |
| **Fauna** | | | | | |
| Regent Honeyeater (breeding) | *Anthochaera phrygia* | As per mapped area. | No | N/A | No.<br>Modification area is outside of the mapped areas. |
| Glossy Black-Cockatoo (breeding) | *Calyptorhynchus lathami* | Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground. | No | N/A | No.<br>Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur (Casuarina and Allocasuarina species). Dependent on large hollow-bearing eucalypts for nest sites. No trees with appropriate hollows are present. Furthermore, no Casuarina and Allocasuarina were recorded within the entire modification area or the surrounding landscape. The species needs to forage for much of the day in order to obtain sufficient food, especially during the breeding season (Garnett & Crowley 2000). Therefore, the energetic demand of foraging over such large distances would negate breeding within the modification area. |

## Table 5.2 Candidate threatened species assessment

| Step 1 – Identify threatened species for assessment | | Step 2 – Assessment of habitat constraints and vagrant species | | Step 3 – Identify candidate species for further assessment | |
|---|---|---|---|---|---|
| **Common name** | **Scientific name** | **Habitat/ geographic constraints** | **Constraint present in modification area** | **Vagrant species?** | **Candidate species (yes/no) and rationale** |
| White-bellied Sea-eagle (breeding) | *Haliaeetus leucogaster* | Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines. | No | N/A | No.<br>Habitat constraints are absent from the modification area. |
| Swift Parrot (breeding) | *Lathamus discolor* | As per mapped area. | No | N/A | No.<br>Modification area is outside of the mapped areas. |
| Large Bent-winged Bat (breeding) | *Miniopterus orianae oceanensis* | Caves.<br>Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC – in cave" observation type code "E nest-roost" with numbers of individuals >500. | No | N/A | No.<br>Breeding habitat within the modification area is absent or within the locality. |

## Table 5.2 Candidate threatened species assessment

| Step 1 – Identify threatened species for assessment | | Step 2 – Assessment of habitat constraints and vagrant species | | Step 3 – Identify candidate species for further assessment | |
|---|---|---|---|---|---|
| **Common name** | **Scientific name** | **Habitat/ geographic constraints** | **Constraint present in modification area** | **Vagrant species?** | **Candidate species (yes/no) and rationale** |
| Southern Myotis | *Myotis macropus* | Hollow bearing trees.<br>Within 200 m of riparian zone.<br>Bridges, caves or artificial structures within 200 m of riparian zone.<br>Waterbodies.<br>This includes rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200 m of the site. | No (with the exception of hollows). | No | No.<br>The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Southern Myotis forages over streams and pools catching insects and small fish by raking their feet across the water surface. The modification area is over 135 km inland and therefore the occurrence of the Southern Myotis is likely to be restricted to major rivers. There are no such suitable rivers or watercourses within the modification area.<br>The closest watercourse which has the potential to provide habitat is Salisbury Waters, which is a series of small ponds links by a narrow and ephemeral watercourse. This watercourse is not likely to provide habitat for the species given its small size and the low quality of habitat. The banks of the watercourse are largely unvegetated, with minimal roosting opportunities, and surrounded by pasture. |
| Squirrel Glider | *Petaurus norfolcensis* | N/A | N/A | N/A | No.<br>The Squirrel Glider inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. The species prefers mixed species stands with a shrub or Acacia mid-storey. The species relies on large old trees with hollows for breeding and nesting; however, trees need to be less than 50 m apart.<br>Box Gum woodland within the modification area is highly disturbed, with a thinned canopy, small patch size and poor. Midstorey species are absent throughout all of the remnant woodland patches with a pasture understorey, therefore insufficient foraging resources are present to support the species. |

## Table 5.2 Candidate threatened species assessment

| Step 1 – Identify threatened species for assessment | | Step 2 – Assessment of habitat constraints and vagrant species | | Step 3 – Identify candidate species for further assessment | |
|---|---|---|---|---|---|
| **Common name** | **Scientific name** | **Habitat/ geographic constraints** | **Constraint present in modification area** | **Vagrant species?** | **Candidate species (yes/no) and rationale** |
| Koala (breeding) | *Phascolarctos cinereus* | Areas identified via survey as important habitat. | No | N/A | No.<br>Koala inhabits eucalypt woodlands and forests, feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. The modification area is within the northern tablelands koala management area. None of the preferred primary food trees have been recorded within the modification area. One secondary feed tree was recorded within the modification area; Blakely's Red Gum. The only woodland in size was limited to a patch of five trees, surrounded by pasture. Given the very small patch size and the lack of connectivity, Koala would be unable to persist in the modification area or the surrounding area. Prior targeted surveys for Koala (EMM 2018) for the NESF did not detect the species. |
| Grey-headed Flying-fox (Breeding) | *Pteropus poliocephalus* | Breeding camps. | No | N/A | No.<br>Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, for giving birth and rearing young. Only one small patch of woodland occurs in the modification area, which does not represent suitable roost habitat for the species. |
| Tusked Frog[1] | *Adelotus brevis*[2] | N/A | N/A | N/A | No.<br>The species are usually found near creeks, ditches and ponds, and call while hidden amongst vegetation or debris. The species breeds from Spring through to Summer, with a peak during late Spring. Eggs are deposited in nests under leaf litter or other cryptic sites such as old yabbie burrows near or in water.<br>Aquatic habitat within the modification area is largely limited to indistinct drainage lines with no suitable breeding habitat present. There is an absence of aquatic and emergent vegetation, with no leaf litter. Furthermore, surrounding foraging habitat is limited to grazed pasture. |

1. Population in the Nandewar and New England Tableland Bioregions.
2. Endangered population.

### 5.3.2 Candidate species credit species requiring further assessment

Candidate species for further assessment were identified in accordance with Step 1 to 2 (Section 5.2.1 to 5.2.2) of BAM (DPIE 2020a). A list of species requiring further assessment is provided in Table 5.3.

**Table 5.3 Candidate species credit species requiring further assessment**

| Scientific name | Common name | EPBC Act | BC Act | Flora or fauna |
|---|---|---|---|---|
| Bluegrass | *Dichanthium setosum* | V | V | Flora |
| Northern Blue Box | *Eucalyptus magnificata* | - | E | Flora |
| Narrow-leaved Black Peppermint | *Eucalyptus nicholii* | V | V | Flora |
| Hawkweed | *Picris evae* | V | V | Flora |

Notes: E – Endangered, V – Vulnerable.

### 5.3.3 Targeted survey methods

#### i Targeted flora surveys

#### a Bluegrass

Bluegrass occurs on heavy basaltic black soils and red-brown loams with clay subsoil. It is often found in moderately disturbed areas, including pasture.

It is considered very unlikely that Bluegrass could persist in the areas of exotic grassland, owing to the intensive agricultural practices used and dominance of exotic species. These areas are considered substantially degraded and no longer provide habitat for the species. Woodland vegetation is also considered unlikely to provide habitat for Bluegrass as groundcover is typically in much lower condition than the surrounding grassland areas. Livestock have favoured the treed areas for shelter resulting in groundcover which is highly enriched, predominately exotic and grazed close to ground level. In addition, planted areas were typically dominated by exotic grass species and therefore considered unfavourable habitat.

The only zone considered as having potential to support Bluegrass is PCT 510_pasture, which contains several native grass species. This potential habitat was refined further by intersecting suitable soil landscapes 9,236ir, 9,236po, 9,236ba and 9,236kp (OEH 2017). Given the size of the modification area and the sub-optimal nature of the habitat, a representative sampling approach was adopted, which included:

- Areas mapped as native pasture with underlying basalt or red loam soils were targeted across the study area (9,236ir, 9,236po, 9,236ba and 9,236kp).
- Approximately 102 ha of potential habitat was identified in the study area, once PCT 510 and the relevant soil types were interrogated. Given the area of potential habitat exceeded 50 ha; the grid-based systematic approach was used in accordance with the Surveying Threatened Plants and their Habitats NSW Survey Guide for the BAM (DPIE 2020b), refer to Figure 5.1.
- A total of 41.5 km pedestrian survey effort was undertaken in the study area; however, due to the removal of one area from the modification area (Figure 6.1), the amount of survey effort within the modification area is 3.54 km within Area 3 (Figure 5.1).
- Surveys were undertaken over three days with two ecologists, between 10 and 12 November 2021.

Associate Professor Ralph (Wal) Whalley of University of New England (UNE), who is a recognised expert on the species, assisted EMM in 2018 with the location of a reference site at Apple Tree Hill Drive, Armidale. This site was again checked on 11 November 2021, with both *Dichanthium setosum* and *D. sericeum* (non-threatened) observed in flower.

#### b Hawkweed (*Picris evae*)

Hawkweed typically occurs north of the Inverell area, in the north-western slopes and plains regions. The closest record to the modification area is an outlier to the main species distribution, approximately 40 km east of the modification area (dated 1991). The Inverell population is approximately 100 km north of the modification area. Hawkweed usually occurs on dark grey/black soils; however, the species is also known to occur on red-brown and reddish clay-loam or medium clay soils. Whilst its main habitat is open Eucalypt forest, recent collections have been from modified habitats such as weedy roadside vegetation and paddocks. This species is likely to be susceptible to grazing.

Given the similar habitat requirements and seasonal survey timing as Bluegrass, Hawkweed and Bluegrass were surveyed simultaneously using the methods outlined above (Section 5.3.3.a).

There are no relevant reference sites for Hawkweed in the locality; however, the surveys were conducted in optimal seasonal timing and conditions.

#### c Northern Blue Box (*Eucalyptus magnificata*) and Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)

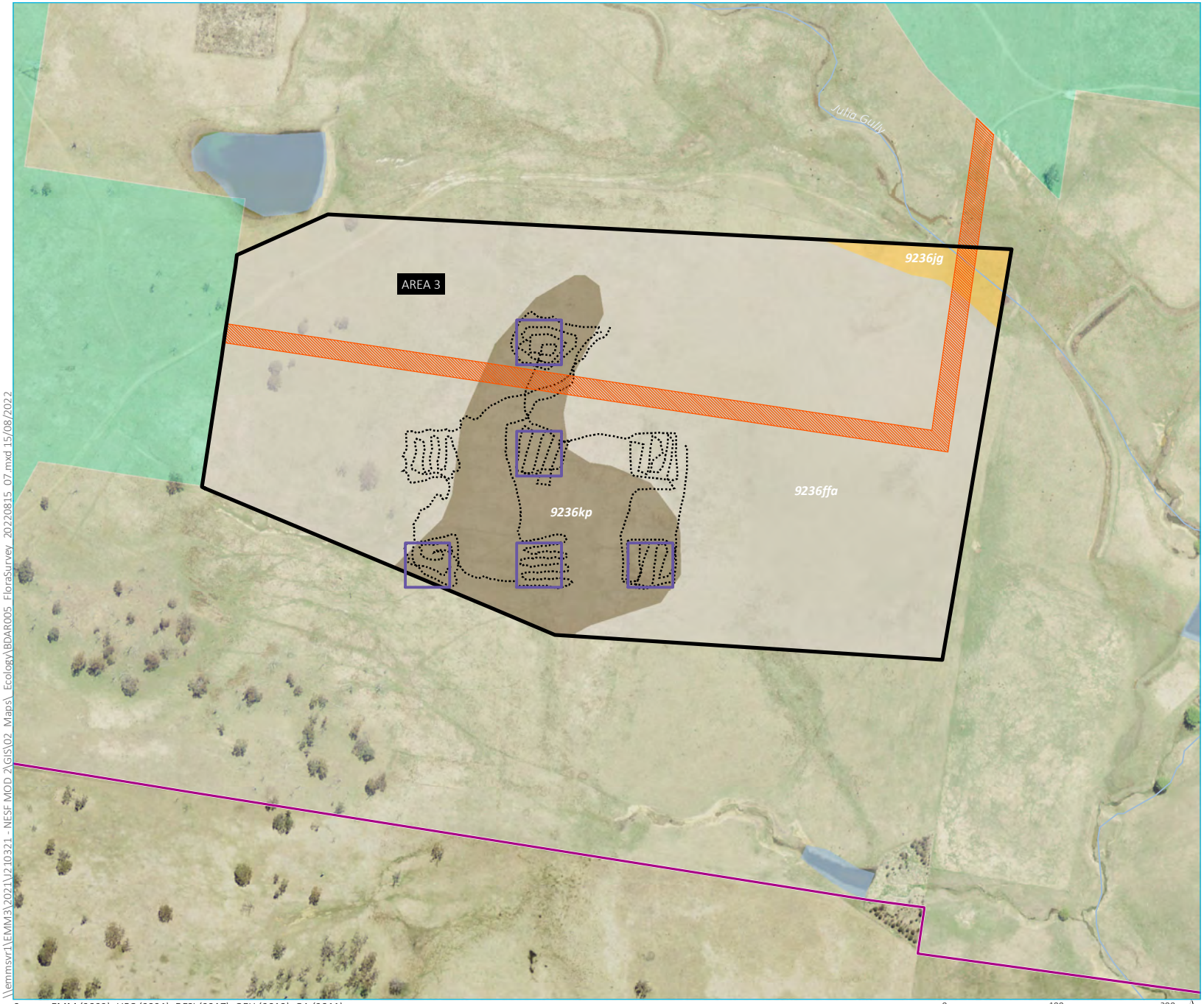
Each patch of woodland and scattered trees was visited between 10 and 12 November 2021, with all individual trees identified to species level.

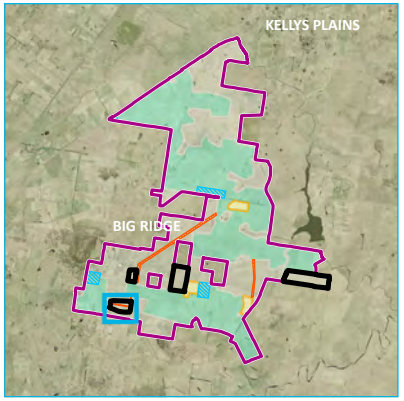
### 5.3.4 Targeted survey results

None of the candidate species were detected, either incidentally or during the targeted species surveys. The candidate species are therefore considered absent for the purposes of this assessment (Table 5.4). The findings are supported by the previous work undertaken for the main project BDAR, where 75 km of survey effort was undertaken for Bluegrass and 57 km for Hawkweed, with no individuals detected (EMM 2018).

**Table 5.4 Species credit species, habitat suitability and targeted survey results**

| Common name | Scientific name | Biodiversity risk weighting | Habitat present within modification area | Recorded during field surveys | Impacted by modification | Justification |
|---|---|---|---|---|---|---|
| Bluegrass | *Dichanthium setosum* | 2 | Yes, sub-optimal habitat present within one soil landscape within PCT 510_pasture. | No | No | Not recorded during targeted surveys. |
| Northern Blue Box | *Eucalyptus magnificata* | 2 | Yes, sub-optimal habitat exists. | No | No | Not recorded during targeted surveys. |
| Narrow-leaved Black Peppermint | *Eucalyptus nicholii* | 2 | Yes, sub-optimal habitat exists. | No | No | Not recorded during targeted surveys. |
| Hawkweed | *Picris evae* | 2 | Yes; however, outside of core range. | No | No | Not recorded during targeted surveys. |




KEY

- Proposed project boundary
- Modification area
- Named watercourse
- Waterbody
- Targeted flora survey track
- 40 x 40 m survey grid

Approved development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint

Soil landscape

- 9236ffa | Fairfield variant a
- 9236jg | Julia Gully
- 9236kp | Kellys Plains

Targeted flora survey

New England Solar and Battery Project
Biodiversity Development Assessment Report
Figure 5.1

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*Source: EMM (2022); UPC (2021); DFSI (2017); OEH (2019); GA (2011)*

0 100 200 m

GDA 1994 MGA Zone 56

N

creating opportunities

# Stage 2 – Impact assessment

# 6 Impact assessment

This chapter identifies the potential impacts of the proposed modification on biodiversity values within the modification area. Measures taken to date to avoid and minimise impacts are summarised.

## 6.1 Potential direct, indirect and prescribed impacts

Potential impacts that could arise from the proposed modification, prior to any avoidance, minimisation or mitigation, include:

- direct impacts:
  - loss of native vegetation; and
  - loss and degradation of native flora and fauna habitats;
- indirect impacts:
  - erosion and sedimentation;
  - weed introduction and spread;
  - increased noise, vibration and dust levels resulting in disturbance of fauna species, and consequent abandonment of habitat, or changes in behaviour (including breeding behaviour); and
  - night-time lighting resulting in disturbance to fauna species and changes in occupancy or behaviour.

Wherever possible, direct impacts have been avoided and/or minimised through the design of the modification area. Impacts will be further managed and mitigated through the ongoing implementation of the *New England Solar Farm – Biodiversity Management Plan* (BMP), which will be updated to include reference to the modification area and any new measures recommended in the below sections. Any residual impacts would be compensated through implementation of the biodiversity offset scheme.

For this assessment, complete clearance has been assumed throughout the disturbance area and offsets calculated accordingly. This provides flexibility for the final design and placement of solar arrays and ensures that biodiversity impacts are fully accounted for.

No management zones have been created for indirect impacts for ecosystem credits, as all woodland within the modification area will be removed (0.42 ha), with no remaining vegetation or habitat for which to manage indirect impacts. The modification area is surrounded by low quality pasture, further reducing the need for any buffers.

## 6.2 Prescribed and uncertain impacts

An assessment of prescribed and uncertain impacts as outlined under Chapter 6 of BAM (DPIE 2020a) is provided in Table 6.1. The assessment concluded that no prescribed or uncertain impacts are likely to result from the proposed modification and therefore no adaptive management strategy is required.

**Table 6.1 Potential prescribed/uncertain impacts**

| Prescribed/uncertain impact | Proposed modification |
|---|---|
| Karst, caves, crevices, cliffs and other geological features of significance; rocks; or human-made structures; or non-native vegetation. | The modification area does not contain geologically significant features, rocky areas, human-made structures or non-native vegetation that represent habitat for threatened species or ecological communities. Accordingly, management of this prescribed impact is not required. |
| Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range. | Native vegetation and fauna habitats are highly disturbed and fragmented and are within an over cleared landscape. As such any impacts will be negligible. Accordingly, management of this prescribed impact is not required. |
| Impacts of development on movement of threatened species that maintains their life cycle. | No threatened species were recorded or are anticipated to occur in the modification area. Any threatened species able to persist in the over cleared landscape will be unaffected by the proposed modification. Accordingly, management of this prescribed impact is not required. |
| Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining). | The proposed modification is not expected to intersect groundwater given its minimal excavation and deep ground works, therefore impacts on groundwater dependent ecosystems are not expected. Accordingly, management of this prescribed impact is not required. |
| Impacts of wind turbine strikes on protected animals. | No wind turbines are proposed. Therefore, this prescribed impact is not relevant to the proposed modification or broader project. Accordingly, management of this prescribed impact is not required. |
| Impacts of vehicle strikes or on animals that are part of a threatened ecological community. | A total of 0.42 ha of BC Act listed Box Gum woodland will be cleared. The woodland is an isolated highly degraded patch with minimal fauna values, as such fauna utilisation is minimal and no impacts are anticipated.<br>The proposed modification will not change the vehicle access route or approved over-dimensional and heavy vehicle restrictions. The proposed modification will not result in additional light or heavy vehicle movements than those previously assessed and approved under SSD-9255 and is unlikely to contribute to additional traffic impacts within the surrounding area.<br>Therefore, the risk of vehicle strikes on animals will not increase above existing levels. Accordingly, management of this prescribed impact is not required. |

## 6.3 Avoidance, minimisation and management

ACEN Australia, in consultation with EMM, has undertaken significant steps to avoid, minimise and mitigate impacts, as per the process outlined below:

- identification of biodiversity values through comprehensive, rigorous and thorough biodiversity surveys across the study area (Figure 6.1);
- communication of identified values to the project team and ACEN Australia; and
- consultation between the design team and project ecologists to consider direct and indirect impacts and work through an iterative design process, to achieve a feasible area for inclusion in the modification with least biodiversity impact.

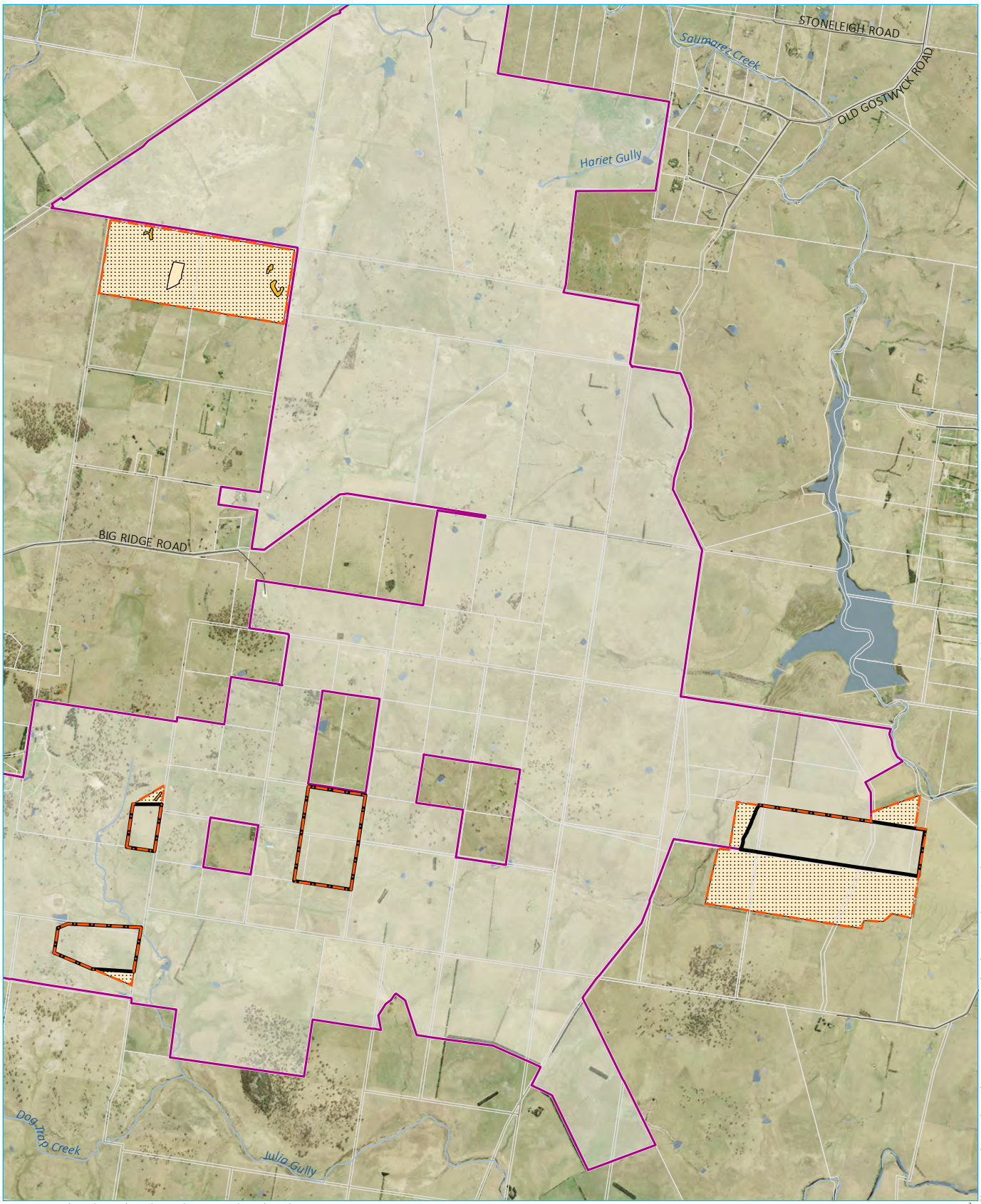
The study area adopted as part of this assessment was 390.93 ha and a biodiversity constraints assessment was completed over this area, including vegetation mapping, habitat mapping and BAM plots (Figure 6.1). The detailed vegetation plots provided an estimate of the vegetation integrity score, which was used to assess the quality of vegetation present, in addition to the habitat-based assessment for threatened species.

Whilst the study area had few constraints given its agricultural use and high levels of disturbance, the highest biodiversity values were associated with Zone 1 (PCT 510_poor). This PCT, despite being degraded, represents a TEC under the BC Act. In addition, planted native vegetation recorded in the north of the study area is also likely to provide habitat for common native fauna species.

As a result of this advice and in conjunction with other specialist studies such as Aboriginal cultural heritage, the extent of the modification area was reduced (Table 6.2). The refinements have resulted in 1.33 ha of Box Gum Woodland CEEC, listed under the BC Act, being avoided, with only 0.42 ha remaining within the disturbance area.

**Table 6.2 Vegetation avoided through refinements**

| Plant community type | Condition | Area (ha) |
|---|---|---|
| 510 – Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion | Poor | 1.33 |
| | Pasture | 190.24 |
| | Planted | 1.96 |
| **Total** | | 193.53 |




Source: EMM (2022); UPC (2021); DFSI (2017, 2022); GA (2011)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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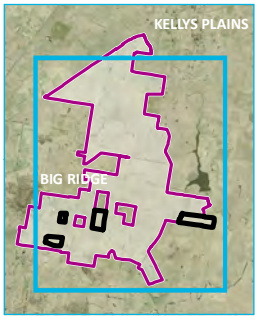



KEY

- Proposed project boundary
- Modification area
- Study area
- Minor road
- Named watercourse
- Waterbody
- Cadastral boundary

PCT 510 | Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion

- Poor
- Planted
- Pasture

# Avoidance of biodiversity values

New England Solar and Battery Project
Biodiversity Development Assessment Report
Figure 6.1

EMM creating opportunities

## 6.4 Serious and irreversible Impacts

### 6.4.1 Threatened ecological communities

The BAM (DPIE 2020a) requires additional impact assessment for TECs that are also listed as candidate entities for Serious and Irreversible Impacts (SAII). Table 6.3 provides an assessment of White Box Yellow Box Blakely's Red Gum Woodland against the assessment criteria provided in Section 9.1.1 of BAM (DPIE 2020a).

**Table 6.3 SAII assessment for White Box Yellow Box Blakely's Red Gum Woodland**

| Assessment question | Response |
|---|---|
| What is the action and what measures have been taken to avoid direct and indirect impacts on the SAII candidate entity? | The action is to modify SSD-9255 to amend the project boundary and development footprint as detailed in Section 1.3.<br>Measures taken to avoid direct and indirect impacts on the CEEC are detailed in Section 6.3. This includes avoidance of 1.43 ha of disturbed woodland, which meets the BC Act Box Woodland definition. |
| What is the area (ha) and condition (ie vegetation integrity score for each vegetation zone) of the TEC to be directly and indirectly impacted by the proposed development? | **Vegetation zone:** 510_poor<br>**Direct impacts (ha)**: 0.42<br>**VI score:** 25.1 |
| To what extent does the impact exceed the threshold for the candidate entity in *Guidance to assist a decision-maker to determine a serious and irreversible impact?* | There are no thresholds specified for the ecological community. |
| What is the extent and overall condition of the TEC within a 1,000 ha and 10,000 ha buffer of the development footprint? | The extent of the TEC within a 1,000 ha and 10,000 ha buffer of the modification is 0.64 ha and 501.33 ha, respectively (EMM 2018 and VIS map 524, DPE 2010).<br>The TEC is highly fragmented in the region and varies in condition from poor to high, depending on the level of agricultural disturbance. |
| What is the extant area and overall condition of the TEC remaining in the IBRA subregion before and after the proposed development? | The estimated extant area (OEH 2018) of the TEC in the Armidale IBRA subregion is 28,233.30 ha. Following the modification, it is estimated to reduce to 28,232.88 ha (ie a reduction of less than 0.002%). |
| How much (ha) of the TEC is reserved within the IBRA region and IBRA subregion? | It is estimated that 440.99 ha of the TEC (OEH 2018) is reserved in the Armidale IBRA subregion, and 12,318 ha is reserved in the New England Tableland IBRA region (DPIE 2019; OEH 2015; OEH 2018). |
| What is the development's impact on: | |
| Abiotic factors critical to the long-term survival of the TEC (eg how much the impact will lead to a reduction of groundwater levels or alter surface flow patterns)? | The modification will remove a small patch of degraded TEC, with no TEC retained within the modification area, hence abiotic impacts are not applicable within the modification area. Given that groundwater will not be impacted and surface water flow patterns will not be significantly affected it is not anticipated that the proposed modification will cause any significant abiotic impacts outside of the modification area. |
| Characteristic and functionally important species through impacts including, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or plant harvesting? | The modification will remove a small patch of degraded TEC, with no TEC retained within the modification area. No habitat will be retained for characteristic and functionally important species. |

### Table 6.3 SAII assessment for White Box Yellow Box Blakely's Red Gum Woodland

| Assessment question | Response |
|---|---|
| The quality and integrity of an occurrence of the TEC through threats and indirect impacts (eg assisting invasive flora and fauna species to become established, mobilising chemicals or fertilisers that may harm or inhibit growth of the TEC)? | The modification will remove a small patch of degraded TEC, with no TEC retained.<br>Outside of the modification area, the TEC is in poor condition with very small patch sizes, highly fragmented, grazed and surrounded by pasture.<br>Given the current land use and disturbance, it is not anticipated that the proposed modification will exacerbate threats and indirect impacts beyond those already present, especially when the mitigation measures outlined in Section 6.3 are enacted.<br>Moderate or high condition TEC are absent or sufficiently disjunct so that no indirect impacts or threats from the proposed modification will occur. |
| Will an important area of the TEC be directly or indirectly fragmented or isolated? | The patch of TEC removed is surrounded by low value grassland and connectivity will not be impacted, given the already very high levels of fragmentation and lack of any corridors of woody vegetation or grassland which meet the TEC listing. |
| What measures are proposed to assist with the TEC's recovery in the IBRA subregion? | There are no thresholds specified for the ecological community. |

SAII were also considered as part of the main project BDAR (EMM 2018) and amendment report (EMM 2019a). Two vegetation zones of PCT 510 – Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion were considered as potentially meeting the SAII principle for the TEC listing of White Box Yellow Box Blakely's Red Gum Woodland (Table 6.4).

### Table 6.4 Vegetation zones considered for SAII in the approved project

| Plant community type | Vegetation zone | ha | VIS |
|---|---|---|---|
| 510 – *Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion* | Woodland | 36.0 | 11 |
| 510 – *Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion* | Pasture | 985.1 | 13.6 |

These reports concluded that, given the low condition of the two zones (which are below the offsetting threshold), SAII did not require any further consideration. No SAII impacts were triggered or highlighted as part the approval process for SSD-9255. The proposed modification will increase clearance of low-quality Box Gum woodland from 36 ha (Table 6.4) to 36.42 ha (PCT 510 poor), a change of +1.7 %. Any cumulative effects upon SAII are therefore considered negligible.

## 6.5 Impacts not requiring offsets

In accordance with Section 9.2.1 of BAM (DPIE 2020a), impacts on vegetation zones and threatened species habitat do not require offsets where:

- a vegetation zone representative of a critically endangered or endangered ecological community has a vegetation integrity score less than 15; and/or
- a vegetation zone representative of a vulnerable ecological community and/or threatened species habitat has a vegetation integrity score less than 17; and/or
- a vegetation zone that is not listed has a vegetation integrity score less than 20.

Table 6.5 provides a summary of the vegetation zones that do not trigger the above thresholds.

**Table 6.5 Summary of ecosystem credits required for all vegetation zones**

| Vegetation zone | Area (ha) | Vegetation integrity score | Future vegetation integrity score | Change in vegetation integrity score | Credits required |
|---|---|---|---|---|---|
| Zone 2 (PCT 510_pasture) | 86.31 | 6.7 | 0 | -6.7 | 0 |

## 6.6 Impacts requiring offset

This section provides an assessment of the impacts requiring offsetting in accordance with Section 9.2 of BAM (DPIE 2020a).

### i Impacts on native vegetation

Impacts to native vegetation requiring offsets include:

- direct impacts on 0.42 ha of PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (PCT 510_poor).

A summary of the ecosystem credits required for all vegetation zones, including changes in vegetation integrity score, are provided in Table 6.6. A total of seven ecosystem credits are required to offset the residual impacts of the proposed modification (refer to Figure 6.2).

A credit report is provided in Appendix D.

**Table 6.6 Summary of ecosystem credits required for all vegetation zones**

| Vegetation Zone | Area (ha) | Vegetation integrity score | Future vegetation integrity score | Change in vegetation integrity score | Credits required |
|---|---|---|---|---|---|
| Zone 1 (PCT 510_poor) | 0.42 | 25.1 | 0 | 25.1 | 7 |

#### ii Impacts on threatened species

No species credit species were recorded within the modification area, or are anticipated to occur; therefore, no species credits are required.

## 6.7 Biodiversity offset framework

Offsets will be provided through implementation of the biodiversity offset scheme. The following section outlines several methods which ACEN Australia can use to compensate the impacts of the proposed modification.

ACEN Australia are committed to satisfying all offset requirements before any impacts associated with the proposed modification occur. ACEN Australia may use a single method or a combination of the three methods outlined below; however, their strategy will generally take the following approach:

1. Identify if suitable credits are available on the market to meet offset requirements.

2. Identify potential on-site or off-site offset sites with the biodiversity values required to compensate for the impacts associated with the proposed modification.

3. Pay into the Biodiversity Conservation Trust.

### 6.7.1 Purchasing credits

Providing suitable credits are available, ACEN Australia may be able to purchase existing credits on the market and retire these to satisfy offset obligations. Initially, like-for-like options should be fully investigated before any variation criteria is explored under clause 6.2 of the BC Regulation. Like-for-like attributes for PCT 510 are outlined below:

- hollow bearing trees must be present;

- the community needs to be within any IBRA subregion that is within 100 km of the outer edge of the modification area or in one of the following IBRA subregions – Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs; and

- PCT 510 can be offset with PCTs which meet the White Box Yellow Box Blakely's Red Gum Woodland TEC[1].

### 6.7.2 Establishment of a biodiversity stewardship site

ACEN Australia have the option to establish a biodiversity stewardship agreement by acquiring suitable land or using any existing land holdings. This involves permanent conservation and management of the biodiversity values on the land.

Given the small number of credits required this is unlikely to be a practical option, unless the intention is to generate excess credits for use on other projects or to sell.

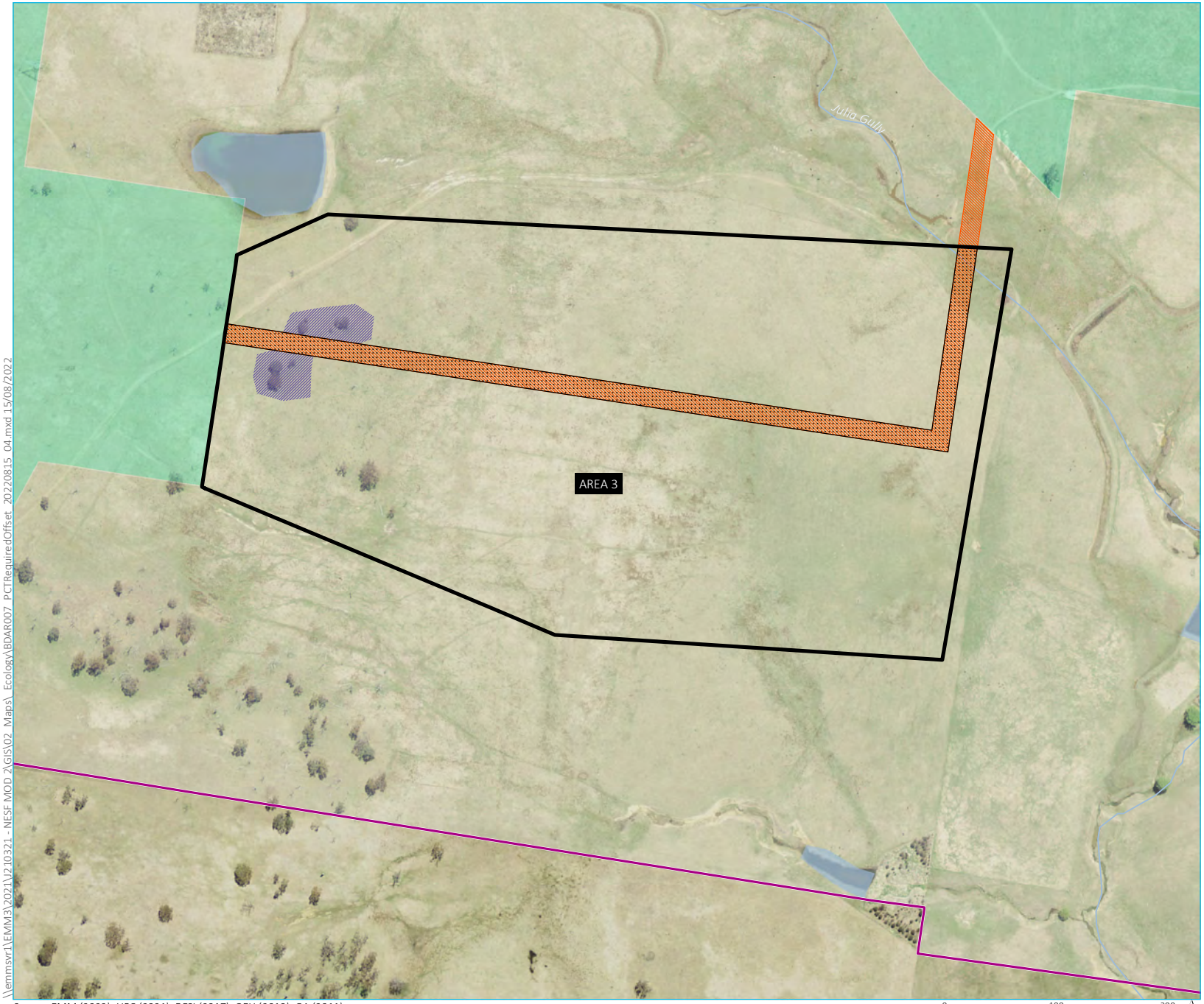
[1] This includes PCT 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 506, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1601, 1606, 1608, 1611, 1691, 1693, 1695 and 1698

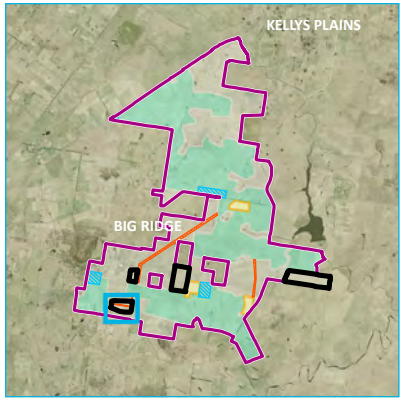
### 6.7.3 Payment into the Biodiversity Conservation Trust

Payment into the Biodiversity Conservation Trust (BCT) can be achieved once the proposed modification is approved and SSD-9255 is amended to specify the number and type of credits to be retired.

This option is low risk and removes any further obligation for ACEN Australia, once payment is made. An administration fee and a risk loading are applied to credits purchased through the BCT, which may result in higher per credit costs.

[2] Price quoted on 1 March 2022.




KEY

- Proposed project boundary
- Modification area
- Named watercourse
- Waterbody
- Area already assessed under original project

PCT requiring offset

- PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (poor)

Approved development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint

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*Source: EMM (2022); UPC (2021); DFSI (2017); OEH (2019); GA (2011)*

0 100 200 m

GDA 1994 MGA Zone 56

N

# Plant Community Types requiring offsets

New England Solar and Battery Project
Biodiversity Development Assessment Report
Figure 6.2

EMM creating opportunities

# 7 Assessment of other relevant biodiversity legislation

## 7.1 Environment Protection and Biodiversity Conservation Act 1999

This chapter provides an assessment of the proposed modification's impacts specific to species and communities listed under the EPBC Act. A likelihood of occurrence assessment for protected matters is presented in Table 7.2 to Table 7.5.

The main project BDAR also considered MNES with five assessments of significance completed for three threatened species (Regent Honeyeater, Painted Honeyeater and Swift Parrot) and two migratory species (White-throated Needletail and Fork-tailed Swift) (EMM 2018). All of the assessments concluded that no significant impacts on threatened entities were predicted to result from the project and the project was not referred.

An assessment of the impacts for the proposed modification on MNES within the modification area was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. MNES relevant to the modification area are summarised in Table 7.1.

No threatened or migratory species are anticipated to occur within the modification area given a lack of suitable habitat. As such no significant impacts will occur and referral of the proposed modification to the Commonwealth Minister for the Environment for assessment is not required.

**Table 7.1 Assessment of the proposed modification against the EPBC Act**

| MNES | Project specifics | Potential for significant impacts |
|---|---|---|
| Threatened species | Eight flora species and seventeen fauna species have been recorded or are predicted to occur within the locality. All of these species are considered unlikely to occur within the modification area owing to the high levels of disturbance present.<br>Sup-optimal foraging habitat is considered present for three threatened species; Regent Honeyeater, Painted Honeyeater and Swift Parrot; however, impacts were concluded not significant. | Significant impact unlikely to result from the proposed modification. |
| Threatened ecological communities | No threatened ecological communities, as listed under the EPBC Act, were recorded within the modification area.<br>PCT 510_poor has the potential to be aligned with the critically endangered White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC. However, the community within the modification area is considered too degraded and is no longer a viable part of the ecological community, therefore not meeting the listing (refer Section 4.3.2i). | Significant impact unlikely to result from the proposed modification. |
| Migratory species | Eleven migratory species have been recorded or are predicted to occur within the locality. The modification area does not provide important habitat for an ecologically significant proportion of any of these species. | Significant impact unlikely to result from the proposed modification. |
| Wetlands of international importance | The modification area does not flow directly into a Ramsar site and the proposed modification is not likely to result in a significant impact. The nearest Ramsar wetland is the Gwydir wetlands, approximately 230 km north-west of the modification area. | Significant impact unlikely to result from the proposed modification. |

## Table 7.2 Likelihood of occurrence for listed ecological communities

| Ecological community | EPBC Act status | Likelihood of occurrence | Habitat requirements | Likelihood of occurrence |
|---|---|---|---|---|
| New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands | CE | Absent | The ecological community occurs in northern NSW in the New England Tablelands. The tree canopy is typically dominated or co-dominated by New England Peppermint. Other associated tree species that may be present and may be co-dominant are Snow Gum (*Eucalyptus pauciflora*) and Mountain Gum (*Eucalyptus dalrympleana* subsp. *heptantha*). Understorey is made up of a dense, species-rich ground layer of grasses and herbs. Shrubs are typically sparse to absent. This ecological community mostly occupies sites in valley bottoms, flats or lower slopes, often in areas subject to cold air drainage. It may occur on basaltic, granitic or sedimentary substrates. | The species composition of the vegetation within the modification area is not consistent with this TEC. The PCTs within the modification area are not associated with this TEC. |
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | CE | Absent | This ecological community occurs along the western slopes and tablelands of the Great Diving Range through NSW in the New England Tableland. This ecological community can occur either as woodland or derived grassland. The ecological community must be, or have previously been, dominated or co-dominated by one or more of the following overstorey species: White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) or Blakely's Red Gum (*E. blakelyi*). The community must have a predominately native understorey with 12 or more understorey species, shrubs are generally sparse or absent. | The modification area contains PCT 510, which is associated with this TEC. However, the vegetation within the modification area does not meet the conditions outlined within the EPBC Act listing for the TEC. |

Notes: 1. EPBC status: CE- critically endangered, Mi – migratory

## Table 7.3 Likelihood of occurrence for threatened flora

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference and rationale | Rationale |
|---|---|---|---|---|---|
| *Arthraxon hispidus* | Hairy-joint Grass | V | Unlikely | A moisture and shade-loving grass, found in or on the edges of rainforest and in wet eucalypt forest, often near creeks or swamps. Occurs over a wide area in south-east Queensland, and on the northern tablelands and north coast of NSW. | Shady areas with moisture are lacking from the modification area. |
| *Callistemon pungens* | | V | Unlikely | The species occurs from Inverell to the eastern escarpment in New England National Park. It occurs along rocky watercourses usually with sandy granite (or occasionally basalt) creek beds, and generally among naturalised species. Habitats range from riparian areas dominated by *Casuarina cunninghamiana* subsp. *cunninghamiana* to woodland and rocky shrubland. Flowering occurs over spring and summer, mostly in November. | The modification area lacks suitable rocky watercourses or sandy creek beds. Watercourses within the modification area lack suitable woodland or shrubland and are highly disturbed. This species was not recorded and is unlikely to occur within the modification area. |
| *Dichanthium setosum* | Bluegrass | V | Unlikely | Bluegrass occurs on the New England Tablelands. The species is associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil. It is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture. Habitat is generally variously grazed, nutrient-enriched and water-enriched. The species overlaps the TEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. | Given this species can occur in disturbed areas and suitable soil types are present, this species has the potential to occur within the modification area.<br>Targeted surveys for the species did not detect the species, nor was it found during the investigations as part of the main project BDAR (EMM 2018). |
| *Diuris pedunculata* | Small Snake Orchid | E | Unlikely | The Small Snake Orchid is confined to north east NSW, mainly found on the New England Tablelands. The species prefers moist areas, and has been found growing in open areas of dry sclerophyll forests with grassy understories, in riparian forests, swamp forests, and in sub-alpine grasslands and herbfields. It is not often found in dense forests or heavily shrubby areas. Soils are well-structure red-brown clay loams, although can also be found on peaty soils, or on shale and trap soils, on fine granite, and among boulders. Flowering occurs during August to October. | The modification area is highly disturbed with a poor diversity of forb species. High grazing pressure occurs within the modification area and the species is not anticipated to occur due to the highly degraded condition of the modification area. |

## Table 7.3 Likelihood of occurrence for threatened flora

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference and rationale | Rationale |
|---|---|---|---|---|---|
| *Eucalyptus mckieana* | McKie's Stringybark | V | Unlikely | The McKie's Stringybark is confined to the drier western side of the New England Tablelands of NSW. It is found in grassy open forest or woodland on poor sandy loams, most commonly on gently sloping or flat sites. It grows on a range of soil types, including deep clay loams but more commonly on sandy loams. The species overlaps the TEC White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. | The modification area is not on the drier western side of the New England Tablelands and therefore is out of the main species distribution, furthermore targeted surveys did not detect the species. |
| *Eucalyptus nicholii* | Narrow-leaved Peppermint | V | Unlikely | Narrow-leaved Peppermint is sparsely distributed on the New England Tablelands. It occurs in grassy or sclerophyll woodland in association with many other eucalypts that grow in the area. It is often found on shallow soils of slopes and ridges, on infertile soils derived from granite or metasedimentary rock. | Potential habitat for this species occurs within the modification area. However, targeted surveys did not record the species. |
| *Euphrasia arguta* | | CE | Unlikely | The species is known in the NSW north western slopes and tablelands. It grows in grassy areas near rivers at elevations up to 700 m above sea level, with an annual rainfall of 600 mm or regrowth vegetation following clearing of a firebreak. | The modification area is out of the known range of the species. No suitable understorey vegetation is present. The modification area is heavily grazed and disturbed, therefore the species is unlikely to occur within the modification area. |
| *Thesium australe* | Austral Toadflax | V | Unlikely | Austral Toad-flax is found in very small populations scattered across eastern NSW. It occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. It is often found in associated with Kangaroo Grass (*Themeda triandra*). | The modification area is highly degraded lacking suitable groundcover for this species. It is therefore unlikely this species will occur within the modification area, considering heavy grazing and pasture modification. |

Notes: 1. EPBC status: CE- critically endangered, E – Endangered, V – Vulnerable

## Table 7.4 Likelihood of occurrence for threatened fauna

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference | Rationale |
|---|---|---|---|---|---|
| **Birds** | | | | | |
| *Anthochaera phrygia* | Regent Honeyeater | CE | Unlikely | The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. These birds are also found in drier coastal woodlands and forests in some years. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany (*Eucalyptus robusta*) and Spotted Gum (*Corymbia maculata*) forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. | Absent.<br>Potential habitat is extremely degraded and consists of a small patch of woodland with five trees. Furthermore, the landscape is over cleared with small patch of remnant trees, many of which are in poor condition with significant canopy dieback. No records are present within the modification area. |
| *Calidris ferruginea* | Curlew Sandpiper | CE | Unlikely | The Curlew Sandpiper is distributed around most of the Australian coastline, particularly in the Hunter Estuary within NSW. It mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. | The modification area does not contain suitable wetland or estuarine habitat. |
| *Erythrotriorchis radiatus* | Red Goshawk | V | Unlikely | The Red Goshawk is endemic to Australia, sparsely distributed through northern and eastern Australia. It inhabits open woodland and forest, preferring a mosaic of vegetation types, large populations of birds (prey), and permanent water. They are often found in riparian habitats along or near watercourses or wetlands. Preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers. Nests are made in tall trees within 1 km of a watercourse or wetland. | The modification area does not contain suitable permanent watercourses with suitable vegetation layers including mid-storey and understorey species. |
| *Falco hypoleucos* | Grey Falcon | V | Unlikely | The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. | The modification area does not provide suitable habitat, given it is predominately pasture and any woodland is too small in patch size, highly disturbed and fragmented. |

## Table 7.4 Likelihood of occurrence for threatened fauna

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference | Rationale |
|---|---|---|---|---|---|
| *Grantiella picta* | Painted Honeyeater | V | Unlikely | The species is sparsely distributed from south-eastern Australia to north-western Queensland, with its greatest concentrations and breeding locations occurring on the inland slopes of the Great Dividing Range in NSW. It inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of Black Box (*E. largiflorens*) and River Red Gum (E. camaldulensis), Box-Ironbark-Yellow Gum woodlands, Acacia-dominated woodlands, Paperbarks, Casuarina, Callitris, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes. It is more common in wider blocks of remnant woodland than in narrower strips although it breeds in quite narrow roadside strips if ample mistletoe fruit is available. | The modification area does not provide suitable habitat, given it is predominately pasture and any woodland is too small in patch size, highly disturbed and fragmented. |
| *Hirundapus caudacutus* | White-throated Needletail | V | Unlikely | The species is chiefly aerial, though recent evidence suggests roosting in trees also occurs at dusk. The species is most frequently record east of the dividing range and while can occur in almost all habitats, it preferences foraging above woody vegetation heathlands and wetlands. | The modification area is highly disturbed and dominated by low quality grassland, which is unlikely to constitute preferred foraging habitat for the species. |
| *Lathamus discolour* | Swift Parrot | CE | Unlikely | The Swift Parrot breeds in Tasmania during spring and summer, then migrates in the autumn and winter months to south-eastern Australia. In NSW, it mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood (*C. gummifera*), Mugga Ironbark and White Box. Commonly used lerp infested trees include Inland Grey Box, Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*). | The modification area does not provide suitable habitat, given it is predominately pasture with woodland too small in patch size, highly disturbed and fragmented. |
| *Rostratula australis* | Australian Painted-snipe | E | Unlikely | The Australian Painted Snipe is restricted to Australia, most records from the south east, particularly the Murray Darling Basin. The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. The species also uses inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Nests are made on the ground amongst tall vegetation, such as grasses, tussocks or reeds. | The modification area does not contain suitable wetland habitat. |

## Table 7.4 Likelihood of occurrence for threatened fauna

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference | Rationale |
|---|---|---|---|---|---|
| **Frogs** | | | | | |
| *Litoria castanea* | Yellow-spotted Tree Frog | E | Unlikely | The Yellow-spotted Tree Frog is known from the New England Tableland. The species requires large permanent ponds or slow flowing 'chain-of-ponds' streams with abundant emergent vegetation such as bulrushes and aquatic vegetation. During breeding season, males call at night from the open water. During autumn and winter the Yellow-spotted Tree Frog shelters under fallen timber, rocks, other debris or thick vegetation. | The modification area is highly degraded due to historical grazing. No suitable breeding habitat is present. Waterbodies are minimal and lack necessary aquatic vegetation and understorey vegetation. As such, this species is considered unlikely to occur within the modification area. |
| *Litoria piperata* | Peppered Tree Frog | V | Unlikely | Found in streamside vegetation and under rocks and fallen timber along rocky streams flowing eastward from the Tablelands. The species has not been definitely recorded in the wild since the 1970s. It was previously found on the New England Tablelands from south of Armidale to the Gibraltar Range, at an altitude of 800 to 1,000 m. | The modification area is highly degraded due to historical grazing. No suitable breeding habitat is present. |
| **Mammals** | | | | | |
| *Chalinolobus dwyeri* | Large-eared Pied Bat | V | Unlikely | In NSW this species has been recorded from a large range of vegetation types including: dry and wet sclerophyll forest; Cyprus Pine (Callitris glauca) dominated forest; tall open eucalypt forest with a rainforest sub-canopy; sub-alpine woodland; and sandstone outcrop country. The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging. | The modification area does not contain suitable roosting habitat, lacking caves and sandstone cliffs. Vegetation within the modification area is sparse and scattered, lacking suitable vegetation cover. Therefore, it is unlikely the species occurs within the modification area. |

## Table 7.4 Likelihood of occurrence for threatened fauna

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference | Rationale |
|---|---|---|---|---|---|
| *Dasyurus maculatus maculatus* (SE mainland population) | Spotted-tailed Quoll | E | Unlikely | This species has been recorded from a wide range of habitats, including: coastal heathlands, open and closed eucalypt woodlands, wet sclerophyll and lowland forests (OEH, 2017l). Unlogged forest or forest that has been less disturbed by timber harvesting is preferable. Habitat requirements include suitable den sites such as hollow logs, tree hollows, rocky outcrops or caves. Individuals require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage. Home ranges are estimated to be 620–2,560 ha for males and 90–650 ha for females. | Suitable woodland habitat within the modification is absent with a lack of structural attributes for den sites. |
| *Petauroides volans* | Greater Glider | V | Unlikely | The Greater Glider is restricted to eastern Australia. The Greater Glider is an arboreal nocturnal marsupial largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. During the day it shelters in tree hollows, with a particular selection for large hollows in large, old trees. | The Greater Glider is unlikely to occur within the modification area as they favour moist eucalypt forests with dense cover and old trees. The modification area is highly degraded and grazed, lacking vegetation cover and large patches of suitable eucalypt forest. As such, this species is considered unlikely to occur within the modification area. |
| *Phascolarctos cinereus* | Koala | V | Unlikely | The Koala has a fragmented distribution throughout eastern Australia. Within NSW it mainly occurs on the central and north costs with some populations in the west of the Great Diving Range. Koalas inhabit a range of temperate, sub-tropical and topical forest, woodland and semi-arid communities dominated by Eucalypt species (DoEE 2012). Koalas feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species (OEH 2018). Distribution is affected by altitude, temperature and leaf moisture. | The only woodland within the modification area is small in size, highly disturbed with no connectivity to other areas of habitat. No suitable Koala habitat exists within the modification area. |

