NEW ENGLAND SOLAR FARM

ENVIRONMENTAL IMPACT STATEMENT

1

Environmental impact statement

Prepared for UPC Renewables Australia Pty Ltd

February 2019

Volume Directory

New England Solar Farm

Environmental impact statement

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February 2019

CREATING OPPORTUNITIES

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Certification

For submission of an environmental impact statement (EIS) under Part 4, Division 4.1 of the NSW Environmental Planning and Assessment Act 1979.

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Description of development

New England Solar Farm
Refer to Chapter 2 of this EIS for a description of the proposed development.

Land to be developed

The legal property description of the land to be developed is provided below (refer Table 2.1 of this EIS):

Lot 2 of DP567937; Lot 79 of DP755814; Lot 89 of DP755827; Lot 103 of DP755827; Lot 101 of DP755827; Lot 102 of DP755827; Lot 90 of DP755827; Lot 91 of DP755827; Lot 92 of DP755827; Lot 4 of DP172594; Lot B of DP172594; Lot 78 of DP755814; Lot 84 of DP755814; Lot 83 of DP755814; Lot 2 of DP127777; Lot 1 of DP127777; Lot 39 of DP755827; Lot 38 of DP755827; Lot 5 of DP127777; Lot 1 of DP405515; Lot 37 of DP755827; Lot 221 of DP755814; Lot 2 of DP174053; Lot 6 of DP172594; Lot 21 of DP1167870; Lot 23 of DP1171290; Lot 24 of DP1171290; Lot 82 of DP755814; Lot 202 of DP755814; Lot 109 of DP755827; Lot 111 of DP755827; Lot 110 of DP755827; Lot 93 of DP755827; Lot 98 of DP755827; Lot 122 of DP755827; Lot 80 of DP755814; Lot 97 of DP755827; Lot 8 of DP173619; Lot 183 of DP755827; Lot 108 of DP755827; Lot 113 of DP755827; Lot 181 of DP755827; Lot 154 of DP755827; Lot 123 of DP755827; Lot 125 of DP755827; Lot 124 of DP755827; Lot 126 of DP755827; Lot 182 of DP755827; Lot 296 of DP755827; Lot 1 of DP227322; Lot 201 of DP755827; Lot 237 of DP755835; Lot 3 of DP1122757; Lot 2 of DP1122757; Lot 1 of DP1206278; Lot 1 of DP1122757; Lot 142 of DP1135106; Lot 2 of DP11311; Lot 214 of DP755836; Lot 2 of DP1018290 and Lot 6 of DP1122757.

Certification

We certify that the contents of this EIS have been prepared in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979*, Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and the NSW Department of Planning and Environment Secretary's Environmental Assessment Requirements issued for the development. To the best of our knowledge, it contains all available information that is relevant to the environmental assessment of the development to which the statement relates. The information contained in this EIS is neither false nor misleading.

Ellie Thackray

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New England Solar Farm

Environmental impact statement

Report Number

J17300 RP1

Client

UPC Renewables Australia Pty Ltd

Date

1 February 2019

Version

v1 Final

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Approved by

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1 February 2019

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

Executive Summary

ES1 Project overview

UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm; 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) (refer Figure ES1).

The project will be developed across three separate arrays of photovoltaic (PV) modules (commonly referred to as 'solar panels'); incorporating transmission infrastructure and substations to enable connection into the existing electricity transmission network. The project will have a targeted 'sent out' electricity generating capacity of up to 720 megawatts (MW) (AC) and a BESS with up to 200 MW (AC) two-hour energy storage.

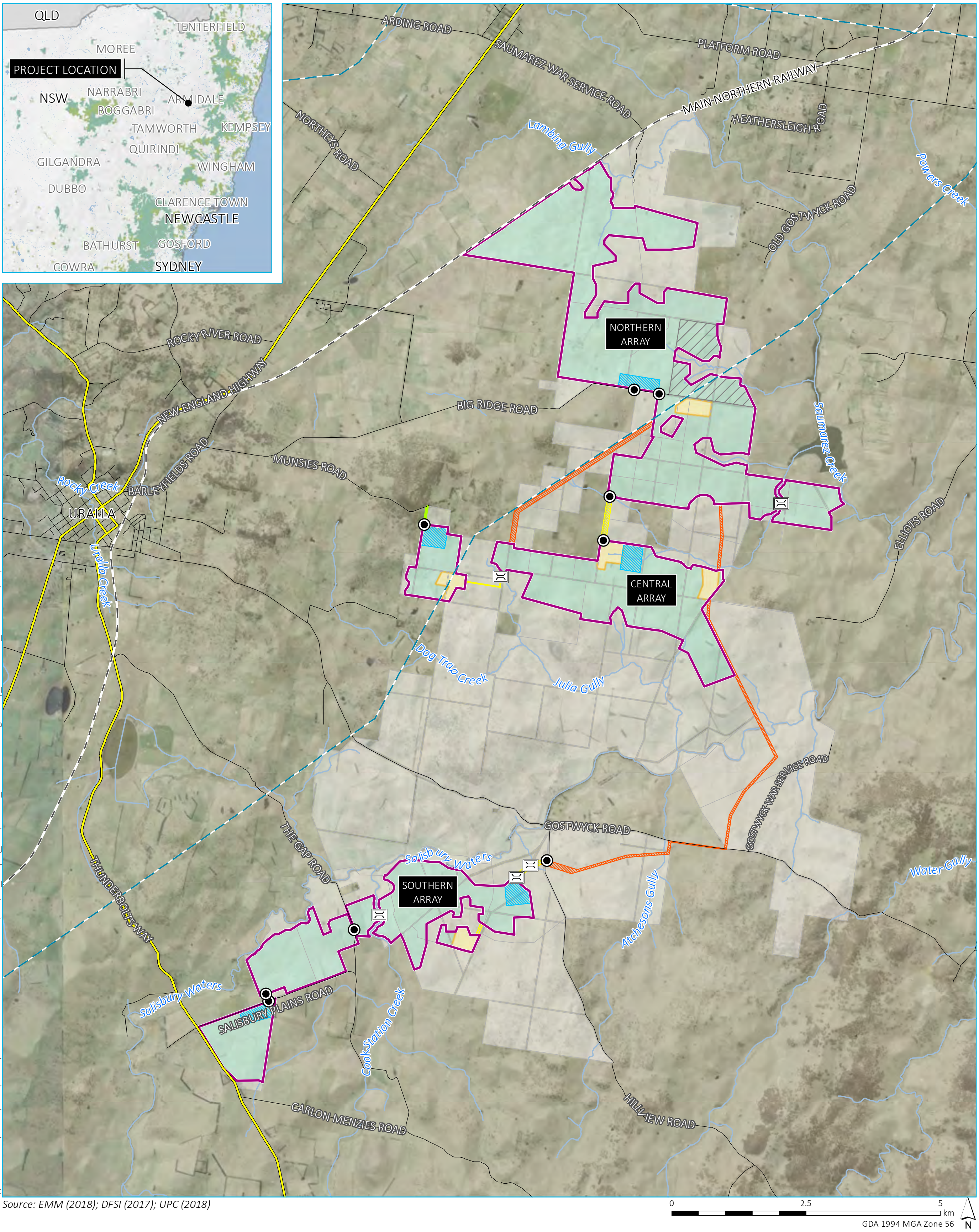
Construction of the project will take approximately 36 months from the commencement of site establishment works to commissioning of the three array areas. It is anticipated that the project will be constructed in two stages to balance the objective of completing construction in a timely manner against the objective of minimising the number of workers on-site and subsequent impacts on local infrastructure and the broader community.

Project components will include:

- the three solar array areas (north, south and central);
- up to three internal solar array substations and a single grid connection substation;
- associated BESS(s);
- operations and maintenance (O&M) infrastructure, including:
    - O&M buildings including a control room, meeting facilities, a temperature-controlled spare parts storage facility, supervisory control and data acquisition (SCADA) facilities, a workshop and associated infrastructure (eg kitchen, toilets and other facilities); and
    - car parking facilities;
- connection infrastructure between the three array areas including up to three overhead electricity transmission lines (ETLs) and underground or overhead cabling; and
- a new internal road network to enable access from surrounding local roads to the three array areas during construction and operations.

In addition, security fencing and creek crossings (should they be required) will be placed within the project boundary. During construction, a site office compound and temporary laydown areas will be established.

The project is a State Significant Development (SSD) which requires development consent under Part 4, Division 4.1 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) from the Minister for Planning, or their delegate. An environmental impact statement (EIS) is a requirement of the approval process.



Source: EMM (2018); DFSI (2017); UPC (2018)

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KEY

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

Development footprint

- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential laydown area / site compound
- Potential substation/BESS footprint
- Potential electrical cabling/site access corridor

- Potential creek crossing
- Proposed primary site access point
- Potential site for construction accommodation village

Location of the New England Solar Farm

New England Solar Farm
Environmental impact assessment
Figure ES1

EMM
creating opportunities

ES2 Project need

The project will support the Commonwealth and NSW governments to achieve renewable energy and greenhouse gas (GHG) emission reduction targets. The production of renewable energy directly aligns with the objectives of the NSW Government's *Renewable Energy Action Plan* (REAP) and the project will contribute to increased energy security through valuable contributions to a more diverse energy mix.

Once operational, the project will generate up to approximately 2,000 GWh of electricity annually. This is the equivalent of the electricity required to power up to 250,000 NSW households. In addition, the electricity generated by the project will contribute to Australia's targets as part of its commitments under the United Nations Paris Agreement on Climate Change. As part of the Paris Agreement, Australia will seek to reduce emissions by 26-28% below 2005 levels by 2030.

The project, in conjunction with other large-scale renewable energy projects, has potential to fill the need for replacement power generating capacity as ageing coal-fired generators in NSW are shut down. The construction of the project and its associated 200 MW (AC) two-hour energy storage will also contribute to the future development of the New England region as a renewable energy zone (REZ) which has been flagged by the NSW Government, TransGrid and the Australian Energy Market Operator (AEMO).

By encouraging economic activity and creating employment opportunities, the project will support growth and development in the New England region and will help to achieve a more diverse and sustainable economy. The project will provide a number of direct and indirect social, economic and environmental benefits that align with the values of Uralla Shire Council and the *New England North West Regional Plan* (NSW Government 2017), including the creation of employment opportunities, diversification of revenue streams and significant reductions in GHG emissions.