## Table 7.4 Likelihood of occurrence for threatened fauna

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference | Rationale |
|---|---|---|---|---|---|
| *Pteropus poliocephalus* | Grey-headed Flying-fox | V | Unlikely | The Grey-headed Flying-fox is generally found within 200 km of the eastern coast of Australia. They occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. This species feeds on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. | Pasture dominates the modification area. Tree habitat within the modification area is limited to a small patch of disturbed woodland and scattered trees. As such, this species is considered unlikely to occur within the modification area. |
| **Reptiles** | | | | | |
| *Uvidicolus sphyrurus* | Border Thick-tailed Gecko | V | Unlikely | The Border Thick-tailed Gecko is found only on the tablelands and slopes of northern NSW and southern Queensland. The species is most common in the granite country of the New England Tablelands. This species often occurs on steep rocky or scree slops, especially granite. Favouring forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Commonly found in areas which often have a dense tree canopy, helping create a sparse understorey. The Border Thick-tailed Gecko is active during the night, sheltering by day under rock slabs, in or under logs, and under the bark of standing trees. | The modification area lacks suitable dense vegetation for the Border Thick-tailed Gecko. The modification area is highly disturbed from historical grazing, missing sufficient understorey and leaf litter. As such, this species is considered unlikely to occur within the modification area. |
| *Wollumbinia belli* | Bell's Turtle | V | Unlikely | Within NSW, the species is found in the upper reaches of the Namoi, Gwydir and MacDonald Rivers on the North West Slopes. The Bell's Turtle inhabits narrow sections of rivers in granite country, preferring shallow to deep pools in upper reaches or small tributaries of major rivers. Favoured pools are generally less than 3 m deep, where there is a sandy or rocky substrate with small patches of weed. Much of the species habitat is now in grazing land where introduced willow trees grow alongside gum trees on the river banks. Nests are dug out in riverbanks of sand or loam between September and January. | The modification area does not contain suitable aquatic habitat for the species. Nearby watercourses are outside of the known catchments where this species occurs. As such, this species is considered unlikely to occur within the modification area. |

Notes: 1. EPBC status: CE- critically endangered, E – Endangered, V – Vulnerable

## Table 7.5 Likelihood of occurrence for migratory species

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference and rationale | |
|---|---|---|---|---|---|
| **Migratory marine birds** | | | | | |
| *Apus pacificus* | Fork-tailed Swift | Mi | Potential | The Fork-tailed Swift has been recorded in all regions within NSW. Many records occur east of the Great Divide, however some populations have been found west. The Fork-tailed Swift is almost exclusively aerial. Within Australia they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands. Habitats include riparian woodland and tea-tree swamps, low scrub and heathland or saltmarsh. Sometimes they can occur above rainforests, wet sclerophyll forest or open forest. | The modification area is highly disturbed and dominated by low quality grassland, which is unlikely to constitute preferred foraging habitat for this species. |
| **Migratory terrestrial species** | | | | | |
| *Hirundapus caudacutus* | White-throated Needletail | Mi | Potential | The White-throated Needletail is widespread in eastern and south-eastern Australia. In NSW this species extends inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. | The modification area is highly disturbed and dominated by low quality grassland, which is unlikely to constitute preferred foraging habitat for this species. |
| *Monarcha melanopsis* | Black-faced Monarch | Mi | Unlikely | The Black-faced Monarch occurs around the eastern slopes and tablelands of the Great Divide. It mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland and warm temperate rainforest. It is also found in nearby open eucalypt forests, including in gullies with a dense, shrubby understorey as well as in dry sclerophyll forests and woodlands, often with a patchy understorey. | The modification area is highly disturbed lacking suitable dense shrubby forests. Eucalypt woodlands are sparse within grazed paddocks. As such, this species is considered unlikely to occur within the modification area. |
| *Motacilla flava* | Yellow Wagtail | Mi | Unlikely | This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. | No suitable damp/wet habitats exist within the modification area. |

## Table 7.5 Likelihood of occurrence for migratory species

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference and rationale | |
|---|---|---|---|---|---|
| *Myiagra cyanoleuca* | Satin Flycatcher | Mi | Unlikely | The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand. Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands. They also occur in eucalypt woodlands with open understorey and grass ground cover, and are generally absent from rainforest. The species is mainly recorded in eucalypt forests dominated by Brown Barrel (*Eucalypt fastigata*), Mountain Gum (*E. Dalrympleana*), Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash (*E. Regnans*). Such forests usually have a tall shrubby understorey of tall acacias, for example Blackwood (*Acacia melanoxylon*). | The modification area is highly degraded due to historical grazing. The modification area is not suitable for the Satin Flycatcher as it lacks mid storey and understorey vegetation. As such, this species is considered unlikely to occur within the modification area. |
| *Rhipidura rufifrons* | Rufous Fantail | Mi | Unlikely | In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (*Eucalyptus microcorys*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns. | The modification area is highly degraded due to historical grazing. The modification area does not contain suitable wet sclerophyll forests or dense vegetated understorey. As such, this species is considered unlikely to occur within the modification area. |
| **Migratory wetlands species** | | | | | |
| *Actitis hypoleucos* | Common Sandpiper | Mi | - Unlikely | The Common Sandpiper is found along all coastlines of Australia and in many areas inland. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper forages in shallow water and on bare soft mud at the edges of wetlands. Roosting sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is also associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. | The modification area lacks suitable wetlands habitat. |

## Table 7.5 Likelihood of occurrence for migratory species

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference and rationale | |
|---|---|---|---|---|---|
| *Calidris acuminata* | Sharp-tailed Sandpiper | Mi | - Unlikely | The Sharp-tailed Sandpiper spends its non-breeding season in Australia. During this time the species is widespread along much of the coast and is very sparsely scattered inland, particularly in central and south-western regions. Within Australia the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast. They also use flooded paddocks, sedgelands and other ephemeral wetlands. Roosting occurs at the edges of wetlands, on wet open mud or sand, in shallow water or in sparse vegetation. | The modification area lacks suitable wetlands habitat. |
| *Calidris ferruginea* | Curlew Sandpiper | CE, Mi | - Unlikely | Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. | The modification area lacks suitable wetlands habitat. |
| *Calidris melanotos* | Pectoral Sandpiper | Mi | Unlikely | The Pectoral Sandpiper prefers shallow fresh to saline wetlands. It is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. They forage in shallow water or soft mud at the edge of wetlands. | The modification area lacks suitable wetlands habitat. |
| *Gallinago hardwickii* | Latham's Snipe | Mi | Unlikely | Latham's Snipe extends inland over the eastern tablelands in south-eastern Queensland and to west of the Great Dividing Range in NSW. Within Australia it occurs in permanent and ephemeral wetlands, usually favouring open, freshwater wetlands with low, dense vegetation. They also occur in habitats with saline or brackish water, in modified or artificial habitats and areas located close to humans. It occurs in temperate and tropical regions of Australia. Foraging occurs in areas of mud and some form of cover. Roosting occurs on the ground near foraging areas, usually in sites providing some ditches or plough marks, among boulders or in shallow water. | The modification area lacks suitable wetlands habitat. |

## Table 7.5 Likelihood of occurrence for migratory species

| Scientific name | Common name | EPBC Act status[1] | Likelihood of occurrence | Habitat preference and rationale | |
|---|---|---|---|---|---|
| *Pandion haliaetus* | Osprey | Mi | Unlikely | The Osprey is found right around the Australian coastline, common around the northern coast on rocky shorelines, islands and reefs. The species favours coastal areas, especially the mouths of large rivers, lagoons and lakes. The Osprey occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia. They require extensive areas of open fresh, brackish or saline water for foraging. | The modification area lacks suitable wetlands habitat. |

Notes: 1. EPBC status: CE- critically endangered, Mi - migratory

## 7.2 Environmental Planning and Assessment Act 1979

### 7.2.1 Koala SEPP 2020

The Koala SEPP 2020 applies to the proposed modification (ie rather than Koala SEPP 2021) given that the land is zoned RU1 Primary Production under the Uralla LEP. The policy defines Koala habitat as:

- potential Koala habitat: areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component; and
- core Koala habitat: an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

The main project BDAR (EMM 2018) considered that Koala had a low likelihood of occurrence within the development footprint; however, targeted surveys were undertaken on a conservative basis. Scat searches were undertaken within the largest and most optimal patches of woodland (albeit these were still considered suboptimal). No signs or observations of Koala were recorded for the main project BDAR (EMM 2018) and it was concluded that potential and core habitat was absent from the development footprint.

No feed tree species listed in Schedule 2 of Koala SEPP 2020 occur in the modification area. Therefore, the modification area is not considered potential Koala habitat.

Koala are likely absent from the modification area given the small patch size of woodland, which is limited to five trees. Furthermore, landscape connectivity is very poor with small patches of woodland existing as islands within expanses of grassland. Accordingly, the modification area is unlikely to represent core Koala habitat and no further assessment is required.

## 7.3 Biosecurity Act 2015

The *Hunter Regional Strategic Management Plan* (NTLLS 2017) outlines how government, industry, and the community will share responsibility and work together to identify, minimise, respond to and manage weeds within the Northern Tablelands region. The plan also supports regional implementation of the BS Act. No priority weeds listed under the Northern Tablelands Local Land Services region were recorded.

## 7.4 Water Management Act 2000

Refinements to the modification area have excluded higher order steams (ie fourth order watercourses and above). Watercourses within the modification area are ephemeral and highly modified and, in many cases, indiscernible. Watercourses that are indiscernible are not considered riparian land and will not be subject to avoidance or buffers.

Julia Gully (Figure 3.2), a third order stream in the north-east corner of Area 3, is highly ephemeral with a poorly defined channel and occasional, small shallow pools during wet periods. A 30 m buffer from each edge of the channel will be maintained to minimise potential impacts on downstream water quality and erosion.

Groundwater will not be intercepted for the proposed modification and therefore it does not represent an aquifer interference activity.

# 8 Conclusion

The modification area is contiguous with the main project and is situated in a heavily cleared agricultural landscape dominated by cropped areas, exotic pasture and native pasture. Woodland areas within the modification area are minimal in extent, fragmented and highly disturbed. Measures to avoid and minimise impacts to vegetation were considered during the initial design stages of the modification, with the proposed modification area avoiding all planted and the majority of remnant woodland areas.

One native vegetation zone, PCT 510_pasture, is dominant across much of the modification area. This grassland is highly modified and is below the vegetation integrity score threshold, therefore offsets are not required for this zone. A total of 0.42 ha of poor condition PCT 510 will be cleared as a result of the proposed modification, which generates a total of seven ecosystem credits.

Based on both habitat assessments and field surveys, the modification area is not likely to be important habitat for threatened flora or fauna species and no species credits would be required to offset the proposed modification. One TEC and candidate for SAII, White Box Yellow Box Blakely's Red Gum Woodland was recorded within the modification area; however, the vegetation is highly disturbed, fragmented and small in size (0.42 ha) and it is anticipated that no serious and irreversible impacts will occur. The cumulative impact of the proposed modification and the project (including an approved modification) upon SAII is considered negligible given the very small increase of Box Gum woodland clearance required.

An assessment of impacts on MNES concluded that no significant impacts are anticipated, with an absence of MNES within the modification area. Given the lack of MNES in the modification area, there will be no cumulative impact with the project (including an approved modification). Referral of the proposed modification to the Commonwealth Minister for the Environment for assessment is not required.

# References


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- 2016, *Mitchell Landscapes Version V3.1*.
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# Appendix A

## Vegetation integrity assessment field datasheets

EMM
creating opportunities

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 1 | **Date:** | 11/05/2021 | **Project number:** | J210321 | **Plot dimensions:** | high |
| **Datum:** | ED | **Easting:** | 30 | **Recorders:** | ED | | |
| **Zone:** | 20x50 | **Northing:** | 510 | **IBRA region:** | | **Midline bearing:** | yes |
| **Plant Community Type:** | | | | **Condition class:** | | **PCT confidence:** | |
| **Vegetation Class:** | | | | **EEC:** | | **EEC confidence:** | |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| High Threat Weed cover: | | 0 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| DBH | Tree stem count | Length of logs (m) (≥10 cm diameter, >50 cm in length) | |
| 80 + cm: | | | |
| 50 – 79 cm: | | | |
| 30 – 49 cm: | | | |
| 20 – 29 cm: | | Tree hollow count | |
| 10 – 19 cm: | | | |
| 5 – 9 cm: | | | |
| < 5 cm: | | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| Subplot: | 1 | 2 | 3 | 4 | 5 |
| Subplot score (%): | | | | | |
| Average litter cover (%): | 0 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED | **Plot ID:** | 1 | **Date:** | 11/05/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| | *Anthoxanthum_odoratum_Sweet_Vernal_Grass* | 15 | 1000 | | |
| | *Elymus_scabrus* | 5 | 500 | | |
| | *Asperula_conferta_Common_Woodruff* | 0.1 | 10 | | |
| | *Bromus_catharticus_Prairie_Grass* | 15 | 400 | | |
| | *Carthamus_lanatus_Saffron_Thistle* | 0.1 | 5 | | |
| | *Pennisetum_sp_Swamp_Foxtail* | 0.1 | 5 | | |
| | *Chloris_truncata_Windmill_Grass* | 15 | 1000 | | |
| | *Conyza_bonariensis_Fleabane* | 0.1 | 20 | | |
| | *Eragrostis_alveiformis* | 20 | 1000 | | |
| | *Eragrostis_pilosa_Soft_Lovegrass* | 15 | 1000 | | |
| | *Euchiton_involucratus_Star_Cudweed* | 0.1 | 10 | | |
| | *Fimbristylis_velata* | 0.1 | 10 | | |
| | *Gamochaeta_americana_Cudweed* | 0.1 | 20 | | |
| | *Geranium_solanderi_Native_Geranium* | 0.1 | 5 | | |
| | *Holcus_lanatus_Yorkshire_Fog* | 5 | 500 | | |
| | *Juncus_australis_Rush* | 0.1 | 10 | | |
| | *Lachnagrostis_filiformis* | 3 | 500 | | |
| | *Sporobolus_creber_Slender_Rats_Tail_Grass* | 20 | 1000 | | |
| | *Eleusine_tristachya_Goose_Grass* | 2 | 400 | | |
| | *Trifolium_repens_White_Clover* | 0.5 | 60 | | |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 2 | **Date:** | 12/05/2021 | **Project number:** | J210321 | **Plot dimensions:** | high |
| **Datum:** | ED | **Easting:** | 212 | **Recorders:** | ED | | |
| **Zone:** | 20 x 50 | **Northing:** | 510 | **IBRA region:** | | **Midline bearing:** | yes |
| **Plant Community Type:** | | | | **Condition class:** | | **PCT confidence:** | |
| **Vegetation Class:** | | | | **EEC:** | | **EEC confidence:** | |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| High Threat Weed cover: | | 0 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| DBH | Tree stem count | Length of logs (m) (≥10 cm diameter, >50 cm in length) | |
| 80 + cm: | | | |
| 50 – 79 cm: | | | |
| 30 – 49 cm: | | | |
| 20 – 29 cm: | | Tree hollow count | |
| 10 – 19 cm: | | | |
| 5 – 9 cm: | | | |
| < 5 cm: | | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| Subplot: | 1 | 2 | 3 | 4 | 5 |
| Subplot score (%): | | | | | |
| Average litter cover (%): | 0 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED | **Plot ID:** | 2 | **Date:** | 12/05/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| | *Conyza_bonariensis_Fleabane* | 0.1 | 10 | | |
| | *Gamochaeta_americana_Cudweed* | 0.1 | 10 | | |
| | *Sporobolus_creber_Slender_Rats_Tail_Grass* | 65 | 1000 | | |
| | *Bothriochloa_decipiens_Red_Grass* | 20 | 1000 | | |
| | *Eragrostis_alveiformis* | 2 | 500 | | |
| | *Hypochaeris_radicata_Catsear* | 0.2 | 40 | | |
| | *Eragrostis_pilosa_Soft_Lovegrass* | 5 | 809 | | |
| | *Oxalis_perennans* | 0.1 | 40 | | |
| | *Rumex_brownii_Swamp_Dock* | 0.1 | 10 | | |
| | *Paronychia_brasiliana_Chilean_Whitlow_Wort_Brazilian_Whitlow* | 0.5 | 50 | | |
| | *Cotula_australis_Common_Cotula* | 0.1 | 20 | | |
| | *Anthoxanthum_odoratum_Sweet_Vernal_Grass* | 5 | 400 | | |
| | *Bromus_catharticus_Prairie_Grass* | 3 | 200 | | |
| | *Cynodon_dactylon_Common_Couch* | 5 | 300 | | |
| | *Eleusine_tristachya_Goose_Grass* | 5 | 600 | | |
| | *Rytidosperma_laeve_Wallaby_Grass* | 0.2 | 50 | | |
| | *Rytidosperma_erianthum_Wallaby_Grass* | 0.2 | 50 | | |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 3 | **Date:** | 12/05/2021 | **Project number:** | J210321 | **Plot dimensions:** | high |
| **Datum:** | ED | **Easting:** | 50 | **Recorders:** | ED | | |
| **Zone:** | 20 x 50 | **Northing:** | 510 | **IBRA region:** | | **Midline bearing:** | yes |
| **Plant Community Type:** | | | | **Condition class:** | | **PCT confidence:** | |
| **Vegetation Class:** | | | | **EEC:** | | **EEC confidence:** | |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| **High Threat Weed cover:** | | 0 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| **DBH** | **Tree stem count** | **Length of logs (m) (≥10 cm diameter, >50 cm in length)** | |
| **80 + cm:** | | | |
| **50 – 79 cm:** | | | |
| **30 – 49 cm:** | | | |
| **20 – 29 cm:** | | **Tree hollow count** | |
| **10 – 19 cm:** | | | |
| **5 – 9 cm:** | | | |
| **< 5 cm:** | | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| **Subplot:** | **1** | **2** | **3** | **4** | **5** |
| **Subplot score (%):** | | | | | |
| **Average litter cover (%):** | 0 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED | **Plot ID:** | 3 | **Date:** | 12/05/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| | *Hypochaeris_glabra_Smooth_Catsear* | 0.5 | 80 | | |
| | *Lomandra_longifolia_Spiny_headed_Mat_rush* | 0.1 | 10 | | |
| | *Sporobolus_creber_Slender_Rats_Tail_Grass* | 10 | 1000 | | |
| | *Cymbonotus_lawsonianus* | 0.1 | 10 | | |
| | *Hypochoeris_radicata_Catsear* | 0.1 | 10 | | |
| | *Eleusine_tristachya_Goose_Grass* | 15 | 1000 | | |
| | *Cynodon_dactylon_Common_Couch* | 20 | 1000 | | |
| | *Chloris_truncata_Windmill_Grass* | 10 | 500 | | |
| | *Bothriochloa_decipiens_Red_Grass* | 10 | 800 | | |
| | *Rytidosperma_laeve_Wallaby_Grass* | 10 | 1000 | | |
| | *Rytidosperma_erianthum_Wallaby_Grass* | 5 | 500 | | |
| | *Rytidosperma_bipartitum_Wallaby_Grass* | 5 | 500 | | |
| | *Eragrostis_aspera* | 1 | 200 | | |
| | *Eragrostis_pilosa_Soft_Lovegrass* | 10 | 500 | | |
| | *Bromus_catharticus_Prairie_Grass* | 3 | 400 | | |
| | *Gamochaeta_americana_Cudweed* | 0.1 | 50 | | |
| | *Trifolium_repens_White_Clover* | 5 | 300 | | |
| | *Paronychia_brasiliana_Chilean_Whitlow_Wort_Brazilian_Whitlow* | 0.1 | 60 | | |
| | *Dichondra_repens_Kidney_Weed* | 0.1 | 5 | | |
| | *Cotula_australis_Common_Cotula* | 0.1 | 39 | | |
| | *Lachnagrostis_filiformis* | 10 | 1000 | | |
| | *Asperula_conferta_Common_Woodruff* | 0.5 | 50 | | |
| | *Euchiton_involucratus_Star_Cudweed* | 0.1 | 20 | | |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 4 | **Date:** | 12/05/2021 | **Project number:** | J210321 | **Plot dimensions:** | high |
| **Datum:** | ED | **Easting:** | 100 | **Recorders:** | ED | | |
| **Zone:** | 20x50 | **Northing:** | 510 | **IBRA region:** | | **Midline bearing:** | yes |
| **Plant Community Type:** | | | | **Condition class:** | | **PCT confidence:** | |
| **Vegetation Class:** | | | | **EEC:** | | **EEC confidence:** | |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| High Threat Weed cover: | | 0 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| DBH | Tree stem count | Length of logs (m) (≥10 cm diameter, >50 cm in length) | |
| 80 + cm: | | | |
| 50 – 79 cm: | | | |
| 30 – 49 cm: | | | |
| 20 – 29 cm: | | Tree hollow count | |
| 10 – 19 cm: | | | |
| 5 – 9 cm: | | | |
| < 5 cm: | | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| Subplot: | 1 | 2 | 3 | 4 | 5 |
| Subplot score (%): | | | | | |
| Average litter cover (%): | 0 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED | **Plot ID:** | 4 | **Date:** | 12/05/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| | *Anthoxanthum_odoratum_Sweet_Vernal_Grass* | 0.5 | 50 | | |
| | *Chloris_truncata_Windmill_Grass* | 10 | 30 | | |
| | *Polygonum_aviculare_Wireweed* | 0.5 | 70 | | |
| | *Juncus_australis_Rush* | 0.1 | 2 | | |
| | *Paspalum_dilatatum_Paspalum* | 0.1 | 4 | | |
| | *Fimbristylis_velata* | 0.1 | 10 | | |
| | *Elymus_scaber_Common_Wheatgrass* | 5 | 20 | | |
| | *Cotula_australis_Common_Cotula* | 0.2 | 100 | | |
| | *Trifolium_repens_White_Clover* | 0.5 | 80 | | |
| | *Geranium_solanderi_Native_Geranium* | 0.5 | 50 | | |
| | *Lomandra_longifolia_Spiny_headed_Mat_rush* | 0.1 | 5 | | |
| | *Eragrostis_alveiformis* | 45 | 1000 | | |
| | *Eragrostis_brownii_Browns_Lovegrass* | 10 | 500 | | |
| | *Lachnagrostis_filiformis* | 2 | 400 | | |
| | *Hypochaeris_radicata_Catsear* | 0.1 | 1 | | |
| | *Oxalis_perennans* | 0.2 | 100 | | |
| | *Conyza_bonariensis_Fleabane* | 0.1 | 10 | | |
| | *Sporobolus_creber_Slender_Rats_Tail_Grass* | 5 | 300 | | |
| | *Gamochaeta_americana_Cudweed* | 0.1 | 10 | | |
| | *Euchiton_involucratus_Star_Cudweed* | 0.1 | 15 | | |
| | *Cynodon_dactylon_Common_Couch* | 10 | 600 | | |
| | *Eleusine_tristachya_Goose_Grass* | 5 | 400 | | |
| | *Rytidosperma_laeve_Wallaby_Grass* | 10 | 100 | | |
| | *Bothriochloa_decipiens_Red_Grass* | 5 | 500 | | |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 5 | **Date:** | 12/05/2021 | **Project number:** | J210321 | **Plot dimensions:** | high |
| **Datum:** | ED | **Easting:** | 27 | **Recorders:** | ED | | |
| **Zone:** | 20x50 | **Northing:** | 510 | **IBRA region:** | | **Midline bearing:** | yes |
| **Plant Community Type:** | | | | **Condition class:** | | **PCT confidence:** | |
| **Vegetation Class:** | | | | **EEC:** | | **EEC confidence:** | |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0 |
| | Ferns: | 0 |
| | Other: | 0 |
| High Threat Weed cover: | | 0 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| DBH | Tree stem count | Length of logs (m) (≥10 cm diameter, >50 cm in length) | |
| 80 + cm: | | | |
| 50 – 79 cm: | | | |
| 30 – 49 cm: | | | |
| 20 – 29 cm: | | Tree hollow count | |
| 10 – 19 cm: | | | |
| 5 – 9 cm: | | | |
| < 5 cm: | | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| Subplot: | 1 | 2 | 3 | 4 | 5 |
| Subplot score (%): | | | | | |
| Average litter cover (%): | 0 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED | **Plot ID:** | 5 | **Date:** | 12/05/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| | *Oxalis_perennans* | 0.1 | 50 | | |
| | *Cynodon_dactylon_Common_Couch* | 60 | 1000 | | |
| | *Elymus_scaber_Common_Wheatgrass* | 0.1 | 30 | | |
| | *Carthamus_lanatus_Saffron_Thistle* | 0.1 | 10 | | |
| | *Eleusine_tristachya_Goose_Grass* | 25 | 1000 | | |
| | *Trifolium_repens_White_Clover* | 1 | 200 | | |
| | *Rytidosperma_laeve_Wallaby_Grass* | 5 | 100 | | |
| | *Rytidosperma_carphoides_Short_Wallaby_Grass* | 0.1 | 20 | | |
| | *Conyza_bonariensis_Fleabane* | 0.1 | 10 | | |
| | *Bromus_catharticus_Prairie_Grass* | 10 | 100 | | |
| | *Sporobolus_creber_Slender_Rats_Tail_Grass* | 0.1 | 20 | | |
| | *Eragrostis_pilosa_Soft_Lovegrass* | 2 | 200 | | |
| | *Bothriochloa_decipiens_Red_Grass* | 0.5 | 60 | | |
| | *Anthoxanthum_odoratum_Sweet_Vernal_Grass* | 0.1 | 10 | | |
| | *Cotula_australis_Common_Cotula* | 0.1 | 30 | | |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 6 | **Date:** | 10/11/21 | **Project number:** | J210321 | **Plot dimensions:** | 20x50 |
| **Datum:** | GDA94 | **Easting:** | 363,199 | **Recorders:** | ED, EJ | | |
| **Zone:** | 56 | **Northing:** | 6,607,810 | **IBRA region:** | Armidale Plateau | **Midline bearing:** | 86 |
| **Plant Community Type:** | 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion | | | **Condition class:** | Poor | **PCT confidence:** | high |
| **Vegetation Class:** | New England Grassy Woodlands | | | **EEC:** | yes | **EEC confidence:** | high |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 2 |
| | Shrubs: | 0 |
| | Grasses etc.: | 3 |
| | Forbs: | 7 |
| | Ferns: | 0 |
| | Other: | 1 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 17 |
| | Shrubs: | 0 |
| | Grasses etc.: | 10.6 |
| | Forbs: | 1 |
| | Ferns: | 0 |
| | Other: | 0.1 |
| High Threat Weed cover: | | 0.1 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| DBH | Tree stem count | Length of logs (m) (≥10 cm diameter, >50 cm in length) | 2 |
| 80 + cm: | 0 | | |
| 50 – 79 cm: | 2 | | |
| 30 – 49 cm: | 1 | | |
| 20 – 29 cm: | 0 | Tree hollow count | 1 |
| 10 – 19 cm: | 1 | | |
| 5 – 9 cm: | 0 | | |
| < 5 cm: | 0 | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| Subplot: | 1 | 2 | 3 | 4 | 5 |
| Subplot score (%): | 3 | 1 | 2 | 2 | 2 |
| Average litter cover (%): | 2 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

Previously grazed and sown exotic grasses

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED, EJ | **Plot ID:** | 6 | **Date:** | 10/11/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| | *Acetosella vulgaris (Sheep Sorrel)* | 0.1 | 10 | | HTE |
| Tree (TG) | *Angophora floribunda (Rough-barked Apple)* | 10 | 1 | | N |
| | *Anthoxanthum odoratum (Sweet Vernal Grass)* | 0.5 | 50 | | E |
| | *Bromus brevis* | 10 | 100 | | E |
| | *Bromus catharticus (Praire Grass)* | 10 | 500 | | E |
| Other (OG) | *Convolvulus angustissimus* | 0.1 | 11 | | N |
| Forb (FG) | *Crassula sieberiana (Australian Stonecrop)* | 0.1 | 20 | | N |
| Forb (FG) | *Cymbonotus lawsonianus (Bear's Ear)* | 0.2 | 40 | | N |
| Grass & grasslike (GG) | *Cynodon dactylon (Common Couch)* | 10 | 300 | | N |
| | *Eleusine tristachya (Goose Grass)* | 5 | 300 | | E |
| Tree (TG) | *Eucalyptus blakelyi (Blakely's Red Gum)* | 7 | 1 | | N |
| | *Gamochaeta calviceps (Cudweed)* | 3 | 300 | | E |
| Forb (FG) | *Geranium solanderi (Native Geranium)* | 0.1 | 10 | | N |
| | *Hypochaeris radicata (Catsear)* | 0.1 | 15 | | E |
| Forb (FG) | *Linum marginale (Native Flax)* | 0.1 | 10 | | N |
| Grass & grasslike (GG) | *Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)* | 0.5 | 50 | | N |
| Forb (FG) | *Oxalis perennans* | 0.2 | 20 | | N |
| | *Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)* | 3 | 200 | | E |
| | *Poa annua (Winter Grass)* | 0.1 | 30 | | E |
| Grass & grasslike (GG) | *Poa labillardierei var. labillardierei (Tussock)* | 0.1 | 10 | | N |
| Forb (FG) | *Rumex brownii (Swamp Dock)* | 0.1 | 2 | | N |
| | *Soliva sessilis (Bindyi)* | 0.1 | 10 | | E |
| Forb (FG) | *Sonchus spp. (Sowthistle)* | 0.2 | 30 | | N |
| | *Trifolium campestre (Hop Clover)* | 5 | 50 | | E |
| | *Trifolium repens (White Clover)* | 5 | 400 | | E |
| | *Trifolium subterraneum (Subterranean Clover)* | 3 | 50 | | E |
| | *Vulpia bromoides (Squirrel Tail Fesque)* | 60 | 1000 | | E |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 7 | **Date:** | 10/11/21 | **Project number:** | J210321 | **Plot dimensions:** | 20x50m |
| **Datum:** | GDA94 | **Easting:** | 363,539 | **Recorders:** | ED, EJ | | |
| **Zone:** | 56 | **Northing:** | 6,607,775 | **IBRA region:** | Armidale Plateau | **Midline bearing:** | 204 |
| **Plant Community Type:** | 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion | | | **Condition class:** | Poor | **PCT confidence:** | high |
| **Vegetation Class:** | New England Grassy Woodlands | | | **EEC:** | yes | **EEC confidence:** | high |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 4 |
| | Forbs: | 5 |
| | Ferns: | 0 |
| | Other: | 0 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 5.5 |
| | Forbs: | 0.5 |
| | Ferns: | 0 |
| | Other: | 0 |
| High Threat Weed cover: | | 3 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| DBH | Tree stem count | Length of logs (m) (≥10 cm diameter, >50 cm in length) | 0 |
| 80 + cm: | 0 | | |
| 50 – 79 cm: | 0 | | |
| 30 – 49 cm: | 0 | | |
| 20 – 29 cm: | 0 | Tree hollow count | 0 |
| 10 – 19 cm: | 0 | | |
| 5 – 9 cm: | 0 | | |
| < 5 cm: | 0 | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| Subplot: | 1 | 2 | 3 | 4 | 5 |
| Subplot score (%): | 1 | 2 | 3 | 1 | 2 |
| Average litter cover (%): | 1.8 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

Previously grazed

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED, EJ | **Plot ID:** | 7 | **Date:** | 10/11/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| Forb (FG) | *Asperula conferta (Common Woodruff)* | 0.1 | 2 | | N |
| | *Bromus catharticus (Praire Grass)* | 1 | 10 | | E |
| | *Bromus diandrus (Great Brome)* | 3 | 40 | | HTE |
| Grass & grasslike (GG) | *Carex inversa (Knob Sedge)* | 0.1 | 10 | | N |
| | *Cirsium vulgare (Spear Thistle)* | 0.1 | 5 | | E |
| Forb (FG) | *Cymbonotus lawsonianus (Bear's Ear)* | 0.1 | 5 | | N |
| Grass & grasslike (GG) | *Cynodon dactylon (Common Couch)* | 5 | 100 | | N |
| | *Gamochaeta calviceps (Cudweed)* | 1 | 100 | | E |
| Forb (FG) | *Geranium solanderi (Native Geranium)* | 0.1 | 5 | | N |
| Grass & grasslike (GG) | *Juncus australis (Rush)* | 0.3 | 5 | | N |
| Forb (FG) | *Linum marginale (Native Flax)* | 0.1 | 35 | | N |
| Grass & grasslike (GG) | *Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)* | 0.1 | 5 | | N |
| | *Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)* | 3 | 100 | | E |
| | *Poa annua (Winter Grass)* | 15 | 500 | | E |
| Forb (FG) | *Rumex brownii (Swamp Dock)* | 0.1 | 5 | | N |
| | *Soliva sessilis (Bindyi)* | 0.1 | 10 | | E |
| | *Sonchus oleraceus (Common Sowthistle)* | 0.1 | 10 | | E |
| | *Trifolium campestre (Hop Clover)* | 2 | 200 | | E |
| | *Trifolium repens (White Clover)* | 5 | 50 | | E |
| | *Trifolium subterraneum (Subterranean Clover)* | 0.5 | 30 | | E |
| | *Vulpia bromoides (Squirrel Tail Fesque)* | 80 | 1000 | | E |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 8 | **Date:** | 11/11/21 | **Project number:** | J210321 | **Plot dimensions:** | 20x50 |
| **Datum:** | GDA94 | **Easting:** | 364,935 | **Recorders:** | ED, EJ | | |
| **Zone:** | 56 | **Northing:** | 6,613,262 | **IBRA region:** | Armidale Plateau | **Midline bearing:** | 157 |
| **Plant Community Type:** | 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion | | | **Condition class:** | Poor | **PCT confidence:** | high |
| **Vegetation Class:** | New England Grassy Woodlands | | | **EEC:** | yes | **EEC confidence:** | high |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 1 |
| | Shrubs: | 0 |
| | Grasses etc.: | 2 |
| | Forbs: | 3 |
| | Ferns: | 0 |
| | Other: | 0 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 10 |
| | Shrubs: | 0 |
| | Grasses etc.: | 10.1 |
| | Forbs: | 0.3 |
| | Ferns: | 0 |
| | Other: | 0 |
| High Threat Weed cover: | | 0 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| DBH | Tree stem count | Length of logs (m) (≥10 cm diameter, >50 cm in length) | 1 |
| 80 + cm: | 0 | | |
| 50 – 79 cm: | 0 | | |
| 30 – 49 cm: | 2 | | |
| 20 – 29 cm: | 0 | Tree hollow count | 0 |
| 10 – 19 cm: | 0 | | |
| 5 – 9 cm: | 0 | | |
| < 5 cm: | 0 | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| Subplot: | 1 | 2 | 3 | 4 | 5 |
| Subplot score (%): | 2 | 2 | 3 | 3 | 2 |
| Average litter cover (%): | 2.4 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

Grazing

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED, EJ | **Plot ID:** | 8 | **Date:** | 11/11/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| | *Bromus catharticus (Praire Grass)* | 60 | 100 | | E |
| | *Capsella bursa-pastoris (Shepherd's Purse)* | 0.1 | 4 | | E |
| Grass & grasslike (GG) | *Carex inversa (Knob Sedge)* | 0.1 | 2 | | N |
| | *Cirsium vulgare (Spear Thistle)* | 8 | 50 | | E |
| | *Conyza bonariensis (Flaxleaf Fleabane)* | 0.1 | 10 | | E |
| Forb (FG) | *Cotula australis (Common Cotula)* | 0.1 | 5 | | N |
| Grass & grasslike (GG) | *Cynodon dactylon (Common Couch)* | 10 | 200 | | N |
| Tree (TG) | *Eucalyptus blakelyi (Blakely's Red Gum)* | 10 | 1 | | N |
| | *Gamochaeta calviceps (Cudweed)* | 0.5 | 100 | | E |
| | *Geranium molle subsp. molle (Cranesbill Geranium)* | 0.1 | 5 | | E |
| Forb (FG) | *Geranium solanderi (Native Geranium)* | 0.1 | 10 | | N |
| | *Holcus lanatus (Yorkshire Fog)* | 0.5 | 20 | | E |
| | *Modiola caroliniana (Red-flowered Mallow)* | 0.1 | 10 | | E |
| | *Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)* | 0.5 | 80 | | E |
| | *Plantago lanceolata (Lamb's Tongues)* | 0.2 | 40 | | E |
| | *Polygonum aviculare (Wireweed)* | 0.1 | 5 | | E |
| Forb (FG) | *Rumex brownii (Swamp Dock)* | 0.1 | 5 | | N |
| | *Sonchus oleraceus (Common Sowthistle)* | 3 | 40 | | E |
| | *Trifolium subterraneum (Subterranean Clover)* | 5 | 50 | | E |
| | *Vulpia bromoides (Squirrel Tail Fesque)* | 5 | 200 | | E |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 9 | **Date:** | 11/11/21 | **Project number:** | J210321 | **Plot dimensions:** | 20x50 |
| **Datum:** | GDA94 | **Easting:** | 364,658 | **Recorders:** | ED, EJ | | |
| **Zone:** | 56 | **Northing:** | 6,613,391 | **IBRA region:** | Armidale Plateau | **Midline bearing:** | 197 |
| **Plant Community Type:** | 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion | | | **Condition class:** | Poor | **PCT confidence:** | high |
| **Vegetation Class:** | New England Grassy Woodlands | | | **EEC:** | yes | **EEC confidence:** | high |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 2 |
| | Ferns: | 0 |
| | Other: | 0 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 0 |
| | Forbs: | 0.2 |
| | Ferns: | 0 |
| | Other: | 0 |
| High Threat Weed cover: | | 0.2 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| DBH | Tree stem count | Length of logs (m) (≥10 cm diameter, >50 cm in length) | 0 |
| 80 + cm: | 0 | | |
| 50 – 79 cm: | 0 | | |
| 30 – 49 cm: | 0 | | |
| 20 – 29 cm: | 0 | Tree hollow count | 0 |
| 10 – 19 cm: | 0 | | |
| 5 – 9 cm: | 0 | | |
| < 5 cm: | 0 | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| Subplot: | 1 | 2 | 3 | 4 | 5 |
| Subplot score (%): | 2 | 1 | 1 | 1 | 2 |
| Average litter cover (%): | 1.4 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

## Plot Disturbance

Grazing

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED, EJ | **Plot ID:** | 9 | **Date:** | 11/11/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| | *Acetosella vulgaris (Sheep Sorrel)* | 0.1 | 5 | | HTE |
| | *Anthoxanthum odoratum (Sweet Vernal Grass)* | 10 | 400 | | E |
| | *Bromus brevis* | 10 | 500 | | E |
| | *Bromus catharticus (Praire Grass)* | 10 | 500 | | E |
| | *Bromus hordeaceus (Soft Brome)* | 0.1 | 5 | | E |
| | *Carthamus lanatus (Saffron Thistle)* | 0.1 | 10 | | HTE |
| | *Cirsium vulgare (Spear Thistle)* | 0.5 | 20 | | E |
| | *Gamochaeta calviceps (Cudweed)* | 0.1 | 10 | | E |
| Forb (FG) | *Geranium solanderi (Native Geranium)* | 0.1 | 20 | | N |
| | *Holcus lanatus (Yorkshire Fog)* | 5 | 200 | | E |
| | *Hordeum vulgare (Barley)* | 0.5 | 10 | | E |
| | *Poa annua (Winter Grass)* | 5 | 200 | | E |
| Forb (FG) | *Rumex brownii (Swamp Dock)* | 0.1 | 5 | | N |
| | *Sonchus oleraceus (Common Sowthistle)* | 0.1 | 10 | | E |
| | *Trifolium campestre (Hop Clover)* | 5 | 200 | | E |
| | *Trifolium repens (White Clover)* | 5 | 200 | | E |
| | *Vulpia bromoides (Squirrel Tail Fesque)* | 50 | 1000 | | E |
| | | | | | |

# BAM Site – Field Survey Form

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plot ID:** | 10 | **Date:** | 11/11/21 | **Project number:** | J210321 | **Plot dimensions:** | 20x50 |
| **Datum:** | GDA94 | **Easting:** | 363,702 | **Recorders:** | ED, EJ | | |
| **Zone:** | 56 | **Northing:** | 6,613,700 | **IBRA region:** | Armidale Plateau | **Midline bearing:** | 211 |
| **Plant Community Type:** | | 510: Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion | | **Condition class:** | Poor | **PCT confidence:** | high |
| **Vegetation Class:** | | New England Grassy Woodlands | | **EEC:** | yes | **EEC confidence:** | high |

*Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.*

| BAM Attribute (400 m2 plot) | | Sum values |
|---|---|---|
| Count of Native Richness | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 4 |
| | Forbs: | 8 |
| | Ferns: | 0 |
| | Other: | 1 |
| Sum of Cover of native vascular plants by growth form group | Trees: | 0 |
| | Shrubs: | 0 |
| | Grasses etc.: | 30.1 |
| | Forbs: | 0.8 |
| | Ferns: | 0 |
| | Other: | 0.1 |
| **High Threat Weed cover:** | | 2 |

| BAM Attribute (1000 m2 plot) DBH | | | |
|---|---|---|---|
| **DBH** | **Tree stem count** | | |
| **80 + cm:** | 0 | **Length of logs (m) (≥10 cm diameter, >50 cm in length)** | 0 |
| **50 – 79 cm:** | 0 | | |
| **30 – 49 cm:** | 0 | | |
| **20 – 29 cm:** | 0 | **Tree hollow count** | 0 |
| **10 – 19 cm:** | 0 | | |
| **5 – 9 cm:** | 0 | | |
| **< 5 cm:** | 0 | | |

*Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.*
*For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.*

| BAM Attribute (1 x 1 m plots) | Litter cover (%) | | | | |
|---|---|---|---|---|---|
| **Subplot:** | **1** | **2** | **3** | **4** | **5** |
| **Subplot score (%):** | 1 | 2 | 1 | 1 | 2 |
| **Average litter cover (%):** | 1.4 | | | | |

*Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.*

## Physiography and site features

Crest of hill

## Plot Disturbance

Grazing

*GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)*
*Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*
*Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...*

| | | | | | |
|---|---|---|---|---|---|
| **Project name:** | J210321 | | | | |
| **Recorders:** | ED, EJ | **Plot ID:** | 10 | **Date:** | 11/11/21 |

| GF Code | Scientific name | Cover | Abundance | Voucher | N, E or HTE |
|---|---|---|---|---|---|
| Forb (FG) | *Acaena novae-zelandiae (Bidgee-widgee)* | 0.1 | 5 | | N |
| | *Acetosella vulgaris (Sheep Sorrel)* | 2 | 100 | | HTE |
| | *Anthoxanthum odoratum (Sweet Vernal Grass)* | 5 | 600 | | E |
| Forb (FG) | *Asperula conferta (Common Woodruff)* | 0.1 | 15 | | N |
| | *Bromus brevis* | 15 | 500 | | E |
| | *Bromus catharticus (Praire Grass)* | 35 | 1000 | | E |
| | *Bromus molliformis (Soft Brome)* | 1 | 60 | | E |
| Grass & grasslike (GG) | *Carex inversa (Knob Sedge)* | 0.1 | 2 | | N |
| | *Cerastium glomeratum (Mouse-ear Chickweed)* | 0.1 | 15 | | E |
| Forb (FG) | *Chrysocephalum semipapposum (Clustered Everlasting)* | 0.1 | 6 | | N |
| Forb (FG) | *Crassula sieberiana (Australian Stonecrop)* | 0.1 | 40 | | N |
| Forb (FG) | *Cymbonotus lawsonianus (Bear's Ear)* | 0.1 | 5 | | N |
| Grass & grasslike (GG) | *Cynodon dactylon (Common Couch)* | 15 | 100 | | N |
| Forb (FG) | *Dichondra repens (Kidney Weed)* | 0.1 | 20 | | N |
| | *Eleusine tristachya (Goose Grass)* | 5 | 400 | | E |
| | *Gamochaeta calviceps (Cudweed)* | 0.1 | 5 | | E |
| Forb (FG) | *Geranium solanderi (Native Geranium)* | 0.1 | 10 | | N |
| Other (OG) | *Glycine tabacina (Variable Glycine)* | 0.1 | 2 | | N |
| | *Holcus lanatus (Yorkshire Fog)* | 0.5 | 50 | | E |
| | *Hordeum leporinum (Barley Grass)* | 0.2 | 40 | | E |
| | *Oxalis thompsoniae* | 0.1 | 20 | | E |
| | *Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)* | 0.1 | 20 | | E |
| | *Plantago lanceolata (Lamb's Tongues)* | 0.1 | 10 | | E |
| Grass & grasslike (GG) | *Poa labillardierei var. labillardierei (Tussock)* | 10 | 200 | | N |
| Forb (FG) | *Rumex brownii (Swamp Dock)* | 0.1 | 5 | | N |
| Grass & grasslike (GG) | *Sporobolus creber (Slender Rat's Tail Grass)* | 5 | 500 | | N |
| | *Trifolium campestre (Hop Clover)* | 5 | 100 | | E |
| | *Trifolium repens (White Clover)* | 5 | 50 | | E |
| | *Trifolium subterraneum (Subterranean Clover)* | 5 | 50 | | E |
| | *Vulpia bromoides (Squirrel Tail Fesque)* | 2 | 70 | | E |
| | | | | | |

# Appendix B
## Vegetation integrity plot data

EMM
creating opportunities

| plot | pct | area | patchsize | conditionclass | zone | easting | northing | bearing | compTree | compShrub | compGrass | compForbs | compFerns | compOther | strucTree | strucShrub | strucGrass | strucForbs | strucFerns | strucOther | funLargeTrees | funHollowtrees | funLitterCover | funLenFallenLogs | funTreeStem5to9 | funTreeStem10to19 | funTreeStem20to29 | funTreeStem30to49 | funTreeStem50to79 | funTreeRegen | funHighThreatExotic |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 510 | 85.9 | 101 | pasture | 55 | 538295 | 6274828 | 212 | 0 | 0 | 6 | 3 | 0 | 0 | 0 | 0 | 92.4 | 0.3 | 0 | 0 | 0 | 0 | 3.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 510 | 85.9 | 101 | pasture | 55 | 536527 | 6275465 | 50 | 0 | 0 | 10 | 5 | 0 | 0 | 0 | 0 | 81.1 | 0.9 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 510 | 85.9 | 101 | pasture | 55 | 536638 | 6280116 | 100 | 0 | 0 | 12 | 3 | 0 | 0 | 0 | 0 | 102.3 | 0.8 | 0 | 0 | 0 | 0 | 1.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| 5 | 510 | 85.9 | 101 | pasture | 55 | 536638 | 6280116 | 27 | 0 | 0 | 6 | 2 | 0 | 0 | 0 | 0 | 65.8 | 0.2 | 0 | 0 | 0 | 0 | 2.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 510 | 85.9 | 101 | pasture | 56 | 363539 | 6607775 | 204 | 0 | 0 | 4 | 5 | 0 | 0 | 0 | 0 | 5.5 | 0.5 | 0 | 0 | 0 | 0 | 1.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 6 | 510 | 0.42 | 2 | poor | 56 | 363199 | 6607810 | 86 | 2 | 0 | 3 | 7 | 0 | 1 | 17 | 0 | 10.6 | 1 | 0 | 0.1 | 2 | 1 | 2 | 2 | 0 | 1 | 0 | 1 | 1 | 0 | 0.1 |

# Appendix C

## Protected Matters Search Tool results

EMM
creating opportunities

Australian Government

Department of Agriculture, Water and the Environment

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 14/02/22 15:09:13



No Image Available

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates
Buffer: 0.0Km

No Image Available

# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | None |
| Wetlands of International Importance: | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 2 |
| Listed Threatened Species: | 25 |
| Listed Migratory Species: | 12 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Land: | None |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 19 |
| Whales and Other Cetaceans: | None |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

| | |
|---|---|
| State and Territory Reserves: | None |
| Regional Forest Agreements: | 1 |
| Invasive Species: | 27 |
| Nationally Important Wetlands: | None |
| Key Ecological Features (Marine) | None |

# Details

## Matters of National Environmental Significance

### Listed Threatened Ecological Communities [ Resource Information ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

| Name | Status | Type of Presence |
|---|---|---|
| New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands | Critically Endangered | Community may occur within area |
| White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland | Critically Endangered | Community may occur within area |

### Listed Threatened Species [ Resource Information ]

| Name | Status | Type of Presence |
|---|---|---|
| **Birds** | | |
| Anthochaera phrygia<br>Regent Honeyeater [82338] | Critically Endangered | Species or species habitat likely to occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Erythrotriorchis radiatus<br>Red Goshawk [942] | Vulnerable | Species or species habitat may occur within area |
| Falco hypoleucos<br>Grey Falcon [929] | Vulnerable | Species or species habitat likely to occur within area |
| Grantiella picta<br>Painted Honeyeater [470] | Vulnerable | Species or species habitat likely to occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat likely to occur within area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat may occur within area |
| Rostratula australis<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat likely to occur within area |
| **Frogs** | | |
| Litoria castanea<br>Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848] | Critically Endangered | Species or species habitat likely to occur within area |
| Litoria piperata<br>Peppered Tree Frog [1827] | Vulnerable | Species or species habitat may occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Mammals | | |
| Chalinolobus dwyeri<br>Large-eared Pied Bat, Large Pied Bat [183] | Vulnerable | Species or species habitat likely to occur within area |
| Dasyurus maculatus  maculatus (SE mainland population)<br>Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184] | Endangered | Species or species habitat likely to occur within area |
| Petauroides volans<br>Greater Glider [254] | Vulnerable | Species or species habitat may occur within area |
| Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)<br>Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104] | Endangered | Species or species habitat known to occur within area |
| Pteropus poliocephalus<br>Grey-headed Flying-fox [186] | Vulnerable | Foraging, feeding or related behaviour may occur within area |
| Plants | | |
| Arthraxon hispidus<br>Hairy-joint Grass [9338] | Vulnerable | Species or species habitat likely to occur within area |
| Callistemon pungens<br>[55581] | Vulnerable | Species or species habitat may occur within area |
| Dichanthium setosum<br>bluegrass [14159] | Vulnerable | Species or species habitat likely to occur within area |
| Diuris pedunculata<br>Small Snake Orchid, Two-leaved Golden Moths, Golden Moths, Cowslip Orchid, Snake Orchid [18325] | Endangered | Species or species habitat likely to occur within area |
| Eucalyptus mckieana<br>McKie's Stringybark [20199] | Vulnerable | Species or species habitat may occur within area |
| Eucalyptus nicholii<br>Narrow-leaved Peppermint, Narrow-leaved Black Peppermint [20992] | Vulnerable | Species or species habitat likely to occur within area |
| Euphrasia arguta<br>[4325] | Critically Endangered | Species or species habitat may occur within area |
| Thesium australe<br>Austral Toadflax, Toadflax [15202] | Vulnerable | Species or species habitat likely to occur within area |
| Reptiles | | |
| Uvidicolus sphyrurus<br>Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578] | Vulnerable | Species or species habitat may occur within area |
| Wollumbinia belli<br>Bell's Turtle, Western Sawshell Turtle, Namoi River Turtle, Bell's Saw-shelled Turtle [86071] | Vulnerable | Species or species habitat may occur within area |

| Listed Migratory Species | | [ Resource Information ] |
|---|---|---|
| * Species is listed under a different scientific name on the EPBC Act - Threatened Species list. | | |
| Name | Threatened | Type of Presence |
| Migratory Marine Birds | | |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |

| Name | Threatened | Type of Presence |
|---|---|---|
| Migratory Terrestrial Species | | |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat likely to occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat may occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat known to occur within area |
| Rhipidura rufifrons<br>Rufous Fantail [592] | | Species or species habitat likely to occur within area |
| Migratory Wetlands Species | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat likely to occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat may occur within area |

## Other Matters Protected by the EPBC Act

| Listed Marine Species | | [ Resource Information ] |
|---|---|---|
| * Species is listed under a different scientific name on the EPBC Act - Threatened Species list. | | |
| Name | Threatened | Type of Presence |
| Birds | | |
| Actitis hypoleucos<br>Common Sandpiper [59309] | | Species or species habitat may occur within area |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area |
| Ardea ibis<br>Cattle Egret [59542] | | Species or species habitat may occur within area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat may occur within |

| Name | Threatened | Type of Presence |
|---|---|---|
| | | area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat may occur within area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area |
| Chrysococcyx osculans<br>Black-eared Cuckoo [705] | | Species or species habitat likely to occur within area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat likely to occur within area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat likely to occur within area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat likely to occur within area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat may occur within area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat may occur within area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat may occur within area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat known to occur within area |
| Neophema chrysostoma<br>Blue-winged Parrot [726] | | Species or species habitat may occur within area |
| Pandion haliaetus<br>Osprey [952] | | Species or species habitat may occur within area |
| Rhipidura rufifrons<br>Rufous Fantail [592] | | Species or species habitat likely to occur within area |
| Rostratula benghalensis (sensu lato)<br>Painted Snipe [889] | Endangered* | Species or species habitat likely to occur within area |

# Extra Information

## Regional Forest Agreements [ Resource Information ]

Note that all areas with completed RFAs have been included.

| Name | State |
|---|---|
| North East NSW RFA | New South Wales |

## Invasive Species [ Resource Information ]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

| Name | Status | Type of Presence |
|---|---|---|
| **Birds** | | |
| Acridotheres tristis<br>Common Myna, Indian Myna [387] | | Species or species habitat likely to occur within area |
| Alauda arvensis<br>Skylark [656] | | Species or species habitat likely to occur within area |
| Anas platyrhynchos<br>Mallard [974] | | Species or species habitat likely to occur within area |
| Carduelis carduelis<br>European Goldfinch [403] | | Species or species habitat likely to occur within area |
| Columba livia<br>Rock Pigeon, Rock Dove, Domestic Pigeon [803] | | Species or species habitat likely to occur within area |
| Passer domesticus<br>House Sparrow [405] | | Species or species habitat likely to occur within area |
| Streptopelia chinensis<br>Spotted Turtle-Dove [780] | | Species or species habitat likely to occur within area |
| Sturnus vulgaris<br>Common Starling [389] | | Species or species habitat likely to occur within area |
| Turdus merula<br>Common Blackbird, Eurasian Blackbird [596] | | Species or species habitat likely to occur within area |
| **Frogs** | | |
| Rhinella marina<br>Cane Toad [83218] | | Species or species habitat may occur within area |
| **Mammals** | | |
| Bos taurus<br>Domestic Cattle [16] | | Species or species habitat likely to occur within area |
| Canis lupus familiaris<br>Domestic Dog [82654] | | Species or species habitat likely to occur within area |
| Equus caballus<br>Horse [5] | | Species or species habitat likely to occur within area |

| Name | Status | Type of Presence |
|---|---|---|
| Felis catus<br>Cat, House Cat, Domestic Cat [19] | | Species or species habitat likely to occur within area |
| Lepus capensis<br>Brown Hare [127] | | Species or species habitat likely to occur within area |
| Mus musculus<br>House Mouse [120] | | Species or species habitat likely to occur within area |
| Oryctolagus cuniculus<br>Rabbit, European Rabbit [128] | | Species or species habitat likely to occur within area |
| Rattus rattus<br>Black Rat, Ship Rat [84] | | Species or species habitat likely to occur within area |
| Vulpes vulpes<br>Red Fox, Fox [18] | | Species or species habitat likely to occur within area |
| **Plants** | | |
| Anredera cordifolia<br>Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] | | Species or species habitat likely to occur within area |
| Cytisus scoparius<br>Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934] | | Species or species habitat likely to occur within area |
| Genista sp. X Genista monspessulana<br>Broom [67538] | | Species or species habitat may occur within area |
| Nassella neesiana<br>Chilean Needle grass [67699] | | Species or species habitat likely to occur within area |
| Nassella trichotoma<br>Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884] | | Species or species habitat likely to occur within area |
| Pinus radiata<br>Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780] | | Species or species habitat may occur within area |
| Rubus fruticosus aggregate<br>Blackberry, European Blackberry [68406] | | Species or species habitat likely to occur within area |
| Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii<br>Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497] | | Species or species habitat likely to occur within area |

# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods.  Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc).  In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Coordinates

-30.659687 151.568557,-30.658727 151.568814,-30.640415 151.576625,-30.642335 151.648551,-30.654371 151.647864,-30.659687 151.568557

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.


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# Appendix D
## Biodiversity credit report

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# BAM Biodiversity Credit Report (Like for like)

## Proposal Details

Assessment Id
00029894/BAAS17009/21/00029895

Proposal Name
NESF MOD 2

BAM data last updated *
16/06/2022

Assessor Name
Eugene Dodd

Assessor Number
BAAS17009

BAM Data version *
54

Proponent Names

Report Created
22/08/2022

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Major Projects

Date Finalised
22/08/2022

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

## Potential Serious and Irreversible Impacts

| Name of threatened ecological community | Listing status | Name of Plant Community Type/ID |
|---|---|---|
| White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla | Critically Endangered Ecological Community | 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion |
| Species | | |

| |
|---|
| **Nil** |

## Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

| PCT |
|---|
| No Changes |

Predicted Threatened Species Not On Site

| Name |
|---|
| **Calyptorhynchus lathami /** Glossy Black-Cockatoo |
| **Chalinolobus nigrogriseus /** Hoary Wattled Bat |
| **Dasyurus maculatus /** Spotted-tailed Quoll |
| **Haliaeetus leucogaster /** White-bellied Sea-Eagle |

## Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

# BAM Biodiversity Credit Report (Like for like)

| Name of Plant Community Type/ID | Name of threatened ecological community | Area of impact | HBT Cr | No HBT Cr | Total credits to be retired |
|---|---|---|---|---|---|
| 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion | White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla | 86.3 | 7 | 0 | 7 |

**510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion**

**Like-for-like credit retirement options**

| Name of offset trading group | Trading group | Zone | HBT | Credits | IBRA region |
|---|---|---|---|---|---|
| White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, | - | 510_pasture | No | 0 | Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698 | | | | | |
| | White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla | - | 510_poor | Yes | 7 | Armidale Plateau, Bundarra Downs, Coffs Coast and Escarpment, Eastern Nandewars, Ebor Basalts, Glenn Innes-Guyra Basalts, Macleay Gorges, Moredun Volcanics, Round Mountain, Walcha Plateau, Wongwibinda Plateau and Yarrowyck-Kentucky Downs.<br>or<br>Any IBRA subregion that is within 100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | This includes PCT's: 74, 75, 83, 250, 266, 267, 268, 270, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 286, 298, 302, 312, 341, 342, 347, 350, 352, 356, 367, 381, 382, 395, 401, 403, 421, 433, 434, 435, 436, 437, 451, 483, 484, 488, 492, 496, 508, 509, 510, 511, 528, 538, 544, 563, 567, 571, 589, 590, 597, 599, 618, 619, 622, 633, 654, 702, 703, 704, 705, 710, 711, 796, 797, 799, 840, 847, 851, 921, 1099, 1103, 1303, 1304, 1307, 1324, 1329, 1330, 1331, 1332, 1333, 1334, 1383, 1401, 1512, 1606, 1608, 1611, 1691, 1693, 1695, 1698 | | | | | kilometers of the outer edge of the impacted site. |

## Species Credit Summary

No Species Credit Data

## Credit Retirement Options

Like-for-like credit retirement options

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# Appendix E
## Aboriginal cultural heritage assessment

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# New England Solar and Battery Project

# Aboriginal Cultural Heritage Assessment

Prepared for ACEN Australia Pty Ltd

August 2022

# New England Solar and Battery Project

# Aboriginal Cultural Heritage Assessment

ACEN Australia Pty Ltd

J210321 RP1

August 2022

| Version | Date | Prepared by | Approved by | Comments |
|---|---|---|---|---|
| V1 Draft | 20 April 2022 | Ryan Desic | David Richards | |
| V2 Final | 22 August 2022 | Ryan Desic | David Richards | |

Approved by

**David Richards**
Associate Environmental Scientist
22 August 2022
Level 3 175 Scott Street
Newcastle NSW 2300

# Acknowledgement of Country

EMM would like to acknowledge and pay respect to the traditional owners of the land on which the project is proposed. We would like to thank all members of the Aboriginal community who generously gave their time and knowledge regarding the Aboriginal cultural heritage values associated with the project.

# Executive Summary

ACEN Australia Pty Ltd (ACEN Australia) (formerly named UPC Renewables Australia Pty Ltd) has approval to develop the New England Solar and Battery Project; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale, in the Uralla Shire local government area (LGA) (the project). The project was approved, subject to conditions, by the NSW Independent Planning Commission (IPC) on 9 March 2020 (SSD-9255).

ACEN Australia is seeking to modify SSD-9255, pursuant to Section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to:

- amend the project boundary and development footprint;
- increase the project's energy storage capacity;
- increase the number of over-dimensional vehicle movements during construction, upgrading and decommissioning;
- increase the number of daily heavy vehicle movements during construction; and
- increase the project's construction hours.

EMM Consulting Pty Ltd (EMM) has been engaged by ACEN Australia to prepare a modification report for the proposed modification. This Aboriginal cultural heritage assessment (ACHA) provides an assessment of the Aboriginal cultural heritage impacts associated with the proposed modification. The ACHA included consultation with the existing project registered Aboriginal parties (RAPs) and archaeological survey of the modification area with EMM archaeologists and RAP representatives.

There was only one previously recorded isolated find in the study area prior to the survey for this ACHA (NE20). The survey team identified 12 Aboriginal sites and 5 areas of potential archaeological deposit (PAD) (total 17 sites) within the study area subject to survey. The site features comprised 3 isolated artefacts, 4 Aboriginal scarred trees, 5 open artefact scatters and 5 PADs.

The modification area has undergone a significant refinement process to avoid Aboriginal heritage impacts. The outcome of this process was that of the 18 Aboriginal sites (13 confirmed sites and 5 PAD areas) identified within the study area, only two sites occur within the modification area and will be impacted (NE119 and NE20).

The proposed additional BESS footprints are within the approved project boundary and have been surveyed previously. No Aboriginal sites will be impacted by the proposed increase to the capacity of the BESS. One previously recorded artefact scatter nearby, NE01, will continue to be actively avoided and is currently fenced.

Aboriginal cultural heritage values within the approved project boundary are currently subject to management under the *New England Solar Farm Aboriginal Heritage Management Plan* (AHMP) (EMM 2021). The AHMP will be updated to incorporate the modification area and additional BESS footprints and will include management requirements for Aboriginal cultural heritage values. The two artefact sites, NE119 and NE20, within the modification area will be subject to surface collection. All other identified sites will be avoided.

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## Appendices



## Tables



## Figures

## Plates

# 1 Introduction

## 1.1 Overview

ACEN Australia Pty Ltd (ACEN Australia) (formerly named UPC Renewables Australia Pty Ltd) has approval to develop the New England Solar and Battery Project; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale, in the Uralla Shire local government area (LGA) (the project) (Figure 1.1). The project was approved, subject to conditions, by the NSW Independent Planning Commission (IPC) on 9 March 2020 (SSD-9255).

The development footprint is the area within the project boundary on which infrastructure is proposed (Figure 1.1). As part of detailed design works, ACEN Australia has investigated the feasibility of construction on additional land adjacent to the northern and central array areas that may be suitable for solar development. It is noted that no new landholdings are being included in the development footprint as part of the proposed modification (ie the new land areas are owned by existing project landholders and are adjacent to the approved development footprint).

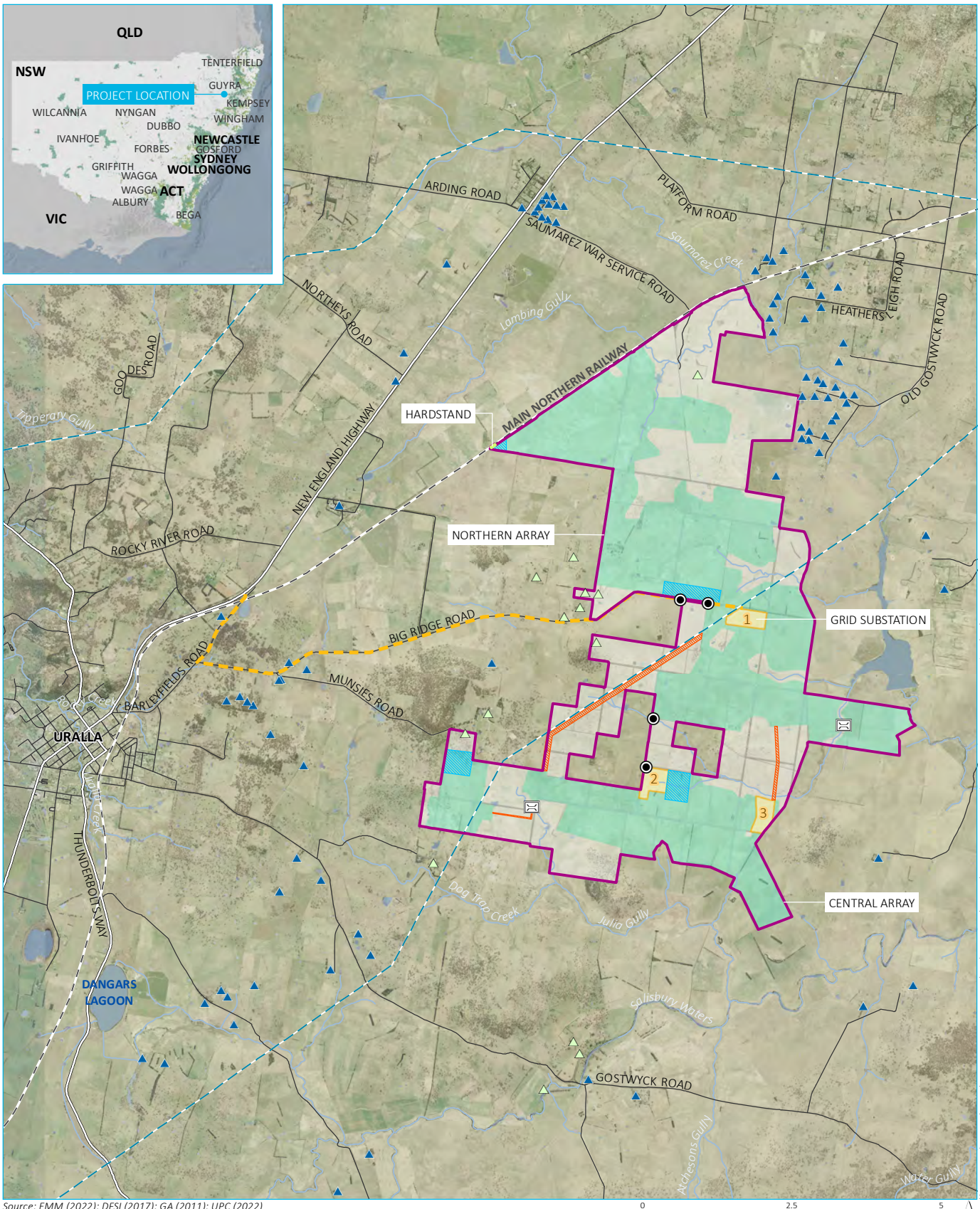
ACEN Australia is seeking to modify SSD-9255, pursuant to Section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) to:

- amend the project boundary and development footprint;
- increase the project's energy storage capacity;
- increase the number of over-dimensional vehicle movements during construction, upgrading and decommissioning;
- increase the number of daily heavy vehicle movements during construction; and
- increase the project's construction hours.

EMM Consulting Pty Ltd (EMM) has been engaged by ACEN Australia to prepare a modification report for the proposed modification. This Aboriginal cultural heritage assessment (ACHA) provides an assessment of the Aboriginal cultural heritage impacts associated with the proposed modification.

The objectives of the ACHA were to:

- identify Aboriginal cultural heritage values relevant to the study area which include:
  - Aboriginal objects and sites;
  - Aboriginal socio-cultural or historic values which might not be related to Aboriginal objects; and
  - areas of archaeological sensitivity;
- assess the significance of Aboriginal objects, sites and locations identified in the course of the archaeological investigations and through Aboriginal community consultation;
- assess the impact of the proposed modification on identified Aboriginal cultural heritage values; and
- propose appropriate management measures for potentially impacted Aboriginal cultural heritage values in response to their assessed significance.




Source: EMM (2022); DFSI (2017); GA (2011); UPC (2022)

0 2.5 5 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMM3\2021\210321 - NESF MOD 2\GIS\02_Maps_MOD\MOD001_RegionalLocation_20220802_04.mxd 15/08/2022

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

Sensitive receptors

- Project related
- Non-project related

- Project boundary *

Development footprint

- Solar array
- Potential site access and electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint (location number) **
- Hardstand in rail corridor
- Primary vehicle access route
- Potential creek crossing
- Proposed primary site access point

* The extent of Lot 1 of DP 227322 within the development footprint is 205.4 hectares, which represents approximately 8.4% of the total lot. Subsequently, the full extent of Lot 1 of DP 227322 has been excluded from the project boundary.

** The grid substation (location 1) and only one of potential substation location numbers 2 or 3 to be constructed

# Location of New England Solar and Battery Project

New England Solar and Battery Project
Aboriginal Cultural Heritage Assessment
Figure 1.1

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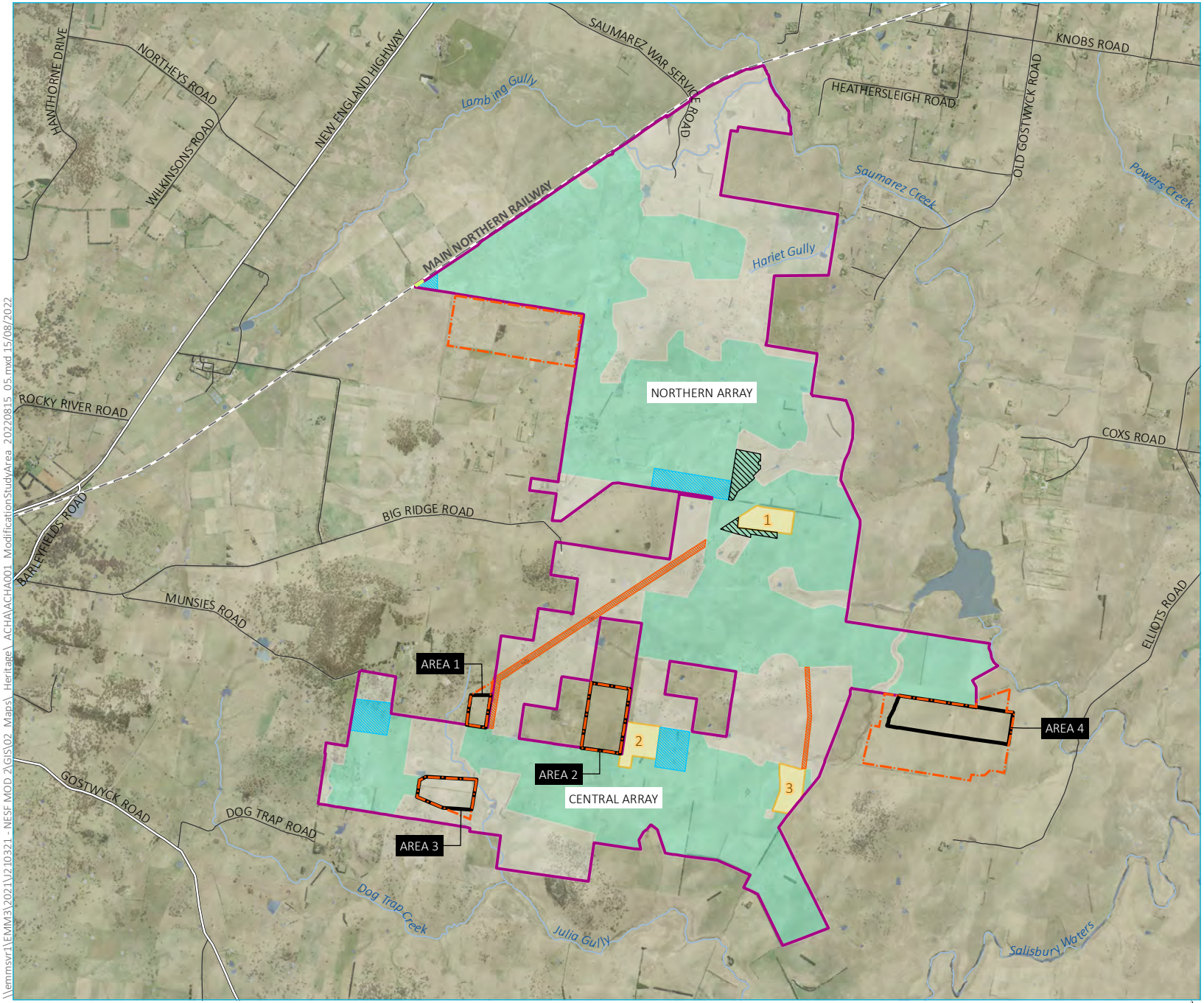


Modification area and study area

New England Solar and Battery Project
Aboriginal Cultural Heritage Assessment
Figure 1.2

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## 1.2 Background

The project is currently being constructed on land within the Uralla Shire LGA. The land in the development footprint is zoned RU1 Primary Production under the *Uralla Local Environmental Plan 2012* (Uralla LEP) and is predominantly used for agricultural purposes. The landform pattern within and surrounding the development footprint can be described as a mix of low rolling hills and flatter areas that are frequently dissected by drainage networks and their adjacent flood plains, terraces and foot slopes.

An area of 426 hectares (ha) was identified by ACEN Australia as potentially suitable for inclusion in the development footprint. During the preparation of the modification application, this area has been refined based on environmental constraints identification (namely areas of biodiversity value and items of Aboriginal cultural heritage significance), stakeholder engagement and consideration of the project infrastructure layout with the objective of maintaining an efficient project that avoids and minimises environmental impacts.

## 1.3 Proposed modification

ACEN Australia proposes to modify SSD-9255 to:

- amend the project boundary and development footprint;
- increase the project's storage capacity from up to 200 MW (AC) by approximately 1,200 MW (AC) to approximately 1,400 MW (AC);
- allow for additional land that could be utilised for adding direct current (DC) solar PV capacity, without changing the solar component of the project's total generating capacity of 720 MW(AC);
- increase the number of over-dimensional vehicle movements during construction, upgrading and decommissioning;
- increase the number of daily heavy vehicle movements during construction; and
- increase the project's construction hours.

The modification area is shown on Figure 1.2 and encompasses an additional 127 ha across four parcels of land. All of this land is adjacent to existing areas within the approved development footprint. The modification area is currently primarily used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production.

The land within the modification area will form part of the project boundary and development footprint and will predominantly be used to house photovoltaic (PV) modules, power control units (PCU) and the medium voltage cable reticulation network. Operations and maintenance infrastructure and internal roads may also be installed within the modification area.

Due to a shift in Australia's energy market needs, the accelerating pace of coal plant retirements in NSW, continuous improvements in BESS technology and associated capital cost reductions, ACEN Australia is seeking approval to increase the capacity of the on-site BESS. To enable the proposed capacity increase, two additional parcels of land within the approved project boundary and development footprint will be used to house BESS infrastructure (Figure 1.2). Both parcels of land are in the northern array and are close to the approved grid substation and BESS footprint.

The other components of the proposed modification will not change previously assessed and approved impacts to Aboriginal cultural heritage under SSD-9255.

The proposed modification will not change the approved life of project operations.

## 1.4 Assessment requirements

The assessment was prepared in accordance with the proposed assessment approach provided by EMM on 4 August 2021 and approved by DPE on 10 September 2021. The proposed assessment approach committed to undertake an ACHA in accordance with the following guidelines:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011);
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a); and
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (the Code) (DECCW 2010b).

The proposed assessment approach also committed to the following for Aboriginal cultural heritage:

- consultation with the existing project registered Aboriginal parties (RAPs);
- archaeological survey of the modification area with EMM archaeologists and RAP representatives; and
- following approval, updating the *New England Solar Farm Aboriginal Heritage Management Plan* (AHMP) (EMM 2021) to include the modification area and additional management measures presented in this ACHA.

## 1.5 Terminology

The following terms are used throughout this assessment to describe the proposed modification:

- Project boundary: the full extent of the involved landholder lots.
- Development footprint: the area within the project boundary on which infrastructure will be located.
- Modification area: the additional land that forms the subject of this assessment and that is proposed for inclusion in the project boundary and development footprint. It comprises four areas: Area 1, 2, 3 and 4.
- Proposed project boundary: the full extent of the involved landholder lots (including the modification area).
- Study area: this refers to the broader investigation area that was the subject of archaeological survey. Through an iterative design process, the study area was refined to the modification area to avoid Aboriginal cultural heritage sites and biodiversity constraints. The measures undertaken to avoid Aboriginal cultural heritage impacts are identified in Section 9.2.

## 1.6 Legislative context

Commonwealth and State legislation manages and protects Aboriginal cultural heritage. Table 1.1 summarises the relevant legislation and comments on their relevance to the proposed modification.

### Table 1.1 Commonwealth and State legislation relevant to the proposed modification

| Legislation | Description | Relevant to the proposed modification | Details |
|---|---|---|---|
| **Commonwealth** | | | |
| *Environment Protection and Biodiversity Conservation Act 1999* | Recognises sites with universal value on the World Heritage List (WHL). Protects Indigenous heritage places with outstanding heritage value to the nation on the National Heritage List (NHL), and significant heritage value on the Commonwealth Heritage List (CHL). | No | There are no Indigenous heritage places within the modification area that are listed on the WHL, NHL, or the CHL. |
| *Native Title Act 1993* | Administers rights and interests over lands and waters by Aboriginal people. Provides for negotiation and registration of Indigenous Land Use Agreements (ILUAs).<br>Often used in NSW to identify relevant stakeholders for consultation. | No | No native title claim applications or determinations or Indigenous Land Use Agreements exist over the modification area. |
| *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* | Preserves and protects areas and objects of particular significance to Aboriginal people that are under threat from injury or desecration. | No | There are no areas or objects within the modification area subject to a Declaration under this Act. |
| **State** | | | |
| *EP&A Act* | Requires environmental impacts, including to Aboriginal heritage, to be considered in land use planning.<br>Provides for the development of environmental planning instruments, including State Environmental Planning Policies and Local Environmental Plans. | Yes | The project was assessed as SSD under Part 4, Division 4.7 of the EP&A Act.<br>The proposed modification will be assessed by a modification application under Section 4.55(2) of the EP&A Act. |
| *National Parks and Wildlife Act 1974 (NPW Act)* | Provides blanket protection for all Aboriginal objects and declared Aboriginal places. Includes processes and mechanisms for development where Aboriginal objects are present, or where Aboriginal Places are proposed for harm. | Yes | The NPW Act generally remains in force for the project in relation to the discovery, impact notification and care of Aboriginal objects in NSW. However, as the project is classed as SSD, an Aboriginal heritage impact permit (AHIP) is not required to permit harm to Aboriginal objects associated with the project or subsequent modifications. Instead, an approved AHMP serves as an approval to manage impacts to Aboriginal objects. |

**Table 1.1 Commonwealth and State legislation relevant to the proposed modification**

| Legislation | Description | Relevant to the proposed modification | Details |
|---|---|---|---|
| *Aboriginal Land Rights Act 1983* | Establishes Local Aboriginal Land Councils (LALCs). Allows transfer of ownership of vacant crown land to a Local Aboriginal Land Council.<br>The Office of the Registrar, *Aboriginal Land Rights Act 1983 (ORALRA),* registers Aboriginal land claims and maintains the Register of Aboriginal Owners. Often used in NSW to identify relevant stakeholders for consultation. | No | A request to search the Register of Aboriginal Owners was made to the ORALRA on 6 August 2019. The study area does not appear to have Registered Aboriginal Owners pursuant to Division 3 of the Act. |

# 2 Aboriginal consultation

## 2.1 Key findings

- The assessment adopted the processes and methods outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a).
- Aboriginal consultation involved continuing consultation with the nine RAPs previously registered for the project in 2018 as part of the *New England Solar Farm Aboriginal Cultural Heritage Assessment* (EMM 2018) (herein referred to as the 'main project ACHA').
- RAPs were provided with details of the proposed modification and ACHA assessment methods on 20 September 2021 and were provided a 28-day review period prior to the archaeological field survey.
- The five-day field program included RAP representatives from the parties engaged for the main project ACHA.
- The draft ACHA was provided to RAPs for review on 20 April 2022; however, no feedback was provided.

A summary of the consultation process is provided below, and full documentation of the consultation process is provided in Appendix B.

## 2.2 Registered Aboriginal parties

There are nine Aboriginal groups registered for the project (Table 2.1). The RAPs were identified, registered and consulted as part of the main project ACHA and subsequent assessments (EMM 2018, EMM 2019a, EMM 2019b).

**Table 2.1 List of registered Aboriginal parties**

| Organisation | Contact | | Date of registration |
|---|---|---|---|
| Armidale Local Aboriginal Land Council | Tom | Briggs | 24 April 2018 |
| Nunawanna Aboriginal Corporation | Colin | Ahoy | 16 April 2018 |
| Armidale and New England Gumbaynggirr Descendants | Hazel | Green | 26 April 2018 |
| Les Townsend | Les | Townsend | 3 May 2018 |
| Steven Ahoy Consultants (now Iwatta Aboriginal Corporation) | Steven | Ahoy | 6 May 2018 |
| Culturally Aware Aboriginal Heritage Consultancy | Cheryl | Kitchener | 7 May 2018 |
| Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants | Rhonda | Kitchener | 7 May 2018 |
| Aaron Broad | Aaron | Broad | 2 May 2018 |
| Nganyawana Clan Group | Les | Ahoy | 14 May 2018 |

## 2.3 Summary of previous consultation approach

The following is a summary of the Aboriginal consultation process followed for the *New England Solar Farm Environmental Impact Statement* (EIS), which is based on the more extensive account given in the main project ACHA and subsequent assessments (EMM 2018, EMM 2019a, EMM 2019b).

The *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a) were used for the main project ACHA. RAPs were invited to provide cultural information about the study area, were provided with draft assessment and fieldwork methods for review and kept consulted about project updates and management via consultation meetings, letters and emails and provided with assessment documentation for review and comment.

Following project approval, EMM and ACEN Australia consulted with RAPs to develop the AHMP in accordance with conditions 17, 18 and 19 of SSD-9255. The AHMP was approved in November 2020 and consultation with RAPs has been ongoing since the approval to undertake the management measures set out in the plan.

A summary of the main consultation components during the main project ACHA and AHMP is provided in Table 2.2. An overview of the entire consultation process to date is provided in the consultation log attached in Appendix B.

**Table 2.2 Summary of consultation prior to the proposed modification**

| Component | Key features |
|---|---|
| Main project ACHA | |
| April–November 2018 (EMM 2018)<br>Main project ACHA consultation component | This phase included:<br>• the identification, notification and registration of RAPs;<br>• presentation of project information and assessment methodologies (including on-site meeting on 21 May 2018);<br>• gathering cultural information;<br>• archaeological survey with RAP involvement;<br>• provision of draft ACHA for RAP review, including a consultation meeting at the Armidale Bowling Club on 19 October 2018; and<br>• provision of final ACHA to RAPs as part of EIS lodgement. |
| February–June 2019 (EMM 2019a)<br>Additional assessment for ACHA Addendum to resolve outstanding commitments. | EMM undertook additional assessment and consultation during the submissions phase of the project (following EIS lodgement and public exhibition).<br>The additional assessment addressed outstanding commitments in the ACHA, comprising survey for additional scar trees, expert scar tree assessment and an archaeological test excavation.<br>RAPs were notified of the additional assessment, participated in field investigations and were invited to comment on the ACHA Addendum report (EMM 2019a). |
| August–September 2019 (EMM 2019b)<br>Additional assessment for project-related road upgrades and intersection improvements between the New England Highway and the development footprint. | RAPs were notified about the additional assessment in August 2019 and RAP representatives were invited to participate in archaeological survey on 8 August 2019.<br>The assessment was issued to RAPs on 9 September 2019 for review and comment. |

**Table 2.2 Summary of consultation prior to the proposed modification**

| Component | Key features |
|---|---|
| **AHMP** | |
| February–November 2020<br>Preparation and approval of AHMP | This phase included:<br>• notification of intent to prepare AHMP (February 2020);<br>• provision of draft AHMP for 28-day review period (May 2020); and<br>• finalisation of AHMP, issue to DPE and Heritage NSW, and approval of document (April to November 2020). |
| January–July 2021<br>AHMP salvage fieldwork and updates to AHMP | This phase included:<br>• salvage and avoidance demarcation for sites within the project's Stage 1 boundary (January and July 2021); and<br>• revisions to AHMP to address site demarcation and salvage issues identified during the first salvage fieldwork stint in January 2021 (March to June 2021). |
| August 2021 to present | Ongoing consultation about cultural awareness training, site maintenance and recording of oral histories. |

## 2.4 Consultation for the proposed modification

### 2.4.1 Project information and proposed methodology

The Aboriginal consultation documentation for the proposed modification is summarised in this section and provided in Appendix B.

The project RAPs were notified about the proposed modification on 20 September 2021 via a letter which provided an overview of the proposed modification and proposed assessment approach and requested any cultural information about the study area. RAPs were provided with a 28-day review period prior to the survey fieldwork in October 2021.

Culturally Aware Aboriginal Consultancy representative Cheryl Kitchener provided comments to the proposed ACHA methods. A summary of the comments and responses are provided in Table 2.3.

**Table 2.3 Proposed methods comments and outcome**

| Organisation | Summary of comment | Response |
|---|---|---|
| Culturally Aware Aboriginal Consultancy | Emphasis that no cultural materials should be removed by RAPs during the assessment until appropriate management measures have been prepared in consultation with RAPs and approved management measures. | All cultural material identified during the archaeological survey was recorded and left in situ in accordance with the Code (DECCW 2010b). |
| | Ensuring that experienced Anaiwan RAP representatives are present during archaeological fieldwork. | Anaiwan RAP representatives were employed by ACEN Australia for the duration of the field survey. The representatives were nominated by relevant RAP organisations. |
| | In response to the methodology stating that the survey will focus on areas predicted to have high archaeological sensitivity, that RAPs are consulted during the process of predictive modelling. | The study area was of a manageable size to facilitate a 'full coverage' survey approach, whereby the full extent of the study area was surveyed, subject to ground surface visibility constraints. As such, predictive modelling to guide the survey effort was not relied upon for survey planning to the extent used in the previous archaeological survey for the main project ACHA.<br>Notwithstanding, the survey effort was discussed with RAPs throughout the archaeological survey with the aid of maps, and any areas of interest or focus identified by RAPs was included in the field survey. |

### 2.4.2 Review of draft Aboriginal cultural heritage assessment

A draft version of this report, which included background information, results, draft significance assessments and draft management recommendations, was issued to RAPs on 20 April 2022 accompanied by an email specifying a 28-day timeframe for review. The draft report included highlighted text indicating sections where RAP input was sought in regard to Aboriginal heritage values, significance assessment and management measures.

No feedback on the draft report was provided during the review period.

# 3 Existing environment

## 3.1 Rationale

Understanding environmental context assists with predictions of archaeological potential, such as the likelihood of archaeological material being present in the landscape, its spatial distribution and its preservation. Landscape features were an important factor for the choice of camping and transitory and ceremonial areas used by Aboriginal people. Similarly, these landscape features and historical land-uses play a role in the level of preservation and the integrity of archaeological sites.

A landscape consisting of suitable topography, hydrology, geology and soils has strong links with natural resources that would have been available to, and sought after by, Aboriginal people. Flora and fauna would have provided food, tools and ceremonial resources; proximity to fresh water was necessary for life and growing crops, as well as gathering fish and eels. Landscape features, such as sandstone overhangs, were useful for shelter; stone artefacts were manufactured from raw stone material that was collected from quarry sites; and stone arrangements relied on the landscape.

## 3.2 Landscape overview

The study area is directly adjacent to the approved project boundary, and therefore shares similar environmental characteristics. These characteristics are explored in detail in Section 3 of the main project ACHA (EMM 2018), and summarised where relevant in this section. Key landscape features are presented in Figure 3.1.

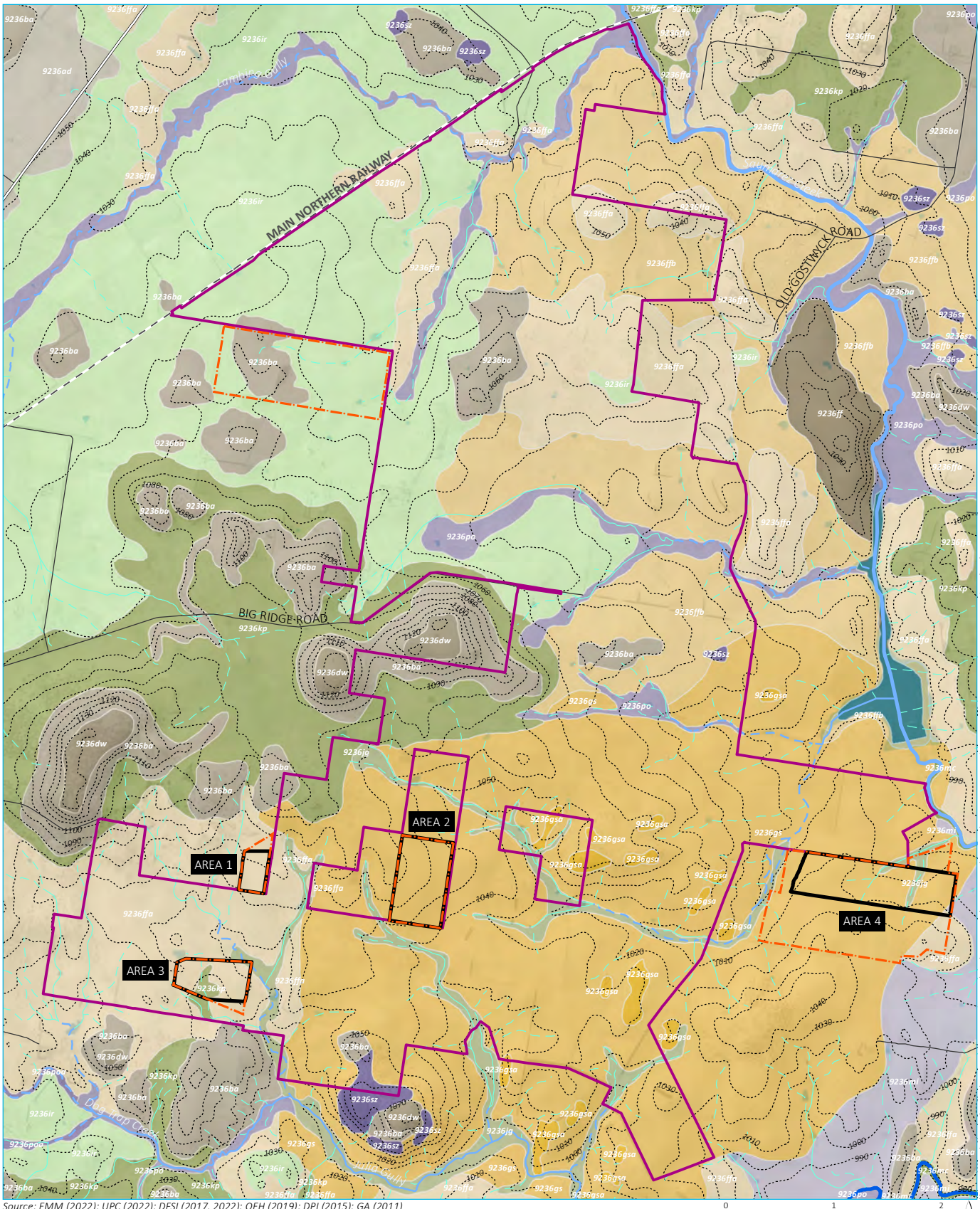
The study area is within the Armidale Plateau subregion of the New England Tablelands Bioregion. This subregion is characterised by an undulating to hilly plateau at an elevation of approximately 1,100 m. The study area generally falls between elevations of 1,000 m and 1,100 m. It has a stepped landscape across Tertiary period basalt flows with broad valleys which steepen to the east at the head of the Great Escarpment Gorges. Local geology is considerably diverse, as the basalt flows not only outcrop frequently, but have also eroded and exposed underlying sedimentary layers. The resulting landscape is a myriad of outcropping materials including basalt, granite, silcrete, chert, jasper, greywacke and ironstone, primarily exposed on eroded landforms such as crests and steep slopes.

Soils are diverse across the study area and comprise nine soil landscapes as mapped by the *Soil Landscapes of Armidale* (DECCW 2009). The study area includes the Gostwyck, Bald Knob, Ironstone and Fairfield Variant A soil landscapes whose landscape properties are presented in more detail in Table 5.1. In general, topsoils are typically very shallow and often rocky on crests. This provides significant limitations for such soils to retain cultural material. The exception to this is the Gostwyck soil landscape that was identified to feature loamy sands and clayey sands featuring archaeological material up to 70 cm in suitable landscape contexts (EMM 2019a).

The study area is within the catchment of the Macleay River which rises to the east of the study area at the confluence of the Gara River, Salisbury Waters and Bakers Creek and flows south-east through a coastal floodplain, where it meets the Pacific Ocean. Local drainage of the study area generally drains east and south-east into Saumarez Creek (5$^{th}$ order) and Salisbury Waters (6$^{th}$ order). The study area is dispersed across a landscape that features tributaries to these main water resources.

The study area has been modified by historical land use practices and past disturbances associated with land clearing, manual and machine rock-picking, cropping and intensive livestock grazing. Although the entire study area has been subject to widespread clearing, there are some mature native trees that have survived (living or dead).

The study area is currently used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production. These paddocks are still subject to cropping for pasture improvement and can be seen in their various stages of crop rotation.




*Source: EMM (2022); UPC (2022); DFSI (2017, 2022); OEH (2019); DPI (2015); GA (2011)*

0 1 2 km

GDA 1994 MGA Zone 56

N

KEY

- Approved Project boundary
- Modification area
- ACHA study area
- Rail line
- Main road
- Local road
- Topographic contour (10 m interval)
- Waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order

Soil landscape

- 9236ad | Arding
- 9236ba | Bald Knob
- 9236dw | Dwyers Range
- 9236ff | Fairfield
- 9236ffa | Fairfield variant a
- 9236ffb | Fairfield variant b
- 9236gs | Gostwyck
- 9236gsa | Gostwyck variant a
- 9236ir | Ironstone
- 9236jg | Julia Gully
- 9236kp | Kellys Plains
- 9236mc | Mccanns Flat
- 9236mi | Mihi
- 9236po | Powers Creek
- 9236poa | Powers Creek variant a
- 9236sz | Saumarez

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## Landscape overview

New England Solar and Battery Project
Aboriginal Cultural Heritage Assessment
Figure 3.1

EMM
creating opportunities

# 4 Aboriginal heritage context

## 4.1 Aboriginal socio-cultural and historical overview

Chapter 4 of the main project ACHA (EMM 2018) provides an overview of the Aboriginal socio-cultural and historical context relevant to the study area including details about the ethno-historical background.

## 4.2 Archaeological background

The Aboriginal cultural heritage within the approved project boundary was identified during the preparation of an ACHA undertaken as part of the development application (main project ACHA). The ACHA included archaeological investigation (field survey and test excavations) and Aboriginal community consultation with RAPs. A total of 100 Aboriginal sites were identified during the course of the main project ACHA, inclusive of the ACHA addendum investigations and assessment (EMM 2018, EMM 2019a, EMM 2019b).

Aboriginal sites were identified and assessed through targeted archaeological survey, targeted test excavation and expert assessment of a selection of potential Aboriginal scar trees. The sites identified comprised stone artefacts in surface and subsurface contexts, stone tool resource quarries, hatchet grinding grooves and Aboriginal scarred trees. Through project design revisions, resulting in the removal of the then proposed southern array area, there were 82 Aboriginal sites within the project boundary that required management considerations. These sites are managed under the AHMP (EMM 2021).

EMM identified 21 potential archaeological deposits (PAD) (indicating concentrated subsurface archaeological material) surrounding quarries (n=5), artefact scatters (n=9), isolated finds (n=3) and grinding grooves with artefact scatters (n=4). Given the somewhat limited amount of previous archaeological investigations in the region, EMM were conservative with predicted areas of PAD. Part of the rationale behind assigning PAD to sites was to have a trigger for archaeological investigation if project impacts were proposed. The trigger for test excavation would allow any site with PAD to be explored to establish its actual archaeological potential and significance. Ultimately five areas (NE15, NE27, NE33, NE70 and NE83) were tested for ACEN Australia to explore options to develop in and around these areas (EMM 2019a).

The test excavation results indicate that subsurface material can occur in suitable landforms and soil landscapes, notably on small rocky/boulder crests adjacent to water within the Gostwyck soil landscape. It is posited that these areas are more intact and feature higher artefact densities because they were somewhat protected by boulders/rock outcrops from intensive disturbance associated with repeated cultivation of paddocks (EMM 2019a). One test area, NE27, around 300 m north of Area 4, featured a cleared and cultivated paddock adjacent to a third order tributary of Saumarez Creek. Although there is evidence of Aboriginal camping and stone tool manufacture, even the most sensitive areas closest to the watercourse were met with patchy results and low to moderate artefact frequencies per test pit (between 0 and 11 artefacts per test pit) when compared to rocky crest areas (eg NE70 up to 60 artefacts per test pit). This contrast may be a result of repeated ploughing and cultivation at NE27, which although only likely to have affected the top 10–15 cm of soil during each plough event, could have increased erosion and movement of soils downslope as a result of the destabilised landscape. Furthermore, there was a notable drop-off in artefacts beyond 100 m of the watercourse near NE27.

Aboriginal site results, archaeological survey transects, and test excavation locations prepared as part of previous investigations are presented on Figure 4.2.

The main project ACHA archaeological investigation provided an informative and representative example of the widespread occupation of past Aboriginal people within the project boundary. The identified site types support the notion of the landscape being used by Aboriginal people more intensively and in more utilitarian ways when compared to earlier theories that suggested mainly ceremonial use (McBryde 1974; Bowdler 1981; Binns & McBryde 1972; Flood 2010, pp.238–239). The frequent distribution of open camp sites on elevated crests near watercourses, along with grinding groove sites, quarries and scarred trees show that the local area was part of the landscape used by Aboriginal people for its natural resources in a utilitarian and functional manner. The high frequency and variation in local geology (namely silcrete, basalt, greywacke and chert) would have allowed Aboriginal people to be selective in what raw materials they used for tool manufacture and this may account for relatively rare quarry sites, despite the plethora of available stone resources.

There is consistent evidence that Aboriginal people were targeting crests with outcropping material, not only for raw materials (eg quarries on silcrete and basalt), but for camping amongst areas of granite and/or silcrete boulders and granite tors. These locations represent relatively flat land in elevated areas with good outlooks over the surrounding landscape. This would have provided safety and visibility over the landscape and boulders for wind breaks and protection from weather. As such, it is likely that these sites are preserved today not only because they have been less disturbed from historical land management practices, but also because they were specifically targeted for occupation and used more intensively than the broader landscape (Section 6.5 and 6.6 of EMM 2018).

Proximity to reliable water sources, notably third order streams and above also contributed to the presence and frequency of Aboriginal sites. This, along with sporadic natural springs, played an important role in the presence of Aboriginal sites, with sites generally decreasing in frequency and size the further away from reliable water sources (Section 6.5 and 6.6 of EMM 2018).

Aboriginal grinding grooves were only found on outcropping silcrete boulders and pavements. One of the most significant sites identified, NE09, encompassing an outcrop with more than 200 grooves, was some distance from flowing water but may have attracted use after rain when rock pools filled. The remaining grinding groove sites are in locations more typical for this site type (ie as close to water as the location of outcropping material permitted).

## 4.3 Previously recorded sites

EMM conducted a search of the Aboriginal Heritage Information Management System (AHIMS) register on 12 May 2021. The search covered an area of approximately 21 km (east-west) by 11 km (north-south) centred on the study area. A copy of the AHIMS search is provided in Appendix A.

The AHIMS search identified 106 Aboriginal sites which are counted in Figure 4.1 and mapped in Figure 4.2. The search results support the discussion of Aboriginal site distribution in Section 4.2, whereby in addition to the typical occurrence of open artefact sites associated with elevated landforms and water resources, there are relatively high incidences of Aboriginal scarred trees (modified trees) (n=16) in areas where remnant native trees remain, and grinding groove sites (n=9) and quarries (n=4) where suitable outcropping geology occurs.

Overall, 82 of the 106 sites (77%) were recorded within the project boundary as part of the main project ACHA (EMM 2018, EMM 2019a). Only one site has been previously recorded within the study area that is the subject of the proposed modification – isolated artefact site NE20 (AHIMS 21-4-0215) within Area 3. Two sites have previously been recorded adjacent to the proposed additional BESS footprints:

- artefact scatter NE01 (AHIMS 21-4-0196) – currently actively avoided and fenced; and
- isolated find NE02 (AHIMS 21-4-0197) – salvaged in July 2021 consistent with the AHMP (EMM 2021).

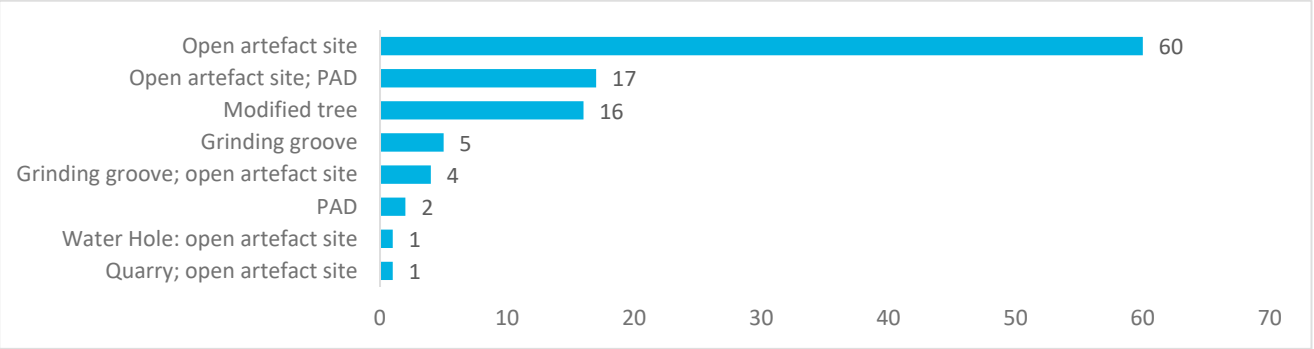
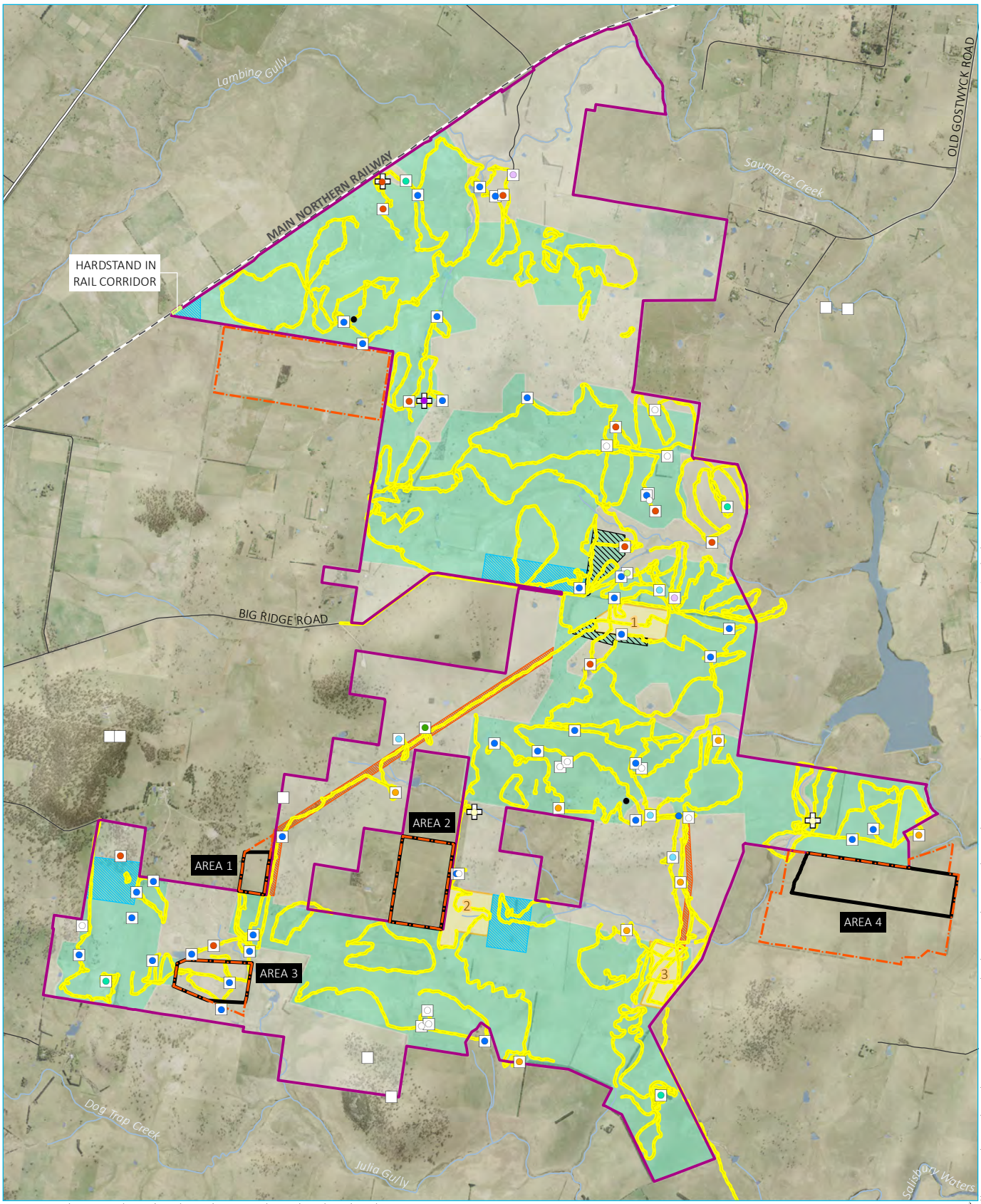



**Figure 4.1 AHIMS site type frequencies**

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*Source: EMM (2018, 2022); UPC (2022); DFSI (2017, 2022); OEH (2021); GA (2011)*

0 1 2 km

GDA 1994 MGA Zone 56

N

## KEY

- Approved Project boundary
- Modification area
- Additional substation/BESS footprint
- ACHA study area

Approved development footprint

- Solar array
- Potential electrical cabling
- Potential laydown area/site compound
- Potential substation/BESS footprint
- Hardstand in rail corridor
- AHIMS site
- Site subject to prior test excavation
- EMM 2018 survey transects

EMM 2018 survey results

- Artefact scatter
- Artefact scatter, PAD
- Artefact scatter, confirmed deposit, PAD
- Grinding groove
- Grinding groove, PAD
- Grinding groove, artefact scatter, PAD
- Isolated find
- Isolated find, PAD
- Isolated find, confirmed deposit, PAD
- Quarry, artefact scatter, PAD
- Scarred tree
- Not an Aboriginal scar tree

Existing environment

- Rail line
- Main road
- Local road
- Waterbody

# Archaeological context

New England Solar and Battery Project
Aboriginal Cultural Heritage Assessment
Figure 4.2

EMM creating opportunities

# 5 Predictive model

The summary of local archaeology demonstrates a close connection with geological and environmental characteristics, namely crests and geological outcrops. These environmental features can be used to predict the presence and distribution of cultural materials within the study area. The archaeology and landscape review presented in Table 5.1 aims to identify key landscape characteristics that indicate the varying levels of archaeological sensitivity across the study area.