ES3 Site selection and project refinement

The broader area surrounding the project was first identified by UPC as having high potential for a major grid-connected solar PV power generation project as a result of it having a combination of:

- relatively high solar irradiance in the order of 1,830 kWh/m^2 global horizontal irradiance (GHI);
- elevation of more than 1,000 metres above sea level (MASL), which reduces heat losses and improves energy yield;
- access to the existing 330 kV electricity transmission network and adequate thermal capacity available for a project of the intended size; and
- interest from landholders to integrate a major solar farm project into ongoing agricultural land use.

The project has been designed to avoid and minimise impacts where possible. During the preparation of the EIS, the development footprint within the project boundary has been refined based on environmental constraints identification, stakeholder engagement, community consultation and consideration of project infrastructure layout with the objective of developing an efficient project that avoids and minimises environmental impacts. The matters considered during project refinement are summarised in Table ES1.

Table ES1 Matters considered during project refinement

Aspect	Matters considered and revisions undertaken
Biodiversity	Avoidance of high priority areas of PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion (ie those which had the largest patch size, highest density of trees remaining and the highest level of connectivity). Exclusion of higher order streams from the development footprint. Most watercourses within the development footprint are ephemeral and have been extensively modified by the construction of dams and retention banks. Increase in distance between the development footprint and the closest wetland. Maximisation of the placement of project infrastructure in cleared areas and, wherever possible, limitation of impacts to low quality native vegetation only.
Aboriginal cultural heritage	Avoidance of Aboriginal Heritage Information Management Information System (AHIMS) listed sites. Establishment of significant set-backs from higher order watercourses and water bodies which have high levels of archaeological and cultural significance. Avoidance of all sites of high significance and most sites of moderate significance that have been identified as part of the archaeological field survey.
Historic heritage	Avoidance of built heritage items identified in the Uralla Local Environmental Plan 2012 (Uralla LEP), including Gostwyck Memorial Chapel and Precinct (I10) and Deeargee Woolshed (I11). Reduction to the extent of the southern and central array areas within the modern extent of Gostwyck Station. Avoidance of impacts to sites identified during field assessments as part of the preparation of the historic heritage assessment (HHA) and Statement of Heritage Impact (SoHI).
Visual	Refinement of the extent of the development footprint in the northern (reduction of 315 ha) and southern (reduction of 585 ha) array areas to avoid or reduce visibility of project infrastructure from a number of sensitive receptors. Positioning of project infrastructure including substations and BESSs within the development footprint with a view to minimising or avoiding visual impacts on nearby residences.
Land use	Exclusion of an area identified by Geological Survey of NSW (GSNSW) – Division of Resources and Geosciences (DRG) as an area of higher mineral significance. Significant refinements to reduce the extent of biophysical strategic agricultural land (BSAL) within the development footprint (a reduction of 40% from approximately 1,100 ha to approximately 670 ha).
Noise	Significant revisions have been made to the northern extent of the northern array area and the southern array area to increase the distance between the development footprint and neighbouring residences, wherever possible.
Traffic and transport	Consideration of proximity to, and capacity of, the local and regional road network and ability to transport the necessary infrastructure to the array areas and resource the workforce demand during construction. Design of construction traffic routes to avoid conflict with other road users, including school buses.
Water	The development footprint provides appropriate setbacks from all third order streams and higher. Flood modelling outputs resulted in refinements being applied to the boundary of the southern array area adjacent to Salisbury Waters.
Hazards and risks	Positioning of potentially hazardous infrastructure within the development footprint to reduce proximity to nearby residences, where practicable.
Socio-economic	Proximity to two of the New England North West region's regional cities (ie Armidale and Tamworth), as well as Uralla and subsequent availability of local businesses, services, and a local labour force.

Throughout the project refinement process, UPC has made considerable effort to avoid potential environmental impacts, where practicable. In those instances where potential impacts cannot be avoided, UPC's design principles have sought to minimise environmental impacts and/or implement mitigation measures to manage the extent and severity of any residual environmental impacts.

ES4 Engagement

As part of the project refinement process and preparation of the EIS, consultation has been, and will continue to be, undertaken with a range of stakeholders including various local and NSW government agencies, the local community and neighbouring landholders.

UPC has been working closely with relevant stakeholders to gain an understanding of the interests that stakeholders have in the project, how potential impacts are predicted to be experienced from their perspective and using these insights to inform project refinement and, if required, appropriate mitigation and management measures.

Community information and feedback sessions have been well attended and the feedback received has been generally positive about the project. In addition to these sessions, a significant number of one-on-one meetings have been held with local residents to gather feedback. Employment opportunities and economic benefits were highlighted throughout community stakeholder engagement as key positives for the local community. Concerns that were raised by the community at the community information and feedback sessions were often practical questions that primarily related to the construction stage of the project.

Applicable feedback and matters raised by the local community during stakeholder engagement have been a valuable source of information for consideration as part of project refinement and the preparation of this EIS.

Through its community engagement, UPC has committed to a Community Benefit Sharing Initiative involving financial contributions to support community-led activities over the life of the solar farm.

ES5 Environmental assessment

ES5.1 Biodiversity

The project is within a heavily disturbed landscape of agricultural land, with limited patches of native vegetation which are highly fragmented. Refinements to the development footprint have excluded areas of higher quality vegetation and habitat that may support threatened species. The plant community types (PCTs) in the development footprint are heavily grazed, and in poor condition, and only support fauna species which are able to persist in highly modified agricultural landscapes. No threatened species were identified during ecological surveys.

No significant impacts on matters of national environmental significance (MNES) are predicted to result from the project.

The project will have direct impacts on biodiversity primarily due to the clearing of native vegetation and loss of species habitat. Indirect impacts on biodiversity may also occur during construction as a result of increased vehicle movements and noise and vibration.

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

Direct impacts to native vegetation requiring offsets include:

- direct impacts on 15.26 ha of PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (planted);
- direct impacts on 5.67 ha of PCT 1174-Silvertop Stringybark open forest of the New England Tableland Bioregion (woodland);
- direct impacts to 86 paddock trees assigned to PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion; and

- direct impacts to 6 paddock trees assigned to PCT 1174-Silvertop Stringybark open forest of the New England Tableland Bioregion.

A total of 393 ecosystem credits are required to offset the residual impacts of the project. Offsets will be provided in accordance with the biodiversity offset framework.

ES5.2 Aboriginal heritage

There are no AHIMS registered sites within the development footprint.

Field surveys performed as part of the Aboriginal cultural heritage assessment (ACHA) identified 96 previously unrecorded sites within the development footprint, including four grinding grooves sites considered to have high significance levels. The majority of the sites identified during the field survey were found on hill crests and slopes and consisted primarily of stone artefacts.

Avoidance of significant Aboriginal cultural heritage values has been a key aspect of the project refinement process, wherever possible. Subsequently, no sites of high significance will be impacted by the project.

No sites of moderate significance are currently designated for impact by the project. However, there are seven sites of moderate significance where impacts are currently undetermined because the detailed design of the project is yet to be undertaken. If these sites cannot be avoided, further assessment, incorporating test excavation and appropriate management measures will be required. Additional assessment requirements, proposed management measures and evidence of RAP and OEH consultation will be provided prior to or as part of the response to submissions report to ensure the NSW Department of Planning and Environment (DPE) can consider any new information prior to project approval.

The 37 sites currently designated for impact by the project are all of low scientific significance. This comprises a total of 30 isolated artefacts and seven artefact scatters. The impact to three scarred trees of low scientific significance (NE47, NE49 and NE67) is currently undetermined as expert assessment is needed to confirm whether they are Aboriginal made and require management.

An Aboriginal heritage management plan (AHMP) will be developed in consultation with DPE, the registered Aboriginal parties (RAPs) and NSW Office of Environment and Heritage (OEH). The AHMP will detail the management and mitigation of all identified Aboriginal sites along with special procedures and training and reporting protocols.

ES5.3 Historic heritage

There are no heritage items listed on the Commonwealth, National or State heritage registers or lists within the project boundary. There are three heritage items listed on the Uralla LEP within or adjacent to the broader project boundary, namely Gostwyck Memorial Chapel and Precinct (I10 - within), Deeargee Woolshed (I11 - within) and Salisbury Court (I14 - adjacent).

The development footprint 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 confirmed that relics and significant structures exist within the broader project boundary and surrounds; however, refinements of the development footprint in response to stakeholder engagement and environmental constraints identification, including historical heritage, will avoid the majority of known sites and items identified during field surveys.

Overall, it is anticipated that the project will have a low-to-moderate negative effect on the historical heritage significance of the rural character of the region and a moderate affect within the development footprint, predominantly by obscuring the cultural landscape rather than destroying it.

The positive aspects of the project will be that the activities that commenced in the early historical period of the colony, namely wool production, will continue on the land surrounding the development footprint. Further, this project has provided opportunity to assess these early squatting runs in the field, which will provide a substantial amount of information that can be put to use to open up areas of investigation that were not available previously. It is noted that the majority of the historic sites and views identified are not accessible to the general public as they are located on private landholdings that form part of the project boundary.

Measures have been developed to manage known and potential impacts to sites identified within the development footprint, project boundary and surrounds. A historic heritage management plan (HHMP) will be prepared to guide the conservation of heritage items, including site specific management measures, along with general measures, including an unexpected finds protocol. The relevant measures in the HHMP will be incorporated into the project's construction and operational environmental management plans to avoid accidental impacts during the construction and operational stages of the project, respectively.

ES5.4 Land

The development footprint is zoned RU1 Primary Production under the Uralla LEP, which permits development for electricity generation with consent. Most of the development footprint has been modified by historical land use practices and past disturbances associated with land clearing, cropping and 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.

The development footprint represents approximately 0.87% of the total land area within the Uralla Shire LGA. Of the land within the three array areas, approximately 670 ha is mapped as BSAL. This represents approximately 0.02% of the total land area mapped as BSAL within NSW.

The project will reduce the total area of land under agricultural production in the Uralla Shire LGA and more generally within the New England North West region through the establishment of the solar arrays and associated infrastructure. However, the loss of agricultural land represents a very small fraction of the agricultural output of both the Uralla Shire LGA and New England North West region.

Land management practises will avoid or minimise potential impacts to neighbouring agricultural operations that have been identified during engagement with the local community and as part of the land use conflict risk assessment. Mitigation measures have been identified to avoid or manage impacts, including site access protocols, implementation of erosion and sediment control (ESC) measures, management of soil resources and biosecurity control.