**Table 5.1 Landscape and archaeological review of study area**

| Study area | Landscape summary | Implications for archaeology |
|---|---|---|
| Area 1 | **Hydrology and topography**<br>• Elevation range between 1,050 and 1,060 metres Australian Height Datum (m AHD).<br>• Continuous hill slope landform.<br>• Area contains no drainage features but is flanked by low order ephemeral tributaries.<br>**Soil landscape and geology**<br>• Soil landscape comprises Fairfield Variant A (Sandon beds: chert, jasper, greywacke).<br>**Soil summary**<br>Fairfield Variant A:<br>• Crests and upper slopes have A horizon of approximately 0–10 cm depth and continue onto shallow B horizon or bedrock.<br>• Lower slopes have slightly deeper A Horizon (0–15 cm).<br>• Area is predominantly cleared of native vegetation, but approximately some isolated trees remain. | This area has not been previously surveyed or had Aboriginal sites recorded.<br>Area landscape features are not typically associated with significant archaeological sites due to low stream order and soil landscapes typically featuring only isolated artefacts or low-density artefact scatters.<br>Isolated trees and tree clusters, if mature and native, have potential to feature Aboriginal scarring or carving. |
| Area 2 | **Hydrology and topography**<br>• Elevation range between 1,050 and 1,060 m AHD.<br>• Continuous hill slope landform bordering on crest on western and eastern borders.<br>• Area contains no drainage features but is bordered by a first order stream to the north.<br>**Soil landscape and geology**<br>• Soil landscape comprises Gostwyck (granites and silcrete).<br>**Soil summary**<br>• A horizon is a shallow loamy sand 0–18 cm depth with an underlying B horizon of brown clayey sand up to 45 cm.<br>• Area is predominantly cleared of native vegetation, but some isolated trees remain. | This area has not been previously surveyed or had Aboriginal sites recorded.<br>The area is part of the Gostwyck soil landscape which is known to contain various site types including grinding grooves, quarries and modified trees. However, the landform of this area and its distance from water indicates that isolated artefacts or small scatters are the most likely items present.<br>Elevation contours between 1,030 and 1,080 m AHD indicate landscape is suitable for outcropping silcrete boulders and pavements, which if present, may feature silcrete quarry or groove sites.<br>Isolated trees and tree clusters, if mature and native, have potential to feature Aboriginal scarring or carving. |

## Table 5.1 Landscape and archaeological review of study area

| Study area | Landscape summary | Implications for archaeology |
|---|---|---|
| Area 3 | **Hydrology and topography**<br>• Elevation range between 1,040 and 1,050 m AHD.<br>• Eastern extent of area borders third order stream Julia Gully and features a gently inclined slope leading from a broad crest.<br>• Western portion of area includes ephemeral first order gullies.<br>**Soil landscape and geology**<br>• Soil landscapes comprise Fairfield Variant A (Sandon beds: chert, jasper, greywacke) on crests and slopes and Kellys Plains (Tertiary basalt) in drainage depressions.<br>**Soil summary**<br>• Refer to Area 1 for Fairfield Variant A description.<br><u>Kellys Plains:</u><br>• A horizon is either clay loams on upper footslopes or very dark brown medium heavy clay on footslopes and continues into a B horizon of very heavy clays.<br>• Area is predominantly cleared of native vegetation, few trees remain. | Area partially surveyed during main project ACHA.<br>One isolated artefact (NE20) is within the modification area boundary and another (NE19) is 30 m south.<br>Area landscape features within 200 m of Julia Gully present a potential for PAD and subsurface archaeological material.<br>Remainder of landscape features are not typically associated with significant archaeological sites due to low stream order and soil landscapes typically featuring only isolated artefacts or low-density scatters.<br>Existing site NE20 is of low significance. Further similar sites may be found across crests in this area.<br>Isolated trees and tree clusters, if mature and native, have potential to feature Aboriginal scarring or carving. |
| Area 4 | **Hydrology and topography**<br>• Elevation range between 1,000 and 1,030 m AHD.<br>• Area is characteristic of low rolling hills with crests, spurs, hill slopes and drainage depressions.<br>• Area contains features within 200 m of Saumarez Creek (fifth order) in north eastern corner, and within 200 m of a third order tributary of Saumarez Creek along the area's western border.<br>**Soil landscape and geology**<br>• Soil landscape comprises Gostwyck (granites and silcrete) and Fairfield Variant A (Sandon beds: chert, jasper, greywacke).<br>**Soil summary**<br>• Refer to Areas 2 and 3 for relevant soil landscape soil profile descriptions.<br>• Area is fully cleared of native trees. | This area has not been previously surveyed or had Aboriginal sites recorded.<br>Landscape features within 200 m of Saumarez Creek at the eastern border and its tributary on the western border may feature open artefact sites with PAD on suitably elevated landforms or rocky/boulder crests.<br>The remainder of the landscape, notably on crests and spurs, may feature outcropping silcrete pavements and boulders common to the Gostwyck Soil landscape. These have potential for grinding groove or quarry sites.<br>Aerial imagery indicates that trees are absent from this property, and therefore the presence of Aboriginal scarred or carved trees is unlikely. |

## Table 5.1 Landscape and archaeological review of study area

| Study area | Landscape summary | Implications for archaeology |
|---|---|---|
| Area 5[1] | **Hydrology and topography**<br>• Elevation range between 1,040 and 1,060 m AHD.<br>• Primarily undulating rises and one elevated crest.<br>• Features only a first order tributary of Lambing Gully.<br>**Soil landscape and geology**<br>• Soil landscapes comprise Bald Knob (Tertiary basalts) on crests and Ironstone (Tertiary ferricite and sporadic silcrete cobbles) on undulating rises.<br>**Soil summary**<br><u>Bald Knob:</u><br>• The A soil horizon is either non-existent or very shallow on crests and upper and mid slopes (0–10 cm depth and continue onto bedrock or B horizons.<br>• A soil horizon can be up to 30 cm on lower slopes or drainage depressions.<br><u>Ironstone:</u><br>• A horizon is generally a shallow clay loam (0–15 cm) onto a medium clay (15–60 cm). Lower slopes and drainage depressions have deeper A horizon of up to 40 cm.<br>• Area is predominantly cleared of native vegetation. Some isolated trees and 2 ha of planted vegetation present. | This area has not been previously surveyed or had Aboriginal sites recorded.<br>Area landscape features are not typically associated with highly significant archaeological sites due to low stream order and soil landscapes typically featuring only isolated artefacts or low-density artefact scatters.<br>Elevation contours between 1,030 and 1,080 m AHD indicate landscape is suitable for outcropping silcrete boulders and pavements, which if present, may feature silcrete quarry or groove sites.<br>Isolated trees and tree clusters, if mature and native, have potential to feature Aboriginal scarring or carving. |

[1] Area 5 was removed from the modification area as part of project refinements. This area is shown as an unlabelled study area parcel to the north of the modification area.

# 6 Archaeological survey

## 6.1 Key findings

## 6.2 General

EMM conducted an archaeological field survey of the study area with the assistance of RAP site officers between 25 October 2021 and 29 October 2021. The survey was completed over a total of five days. The aims of the survey were to:

- identify Aboriginal archaeological sites and/or Aboriginal places with the assistance of Aboriginal knowledge holders;
- characterise the landscape to aid predictions of archaeological potential;
- identify sites or areas that would require further investigation if planned for development as part of the proposed modification;
- identify sites or areas to be avoided by development, where possible; and
- identify areas with minor or negligible Aboriginal cultural heritage values that are most suitable for development.

## 6.3 Sampling strategy

The manageable size of the study area allowed for all of its landform units to be sampled. The survey effort was generally weighted towards focusing on landforms close to water courses. The geographic extent of each study area land parcel was extensively sampled.

The study area was categorised into classes of landforms for sampling during the survey (Table 6.1). The extent of sampling within each landform class was proportionate to its level of archaeological sensitivity as presented in the predictive model.

Prior to the survey, the study area was divided into broad landform morphological classes, guided by the definitions presented in the *Australian Soil and Land Survey Field Book* (National Committee on Soil and Terrain 2009). This approach allowed for a broad landscape division to assist survey planning and was flexible enough to allow specific landform elements to be defined during the field survey. The landform classes and their corresponding landform elements are described in Table 6.1. The landform classes guided the boundaries of the survey transects which were further categorised into more specific landform elements.

**Table 6.1 Landform classes and their corresponding landform elements**

| Landform class | Landform element |
|---|---|
| Crest | This includes hill crest, spur crest and ridge landform elements. |
| Hill slope | Hill slope was divided into two categories:<br>• Hill slope 1 – very gentle to gently inclined slopes (representing areas suitable for Aboriginal camping activities); and<br>• Hill slope 2 – slopes of moderate inclination and above (representing steeper terrain not typically suitable for open camp sites). This element was not observed during survey. |
| Flat | This includes flat terrain including undulating plains, floodplains and terraces. |
| Watercourse | This includes stream channels and a 50 m wide corridor of land adjacent to watercourses. Watercourse landform units are further divided into three categories: 1st and 2nd order streams; 3rd order streams; and 4th order and above. |

## 6.4 Survey methods

The archaeological survey and data collection methods followed Section 2.2 of the Code (DECCW 2010b). The survey involved pedestrian field transects within defined landform units. The survey team comprised five people per day. Each survey participant was spaced approximately 10–15 m apart within an approximate 50 m wide corridor. This method was considered to be suitable for a landscape characterised by grassed paddocks, whereby suitable ground exposures were easy to identify and targeted at this spacing. Although the survey team was spread across a 50 m wide corridor, the assessment calculations assume that each participant could only observe approximately 5 m of the ground surface in front of them (eg five field members covered 25 m of ground within the 50 m corridor). Notwithstanding, this calculation does not account for more obtrusive site types (such as grinding grooves and scar trees) which are typically observable from a much greater distance.

The effectiveness of the survey is determined through recording and analysing survey coverage data. It is evaluated for its effectiveness in identifying the distribution of Aboriginal objects across the landscape, taking into account the potential for archaeological deposits. The percentage of the ground surface exposed in each landform and the visible ground surface within exposures (as ground exposures are often obscured by vegetation, gravels, etc) influences the survey results. For example, an archaeologically sensitive landform surface that is highly exposed by erosion is likely to reveal Aboriginal objects, whereas a similar landform that is thickly grassed will obscure surface artefacts if they are present. Overall, calculation of effective survey coverage is used to estimate not only how much area was physically surveyed, but also how favourable the survey conditions were for the identification of Aboriginal sites.

Site recording was completed in accordance with the Code (DECCW 2010b). Site locations and their details were recorded with digital tablets using site recording forms created by EMM on the Survey123 application for ArcGIS (Esri© software). The digital tablets had a location accuracy of up to ±3 m which is similar to hand-held non-differential GPS units. The Survey123 forms allowed for a site's location, details and representative photographs to be linked together, which avoided potential post-fieldwork issues around data integrity.

All artefact locations were marked with high visibility stake flags and/or flagging tape (eg scar trees). Site locations and details were checked and finalised using ArcGIS software, Collector and ArcMap, post-fieldwork. Hand-held non-differential GPS units were also used to mark individual artefact locations when recording sites with multiple artefacts. These locations were linked to the Survey123 site locations and assisted in defining site boundaries during the post-fieldwork phase of this ACHA.

Survey transects were recorded on a separate Survey123 form created by EMM. The Survey123 form allowed for survey transect starting points, details and representative photographs to be recorded. The course of survey transects were recorded as tracks on hand-held non-differential GPS units which were linked to the Survey123 forms.

Further information regarding Aboriginal site definitions and recording methods are provided in Table C.1.

## 6.5 Survey coverage

The survey comprised 18 walking transects across the study area, completed over 5 days. GPS track log data indicates that each survey participant walked approximately 41 km, which represents the total length of the survey transects.

Figure 6.1 to Figure 6.3 presents the survey transects logged by GPS, but represents only where two archaeologists walked during survey. It does not accurately represent the transect width covered by the survey team, which sometimes involved people separating beyond the 50 m wide corridor to inspect key landscape features such as rock outcrops and trees along the general transect alignment.

Landform coverage data is summarised in Table 6.2 and data for individual transects are provided in Appendix D. Examples of different landforms, ground surface visibility conditions and disturbance levels are shown in Plate 6.1 to Plate 6.8.

**Table 6.2 Survey effective coverage summary**

| Landform class | Total length (m) | Proportion of survey effort (%) | Sum of area (m) | Sum of effective coverage area (m) | Effective coverage% | Number of Aboriginal sites |
|---|---|---|---|---|---|---|
| Crest | 10,472 | 25.5 | 209,450 | 11,048.5 | 5 | 5 |
| Hillslope | 24,707 | 60.2 | 494,131 | 23,692.6 | 5 | 10 |
| Plain | 3,088 | 7.5 | 61,758 | 3,722.3 | 5 | 2 |
| Watercourse | 2,749 | 6.7 | 54,980 | 1,099.6 | 5 | - |
| **Total** | **41,016** | **100*** | **820,319** | **39,563** | **-** | **17** |

Note: *Values do not add to 100 due to rounding error.

Hillslopes were the most surveyed landform class and received approximately 60% of the survey effort. Effective coverage of this landform class was relatively low at 5%. This was largely attributed to high levels of grass coverage along the vast grazing paddocks that characterise this landform type. Rock outcropping was relatively infrequent whereby granite and silcrete pavements and tors (Plate 6.2) were easily visible across the Gostwyck soil landscape, as was basalt (Plate 6.3) across the Ironstone and Fairfield Variant A soil landscapes. Disturbance levels were moderate on this landform class, as they represent where extensive clearing, followed by repeated ploughing for pasture improvement has occurred.

Crests (hill crests, ridges and spurs) received 25% of the survey effort. Effective coverage was very similar to the hillslope landform because of the extensive grass cover. This had the effect of obscuring much of the smaller surface strewn geologies such as basalt and ironstone. The low-lying plain landforms sampled were the most densely vegetated due to peat and swampy conditions. The only drainage feature directly surveyed was during T15 and formed part of a low-lying swamp drainage feature in Area 3.

Plate 6.1 T1: grassed crest overlooking Saumarez Creek (view north)

Plate 6.2 T3: Granite tor and silcrete pavement outcropping on hill slope (view north-west)

Plate 6.3 T9: Basalt outcropping and example of dead tree in grassed paddock (view east)

Plate 6.4 T15: broad hill crest with example of mature tree and vehicle track (view north-east)

Plate 6.5 T15: Broad hill crest overlooking flat swampy plain of T14 (view south-east)

Plate 6.6 T18: Grassed hill slope looking south

Plate 6.7 T18: Grassed hill slope with minor exposures of silcrete pavement (view north-east)

Plate 6.8 T17: Grassed hill slope showing horse track circuit in foreground (view north)

The effective coverage results from this survey were generally lower than previous surveys undertaken as part of the main project ACHA. Previous surveys were completed during a period of significant drought which had made grass cover very sparse and allowed large scalds and continuous exposures for inspection. The landscape received much more rain in 2021 resulting in greater density grass coverage. Consequently, effective survey coverage has dropped between 5%–10% on comparable landforms. As such, predictions for the presence of stone artefacts have had to rely on the predictive model to a greater extent than survey surface inspection alone.

Despite the above, the survey was considered effective for the detection of grinding grooves, stone quarries and scarred trees. Outcropping stone material was still highly visible, along with outcropping stones and boulders. Furthermore, the survey team inspected every mature tree in the study area for the presence of Aboriginal scarring or carving.

## 6.6 Aboriginal sites identified

### 6.6.1 Overview

The survey team identified 12 Aboriginal sites and 5 areas of PAD (total 17 sites). Sites were labelled sequentially from previous investigations starting at NE103 to NE119. The site features comprised three isolated artefacts, four Aboriginal scarred trees, five open artefact scatters and five PADs. A summary of the site characteristics is provided in Table 6.3 and Figure 6.1 to Figure 6.3. Some examples of the sites are shown in Plate 6.9 to Plate 6.14.

## Table 6.3 Summary of Aboriginal site results

| Site name | Site features | Easting | Northing | Landform element | Site description |
|---|---|---|---|---|---|
| NE103 | Artefact scatter | 370392 | 6608850 | Spurcrest | Artefact count: 2<br>One silcrete distal flake and one chert medial flake identified on scald exposure. Rocky spur crest landform indicates highly skeletal and eroded soil profile, so no PAD predicted. |
| NE104 | PAD | 370246 | 6608905 | Footslope | Elevated footslope landform at the confluence of Saumarez Creek and its ephemeral tributary. Proximity to artefact scatter NE103 indicates local Aboriginal occupation, but with more intact soils. |
| NE105 | PAD | 37023 | 6608765 | Hillslope | Extension mid slope leading uphill and away from NE104. This area was recorded as the elevated area with good outlook over Saumarez Creek continues to this point before the landscape transitions into an undefined hill slope. |
| NE106 | PAD | 368841 | 6608892 | Footslope | Elevated footslope including large granite tor outcrops within 200 m of a 3rd order tributary of Saumarez Creek.<br>Similar landscape features of nearby NE27, which was test pitted and confirmed to have subsurface deposit within 100 m of this water source. |
| NE107 | PAD | 368657 | 6608468 | Footslope | Similar to NE106 but absent of granite tors. |
| NE108 | Isolated artefact | 365052 | 6613423 | Hillslope | Isolated silcrete core found in uprooted tree stump on very gently inclined grassed paddock. |
| NE109 | Artefact scatter | 364932 | 6613470 | Hillslope | Artefact count: 2<br>Two silcrete cores identified within approximately 5 m of each other in open paddock within 120 m of NE108. |
| NE110 | Scarred tree | 364790 | 6613119 | Hillslope | Dead eucalypt standing tree with two scar features. Tree is approximately 12 m high and 2.3 m in circumference. Tree dry face is present but heavily laminating. Scars are oval shaped with extensive regrowth over scar features.<br>Scar 1 – facing north, length 108 cm, max. width 19 cm, regrowth 60–70 cm wide.<br>Scar 2 – facing east, length 45 cm, max width 18 cm, regrowth indeterminate. |
| NE111 | Scarred tree | 364710 | 6613211 | Hillslope | Living eucalypt standing tree with one scar feature. Tree is approximately 20 m high and 3 m circumference. Scar is significantly regrown leaving a thin irregular shape scar. Dry face is intact.<br>Scar is facing south, length 90 cm, open scar section 50 cm long, max width 4–8 cm. |
| NE112 | Scarred tree | 364409 | 6613290 | Hillslope | Living eucalypt standing tree with one scar feature. Tree is approximately 20 m high and 2.8 m circumference. Dry face of scar has decayed and is now missing. Scar regrowth has extended into trunk obscuring any sign of original scar.<br>Scar facing south, length 68 cm, max. width 10 cm. |

## Table 6.3 Summary of Aboriginal site results

| Site name | Site features | Easting | Northing | Landform element | Site description |
|---|---|---|---|---|---|
| NE113 | Scarred tree | 364279 | 6613417 | Hillslope | Dead eucalypt standing tree with two scar features. Tree remains are approximately 15 m high and 2.8 m circumference. Scar continues to base of trunk and original scar is likely to have died back towards the base of the trunk. Regrowth around scar and striations extending up the trunk away from scar indicate potential for it to have originally extended further (approx. 70 cm up tree trunk).<br>Scar facing east, length 244 cm, max. width 40 cm. |
| NE114 | Artefact scatter | 364053 | 6613723 | Hillslope | Artefact count: 11<br>Open artefact scatter identified on red soil exposures along northern fence of surveyed area next to cattle track.<br>Artefacts are distributed across a 50 m x 50 m area.<br>Artefacts comprise silcrete, quartzite and chert flakes and flake fragments. |
| NE115 | Isolated artefact | 363865 | 6613737 | Hillslope | Artefact count: 2<br>Two silcrete flakes identified on cattle tracks in north-western portion of the study area near fence line. Eroding out of red soil on northern slope of knoll with basalt outcropping. |
| NE116 | Isolated artefact | 363861 | 6613457 | Dam | Isolated quartzite flake identified in highly disturbed context of dam wall. |
| NE117 | PAD | 363735 | 6607408 | Footslope | Elevated footslope with a south-easterly aspect overlooking a 2nd order tributary of Julia Gully. Area within 200 m of the tributary on this landform was ascribed with PAD. |
| NE118 | Artefact scatter | 363618 | 6607941 | Hillslope | Artefact count: 8<br>Open scatter of chert, silcrete, basalt and quartzite flake fragments identified on the southern side of an unsealed farm vehicle track. Site is moderately to highly disturbed from vehicle track cutting. Site's presence is attributed to its proximity to Julia Gully (100 m east). |
| NE119 | Artefact scatter | 363233 | 6607821 | Hillcrest | Artefact count: 7<br>Open scatter of chert and quartz flakes identified on a halo exposure beneath mature tree on a small hill crest. Soils appear highly gravelly and eroded with very limited potential for subsurface material. Site is only near ephemeral water sources and unlikely to have experienced intensive occupation. |

Plate 6.9 NE104: gently inclined footslope PAD overlooking Saumarez Creek, view north


Plate 6.10 NE103: basalt flake fragment, likely component of broken hatchet/axe

Plate 6.11 NE106: area of PAD adjacent to tributary of Saumarez Creek including outcropping of granite tors, view south-east

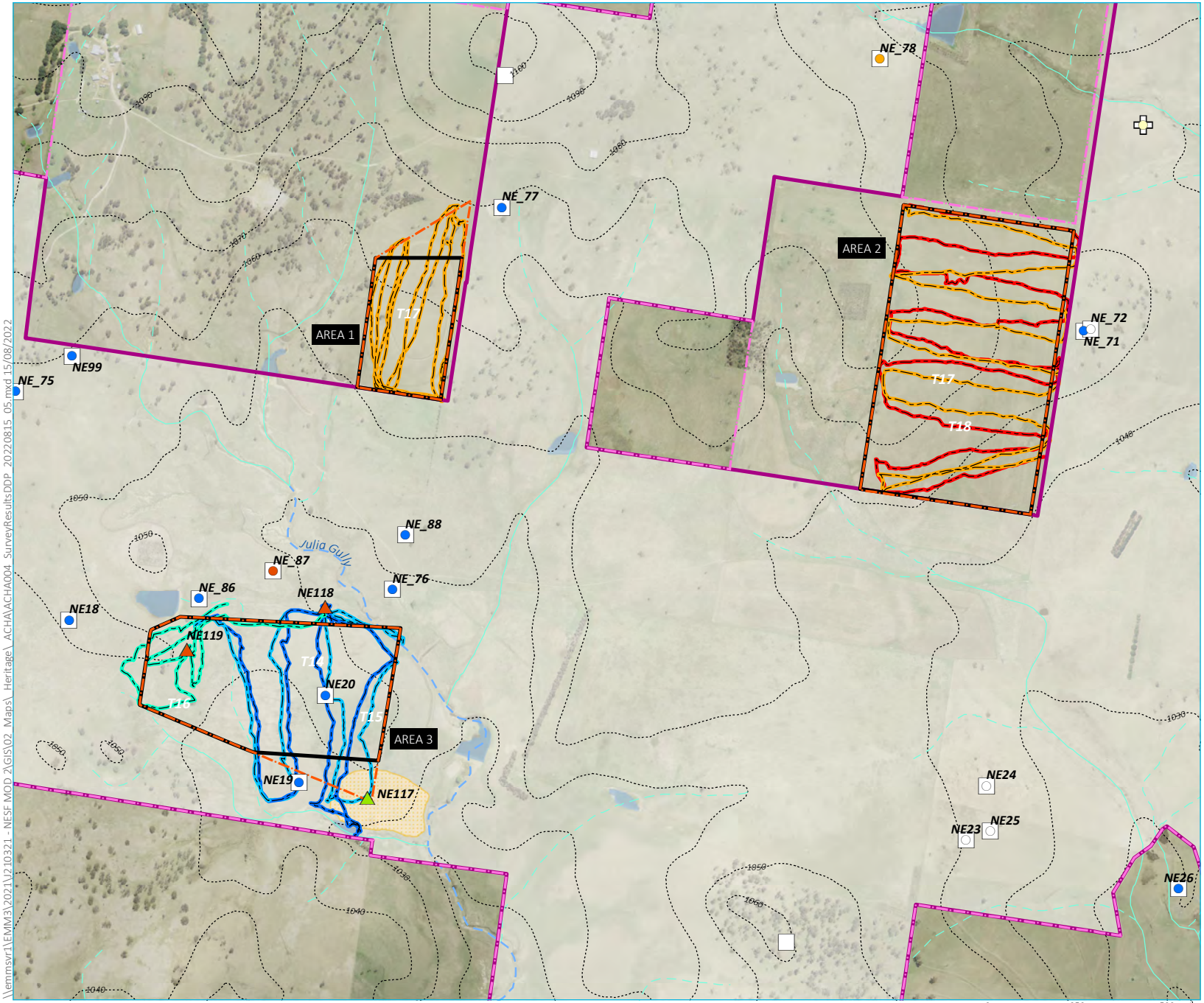
Plate 6.12 NE117: area of PAD on gently inclined footslope overlooking Julia Gully and its tributary, view south-east

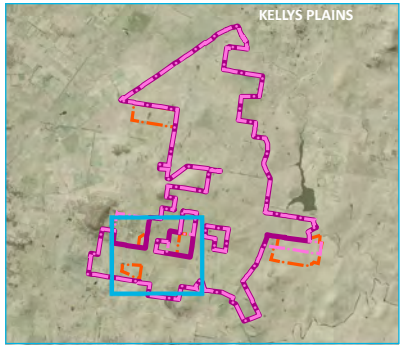
Plate 6.13 NE118: context shot of open artefact scatter identified in unsealed vehicle track, view north


Plate 6.14 NE118: example of silcrete and chert artefacts which are common materials to the local area

Plate 6.15 NE113: Scar feature on dead eucalypt tree

Plate 6.16 NE110: Context shot of dead scar tree in open paddock




KEY

- Approved project boundary
- Proposed project boundary
- Modification area
- ACHA study area
- Topographic contour (10 m interval)
- Waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order

**Previous recorded sites**

- AHIMS site
- Site subject to previous investigation
- Artefact scatter
- Artefact scatter, PAD
- Artefact scatter, confirmed deposit, PAD
- Isolated find
- Scarred tree

**EMM 2021 survey results**

Site type

- Artefact scatter
- PAD
- PAD area

Heritage survey track

- T14
- T15
- T16
- T17
- T18

Source: EMM (2018, 2021, 2022); UPC (2022); DFSI (2017, 2022); OEH (2021); GA (2011)

0 250 500 m

GDA 1994 MGA Zone 56

N

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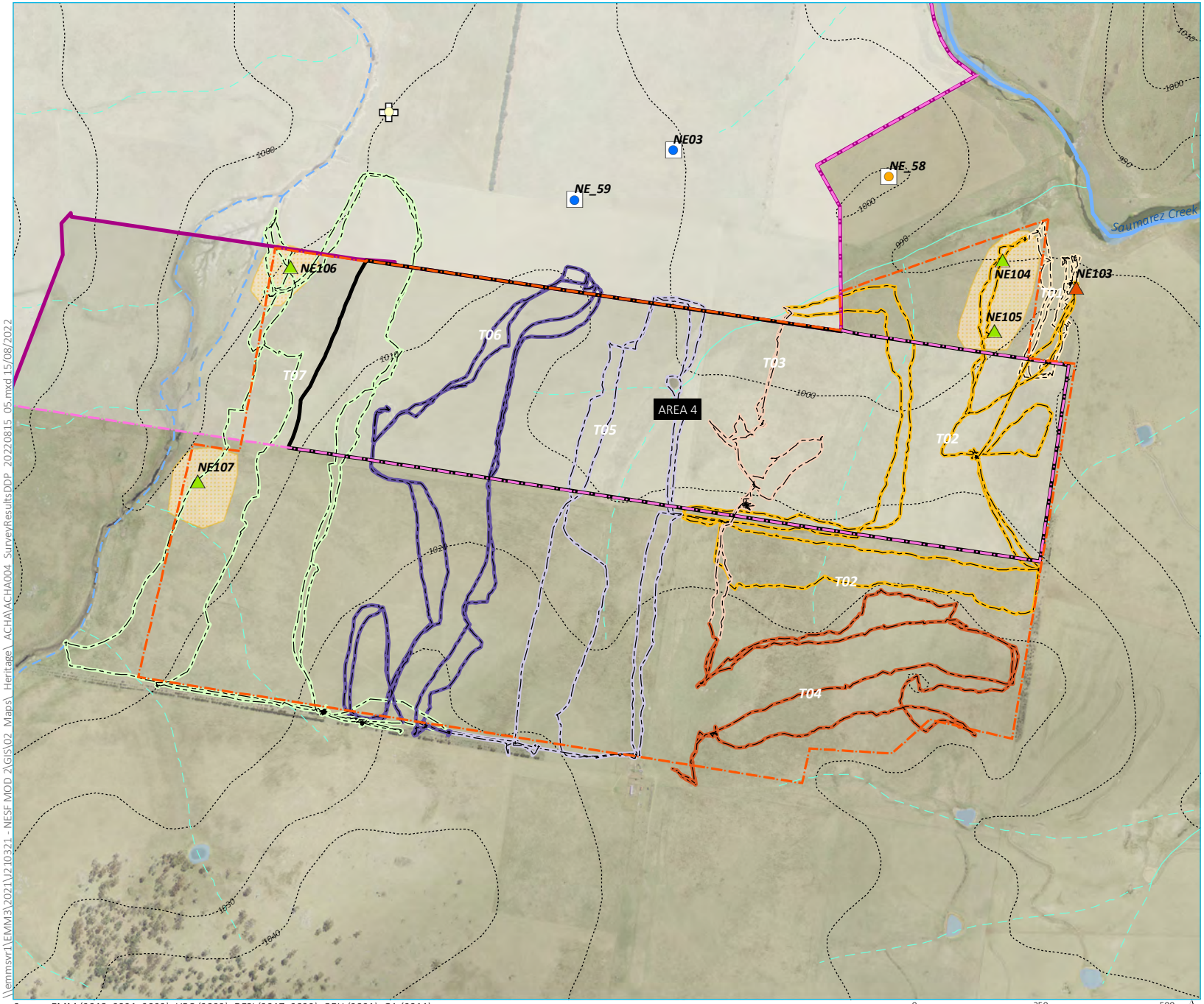
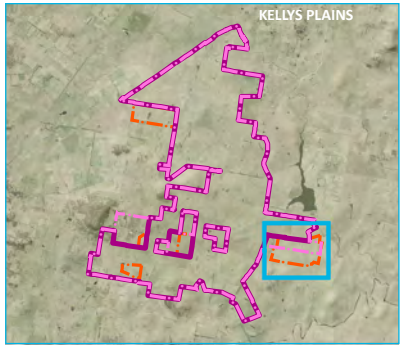
# Archaeological survey results – Areas 1, 2 and 3

New England Solar and Battery Project
Aboriginal Cultural Heritage Assessment
Figure 6.1

EMM creating opportunities




KEY

- Approved project boundary
- Proposed project boundary
- Modification area
- ACHA study area
- Topographic contour (10 m interval)
- Waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 5th order

**Previous recorded sites**

- AHIMS site
- Site subject to previous investigation
- Artefact scatter, PAD
- Artefact scatter, confirmed deposit, PAD
- Isolated find

**EMM 2021 survey results**

Site type

- Artefact scatter
- PAD
- PAD area

Heritage survey track

- T01
- T02
- T03
- T04
- T05
- T06
- T07

Source: EMM (2018, 2021, 2022); UPC (2022); DFSI (2017, 2022); OEH (2021); GA (2011)

0 250 500 m

GDA 1994 MGA Zone 56

N

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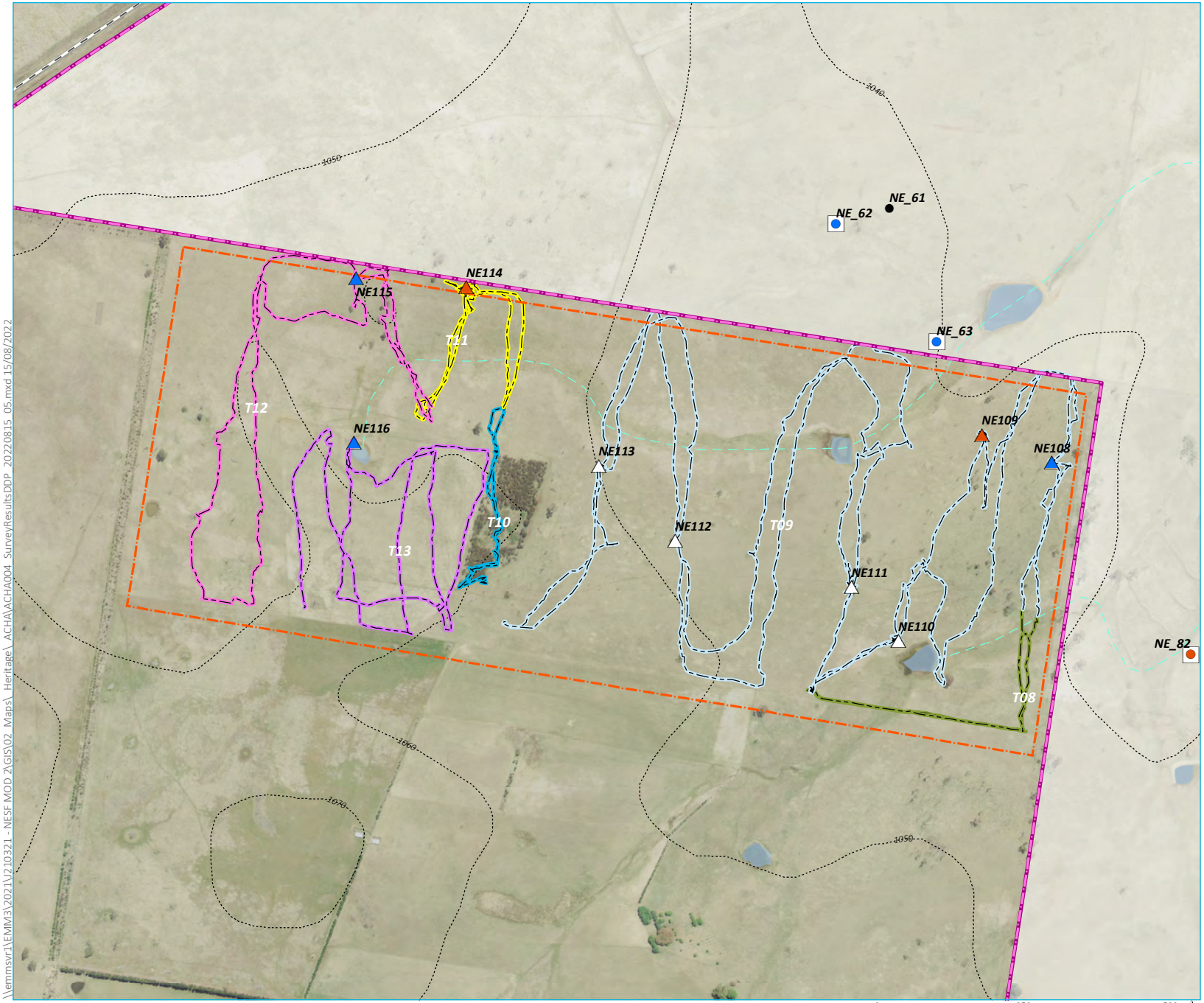
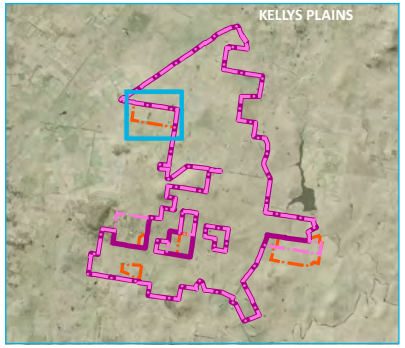
# Archaeological survey results – Area 4

New England Solar and Battery Project
Aboriginal Cultural Heritage Assessment
Figure 6.2

EMM
creating opportunities




KEY

- Approved project boundary
- Proposed project boundary
- ACHA study area
- Rail line
- Topographic contour (10 m interval)
- Waterbody

Strahler stream order

- 1st order

**Previous recorded sites**

- AHIMS site
- Artefact scatter
- Isolated find
- Not an Aboriginal scar tree

**EMM 2021 survey results**

Site type

- Artefact scatter
- Isolated artefact
- Scarred tree

Heritage survey track

- T08
- T09
- T10
- T11
- T12
- T13

Note: Area 5 was removed from the proposed modification.

Source: EMM (2018, 2021, 2022); UPC (2022); DFSI (2017, 2022); OEH (2021); GA (2011)

0 250 500 m

GDA 1994 MGA Zone 56

N

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# Archaeological survey results – Area 5

New England Solar and Battery Project
Aboriginal Cultural Heritage Assessment
Figure 6.3

EMM creating opportunities

# 7 The archaeological resource

The results of the archaeological investigation for the study area are consistent with the findings of the main project ACHA (Section 4.2), albeit with less diversity of Aboriginal site types identified during recent fieldwork. While the main project ACHA identified an array of site types including grinding grooves, quarries and hatchets, the study area archaeological evidence was confined to stone artefacts and scar trees. This disparity is possibly partly because the recent survey effort focused extensively on generic hill slope landscapes (60% of survey) that characterised the study area, rather than crest landforms which are of higher archaeological significance. For example, 57% of sites identified during the main project ACHA were on crests and included a range of archaeological features (eg stone artefacts, basalt hatchets/axes, grinding grooves, PADs, quarries and scarred trees). The relatively few open artefact sites identified during the recent survey can also be attributed to a survey effort with less focus on crest landforms.

It is also clear that the reduced ground surface visibility conditions experienced during the recent surveys affected the number of stone artefact sites identified. Despite this limitation, the landscape distribution of stone artefacts and areas of PAD are somewhat predictable from the results of the main project ACHA (including the targeted test excavation). The main project ACHA excavation results suggest that subsurface deposit concentrations are highly landform-dependent (eg discrete crests or knolls identifiable by contour data) and/or highly influenced by proximity to water (concentrations within 100 m and typical abrupt drop off past this distance) (refer Chapter 4 of EMM 2019a). None of the PADs identified during the recent survey effort are highly distinguished from the surrounding landscape, but their elevated outlooks and proximity to key watercourses in the local area indicate that subsurface material may be traceable if subject to archaeological excavation.

The relatively high incidence of Aboriginal scar trees identified during the recent survey is further evidence that these site types are far more common locally, despite being relatively rare throughout NSW. This finding reiterates the importance of inspecting all mature paddock trees during archaeological survey in this region.

# 8 Significance assessment

## 8.1 Overview

Aboriginal objects in NSW are protected under the NPW Act. It is recognised that the destruction of sites may be necessary to allow other activities or developments to occur. In order for the consent authority to make informed decisions on such matters, an important element of cultural resource management is determining the significance of cultural heritage places and objects to understand what may be lost and how best it can be mitigated.

Cultural significance is outlined in Article 1.2 of the Burra Charter – the best practice document for managing cultural heritage – as 'aesthetic, historic, scientific, social or spiritual value for past, present or future generations' (Australia ICOMOS 2013). These values are reiterated in the NSW guidelines, which determine the cultural significance of a place can be assessed by identifying the values that are present across the subject area and assessing what is important and why (OEH 2011).

In assessing the scientific significance of sites, aspects such as rarity, representativeness and integrity must be considered. Generally, a site or object that is rare will have a heightened significance, although a site that is suitable of conservation as 'representative' of its type will also be significant. Conversely, an extremely rare site may no longer be significant if its integrity has been sufficiently compromised.

The criteria adopted for this report are defined in Table 8.1.

**Table 8.1 A summary of criteria used to assess the cultural significance**

| Criterion | Definition |
|---|---|
| **Socio-cultural value** — Does the place have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons? | Social (or cultural) value refers to the spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them.<br>Social or cultural value can only be identified through consultation with Aboriginal people. As no specific feedback was provided by the RAPs during their review of the draft ACHA, socio-cultural values have not been assessed for the newly identified sites. |
| **Historic value** — Is the place important to the cultural or natural history of the local area and/or region and/or state? | Historic value refers to the association of a place with a historically important person, event, phase or activity. Historic places do not always have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have 'shared' historic values with other (non-Aboriginal) communities. |
| **Scientific (archaeological) value** — Does the place have potential to yield information that will contribute to an understanding of the cultural or natural history of the local area and/or region and/or state? | Scientific (archaeological) value refers to the importance of a landscape, area, place or object because of its rarity, representativeness and the extent to which it may contribute to further understanding and information.<br>Information about scientific values is gathered through archaeological investigation undertaken in this report. |
| **Aesthetic value** — Is the place important in demonstrating aesthetic characteristics in the local, regional, and/or State environment? | Aesthetic value refers to the sensory, scenic, architectural and creative aspects of the place. It is often linked with social value, and can consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use. This value is only relevant to archaeological sites on only rare occasions, such as rockshelters that contain art, or culturally modified trees in prominent positions, etc. |

Source: OEH (2011).

## 8.2 Statement of significance

The significance of each of the 17 sites identified during the recent survey has been assessed. This comprises the 12 sites where physical archaeological evidence was identified and the five areas of PAD. Note that the significance of the PAD areas can only be speculated in the absence of test excavation results, and the significance of PADs are often primarily based on their scientific research potential. The assessment of significance was made consistent with the approach adopted in the main project ACHA.

Table 8.2 provides a summary of the significance values for each Aboriginal object and/or site identified.

All scarred trees were assessed to be of moderate significance, partly due to their interregional rarity and aesthetic appeal as clear markers of past Aboriginal occupation in the landscape. Notably, some scars with clear oval form and relative intactness (NE113) were assessed to have higher aesthetic significance when compared to ambiguous or nearly closed scars (eg NE111 and NE112). The main limiting factors for the scarred trees to be considered high significance was the general level of decay, ambiguity and lack of distinct archaeological traces (eg axe marks). Notwithstanding, each tree recorded had sufficient attributes to be considered Aboriginal objects unless proven otherwise through third-party specialist assessment.

All of the stone artefact sites (isolated finds and open scatters) were assessed to have low significance. These are sites that do not have the same capacity to inform us about past Aboriginal life. While such sites symbolise Aboriginal presence in the landscape through their very existence, they can tell us little else, or little further than what is already known and established in archaeology. Notwithstanding the limited information potential, each site is of cultural significance to the Aboriginal community. These sites are in moderately to highly disturbed contexts, such as highly exposed contexts within pasture improved paddocks, graded vehicle tracks or excavated mounds (eg dam walls). Overall, these sites hold little value beyond their physical contents (ie stone artefacts) as their contexts have been compromised.

The areas of PAD were nominally assigned with a moderate level of significance, primarily linked to archaeological research potential associated with PAD. The main limiting factors of these sites relate to the predicted integrity of these sites, whereby these sites are in open landscapes subject to historic land clearance and cultivation. As evidenced by test excavation at nearby sites (eg NE27), it is likely that some subsurface material exists and clustering of artefacts may indicate some discrete activity areas.

## Table 8.2 Significance of Aboriginal objects and/or sites identified

| Site name | AHIMS number | Site type | Significance | | | |
|---|---|---|---|---|---|---|
| | | | Scientific | Aesthetic | Historical | Overall |
| NE20 | 21-4-0215 | Isolated artefact | L | L | L | Low |
| NE103 | TBC | Artefact scatter | L | L | L | Low |
| NE104 | TBC | PAD | M | L | L | Moderate |
| NE105 | TBC | PAD | M | L | L | Moderate |
| NE106 | TBC | PAD | M | L | L | Moderate |
| NE107 | TBC | PAD | M | L | L | Moderate |
| NE108 | TBC | Isolated artefact | L | L | L | Low |
| NE109 | TBC | Artefact scatter | L | L | L | Low |
| NE110 | TBC | Scarred tree | M | M | L | Moderate |
| NE111 | TBC | Scarred tree | M | L | L | Moderate |
| NE112 | TBC | Scarred tree | M | L | L | Moderate |
| NE113 | TBC | Scarred tree | M | H | L | Moderate |
| NE114 | TBC | Artefact scatter | L | L | L | Low |
| NE115 | TBC | Isolated artefact | L | L | L | Low |
| NE116 | TBC | Isolated artefact | L | L | L | Low |
| NE117 | TBC | PAD | M | L | L | Moderate |
| NE118 | TBC | Artefact scatter | L | L | L | Low |
| NE119 | TBC | Artefact scatter | L | L | L | Low |

# 9 Impact assessment

## 9.1 Potential sources of impact

The need for heavy civil works such as grading/levelling and compaction within the modification area will be minimised (where feasible), as the modification area is already mostly flat and cleared of vegetation.

Ground disturbance activities that have the potential to disturb Aboriginal objects within the modification area are:

- installation of the steel tracking systems, which are mounted on piles (this involves driving or screwing piles into the ground, possibly including pre-drilling but only if required);
- trenching for underground cabling;
- clearing for internal access tracks and level pads for PCU placement; and
- installation of new internal roads or gravel access tracks.

A level pad is required to house BESS infrastructure and therefore heavier earth moving may be required in the proposed additional BESS footprints. The proposed additional BESS footprints are within the approved project boundary and development footprint (Figure 1.2).

## 9.2 Measures to minimise harm and alternatives

The modification area has undergone significant refinements during the environmental assessment process. ACEN Australia and EMM adopted an iterative design process with the objective of developing an efficient project that avoids and/or minimises environmental impacts wherever feasible whilst still being constructable. Avoidance of Aboriginal cultural heritage values have been a primary feature of the refinement process.

The study area (shown on figures throughout this report) was the initial investigation area for the proposed modification and was the subject of archaeological investigations, including desktop assessment and archaeological survey. After a number of Aboriginal sites and areas of archaeological potential were identified during the survey, EMM provided ACEN Australia with site spatial data to be used in the refinement process. The outcome of this process was that of the 18 Aboriginal sites (13 Aboriginal confirmed sites and 5 PAD areas) identified in the study area, only 2 sites are within the modification area and will be impacted by the proposed modification (NE119 and NE20).

The primary refinements to the modification area have included:

- Significantly reducing the extent of Area 4 to exclude land within 200 m of Saumarez Creek and one if its primary tributaries. This has avoided four PAD areas (NE104, NE105, NE106 and NE107).
- Removal of a fifth land parcel from the modification area where nine sites (NE108, NE109, NE110, NE111, NE112, NE113, NE114, NE115 and NE116) were identified. This includes all four of the Aboriginal scar trees identified during the survey.
- Reduction in the extent of Area 3 to avoid NE117 (PAD) within 200 m of Julia Gully and a tributary flanking it to the south.

The proposed modification will result in only a minor addition to the project's cumulative impact on Aboriginal cultural heritage values. This outcome is largely the result of the modification area refinement process, which has focused on avoiding most of the Aboriginal cultural heritage values identified during the field surveys. As such, the proposed additional impact to two known sites of low significance represents a minimal increase from the 35 sites already approved for impact as part of the project. The significant refinements to the modification area will ensure that a substantial local archaeological resource remains within the broader landscape, including open camp sites, stone quarries and grinding groove sites that are representative of Aboriginal occupation of the local area.

# 10 Management strategy and recommendations

## 10.1 Management strategy

Aboriginal cultural heritage values within the approved project boundary are currently subject to management under the AHMP (EMM 2021). As nominated in Section 7 of the AHMP, the document will be updated to reflect the proposed changes to the project boundary and development footprint and will include management requirements for Aboriginal cultural heritage values within the modification area.

The updated AHMP will be prepared in consultation with Heritage NSW and project RAPs. RAP consultation will involve providing RAPs with a draft of the modified AHMP for their review and comment within a minimum 14-day period (refer Section 7.2 of AHMP).

The management measures set out in this chapter are aligned with those under the AHMP in relation to proposed measures for Aboriginal sites of similar type and assessed significance. Additionally, the protocols for the discovery of new Aboriginal sites and the management of potential and confirmed Aboriginal human remains set out in Chapter 5 of the AHMP will be adopted for the modification area and are not repeated in this chapter.

## 10.2 Registration of newly identified sites

The newly identified sites recorded as part of this ACHA will be registered on AHIMS and the New England Solar Farm Aboriginal Heritage Database (NESF AH Database) (Section 7.3 of AHMP – EMM 2021).

## 10.3 Aboriginal heritage protection

Passive management will apply to the Aboriginal sites identified for avoidance on land within the proposed project boundary but over 20 m from the development footprint. While no fencing, signage or active land management measures are proposed for these sites, their locations will be kept on the NESF AH Database for persons working on or visiting the project boundary. Their presence in the landscape will be demarcated by at least one high visibility peg, stake or other marker to alert persons to their location. These locations will be marked by the project archaeologist and at least one RAP representative. These measures will apply to NE106, NE118 and NE117.

The remaining avoided sites and PAD areas are outside the proposed project boundary and will remain on private land. Notwithstanding, ACEN Australia will liaise with relevant landholders where Aboriginal sites have been recorded on their land and communicate that Aboriginal objects are protected by law and must not be impacted. ACEN Australia will work with landholders to determine appropriate protective measures where agreed to by the landholders.

No newly identified sites will require active protective measures such as fencing, as none of the avoided sites are within 20 m of the development footprint (as amended by the proposed modification) and/or within the project boundary (as amended by the proposed modification).

One previously recorded artefact scatter, NE01, will continue to be actively avoided (consistent with the AHMP) and will not be impacted by the proposed modification.

## 10.4 Surface artefact collection

Salvage surface collection of all Aboriginal sites in the development footprint will be completed by the project archaeologist and RAP representatives. This will be undertaken prior to any ground disturbance related to the project within the boundaries of the Aboriginal sites. This will apply to sites NE119 and NE20 within Area 3.

The collection will be undertaken by qualified archaeologists and RAP representatives. The collection method will be as follows:

1. Site coordinates and area polygons for each site will be entered into mobile GPS devices to re-locate and confirm the location. It is noted that it may not be possible to find all of the recorded artefacts.

2. The general vicinity of each site location will be inspected by the field team. Stone artefacts will be flagged on the ground and a photo taken of the flagged site. Each flagged artefact will be marked as a waypoint in the GPS.

3. All artefacts will be collected into snap lock plastic bags or similar, marked with the project name, site name, collection date and waypoint number.

4. All artefacts will be sorted and recorded post-fieldwork with respect to technological type, implement type, raw material, maximum block length and weight.

5. The collected artefacts will be incorporated into a salvage report detailing the results of the fieldwork, the artefacts recovered at each site and GIS figures showing the artefact locations.

6. AHIMS records will be updated with a site impact recording form for each collected site.

If ground surface visibility conditions are poor and grass coverage is preventing the relocation of the artefacts requiring collection, the following will be employed:

- A mower, line trimmer or similar device will be used to clear vegetation over the site areas.

- An archaeologist and RAP representatives will monitor the vegetation clearance and provide guidance to ensure it is employed to a level satisfactory to reveal the ground surface for the identification of Aboriginal objects.

- The vegetation clearance will cover the mapped site area of the relevant sites. For isolated finds without mapped site areas, this will require clearing an area of up to approximately 10 m x 10 m over the original site coordinates.

- Following vegetation clearance, RAPs and an archaeologist will inspect the cleared areas. If the artefacts are not identified through vegetation clearance alone, the RAPs and an archaeologist will use suitably fine gauged steel rakes over the areas to reveal artefacts for collection.

- Any artefacts identified within these areas will be recorded and collected in accordance with the surface artefact collection method in the AHMP (as per above).

- Regardless of whether stone artefacts are identified during this process, no further collection attempts or mitigation measures will be required after the exercise is completed for each relevant site. Following this procedure, the management status of these sites will be regarded as completed and project-related development may proceed without further heritage measures.

All collected cultural materials will be provided to the nominated project keeping place, the Armidale and Region Aboriginal Cultural Centre and Keeping Place (96–104 Kentucky Street, Armidale NSW) and subject to the same storage, recording and reporting requirements under Chapter 4 of the AHMP (EMM 2021).

## 10.5 Management summary

Table 10.1 provides a summary of all Aboriginal sites, significance ratings, impact types and management recommendations presented as part of this report.

**Table 10.1 Site significance, impact and management summary**

| Site name | AHIMS # | Site type | Significance rating | Level of impact | Impact type | Management strategy |
|---|---|---|---|---|---|---|
| NE01 | 21-4-0196 | Artefact scatter | Low | None | None | Active protection |
| NE20 | 21-4-0215 | Isolated artefact | Low | Total | Total disturbance | Surface collection |
| NE103 | TBC | Artefact scatter | Low | None | None | None – outside proposed project boundary |
| NE104 | TBC | PAD | TBC – moderate | None | None | None – outside proposed project boundary |
| NE105 | TBC | PAD | TBC – moderate | None | None | None – outside proposed project boundary |
| NE106 | TBC | PAD | TBC – moderate | None | None | Passive protection |
| NE107 | TBC | PAD | TBC – moderate | None | None | None – outside proposed project boundary |
| NE108 | TBC | Isolated artefact | Low | None | None | None – outside proposed project boundary |
| NE109 | TBC | Artefact scatter | Low | None | None | None – outside proposed project boundary |
| NE110 | TBC | Scarred tree | Moderate | None | None | None – outside proposed project boundary |
| NE111 | TBC | Scarred tree | Moderate | None | None | None – outside proposed project boundary |
| NE112 | TBC | Scarred tree | Moderate | None | None | None – outside proposed project boundary |
| NE113 | TBC | Scarred tree | Moderate | None | None | None – outside proposed project boundary |
| NE114 | TBC | Artefact scatter | Low | None | None | None – outside proposed project boundary |
| NE115 | TBC | Isolated artefact | Low | None | None | None – outside proposed project boundary |
| NE116 | TBC | Isolated artefact | Low | None | None | None – outside proposed project boundary |
| NE117 | TBC | PAD | TBC – moderate | None | None | Passive protection |
| NE118 | TBC | Artefact scatter | Low | None | None | Passive protection |
| NE119 | TBC | Artefact scatter | Low | Total | Total disturbance | Surface collection |

# References


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- 2019a, *New England Solar Farm - Addendum to the Aboriginal cultural heritage assessment report,* prepared for UPC June 2019.
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National Committee on Soil and Terrain 2009, *Australian Soil and Land Survey Field Book*.

Office of Environment and Heritage (OEH) 2011, *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales.*

# Abbreviations

## Abbreviations

| | |
|---|---|
| AHD | Australian Height Datum |
| ACHA/ACHAR | Aboriginal cultural heritage assessment report |
| AHIMS | Aboriginal Heritage Information Management System |
| AHMP | Aboriginal Heritage Management Plan |
| BP | Years before present |
| c. | circa |
| CHL | Commonwealth Heritage List |
| cm | centimetres |
| DECCW | Department of Environment Climate Change and Water, now DPC |
| DPE | Department of Planning and Environment |
| EIS | Environmental Impact Statement |
| EMM | EMM Consulting |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| g | grams |
| GIS | geographical information system |
| GPS | global positioning system |
| ha | hectare |
| ICOMOS | International Council on Monuments and Sites |
| ILUA | Indigenous Land Use Agreement |
| km | kilometres |
| LALC | Local Aboriginal Land Council |
| LEP | Local Environmental Plan |
| LGA | Local Government Area |
| m | metres |
| $m^2$ | square metres |
| mm | millimetres |
| NHL | National Heritage List |
| NPW Act | *National Parks and Wildlife Act 1974* |
| n | Number |
| NSW | New South Wales |
| OEH | Office of Environment and Heritage, now Heritage NSW |

## Abbreviations

| | |
|---|---|
| ORALRA | The Office of the Registrar, *Aboriginal Land Rights Act 1983* |
| PAD | Potential archaeological deposit |
| RAP | Registered Aboriginal Party |
| SEARs | Secretary's Environmental Assessment Requirements |
| WHL | World Heritage List |

# Appendix A
## AHIMS search results

EMM
creating opportunities

# AHIMS Web Services (AWS)

## Extensive search - Site list report

Your Ref/PO Number : J210321_NESF_MOD3

Client Service ID : 590456

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 21-4-0043 | Chiswick Axe Grinding Site; | GDA | 56 | 361241 | 6613935 | Open site | Valid | Grinding Groove : - | Axe Grinding Groove | |
| | **Contact** | **Recorders** | Mr.John Appleton,S.R Hudson | | | | | **Permits** | | |
| 21-4-0077 | Stoneleigh Quarry | AGD | 56 | 369535 | 6615374 | Open site | Valid | Stone Quarry : 2, Artefact : 10 | | |
| | **Contact** T Russell | **Recorders** | Mr.Bruce Cohen | | | | | **Permits** | | |
| 21-4-0078 | Stoneleigh water hole | AGD | 56 | 369053 | 6613777 | Open site | Valid | Water Hole : 1, Artefact : 5 | | |
| | **Contact** T Russell | **Recorders** | Mr.Bruce Cohen | | | | | **Permits** | | |
| 21-4-0079 | Stoneleigh grinding groves | AGD | 56 | 369254 | 6613764 | Open site | Valid | Grinding Groove : 1 | | |
| | **Contact** T Russell | **Recorders** | Mr.Bruce Cohen | | | | | **Permits** | | |
| 20-6-0067 | Barley Uralla L&H P1 | GDA | 56 | 355890 | 6611030 | Open site | Valid | Potential Archaeological Deposit (PAD) : - | | |
| | **Contact** | **Recorders** | Mr.John Appleton | | | | | **Permits** | 3893,4108 | |
| 21-4-0097 | Dangars Uralla L&H P1 | GDA | 56 | 357000 | 6604900 | Open site | Valid | Potential Archaeological Deposit (PAD) : - | | |
| | **Contact** | **Recorders** | Mr.John Appleton | | | | | **Permits** | 3893,4108 | |
| 20-6-0069 | RACECOURSE ISO 2 | AGD | 56 | 355440 | 6605130 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.John Appleton,University of New England - Armidale | | | | | **Permits** | | |
| 20-6-0070 | RACECOURSE OS 1 | AGD | 56 | 355548 | 6605100 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.John Appleton,University of New England - Armidale | | | | | **Permits** | | |
| 21-4-0108 | BARLEY M1 | GDA | 56 | 358963 | 6610845 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.John Appleton,University of New England - Armidale | | | | | **Permits** | | |
| 20-6-0068 | RACECOURSE ISO 3 | GDA | 56 | 355430 | 6605080 | Open site | Valid | Artefact : 1 | | |
| | **Contact** | **Recorders** | Mr.John Appleton,University of New England - Armidale | | | | | **Permits** | | |
| 21-4-0109 | Barley OS 5 | GDA | 56 | 358407 | 6610250 | Open site | Valid | Artefact : - | | |
| | **Contact** | **Recorders** | Mr.John Appleton | | | | | **Permits** | | |
| 21-4-0110 | Barley OS 1 | GDA | 56 | 358850 | 6610840 | Open site | Valid | Artefact : - | | |
| | **Contact** | **Recorders** | Mr.John Appleton | | | | | **Permits** | 3893,4108 | |
| 21-4-0111 | Barley OS 2 | GDA | 56 | 358540 | 6610760 | Open site | Valid | Artefact : - | | |
| | **Contact** | **Recorders** | Mr.John Appleton | | | | | **Permits** | | |
| 21-4-0112 | Barley OS 3 | GDA | 56 | 358450 | 6610670 | Open site | Valid | Artefact : - | | |
| | **Contact** | **Recorders** | Mr.John Appleton | | | | | **Permits** | | |
| 21-4-0113 | Barley OS4 | GDA | 56 | 358349 | 6610456 | Open site | Valid | Artefact : - | | |
| | **Contact** | **Recorders** | Mr.John Appleton | | | | | **Permits** | | |

**Report generated by AHIMS Web Service on 12/05/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 351232 - 372370, Northings : 6604862 - 6615727 with a Buffer of 0 meters. Additional Info : Constraints assessment. Number of Aboriginal sites and Aboriginal objects found is 105**

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 21-4-0199 | NE04 | GDA | 56 | 367310 | 6611497 | Open site | Valid | Grinding Groove : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0200 | NE05 | GDA | 56 | 367258 | 6611463 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0201 | NE06 | GDA | 56 | 367195 | 6611269 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0202 | NE07 | GDA | 56 | 366969 | 6610650 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0203 | NE08 | GDA | 56 | 368261 | 6610988 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0204 | NE09 | GDA | 56 | 367526 | 6609255 | Open site | Valid | Artefact : 1, Grinding Groove : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | 4556 | |
| 21-4-0205 | NE10 | GDA | 56 | 366253 | 6615198 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0206 | NE11 | GDA | 56 | 366088 | 6615000 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0259 | NE66 | GDA | 56 | 367205 | 6612854 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0260 | NE67 | GDA | 56 | 367572 | 6613014 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0261 | NE68 | GDA | 56 | 367612 | 6611341 | Open site | Valid | Artefact : 1, Grinding Groove : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0262 | NE69 | GDA | 56 | 367261 | 6610932 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0263 | NE70 | GDA | 56 | 365894 | 6609282 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |

**Report generated by AHIMS Web Service on 12/05/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 351232 - 372370, Northings : 6604862 - 6615727 with a Buffer of 0 meters. Additional Info : Constraints assessment. Number of Aboriginal sites and Aboriginal objects found is 105**

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 21-4-0264 | NE71 | GDA | 56 | 365728 | 6608709 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0265 | NE72 | GDA | 56 | 365748 | 6608714 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0266 | NE73 | GDA | 56 | 366311 | 6606963 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0267 | NE74 | GDA | 56 | 362222 | 6607961 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0268 | NE75 | GDA | 56 | 362757 | 6608541 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0269 | NE76 | GDA | 56 | 363806 | 6607990 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0270 | NE77 | GDA | 56 | 364110 | 6609052 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0271 | NE78 | GDA | 56 | 365161 | 6609466 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0272 | NE79 | GDA | 56 | 365190 | 6609962 | Open site | Valid | Artefact : 1, Grinding Groove : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0273 | NE80 | GDA | 56 | 365436 | 6610068 | Open site | Valid | Grinding Groove : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0275 | NE82 | GDA | 56 | 365289 | 6613096 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0276 | NE83 | GDA | 56 | 365430 | 6613098 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |

**Report generated by AHIMS Web Service on 12/05/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 351232 - 372370, Northings : 6604862 - 6615727 with a Buffer of 0 meters. Additional Info : Constraints assessment. Number of Aboriginal sites and Aboriginal objects found is 105**

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 21-4-0277 | NE84 | GDA | 56 | 365596 | 6613099 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0279 | NE86 | GDA | 56 | 363268 | 6607964 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0280 | NE87 | GDA | 56 | 363473 | 6608041 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0281 | NE88 | GDA | 56 | 363842 | 6608142 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0282 | NE89 | GDA | 56 | 366481 | 6609848 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0283 | NE90 | GDA | 56 | 366825 | 6610039 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0284 | NE91 | GDA | 56 | 368085 | 6610723 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0285 | NE92 | GDA | 56 | 366384 | 6613124 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0286 | NE93 | GDA | 56 | 367737 | 6608865 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1, Grinding Groove : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0287 | NE94 | GDA | 56 | 367809 | 6608634 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0288 | NE96 | GDA | 56 | 367884 | 6609230 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0289 | NE97 | GDA | 56 | 362252 | 6608228 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0290 | NE98 | GDA | 56 | 362716 | 6608298 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0291 | NE99 | GDA | 56 | 362914 | 6608639 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |

**Report generated by AHIMS Web Service on 12/05/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 351232 - 372370, Northings : 6604862 - 6615727 with a Buffer of 0 meters. Additional Info : Constraints assessment. Number of Aboriginal sites and Aboriginal objects found is 105**

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 21-4-0292 | NE100 | GDA | 56 | 362607 | 6608873 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0293 | NE102 | GDA | 56 | 366691 | 6609700 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0196 | NE01 | GDA | 56 | 367291 | 6611743 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0197 | NE02 | GDA | 56 | 366870 | 6611364 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0198 | NE03 | GDA | 56 | 369597 | 6609122 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0232 | NE37 | GDA | 56 | 366758 | 6609752 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0233 | NE38 | GDA | 56 | 368160 | 6609949 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0234 | NE39 | GDA | 56 | 367447 | 6609689 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0235 | NE40 | GDA | 56 | 367392 | 6609207 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0236 | NE41 | GDA | 56 | 366675 | 6609320 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0237 | NE42 | GDA | 56 | 366079 | 6609918 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0238 | NE43 | GDA | 56 | 368244 | 6612115 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1, Stone Quarry : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0239 | NE44 | GDA | 56 | 368098 | 6611783 | Open site | Valid | Artefact : 1 | | |

**Report generated by AHIMS Web Service on 12/05/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 351232 - 372370, Northings : 6604862 - 6615727 with a Buffer of 0 meters. Additional Info : Constraints assessment. Number of Aboriginal sites and Aboriginal objects found is 105**

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0240 | NE45 | GDA | 56 | 367686 | 6612583 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0241 | NE46 | GDA | 56 | 367575 | 6612074 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0242 | NE47 | GDA | 56 | 367512 | 6612242 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0243 | NE48 | GDA | 56 | 367495 | 6612223 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0244 | NE49 | GDA | 56 | 367124 | 6612682 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0245 | NE50 | GDA | 56 | 367752 | 6611268 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0252 | NE58 | GDA | 56 | 370022 | 6609070 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0253 | NE59 | GDA | 56 | 369402 | 6609025 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0254 | NE60 | GDA | 56 | 367391 | 6609737 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0255 | NE62 | GDA | 56 | 364684 | 6613830 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0256 | NE63 | GDA | 56 | 364856 | 6613629 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0257 | NE64 | GDA | 56 | 365368 | 6615010 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0258 | NE65 | GDA | 56 | 365546 | 6613878 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |

**Report generated by AHIMS Web Service on 12/05/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 351232 - 372370, Northings : 6604862 - 6615727 with a Buffer of 0 meters. Additional Info : Constraints assessment. Number of Aboriginal sites and Aboriginal objects found is 105**

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 21-4-0207 | NE12 | GDA | 56 | 365943 | 6615084 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0209 | NE14 | GDA | 56 | 365258 | 6615140 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1, Stone Quarry : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0210 | NE15 | GDA | 56 | 365041 | 6615131 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0211 | NE16 | GDA | 56 | 365045 | 6614883 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0212 | NE17 | GDA | 56 | 367306 | 6608186 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0213 | NE18 | GDA | 56 | 362906 | 6607904 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0214 | NE19 | GDA | 56 | 363546 | 6607452 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0215 | NE20 | GDA | 56 | 363619 | 6607695 | Open site | Valid | Artefact : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0216 | NE21 | GDA | 56 | 362472 | 6607709 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1, Stone Quarry : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0217 | NE22 | GDA | 56 | 367627 | 6606654 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1, Stone Quarry : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0218 | NE23 | GDA | 56 | 365401 | 6607293 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | | Permits | | |
| 21-4-0219 | NE24 | GDA | 56 | 365458 | 6607443 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |

**Report generated by AHIMS Web Service on 12/05/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 351232 - 372370, Northings : 6604862 - 6615727 with a Buffer of 0 meters. Additional Info : Constraints assessment. Number of Aboriginal sites and Aboriginal objects found is 105**

# AHIMS Web Services (AWS)

## Extensive search - Site list report

Your Ref/PO Number : J210321_NESF_MOD3

Client Service ID : 590456

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0220 | NE25 | GDA | 56 | 365469 | 6607317 | Open site | Valid | Modified Tree (Carved or Scarred) : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0221 | NE26 | GDA | 56 | 365992 | 6607157 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0222 | NE27 | GDA | 56 | 369035 | 6609198 | Open site | Valid | Artefact : 1, Potential Archaeological Deposit (PAD) : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0208 | NE13 | GDA | 56 | 366163 | 6615009 | Open site | Valid | Artefact : 1 | | |
| | Contact | Recorders | Mr.Ryan Desic,EMM Consulting - St Leonards - Individual users | | | | | Permits | | |
| 21-4-0370 | Chiswick OS 1 | GDA | 56 | 360885 | 6613875 | Open site | Valid | Artefact : - | | |
| | Contact | Recorders | Mr.John Appleton | | | | | Permits | | |
| 21-4-0371 | Chiswick OS 2 | GDA | 56 | 360772 | 6613851 | Open site | Valid | Artefact : - | | |
| | Contact | Recorders | Mr.John Appleton | | | | | Permits | | |
| 21-4-0045 | SC1 | AGD | 56 | 362400 | 6609800 | Open site | Valid | Modified Tree (Carved or Scarred) : - | Scarred Tree | |
| | Contact | Recorders | Alice Gorman | | | | | Permits | 1104,1109 | |
| 21-4-0047 | SC3 | AGD | 56 | 362500 | 6609800 | Open site | Valid | Modified Tree (Carved or Scarred) : - | Scarred Tree | |
| | Contact | Recorders | Alice Gorman | | | | | Permits | | |
| 21-4-0054 | Chiswick Camp Site | GDA | 56 | 361241 | 6613935 | Open site | Valid | Grinding Groove : -, Artefact : - | | |
| | Contact | Recorders | Mr.John Appleton,Karen Moorhouse | | | | | Permits | | |
| 21-4-0167 | Barley Q 4 | AGD | 56 | 358349 | 6610456 | Open site | Valid | Artefact : - | | |
| | Contact | Recorders | Mr.John Appleton,University of New England - Armidale | | | | | Permits | | |
| 21-4-0306 | big ridge | GDA | 56 | 364902 | 6607008 | Closed site | Valid | Grinding Groove : - | | |
| | Contact | Recorders | Mr.Colin Ahoy,Mrs.Mikaela Palmer | | | | | Permits | | |
| 21-4-0308 | big ridge 5 | GDA | 56 | 365122 | 6606639 | Closed site | Valid | Modified Tree (Carved or Scarred) : - | | |
| | Contact | Recorders | Mr.Colin Ahoy,Mrs.Mikaela Palmer | | | | | Permits | | |
| 21-4-0309 | big ridge 4 | GDA | 56 | 364119 | 6609420 | Closed site | Valid | Grinding Groove : - | | |
| | Contact | Recorders | Mr.Colin Ahoy,Mrs.Mikaela Palmer | | | | | Permits | | |

**Report generated by AHIMS Web Service on 12/05/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 56, Eastings : 351232 - 372370, Northings : 6604862 - 6615727 with a Buffer of 0 meters. Additional Info : Constraints assessment. Number of Aboriginal sites and Aboriginal objects found is 105**

# Appendix B
## Aboriginal community consultation

EMM
creating opportunities

## B.1 Consultation log

| Aboriginal Consultation Log:<br>New England Solar and Battery Project<br>Consultation log - MOD 2 | Contact type | Date | Comment |
|---|---|---|---|
| **Notice of Modification 2 Methodology** | | | |
| **Organisation** | **Contact type** | **Date Sent** | **Feedback requested by 20 October 2021** |
| Les Townsend | Express post - mail | 22-Sep-21 | |
| Nunawanna Aboriginal Corporation (NAC) | Email | 21-Sep-21 | |
| Armidale Local Aboriginal Land Council | Email | 21-Sep-21 | |
| Armidale and New England Gumbaynggirr Descendants | Email | 21-Sep-21 | |
| Aaron Broad | Email | 21-Sep-21 | |
| Steven Ahoy | Email | 21-Sep-21 | |
| Culturally Aware | Email | 21-Sep-21 | Response received 23/09/2021 |
| Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants | Email | 21-Sep-21 | |
| Nganyawana Clan Group | Email | 21-Sep-21 | |
| **Notice of ACHA review period** | | | |
| **Organisation** | **Contact type** | **Date Sent** | **Feedback requested by 19 May 2022** |
| Les Townsend | Express post - mail | 20-Apr-22 | |
| Nunawanna Aboriginal Corporation (NAC) | Email | 20-Apr-22 | |
| Armidale Local Aboriginal Land Council | Email | 20-Apr-22 | |
| Armidale and New England Gumbaynggirr Descendants | Email | 20-Apr-22 | |
| Aaron Broad | Email | 20-Apr-22 | |
| Steven Ahoy | Email | 20-Apr-22 | |
| Culturally Aware | Email | 20-Apr-22 | |
| Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants | Email | 20-Apr-22 | |
| Nganyawana Clan Group | Email | 20-Apr-22 | |
| **Notice of change in scope of modification** | | | |
| **Organisation** | **Contact type** | **Date Sent** | |
| Nunawanna Aboriginal Corporation (NAC) | Email | 11-Aug-22 | Response received 14/08/2022 |
| Armidale Local Aboriginal Land Council | Email | 11-Aug-22 | |
| Armidale and New England Gumbaynggirr Descendants | Email | 11-Aug-22 | |
| Aaron Broad | Email | 11-Aug-22 | |
| Steven Ahoy | Email | 11-Aug-22 | |
| Culturally Aware | Email | 11-Aug-22 | |
| Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants | Email | 11-Aug-22 | |
| Nganyawana Clan Group | Email | 11-Aug-22 | |

## B.2 Presentation of assessment methods

## David Richards

**From:** Ryan Desic
**Sent:** Tuesday, 21 September 2021 6:34 PM
**To:**
**Cc:**
**Subject:** New England Solar Farm: proposed project modification and assessment methods for Registered Aboriginal Parties
**Attachments:** J210321_AH_MOD3_ProjectInfoMethods_V1.pdf

Dear Registered Party,

Thank you for your continued participation in the Aboriginal Cultural Heritage consultation process for the New England Solar Farm (the project). This letter is to advise your party that EMM Consulting Pty Limited (EMM) has been engaged by UPC\AC Renewables Australia (UPC\AC) to prepare an Aboriginal cultural heritage assessment (ACHA) and opportunities assessment for Modification 2 (MOD 2) to the development consent (SSD-9255) for the project. The ACHA will support a broader modification report (MR) currently being prepared for the proposed modification.

Please read the attached document carefully. We welcome your written feedback at your earliest opportunity, and no later than **20 October 2021**. Email or letters
attached to email is the preferred mode of written communication as it will reduce postal waiting periods.

Regards,

**Ryan Desic**
Associate Archaeologist – Heritage Team Leader – MAACAI
Bushfire, Ecology, Heritage and Spatial Solutions (BEHSS)

EMM
creating opportunities

T 02 9493 9500
M 0411 329 712
D 02 9493 9541
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Level 3, 175 Scott Street
Newcastle NSW 2300

T 02 4907 4800
E info@emmconsulting.com.au

www.emmconsulting.com.au

20 September 2021

Registered Aboriginal Party

**Re: New England Solar Farm: proposed project modification and assessment methods for Registered Aboriginal Party (RAP) review**

Dear Registered Party,

# 1 Introduction

Thank you for your continued participation in the Aboriginal Cultural Heritage consultation process for the New England Solar Farm (the project). This letter is to advise your party that EMM Consulting Pty Limited (EMM) has been engaged by UPC\AC Renewables Australia (UPC\AC) to prepare an Aboriginal cultural heritage assessment (ACHA) and opportunities assessment for Modification 2 (MOD 2) to the development consent (SSD-9255) for the project. The ACHA will support a broader modification report (MR) currently being prepared for the proposed modification.

The aims of this letter are to:

- provide an overview of the proposed modification;
- provide your party with an opportunity to inform EMM about any Aboriginal cultural heritage values associated with the proposed modification area and how they may affect, inform or refine the proposed modification and/or assessment methods;
- identify any culturally appropriate protocols that registered parties wish to be adopted during the information gathering process (eg protocols during field survey, or handling of culturally sensitive information);
- present a draft of the intended ACHA methods for your review and comment; and
- notify your party of upcoming fieldwork.

We welcome your written feedback at your earliest opportunity, and no later than **15 October 2021**. Letters attached to email is the preferred mode of written communication as it will reduce postal waiting periods.

# 2 Proposed modification overview

UPC\AC has approval to develop the project approximately 6 kilometres (km) east of the township of Uralla in the Uralla Shire local government area (LGA). The project was approved, subject to conditions, by the NSW Independent Planning Commission (IPC) on 9 March 2020.

As part of detailed design works, UPC\AC has been investigating additional land adjacent to the northern and central array areas that may be suitable for solar development. The aim of this modification is to optimise the site and account for possible unsuitable areas.

UPC\AC has identified five additional parcels of land that may be suitable for inclusion in the development footprint. The proposed modification area encompasses a total of 325 hectares (ha) and is owned by four of the existing project-related landholders (Figure 2.1). Depending on the outcomes of this assessment and other technical assessments, approval will be sought to include the land within the proposed modification area in the project's development footprint.

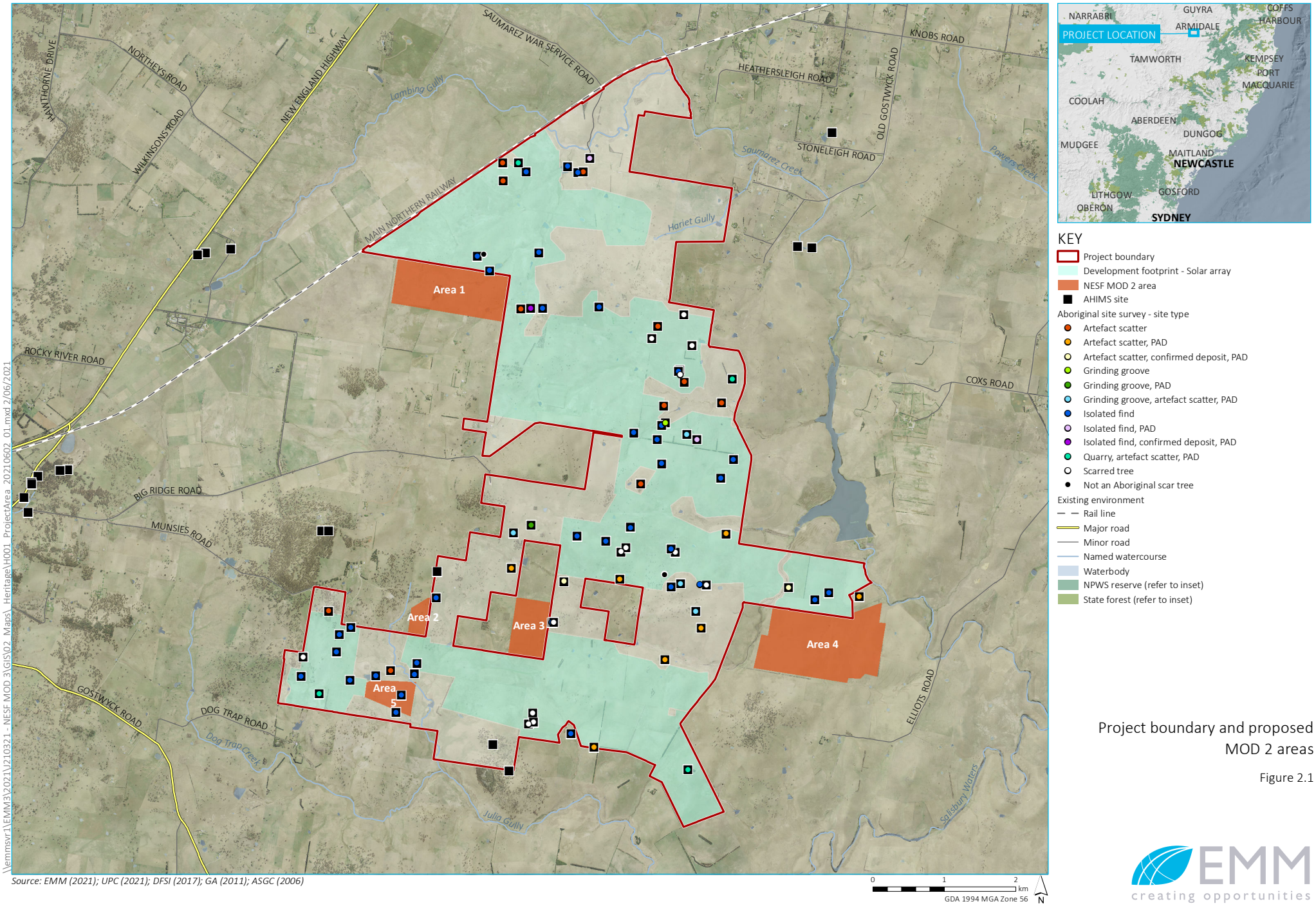
# 3 Proposed assessment methods

EMM will prepare an ACHA to assess and manage potential impacts to Aboriginal cultural heritage values on the proposed modification area. The ACHA will be summarised within, and appended to, the MR. The ACHA for the proposed modification will be prepared with respect to the main project ACHA, and therefore be structured as an addendum that builds upon its findings. Notwithstanding, the ACHA will be prepared generally in accordance with the following NSW heritage guidelines:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011)*;*
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a); and
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b).

The key aspects of the ACHA process will comprise:

- Consultation with the RAPs already established for the project.
- An archaeological survey over the five areas that comprise the proposed modification area (Figure 2.1). The key points of the survey will be as follows:
    - A survey sampling strategy will be used that is consistent with that undertaken for the main project ACHA. As such, the survey will focus on areas predicted to have high archaeological sensitivity in accordance with the predictive model established for the project, but will also sample areas predicted to have lower potential to test the accuracy of the model.
    - The archaeological survey will aim to inspect all mature native trees for their potential to be Aboriginal modified trees. This may involve vehicle traverses to target trees identified via aerial mapping and field observations.
    - We anticipate that the archaeological survey may take between three to five days.
    - RAP field officers will be engaged by UPC\AC Renewables for the survey fieldwork. UPC\AC will engage three RAP field officers each day according to a roster which is consistent with current project fieldwork arrangements.
- If archaeological test excavation is pursued for the proposed modification, it would be according to the methodology implemented during the main ACHA phase for the project. This methodology has been attached to this letter for your consideration (Attachment A).




\\emmsvr1\EMM3\2021\210321 - NESF MOD 3\GIS\02 Maps\ Heritage\H001 ProjectArea 20210602 01.mxd 2/06/2021

*Source: EMM (2021); UPC (2021); DFSI (2017); GA (2011); ASGC (2006)*

Project boundary and proposed MOD 2 areas

Figure 2.1

EMM creating opportunities

- At the completion of fieldwork, EMM will prepare a draft ACHA for RAP review and comment. If required, UPC\AC will endeavour to make refinements to the proposed modification areas with the aim to minimise impacts to Aboriginal cultural heritage values.

- We propose a 28-day ACHA review timeframe in accordance with current consultation protocols. An Aboriginal focus group meeting may be warranted during this stage depending on the complexity of issues, impacts and proposed management measures. Any such meeting would be subject to COVID-19 restrictions and may take form as a face-to-face or online session.

- Once the RAP review period has ended, EMM and UPC\AC will address any outstanding issues prior to ACHA finalisation. The ACHA will be submitted with the MR for Heritage NSW and NSW Department of Planning, Industry and Environment (DPIE) review. It may also be placed on public exhibition.

- Aboriginal cultural heritage values are currently managed under the *New England Solar Farm Aboriginal Heritage Management Plan* (AHMP) (EMM 2020). Following DPIE approval, the AHMP will require updating to include the management measures associated with the proposed modification. The AHMP update will be prepared in consultation with RAPs and Heritage NSW and submitted to DPIE for review and approval.

# 4 Consultation approach

### 4.1.1 Overview of consultation

The roles, functions and responsibilities of all parties involved in the consultation process are outlined in Table 1**.**

**Table 1 Roles, functions and responsibilities**

| Stakeholder | Roles and responsibilities |
|---|---|
| RAPs | Provide cultural perspectives, views, knowledge and advice to EMM. |
| | Indicate areas of cultural significance. |
| | Provide Aboriginal sites representatives for archaeological fieldwork (if desired and suitably qualified and insured). |
| | Have an awareness and understanding of the commercial environment and constraints in which UPC\AC operate. |
| | Demonstrate awareness and understanding of the opportunities to provide input into the ACHA and management recommendations. |
| | Identify, raise, and discuss cultural concerns, perspectives and assessment requirements (if any). |
| EMM (on behalf of UPC\AC) | Undertake the ACHA, including coordinating and directing the fieldwork. |
| | Facilitate the Aboriginal consultation process. |
| | Consider the cultural perspectives, views, knowledge and advice of the RAPs in assessing cultural significance and developing management measures. |
| | Provide clear management measures that comply with relevant legislation, guidelines and significance. |
| All stakeholders | Mutual respect (each person has the right to have a say and be heard). |
| | Communicate in a professional manner. |

### 4.1.2 Providing cultural information

Aboriginal heritage incorporates a wide range of values such as stories, traditions and cultural practices. EMM welcomes any advice from the Aboriginal community about any form of Aboriginal cultural heritage values (which might include archaeological sites or other types of values) relevant to the project and the proposed modification area and surrounds.

Knowledge of areas of cultural significance may include, but are not limited to:

- sites or places associated with ceremonies, spiritual/mythological beliefs and traditional knowledge, which date from pre-contact period (note that these activities do not have to have persisted until the present time);
- sites or places associated with historical associations, which date from the post-contact period and are remembered today (eg plant and animal resource use areas and known camp sites); and
- sites or places of contemporary significance, for which the significance has been acquired in recent times.

EMM is seeking cultural information about the proposed modification area from registered RAPs in accordance with Section 4.3 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a). If you are aware of any form of Aboriginal cultural heritage values (which might include archaeological sites or other types of values), please let us know so that we can take these values into account in the ACHA.

# 5 Indicative timing

An indicative timeframe for the ACHA is provided in Table 2. The timeframe is subject to change and may be influenced by changes in project design or additional requirements (eg further survey/test excavation).

**Table 2 Indicative timing**

| Stage | Timing |
|---|---|
| RAP response to presentation of information and methods (this letter) | Mid-September to Mid-October 2021 |
| Field survey | Late October (dates and roster TBC) 2021 |
| Preparation of draft ACHA | Late October to Mid-November 2021 |
| RAP review period of ACHA | Mid-November to Mid-December 2021 |
| Submission of final report to DPIE | January 2022 |

# 6 What's next?

We look forward to receiving any response your party wishes to make about the methodology or any cultural information or protocols you would like to provide that may influence the proposed modification. Your response will be documented and considered as part of the ACHA.

Please remember to respond prior to **20 October 2021.** To avoid any COVID-19 related delays, please consider attaching your response to an email and sending to rdesic@emmconsulting.com.au.

EMM will be contacting RAPs shortly with an additional letter to organise fieldwork participation from RAP representatives. Further information about the survey plan will be distributed prior to the survey.

# 7 Any questions or information?

Please feel free to contact me with any questions or queries about the project via email (provided below) or telephone on 0411 329 712.

Yours sincerely,

**Ryan Desic**
Associate Archaeologist - Heritage Team Leader

rdesic@emmconsulting.com.au

# Attachment A – Potential excavation methodology

Below is an example of the test excavation method that would be used for the proposed modification if required. This is consistent with the methodology employed across five Aboriginal sites for the project's test excavation program in March 2019 .

## Method

The proposed excavation method would follow Requirement 15c of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) and would be generally as follows:

- Linear transects made of up of 50 cm by 50 cm test pit units.
- The test pit transects would follow a grid system. Test pit locations in each transect would be spaced at a minimum of 5 m apart and up to 20 m apart. The exact spacing at each site may vary based on observations in the field and artefact density results as they come to hand.
- The first test pit at each site would be dug manually with hand tools in 5 cm levels termed 'spits' to identify the nature of the soils and to identify any stratigraphic sequence. All subsequent test pits would be excavated in 10 cm spits or in stratigraphic sequence (whichever is smaller).
- Each pit would be excavated until basal clay is reached, or to at least one spit (10 cm) below the artefact bearing level identified at each test area.
- Each test pit would be photographed and a soil profile/section drawn.
- All excavated soil would be dry-sieved through a 5 mm aperture mesh.
- All pits would be backfilled after recording.
- Soil samples may be taken for laboratory analysis.

## Storing recovered material

Any recovered artefacts would be retained temporarily by EMM for the required analysis of technological attributes and eventually stored at the project keeping place.

## Post-fieldwork analysis

### Artefact analysis

Basic recording and analysis would be undertaken for the artefact assemblage recovered from the test excavation with the aim to form a baseline characterisation of the excavated material. Analysis of excavated stone artefacts would include:

- initial sorting and cleaning of excavated material;
- establishment of a computer database using Microsoft Access or Microsoft Excel (depending on the size of the assemblages) to record all provenance information;
- measuring and recording the attributes of stone artefacts; and
- statistical analysis of the data to explore the frequency, distribution, raw material type, implement type and size of the of the artefacts in the assemblage.

## Reporting

Aboriginal Heritage Information Management System (AHIMS) site cards would be completed for each Aboriginal site and an Aboriginal Site Impact Recording Form prepared for each site impacted by the test excavation.

The results of excavation and subsequent management measures derived from the results would be formulated in consultation with RAPs provided in an excavation report.

## B.3 Issue of draft ACHA and notification of revised modification components

## David Richards

**From:** Ryan Desic
**Sent:** Wednesday, 20 April 2022 8:42 PM
**To:**
**Cc:**
**Subject:** New England Solar Farm Modification 2 Aboriginal Cultural Heritage Assessment (ACHA): Draft ACHA for RAP review and feedback.

**Follow Up Flag:** Follow up
**Flag Status:** Completed

Dear Registered Party,

Thank you for your continued participation in the Aboriginal Cultural Heritage consultation process for the New England Solar Farm (the project). This letter is to advise your party that a draft of the Aboriginal cultural heritage assessment (ACHA) for Modification 2 (MOD 2) of the project is ready for your review. You may recall we undertook archaeology survey for these proposed works in October 2021.

A copy of the ACHA is available for download at the link below:

https://spaces.hightail.com/receive/VcHMmY1htS

Please read the attached document carefully. We welcome your written feedback at your earliest opportunity, and no later than **19 May 2022.** Email or letters
attached to email is the preferred mode of written communication as it will reduce postal waiting periods.

As always, please do not hesitate to contact me if you would like to discuss the ACHA, or have any questions regarding the proposed modification.

Regards,

**Ryan Desic**
Associate Archaeologist – Heritage Team Leader – MAACAI
Bushfire, Ecology, Heritage and Spatial Solutions (BEHSS)

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M 0411 329 712
D 02 9493 9541
Connect with us

NEWCASTLE | Level 3, 175 Scott Street, Newcastle NSW 2300

## David Richards

**From:** David Richards
**Sent:** Thursday, 11 August 2022 10:06 AM
**To:**

**Subject:** New England Solar Farm Modification 2 - Aboriginal Cultural Heritage Assessment (ACHA) - Update

Dear Registered Party,

Thank you for your continued participation in the Aboriginal Cultural Heritage consultation process for the New England Solar and Battery Project (the project).

A draft of the Aboriginal cultural heritage assessment (ACHA) for Modification 2 (MOD 2) of the project was provided for your review on 20 April 2022.

To date, no feedback on the draft ACHA for MOD 2 has been provided.

As described in Section 1.3 of the ACHA for MOD 2, ACEN Australia (formerly UPC\AC Renewables) proposes to modify SSD-9255 to, amongst other changes, increase the capacity of the Battery Energy Storage System or BESS. This is due to a shift in Australia's energy market needs, the accelerating pace of coal plant retirements in NSW, continuous improvements in BESS technology and associated capital cost reductions. To enable the proposed capacity increase, two additional parcels of land within the approved project boundary and development footprint were proposed to house BESS infrastructure (Figure 1.2 of ACHA for MOD 2).

Since a copy of the draft ACHA for MOD 2 was provided to your organisation, ACEN Australia has revised the proposed footprint for the additional BESS infrastructure in response to ongoing design considerations. Both parcels of land are still in the northern array and remain close to the approved grid substation and BESS footprint. The image below identifies the proposed additional BESS areas (light blue boundary) in the context of:

- the approved grid substation and BESS footprint (dark blue boundary);
- approved development footprint (orange boundary); and
- previously identified Aboriginal sites.


As the proposed footprint for the additional BESS infrastructure is within the approved project boundary and development footprint, no further archaeological survey is proposed. Archaeological surveys performed as part of the project ACHA included coverage of the proposed footprints for the additional BESS infrastructure (refer Figure 6.2D of the project ACHA – p. 89).

The purpose of this email is to inform you of the proposed change to the additional BESS footprint and address any questions you may have about this component of MOD 2. The scope of MOD 2 has also expanded to encompass an expansion in the project's construction hours and an increase in the number of daily heavy vehicle movements during construction. These elements of MOD 2 will not result in further impacts to Aboriginal sites.

We welcome your feedback on the change in scope of MOD 2.

Email or letters attached to email is the preferred mode of written communication as it will reduce postal waiting periods.

Please do not hesitate to contact me if you would like to discuss the ACHA or have any questions regarding the proposed modification.

Many thanks and kind regards,

David

**David Richards**
Senior Environmental Scientist
**M** 0405 593 675
www.emmconsulting.com.au

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**From:** Ryan Desic <rdesic@emmconsulting.com.au>
**Sent:** Wednesday, 20 April 2022 8:42 PM

**Cc:** David Richards <drichards@emmconsulting.com.au>
**Subject:** New England Solar Farm Modification 2 Aboriginal Cultural Heritage Assessment (ACHA): Draft ACHA for RAP review and feedback.

Dear Registered Party,

Thank you for your continued participation in the Aboriginal Cultural Heritage consultation process for the New England Solar Farm (the project). This letter is to advise your party that a draft of the Aboriginal cultural heritage assessment (ACHA) for Modification 2 (MOD 2) of the project is ready for your review. You may recall we undertook archaeology survey for these proposed works in October 2021.

A copy of the ACHA is available for download at the link below:

https://spaces.hightail.com/receive/VcHMmY1htS

Please read the attached document carefully. We welcome your written feedback at your earliest opportunity, and no later than **19 May 2022.** Email or letters
attached to email is the preferred mode of written communication as it will reduce postal waiting periods.

As always, please do not hesitate to contact me if you would like to discuss the ACHA, or have any questions regarding the proposed modification.

Regards,

**Ryan Desic**
Associate Archaeologist – Heritage Team Leader – MAACAI
Bushfire, Ecology, Heritage and Spatial Solutions (BEHSS)

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# Appendix C
## Additional archaeological information

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## C.1 Definitions and recording methods used for this assessment

### C.1.1 Aboriginal sites

In the AHIMS database, Aboriginal sites are defined in several ways. At the simplest level, sites are recorded as 'closed' or 'open'. Closed sites are associated with rockshelters and include other evidence of Aboriginal occupation that may be present, such as areas where subsurface Aboriginal objects may occur within the shelter ('potential archaeological deposit' (PAD)), faunal remains, and art on the shelter walls (paintings/engravings). Open sites are broadly defined and encompass all other types of Aboriginal site features that are located in areas where there is no rockshelter. The most common open site features found generally include artefacts, grinding grooves, art, culturally modified trees, and shell deposits (middens) (OEH 2012). The presence or absence of stone artefacts is often a defining factor in site identification, with almost every site likely to have at least some associated artefacts, as discard or loss of this most ubiquitous and practically indestructible marker of past Aboriginal visitation.

Any one site (or group of linked sites described as a 'complex') can contain several different site features. For example, a shelter may have art on the walls, artefacts on the floor surface or outside the shelter, and be predicted to contain faunal remains and further artefacts in the accumulated deposit inside.

A description of terms used to describe different site features known to occur in the vicinity of the study area is provided in Table C.1 and use definitions provided by OEH and those adopted by EMM in their field investigations to ensure consistency in recording. Similarly, there may be places of contemporary significance to Aboriginal people in the region and that will require consultation with this community to identify.

**Table C.1 Site definitions and recording**

| Site feature | Definition and recording methods |
|---|---|
| Aboriginal ceremony and Dreaming | Previously referred to as mythological sites these are spiritual/story places where no physical evidence of previous use of the place may occur; eg natural unmodified landscape features, ceremonial or spiritual areas, men's/women's sites, dreaming (creation) tracks, marriage places etc. |
| Artefact site (open stone artefact site) | Objects such as stone tools, and associated flaked material, spears, manuports, grindstones, discarded stone flakes, modified glass or shell demonstrating evidence of use of the area by Aboriginal people.<br>Open stone artefact sites were defined by the presence of one (isolated find) or more (artefact scatter) stone artefacts visible on the ground surface. The boundaries of a site are limited to the spatial extent of the visible stone artefacts. The mapped site points and/or 'site areas' do not represent the areas of potential archaeological deposit (PAD) that also apply to some sites (refer to the term 'PAD' below).<br>Open stone artefact sites were recorded by marking each artefact location or each cluster of artefacts within a 5 m radius as a separate waypoint in the GPS. Site boundaries were allocated by drawing a line around the cluster waypoints for each site using ArcGIS software. Stone artefacts more than 50 m apart were recorded as separate sites. EMM acknowledges that the 50 m rule applied here is an arbitrary distinction for site boundaries and is used mainly for efficiencies in site management and to establish consistency in site recording methods. |
| Burials | A traditional or contemporary (post-contact) burial of an Aboriginal person, which may occur outside designated cemeteries and may not be marked; eg in caves, marked by stone cairns, in sand areas, along creek banks etc. |
| Fish trap | A modified area on watercourses where fish were trapped for short-term storage and gathering. |
| Grinding grooves | Grinding grooves were defined as an area of outcropping bedrock containing evidence of one or more grinding grooves where ground-stone hatchets or other grinding practices (ie seed grinding) were implemented. |

## Table C.1 Site definitions and recording

| Site feature | Definition and recording methods |
|---|---|
| Habitation structure | Structures constructed by Aboriginal people for short- or long-term shelter. More temporary structures are commonly preserved away from the NSW coastline, may include historic camps of contemporary significance. Smaller structures may make use of natural materials such as branches, logs and bark sheets or manufactured materials such as corrugated iron to form shelters. Archaeological remains of a former structure such as chimney/fireplace, raised earth building platform, excavated pits, rubble mounds etc. |
| Modified tree (carved or scarred) | Trees which show the marks of modification as a result of cutting of bark from the trunk for use in the production of shields, canoes, boomerangs, burials shrouds, for medicinal purposes, foot holds etc, or alternately intentional carving of the heartwood of the tree to form a permanent marker to indicate ceremonial use/significance of a nearby area, again these carvings may also act as territorial or burial markers.<br>Modified trees (either carved or scarred) can be difficult to identify. Scars commonly occur on trees through natural processes such a branch tears, insect damage, storm and fire damage and faunal damage. Scars can also occur from mechanical damage from vehicles or farming equipment.<br>The attributes of potential scarred trees were discussed during the survey amongst archaeologists and RAPs before it was decided if a scar would be recorded or not. A precautionary approach was adopted, whereby some of the more ambiguous examples were recorded anyway. The assessment of scar trees was made from the experience of the survey team and the guideline *Aboriginal scarred trees in New South Wales: a field manual* (DEC 2005). In some of the more ambiguous examples, it cannot be verified whether some scars recorded during the survey are of natural or Aboriginal origin. In such instances, an expert evaluation by a scar tree expert (arborist or other) would be required to determine the status of certain trees. |
| Potential archaeological deposit (PAD) | An area where Aboriginal objects may occur below the ground surface.<br>The term 'potential archaeological deposit' was first applied in Sydney regional archaeology in the 1980s, and referred to rockshelters that were large enough and contained enough accumulated deposit to allow archaeologists to predict that subsurface cultural material was likely to be present. Since then the term has come to include open sites where the same prediction can be made.<br>EMM has defined PADs as the predicted extent of concentrated subsurface Aboriginal objects in a particular area. PADs are not technically Aboriginal sites until, and if, subsurface Aboriginal objects are identified, which is typically established through archaeological test excavation. PAD areas have been assigned to landforms that are distinguishable from the surrounding landscape (eg elevated areas with good outlook overlooking watercourses) as being likely to retain higher artefact densities than the assumed 'background scatter' of archaeological material in the broader landscape.<br>The identification of PADs associated with Aboriginal open camp sites was partly based on observations in the field and discussions with RAPs, but also related to the predictive model. Although PAD was attributed to areas for a variety of reasons, the main qualifiers were:<br>The presence of surface artefacts or other Aboriginal objects. Ground surface visibility as part of the archaeological survey effort was typically considered high enough in each PAD area to identify at least one or more surface artefacts thereby indicating likelihood of subsurface potential. Notwithstanding, finding no visible surface artefacts in an area would not disqualify an area from being attributed with PAD.<br>Level to gently inclined ground (<10%) indicating suitable camping or activity areas.<br>Contours that distinguish the landforms with PAD from the surrounding landscape (eg spur crest, hill crest or knoll). Landform boundaries were also interpreted through observations in the field. Notably, rocky crest landforms that were protected from intensive cultivation were often attributed with PAD.<br>Proximity to water: typically up to 100 m from 1st and 2nd order streams and up to 200 m from 3rd order streams and above. Elevated landforms at the confluence of higher order streams were also more likely to be attributed with PAD. |

## Table C.1 Site definitions and recording

| Site feature | Definition and recording methods |
|---|---|
| | EMM acknowledges that all PAD areas have been historically cleared of native vegetation and some have been subject to pasture improvements such as ploughing. As such, the term PAD does not assume high subsurface integrity; instead, it is a prediction of potential subsurface artefact concentrations.<br>All stone quarry sites are predicted to have PAD. The assumption is that in most cases the visible surface material at quarries is represented by larger artefacts (such as cores) and that smaller material (eg flakes) is likely to be buried. |
| Restricted | Site information contained in the Aboriginal Heritage Information Management System is available only to certain authorised groups of people, as requested by the Aboriginal community. Detailed information may not be available in search reports. |
| Shell | An accumulation or deposit of shellfish from beach, estuarine, lacustrine or riverine species resulting from Aboriginal gathering or consumption. Usually found in deposits previously referred to as shell middens. Must be found in association with other objects like stone tools, fish bones, charcoal, fireplaces/hearths, and burials. Will vary greatly in size and composition. |
| Stone quarry | Usually a source of good quality stone which is quarried and used for the production of stone tools.<br>Stone quarries represent where Aboriginal people gathered raw stone materials for stone tools and/or manufactured stone tools from the adjacent source material. Quarry sites are found at rock outcrops where the material was of suitable quality to have been used to manufacture stone tools. Stone quarries were defined by the presence of outcropping stone material with nearby evidence of the same material type used in the stone tool manufacture process. This was most commonly indicated by large stone cores or stone flakes distributed amongst the same naturally outcropping material.<br>EMM acknowledges that the 'open stone artefact' site type shares some of the same characteristics as 'stone quarries', such as the presence of stone artefacts. However, they have been distinguished from each other because quarries can not only represent open camping activities, but also a fixed location where Aboriginal people needed to visit to extract a resource. In contrast, the location of typical open camp sites were not fixed, but chosen by Aboriginal people for their favourable conditions. |

# Appendix D

## Survey transect coverage details

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| Transect number | Landform element | Length (m) | Width (m) | Area (m) | Exposure (%) | Visibility (%) | Effective coverage area (m) | Effective coverage % | Soil landscape | Rock outcrop material | Extent of rock outcrop % | Ground cover types | Exposure types | Disturbance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | Crest_hillcrest | 1121 | 20 | 22412 | 0.1 | 0.7 | 1569 | 7 | Gostwyck | None | 5_10 | grass | scald,sheet_wash,animal_track,erosion | moderate |
| T2 | hillslope_1 | 3614 | 20 | 72280 | 0.1 | 0.4 | 2891 | 4 | Gostwyck | Granite | 5_10 | grass | animal_track,erosion,scald | moderate |
| T3 | hillslope_1 | 1478 | 20 | 29554 | 0.1 | 0.5 | 1478 | 5 | Gostwyck | Granite tors, boulders and pavement | 5_10 | grass | scald,animal_track,sheet_wash,erosion | moderate |
| T4 | crest_hillcrest | 2236 | 20 | 44720 | 0.1 | 0.5 | 2236 | 5 | Gostwyck | Granite silcrete | 5_10 | grass | fence_line,erosion,animal_track,scald | moderate |
| T5 | hillslope_1 | 2841 | 20 | 56811 | 0.1 | 0.7 | 3977 | 7 | Gostwyck | Small silcrete nodules, chert nodules | 0_5 | grass | vehicle_track,sheet_wash,erosion | |
| T6 | crest_hillcrest | 3389 | 20 | 67782 | 0.1 | 0.5 | 3389 | 5 | Gostwyck | Silcrete | 0_5 | grass | scald,animal_track,erosion | moderate |
| T7 | hillslope_1 | 4274 | 20 | 85489 | 0.1 | 0.7 | 5984 | 7 | Gostwyck | Granite, silcrete | 5_10 | | | |
| T8 | flat_plain | 627 | 20 | 12537 | 0.1 | 0.5 | 627 | 5 | Ironstone | Basalt, silcrete, ironstone | 0_5 | grass,native_trees | vehicle_track,scald,animal_track | moderate |
| T9 | hillslope_1 | 5037 | 20 | 100739 | 0.1 | 0.1 | 1007 | 1 | Ironstone | Basalt, silcrete, ironstone | 0_5 | grass,regrowth_trees,native_trees | scald,animal_track,erosion | moderate |
| T10 | crest_hillcrest | 472 | 20 | 9435 | 0.1 | 0.5 | 472 | 5 | Ironstone | Basalt, silcrete | 20_30 | grass,disturbance,native_trees,exotic_trees | animal_track,scald,erosion | moderate |
| T11 | flat_plain | 875 | 20 | 17502 | 0.1 | 0.5 | 875 | 5 | Ironstone | Basalt, silcrete, ironstone | 0_5 | grass,disturbance,native_trees | | moderate |
| T12 | crest_hillcrest | 1398 | 20 | 27955 | 0.1 | 0.5 | 1398 | 5 | Ironstone | Basalt | 10_20 | gravel,grass | sheet_wash,scald,erosion | moderate |
| T13 | flat_plain | 1586 | 20 | 31720 | 0.1 | 0.7 | 2220 | 7 | Ironstone | Basalt, silcrete | 0_5 | grass,native_trees | vehicle_track,scald,animal_track | moderate |
| T14 | crest_hillcrest | 639 | 20 | 12773 | 0.1 | 0.6 | 766 | 6 | Fairfield variant a | None | | grass | vehicle_track,scald,animal_track | moderate |
| T15 | wtrcrs_1_2 | 2749 | 20 | 54980 | 0.1 | 0.2 | 1100 | 2 | Kellys Plains | None | 0_ | grass | | moderate |
| T16 | crest_hillcrest | 1219 | 20 | 24372 | 0.1 | 0.5 | 1219 | 5 | Fairfield variant a | Basalt, stones | | grass,native_trees | sheet_wash,scald,erosion | moderate |
| T17 | hillslope_1 | 2231 | 20 | 44620 | 0.1 | 0.7 | 3123 | 7 | Fairfield variant a | None | 0_ | grass,native_trees | scald,vehicle_track,sheet_wash,animal_track | moderate |
| T18 | hillslope_1 | 5232 | 20 | 104638 | 0.1 | 0.5 | 5232 | 5 | Gostwyck | None | | grass,native_trees | vehicle_track,scald,animal_track,erosion | moderate |