ES5.5 Visual

The project design, development footprint and placement of the three array areas have progressively evolved to minimise or avoid visual impacts, where possible. This has included significant revisions to the extent of the northern and southern array areas.

The visual assessment determined that, of the viewpoints assessed, infrastructure may be visible to varying degrees from 17 of the 19 viewpoints. Based on variable elevation and undulation in the landscape and the presence of vegetation, combined with the height of the PV modules, the impact assessment predicts the following for the unmitigated scenario:

- a slight visual impact for viewpoints 9, 12, 14, 18 and 19;
- a slight/moderate visual impact for viewpoints 3, 4, 10, 11, 13 (Thunderbolts Way and S17), 15, 16 and 17;
- a moderate visual impact for viewpoints 2, 5, 6, 7, 8 and 13 (Salisbury Court); and

- a potentially significant impact for Viewpoint 1.

Landscape screening is proposed to mitigate visual impacts at the following:

- S11 – discussions between UPC, the relevant project landholder and the tenant at S11 will inform requirements for landscaping to mitigate views at Viewpoint 1;

- S9 – existing vegetation was observed along the boundary of this property; however, additional landscape screening is proposed to mitigate visual impacts at S9; and

- N1 – discussions between UPC and N1 are ongoing and include consideration of options for landscaping to address the potential visibility of project infrastructure from the southern aspect of the dwelling at Viewpoint 5, should it be required.

Visual impacts from three items of local heritage significance listed on the Uralla LEP have also been considered as part of the visual impact assessment. It is anticipated that distance between these items and the development footprint, existing remnant vegetation, planted vegetation and wind breaks will mitigate the visibility of project infrastructure in the southern array area from these locations.

ES5.6 Noise

Modelling has demonstrated that noise levels during peak construction are predicted to satisfy the recommended noise management levels (NMLs) at most locations during standard hours, with the exception of one location (S11). S11 is a rental property owned by one of the project landholders. At the time of writing, there were no formal negotiated noise agreements in place between the tenant at S11, the relevant project landholder and UPC. It is recommended that potential construction noise impacts be discussed with the tenant and landholders to identify appropriate mitigation to be adopted at this residence.

During limited out of hours (OOH) periods, predicted construction noise levels and maximum event noise levels are above the relevant criteria at a number of the assessment locations considered as part of the construction noise and construction sleep disturbance assessments. Construction noise levels are predicted to be above the recommended NMLs at five locations during the *NSW Noise Policy for Industry* (NPfI) (EPA 2017) defined daytime period and at 15 locations during limited times in the NPfI defined night-time shoulder period (ie 6am to 7am Monday to Saturday, 6am to 8am Sundays and public holidays). Given that the predictions assume equipment operating simultaneously and at the nearest locations to the relevant assessment locations, it is likely that actual construction noise levels will be less than those predicted.

The project's construction environmental management plan (CEMP) will include management and mitigation measures consistent with the best practice requirements outlined in the *NSW Interim Construction Noise Guideline* (DECC 2009). Buffer zones are proposed during OOH periods with the aim of minimising impacts and reducing construction noise levels to below the relevant criteria at select assessment locations. In addition, as part of the preparation of the CEMP, consideration will be given to the construction activities proposed to be undertaken during OOH periods.

Vibration associated with the proposed construction works is unlikely to generate impacts at the nearest vibration sensitive receivers.

Traffic generated by the project is expected to comply with the relevant *NSW Road Noise Policy* (RNP) (DECCW 2011) criteria at the majority of the assessment locations. The exceptions are potentially the most affected residences on Big Ridge Road and Salisbury Plains Road, where predicted noise levels are 2 dB above the relevant RNP criteria during the daytime period. The road traffic noise predictions are based on peak construction traffic volumes and provide a highly conservative assessment.

Given the limited emissions during operations, noise levels are expected to satisfy the NPfI noise trigger levels at all assessment locations, during the daytime, evening and night-time periods for the entirety of the project's operations.

ES5.7 Traffic and transport

An assessment of the road network and traffic generated impacts for the project considered all the existing major and minor roads in the Uralla Shire LGA that are likely to be used for vehicle access during project construction, operations and decommissioning.

Access to the three array areas will be from the following local roads:

- Barleyfields Road and Big Ridge Road (northern array);
- Barleyfields Road, Big Ridge Road and Munsies Road (central array); and
- Gostwyck Road and Hillview Road or Thunderbolts Way, Salisbury Plains Road and The Gap Road (southern array).

These access routes consist of a wide range of road types and cross sections. Other roads which may be used include urban roads within the township of Uralla and surrounds and for regional access, the New England Highway and Thunderbolts Way.

The proposed project construction daily traffic movements will be much greater than during longer term operations, with up to 494 total daily vehicle movements (380 by light vehicles and 114 by heavy vehicles) forecast to occur during the average construction period and up to 912 daily vehicle movements (760 by light vehicles and 152 by heavy vehicles) forecast to occur during the peak construction periods. Project-related vehicle movements during construction will be distributed between a number of different access routes (depending on the array area). Subsequently, the maximum forecast additional daily traffic volumes using any specific local access route will be significantly lower than the overall daily peak totals described above.

These daily project-related vehicle movements should be considered as a limited duration construction traffic impact as they are anticipated to occur across two four-month periods within the overall 36-month construction stage.

Project-related peak and average construction vehicle movements for these roads will have a short-term impact on traffic conditions and usability, which is proposed to be managed by road condition inspections and maintenance procedures. These additional road maintenance procedures will be negotiated and agreed between UPC and Uralla Shire Council as part of the project's traffic management plan (TMP). The TMP will include commitments to perform a dilapidation survey, restoration works (where required), implementation of a Driver Code of Conduct, undertaking swept path analyses and further investigating any alternative heavy vehicle routes that could be utilised to bypass the township of Uralla.

ES5.8 Water

The site selection and refinement process considered a range of factors, including the placement of infrastructure to reduce impacts on watercourses and the risk of flooding. This refinement has excluded higher order streams (ie third order and above), reduced the number of watercourse crossings required and increased the set-back of the development footprint from areas prone to flooding.

There are several first and second order watercourses in the development footprint; however, these are ephemeral and, in most cases, do not have a discernible channel, lack aquatic vegetation and are dominated by grass species prevalent across the development footprint. In addition, there are man-made farm dams across the development footprint that are primarily used for stock watering. These dams have limited habitat or environmental value.

Limited parts of the development footprint are prone to flooding or overland flow in the case of a 1 in 100 year flood event; however, flooding generally follows the alignment of watercourses and there is no substantial overbank flooding within the development footprint.

Impacts on 1st and 2nd order watercourses within the development footprint will be minimised to the extent practicable. Watercourse crossing plans detailing the design of proposed crossings of higher order watercourses outside of the development footprint will be prepared in consultation with NSW Department of Industry – Lands and Water Division. Ongoing monitoring of watercourse condition and vegetated riparian zone (VRZ) condition for all retained watercourses where these run through or immediately adjacent to the development footprint will be undertaken during operations, with maintenance as required to minimise scouring and erosion and ensure waterway health and stability.

Proposed key surface water management measures include implementation of ESC measures in accordance with Landcom (2004); progressive revegetation or stabilisation of disturbed areas to minimise exposed soils to the extent possible; and implementation of procedures for hazardous material storage and spill management.

The project is not likely to impact groundwater during construction, operation and decommissioning due to the estimated depth to groundwater within the project boundary and the limited amount and depth of subsurface disturbance activities required during the installation and decommissioning of project infrastructure. The project will also not require access to groundwater resources.

Water demands during construction and operation will be satisfied by potable water imported (trucked in) to site. Any opportunistic use of water for construction sourced from farm dams to be removed would be undertaken in accordance with harvestable rights provisions. The project therefore will not impact adjacent licensed water users or basic landholder rights during construction and operations.

ES5.9 Hazard and bushfire

All project infrastructure will be designed in accordance with relevant industry standards. All electrical infrastructure generates electric and magnetic fields (EMF). The EMF created by the project will not exceed the International Commission on Non-Ionising Radiation Protection (ICNIRP) occupational exposure reference level. The project will not exceed the ICNIRP reference level for exposure to the general public and impacts will be negligible.

A very small part of the land within the development footprint (approximately 12 ha or 0.4%) is mapped bushfire prone by Uralla Shire Council. The project will be exposed to bushfire threat in the form of grassfire and has the potential to cause unplanned ignition of surrounding grassland. Subsequently, bushfire risks associated with the project have been assessed in accordance with *Planning for Bushfire Protection* (PBP) (RFS 2006).

Public safety risks, including bushfire, hazards and risks associated with project infrastructure, and emergency access and evacuation will be mitigated through design of buildings, construction areas and other assets to include appropriate bushfire protection standards and emergency access and evacuation protocols will be developed as part of the emergency response plan (ERP). The risk of the project initiating a bushfire will be reduced through the implementation of a fire management plan (FMP) throughout the construction and ongoing operation of the project.

ES5.10 Social

The project is justified on social grounds for three principal reasons:

- it is broadly supported by the local community, despite specific concerns that have been raised;
- it will significantly contribute to the local and regional economy; and
- it will provide indirect benefits through the use of services and facilities both locally and regionally.

Subject to availability, the project is likely to employ locals and utilise existing community services and facilities. An influx of a significant number of workers during the project's construction period has the potential to impact social characteristics within the local community such as accommodation, local infrastructure and local businesses, including community services and facilities.

Construction staging is intended to spread the workforce demand and reduce the aggregate peak construction workforce. Should it be required, the construction accommodation village will be scalable and flexible to ensure that it can respond to demand.

On balance, the project is likely to be welcomed by the community and the potential adverse social impacts associated with a large construction workforce are able to be managed or mitigated to an acceptable level through a range of actions. The project's construction workforce management plan (CWMP) will help to achieve the best mix of benefits for the local community without placing pressure on accommodation and other local services.

Through the provision of additional economic stimulus, employment opportunities and investment in community infrastructure and services, the net community benefit of the project is considered to be positive.

ES5.11 Economic

The project is justified economically due to the economic benefits and stimulus it will provide to the local region and its growing population. It is noted that the Uralla Shire, Tamworth and Armidale LGA populations have grown by 5.5%, 11.3% and 6.7% respectively since 2006 and are forecast to grow further.

In addition, there is capacity within the local region to take up the employment opportunities generated by the project's construction and ongoing operations. The Uralla Shire, Armidale and Tamworth LGAs have a population which typically experiences an unemployment rate of approximately 6-8%. Given the region's youth unemployment rates, employment opportunities generated by the project could also be taken up by younger generations.