# Appendix E
## Aboriginal site raw data

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| Site name | Easting | Northing | Zone | Date and time | Recorder | Landform element | Elevation (m) | Transect number | Site features | Artefact count | Site description | Soil landscape | Geology | Exposure type | Land use | Vegetation | Exposure visibility (%) | Ground disturbance | Disturbance levels |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NE103 | 370392 | 6608850 | 56 | 24/10/2021 22:21 | Ryan Desic | Spurcrest | 1000 | T1 | Open_artefact_scatter | 2 | One silcrete distal flake and one chert medial flake identified on scald exposure. Rocky spur crest landform indicates highly skeletal and eroded soil profile, so no PAD predicted. | | | Scald | Farming_low_intensity | Grasslands | 0.5 | Moderate | Cleared, grazing |
| NE104 | 370246 | 6608905 | 56 | 24/10/2021 23:57 | Ryan Desic | Footslope | 993 | | PAD | 0 | Elevated footslope landform at the confluence of Saumarez Creek and its ephemeral tributary. Proximity to artefact scatter NE103 indicates local Aboriginal occupation, but with more intact soils. | | | | | | | | |
| NE105 | 37023 | 6608765 | 56 | 25/10/2021 0:05 | Ryan Desic | Hillslope | 1001 | T2 | PAD | 0 | Extension mid slope leading uphill and away from NE104. This area was recorded as the elevated area with good outlook over Saumarez Creek continues to this point before the landscape transitions into an undefined hill slope. | | | | | | | | |
| NE106 | 368841 | 6608892 | 56 | 26/10/2021 2:55 | Ryan Desic | Footslope | 1005 | | PAD | 0 | Elevated footslope including large granite tor outcrops within 200 m of a 3rd order tributary of Saumarez Creek. Similar landscape features of nearby NE27, which was test pitted and confirmed to have subsurface deposit within 100 m of this water source. | | | | | | | | |
| NE107 | 368657 | 6608468 | 56 | 26/10/2021 3:10 | Ryan Desic | Footslope | 1009 | T7 | PAD | 0 | Similar to NE106 but absent of granite tors. | | | Erosion_scar | | | | | |
| NE108 | 365052 | 6613423 | 56 | 26/10/2021 22:26 | Ryan Desic | Hillslope | 1085 | T9 | Isolated_find | 1 | Isolated silcrete core found in uprooted tree stump on very gently inclined grassed paddock. | | | | Pastoral/grazing | Grasslands | 0 | Moderate | Cleared, grazing |
| NE109 | 364932 | 6613470 | 56 | 26/10/2021 22:55 | Ryan Desic | Hillslope | 1086 | T9 | Open_artefact_scatter | 2 | Two silcrete cores identified within approximately 5 m of each other in open paddock within 120 m of NE108. | | | N/A | Pastoral/grazing | Grasslands | 0 | Moderate | Cleared, grazing |
| NE110 | 364790 | 6613119 | 56 | 26/10/2021 23:14 | Ryan Desic | Hillslope | 1089 | T9 | Modified_tree | 0 | Dead eucalypt standing tree with two scar features. Tree is approximately 12 m high and 2.3 m in circumference. Tree dry face is present but heavily laminating. Scars are oval shaped with extensive regrowth over scar features. Scar 1 – facing north, length 108 cm, max. width 19 cm, regrowth 60-70 cm wide. Scar 2 – facing east, length 45 cm, max width 18 cm, regrowth indeterminate. | | | | Pastoral/grazing | Grasslands | | Moderate | Cleared, grazing |
| NE111 | 364710 | 6613211 | 56 | 27/10/2021 0:09 | Ryan Desic | Hillslope | 1093 | T9 | Modified_tree | 1 | Living eucalypt standing tree with one scar feature. Tree is approximately 20 m high and 3 m circumference. Scar is significantly regrown leaving a thin irregular shape scar. Dry face is intact. Scar is facing south, length 90 cm, open scar section 50 cm long, max width 4–8 cm. | | | N/A | Pastoral/grazing | Grasslands | | Moderate | Cleared, grazing |
| NE112 | 364409 | 6613290 | 56 | 27/10/2021 1:03 | Ryan Desic | Hillslope | 1103 | T9 | Modified_tree | 0 | Living eucalypt standing tree with one scar feature. Tree is approximately 20 m high and 2.8 m circumference. Dry face of scar has decayed and is now missing. Scar regrowth has extended into trunk obscuring any sign of original scar. Scar facing south, length 68 cm, max. width 10 cm. | | | | Pastoral/grazing | Grasslands | | | |
| NE113 | 364279 | 6613417 | 56 | 27/10/2021 1:29 | Ryan Desic | Hillslope | 1103 | T9 | Modified_tree | 0 | Dead eucalypt standing tree with two scar features. Tree remains are approximately 15 m high and 2.8 m circumference. Scar continues to base of trunk and original scar is likely to have died back towards the base of the trunk. Regrowth around scar and striations extending up the trunk away from scar indicate potential for it to have originally extended further (approx. 70 cm up tree trunk). Scar facing east, length 244 cm, max. width 40 cm. | | | | Pastoral/grazing | Grasslands | 0 | Moderate | Cleared, grazing |
| NE114 | 364053 | 6613723 | 56 | 27/10/2021 3:07 | Ryan Desic | Hillslope | 1115 | T11 | Open_artefact_scatter | 11 | Open artefact scatter identified on red soil exposures along northern fence of surveyed area next to cattle track. Artefacts are distributed across a 50 m x 50 m area. Artefacts comprise silcrete, quartzite and chert flakes and flake fragments. | | | Scald | Pastoral/grazing | Grasslands | 0.2 | Moderate | Cleared, grazing |
| NE115 | 363865 | 6613737 | 56 | 27/10/2021 3:44 | Ryan Desic | Hillslope | 1118 | T12 | Isolated_find | 2 | Two silcrete flakes identified on cattle tracks in north western portion of the study area near fence line. Eroding out of red soil on northern slope of knoll with basalt outcropping. | | | | | Grasslands | | Moderate | Cleared, grazing |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NE116 | 363861 | 6613457 | 56 | 27/10/2021 21:50 | Ryan Desic | Dam | 1097 | T13 | Isolated_find | 1 | Isolated quartzite flake identified in highly disturbed context of dam wall. | | | Erosion_scar | Pastoral/grazing | Grasslands | | Moderate | Cleared, grazing |
| NE117 | 363735 | 6607408 | 56 | 27/10/2021 23:13 | Ryan Desic | Footslope | 1036 | T14 | PAD | 0 | Elevated footslope with a south-easterly aspect overlooking a 2nd order tributary of Julia Gully. Area within 200 m of the tributary on this landform was ascribed with PAD. | | | N/A | Farming_low_intensity | Cleared | | Moderate | Cleared, grazing |
| NE118 | 363618 | 6607941 | 56 | 28/10/2021 0:12 | Ryan Desic | Hillslope | 1082 | T14 | Open_artefact_scatter | 8 | Open scatter of chert, silcrete, basalt and quartzite flake fragments identified on the southern side of an unsealed farm vehicle track. Site is moderately to highly disturbed from vehicle track cutting. Site's presence is attributed to its proximity to Julia Gully (100 m east). | | | Vehicle_track | Pastoral/grazing | Grasslands | | Moderate | Vehicle track |
| NE119 | 363233 | 6607821 | 56 | 28/10/2021 1:18 | Ryan Desic | Hillcrest | 1099 | T15 | Open_artefact_scatter | 7 | Open scatter of chert and quartz flakes identified on a halo exposure beneath mature tree on a small hill crest. Soils appear highly gravelly and eroded with very limited potential for subsurface material. Site is only near ephemeral water sources and unlikely to have experienced intensive occupation. | | | Erosion_scar | Pastoral/grazing | Grasslands | | Moderate | Cleared, grazing |

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# Appendix F
## Stakeholder engagement

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Watson McNamara & Watt
156 Beardy St,
Armidale NSW 2350

22 August 2022

Dear Mr Watt,

**Re: Modification of Development Consent for New England Solar project**

We are writing to you as you represent [redacted], who resides on Elliott's Road, Dangarsleigh. [redacted] residence is approx. 1.3km south of the New England Solar project ("the Project") owned by ACEN Australia Pty Ltd, formerly known as UPC\AC Renewables Australia.

Following on from our update in February 2022, we are progressing with the NSW Development Consent Modification process, aiming to submit the Modification Report to the Department of Planning and Environment in the coming weeks. The application will include an additional 130 ha of land to the approved project footprint. The additional land will allow for flexibility and optimisation during the detailed design process, with no proposed change to the approved generated capacity of 720 MW. No new landholdings are involved compared with the approved project, nor are any being investigated as part of this process. No additional neighbouring landholders have been identified as being impacted as part of these proposed project refinements.

In addition, ACEN Australia is proposing to increase the maximum capacity of the associated battery by up to 1200 MW. This is in addition to the existing approved battery capacity of 200 MW and is in response to the market signalling the need for more firm dispatchable capacity to replace ageing coal fired generators. If fully built out in the future, the battery project would thus be able to guarantee the supply of 700 MW for 4 hrs when it is needed and helping to support the stability of the NSW grid. Should the detailed design allow for it, the optimised design may allow for additional solar PV capacity to charge the future expanded battery. This will depend on the connection asset configuration.

To allow us to work with the continued variable weather conditions and impacts of COVID-19 we are seeking an increase in the heavy vehicle movements and working hours. We will be requesting an increase from 56 to 84 daily heavy vehicle movements along Big Ridge Road during the construction phase of the project. We are proposing to extend the working hours on Saturday from 7am to 6pm (currently limited to 8am to 1pm), with some works allowed on Sunday, albeit limited to inaudible works.

As previously highlighted, the Modification will have no impact on [redacted] residence which we have assessed for possible visual impact using the same desktop methodology used for the original Development Application. A viewshed analysis has been done from Vantage Point 11 (VP11) on Elliott's Road consistent with the original Development Application Environmental Impact Statement (EIS) processes. [redacted] residence is noted as C5 in the documentation, however, for the avoidance of doubt [redacted] is not mentioned in the report.

The original EIS and Development Consent can be found via the Department of Planning's Major Projects Portal or on the Project website https://newenglandsolarfarm.com.au/.

**ACEN Australia**
Suite 2, Level 2
15 Castray Esplanade
Battery Point, TAS 7004

ACN 616 856 672
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We are happy to answer any questions you or your client may have regarding this matter.

Kind Regards

J K Wentrup (Aug 23, 2022 07:45 GMT+10)

Killian Wentrup

**Head of Solar Development**

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Planning, Industry & Environment

Ms Alexandra Hall
Project Development
UPC Renewables Australia Pty Ltd

Via email: alexandra.hall@upc-ac.com

10/09/2021

Dear Ms Hall

**New England Solar Farm (SSD 9255)**
**Modification 2 – Changes to project layout**

I refer to your letter indicating the intention to modify the New England Solar Farm development consent (SSD 9255) to change the layout of the project to add 321 ha of land to the project to accommodate additional project infrastructure including solar arrays.

The Department is generally satisfied with the issues identified in your letter to be addressed in the Modification Report. In addition to these matters, the Department requests that you provide the following:

- a detailed justification for the proposed modification;
- a summary of the environmental, social and economic benefits and impacts associated with the proposed modification; and
- a summary of the visual and noise impacts previously assessed and approved, and any changes in these impacts resulting from the expanded footprint;

Based on the information provided, the Department considers that the appropriate approval pathway for the modification application would be section 4.55(2) of the *Environment Planning and Assessment Act 1979* and the Department would place the modification application on public exhibition for a minimum of 14 days.

Your next step will be to lodge your modification application through your dashboard on the new major projects website (http://www.planningportal.nsw.gov.au/major-projects).

Once you submit your modification application, we will check it for completeness to confirm it addresses the above requirements. We will also notify you of the application fee for your project.

Please note that **your application is not taken to be lodged until the fee has been paid.**

If you have any questions, please contact Javier Canon on (02) 9373 2821 or Javier.Canon@planning.nsw.gov.au.

Yours sincerely,

Nicole Brewer
Director
Energy Assessments

20 July 2022

Our reference: NESF1-GLC -EN -00GRL-APV-002

Kate Jessep
General Manager
Uralla Shire Council
**PO Box 106 Uralla 2358**

Dear Kate,

**RE: New England Solar Farm – Temporary heavy vehicle increase**

## 1 Introduction

The New England Solar Farm (NESF) (the Project) is a significant grid-connected solar farm and battery energy storage system, located approximately 6 kilometres (km) east of Uralla in New South Wales (NSW). The Project was granted development consent under Section 4.38 of the *Environmental Planning & Assessment Act 1979* (NSW) (EP&A Act) by the NSW Independent Planning Commission (IPC) on 9 March 2020 (State significant development [SSD] 9255). The development consent for the Project was subsequently modified on 19 February 2021. ACEN Australia (ACEN) is the proponent of the NESF, and Green Light Contractors Pty Ltd (GLC) has been awarded the engineering, procurement and construction (EPC) contract.

The commencement of Project construction has been delayed due to COVID-19 restrictions, inclement weather, and completion of road upgrades required by the development consent.

To accelerate construction works and reduce the duration of construction-related noise on nearby receivers and the community, GLC is seeking approval from the Secretary (in accordance with Schedule 3, Condition 1) for a temporary increase in heavy vehicle movements from 56 a day to 84 a day (a 50% increase), for a period of three months.

The temporary increase is expected to reduce the duration of Stage 1 construction works by approximately six weeks, with an equivalent reduction in the duration of construction-related noise impacts on nearby receivers and the community.

Monitoring, management and mitigation measures would be implemented during the period to ensure the road network capacity and safety of all road users is not affected.

The request does not involve changes to the following:

- expected total heavy vehicle movements required for Stage 1 construction;
- no heavy vehicle movements on Sundays and public holidays; and
- approved working hours.

ACEN is separately seeking a modification to the development consent to increase heavy vehicle movements to 84 a day for the remainder of construction, which will predominantly benefit the Stage 2 construction schedule and further reduce the duration of noise impacts on receivers and the community.

## 2 Background

Commencement of Stage 1 construction (i.e. 7 February 2022) was significantly delayed due to the following factors, including:

- COVID-19 effects:
- border closures preventing delivery of key pre-construction project materials;
- regional lockdowns preventing skilled labour travel;
- and local cases preventing access of personnel to site;
- ongoing inclement weather, including significant rainfall and flooding in the region; and
- completion of road upgrades required by the development consent.

To assist in accelerating construction works and recover from delays, GLC proposes to temporarily increase heavy vehicle movements to 84 a day for a period of three months. The total number of heavy vehicle movements required for Stage 1 construction is not expected to change.

An indicative breakdown of the daily heavy movements (consistent with the configuration and breakdown of heavy vehicles currently accessing site) would be:

- 15 movements for logistics deliveries (e.g. piles, torque tubes, cable drums, tracker equipment and PV modules).
- 10 movements for GLC substation deliveries (e.g. concrete, gravel for capping layer, substation equipment).
- 10 movements for TransGrid substation deliveries (similar to GLC substation deliveries).
- 22 movements for civil works deliveries (e.g. machinery, gravel for internal roads and hardstands, concrete for drainage works and PCU foundations).
- 16 movements for mechanical works deliveries (e.g. concrete trucks with stabilised sand, machines such as piling rigs and telehandlers).
- 10 movements for electrical works deliveries (e.g. thermal sands for trenches, excavators and trenching machines).
- 1 movement for other miscellaneous works (e.g. potable water and sewage).

## 3 Traffic considerations

Existing traffic management measures will continue to be implemented in accordance with the approved Traffic Management Plan (TMP) to ensure ongoing safety for all road users.

In addition to the TMP, GLC proposes to implement the following temporary measures during the period:

- Weekly monitoring of the New England Highway intersection during peak periods to confirm the existing TMP measures (e.g. implementation of a traffic forecasting and scheduling regime, and implementation of a “drive-by measure to be executed where the channelised right turn lane on the New England Highway is occupied) are adequate.
- Weekly monitoring of Barleyfields Road (north) to ensure vehicles are not queueing over the rail crossing.
- Monthly dilapidation surveys of Barleyfields Road and Big Ridge Road to monitor for increased degradation of the access route (as per the TMP, degradation will effectively become the road repair works required).

It is also understood that ACEN and USC would conduct weekly monitoring and inspection of Barleyfields Road (north) and Big Ridge Road.

## 4 Noise and dust considerations

The proposed increase in heavy vehicle movements would result in temporary elevated noise levels on weekdays at some nearby receptors. Noise would be minimised as far as practicable in accordance with the development consent and TMP, including ensuring that deliveries are restricted to construction hours, and enforcing the driver’s Code of Conduct (which addresses travelling speed and consideration of other road users). The location of receivers along Barleyfields Road and Big Ridge Road are shown on Figure 1.

The key advantage of increasing heavy vehicle deliveries would be to minimise the duration of construction-related noise impacts on nearby receivers and the community associated with Stage 1.

As required by the development consent, noise from construction activities on site would continue to be minimised in accordance with the Interim Construction Noise Guideline. Stage 1 construction activities would be spread across the footprint to minimise concentrated noise sources.

Dust from road traffic and construction activities would be managed through the increased use of water carts (particularly Big Ridge Road Segments 4 and 5). It is noted that, as part of the Project water supply strategy, GLC has entered a commercial agreement with an adjacent landholder which provides sufficient water supply for dust suppression even under dry conditions.

Consultation has been undertaken with sensitive receptors along Barleyfields Road (north) and Big Ridge Road regarding the temporary heavy vehicle increase. Correspondence regarding the request is provided in Attachment 1.

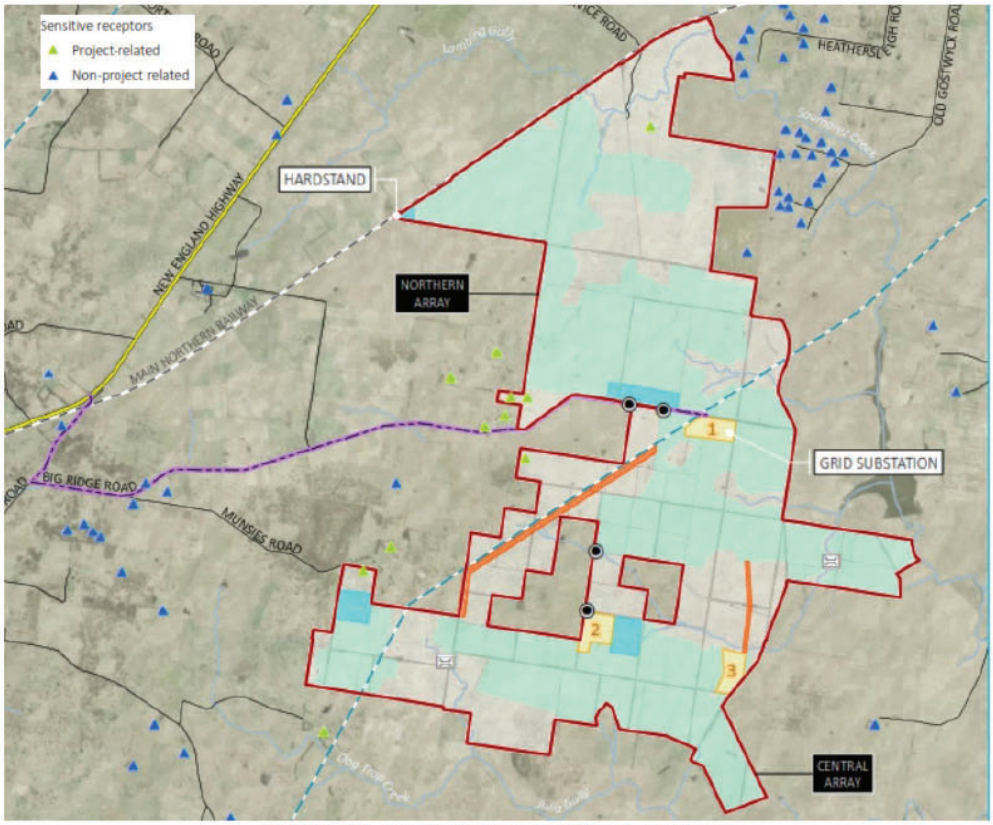


**Figure 1 Location of sensitive receptors**

## 5 Conclusion

To accelerate construction works and reduce the duration of construction-related noise on nearby receivers and the community, GLC is seeking approval from the Secretary (in accordance with Schedule 3, Condition 1) for a temporary increase in heavy vehicle movements from 56 a day to 84 a day, for a period of three months.

The temporary increase is expected to reduce the duration of Stage 1 construction works by approximately six weeks, with an equivalent reduction to the duration of construction-related noise impacts on nearby receivers and the community.

Monitoring, management and mitigation measures would be implemented during the period to ensure the road network capacity and safety of all road users is not affected.

Consultation has been undertaken with receptors near Barleyfields Road and Big Ridge Road and correspondence has been provided in Attachment 1.

It would be greatly appreciated if USC could provide their support for the intent of this letter.

Regards

Volodymyr Koziy
Project Manager

Date:
14 July 2022

Green Light Contractors Pty Ltd
84 Bridge Street
Uralla NSW 2358

Delivered by hand.

Dear neighbour,

**RE: New England Solar Farm – Heavy vehicle increase**

To allow us to work with the continued variable weather conditions and impacts of COVID-19, ACEN Australia and GLC are seeking approval from the Secretary to increase the limit of heavy vehicle movements from 56 a day to 84 a day during construction (a 50% increase).

ACEN Australia and GLC are proposing two separate approvals from the Secretary:

- A temporary request to increase heavy vehicle movements to 84 a day for a period of three months (to be sought imminently).
- A modification to the development consent to increase heavy vehicle movements to 84 a day for the remainder of construction (to be lodged in late July 2022 and determined later in 2022).

The temporary request to increase heavy vehicle movements will accelerate the Stage 1 construction schedule by up to two months, which will reduce the duration of construction-related noise impacts on neighbours. The modification would predominantly benefit the Stage 2 construction schedule and further reduce the duration of noise impacts on neighbours.

Road safety will be managed through the approved Traffic Management Plan, which includes measures to schedule traffic to avoid convoy lengths or platooning on roads, and a driver Code of Conduct (which addresses travelling speed and consideration of other road users).

GLC will conduct additional dilapidation surveys of Barleyfields Road (north) and Big Ridge Road to monitor for any road degradation during construction and inform road repair works required.

Additional noise from temporary increased traffic movements will be minimised as far as practicable, including ensuring that deliveries are restricted to construction hours (7 am to 6 pm Monday to Friday, and 8 am to 1 pm on Saturdays). The key advantage of increasing movements would be to minimise the duration of construction-related noise impacts on nearby receivers and the community.

Please don't hesitate to contact me if you have any queries or concerns regarding the above.

Yours sincerely,

VK

Volodymyr Krasiy
Project Manager
M: 0455 054 439
Green Light Contractors Team

ACEN | Australia

green light elecnor

# NEW ENGLAND SOLAR FARM - HEAVY VEHICLES INCREASE CONSULTATION LOG

| Receptor Reference No. | Date | Time | GLC personnel | Delivery | Neighbour's name | Neighbour's comments |
|---|---|---|---|---|---|---|
| 1 | 15/7/2022 | 12:05 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Hand delivered. | [redacted] | Supportive with the request. |
| 2 | 15/7/2022 | 11:45 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | NA | [redacted] | Supportive with the request. |
| 3 | 15/7/2022 | 11:40 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Hand delivered to relative. | [redacted] | Not at home at time of delivery |
| 4 | 15/7/2022 | 11:30 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Not at home. Letter dropped by the door. | [redacted] | Not at home at time of delivery |
| 5 | 15/7/2022 | 11:35 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Not at home. Letter dropped by the door. | [redacted] | Not at home at time of delivery |
| 6 | 15/7/2022 | 11:25 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Not at home. Letter dropped by the door. | [redacted] | Not at home at time of delivery |
| 7 | 15/7/2022 | 11:10 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Not at home. Letter dropped by the door. | [redacted] | Not at home at time of delivery |
| 8 | 15/7/2022 | 11:05 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Not at home. Letter dropped by the door. | [redacted] | NA |
| 9 | 15/7/2022 | 11:05 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Not at home. Letter dropped by the door. | [redacted] | NA |
| 10 | 15/7/2022 | 10:50 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Hand delivered. | [redacted] | Supportive with the request. Speed limit reinforce. |
| 11 | 15/7/2022 | 11:00 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Hand delivered. | [redacted] | Supportive with the request. |
| 12 | 15/7/2022 | 10:30 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Hand delivered to relative. | [redacted] | Not at home at time of delivery |
| 13 | 15/7/2022 | 10:45 | Javier Gieure (GLC)<br>Volodymyr Krasiy (GLC) | Hand delivered to Tom | [redacted] | Supportive with the request. |

ACEN | Australia

green light elecnor

# NEW ENGLAND SOLAR FARM - HEAVY VEHICLES INCREASE CONSULTATION LOG

| Receptor Reference No. | Date | Time | GLC personnel | Delivery | Neighbour's name | Neighbour's comments |
|---|---|---|---|---|---|---|
| 1 | 25/7/2022 | | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Supportive with the request. Not visited. |
| 2 | 25/7/2022 | | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Supportive with the request. Not visited. |
| 3 | 25/7/2022 | 11:30 | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered and delivered again | [redacted] | Not supportive with the request. |
| 4 | 25/7/2022 | | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Not visited. |
| 5 | 25/7/2022 | | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Not visited. |
| 6 | 25/7/2022 | | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Not visited. |
| 7 | 25/7/2022 | 10:30 | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered and delivered again | [redacted] | Not supportive with the request. |
| 8 | 25/7/2022 | 10:20 | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered and delivered again | [redacted] | Not at home at time of delivery |
| 9 | 25/7/2022 | 10:23 | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered and delivered again | [redacted] | Not at home at time of delivery |
| 10 | 25/7/2022 | | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Supportive with the request. Not visited. |
| 11 | 25/7/2022 | | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Supportive with the request. Not visited. |
| 12 | 25/7/2022 | 10:00 | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Not at home at time of delivery |
| 13 | 25/7/2022 | 10:10 | Volodymyr Krasiy (GLC)<br>Adin Pilcer (ACEN) | Previously delivered | [redacted] | Supportive with the request. |

**Subject:** RE: New England Solar Farm - OSOM Vehicles
**Date:** Monday, 9 August 2021 at 4:17:00 pm Australian Eastern Standard Time
**From:** Development Northern
**To:** Tim Greenaway
**Attachments:** 20210805 NESF OSOM Vehicles.pdf, image001.png, image002.jpg



Hi Tim

Thank you for contacting Transport for NSW and for the opportunity to comment on the attached submission.

TfNSW has reviewed the document and the further clarification of heavy vehicle movements generated by the approved project.

It is noted that the Developer has entered into an agreement (WAD) with TfNSW to complete an upgrade of the New England Highway and Barleyfields Road North intersection, and that construction traffic demands will be appropriately managed under the approved Construction Traffic Management Plan.

TfNSW notes that all heavy vehicles movements are proposed in accordance with the requirements of the NHVR and TfNSW.

It is recommended that the Developer undertake consultation Uralla Shire Council with respect to affected public roads between the New England Highway and the development site.

It is recommended that the attached information be incorporated into the approved CTMP.

Please contact me if you have any further questions.

Best Regards

Matt Adams
Team Leader, Development Services
Community and Place | Region North
Regional & Outer Metropolitan
**Transport for NSW**

**P** 02 6640 1362
**M** 0400 474 068
**E** development.northern@transport.nsw.gov.au
**A** Level 1, 76 Victoria Street, Grafton NSW 2460

NSW GOVERNMENT | Transport for NSW

I acknowledge the traditional owners and custodians of the land in which I work and pay my respects to Elders past, present and future.

**From:** Tim Greenaway [mailto:tim.greenaway@upc-ac.com]
**Sent:** Thursday, 5 August 2021 9:59 AM
**To:** Development Northern <development.northern@transport.nsw.gov.au>
**Subject:** New England Solar Farm - OSOM Vehicles



For the Attention of Matt Adams

Hello Matt

Further to our discussions earlier this year regarding over-dimension vehicles, please find attached a letter to DPIE seeking approval to increase the number of OSOM vehicle movements allowed under the Development Consent from 6 to 30. This covers the period of construction, operations and decommissioning of the solar farm.

Since the discussions earlier this year we have completed a detailed review of the required vehicles and vehicle movements with Green Light Contractors and assessed the OSOM requirements. The OSOM limitation in the Development Consent, we conclude in the attached, does not include Restricted Access Vehicles / Special Purpose Vehicles or vehicles that are exempt from OSOM Dimension limits, such as low loaders.

All heavy vehicle movements will be in accordance with the requirements of NHVR and TfNSW.

We are required to consult with TfNSW prior to lodgement of this letter with DPIE. Could you please review and if possible provide your endorsement.

Regards

Tim

**Tim Greenaway** | NESF Project Director
UPC\AC Renewables Australia
*A UPC Renewables and AC Energy Company*

**Hobart:** Suite 2, Level 2, 15 Castray Esplanade, Battery Point, TAS, 7004

www.upc-ac.com

URALLA SHIRE COUNCIL

Infrastructure & Development

**P:** 02 6778 6300
**F:** 02 6778 6349
**E:** council@uralla.nsw.gov.au
32 Salisbury Street, Uralla NSW 2358
PO Box 106, Uralla NSW 2358
**ABN:** 55 868 272 018

30 August 2021

Responsible Officer: TS
In reply, please quote: UO/21/3283

Tim Greenaway
NESF Project Director
UPC\AC Renewables Australia

By email: tim.greenaway@upc-ac.com

Dear Tim

Council refers to the request from UPC Renewables to amend Schedule 3, Condition 1 of the Conditions of Consent for SSD-9255 for New England Solar Farm, as follows:

**TRANSPORT**

**Over-Dimensional and Heavy Vehicle Restrictions**

1. The Applicant must ensure that the:

   (a) development does not generate more than:
   - 56 heavy vehicle movements a day during construction, upgrading and decommissioning;
   - 30 ~~6~~ over-dimensional vehicle movements during construction, upgrading and decommissioning;

   and
   - 5 heavy vehicle movements a day during operations;

   on the public road network;

   (b) length of any vehicles (excluding over-dimensional vehicles) used for the development does not exceed 26 metres,

   unless the Secretary agrees otherwise.

Uralla Shire Council has considered the request and, given the other existing conditions of consent, has no objections to this request.

Yours sincerely

Terry Seymour
**Director Infrastructure and Development**

## David Richards

**From:** Tessa Verkerk <tessa.verkerk@acenrenewables.com.au>
**Sent:** Monday, 22 August 2022 4:25 PM
**To:** David Richards
**Subject:** FW: For Comment: New England Solar Farm - Revised Traffic Management Plan
**Attachments:** NESF1-SMEC-CW-00GRL-PLN-001-Rev7-20220819.pdf



Correspondence sent to Uralla Council

**Tessa Verkerk**
Developer

ACEN Australia

**ACEN Australia**
M: +61 477 489 552
E: tessa.verkerk@acenrenewables.com.au
Suite 2, Level 2, 15 Castray Esplanade, Battery Point, TAS 7004
www.upc-ac.com

**ACEN Australia acknowledges the resilience and knowledge of the Traditional Custodians of this nation. We pay our respects to elders past and present, the many Aboriginal people that did not make their elder status and to those that continue to care for country.**

**We're re-branding.** ACEN has increased its ownership in UPC\AC Renewables in 2021 to be 100% by early 2023.



**From:** Sarah Donnan <sarah.donnan@acenrenewables.com.au>
**Date:** Monday, 22 August 2022 at 4:23 pm
**To:** Tessa Verkerk <tessa.verkerk@acenrenewables.com.au>
**Subject:** Fwd: For Comment: New England Solar Farm - Revised Traffic Management Plan

Sarah Donnan
ACEN Australia

0402 206 088

**From:** Sarah Donnan <sarah.donnan@acenrenewables.com.au>
**Sent:** Monday, August 22, 2022 2:18 pm
**To:** William Barr <WBarr@uralla.nsw.gov.au>
**Cc:** CBennett@uralla.nsw.gov.au <CBennett@uralla.nsw.gov.au>; Adin Pilcer <adin.pilcer@acenrenewables.com.au>; Council <Council@uralla.nsw.gov.au>; Kate Jessep <kjessep@uralla.nsw.gov.au>; Tim Greenaway <tim.greenaway@acenrenewables.com.au>
**Subject:** For Comment: New England Solar Farm - Revised Traffic Management Plan

Good morning Will,

As noted previously, the New England Solar Farm **Traffic Management Plan** has been revised to reflect the proposed increase in Heavy Vehicle Movements.

We have been formally requested by Department of Planning and Environment (DPE) to submit this revised document to Council for review.

They have requested that we source written comment from Council that is then submitted to DPE as part of their assessment.

As you may have been aware, we have spoken to Council representatives a number of times on the proposal for an increase in the number of allowable Heavy Vehicle movements allowed per day along Barleyfields Road and Big Ridge Road to the project site. We also presented to the Councillors a few weeks ago.

We therefore would like to request written feedback on the attached document. Please let me know if you require any additional information or would prefer to talk it through.

Written feedback would be appreciated so that we can submit to DPE as per their request.

Kind regards, Sarah

**Sarah Donnan**
Project Manager

ACEN Australia

**ACEN Australia**
M: +61 402 206 088
E: sarah.donnan@acenrenewables.com.au
Suite 2, Level 2, 15 Castray Esplanade, Battery Point, TAS 7004
www.upc-ac.com

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**We're rebranding.** ACEN has increased its ownership in UPC\AC Renewables in 2021 to be 100% by early 2023.

## David Richards

**From:** Tessa Verkerk <tessa.verkerk@acenrenewables.com.au>
**Sent:** Monday, 22 August 2022 4:25 PM
**To:** David Richards
**Subject:** FW: NEW ENGLAND SOLAR FARM - Revised Traffic Management Plan for TfNSW review
**Attachments:** NESF1-SMEC-CW-00GRL-PLN-001-Rev7-20220819.pdf; SCT_00107 _NESF_TAN_Transport assessment_Heavy vehicles_Rev3.0.pdf



Correspondence sent to TfNSW

**Tessa Verkerk**
Developer

ACEN Australia

**ACEN Australia**
M: +61 477 489 552
E: tessa.verkerk@acenrenewables.com.au
Suite 2, Level 2, 15 Castray Esplanade, Battery Point, TAS 7004
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**We're re-branding.** ACEN has increased its ownership in UPC\AC Renewables in 2021 to be 100% by early 2023.



**From:** Sarah Donnan <sarah.donnan@acenrenewables.com.au>
**Date:** Monday, 22 August 2022 at 4:23 pm
**To:** Tessa Verkerk <tessa.verkerk@acenrenewables.com.au>
**Subject:** Fwd: NEW ENGLAND SOLAR FARM - Revised Traffic Management Plan for TfNSW review

Sarah Donnan
ACEN Australia

0402 206 088

**From:** Sarah Donnan
**Sent:** Monday, August 22, 2022 2:26:53 PM
**To:** development.northern@transport.nsw.gov.au <development.northern@transport.nsw.gov.au>
**Cc:** Adin Pilcer <adin.pilcer@acenrenewables.com.au>; Tim Greenaway <tim.greenaway@acenrenewables.com.au>
**Subject:** NEW ENGLAND SOLAR FARM - Revised Traffic Management Plan for TfNSW review

Dear Matt,

Attached is a revised copy of the Traffic Management Plan for the New England Solar Farm.

We have been formally requested by Department of Planning and Environment (DPE) to submit this revised document to TfNSW for review.

They have requested that we source written comment from TfNSW that is then submitted to DPE as part of their assessment.

DPE are currently assessing our application for an increase of permitted Heavy Vehicle Movements per day from 56 maximum movements to 84. If this proposal was accepted, the maximum number of project related Heavy Vehicles on the New England Highway per day would increase to 84. I have also attached our transport assessment document to provide additional context.

You may notice that previous correspondence relating to the New England Solar Farm project was received from UPC\AC Renewables. ACEN has recently increased its ownership of UPC\AC Renewables, transitioning to 100% by 2023. Therefore, all future correspondence will be noted as ACEN Australia. However, we are still the same project team (just a name change).

We therefore would like to request written feedback on the attached document. Please let me know if you require any additional information.

Kind regards, Sarah

**Sarah Donnan**
Project Manager

ACEN | Australia

**ACEN Australia**
M: +61 402 206 088
E: sarah.donnan@acenrenewables.com.au
Suite 2, Level 2, 15 Castray Esplanade, Battery Point, TAS 7004
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# Appendix G

## Traffic impact assessment – technical advisory notes

EMM
creating opportunities

# Technical Advisory Note

| Quality Information | |
|---|---|
| **Project:** | New England Solar Farm |
| **Project Number:** | SCT_00107 |
| **Document Name:** | New England Solar Farm: Traffic and Transport Impact Assessment (Update) |
| **Date:** | 05/07/2021 |
| **Prepared:** | Matthew Cen, Consultant |
| **Reviewed:** | Seamus Christley, Director |
| **Authorised:** | Seamus Christley, Director |

## Introduction

In 2019 SCT Consulting prepared a Traffic and Transport Impact Assessment, on behalf of UPC Renewables Australia Pty Ltd (UPC), to support the planning approval for the New England Solar Farm. The assessment was based on an assumed mix of construction vehicle traffic for the proposal and resulted in the following planning approval condition being issued by Department and Planning, Industry and Environment (DPIE):

**TRANSPORT**

**Over-Dimensional and Heavy Vehicle Restrictions**

1. The applicant must ensure that the

   A) Development does not generate more than

   - 56 heavy vehicles movements a day during construction, upgrading and decommissioning
   - 6 over-dimensional vehicle movements during construction, upgrading and decommissioning; and
   - 5 heavy vehicle movements a day during operations;

   on the public road network.

   B) Length of any vehicles (excluding over-dimensional vehicles) used for the development does not exceed 26 metres,

   Unless the Secretary agrees otherwise.

Note: Over-dimensional vehicles are hereafter referred to as oversize over mass (OSOM) vehicles

Following further detailed project planning Green light (Elecnor group), engaged by UPC to construct the New England Solar Farm, has generated a detailed construction heavy vehicle inventory list, provided in Attachment A.

This Technical Advisory Note utilises the information in Attachment A to outline the implications, on the previous technical assessment contained within the completed Traffic and Transport Impact Assessment (2019), of UPC:

– Retaining the previous cap of 56 heavy vehicles per day.

– Requesting an increase in the cap of High Risk OSOM (non-exempt) heavy vehicles to 30 to enable the transport of both transformers and large plant required to perform some of the civil works of the project.

## Technical assessment

Based on the refined information SCT Consulting has reviewed the previously completed traffic and transport assessment to ensure impacts identified are consistent with those previously assessed regarding mid-block capacity and intersection performance.

**Midblock assessment**

A mid-block capacity assessment was previously undertaken for the New England Highway, Barleyfields Road and Big Ridge Road. The refined list of OSOM vehicles (**Attachment A)** allows for a more accurate midblock capacity assessment using the weighted average Passenger Car Unit (PCU) factor. The previous assessment used a conservative PCU factor of 3.6 as recommended within Transport for NSW's *'Traffic Modelling Guidelines'* (2013). The revised weighted average PCU factor was calculated as 2.8, indicating that the previous assessment overestimated the impact of construction vehicles on the mid-block capacity of the road network.

**Intersection performance**

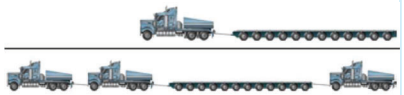
Previously an assessment of intersection performance was undertaken at the intersection of New England Highway / Barleyfields Road (north) for the AM and PM peak periods. Results indicated construction traffic vehicles would not adversely impact intersection performance. As the total number of daily vehicle volumes are unchanged the findings from the previously completed assessment are unchanged.

## Summary

Based on the revised construction heavy vehicle mix mid-block capacity and intersection performance are forecast to be no worse than the previously completed traffic and transport assessment for the New England Solar Farm.

**Attachment A – Construction heavy vehicle composition**

**Table 1 Proposed Elecnor Group construction vehicles**

| Item | Estimated quantity of vehicle during construction period | Vehicle | OD vehicle | HV Class | Subclass | Risk for OSOM movements | Preliminary Dimensions (W x L x H) in m | Estimated Weight in tons | Purpose | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 10 | Block Truck towing a Load, Load platform |  | Class 1 | OSOM | High Risk | 4.5 x 25 x 5 | 250 | Transport of 330/33kV Power transformers | 170 ton transformer tank 10m long, 4 wide and 4 tall (approx.); there are 4 transformers in the project, and one vehicle per transformer (decommissioning would require same amount of vehicles) |
| 2 | 4 | 500 tons All Terrain Mobile crane |  | Class 1 | RAV | N.A. | 3.1 x 20 x 3.7 | 96 | Lifting the 330/33kV Power Transformers | 8 axle crane, 500 tons lifting capacity crane (preliminary crane selection), assumed one per transformer. 19-20m long 3.1m wide. |
| 3 | 8 | Prime mover with Low Loader |  | Class 1 | OSOM Exempt | N.A. | 2.5 x 19 x 4 | <50 | Transport of the Substation Switching Rooms and Control rooms | Prefabricated buildings containing the substation control room, and the switching rooms. (estimated as 6 for SF substation (3 per PoC) and 2 for TransGrid Substation) |
| 4 | 4 | 200 tones All Terrain Mobile Crane |  | Class 1 | RAV | N.A. | 3 x 16 x 4 | <60 | TransGrid has to install their substation Buildings, substation equipment, and construction of the new 330kV OHPL structures. | 6 axle crane, 200 tons lifting capacity crane (preliminary crane selection) 16m long and 3m wide. |
| 5 | 6 | 200 tones All Terrain Mobile Crane |  | Class 1 | RAV | N.A. | 3 x 16 x 4 | <60 | Substation Buildings unloading and installation | 6 axle crane, 200 tons lifting capacity crane (preliminary crane selection) 16m long and 3m wide. |
| 6 | 140 | Prime mover with Low Loader/Platform trailer |  | Class 1 | OSOM Exempt | N.A. | 2.5-3.5 x 19 x 4 | TBC | Transport to site the civil work machinery | Required to bring to site Graders, Lime stabilizers, Trenchers, Excavators, Front Loaders, Dump trucks, Rollers, Drill Rigs, Water tankers, etc. In some cases, the machinery weight is in the 40-60 tones (i.e. excavators, front loaders, and trenchers).<br>The amount are approximated and will be dependent on the (amount of site mobilizations required) timing of the NTPs and the Stage 2 (overlapping will increase the amount) and any need of accelerate the construction capacity due to difficult ground conditions, heavy rain stopping the jobs, etc. |
| 6a | 10 | Prime mover with Low Loader/Platform trailer |  | Class 1 | OSOM | N.A. | 2.5-3.5 x 19 x 4 | TBC | Transport to site the civil work machinery | Required to bring to site LARGER Graders, Lime stabilizers, Trenchers, Excavators, Front Loaders, Dump trucks, Rollers, Drill Rigs, Water tankers, etc. In some cases, the machinery weight is in the 40-60 tones (i.e. excavators, front loaders, and trenchers).<br>The amount are approximated and will be dependent on the (amount of site mobilizations required) timing of the NTPs and the Stage 2 (overlapping will increase the amount) and any need of accelerate the construction capacity due to difficult ground conditions, heavy rain stopping the jobs, etc. |

| Item | Estimated quantity of vehicle during construction period | Vehicle | OD vehicle | HV Class | Subclass | Risk for OSOM movements | Preliminary Dimensions (W x L x H) in m | Estimated Weight in tons | Purpose | Description |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 90 | 150 tones All Terrain Mobile Crane |  | Class 1 | RAV | N.A. | 2.8 x 15 x 4 | TBC | Downloading and installing the Inverter Stations (130) | 5 axle crane, 150 tons lifting capacity crane (preliminary crane selection), assumed one per transformer. 15m long 2.8m wide. |
| 8 | 30 | 150 tones All Terrain Mobile Crane |  | Class 1 | RAV | N.A. | 2.8 x 15 x 4 | TBC | Downloading and installing BESS equipment (Batteries and Inverters) | 5 axle crane, 150 tons lifting capacity crane (preliminary crane selection), assumed one per transformer. 15m long 2.8m wide. |

Source: Green light (Elecnor group), 2020

# Technical Advisory Note

| Quality Information | |
|---|---|
| **Project:** | New England Solar Farm |
| **Project Number:** | SCT_00107 |
| **Document Name:** | Transport assessment: Proposed daily heavy vehicle volume modification |
| **Date:** | 7/09/2022 |
| **Prepared:** | Nicholas Bradbury, Consultant |
| **Reviewed:** | Seamus Christley, Director |
| **Authorised:** | Seamus Christley, Director |

# Introduction

In 2019 SCT Consulting prepared a Traffic and Transport Impact Assessment (2019 assessment), on behalf of ACEN Australia, formally known as UPC Renewables Australia Pty Ltd, to support the planning approval for the New England Solar Farm. The 2019 assessment was based on the construction vehicle traffic proportions noted below in the planning approval conditions - issued by the Department of Planning and Environment (DPE):

**TRANSPORT**

**Over-Dimensional and Heavy Vehicle Restrictions**

1. The applicant must ensure that the
   - A) Development does not generate more than
     - 56 heavy vehicles movements a day during construction, upgrading and decommissioning
     - 6 over-dimensional vehicle movements during construction, upgrading and decommissioning; and
     - 5 heavy vehicle movements a day during operations;

     on the public road network.
   - B) Length of any vehicles (excluding over-dimensional vehicles) used for the development does not exceed 26 metres, unless the Secretary agrees otherwise.

Source: DPE; 2020

ACEN have requested that further assessment be undertaken to determine the applicability of increasing the number of daily heavy vehicles from 56 to 84. The assessment, and the subsequent structure of this document, is focused on the following key technical elements:

– Safety
  - Identifying the impact of heavy vehicles on local roads (Barleyfields Road and Big Ridge Road)

– Intersection performance
  - At the key access intersection of New England Highway / Barleyfields Road

– Mid-block capacity
  - To assess the operational capacity of the road network along the construction access route

# Technical assessment

## Safety

As a result of dialogue between ACEN, Uralla Shire Council and DPE, following completion of the 2019 assessment, ACEN were conditioned to undertake multiple corridor and intersection upgrades along the construction vehicle access route. These are reflected in Table 1 and have resulted in improved safety outcomes for all road users.

**Table 1 New England Solar Farm Development consent conditions (2020)**

| Road | Location | Upgrade Requirements |
|---|---|---|
| New England Highay / Barleyfields Road (north) | Intersection | Channelised Right Turn (CHR) treatment for the largest vehicle assessing the site (excluding over-dimensional vehicles) |
| Barleyfields Road | Between New England Highway and Big Ridge Road | Seal to a width of 7.2 m with 1 m unsealed shoulders (total carriageway 9.2 m) |
| Barleyfields Road / Big Ridge Road | Intersection | Basic Left Turn (BAL) treatment to cater for the largest vehicle accessing the site (excluding ove r-dimensional vehicles) |
| Big Ridge Road* | Segment 1 | Seal to a width of 7.2 m with 1 m unsealed shoulders (total carriageway of 9.2 m) |
| | Segment 3 | |
| | Segment 4 | Gravel (unsealed) carriageway to a width of 8.7 m |
| | Segment 5 | |

* = Segment 2 was deemed to meet the design requirements specified for Segment 1 and Segment 3.

Source: DPE; 2020

In accordance with Austroads (2017) 'Guide to Road Design Part 3: Geometric Design' the conditioned road width of 7.2m (9.2m carriageway), delivered for Barleyfields Road and Big Ridge Road (Segments 1 – 3), provides for a capacity of up to 1,000 vehicles per day. The 2019 assessment considered a total of 276 daily construction vehicles (220 light vehicles and 56 heavy vehicles). Based on this assessment the daily volume of traffic on Barleyfields Road, during construction, was forecast to reach 971[1]. Big Ridge Road was forecast to reach no higher than 671 daily vehicles.

To ensure that the overall level of daily traffic on Barleyfieds Road remains at or below 1,000 vehicles daily light construction vehicles should be reduced by 14 to account for the increase in heavy vehicles. The revised daily construction vehicle numbers would be 206 light vehicles and 84 heavy vehicles. This change will ensure continued compliance with the design criteria provided in ACEN's initial development consent.

The design requirements contained within Table 1 further ensured that ACEN complied with Austroads guidance that 'A minimum 7.0m seal should be provided on designated heavy vehicle routes (or where the AADT contains more than 15 per cent heavy vehicles' (Austroads Guide to Road Design Part 3: Geometric Design; 2017; p47). Despite the proposed increase in daily heavy vehicles, the road will remain compliant with relevant guidelines.

Intersection upgrades, supporting heavy vehicle access to site, have been provided at New England Highway / Barleyfields Road and Barleyfields Road / Big Ridge Road. These upgrades provide improved safety outcomes regarding pavement condition, line of sight and swept path requirements. The upgrades, at their current level of design, will satisfactorily support the proposed increase in daily construction heavy vehicles from 56 to 84.

[1] Note that daily volumes include both local and construction traffic. All construction vehicles make a return journey which is attributed to daily vehicle volumes.

## Intersection performance

### Definition

Intersection performance is typically measured through an assessment of the throughput of vehicles across a traffic network, with the average delay per vehicle used to assess the performance of an intersection. This is consistent with Transport for NSW (TfNSW) best practice and is the industry standard for the assessment of intersection performance. The average delay per vehicle measure is linked to a Level of Service (LoS) index which characterises the intersection's operational performance. Table 2 provides a summary of the LoS performance bands.

**Table 2 Level of Service Index**

| Level of Service | Average Delay per Vehicles (sec/h) | Traffic Signals/Roundabout | Give Way/Stop Signs |
|---|---|---|---|
| A | Less than 14.5 | Good operation | Good operation |
| B | 14.5 to 28.4 | Good with acceptable delays and spare capacity | Acceptable delays and spare capacity |
| C | 28.5 to 42.4 | Satisfactory | Satisfactory, but incident study required |
| D | 42.5 to 56.4 | Operating near capacity | Near capacity and incident study required |
| E | 56.5 to 70.4 | At capacity, at signals incidents will cause excessive delays. Roundabouts require other control method. | At capacity, requires other control method |
| F | 70.5 or greater | | |

Source: Guide to Traffic Generating Developments; (then) Roads and Maritime Services; 2002

The other measure assessed as part of an intersection's performance is Degree of Saturation (DoS). DoS is used to identify the capacity of the intersection. This is determined by the ratio of the volume of vehicles that can pass through the intersection against the capacity provided by traffic signals, if applicable, and number of available traffic lanes. i.e. vehicle / capacity = DoS. Capacity is reached when DoS = 1.0.

### Results

A summary of performance at the intersection of New England Highway / Barleyfields Road, reflecting the proposed increase in heavy vehicles, is provided in Table 3. For the purposes of evaluation assumptions have been kept consistent with the 2019 assessment, specifically:

– Heavy vehicle origin / destination distribution has been assigned as 50 per cent (north) / 50 per cent (south)

– The proportion of daily heavy vehicles that occur in the AM and PM peak hour, respectively is approximately 10 per cent. For the revised assessment this equates to eight vehicles accessing and eggressing the site.

Results indicate that the change in daily heavy vehicle volumes results in a negligible impact to intersection operation, which remains at the highest level of performance – LoS A. The intersection, which was upgraded to facilitate additional heavy movements as part of the initial development consent, has improved safety outcomes for all road users through the introduction of a channelised right turn bay and left turn deceleration lane.

**Table 3 New England Highway / Barleyfields Road intersection performance**

| Performance metric | Initial assessment (2019) | | Revised assessment (2022) | |
|---|---|---|---|---|
| | AM | PM | AM | PM |
| DoS | 0.156 | 0.185 | 0.156 | 0.185 |
| Delay (seconds) | 11.9 | 13.2 | 12.1 | 13.5 |
| LoS | A | A | A | A |

Source: SCT Consulting 2022

Detailed intersection performance results are provided in **Appendix A**.

## Midblock assessment

A mid-block assessment determines, using a volume to capacity ratio (V/C), the ultimate capacity of a road segment within a one hour period. V/C is a ratio of demand to capacity, whereby a value of 1.0 would represent saturated conditions, or full capacity. A mid-block assessment was completed during the 2019 assessment and indicated a high degree of mid-block capacity was present due to low hourly traffic volumes. Since the previous assessment was completed Barleyfields Road and Big Ridge Road have been upgraded in accordance with the design specifications provided in Table 1 – further increasing their capacity and ability to accommodate a higher volume of traffic within each hour. The proposed marginal increase in hourly heavy vehicle movements, three vehicles, is able to be accommodated within the existing spare capacity. The increase in hourly heavy vehicles was calculated using the same methodology as the 2019 assessment, apportioning the increase in daily heavy vehicles across an 11 hour site operational period, and then calculating the difference in hourly volume.

The impact of an increase in construction heavy vehicles on local road mid-block capacity is superficial. Observing Barleyfields Road, as an example, the daily two-way vehicle movements are forecast to be approximately 1,000 under the proposed increase in heavy vehicles / reduction in light vehicles. This is comprised of 419 two-way local vehicle movements and 580 two-way construction vehicle movements. The hourly capacity of a single lane, in one direction, can reach as high as 1,700 vehicles (Austroads; 2020).