The peak construction year (Year 2) of the project is estimated to make up to the following total contribution to the regional economy (includes multiplier effects):

- $425 million in annual direct and indirect output;
- $169 million in annual direct and indirect value added;
- $92 million in annual direct and indirect household income; and
- 1,155 direct and indirect jobs.

Throughout operations, the project is estimated to make up to the following total annual contribution to the regional economy (includes multiplier effects):

- $86 million in annual direct and indirect output;

- $26 million in annual direct and indirect value added;
- $3 million in annual direct and indirect household income; and
- 39 direct and indirect jobs.

UPC will work in partnership with Uralla Shire Council and the local community to ensure that, as far as possible, the benefits of the projected economic growth in the region are maximised and community and social impacts minimised.

ES5.12 Air quality

Emissions to the atmosphere from the project during construction will be temporary in nature and will be restricted to dust caused by land disturbance and vehicle, plant and equipment exhaust emissions.

Ongoing maintenance of project infrastructure and the land within the development footprint will be required during operation. Maintenance activities will result in very minor, localised vehicle emissions and generation of dust from vehicles travelling along internal, unsealed access roads.

The implementation of mitigation measures such as dust suppression and local road maintenance will reduce air quality impacts during construction and operations.

ES5.13 Waste management

The project will produce a number of waste streams during the construction period. Minor quantities of waste will also continue to be generated during operations. Potential impacts from poor management of waste include contamination of land and water and human and animal health impacts.

All wastes produced by the project will be classified, stored and handled in accordance with the *Waste Classification Guidelines – Part 1: Classifying Waste* (EPA 2014).

A waste management plan (WMP) will be prepared and implemented in consultation with Uralla Shire Council and DPE. A key objective of the WMP will be to ensure that any use of local waste management facilities does not disadvantage local businesses and, more generally, the local community, by exhausting any available capacity at these facilities.

ES5.14 Cumulative impacts

There are a number of projects either planned or already approved within the immediate region. This includes three additional large-scale solar farm developments, the closest being proposed on a site approximately 4.9 km from the northern array area.

There may be cumulative impacts from the concurrent construction of the project and other large-scale solar farm developments due to the size of the construction workforce and subsequent demand for short-term accommodation, local infrastructure and services and associated vehicle movements on the regional road network.

Mitigation measures for predicted effects are noted within this EIS; however, in summary with specific reference to potential cumulative effects, proposed mitigation measures include:

- preparation of a CWMP; and
- development and implementation of a community engagement framework as part of the project's stakeholder engagement strategy.

ES6 Justification and conclusion

The project has been designed to avoid and minimise adverse biophysical, social and economic impacts where possible. The residual impacts have been identified and assessed. While there are some unavoidable impacts, principally during the project's construction period, the project will provide a number of longer-term benefits to the local community, New England region and State.

The project is considered to be justified and in the public interest because:

- It is suitably located:
  - in a region with ideal climatic and physical conditions for large-scale solar energy generation that has been identified by the NSW Government as a promising 'renewable energy zone';
  - within close proximity of existing infrastructure with adequate capacity to receive the energy proposed to be generated; and
  - adjacent to agricultural land uses that are compatible with large-scale solar energy generation.
- The design of the project has been an iterative process which has considered environmental assessment outcomes to ensure impacts have been avoided and minimised as much as possible. This has included refining the design in consultation with neighbouring landholders, registered Aboriginal parties and the local community.
- The project will not result in significant biophysical, social or economic impacts and the EIS has identified that any residual impacts can be appropriately managed and/or offset in accordance with NSW Government policy.
- The benefits of the project are in the public interest and will provide renewable energy, increased energy security and direct and indirect economic benefits, through the creation of employment opportunities and benefits to the local and regional economy through income and expenditure during the life of the project.
- UPC is committed to the long-term environmental management of the land within the development footprint. At the end of the project's investment and operational life, the development footprint will be returned to its pre-existing agricultural land use or another land use as agreed by the project owner and the landholder at that time.

The project is in line with the objects of the EP&A Act and will enable the orderly and logical use of natural, physical and human resources existing within the local area and greater New England North West region. 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.

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

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Appendices

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Photographs

1 Introduction

1.1 Project overview

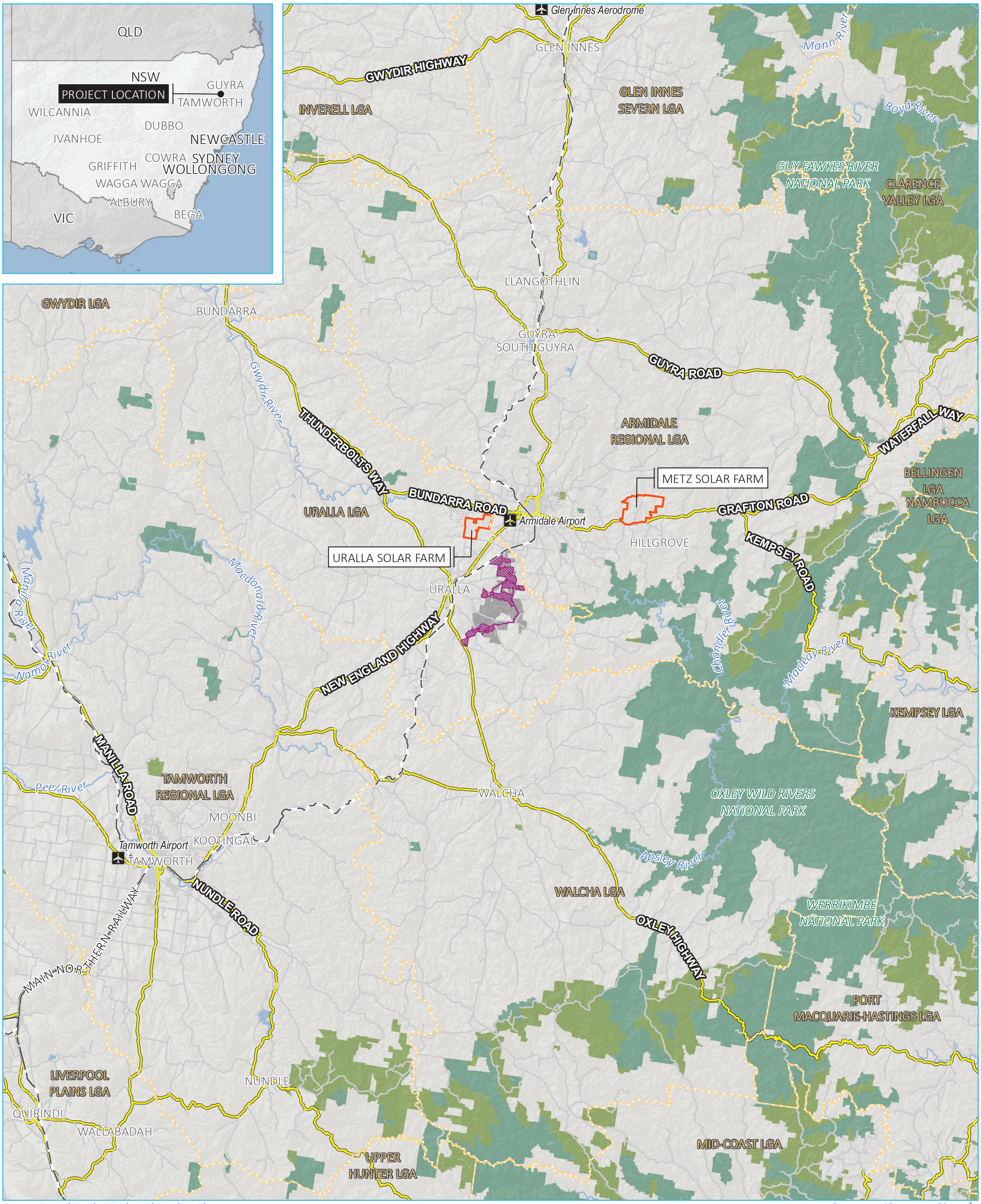
UPC Renewables Australia Pty Ltd (UPC) proposes to develop the New England Solar Farm; a significant grid-connected solar farm and battery energy storage system (BESS) along with associated infrastructure, approximately 6 kilometres (km) east of the township of Uralla, which lies approximately 19 km south of Armidale in the Uralla Shire local government area (LGA) (Figure 1.1) (the project).

The project will be developed across three separate arrays of photovoltaic (PV) modules (commonly referred to as 'solar panels'); incorporating transmission infrastructure between each of the three arrays and a centralised grid-interfacing substation (grid substation) to enable connection into the existing electricity transmission network (refer Figure 1.2). The project will have a targeted 'sent out' electricity generating capacity of up to 720 megawatts (MW) (AC) and up to 200 MW (AC) two-hour energy storage. Depending on its final size and design, the project will have an estimated capital investment value of up to $768 million AUD.

The project will provide a number of direct and indirect social, economic and environmental benefits throughout its life. Once operational, the project will generate up to 2,000,000 megawatt hours (MWh) of electricity annually, depending on its final size and design. This is the equivalent of the electricity required to power approximately 250,000 NSW households. The project will also contribute to an increase in energy security by creating a more diverse energy mix.

The project will represent a major injection of capital investment into the New England North West region and the Uralla Shire LGA. The regional economy will benefit from the project through the creation of employment opportunities and other indirect economic benefits. Direct employment opportunities generated by the project will include up to 700 full-time equivalents (FTEs) at the peak of construction and up to 15 FTEs during operations. The project will also result in a diversification of the income earned by the landholders involved in the project, most of whom will continue farming on their properties within the region.

The project is classed as a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). Therefore, a development application (DA) for the project is required to be submitted under Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The NSW Minister for Planning (Minister), or the Minister's delegate, is the consent authority.



\\EMMSVR1\emm\Jobs\2017\J17300 - UPC NSW Solar Farm\GIS\02_Maps_EIS\EIS001_Regional_Location_20180917_02.mxd 17/10/2018

Source: EMM (2018); DFSI (2017); GA (2015)

0 10 20 km
GDA 1994 MGA Zone 56
N

KEY

- Development footprint
- Project boundary
- Other SSD solar development
- Airport
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody
- Local government area
- NPWS reserve
- State forest

Regional context

New England Solar Farm
Environmental impact statement
Figure 1.1

EMM
creating opportunities

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Source: EMM (2018); DFSI (2017); UPC (2018)

0 2.5 5 km

GDA 1994 MGA Zone 56 N

KEY

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

Development footprint

- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential laydown area / site compound
- Potential substation/BESS footprint
- Potential electrical cabling/site access corridor

- Potential creek crossing
- Proposed primary site access point
- Potential site for construction accommodation village

Location of the New England Solar Farm

New England Solar Farm
Environmental impact assessment
Figure 1.2

EMM creating opportunities

1.2 The proponent

UPC is a leading renewable energy development company that has been operating globally since the 1990s with experience in North America, Europe, Asia and Africa. To date, UPC-formed companies have developed more than 3,500 MW of operating wind and solar projects with an estimated investment value of over $6 billion. In recent years, UPC has demonstrated its ability to enter new markets with advanced technology and creative local business strategies, helping to accelerate renewable energy deployment around the world.

In Australia, UPC is developing both the Robbins Island Wind Farm and Jim's Plain Wind Farm in Tasmania. UPC is focused on supplying renewable energy at the lowest possible price in a socially responsible way. UPC independently develops, builds, owns and operates its wind and solar assets as an Independent Power Producer (IPP). Within Australia, the UPC management team has extensive experience in the development, construction, project management, financing and operations and maintenance of large-scale wind, solar and hydro projects both in Australia and overseas.

UPC is a signatory to the Clean Energy Council's Best Practice Charter for Renewable Energy Developments, which outlines a commitment by signatories to:

- engage respectfully with the communities in which they plan and operate projects;
- be sensitive to environmental and cultural values; and
- make a positive contribution to the regions in which they operate.

In addition, UPC's activities are undertaken in accordance with its environmental policy, which states that UPC will:

- comply with environmental laws and regulations in all work locations as an absolute minimum;
- understand and manage potential environmental risks at all work locations;
- contribute to the overall health and resiliency of ecosystems in all work locations;
- consult with communities and other relevant stakeholders about UPC activities;
- participate in integrated approaches to land use planning;
- identify and implement opportunities for efficient energy and water usage;
- identify and implement opportunities for waste avoidance and minimisation; and
- report annually to stakeholders on UPC's environmental performance.

1.3 Project objectives

The project will support the Commonwealth and NSW governments to achieve their respective renewable energy and greenhouse gas (GHG) emission reduction targets. The aim of the Commonwealth Government's Renewable Energy Target (RET) policy is to ensure that at least 33,000 gigawatt hours (GWh) of Australia's electricity is derived from renewable sources by 2020. In 2017, renewable energy contributed approximately 17% of Australia's total electricity generation (Clean Energy Council 2018). The Commonwealth Government has also committed to reducing Australia's GHG emissions by 26-28% on 2005 levels by 2030. Investment in renewable energy including large-scale, grid-connected wind and solar projects, must play an increasing role in helping to meet this GHG abatement target. Furthermore, the intent of the NSW Government's Renewable Energy Action Plan (REAP) is to increase the proportion of electricity derived from renewable sources in NSW by up to 20% by 2020.

The project will help to achieve this through the following objectives:

- develop a significant grid-connected solar farm and associated infrastructure that avoids and minimises environmental, community and landholder impacts;
- contribute to energy security in NSW by diversifying the State's energy mix and helping to prepare for the retirement of large-scale coal-fired power generation;
- provide ongoing economic benefits for both the local economy within the Uralla Shire LGA and, more broadly, the regional economy within the New England North West region;
- provide significant employment opportunities during the 36 month construction period; and
- contribute to the strategic objectives and targets of the NSW and Commonwealth governments for renewable energy generation.

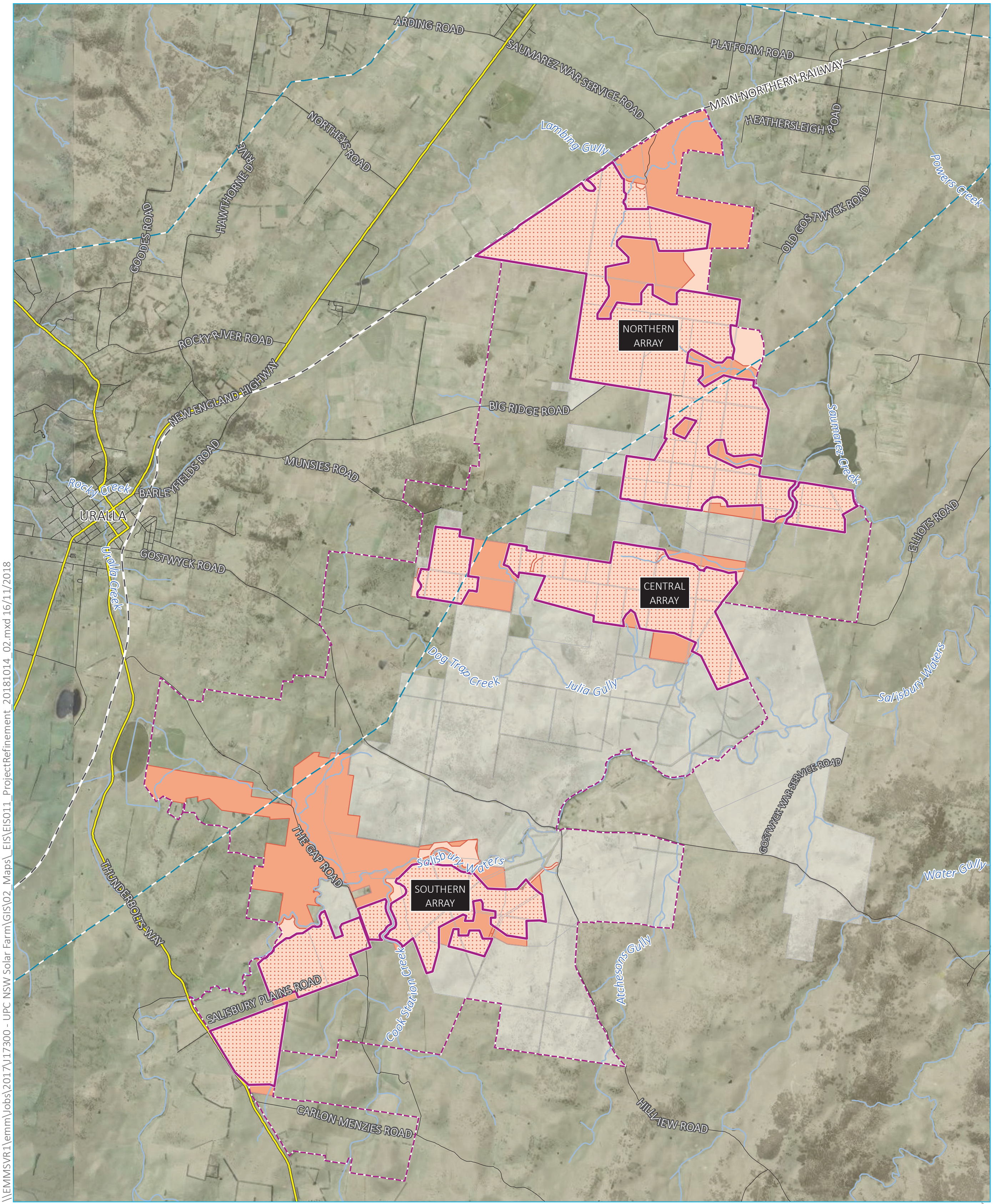
1.4 Project background

1.4.1 Site selection

The evolution of the project from the project investigation area through to the proposed development footprint is illustrated in Figure 1.3 and further described in Table 1.1.

Table 1.1 Key steps in project refinement

Footprint	Area (ha)	Key reasons for selection
Project investigation area	11,622	Proximity to 330 kV electricity transmission network. Elevation and high solar irradiance.
PEA site boundary (array areas only)	4,244	Favourable topography. Modified landscape. Access to the local and regional road network.
Preliminary study area (array areas only)	2,863	Minimise clearance of native vegetation. Minimise surface disturbance requirements. Minimise visibility of project infrastructure from receptors. Reduce land use conflicts. Avoid higher order watercourses.
Refined study area (array areas only)	2,711	Avoid Aboriginal cultural heritage and historic heritage sites. Avoid areas likely to be inundated by flood waters adjacent to Salisbury Waters. Minimise visibility of project infrastructure from receptors.
Development footprint (array areas only)	2,696	The development footprint represents the final extent of this environmental impact statement (EIS) and DA and was reduced further in size as a response to identified environmental constraints. Avoid Aboriginal cultural heritage and historic heritage sites.



Source: EMM (2018); DFSI (2017); UPC (2018)

0 2.5 5 km
GDA 1994 MGA Zone 56

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Project investigation area
- PEA site boundary
- Preliminary study area
- Refined study area
- Project boundary
- Development footprint

Key steps in project refinement

New England Solar Farm
Environmental impact statement
Figure 1.3

EMM
creating opportunities

UPC identified the New England region as a suitable location for the project as other regions with favourable characteristics for large-scale solar projects (eg the Riverina region of south-west NSW or areas of central NSW) have already experienced a significant level of solar development with a number of approved projects and projects under development and construction. This increases the risks relating to grid connection and power evacuation when compared with the New England region, where relatively limited large-scale solar development has taken place to date.

As part of the project's early stages of development, UPC performed a preliminary assessment of available land within 5 km of TransGrid's 330 kV transmission line within the New England region of NSW. The initial focus of this assessment was a desktop review of topography, which can have significant impacts on both the feasibility and constructability of large-scale solar developments, and easily identifiable environmental constraints, including patches of remnant vegetation and significant surface water features. Attempts were also made to avoid areas within proximity to clusters of rural residential dwellings. This process resulted in the selection of the project investigation area (refer to Figure 1.3). Alternatives to the project investigation area, including land west of the New England Highway and north of the township of Uralla were considered; however, due to less favourable topography, high levels of remnant vegetation and the higher density of rural residential dwellings in relative proximity to the available land, these areas were considered to be less suitable than the project investigation area for a large-scale solar development.

The project investigation area presented on Figure 1.3 covers an area of approximately 11,622 ha. This area was first identified by UPC as having high potential for a major grid-connected solar PV power generation project as a result of it having a combination of:

- relatively high solar irradiance in the order of 1,830 kWh/m^2 global horizontal irradiance (GHI);
- elevation of more than 1,000 metres above sea level (MASL), which reduces heat losses and improves energy yield; and
- access to the existing 330 kV electricity transmission network and adequate thermal capacity available for a project of the intended size.