## Cumulative impacts

The New England Solar Farm is within the New England Renewable Energy Zone (REZ). The REZ contains multiple renewable energy projects such as:

– Salisbury Solar Farm (proposed)

– Armidale Battery Energy Storage System (proposed)

– Oxley Solar Farm (proposed)

– Thunderbolt Wind Farm (proposed)

– Thunderbolt Solar Farm (proposed)

– Metz Solar Farm (approved)

Of the above projects Salisbury Solar Farm is the closest to the New England Solar Farm at approximately two kilometres. The status of this project is not certain with SEARs issued for the project in 2019 and no subsequent assessment documentation published since that time. Subsequently, no construction activities currently being undertaken for this project and no cumulative traffic impacts are anticipated to occur because of the proposed modification.

Metz Solar Farm is currently under construction and nearing completion. The Metz Solar Farm site is far enough away to not have a discernible impact on the township of Uralla or the local haulage routes used by New England Solar Farm construction vehicles.

All remaining projects within the New England REZ remain in ‘proposed’ form. Should these projects be constructed, the only road anticipated to experience cumulative impacts under a concurrent construction scenario with the New England Solar Farm is the New England Highway.

Construction vehicles for New England Solar Farm can satisfactorily use local roads to access the site. This has been ensured through intersection and road corridor upgrades undertaken across the haulage route prior to construction commencing. The other projects proposed within the New England REZ are not expected to require access to Barleyfields Road or Big Ridge Road and therefore will not result in cumulative traffic impacts on the local road network.

## Summary

This technical note has focused on the capacity (intersection and mid-block) and safety in design components culminating from an increase in the daily volume of heavy vehicles, associated with the New England Solar Farm, from 56 to 84. Based on the completed assessment any impact associated with the change is negligible, compared to the 2019 assessment, and able to be facilitated by the high standard of road and intersection upgrades ACEN have delivered since development consent was provided in 2020.

The increase in heavy vehicle volume, from a traffic and transport perspective, is considered acceptable in the event that daily construction light vehicles are reduced by 14. The revised permissible daily construction vehicle numbers would be 206 light vehicles and 84 heavy vehicles. This will ensure that the daily vehicle trips, also referred to as annual average daily traffic (AADT), across the construction access route remain within the intended design capacity of 1,000 vehicles.

There are no cumulative construction impacts foreseen for the local community, as part of the proposed modification, within the context of the broader New England REZ.

APPENDIX A

# SIDRA results

# MOVEMENT SUMMARY

## Site: [New England Hwy & Barleyfields Rd_AM_C_56HV]

AM peak: 0700-0800
Site Category: (None)
Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed km/h |
| South: New England Hwy (S) | | | | | | | | | | | | |
| 11 | T1 | 286 | 9.9 | 0.156 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| 12 | R2 | 4 | 50.0 | 0.005 | 10.3 | LOS A | 0.0 | 0.2 | 0.38 | 0.63 | 0.38 | 55.9 |
| Approach | | 291 | 10.5 | 0.156 | 0.2 | NA | 0.0 | 0.2 | 0.01 | 0.01 | 0.01 | 99.4 |
| East: Barleyfields Rd | | | | | | | | | | | | |
| 1 | L2 | 3 | 66.7 | 0.115 | 9.1 | LOS A | 0.4 | 3.2 | 0.55 | 0.80 | 0.55 | 42.4 |
| 3 | R2 | 58 | 5.5 | 0.115 | 11.9 | LOS A | 0.4 | 3.2 | 0.55 | 0.80 | 0.55 | 67.6 |
| Approach | | 61 | 8.6 | 0.115 | 11.7 | LOS A | 0.4 | 3.2 | 0.55 | 0.80 | 0.55 | 66.4 |
| North: New England Hwy (N) | | | | | | | | | | | | |
| 4 | L2 | 74 | 4.3 | 0.041 | 8.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.66 | 0.00 | 75.3 |
| 5 | T1 | 166 | 18.4 | 0.095 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| Approach | | 240 | 14.0 | 0.095 | 2.5 | NA | 0.0 | 0.0 | 0.00 | 0.20 | 0.00 | 92.0 |
| All Vehicles | | 592 | 11.7 | 0.156 | 2.3 | NA | 0.4 | 3.2 | 0.06 | 0.17 | 0.06 | 92.5 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: [New England Hwy & Barleyfields Rd_AM_C_84HV]

AM peak: 0700-0800
Site Category: (None)
Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed km/h |
| South: New England Hwy (S) | | | | | | | | | | | | |
| 11 | T1 | 286 | 9.9 | 0.156 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| 12 | R2 | 6 | 66.7 | 0.008 | 11.0 | LOS A | 0.0 | 0.3 | 0.39 | 0.64 | 0.39 | 53.3 |
| Approach | | 293 | 11.2 | 0.156 | 0.3 | NA | 0.0 | 0.3 | 0.01 | 0.01 | 0.01 | 99.0 |
| East: Barleyfields Rd | | | | | | | | | | | | |
| 1 | L2 | 5 | 80.0 | 0.122 | 9.4 | LOS A | 0.5 | 3.6 | 0.54 | 0.81 | 0.54 | 40.2 |
| 3 | R2 | 59 | 7.1 | 0.122 | 12.1 | LOS A | 0.5 | 3.6 | 0.54 | 0.81 | 0.54 | 66.7 |
| Approach | | 64 | 13.1 | 0.122 | 11.9 | LOS A | 0.5 | 3.6 | 0.54 | 0.81 | 0.54 | 64.6 |
| North: New England Hwy (N) | | | | | | | | | | | | |
| 4 | L2 | 75 | 5.6 | 0.042 | 8.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.66 | 0.00 | 75.1 |
| 5 | T1 | 166 | 18.4 | 0.095 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| Approach | | 241 | 14.4 | 0.095 | 2.5 | NA | 0.0 | 0.0 | 0.00 | 0.20 | 0.00 | 91.9 |
| All Vehicles | | 598 | 12.7 | 0.156 | 2.4 | NA | 0.5 | 3.6 | 0.06 | 0.18 | 0.06 | 91.9 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [New England Hwy & Barleyfields Rd_PM_C_56HV]

PM peak: 1600-1700
Site Category: (None)
Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed km/h |
| South: New England Hwy (S) | | | | | | | | | | | | |
| 11 | T1 | 214 | 8.9 | 0.116 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| 12 | R2 | 3 | 66.7 | 0.005 | 12.4 | LOS A | 0.0 | 0.2 | 0.49 | 0.67 | 0.49 | 51.8 |
| Approach | | 217 | 9.7 | 0.116 | 0.2 | NA | 0.0 | 0.2 | 0.01 | 0.01 | 0.01 | 99.3 |
| East: Barleyfields Rd | | | | | | | | | | | | |
| 1 | L2 | 3 | 66.7 | 0.160 | 10.5 | LOS A | 0.6 | 4.4 | 0.60 | 0.85 | 0.60 | 41.5 |
| 3 | R2 | 72 | 4.4 | 0.160 | 13.2 | LOS A | 0.6 | 4.4 | 0.60 | 0.85 | 0.60 | 66.8 |
| Approach | | 75 | 7.0 | 0.160 | 13.0 | LOS A | 0.6 | 4.4 | 0.60 | 0.85 | 0.60 | 65.8 |
| North: New England Hwy (N) | | | | | | | | | | | | |
| 4 | L2 | 44 | 9.5 | 0.025 | 8.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.66 | 0.00 | 74.7 |
| 5 | T1 | 328 | 15.4 | 0.185 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| Approach | | 373 | 14.7 | 0.185 | 1.0 | NA | 0.0 | 0.0 | 0.00 | 0.08 | 0.00 | 96.7 |
| All Vehicles | | 664 | 12.2 | 0.185 | 2.1 | NA | 0.6 | 4.4 | 0.07 | 0.14 | 0.07 | 93.5 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

## Site: 101 [New England Hwy & Barleyfields Rd_PM_C_84HV]

PM peak: 1600-1700
Site Category: (None)
Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate | Aver. No. Cycles | Average Speed km/h |
| South: New England Hwy (S) | | | | | | | | | | | | |
| 11 | T1 | 214 | 8.9 | 0.116 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| 12 | R2 | 9 | 44.4 | 0.013 | 11.3 | LOS A | 0.0 | 0.5 | 0.48 | 0.69 | 0.48 | 55.3 |
| Approach | | 223 | 10.4 | 0.116 | 0.5 | NA | 0.0 | 0.5 | 0.02 | 0.03 | 0.02 | 98.3 |
| East: Barleyfields Rd | | | | | | | | | | | | |
| 1 | L2 | 5 | 80.0 | 0.169 | 11.0 | LOS A | 0.6 | 4.9 | 0.61 | 0.86 | 0.61 | 39.3 |
| 3 | R2 | 73 | 5.8 | 0.169 | 13.5 | LOS A | 0.6 | 4.9 | 0.61 | 0.86 | 0.61 | 65.9 |
| Approach | | 78 | 10.8 | 0.169 | 13.3 | LOS A | 0.6 | 4.9 | 0.61 | 0.86 | 0.61 | 64.1 |
| North: New England Hwy (N) | | | | | | | | | | | | |
| 4 | L2 | 45 | 11.6 | 0.026 | 8.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.66 | 0.00 | 74.5 |
| 5 | T1 | 328 | 15.4 | 0.185 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| Approach | | 374 | 14.9 | 0.185 | 1.0 | NA | 0.0 | 0.0 | 0.00 | 0.08 | 0.00 | 96.6 |
| All Vehicles | | 675 | 12.9 | 0.185 | 2.3 | NA | 0.6 | 4.9 | 0.08 | 0.15 | 0.08 | 92.7 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# Appendix H
## Preliminary hazard analysis

EMM
creating opportunities

# REPORT

# PRELIMINARY HAZARD ANALYSIS

# MOD 2 - INCREASED BESS CAPACITY

# NEW ENGLAND SOLAR AND BATTERY PROJECT

## EMM CONSULTING PTY LTD

| | |
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| **DOCUMENT NO:** | **21214-RP-002** |
| **REVISION:** | **0** |
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| **Title:**<br>**Report**<br>**Preliminary Hazard Analysis**<br>**Mod 2 - Increased BESS Capacity**<br>**New England Solar and Battery Project** | **QA verified:**<br>K. Shen<br><br>**Date:** 22-Aug-2022 |
|---|---|

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# ABBREVIATIONS

| | |
|---|---|
| AC | Alternating Current |
| APZ | Asset Protection Zone |
| ARPANSA | Australian Radiation Protection and Nuclear Safety Agency |
| AS/NZS | Australian Standard/New Zealand Standard |
| BESS | Battery Energy Storage System |
| BMS | Battery Management System |
| DA | Development Application |
| DC | Direct Current |
| DPE | Department of Planning and Environment |
| DVC | Decisive Voltage Classification |
| EIS | Environmental Impact Statement |
| ELF | Extremely Low Frequency |
| EMF | Electric and Magnetic Fields |
| EMM | EMM Consulting Pty Limited |
| FHA | Final Hazard Analysis |
| FRNSW | Fire and Rescue NSW |
| ha | Hectare |
| HAZID | Hazard Identification |
| HIPAP | Hazardous Industry Planning Advisory Paper |
| HV | High Voltage |
| HVAC | Heating Ventilation Air Conditioning |
| Hz | Hertz |
| ICNIRP | International Commission on Non-Ionizing Radiation Protection |
| IEC | International Electrotechnical Commission |
| IP | Ingress Protection |
| ISO | International Standards Organization |
| km | Kilometres |
| kV | Kilovolt |
| kW | Kilowatt |

| | |
|---|---|
| kWh | Kilowatt hours |
| LEP | Local Environmental Plan |
| LGA | Local Government Area |
| LPG | Liquefied Petroleum Gas |
| LV | Low Voltage |
| MLRA | Multi-level Risk Assessment |
| MV | Medium Voltage |
| MW | Megawatt |
| MWh | Megawatt hours |
| NESF | New England Solar and Battery Project |
| NFPA | National Fire Protection Association |
| NSW | New South Wales |
| O&M | Operations and Maintenance |
| OEM | Original Equipment Manufacturer |
| PCS | Power Conversion System |
| PCU | Power Conversion Unit |
| PHA | Preliminary Hazard Analysis |
| PPE | Personal Protective Equipment |
| PV | Photovoltaic |
| RFS | Rural Fire Safety |
| SEARs | (Planning) Secretary's Environmental Assessment Requirements |
| SEPP | State Environmental Planning Policy |
| SRD | State and Regional Development |
| SSD | State Significant Development |

# TERMINOLOGY

| | |
|---|---|
| Additional substation/ BESS footprint | The two land parcels on which the additional substation or BESS infrastructure is proposed |
| Project related sensitive receptors | Receptors (e.g. dwellings) that are associated with the project, whose owners have a landholder agreement with ACEN Australia |
| Consequence | Outcome or impact of a hazardous incident, including the potential for escalation |
| Development footprint | The area within the project boundary on which infrastructure will be located |
| Modification area | The additional land that is proposed for inclusion in the project boundary and development footprint. It comprises four areas: Area 1, 2, 3 and 4 |
| Non-project related sensitive receptors | Receptors (e.g. dwellings) that are not associated with the project and have no landholder agreement with ACEN Australia |
| Offsite | Areas extending beyond the additional substation/BESS footprint boundary |
| Project | New England Solar and Battery Project |
| Project boundary | The full extent of the involved landholder lots |
| Proposed project boundary | The full extent of the involved landholder lots (including the modification area) |
| Proponent | ACEN Australia |
| Risk | The likelihood of a specified undesired event occurring within a specified period or in specified circumstances. It may be either a frequency (the number of specified events occurring in unit time) or a probability (the probability of a specified event following a prior event), depending on the circumstances |

# 1. INTRODUCTION

## 1.1. Background

ACEN Australia Pty Ltd (ACEN Australia) is the developer of the New England Solar and Battery Project (NESF); a significant grid-connected solar farm and Battery Energy Storage System (BESS) along with associated infrastructure, approximately 6 km east of the Uralla township, about 19 km south of Armidale in the Uralla Shire Local Government Area (LGA) (the project).

The project is a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). The project was approved, subject to conditions, by the NSW Independent Planning Commission in March 2020 (SSD-9255).

ACEN Australia is seeking to modify SSD-9255 to:

- Amend the project boundary and development footprint.
- Increase the project's storage capacity from up to 200 MW (AC) by approximately 1,200 MW (AC) to approximately 1,400 MW (AC).
- Allow for additional land that could be utilised for adding direct current (DC) solar PV capacity, without changing the solar component of the project's total generating capacity of 720 MW (AC).
- Increase the number of over-dimensional vehicle movements during construction, upgrading and decommissioning.
- Increase the number of daily heavy vehicle movements during construction.
- Increase the project's construction hours.

Currently, SSD-9255 has an approval for a BESS with 200 MW/400 MWh capacity (i.e. two-hour energy storage). Due to a shift in Australia's energy market needs, the accelerating pace of coal plant retirements in NSW, continuous improvements in BESS technology and associated capital cost reductions, ACEN Australia is seeking approval to increase the capacity of the onsite BESS. The additional capacity proposed as part of the modification will be 1200 MW/2400 MWh. When approved, the overall BESS capacity for the project will be rated for 1400 MW/2800 MWh. To enable the proposed increased capacity, additional land within the approved development footprint will be utilised to house the BESS infrastructure[1].

ACEN Australia has engaged EMM Consulting Pty Ltd (EMM) to prepare a modification report for the modification application including preparation of required technical assessments for submission to the Department of Planning and Environment (DPE).

[1] The additional lands that form the modification area will predominantly be used to house photovoltaic modules, power conversion units and the medium voltage cable reticulation network. These additional lands will form part of the project boundary and development footprint.

EMM has retained Sherpa Consulting Pty Ltd (Sherpa) to undertake a Preliminary Hazard Analysis (PHA) for the proposed additional BESS storage for input to the amendment report.

## 1.2. Objectives

The overall study objective was to address DPE's 'Hazards and Risks' assessment requirement for the proposed additional BESS storage.

The following assessment requirement was identified from the consultation discussion between EMM and DPE:

> *The Amendment Report must include an update of the 2018 Preliminary Hazard Analysis (PHA), in accordance with the Department's Hazardous Industry Planning Advisory Paper (HIPAP) No. 6, 'Hazard Analysis' and Multi-level Risk Assessment (DoP, 2011). The updated PHA must:*
>
> 1. *Consider the most recent standards and codes such as (and not limited to): NFPA 855, AS 5139, IEC 62897, UL 9540, FM Global DS 5-33, and UL 9540A test reports when establishing separation distances;*
> 2. *Consider the scenarios and findings from the reports on the 2021 Victorian Big Battery fire, including fire propagation to the top-side of adjacent BESS sub-units (containers, modules, etc.);*
> 3. *Demonstrate that the separation distances between BESS to on-site or off-site receptors and the separation distances between BESS sub-units (containers, modules, etc.) prevent fire propagation;*
> 4. *Verify that the areas designated for BESS are sufficient taking into account separation distances between BESS sub-units;*
> 5. *Demonstrate that the fire risks from BESS can comply with the Department's Hazardous Industry Advisory Paper No. 4, 'Risk Criteria for Land Use Safety Planning'; and*
> 6. *An assessment of potential hazards and risks including but not limited to bushfires, land contamination, spontaneous ignition, electromagnetic fields for the proposed grid connection infrastructure against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.*

This report forms an addendum to the 2018 New England Solar Farm Hazards and Risk Assessment report, Ref [1], prepared as part of Environmental Impact Statement (EIS) submission for the project (SSD-9255).

## 1.3. Scope

The scope of the study was limited to the proposed additional BESS storage and interactions with the BESS and facilities approved under SSD-9255. Three indicative BESS housing configurations and layouts were assessed.

## 1.4. Exclusions and limitations

The study exclusions and limitations are summarised in Table 1.1.

**Table 1.1: Exclusions and limitations**

| No. | Item | Exclusions and limitations |
|---|---|---|
| 1 | Indicative BESS layouts | Verification that the areas designated for the BESS would be sufficient for the proposed capacity, taking into account separation distances between BESS sub-units, will be based on the BESS design (e.g. make and model) and housing configuration adopted by ACEN Australia. Three indicative BESS layout drawings reflecting the potential housing configurations were assessed. These are shown in Figure 6.1 to Figure 6.3. |
| 2 | Design elements for the BESS | Design elements for the BESS are subject to change prior to construction. Sherpa noted that the selection of the BESS supplier and layout of the BESS units within the compound will be finalised during detailed design. Detailed design will be conducted upon project approval to allow sufficient flexibility in the selection of technology. This approach will allow for the rapid technology advancements currently being developed in the BESS industry to be accommodated. |
| 3 | Bushfire hazard assessment | A bushfire hazard assessment was excluded from the study scope. EMM considered that the bushfire management and mitigation measures outlined in the project's Environmental Impact Statement (EIS) are sufficient to address the potential bushfire impacts on the additional BESS infrastructure which will be located within the approved development footprint. Risk events associated with bushfire and the relevant controls will be included in the PHA (e.g. fire management plan) to demonstrate that this event has been considered. |
| 4 | Hazards associated with proposed operations | The PHA identified and assessed credible hazards associated with proposed operations of the BESS, and excluded specific hazards relating to construction, commissioning and decommissioning. This approach is assumed to be appropriate for assessment at the Development Application (DA) stage aimed to obtain approval for the modification application. |
| 5 | Construction Safety Study | The PHA does not constitute a Construction Safety Study. Requirement for a Construction Safety Study will be subject to the conditions of consent of the modification application approval. For more information, refer to HIPAP No. 7 *Construction Safety*. |

| No. | Item | Exclusions and limitations |
|---|---|---|
| 6 | Fire Safety Study | This study does not constitute a Fire Safety Study. Requirement for a Fire Safety Study will be subject to the conditions of consent of the modification application approval. For more information, refer to HIPAP No. 2 *Fire Safety Study*. |

# 2. PROJECT DESCRIPTION

## 2.1. Location and project site

The project is located within the Uralla Shire LGA, approximately 6 km east of the Uralla township and 19 km south of Armidale. All vehicles associated with the development must travel to and from the site via the New England Highway, Barleyfields Road, Big Ridge Road and the two site access points off Big Ridge Road. Figure 2.1 shows the project location and the project boundary.

## 2.2. Modification area

The modification area is the additional land that is proposed for inclusion in the project boundary and development footprint. It comprises four areas (areas 1-4 as shown in Figure 2.2) which encompasses an area of 127 ha, all of which is adjacent to existing areas within the approved development footprint. The modification area will predominantly be used to house photovoltaic (PV) modules, power conversion units (PCUs) and the medium voltage cable reticulation network, and may also accommodate operations and maintenance infrastructure and internal roads. The modification area is not considered for the additional BESS and not relevant for assessment in this PHA.

## 2.3. Additional substation/BESS footprint

The additional substation/BESS footprint comprises two areas of land within the approved development footprint on which the additional BESS infrastructure is proposed (i.e. north block and south block). The additional substation/BESS footprint is shown in Figure 2.2.

## 2.4. Surrounding land use

The land in the development footprint is zoned RU1 under the Uralla Local Environmental Plan (LEP) 2012 and is predominantly used for agricultural purposes and farming.

The locations of the project and non-project related sensitive receptors are shown in Figure 2.2. For the PHA, non-project related sensitive receptors are considered as offsite receptors[2]. The closest non-project related sensitive receptor (N1) is located approximately 1.7 km north of the additional substation/BESS footprint boundary.

The nearest township to the project is Uralla, located approximately 6 km west of the development footprint.

[2] Receptors (e.g. dwellings) that are not associated with the project and have no landholder agreement with ACEN Australia.

## Figure 2.1: Project location and development footprint

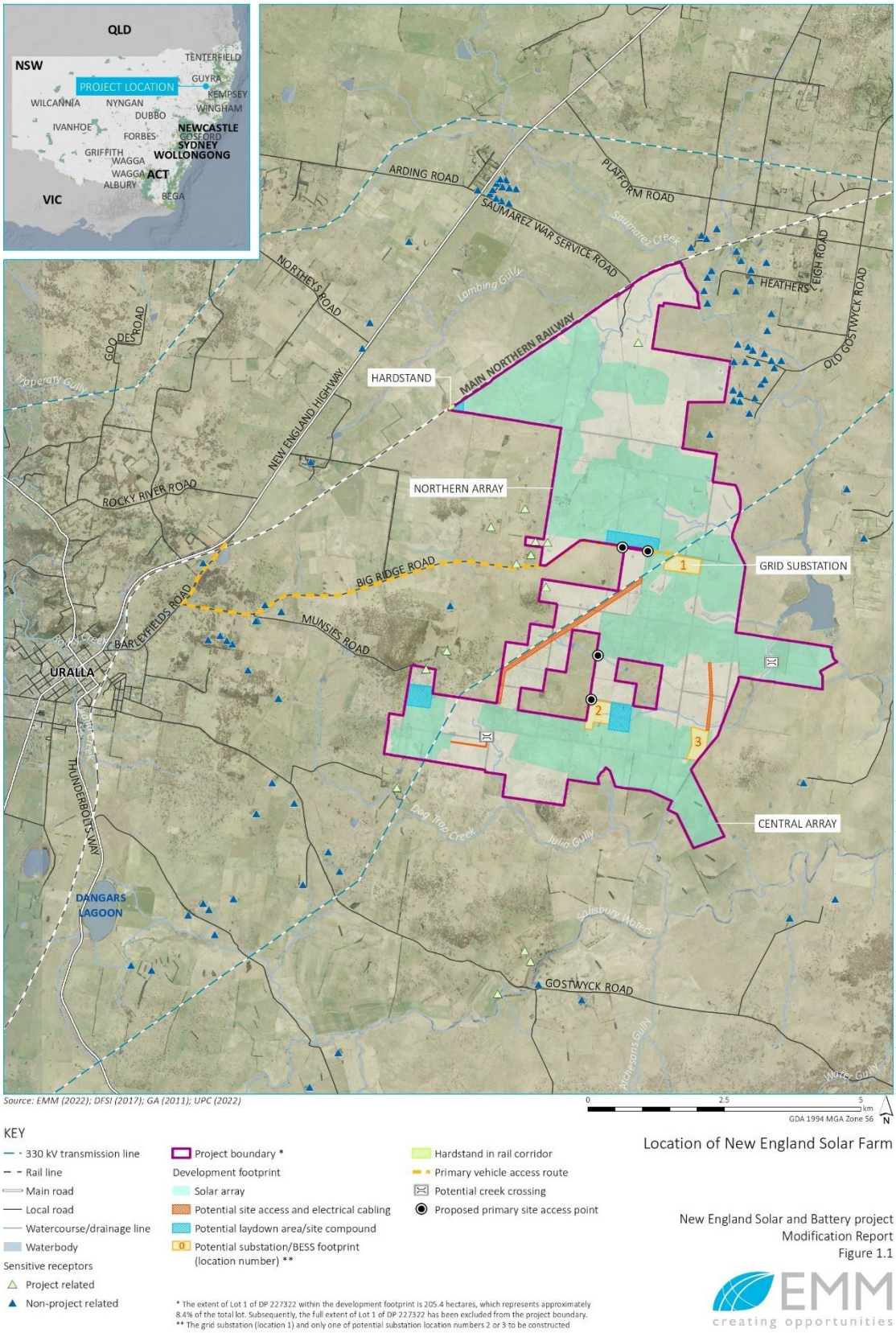
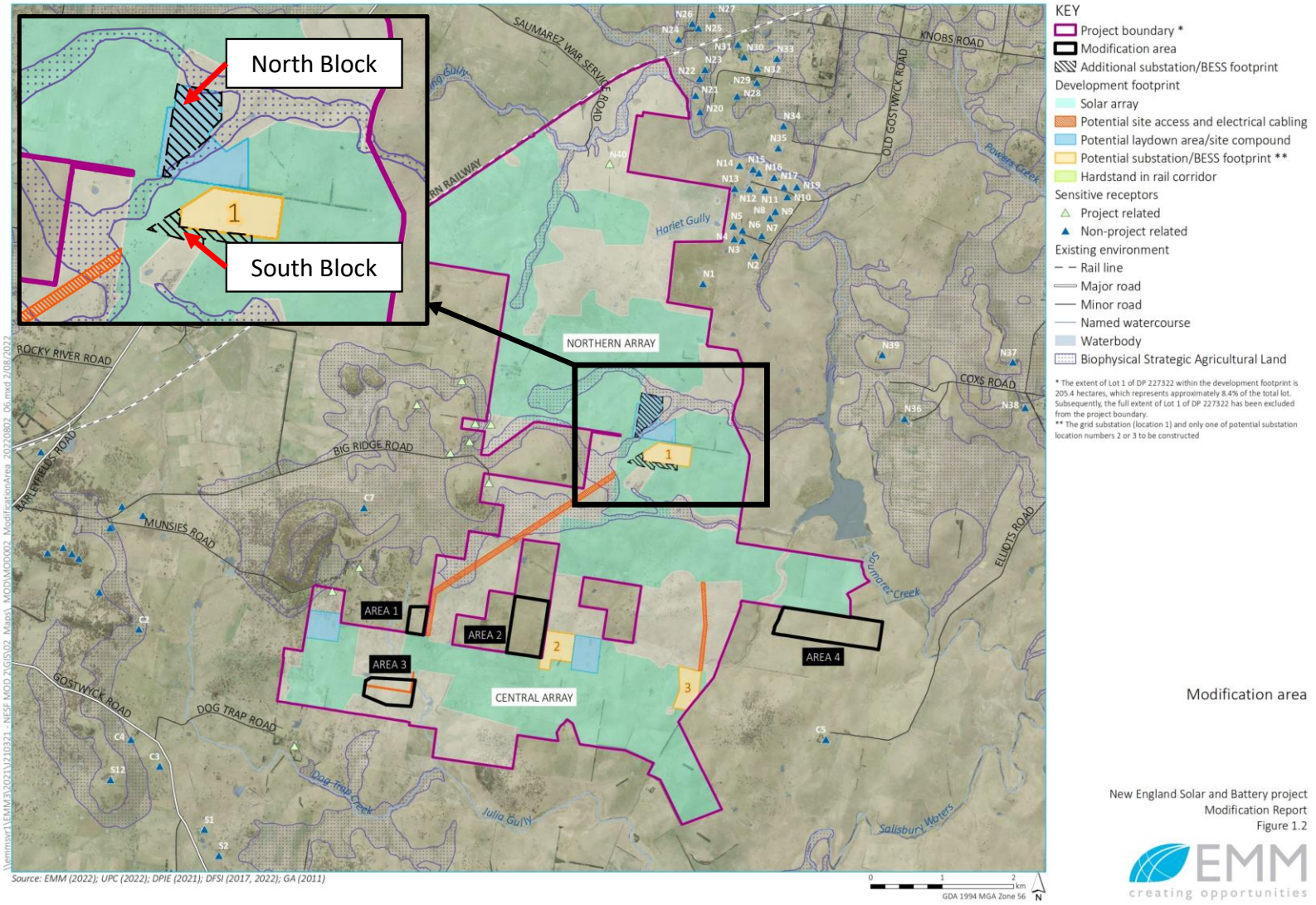


**Figure 2.2: Modification area and additional substation/BESS footprint**



## 2.5. Battery Energy Storage System

The purpose of the BESS will be to provide a dispatchable capability to the project's energy generation profile and support stabilising the supply of electricity to the National Electricity Market. Indicatively, the additional BESS will have a capacity of up to 1200 MW/2400 MWh with up to 25% overbuild to account for losses and degradation and make use of lithium-ion technology.

The additional BESS will be located within the additional substation/BESS footprint (north and south blocks as shown in Figure 2.2). The south block will be located adjacent to the project's existing substation/BESS area. A minimum of 10 m Asset Protection Zone (APZ) will be provided around the additional BESS[3], Ref [2]. The additional BESS will be located within the NESF project area and secured behind the NESF project fencing.

At the time of this study, Sherpa was advised that three different types of enclosures are being considered by ACEN Australia for the battery system. The assessment made in this study was based on the potential use of the following BESS enclosures:

- Containerised
- Outdoor rack
- Indoor rack within a building.

Major components for the proposed BESS and specific features for the battery systems for the various enclosures being considered are provided in Table 2.1, Ref [3].

The selection of the BESS supplier, layout of the BESS units within the compound and amount of overbuild required will be finalised during detailed design. Detailed design will be conducted upon modification approval to allow sufficient flexibility in the selection of technology. The following were assumed for the PHA:

1. The BESS units will be installed in accordance with the manufacturer's instructions provided for best practice for mitigation of fire propagation, including clearance requirements.
2. The BESS units will be installed and meet requirements of the relevant Australian Standards and other codes and standards. For BESS installation in dedicated use buildings, this also includes the National Construction Code requirements.
3. The BESS units will be tested and certified to UL 9540A *Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems*.

[3] For the south block, if the additional BESS will be located next to the existing BESS infrastructure they will be considered as part of the same facility/infrastructure and only one APZ is required.

**Table 2.1: Potential BESS options for the development**

| Component | Containerised | Outdoor rack | Indoor rack within a dedicated building |
|---|---|---|---|
| Description | Modular design where the battery modules are assembled in 40-foot ISO high-cube containers (L 12,190 mm x W 2,440 mm x H 2,990 mm) with externally mounted Heating Ventilation Air Conditioning (HVAC) system. | Modular design where the battery modules are assembled in outdoor-rated battery racks.<br>Each battery rack consists of battery modules, a control box, chiller and fire protection system. The size of each battery rack is approximately: L 1,300 mm x W 1,300 mm x H 2,280 mm. | Modular design where the battery modules are assembled in battery racks.<br>The indoor racks are similar to the outdoor-rated racks but allows for the use of a lower ingress protection (IP) rating.<br>Each battery rack consists of battery modules, a control box, chiller and fire protection system. The size of each battery rack is approximately: L 924 mm x W 1,185 mm x H 2,329 mm. |
| Battery modules | Each container will be rated for 4.6 MW/4.6 MWh (1.0C) or 2.88 MW/5.76 MWh (0.5C).<br><br>Accounting for losses and usable capacity, to achieve the proposed capacity, it is estimated that approximately (in the order of) 513 containers and 513 PCS skids will be installed. The number of units will be confirmed during detailed design. | Each battery rack consists of eight battery modules. Each battery rack is rated for 372.7 kWh.<br><br>Accounting for losses and usable capacity, to achieve the proposed capacity, it is estimated that approximately (in the order of) 8,064 battery racks and 504 PCS skids will be installed. Each PCS skid will feed 16 battery racks via a DC combiner box. The number of units will be confirmed during detailed design. | Each battery rack consists of eight battery modules. Each battery rack is rated for 372.7 kWh.<br><br>Accounting for losses and usable capacity, to achieve the proposed capacity, it is estimated that approximately (in the order of) 8,064 battery racks and 504 PCS skids will be installed. Each PCS skid will feed 16 battery racks via a DC combiner box. The number of units will be confirmed during detailed design. |
| Power Conversion systems (PCS) or inverters | Inverters are electrical devices that convert Direct Current (DC) to Alternating Current (AC) or vice versa (i.e. bi-directional). The inverters will function to convert the current between the battery and grid.<br>A turnkey solution skid (e.g. Power Electronics MV Skid) is considered as a base. It contains a transformer and low voltage distribution panel, the inverter, and a medium voltage switchgear able to be connected in a ring main unit configuration. | | |
| Battery Management System (BMS) | A BMS is the electronic system that monitors and manages the battery system electric and thermal states enabling it to operate within the safe operating region of the battery (e.g. protection against overcurrent, over-charge, over-discharge, overheating, over voltage). The BMS gathers status data from cell, module and rack and exchange information with other components, Ref [4]. | | |
| Thermal management system | Redundant wall-mounted reverse cycle air conditioning (air cooling) HVAC systems will be provided for temperature control. | Each battery rack includes a sealed liquid cooling system (8 kW chiller) using a 50% ethylene glycol aqueous solution as coolant. | Each battery rack includes a sealed liquid cooling system (8 kW chiller) using a 50% ethylene glycol aqueous solution as coolant. |
| Fire protection system | Battery container will be equipped with:<br>• Fire detection systems control panel<br>• Smoke and temperature detectors<br>• Automatic gas fire extinguishing system including fire suppression system (gas agent, gas cylinder, spray pipes, passive gas release and exhaust fans).<br>When a smoke or temperature sensor alarms, fans and alarms will start. If any two sensors alarm simultaneously, fire suppression system will be discharged after 30-seconds delay. Once the fire extinguishing gas agent is released, the internal pressure will increase resulting in the pressure release valve to open to reduce the pressure.<br>Water sprinkler system may also be added (subject to detailed design outcome). | Each battery rack is provided with a built-in fire protection/ suppression system which includes a smoke detector, heat detector and aerosol spray fire extinguishing device. When both smoke and heat detectors are triggered, the aerosol spray will be released. | Each battery rack is provided with a built-in fire protection/ suppression system which includes a smoke detector, heat detector and aerosol spray fire extinguishing device. When both smoke and heat detectors are triggered, the aerosol spray will be released. |

## 2.6. Operations

The BESS will operate 24 hours per day, seven days per week, 365 days per year and is normally manned.

The operational lifespan of the project may be in the order of 30 years, depending on the nature of solar PV technology and energy markets. Should the PV modules be replaced during operations, the lifespan of the project may extend to up to 50 years. During the operations phase, the project will employ a workforce of up to 15 full time employees.

## 2.7. Decommissioning

Once the project reaches the end of its investment and operational life, the project infrastructure will be decommissioned, and the development footprint returned to its pre-existing land use, suitable for farming (cropping and grazing), agricultural uses, or another land use as agreed by the project owner and the landholder at that time.

ACEN Australia will attempt to recycle all dismantled and decommissioned infrastructure and equipment, where possible. Structures and equipment that cannot be recycled will be disposed of at an approved waste management facility.

# 3. METHODOLOGY

## 3.1. Overview

This PHA was carried out in accordance with the requirements of HIPAP No. 6 *Hazard Analysis*, Ref [5], and included the following steps:

1. Establishment of the study context.
2. Identification of hazards resulting from the project operations and events with the potential for offsite impact *(Hazard Identification)*.
3. Analysis of the severity of the consequences for the identified events with offsite impact, e.g. fires and explosions *(Consequence Analysis)*.
4. Determination of the level of analysis and risk assessment criteria.
5. Analysis of the risk of identified events with offsite impact (*Risk Analysis*).
6. Assessment of the estimated risks from identified events against risk criteria to determine acceptability (*Risk Assessment)*.

The PHA assessed events associated with proposed operation of the additional BESS (i.e. excluded construction related events). At the DA stage, the PHA is focused on the risk to surrounding land uses (offsite impacts) and assesses if the development is appropriate for the location. For this modification application, the additional substation/ BESS footprint boundary was used to define and determine offsite impact (i.e. impact extending outside of the additional BESS substation/footprint boundary). In this PHA, offsite impacts were determined based on potential to impact non-project related sensitive receptors. Project related sensitive receptors were not considered as offsite receptors as the associated landowners have an agreement in place with ACEN Australia and consent to the risk exposed by the development and proposed infrastructure.

In addition to the PHA, the 'Hazards and Risks' assessment requirement also requires "an assessment of potential hazards and risks" associated with the additional BESS and its operations. This requirement is addressed by the PHA which is aligned with the risk management process outlined in AS ISO 31000 *Risk Management Guidelines,* Ref [6].

## 3.2. Level of analysis

The *Multi-Level Risk Assessment* guidelines, Ref [7], sets out three levels of risk analysis that may be appropriate for a land use safety planning assessment, as shown in Table 3.1. This guidance document was consulted to determine the level of analysis required for this study. The outcomes of the *Hazard Identification* and *Consequence Analysis* were used to determine the level of analysis appropriate for the PHA.

**Table 3.1: Level of analysis**

| Level | Analysis type | Appropriate/can be justified if |
|---|---|---|
| 1 | Qualitative | There are no potential events with significant offsite consequences and societal risk is negligible. |
| 2 | Partially quantitative | The frequency of occurrence of risk contributors having offsite consequences is low. |
| 3 | Quantitative | There are significant offsite risk contributors, and a Level 2 analysis is unable to demonstrate that the risk criteria will be met. |

## 3.3. Risk assessment criteria

The risk criteria used for assessment followed the guidance provided in HIPAP No. 4 *Risk Criteria for Land Use Safety Planning*, Ref [8], appropriate for the level of analysis determined (based on guidance outlined in Table 3.1).

# 4. HAZARD IDENTIFICATION

## 4.1. Overview

Hazard Identification (HAZID) aims to identify all reasonably foreseeable hazards and associated events that may arise due to the operation of the BESS and defining the relevant controls through a systematic and structured approach.

The HAZID process was completed using the following input:

1. Risk assessment for SSD-9255 BESS completed by Sherpa.
2. Review of AS/NZS 5139:2019 *Electrical installations – Safety of battery systems for use with power conversion equipment*, Ref [9].
3. Literature research of past incidents involving similar BESS systems.
4. Review of the NESF BESS Design Considerations report, Ref [3].
5. Review of a typical battery manufacturer's product brochure, Ref [10], product specifications, Ref [4], and fire safety design, Ref [11], for controls provided.
6. Consultation and feedback from ACEN Australia.

At the time of this study, the specific Safety Data Sheet and/or emergency response guide for the battery systems were not available. The HAZID for the battery system was based on Sherpa's experience for similar BESS facilities, which assumed that the modes of failure of lithium-ion batteries are not dissimilar. This was further supplemented with a review of the AS/NZS 5139 and literature research of past incidents involving similar BESS systems. The HAZID was reviewed by the stakeholders and accepted for the project.

## 4.2. Identified hazard and events

The following factors were considered to identify the hazards:

- Additional BESS component and type of equipment
- Hazardous materials present
- Proposed operation and maintenance activities
- External factors (e.g. unauthorised personal access, lightning storm)
- Interaction with approved BESS and facilities.

The types of hazards and associated events considered were informed from AS/NZS 5139. The identified hazards and events are presented in Table 4.1.

Events with the potential to result in major consequence impacts to people (i.e. injury and/or fatality) were identified. The study excluded hazards related with Occupational Health & Safety, e.g. slips, trips and falls.

**Table 4.1: Identified hazards and events**

| Hazard | Event |
|---|---|
| Electrical | Exposure to voltage |
| Arc flash | Release of energy |
| Fire | Infrastructure fire |
| Chemical | Release of hazardous materials |
| Explosive gas | Generation of explosive gas |
| Reaction | Battery thermal runaway |
| EMF | Exposure to Electric and Magnetic Fields (EMF) |
| External factors | Unauthorised access/trespasser, bushfire, lightning storm, water ingress (rain and flood) |

In this study, bushfire was considered as a cause of fire resulting from encroachment of an offsite bushfire impacting the BESS. Identified controls have been referenced in this study (i.e. asset protection zone requirements, fire management plan), where applicable.

A summary of the hazards present at/applicable to the BESS is provided in Table 4.2.

**Table 4.2: Hazards by project infrastructure**

| | BESS Components | | | |
|---|---|---|---|---|
| **Hazard** | **Battery modules** | **Battery Management System (BMS)** | **Thermal Management System/HVAC** | **Inverters** |
| Electrical | ✓ | ✓ | - | ✓ |
| Energy (arc flash) | ✓ | ✓ | - | ✓ |
| Fire | ✓ | ✓ | ✓ | ✓ |
| Chemical | ✓ | ✓ | ✓ | - |
| Explosive Gas | ✓ | - | ✓ | - |
| Reaction | ✓ | - | - | - |
| EMF | ✓ | ✓ | - | ✓ |
| External factors | ✓ | ✓ | ✓ | ✓ |

## 4.3. Exposure to EMF

The ‘Hazards and Risks’ assessment requirement for the modification application includes requirement to assess potential hazards and risks associated with exposure to EMF against the ICNIRP guidelines. Details on exposure to EMF and assessment against ICNIRP guideline and reference levels are presented in Section 5.

## 4.4. Separation distances to offsite receptors

To inform whether the consequence of a hazardous event has the potential to impact offsite receptors, separation distances from the additional substation/BESS footprint boundary to the nearest non-project related receptors were reviewed. This review is provided in Section 6.

## 4.5. HAZID register

The identified hazards, events, applicable infrastructure and the relationships with causes, consequences and controls are summarised in the HAZID register. Information contained in the register are described in Table 4.3.

The HAZID register is provided in Table 4.4. The findings are as follows:

- A total of 12 hazardous events were identified.
- As the additional BESS will be located close to the additional substation/BESS footprint boundary, some hazardous events with potential for escalated fire may extend beyond the additional substation/BESS footprint boundary (i.e. offsite impact in the context of HIPAP No. 6). However, the consequences from these events are not expected to result in significant offsite impacts (serious injury and/or fatality to the public or offsite population) as:
  - The additional BESS will be situated in a rural area.
  - The closest non-project related sensitive receptor (N1) is located 1.7 km away.

**Table 4.3: Information description – HAZID register**

| Column Heading | Description |
|---|---|
| Hazard | Description of the source of potential harm |
| BESS component | The BESS component(s) the hazard/event is applicable to |
| Event | Description of mechanism by which the hazard potential is realised |
| Cause | Description of the potential ways in which the event could arise |
| Consequence | Description of consequences of the event and potential impact to people |
| Controls | Any existing aspects of the design and operations which prevent and/or mitigate against the event and resulting consequences |
| Other comments | Miscellaneous notes applicable for the line item |
| Significant offsite impact? | Determination of whether the consequence of the event have the potential to result in significant offsite impact (i.e. Yes or No) |

**Table 4.4: HAZID register**

| ID | Hazard | BESS component/ infrastructure | Event | Cause | Consequence | Controls | Other Comments | Significant offsite impact? |
|---|---|---|---|---|---|---|---|---|
| 1 | Electrical | Battery modules<br>BMS<br>Inverters | Exposure to voltage | <u>Short circuit/electrical connection failure</u><br>- Faulty equipment<br>- Incorrect installation<br>- Incorrect maintenance<br>- Human error during maintenance<br>- Safety device/circuit compromised<br>- Battery casing/enclosure damage<br><br><u>Earth potential rise (exposure to step and touch potentials)</u><br>- Electrical faults | - Electrocution<br>- Injury and/or fatality to onsite employees<br>- Injury and/or fatality to member of public due to touch and step potential (e.g. transferred through fences)<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Equipment and systems will be designed and tested to comply with relevant international and/or Australian standards and guidelines.<br>- Decisive Voltage Classification (DVC) followed, and equipment marked accordingly.<br>- Warning signs (electrical hazards, arc flash)<br>- Engagement of reputable contractors<br>- Installation, operations and maintenance by trained personnel (including reputable third party) in accordance with relevant procedures<br>- Independent certifiers/owner's engineers<br>- Electrical switch-in & switch-out protocol<br>- BESS BMS fault detection and safety shut-off<br>- Earthing study (mitigate touch and step potentials)<br>- Earthing as per manufacturer and standards requirements<br>- Site perimeter fence with signage (warning of electrical hazard)<br>- Emergency Response Plan<br>- External firefighting assistance (FRNSW & RFS)<br>- Use of appropriate PPE<br>- Rescue kits (i.e. insulated hooks) | - | No |
| 2 | Energy | Battery modules<br>BMS<br>Inverters | Arc flash | - Incorrect procedure (i.e. installation/ maintenance)<br>- Faulty equipment (e.g. corrosion on conductors)<br>- Faulty design<br>- Human error during maintenance<br>- Insufficient isolation/insulation to applied voltage<br>- Mechanical damage<br>- Vibration | - Arc blasts and resulting heat, may result in fires and pressure waves<br>- Burns<br>- Exposure to intense light and noise<br>- Injury and/or fatality to onsite employees<br><br>Localised effects, the effects are not expected to have an offsite impact. | - Equipment and systems will be designed and tested to comply with relevant international and/or Australian standards and guidelines.<br>- Warning signs (arc flash boundary)<br>- Engagement of reputable contractors<br>- Installation, operations and maintenance by trained personnel (including reputable third party) in accordance with relevant procedures<br>- Independent certifiers/owner's engineers<br>- Site induction and training (i.e. high voltage areas)<br>- Maintenance procedure (e.g. deenergize equipment)<br>- Preventative maintenance (insulation)<br>- Emergency Response Plan<br>- External firefighting assistance (FRNSW & RFS)<br>- Use of appropriate PPE for flash hazard within the arc flash boundary. Conductive items not worn while working on or near energised or live conductive parts (e.g. rings, jewellery) | Arc flash is an electrical explosion or discharge, which occurs between electrified conductors during a fault or short circuit condition, Ref [9].<br><br>Arc flash occurs when electrical current passes through the air between electrified conductors when there is insufficient isolation or insulation to withstand the applied voltage.<br><br>Arc flash may result in rapid rise in temperature and pressure in the air between electrical conductors, causing an explosion known as an arc blast. | No |

| ID | Hazard | BESS component/ infrastructure | Event | Cause | Consequence | Controls | Other Comments | Significant offsite impact? |
|---|---|---|---|---|---|---|---|---|
| 3 | Fire | Battery modules<br>BMS<br>HVAC<br>Inverters | BESS fire | - Faulty equipment<br>- Arc flash<br>- Damage or failure of battery case (e.g. overload, insulation breakdown, connection failures)<br>- Battery thermal runaway (e.g. short circuit, overheating, overcharge)<br>- External fire (e.g. substation fire, fire from adjacent infrastructure or existing BESS)<br>- Bushfire | - Release of toxic and/or explosive combustion products<br>- Escalation to the entire BESS<br>- Injury and/or fatality to onsite employees<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Equipment and systems will be designed and tested to comply with relevant international and/or Australian standards (e.g. AS/NZS 5139) and guidelines<br>- Equipment will be procured from reputable supplier<br>- Independent certifiers/owner's engineers<br>- Installation, operations and maintenance by trained personnel (including reputable third party) in accordance with relevant procedures<br>- All relevant Transgrid's requirements for the substation will be met<br>- Electrical switch-in & switch-out protocol at the substation<br>- Circuit breakers provided for the substation<br>- Substation is locked with security fence<br>- To minimise escalation between sub-units or other structures, the BESS configurations will follow the specified clearances required by the manufacturer and/or applicable standards<br>- Preventative maintenance (e.g. insulation, replacement of faulty equipment)<br>- BMS fault detection and shut-off function<br>- BESS fire protection/suppression system (battery system specific features, refer to Table 2.1)<br>- Activation of emergency shutdown<br>- Fire Management Plan<br>- Emergency Response Plan<br>- Inclusion of APZ buffer<br>- External assistance for firefighting (FRNSW & RFS) | - | No |
| 4 | Fire | BESS (overall) | Bushfire | - Encroachment of offsite bushfire<br>- Escalated event due to fire from other project infrastructure | - Escalation to adjacent infrastructure<br>- Injury and/or fatality to onsite employees<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Fire Management Plan<br>- Defendable boundary for firefighting will be established<br>- Emergency Response Plan<br>- External assistance for firefighting (FRNSW & RFS)<br>- Inclusion of APZ buffer<br>- Use of appropriate PPE | - | No |

| ID | Hazard | BESS component/ infrastructure | Event | Cause | Consequence | Controls | Other Comments | Significant offsite impact? |
|---|---|---|---|---|---|---|---|---|
| 5 | Chemical | Battery modules<br>BMS<br>HVAC | Release of battery electrolyte (liquid/vented gas) from the battery cell | <u>Mechanical failure/damage</u><br>- Dropped impact (installation/maintenance)<br>- Damage (crush/penetration/puncture)<br><br><u>Abnormal heating/elevated temperature</u><br>- Thermal runaway<br>- Bushfire<br>- External fire (e.g. fire from adjacent infrastructure) | - Release of flammable liquid electrolyte<br>- Vapourisation of liquid electrolyte<br>- Release of vented gas from cells<br>- Fire and/or explosion in battery enclosure<br>- Release of toxic combustion products<br>- Injury and/or fatality to onsite employees<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Equipment and systems will be designed and tested to comply with relevant international and/or Australian standards (e.g. AS/NZS 5139) and guidelines<br>- Equipment will be procured from reputable supplier<br>- Independent certifiers/owner's engineers<br>- Installation, operations and maintenance by trained personnel (including reputable third party) in accordance with relevant procedures<br>- To minimise escalation between sub-units or other structures, the BESS configurations will follow the specified clearances required by the manufacturer and/or applicable standards<br>- Venting and containment requirements of the BESS manufacturer to be followed<br>- Spill cleanup using dry absorbent material<br>- BESS BMS fault detection and shut-off function<br>- BESS fire protection/suppression system (battery system specific features, refer to Table 2.1)<br>- Activation of emergency shutdown<br>- Fire Management Plan<br>- Emergency Response Plan<br>- Inclusion of APZ buffer<br>- External assistance for firefighting (FRNSW & RFS) | Vented gases are early indicator of a thermal runaway reaction | No |
| 6 | Chemical | Battery modules<br>BMS<br>HVAC | BESS chiller unit or coolant leak | - Mechanical failure/damage<br>- Incorrect maintenance | - Irritation/injury to onsite employee on exposure to leak (e.g. inhalation and skin contact)<br>- Ingress of coolant to battery or other electrical components (battery enclosure) leading to short circuit and fire, resulting in injury and/or fatality to onsite employees.<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Equipment and systems will be designed and tested to comply with relevant international and/or Australian standards (e.g. AS/NZS 5139) and guidelines<br>- Equipment will be procured from reputable supplier<br>- Independent certifiers/owner's engineers<br>- Installation, operations and maintenance by trained personnel (including reputable third party) in accordance with relevant procedures<br>- To minimise escalation between sub-units or other structures, the BESS configurations will follow the specified clearances required by the manufacturer and/or applicable standards<br>- Battery cells are enclosed with external casing<br>- Spill cleanup using dry absorbent material<br>- BESS BMS fault detection and shut-off function<br>- BESS fire protection/suppression system (battery system specific features, refer to Table 2.1)<br>- Activation of emergency shutdown<br>- Fire Management Plan<br>- Emergency Response Plan<br>- Inclusion of APZ buffer<br>- External assistance for firefighting (FRNSW & RFS) | [Containerised BESS]: Wall or roof mounted reverse cycle HVAC unit with enclosed refrigerant, e.g. R407C or equivalent to Australian Standards<br><br>[Outdoor/Indoor Rack]: Coolant is 50% ethylene glycol aqueous solution, or equivalent to Australian Standards | No[4] |

[4] The Victorian Big Battery fire (30-Jul-21) was caused by a short circuit (a coolant leak from the cooling system leading to a fire in an electronic component) and subsequent overheating (thermal runaway). The fire involved 2 battery packs and was locally confined to the area. Energy Safe Victoria reported that the battery was offline and the monitoring and protection systems not being available, allowed the initial fault to go undetected.

| ID | Hazard | BESS component/ infrastructure | Event | Cause | Consequence | Controls | Other Comments | Significant offsite impact? |
|---|---|---|---|---|---|---|---|---|
| 7 | Explosive Gas | Battery modules | Generation of explosive gas<br><br>Note: also refer to above item (release of vented gas) | - Thermal runaway<br>- Bushfire<br>- External fire (e.g. fire from adjacent infrastructure) | - Fire and/or explosion in battery enclosure<br>- Release of toxic combustion products<br>- Injury and/or fatality to onsite employees<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Equipment and systems will be designed and tested to comply with the relevant international and Australian standards (e.g. AS/NZS 5139) and guidelines<br>- Equipment will be procured from reputable supplier<br>- Independent certifiers/owner's engineers<br>- Installation, operations and maintenance by trained personnel (including reputable third party) in accordance with relevant procedures<br>- To minimise escalation between sub-units or other structures, the BESS configurations will follow the specified clearances required by the manufacturer and/or applicable standards<br>- Ventilation requirements as per manufacturer's instruction<br>- BESS BMS fault detection and shut-off function<br>- BESS fire protection/suppression system (battery system specific features, refer to Table 2.1)<br>- Activation of emergency shutdown<br>- Fire Management Plan<br>- Emergency Response Plan<br>- Inclusion of APZ buffer<br>- External assistance for firefighting (FRNSW & RFS) | - | No |
| 8 | Reaction | Battery modules | Thermal runaway in battery | Elevated temperature<br>- Bushfire<br>- External fire (e.g. fire from adjacent infrastructure)<br>Electrical failure<br>- Short circuit<br>- Excessive current/voltage<br>- Imbalance charge across cells<br>Mechanical failure<br>- Internal cell defect<br>- Damage (crush/penetration/puncture)<br>Systems failure<br>- BMS failure<br>- Venting failure | - Fire in the battery cell and enclosure<br>- Escalation to the entire BESS<br>- Injury and/or fatality to onsite employees<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Equipment and systems will be designed and tested to comply with relevant international and/or Australian standards and guidelines.<br>- Equipment will be procured from reputable supplier<br>- Independent certifiers/owner's engineers<br>- Installation, operations and maintenance by trained personnel (including reputable third party) in accordance with relevant procedures<br>- To minimise escalation between sub-units or other structures, the BESS configurations will follow the specified clearances required by the manufacturer and/or applicable standards<br>- BESS BMS temperature monitoring, fault detection and shut-off function<br>- Cell chemistry selection (minimise runaway)<br>- BESS BMS fault detection and shut-off function<br>- BESS fire protection/suppression system (battery system specific features, refer to Table 2.1)<br>- Activation of emergency shutdown<br>- Fire Management Plan<br>- Emergency Response Plan<br>- Inclusion of APZ buffer<br>- External assistance for firefighting (FRNSW & RFS) | Thermal runaway refers to a cycle in which excessive heat, initiated from inside/outside the battery cell, keeps generating more heat. Chemical reactions inside the cell in turn generate additional heat until there are no reactive agents left in the cell and eventually lead to destruction of the battery. | No |

| ID | Hazard | BESS component/ infrastructure | Event | Cause | Consequence | Controls | Other Comments | Significant offsite impact? |
|---|---|---|---|---|---|---|---|---|
| 9 | EMF | BESS (overall) | Exposure to electric and magnetic fields | Operations of energy storage system and associated equipment | - High level exposure (i.e. exceeding the reference limits) may affect function of the nervous system (i.e. direct stimulation of nerve and muscle tissue and the induction of retinal phosphenes)<br>- Injury to onsite employees<br><br>EMF created from the project will not exceed the ICNIRP reference level for exposure to the general public. Additionally, the strengths of electric and magnetic fields attenuate rapidly away from the source. Impact to the general public in surrounding land uses will be negligible (refer to Section 5). | - Location siting and selection (i.e. separation distance to sensitive receptors)<br>- Optimising equipment layout and orientation<br>- Reducing conductor spacing<br>- Balancing phases and minimising residual current<br>- Incidental shielding (i.e. BESS enclosure)<br>- Equipment and systems will be designed and tested to comply with relevant international and/or Australian standards and guidelines.<br>- Exposure to personnel is short duration in nature (transient)<br>- Warning signs<br>- Studies found that the EMF for commercial power generation facilities comply with ICNIRP occupational exposure limits | Adverse health effects from EMF have not been established based on findings of science reviews conducted by credible authorities, Ref [12].<br><br>No established evidence that Extremely Low Frequency (ELF) EMF is associated with long term health effects (ARPANSA), Ref [13]. | No |
| 10 | External factors | BESS (overall) | Water ingress | - Rain<br>- Flood | - Electrical fault/short circuit<br>- Fire<br>- Injury and/or fatality to onsite employees<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Location siting (i.e. outside of flood prone area)<br>- BESS will be housed in dedicated enclosure which will be constructed in accordance with relevant standards<br>- Outdoor rack BESS enclosure will be IP rated for water ingress protection<br>- Substation and switchroom will be housed in a dedicated building and constructed in accordance to relevant standards<br>- Drainage system<br>- Preventative maintenance (check for leaks)<br>- To minimise escalation between sub-units or other structures, the BESS configurations will follow the specified clearances required by the manufacturer and/or applicable standards<br>- BESS BMS fault detection and shut-off function<br>- BESS fire protection/suppression system (battery system specific features, refer to Table 2.1)<br>- Activation of emergency shutdown<br>- Fire Management Plan<br>- Emergency Response Plan<br>- Inclusion of APZ buffer<br>- External assistance for firefighting (FRNSW & RFS) | - | No |

| ID | Hazard | BESS component/ infrastructure | Event | Cause | Consequence | Controls | Other Comments | Significant offsite impact? |
|---|---|---|---|---|---|---|---|---|
| 11 | External factors | BESS (overall) | Vandalism | Unauthorised personnel access<br>Trespassing<br>Deliberate damage to BESS infrastructure | - Asset damage<br>- Equipment failure<br>- Fire<br>- Potential hazard to unauthorised person/ trespasser and injury (e.g. electrocution)<br><br>Effects to unauthorised person are expected to be localised and not expected to have an offsite impact. The impact is to a member of public but occurs onsite.<br><br>For a fire event, the effects are not expected to have an offsite impact as the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor. | - The BESS will be located in a rural location<br>- The BESS will be located in the NESF project area and secured behind the NESF project fencing<br>- Warning signs (i.e. trespassers and onsite hazards)<br>- Security cameras will be provided at the BESS area (or in vicinity)<br>- Onsite security protocol<br>- Presence of staff during operational hours | - | No |
| 12 | External factors | BESS (overall) | Lightning strike | Lightning storm | - Fire<br>- Injury and/or fatality to onsite employees<br><br>As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | - Earthing<br>- Lightning protection mast<br>- Activation of emergency shutdown<br>- Fire Management Plan<br>- Emergency Response Plan<br>- Inclusion of APZ buffer<br>- External assistance for firefighting (FRNSW & RFS) | - | No |

# 5. ELECTRIC AND MAGNETIC FIELDS

## 5.1. Overview

EMF are naturally present in the environment. They are present in the earth's atmosphere as electric fields, while static magnetic fields are created by the earth's core. EMF are also produced wherever electricity or electrical equipment is in use (e.g. household appliances, powerlines), Ref [12].