The project investigation area was the subject of a planning and environmental constraints analysis, which identified the key risks and constraints to the project based on preliminary design considerations, State and Commonwealth planning and assessment frameworks and the environment both within and surrounding the project investigation area. The results of this analysis informed the basis for preliminary field surveys and further assessment as part of the preparation of the preliminary environmental assessment (PEA). The purpose of the PEA was to request and inform the content of the Secretary's Environmental Assessment Requirements (SEARs) for the project (refer Section 1.7). The PEA was submitted to DPE on 18 April 2018 and SEARs were released on 8 May 2018.

Biodiversity field surveys, preliminary Aboriginal cultural heritage and historical heritage assessments and consultation with regulatory, industry and community stakeholders informed the selection of the site as defined in the PEA (refer to the PEA site boundary presented in Figure 1.3). The site boundary presented as part of the PEA encompassed a total area of 4,244 ha. In addition to the characteristics listed above which apply to the project investigation area more broadly, the site boundary presented in the PEA was considered favourable for the project for a number of reasons, including:

- it is mostly flat with minimal slope across large sections of the three array areas;
- it has been modified by past disturbances associated with clearing, cropping and livestock grazing; and
- it incorporates a mix of large-scale and small-scale farms from within the local community, with high potential for continuation of sheep grazing activities during the project's operations, as well as continuation of farming activities on land in between the three array areas.

1.4.2 Project refinement

Since the submission of the PEA to DPE in April 2018, the design and location of the development footprint within the site boundary has undergone a number of significant revisions in response to ongoing stakeholder engagement, environmental constraints identification and engineering assessment.

Throughout the project refinement process, UPC has made considerable effort to avoid potential environmental impacts, where possible. In those instances where potential impacts cannot be avoided, UPC's design principles have sought to minimise environmental impacts and/or implement mitigation measures to manage the extent and severity of any residual environmental impacts. In addition to this design hierarchy, UPC has adopted a number of specific design principles to further inform the refinement of the development footprint within the site boundary presented as part of the PEA, including:

- minimising clearance of native vegetation;
- minimising surface disturbance requirements;
- avoidance of higher order watercourses and riparian corridors;
- minimising direct and indirect impacts on receptors and neighbouring agricultural operations; and
- avoidance of identified Aboriginal cultural and historic heritage items.

As illustrated in Figure 1.3 and described in Table 1.1, there have been a number of revisions to the PEA site boundary since the receipt of the SEARs in May 2018. The preliminary study area shown on Figure 1.3 was selected following the receipt of the SEARs and informed the extent of a number of the field surveys performed as part of the preparation of the EIS. In response to feedback received from nearby residents and to avoid sites identified during these field surveys, the refined study area was selected (refer Figure 1.3). Additional refinements to the refined study area were performed to avoid Aboriginal cultural heritage and historic heritage sites, resulting in the development footprint (refer Figure 1.3). As noted in Table 1.1, the development footprint represents the final extent of this EIS and DA. 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.

In addition to the refinements described above and in Table 1.1, a number of alternative arrangements have also been considered throughout the project refinement process for the placement of electricity transmission lines and access corridors to connect the three array areas, as well as the proposed footprints for substations and BESS infrastructure. UPC has adopted a flexible approach to design for this infrastructure to ensure that the final location can respond to identified environmental impacts and constraints.

A summary of the key environmental constraints considered as part of the project refinement process and selection of the development footprint is provided in Table 1.2.

Table 1.2 Matters considered during project refinement

Aspect	Matters considered and revisions undertaken
Biodiversity	Measures to avoid and minimise impacts to vegetation were considered during the project refinement process, resulting in avoidance of significant biodiversity values including woodland areas representative of PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion and PCT 507 Black Sallee – Snow Gum grassy woodland of the New England Tableland Bioregion. As part of the project refinement process, EMM Consulting Pty Ltd (EMM) provided advice to UPC on areas of PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion that were the highest priority for avoidance (ie those which had the largest patch size, highest density of trees remaining and the highest level of connectivity). This led to areas of PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion being avoided, particularly in the south-east of the southern array area and the north-east of the northern array area (refer Figure 1.6 and Figure 1.4, respectively). Refinements to the PEA site boundary have also excluded higher order streams from the development footprint. Most watercourses within the development footprint are ephemeral and have been extensively modified by the construction of dams and retentions banks. Refinements to the southern array area have also increased the distance between the development footprint and the closest wetland, Dangars Lagoon, which is approximately 4.2 km from the southern array area. The alignment of the ETL between the southern and central array areas has also been refined to avoid potential impacts to PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion. In addition, a key design principle within the project refinement process has been to maximise the placement of project infrastructure in cleared areas and, wherever possible, limit impacts to native vegetation of low quality only. All unavoidable impacts will be offset in accordance with NSW Government policy.
Aboriginal cultural heritage	Initial measures to avoid areas of archaeological sensitivity were made during the preparation of the PEA. This analysis focused on the implications of Aboriginal Heritage Information Management Information System (AHIMS) search results and a landscape review, including an accepted sensitivity model. This resulted in the selection of the site boundary presented as part of the PEA, which avoided higher order watercourses and a previously recorded Bora Ring site on AHIMS (#21-4-0002 – refer Figure 4.2 of Appendix D). Following the receipt of the SEARs, the preliminary study area (refer Figure 1.3) was selected. Significant refinements made during the progression from the PEA site boundary to the preliminary study area included: • refining the southern array area further away from Dangars Lagoon, a known area of Aboriginal archaeological and cultural significance; • establishing significant setbacks to third order and above watercourses within each of the three array areas; and • refining the southern array area away from land on the Harnham Hill soil landscape which is known to feature a significant quarry site referred to as 'Salisbury Court' on AHIMS (#21-4-0004). The preliminary study area was the subject of the archaeological survey effort as part of the Aboriginal cultural heritage assessment (ACHA). A clear way to emphasise the measures employed to minimise harm to sites of Aboriginal archaeological and cultural significance is to note that all 96 sites identified during the survey of the preliminary study area were previously within the proposed area of impact. Through the project refinement process, all sites of high significance and most sites of moderate significance have been avoided (refer Section 5.3). Only sites of low and moderate significance will be impacted by the project. Impacts to these sites will be managed as part of the Aboriginal heritage management plan (AHMP).

Table 1.2 Matters considered during project refinement

<table>
<tr><th>Aspect</th><th>Matters considered and revisions undertaken</th></tr>
<tr><td>Historic heritage</td><td> Initial measures to avoid areas of archaeological sensitivity, built heritage and other features of known or potential heritage significance were made during the preparation of the PEA. This analysis focused on Uralla LEP listed items including Gostwyck Memorial Chapel and Precinct (I10) and Deeargee Woolshed (I11) (refer Section 5.4).
Following the receipt of the SEARs, the preliminary study area (refer Figure 1.3) was selected. Significant refinements made during the progression from the PEA site boundary to the preliminary study area, including reductions to the extent of the southern and central array areas, reduced the area of the development footprint within the modern extent of Gostwyck Station (ie Lot 1 of DP 227322) by approximately 234 ha.
As a result of the field assessments performed during the preparation of the historic heritage assessment (HHA) and Statement of Heritage Impact (SoHI), refinements were made to the central and northern array areas to avoid potential impacts to:

HNE17 – Remnant shepherd's hut archaeological site (central array);
HNE36 – Saumarez Hut archaeological site (northern array); and
HNE 10 – Remnant house archaeological site (northern array).

The selection of the footprint for the solar array substation in the southern array area also considered potential visibility of this infrastructure from Gostwyck Memorial Chapel and Precinct and Deeargee Woolshed.
Specific management measures for historic heritage sites within the development footprint are described in Section 5.4. </td></tr>
<tr><td>Visual</td><td> In response to feedback received from neighbouring landholders and the local community during targeted engagement, significant revisions have been performed to greatly reduce the extent of the development footprint in the southern array area. This has reduced the level of impact on a number of receptors, including: S1, S2, S3, S4, S5, S6, S7, S9, S10, S12 and S13. As part of this refinement process, an area of approximately 585 ha north of Salisbury Waters has been excluded from the development footprint for the southern array area (refer Figure 1.3). In addition, approximately 40 ha of land south of Salisbury Waters, adjacent to S9, has also been excluded from the southern array area, thereby increasing the buffer between S9 and the development footprint from approximately 50 m to approximately 240 m.
In addition, due to proximity to residences along Heathersleigh Road, Corey Road, Burns Road and Hariet Gully Road, the results of a preliminary viewshed analysis and targeted engagement with N1, significant revisions have also been made to the northern extent of the northern array area to increase the distance between the development footprint and neighbouring residences. As part of this refinement, an area of approximately 315 ha has been excluded from the development footprint for the northern array area (refer Figure 1.3).
Further to the significant refinements performed to date, as part of the detailed design stage of the project, project infrastructure including substations and BESSs will be positioned within the development footprint with a view to minimising or avoiding visual amenity impacts on nearby residences where practicable. </td></tr>
</table>

Table 1.2 Matters considered during project refinement

Aspect	Matters considered and revisions undertaken
Land use	An area identified by Geological Survey of NSW (GSNSW) – Division of Resources and Geosciences (DRG) as an area of higher mineral significance has been removed from the southern array area. Approximately 1,100 ha of land within the PEA site boundary is mapped as biophysical strategic agricultural land (BSAL) as defined by Strategic Agricultural Land Map – New England North West regional mapping presented in State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (the Mining SEPP). Significant reductions to the extent of the northern and southern array areas have reduced the extent of BSAL within the development footprint for the three array areas by 40% to approximately 670 ha (refer Figure 5.5). In consultation with one of the project landholders, refinements have been performed to the central array area to avoid an area prone to soil erosion. UPC has designed the project to minimise impacts on agricultural land, wherever possible. In addition, as part of the land use conflict risk assessment (LUCRA) (refer Appendix F), impacts to neighbouring agricultural operations have also been considered. Engagement with the project landholders has enabled consideration of a range of potential land uses over the life of the project, and consideration of the value of agricultural production on the land to the landholders, compared to utilising the land for solar power generation. The project landholders will benefit from an alternative source of income throughout the life of the project. Where possible, project landholders have maintained ownership over land parcels of higher agricultural productivity and the development footprint has been amended accordingly.
Noise	Potential noise impacts during construction and operation and proximity to surrounding residences. Significant revisions have been made to the northern extent of the northern array area and the southern array area to increase the distance between the development footprint and neighbouring residences, wherever possible. As part of the detailed design process, potential noise-generating infrastructure (including substations and BESSs) will be positioned within the development footprint with a view to maximising distance between this infrastructure and nearby residences where practicable.
Traffic and transport	Proximity to, and capacity of, the local and regional road network and ability to transport the necessary infrastructure to the array areas and resource the workforce demand during construction. Construction traffic movements to and from the southern array area will not turn directly on to The Gap Road from Thunderbolts Way and will be required to travel along Salisbury Plains Road before turning left on to The Gap Road.
Water	The development footprint has been designed to minimise impacts on watercourses within the three array areas and their surrounds. In a number of instances, the irregular shape of the three array areas is a result of avoidance of higher order watercourses (refer Figure 1.3). The development footprint provides appropriate setbacks from all third order streams and higher. Project refinements have also reduced the number of creek crossings required for as part of the project's internal access tracks. Flood modelling outputs resulted in refinements being applied to the boundary of the southern array area that lies adjacent to Salisbury Waters (refer Section 5.10). The majority of first and second order watercourses within the development footprint have no discernible channel. Nonetheless, the placement of project infrastructure within the development footprint will avoid first and second order streams, where possible.
Hazards and risks	The *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields* (ICNIRP 1998) were considered in the placement of project infrastructure, including substations, connection infrastructure, electricity transmission lines (ETLs) and BESSs. The location of potentially hazardous infrastructure within the development footprint has been informed by proximity to nearby residences, where practicable.

Table 1.2 Matters considered during project refinement

Aspect	Matters considered and revisions undertaken
Socio-economic	Proximity to two of the New England North West region's regional cities (ie Armidale and Tamworth), as well as Uralla and subsequent availability of local businesses, services, and a local labour force.
Preferred technology	The project is likely to utilise single axis tracking technology in combination with high watt-rated PV modules. This technology would increase the energy density of the three array areas and reduce the ground coverage ratio. When compared with fixed tilt and lower watt-rated PV module technology, the use of this technology will allow the project to utilise considerably less area within the development footprint for the same MW generating capacity. It is anticipated that the ground coverage ratio will be approximately 30-40%.

1.4.3 Site features and identified constraints

As identified in Table 1.2, UPC has actively sought to identify and avoid environmental constraints as part of the project development, which has resulted in continual refinement of the project boundary and development footprint (Figure 1.3). This process has involved UPC's team working closely with EMM, project landholders, neighbouring residents and the local community to:

- complete site inspections, surveys and desktop review to map potential environmental and land use constraints;
- assess the significance of potential constraints; and
- identify opportunities to avoid constraints where required.

Detailed technical environmental investigations have identified environmental and land use constraints that have informed the site selection process, development footprint and infrastructure layout. Identified site features are provided in Figure 1.4 (northern array), Figure 1.5 (central array) and Figure 1.6 (southern array). The key environmental and other land use constraints that have informed the selection of the development footprint include:

- sites previously recorded on AHIMS;
- Aboriginal cultural heritage sites identified during archaeological surveys;
- historic heritage sites identified during archaeological surveys;
- items of local heritage significance listed under Schedule 5 of the Uralla Local Environmental Plan 2012 (Uralla LEP);
- native vegetation mapped during biodiversity surveys (including scattered paddock trees and planted wind breaks);
- location of receptors (ie dwellings);
- location of higher order watercourses and drainage lines;
- Crown land (including Crown roads and waterways);
- areas of higher mineral significance;

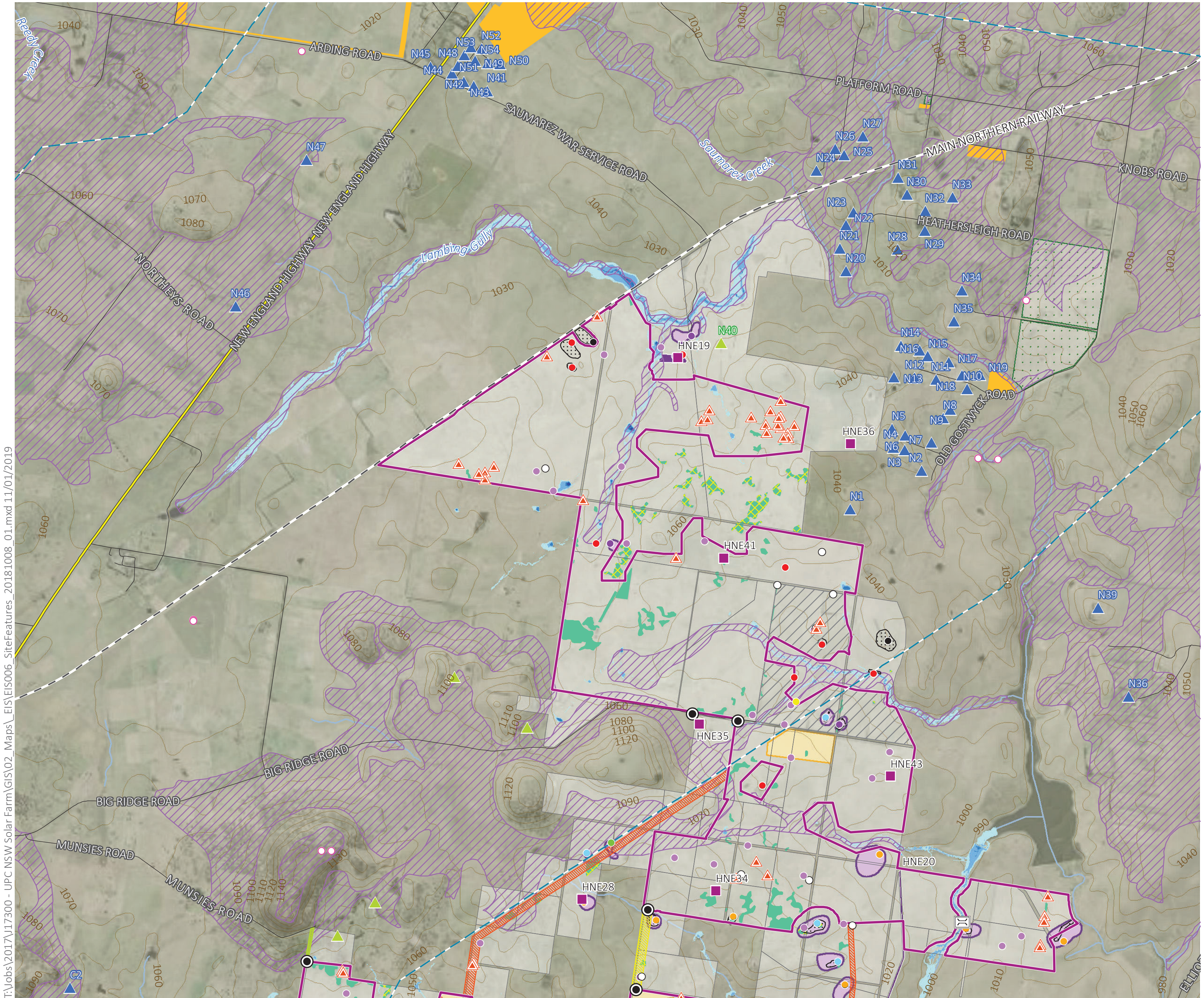
- areas mapped as BSAL under the Mining SEPP; and
- areas with potential flooding depths of greater than 300 mm during a 1% AEP event (ie 1 in 100 year flood) based on the results of modelled flood extents (primarily adjacent to Salisbury Waters).

Major and local roads, transport infrastructure and existing ETLs have also been identified on Figure 1.4, Figure 1.5 and Figure 1.6.

1.4.4 Land use

The land in the development footprint is zoned RU1 Primary Production under the Uralla LEP and is predominantly used for agricultural purposes. The project boundary presented on Figure 1.2 encompasses 61 lots (refer Table 2.1), 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.

As noted within Table 1.2, parts of the development footprint are mapped as BSAL as defined by Strategic Agricultural Land Map – New England North West regional mapping presented in the Mining SEPP (refer Figure 1.4, Figure 1.5 and Figure 1.6). As part of the project refinement process, the area within the development footprint that is mapped as BSAL has reduced from approximately 1,100 ha (within the PEA site boundary) to approximately 670 ha (within the development footprint for the three array areas presented on Figure 1.4, Figure 1.5 and Figure 1.6), which represents a reduction of 40%.



Source: EMM (2018); DFSI (2017); DPE (2017); LPI (2018); UPC (2018)

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0 1 2 km

GDA 1994 MGA Zone 56

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Contour (10 m)
- Watercourse/drainage line
- Project boundary

Development footprint
- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential site for construction accommodation village
- Potential substation/BESS footprint
- Potential creek crossing
- Proposed primary site access point

Heritage
- LEP historic heritage listing
- Historic heritage buffer
- Aboriginal heritage site
- Potential Archaeological Deposit (PAD)
- Historic heritage survey item
- AHIMS