Electric fields are created where there is flow of electricity. Electric fields are related to and directly proportional to voltage (i.e. higher the voltage higher the electric field). Electric fields are often described in terms of their strength and commonly expressed in volts per metre (V/m) or kilovolts per metre (kV/m).

Magnetic fields are created whenever electric current flows. Magnetic fields are directly proportional to the current (i.e. higher the current higher the magnetic field). Magnetic fields are often described in terms of their flux density and commonly measured in either Tesla (T) or Gauss (G).

Electric and magnetic fields are strongest closest to source and their strength attenuates rapidly away from the source. The strength of electric fields is weakened due to shielding effect from common materials (i.e. buildings, walls), whereas magnetic fields are not.

Use of electricity means that people are exposed to EMF as part of daily life. The background electric and magnetic fields in a typical home is around 20 V/m and 0.1 µT, respectively. These may vary depending on the number and type of appliances, configuration and positioning and distances to the other sources (e.g. powerlines). Typical EMF strengths for common household electrical appliances (at distance of 30 cm) are shown in Table 5.1, Ref [14].

EMF associated with the generation, distribution and use of electricity power systems in Australia which have a frequency of 50 Hertz (Hz) are classified by Energy Networks Australia[5] as Extremely Low Frequency[6] (ELF) EMF, Ref [12].

**Table 5.1: Typical EMF strengths for household appliances**

| Electric appliance | Electric field strength (V/m) | Magnetic field density (µT) |
|---|---|---|
| Refrigerator | 120 | 0.01 – 0.25 |
| Iron | 120 | 0.12 – 0.3 |
| Hair dryer | 80 | 0.01 – 7 |
| Television | 60 | 0.04 – 2 |
| Vacuum cleaner | 50 | 2 – 20 |
| Electric oven | 8 | 0.15 – 0.5 |

[5] Energy Networks Association is the peak national body representing gas distribution and electricity transmission and distribution businesses throughout Australia.
[6] ELF EMF occupy the lower part of the electromagnetic spectrum in the frequency range 0-3000 Hz.

## 5.2. Effects of exposure to EMF

### 5.2.1. Acute effect

Studies have been conducted to determine the effects of EMF exposure. There have been a number of well-established acute effects on the nervous system due to exposure to high levels of EMF. These include direct stimulation of the nerve and muscle tissue, and induction of retinal phosphene (i.e. sensation of ring or spot of light on eye ball). However, it should be noted that exposure to high levels of EMF is not normally found in everyday environment from electrical sources. There is also indirect scientific evidence that EMF can transiently affect visual processing and motor coordination. For certain occupational instances, the ICNIRP considered that with appropriate training, it is reasonable for workers to voluntarily experience transient effects such as retinal phosphene and minor changes in brain function since these are not believed to result in long term or pathological health effects, Ref [15].

### 5.2.2. Chronic effect

Numerous studies have been conducted to understand the effects of long-term exposure to EMF. Some studies have linked prolonged exposure of EMF to increased rates of childhood leukemia. Based largely on limited evidence, the International Agency for Research on Cancer has classified ELF magnetic fields as 'possibly carcinogenic to humans'. The ICNIRP views that the current existing scientific evidence is too weak to ascertain a causal relationship that prolonged exposure to ELF magnetic fields is related with increased risk of childhood leukemia, Ref [15].

### 5.2.3. Advice from public authority

Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) is a federal government agency assigned with the responsibility for protecting the health and safety of people and the environment from EMF, Ref [12].

ARPANSA advises that:

- *"The scientific evidence does not establish that exposure to ELF EMF found around the home, the office or near powerlines and other electrical sources is a hazard to human health."*
- *"There is no established evidence that ELF EMF is associated with long term health effects. There is some epidemiological research indicating an association between prolonged exposure to higher-than-normal ELF magnetic fields (which can be associated with residential proximity to transmission lines or other electrical supply infrastructure, or by unusual domestic electrical wiring), and increased rates of childhood leukaemia. However, the epidemiological evidence is weakened by various methodological problems such as potential selection bias and confounding. Furthermore this association is not supported by laboratory or animal studies and no credible theoretical mechanism has been proposed."*

## 5.3. Study approach

Although the adverse health impacts have not been established, the possibility of impact due to exposure to EMF cannot be ruled out. As part of a precautionary approach, the study will assess the typical exposure levels to EMF for the proposed project infrastructure.

A task group assembled by the World Health Organisation to assess any potential health risks from exposure to ELF EMF in the frequency range of 0 to 100,000 Hz found that there are no substantive health issues related to ELF electric fields at levels generally encountered by the general public, Ref [16]. Therefore, the information presented in the following sections address predominantly the effects of exposure to ELF magnetic fields.

## 5.4. Guidelines for limiting EMF exposure

The ICNIRP has produced a publication to establish guidelines for limiting EMF exposure to assist in providing protection against adverse health effects. Separate guidance is given for general public and occupational exposure within the guideline.

The guideline has defined general public and occupational exposures as follows:

- General public – individuals of all ages and of varying health status which might increase the variability of the individual susceptibilities.
- Occupational exposure – adults exposed to time-varying EMF from 1 Hz to 10 MHz at their workplaces, generally under known conditions, and as a result of performing their regular or assigned job.

The ICNIRP reference levels for exposure to EMF at 50 Hz is presented in Table 5.2, Ref [15]. The guideline adopted more stringent exposure restrictions compared to occupational exposures recognising that in many cases general public are unaware of their exposure to EMF.

**Table 5.2: Reference levels for EMF levels at 50 Hz**

| Exposure | ICNIRP Reference Levels | |
|---|---|---|
| | Electric field (V/m) | Magnetic field (μT) |
| General public | 5,000 | 200 |
| Occupational | 10,000 | 1,000 |

## 5.5. BESS and grid connection infrastructure EMF

### 5.5.1. BESS

The magnetic field associated with a BESS will vary depending on a number of factors including configuration, capacity and type of housing. Due to the limited information on typical measurement of magnetic fields around BESS associated with large scale solar energy generating facilities, the study has assumed the typical magnetic field is not too dissimilar with that of a substation. The study also assumed that the BESS will be

designed in accordance with electrical safety standards and codes which will result in exclusion of general public exposures from these sources.

### 5.5.2. Substation and grid connection

Main sources of magnetic fields within a large substation (e.g. transmission substation) include transformer secondary terminations, cable runs to the switch room, capacitors, reactors, bus-bars, and incoming and outgoing feeders. For the majority of the cases, the highest magnetic fields at the boundary come from the incoming and outgoing transmission lines.

Generally, the application of electrical safety standards and codes (e.g. fence, enclosure, distance) will result in exclusion of general public exposures from these sources. This is consistent with the measurement of typical magnetic field reported which ranges between 1-8 µT at substation fence, Ref [13].

### 5.5.3. Transmission lines

The magnetic field from transmission lines will vary with configuration, phasing and load. The typical magnetic fields near overhead transmission lines measured at one metre above ground level range between 1-20 µT (directly underneath) and 0.2-5 µT (at the edge of easement), Ref [13].

## 5.6. Controls to limit exposure to EMF

The following controls were identified to limit exposure to EMF:

- The design, selection and procurement of electrical equipment for the project will comply with relevant international and Australian standards.
- Location selection for the project infrastructure (i.e. accounts for separation distance to surrounding land uses including neighbouring properties and agricultural operations) and fencing within the project boundary will assist to limit the exposure to EMF for the general public.
- Exposure to EMF (specifically magnetic fields) from electrical equipment will be localised and the strength of the field attenuates rapidly with distance.
- Duration of exposure to EMF for personnel onsite will be transient.

## 5.7. Conclusion

Based on the review completed in the preceding sections, the study concludes that:

- EMF created from the project will not exceed the ICNIRP occupational exposure reference level.
- As the strengths of EMF attenuate rapidly with distance, the study determined that the ICNIRP reference level for exposure to the general public will not be exceeded and impact to the general public in surrounding land uses will be negligible.

- For the risk assessment, consequence from exposure to EMF was assumed to result in no or minor injury (‘Insignificant’) in reference to the consequence impact rating shown in Table 8.2.

# 6. BESS SEPARATION DISTANCES

## 6.1. Overview

To address DPE's 'Hazards and Risks' assessment requirement, the PHA for this project also includes requirement to '*consider all recent standards and codes'* and *'demonstrate that the separation distances between the BESS to onsite or offsite receptors and the separation distances between BESS sub-units prevent fire propagation'*.

Specifically, the proponent must demonstrate that the proposed additional BESS capacity would be able to fit within the land area designated for the additional BESS accounting for separation distances between the:

- BESS sub-units (racks, modules, enclosures, etc.), to ensure that a fire from a sub-unit do not propagate to neighbouring sub-units; and
- The overall BESS and other onsite or offsite receptors.

This section covers the following:

1. Review of separation distances/clearances provided between the BESS sub-units against applicable codes and standards.
2. Verification that the required land area for the proposed BESS capacity would fit within the land area designated for the BESS.
3. Review of separation distances between the BESS and onsite and offsite receptors including the approved BESS and associated equipment.

## 6.2. Separation distances between BESS sub-units

A review of NFPA 855 *Standard for the Installation of Stationary Energy Storage Systems*, Ref [17], was undertaken by Entura as part of the NESF BESS Design Considerations study, Ref [3]. This included a review to determine the required separation distances between (1) the BESS units and (2) the BESS and other infrastructure.

Clause 4.6 of NFPA 855 sets the default maximum allowable energy storage unit at 50 kWh and minimum separation of 914 mm for units that are contained in (1) non-dedicated buildings, or (2) outdoor installation near exposures. However, NFPA 855 also specifies that BESS can be installed in larger energy groups and smaller separation if they meet the large-scale fire testing requirements set by UL 9540A *Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems*, or equivalent test standard[7]. As such, the result of the UL 9540A test (performed with clearances as specified by the BESS manufacturer) results form a key parameter to determine clearances.

[7] Clause 4.1.5 of NFPA 855 (Large-scale fire test).

The following clearances for the BESS components were identified by Entura, Ref [3]:

- Minimum clearances

  These are manufacturer specified minimum clearances between the equipment to prevent thermal propagation during fire or explosion (i.e. basis for UL 9540A test). These were determined from Original Equipment Manufacturer (OEM) specifications from multiple surveyed manufacturers.

- Additional clearances for operability

  These are specified by manufacturer or based on AS 3000:2018 *Wiring Rules* and AS 2067:2016 *Substations and high voltage installations exceeding 1 kV a.c* as a guide to operability requirements.

The clearances for the BESS components are shown in Table 6.1. These clearances form an input to the concept layouts produced for the project.

The conceptual BESS layouts for all three enclosure options, Ref [3], showing the separation distances are shown in:

- Figure 6.1 – Containerised
- Figure 6.2 – Outdoor racks
- Figure 6.3 – Indoor racks within a building.

**Table 6.1: Summary of clearances for BESS[8]**

| Source | Target | Clearance (Safety) | Clearance (Recommended operability) | Comment | Reference |
|---|---|---|---|---|---|
| Battery rack | Other battery racks<br>Non-combustible surfaces | 0.1-0.15 m (indoor or outdoor) | 1.0 m (indoor)<br>1.5 m (outdoor) | Operability clearance relevant to front cabinet door. | • OEM specifications from two surveyed manufacturers.<br>• AS 3000:2018 accessibility requirement. |
| Battery container | Other battery racks<br>Non-combustible surfaces | 0.1-0.15 m | 1.9 m | Operability clearance includes door (1300 mm) and access (600 mm). Access may be shared with adjacent containers. | • OEM specifications from two surveyed manufacturers.<br>• AS 3000:2018 accessibility requirement. |
| Integrated Power Conversion Unit | Any other equipment | 2 m | 2-4 m | - | • OEM specifications from three surveyed manufacturers. |
| Inverter or switchgear | Any other equipment | 2 m | 2-4 m | - | • OEM specifications from three surveyed manufacturers. |
| Transformer | Non-combustible equipment, including other transformers or fire-resistant building materials | 1 m | - | - | • AS 2067:2016. |
| Transformer | Combustible surfaces | 6 m | - | - | • AS 2067:2016. |
| All equipment | Perimeter fence | 10 m | 10 m | APZ (perimeter)<br>Allows semi-trailer turning with minimal clearance.<br>May include clearance required for adjacent equipment. | • Victorian Rural Fire Service (2022) Design Guidelines and Model Requirements for Renewable Energy Facilities.<br>• Austroads turning templates. |
| Internal roads | All other equipment | N/A | 10-16m | May include clearance required for adjacent equipment. | • Entura experience.<br>• Austroads turning templates. |

[8] Reproduced from Table 3.2 of the NESF BESS Design Considerations report, Ref [3].

**Figure 6.1: Concept BESS layout – Containerised**

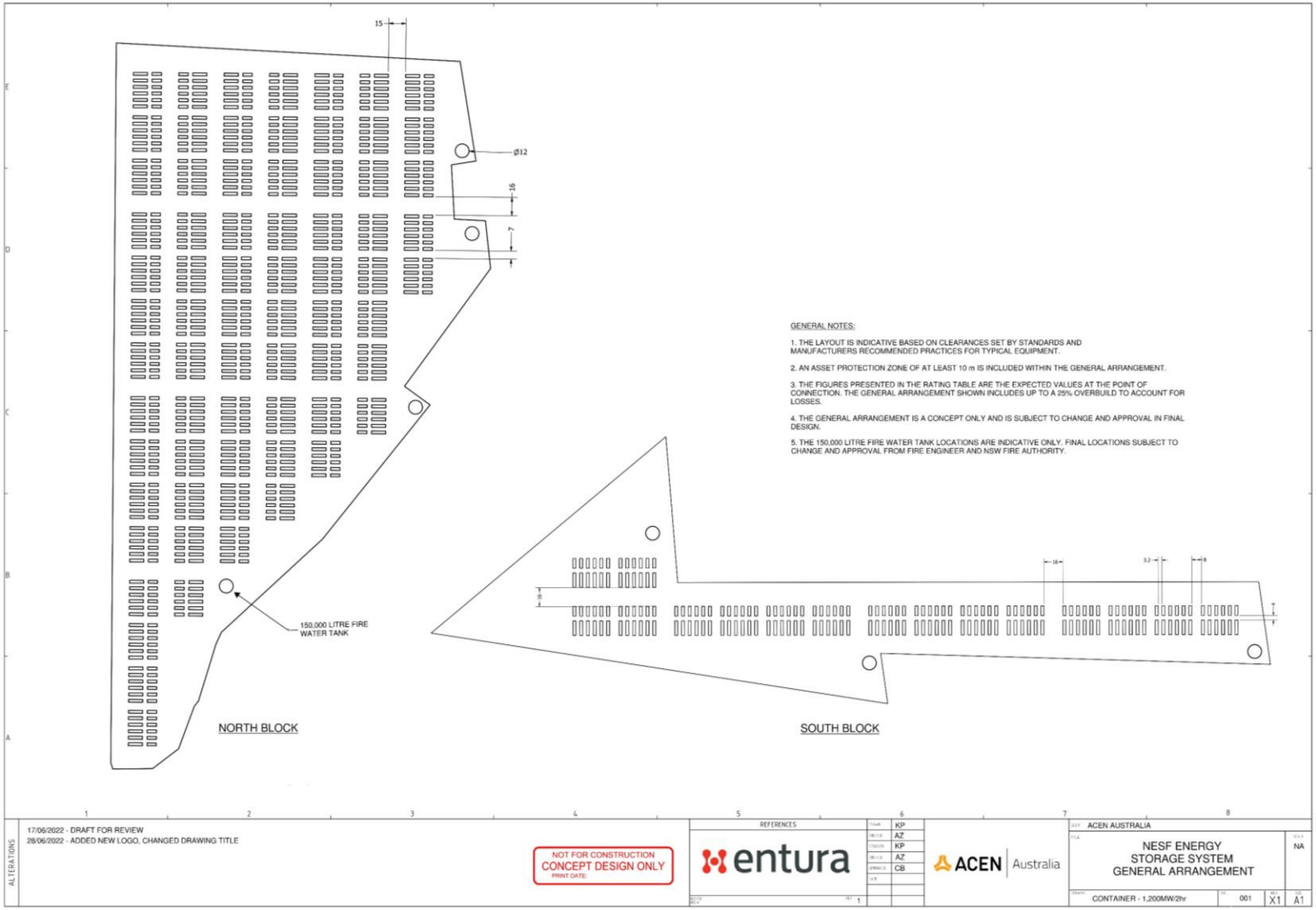


**Figure 6.2: Concept BESS layout – Outdoor racks**

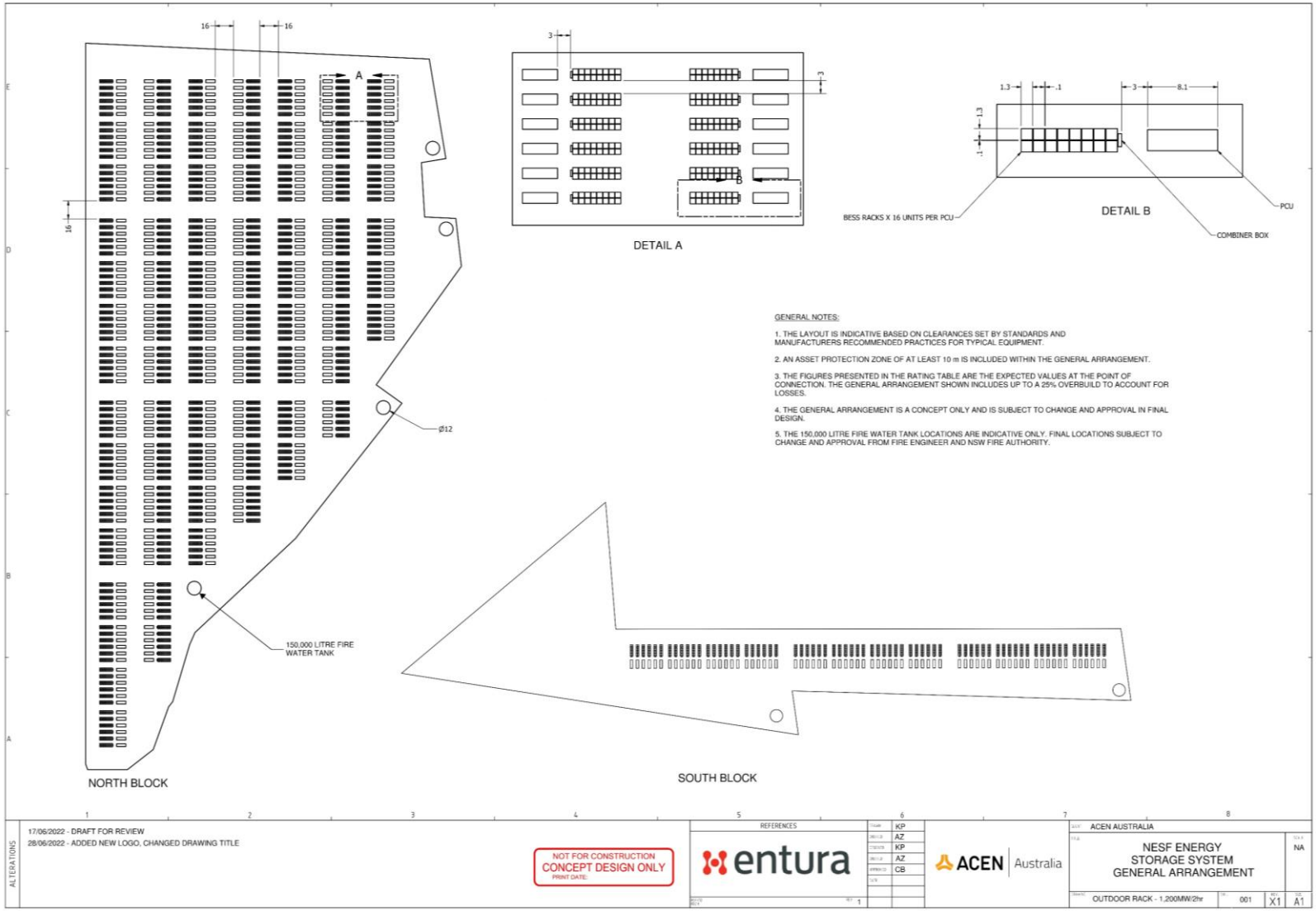
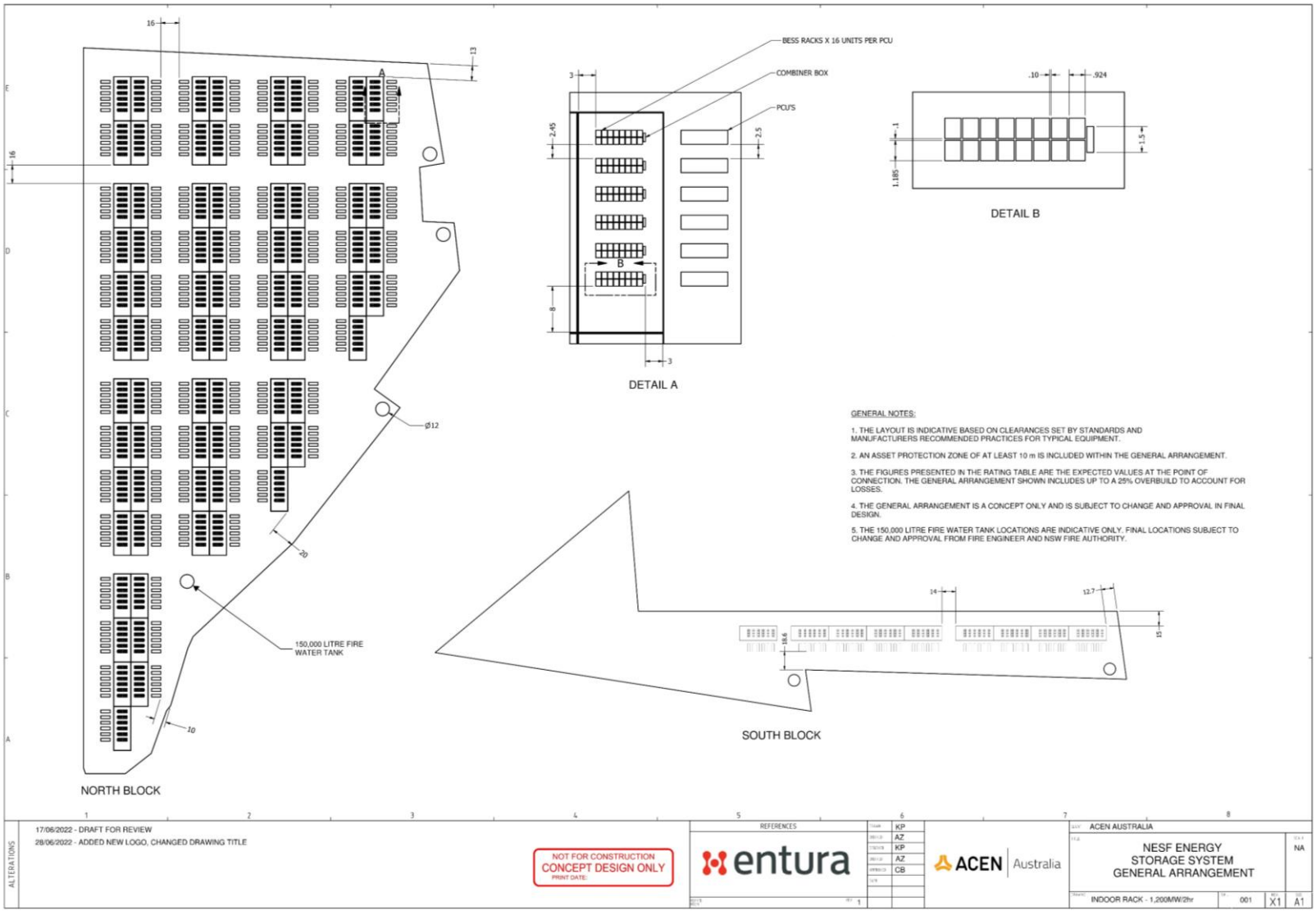


**Figure 6.3: Concept BESS layout – Indoor racks within building**



## 6.3. Land area designated for the additional BESS

The additional BESS will be fitted within the additional substation/BESS footprint, which includes the north block (22 ha) and the south block (6 ha), as shown in Figure 2.2.

The designated land area is sufficient to accommodate the proposed additional BESS units for all three enclosure options as shown in Figure 6.1 to Figure 6.3, which accounts for the required separation distances between the BESS sub-units and also a minimum of 10 m APZ.

## 6.4. Onsite receptors

The closest onsite receptors to the additional BESS area will be other project infrastructure located within the development footprint, including:

- Existing substation/BESS area
- Operations and Maintenance (O&M) facilities.

The separation distances between the additional BESS and the identified onsite receptors are shown in Table 6.2. The separation distances are illustrated in Figure 6.4. A minimum of 10 m APZ will be provided for all structures and associated buildings/infrastructures, Ref [2].

**Table 6.2: Separation distances between additional BESS and onsite receptors**

| | **Distance from additional substation/BESS footprint boundary (m)** | |
|---|---|---|
| **Onsite receptors** | **North block** | **South block** |
| Existing substation/BESS area | 215 | 0[#] |
| Operations and maintenance facilities | 590 | 195 |

Note
[#] The additional substation/BESS footprint for the south block will be located adjacent to the existing substation/BESS area boundary. If the additional BESS will be located next to the existing BESS infrastructure, they will be considered as part of the same infrastructure and only one APZ is required.

## 6.5. Offsite receptors

For the PHA, the non-project related receptors or occupied areas are considered as sensitive receivers for determination of offsite impact. The nearest township to the project is Uralla, located approximately 6 km west.

For fire events the separation distance from the additional substation/BESS footprint boundary to the non-project related sensitive receptors was used to determine offsite impact.

A review of the separation distances to offsite receptors is shown in Figure 6.4. The separation distance to the nearest non-project related receptor (N1) is 1.7 km away from the additional substation/BESS footprint boundary (north block).

## 6.6. Review findings

The review of the BESS separation distances found that:

- The BESS concept layouts for all three options included clearances between the sub-units that would meet the minimum and/or recommended separation distances specified by the manufacturer to minimise risks of fire propagation. Additionally, the selected BESS would also be tested for certification to UL 9540A.
- The designated land area (north and south blocks) can accommodate the additional BESS units to meet the proposed increased capacity.
- For the north block, there is a considerable separation distance between the additional substation/BESS footprint boundary to the onsite receptors. The additional substation/BESS footprint for the south block will be located adjacent to the existing substation/BESS area boundary. However, if the additional BESS is located next to the existing BESS infrastructure, they will be considered as part of the same infrastructure.
- The closest non-project related receptor (N1) is located at least 1.7 km away from the additional substation/BESS footprint boundary. No offsite impact is expected as the BESS will be situated in a rural area and there is a large separation distance to the nearest residential dwelling.

**Figure 6.4: Separation distance to onsite receptors**

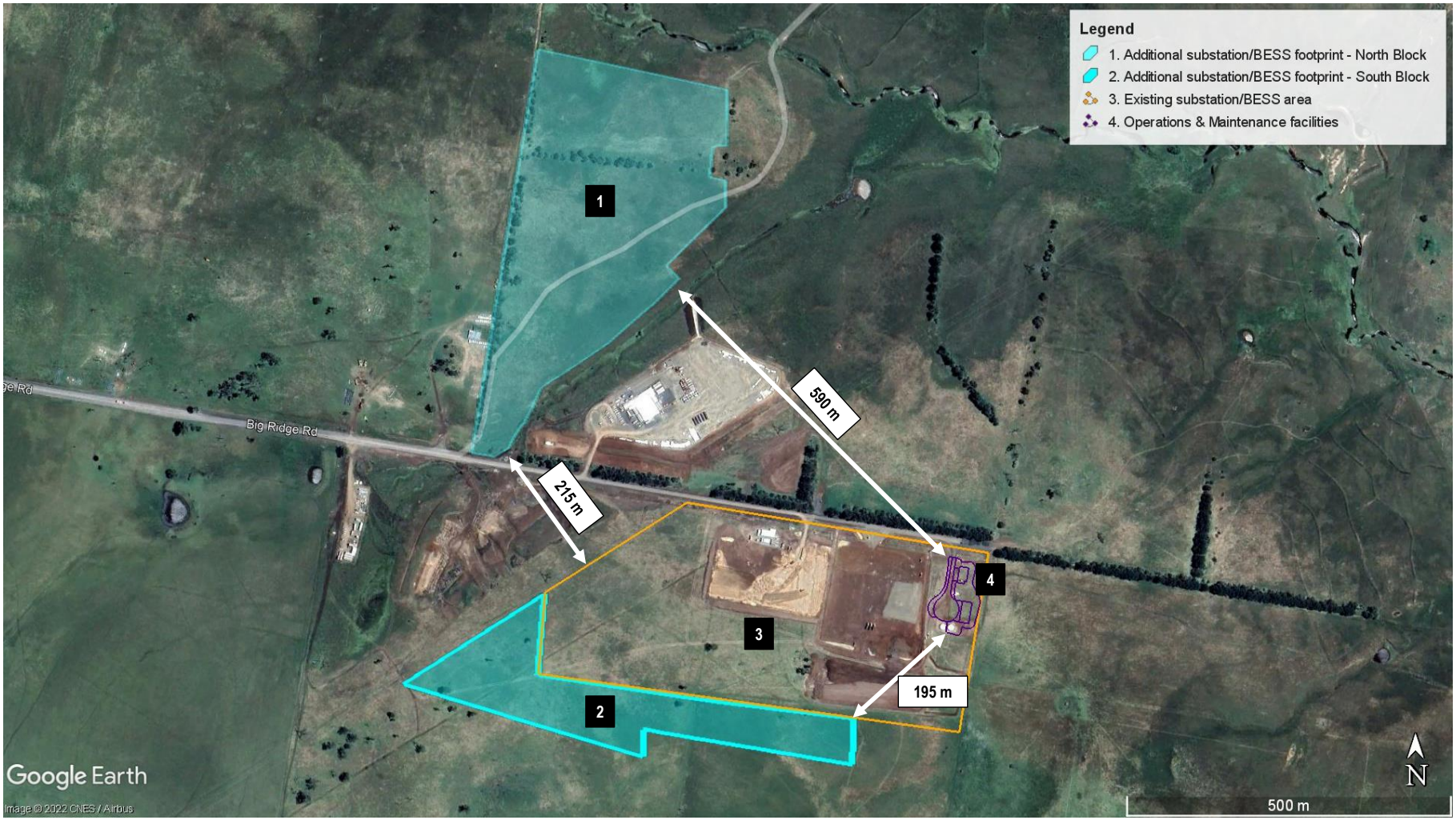
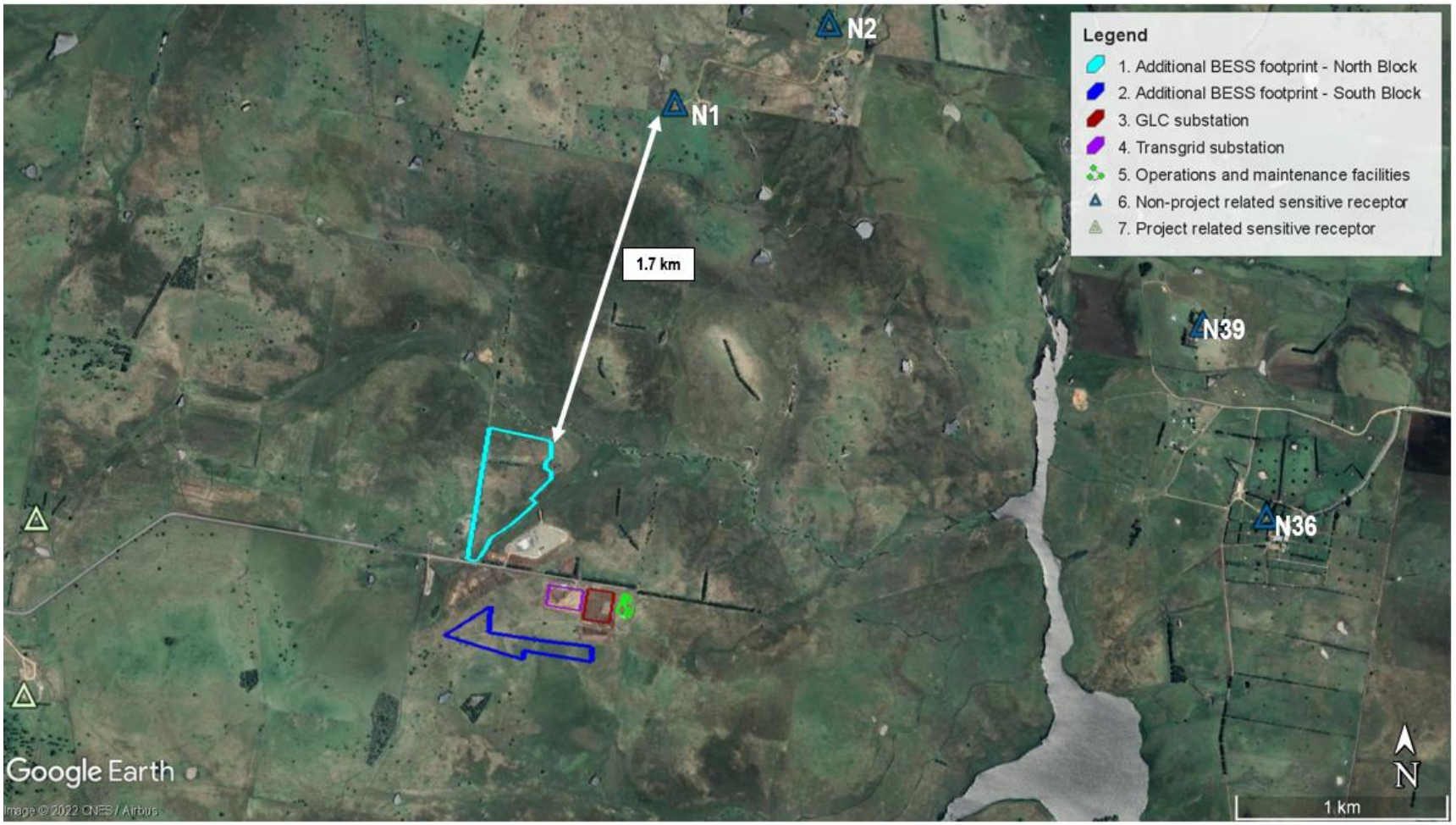


**Figure 6.5: Separation distance to offsite receptors**



# 7. LEVEL OF ANALYSIS DETERMINATION

## 7.1. Level of analysis

The HAZID found that for all identified events the resulting consequences are not expected to have significant offsite impacts (serious injury and/or fatality to the public or offsite population), based on the following considerations:

- The additional BESS will be situated in a rural area, within the approved development boundary for the project.
- The nearest non-project related sensitive receptor (N1) is located approximately 1.7 km from the additional substation/BESS footprint boundary.

Additionally, the identified events are expected to present negligible societal risk impact as:

- The project and additional BESS will be situated in a rural area with scattered residential dwellings.
- The nearest township is Uralla, located approximately 6 km west of the additional substation/BESS footprint boundary.

Based on the above findings and the Multi-level Risk Assessment, Ref [7], guidance to determine the required level of analysis for the PHA (Table 3.1), a fully qualitative approach (i.e. Level 1 analysis) was determined appropriate for this study. The risk analysis is presented in Section 8.

## 7.2. Qualitative risk criteria

The HIPAP No. 4 *Risk Criteria for Land Use Safety Planning*, Ref [8], recommends a set of qualitative criteria/principles to be adopted concerning the land use safety acceptability of a development.

The risk assessment against HIPAP No. 4 criteria is provided in Section 9.

# 8. RISK ANALYSIS

## 8.1. Overview

In this study, risk is defined as the likelihood of a specified undesired event occurring within a specified period or in specified circumstances. It may be either a frequency (the number of specified events occurring in a unit of time) or a probability (the probability of a specified event following a prior event) depending on the circumstances.

For each identified event, the risk to offsite population was qualitatively determined from the resulting severity and likelihood rating pair using the risk matrix shown in Table 8.1. In the absence of a suitable company risk matrix, the risk matrix provided in AS/NZS 5139 was used for the study. In line with AS/NZS 5139, events with risks greater than 'Low' should be discussed with the system owner and operator and anyone involved in the installation of the system.

For this study, the acceptance criteria used to assess the risk for offsite population are as follows:

- High and Extreme – Unlikely to be tolerable, review if activity should proceed.
- Medium – Tolerable, if So Far As Reasonable Practicable.
- Very Low and Low – Broadly acceptable.

**Table 8.1: Risk matrix**

| Consequence | Likelihood | | | | |
|---|---|---|---|---|---|
| | **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 |

## 8.2. Severity rating

For each event, the severity rating was qualitatively assigned based on the consequence description identified in the HAZID register using the category scale shown in Table 8.2 which was reproduced from AS/NZS 5139.

For this study, the severity scale was used to assess impact for offsite population. For example, an event with consequence outcome identified as 'localised effects' or 'effects are not expected to have an offsite impact' was assigned a 'Insignificant' rating to indicate minimal impact to offsite population.

**Table 8.2: Consequence rating**

| Consequence rating | Rating definition |
|---|---|
| Catastrophic | Any fatality of staff, contractor or public |
| Major | Non-recoverable occupational illness or permanent injury<br>Injury or illness requiring admission to hospital |
| Moderate | Injury or illness requiring medical treatment by a doctor<br>Dangerous/reportable electrical incident |
| Minor | Injury requiring first aid<br>Circumstances that lead to a near miss |
| Insignificant | No or minor injury |

## 8.3. Likelihood rating

The likelihood of an event was estimated using the category scale shown in Table 8.3 which was reproduced from AS/NZS 5139.

**Table 8.3: Likelihood rating**

| Likelihood rating | Rating definition |
|---|---|
| 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 |

The likelihood ratings were assigned based on knowledge of historical incidents in the industry and in consultation with ACEN Australia. The likelihood ratings were assigned accounting for the initiating causes, resulting consequences with controls (prevention and mitigation) in place.

## 8.4. Risk results and analysis findings

The qualitative risk results for the identified events are shown in Table 8.4.

The risk analysis findings are as follows:

- **Consequence**: The worst-case consequence for the identified events is a BESS fire and/or explosion event which may result from a variety of causes (e.g. battery thermal runaway, substation fire). The study found that for all events the consequence impacts are not expected to have significant offsite impacts. This was assessed based on the proposed location of the additional BESS (i.e. rural area) and separation distance between the additional substation/BESS footprint boundary and non-project related sensitive receptors.
- **Likelihood**: The highest likelihood rating for the identified events is 'Unlikely' (i.e. not expected to occur, but there is a slight possibility it may occur at some time).
- **Risk analysis**: A total of 12 hazardous events were identified. The breakdown of these events according to their risk ratings are as follows:
  - 'Medium' risk event: 1

    This event relates to unauthorised person access to the proposed additional BESS area resulting in vandalism/asset damage to the infrastructure, with no significant offsite impact expected. Severity rating of 'Major' was assigned to account for the trespasser potentially injuring themselves in the act. This study noted that the controls for this event are well understood and the likelihood was rated as 'Unlikely'.
  - 'Very Low' risk events: 11

    Most of these events relate to fire and/or explosion events, with no significant offsite impact expected (i.e. more likely to affect onsite employees). The study identified proposed prevention controls to reduce the likelihood of these fire events and mitigation controls to contain the fires to minimise potential for escalated events (e.g. fire management plan). Based on the identified controls, the highest likelihood for these events was rated as 'Unlikely'.

**Table 8.4: Risk results**

| Hazard | Event | Consequence | Offsite consequence | Significant offsite impact? | Risk analysis (offsite and public impact) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Severity | Likelihood | Risk |
| Electrical | Exposure to voltage | - Electrocution<br>- Injury and/or fatality to onsite employees<br>- Injury and/or fatality to member of public due to touch and step potential | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |
| Arc flash | Arc flash | - Arc blasts and resulting heat, may result in fires and pressure waves<br>- Burns<br>- Exposure to intense light and noise<br>- Injury and/or fatality to onsite employees | Localised effects, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |
| Fire | BESS fire | - Release of toxic and/or explosive combustion products<br>- Escalation to the entire BESS<br>- Injury and/or fatality to onsite employees | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |
| | Bushfire | - Escalation to adjacent infrastructure<br>- Injury and/or fatality to onsite employees | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |
| Chemical | Release of battery electrolyte (liquid/vented gas) from the battery cell | - Release of flammable liquid electrolyte<br>- Vapourisation of liquid electrolyte<br>- Release of vented gas from cells<br>- Fire and/or explosion in battery enclosure<br>- Release of toxic combustion products<br>- Injury and/or fatality to onsite employees | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |
| | BESS chiller unit or coolant leak | - Irritation/injury to onsite employee on exposure to leak (e.g. inhalation and skin contact)<br>- Ingress of coolant to battery or other electrical components (battery enclosure) leading to short circuit and fire, resulting in injury and/or fatality to onsite employees | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |

| Hazard | Event | Consequence | Offsite consequence | Significant offsite impact? | Risk analysis (offsite and public impact) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Severity | Likelihood | Risk |
| Explosive Gas | Generation of explosive gas | - Fire and/or explosion in battery enclosure<br>- Release of toxic combustion products<br>- Injury and/or fatality to onsite employees | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |
| Reaction | Thermal runaway in battery | - Fire in the battery cell and enclosure<br>- Escalation to the entire BESS<br>- Injury and/or fatality to onsite employees | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |
| EMF | Exposure to electric and magnetic fields | - High level exposure (i.e. exceeding the reference limits) may affect function of the nervous system (i.e. direct stimulation of nerve and muscle tissue and the induction of retinal phosphenes)<br>- Injury to onsite employees | EMF created from the project will not exceed the ICNIRP reference level for exposure to the general public. Impact to the general public in surrounding land uses will be negligible. | No | Insignificant | Rare | Very Low |
| External factors | Water ingress (e.g. rain, flood) | - Electrical fault/short circuit<br>- Fire<br>- Injury and/or fatality to onsite employees | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |
| | Vandalism due to unauthorised personnel access and deliberate damage to project infrastructure | Asset damage and potential hazard to unauthorised person (e.g. electrocution) | Effects to unauthorised person are expected to be localised and not expected to have an offsite impact. The impact is to a member of public but occurs onsite.<br><br>For a fire event, the effects are not expected to have an offsite impact as the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor. | No | Major | Unlikely | Medium |
| | Lightning strike | - Fire<br>- Injury and/or fatality to onsite employees | As the BESS will be situated in a rural area and there is a large separation distance to the nearest non-project related sensitive receptor, the effects are not expected to have an offsite impact. | No | Insignificant | Unlikely | Very Low |

# 9. RISK ASSESSMENT

## 9.1. Assessment against study risk acceptance criteria

Using the study risk matrix referenced from AS/NZS 5139, the identified hazardous events were qualitatively risk profiled. Of the 12 events identified, all were rated as 'Very Low' risks except for one 'Medium' risk event. This event is related to unauthorised person access to the proposed additional BESS area, resulting in vandalism/asset damage to the infrastructure with the potential for self-injury during the act. This study noted that the controls for this event are well understood and will be implemented accordingly. In addition to the rural location of the site, the proposed additional BESS will be located within a secure area with fencing and cameras, and warning signs will be provided. Mitigation measures would also include onsite security protocol and presence of staff during operational hours. In combination, these prevention and mitigation measures are expected to significantly reduce the likelihood of this event. The likelihood rating for this event was rated as 'Unlikely'.

All identified events are not expected to have significant offsite impacts. Based on the study risk acceptance criteria, the risk profile for the proposed additional BESS is considered to be tolerable.

## 9.2. Assessment against HIPAP 4 criteria

Assessment against the HIPAP No. 4 qualitative land use planning risk criteria is provided in Table 9.1.

**Table 9.1: Assessment against HIPAP qualitative risk criteria**

| HIPAP 4 qualitative criteria | Remarks | Complies? |
|---|---|---|
| *All 'avoidable' risks should be avoided. This necessitates the investigation of alternative locations and alternative technologies, wherever applicable, to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.* | This study has identified hazardous events and assessed the risks associated with the proposed operations of the additional BESS.<br>The location of the additional BESS is suited for the proposed operation, situated in a rural area with considerable separation distance to non-project related sensitive receptors to avoid offsite risks. | Yes |
| *The risk from a major hazard should be reduced wherever practicable, irrespective of the numerical value of the cumulative risk level from the whole installation. In all cases, if the consequences (effects) of an identified hazardous incident are significant to people and the environment, then all feasible measures (including alternative locations) should be adopted so that the likelihood of such an incident occurring is made very low. This necessitates the identification of all contributors to the resultant risk and the consequences of each potentially hazardous incident. The assessment process should address the adequacy and relevancy of safeguards (both technical and locational) as they relate to each risk contributor.* | Based on the separation distance to non-project related sensitive receptors, consequence impacts from the identified hazardous events are not expected to have significant offsite impacts. | Yes |
| *The consequences (effects) of the more likely hazardous events (i.e. those of high probability of occurrence) should, wherever possible, be contained within the boundaries of the installation.* | This study found that for all events the impacts are expected to be contained within the boundaries of the installation with no significant offsite impacts. | Yes |
| *Where there is an existing high risk from a hazardous installation, additional hazardous developments should not be allowed if they add significantly to that existing risk.* | There are no other additional hazardous developments in the vicinity of the additional BESS or the project site. | Yes |

## 9.3. Conclusion and recommendations

A PHA was completed to identify the hazards and assess the risks associated with the proposed operations of the additional BESS for the project at the planning stage to determine risk acceptability from land use safety planning perspective.

The PHA was completed following the methodology specified in HIPAP No. 6 *Hazard Analysis* and the *Multi-Level Risk Assessment* guidelines for assessment against the HIPAP No. 4 criteria. A Level 1 PHA (qualitative) was completed for the project.

The PHA concluded that:

- For all identified events associated with the proposed operation of the additional BESS, the resulting consequences are not expected to have significant offsite impacts.
- The project meets the HIPAP No. 4 qualitative risk criteria.

The following recommendations were identified:

1. ACEN Australia to consider and/or implement the relevant recommendations outlined in the Entura NESF BESS Design Considerations report for the selected BESS design and enclosure type during detailed design of the project. Of note:
    - Requirement that the units are certified to UL 9540A and installed in accordance with the manufacturer's instructions for best practice to mitigate fire propagation.
    - Requirement for manufacturers to provide a deflagration hazard study in accordance with UL 9540 or include explosion control measures such as passive safe ventilation of flammable gases under pressure.
    - Requirement for a minimum one-hour fire rating for containerised BESS.
    - For indoor BESS installed within a purpose-built structure, considerations for (i) compartmentalisation, (ii) occupancy and means of egress, (iii) fire barriers, (iv) exhaust and ventilation system, (v) sprinkler system and required water volume, and (vi) containment system for the expected fire protection system discharge.
    - Requirement to meet National Construction Code and regulated Australian standards and codes for indoor BESS within dedicated use buildings (e.g. fire rating of materials, fire detection systems).
2. ACEN Australia to review the investigation reports on the Victorian Big Battery Fire (occurred on 31 July 2021) and implement relevant findings for the project. The publicly available investigation reports include:
    - Energy Safe Victoria: **Statement of Technical Findings on fire at the Victorian Big Battery**.
    - Fisher Engineering and Energy Safety Response Group: **Report of Technical Findings on Victorian Big Battery Fire**.

3. ACEN Australia to consult with Fire and Rescue NSW (FRNSW) during detailed design of the project to ensure that the relevant aspects of fire protection measures have been included. These may include: (i) type of firefighting or control medium (ii) demand, storage and containment measures for the medium. The above aspects will form an input to the Fire Safety Study which may be required as part of the development consent conditions, for review and approval by FRNSW.
4. ACEN Australia to install security fencing, cameras, warning signs and implement onsite security protocol to deter trespassers and minimise unauthorised person access resulting in vandalism/asset damage to the infrastructure with the potential for self-injury during the act.

# 10. REFERENCES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[5] NSW Department of Planning, “Hazardous Industry Planning Advisory Paper No 6 - Guidelines for Hazard Analysis,” 2011.

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