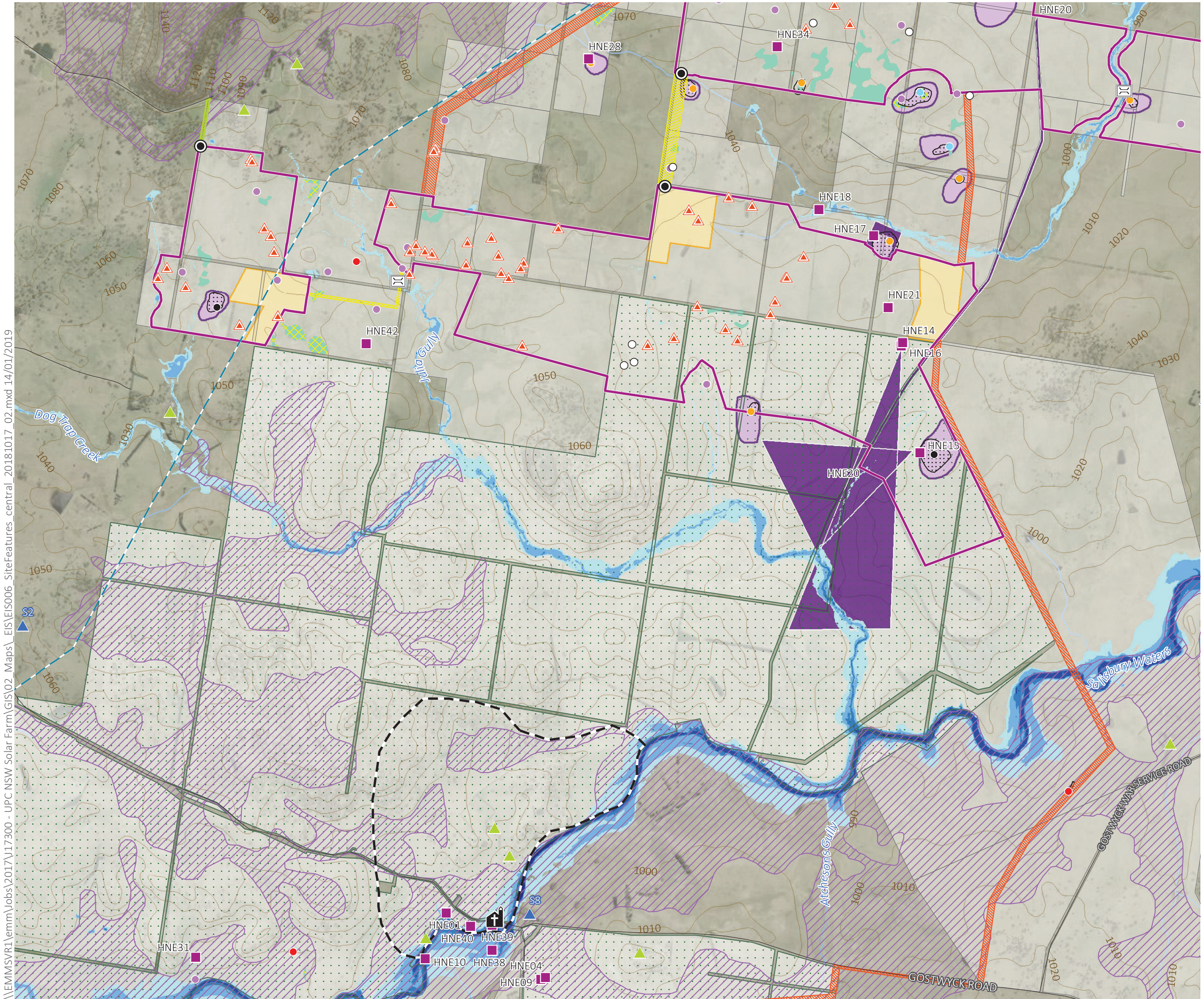
Aboriginal heritage survey - Site type
- Artefact scatter
- Artefact scatter, PAD
- Grinding groove
- Grinding groove, PAD
- Grinding groove, artefact scatter, PAD
- Isolated find
- Isolated find, PAD
- Quarry, artefact scatter, PAD
- Scarred tree
- Biophysical strategic agricultural land
- Crown land

Plant community type
- PCT 510 woodland
- PCT 510 woodland avoidance
- Paddock trees
- Non-project related sensitive receptor
- Project-related sensitive receptor

Potential flooding depths > 300 mm
- 0.3 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 5.0 m

Site features - northern array

New England Solar Farm
Environmental impact statement
Figure 1.4



Source: EMM (2018); DFSI (2017); DPE (2017); LPI (2018); UPC (2018)

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KEY

- 330 kV transmission line
- Local road
- Contour (10 m)
- Watercourse/drainage line
- Project boundary

Development footprint

- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential substation/BESS footprint
- Potential creek crossing
- Proposed primary site access point

Heritage

- LEP historic heritage listing
- Historic heritage buffer
- Aboriginal heritage site
- Potential Archaeological Deposit (PAD)
- Historic heritage survey item
- Chapel
- Gostwyck Memorial Chapel Precinct

Aboriginal heritage survey - Site type

- Artefact scatter
- Artefact scatter, PAD
- Grinding groove, artefact scatter, PAD
- Isolated find
- Quarry, artefact scatter, PAD
- Scarred tree
- Biophysical strategic agricultural land

Plant community type

- PCT 510 woodland
- PCT 510 woodland avoidance
- Paddock trees
- Non-project related sensitive receptor
- Project-related sensitive receptor

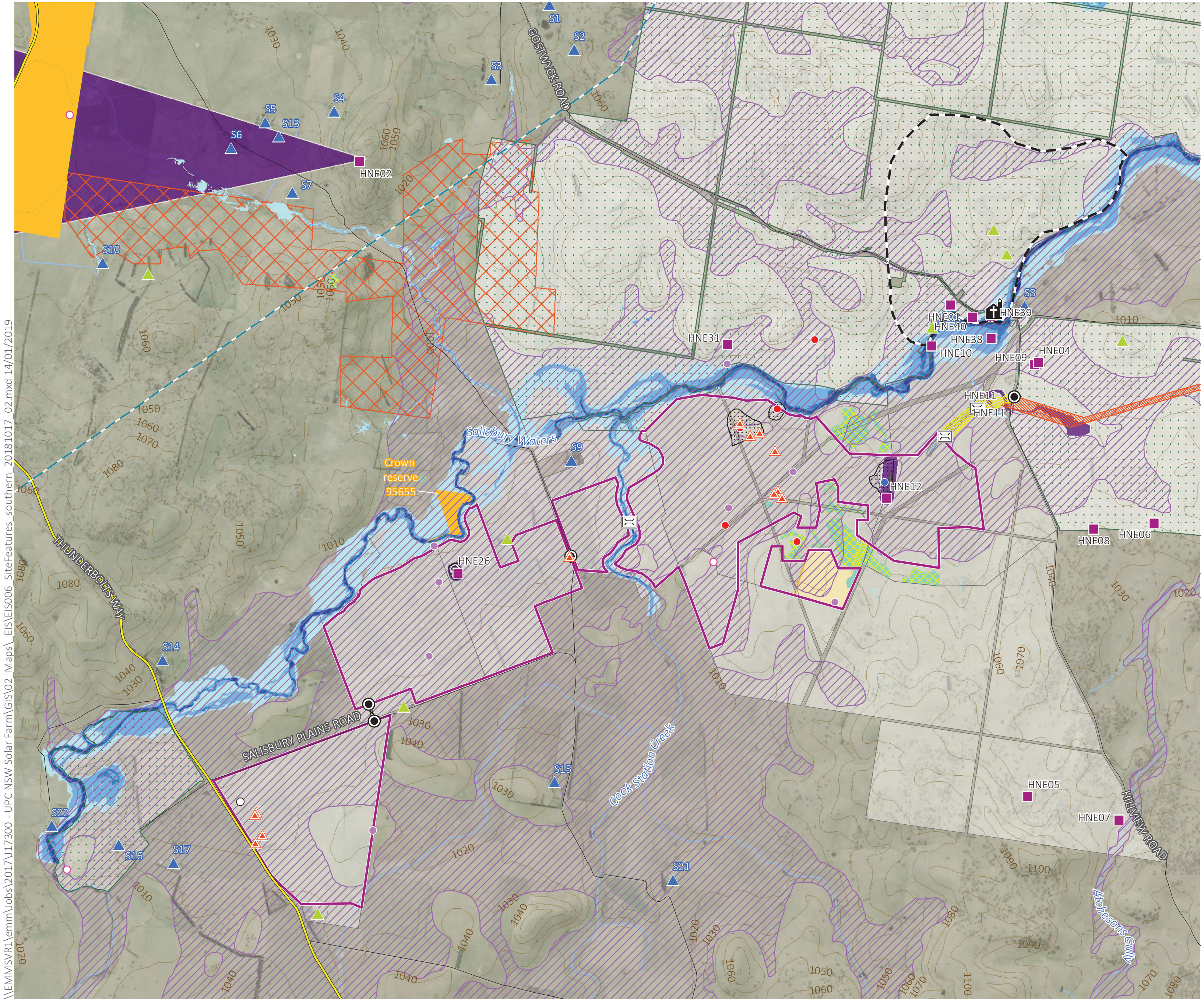
Potential flooding depths > 300 mm

- 0.3 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 5.0 m
- 5.0 - 10.0 m

Site features - central array

New England Solar Farm
Environmental impact statement
Figure 1.5

creating opportunities



KEY

- 330 kV transmission line
- Main road
- Local road
- Contour (10 m)
- Watercourse/drainage line
- Project boundary

Development footprint
- Solar array
- Potential ETL easement
- Potential site access/ETL easement
- Potential electrical cabling/site access corridor
- Potential substation/BESS footprint
- Potential creek crossing
- Proposed primary site access point

Heritage
- LEP historic heritage listing
- Historic heritage buffer
- Aboriginal heritage site
- Potential Archaeological Deposit (PAD)
- Historic heritage survey item
- Chapel
- Gostwyck Memorial Chapel Precinct
- AHIMS

Aboriginal heritage survey - Site type
- Artefact scatter
- Historical site - unverified
- Isolated find
- Quarry, artefact scatter, PAD
- Scarred tree
- Biophysical strategic agricultural land
- Crown land
- Area of higher mineral significance

Plant community type
- PCT 510 woodland
- PCT 510 woodland avoidance
- Paddock trees
- Non-project related sensitive receptor
- Project-related sensitive receptor

Potential flooding depths > 300 mm
- 0.3 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 5.0 m
- 5.0 - 10.0 m

Site features - southern array

New England Solar Farm
Environmental impact statement
Figure 1.6

EMM
creating opportunities

Source: EMM (2018); DFSI (2017); DPE (2017); LPI (2018); UPC (2018); DRG (2018)

0 1 2 km
GDA 1994 MGA Zone 56
N

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1.5 Alternatives

1.5.1 'Do nothing'

The 'do nothing' scenario would prohibit the potential project benefits including:

- production of renewable energy;
- creation of employment opportunities;
- direct and indirect benefits to the local and regional economy;
- diversification of local revenue streams;
- faster achievement of State and Commonwealth RETs and GHG reductions; and
- increased energy security.

1.5.2 Alternative technology

Under the guidance of the NSW Renewable Energy Action Plan (REAP), renewable energy is predicted to grow and make important contributions to the NSW economy. As noted within the REAP, NSW has excellent renewable energy resources and is suitable for a number of different renewable energy technologies, including, hydroelectricity, wind, PV solar, solar thermal, bioenergy, geothermal and wave and tidal energy projects (NSW Government 2013). Aligning with the *New England North West Regional Plan 2036* (NSW Government 2017) and the vision for accelerated renewable energy development in the region, the New England region has also been identified by AEMO in the *Integrated System Plan Consultation* (AEMO 2017) as having high potential for a renewable energy zone (REZ).

UPC's experience in the development of renewable energy across the world, supports the decision to develop a large-scale solar PV energy project within the Uralla Shire LGA. At the chosen location, a solar PV facility is considered to be more viable from a planning and environment perspective and will be able to be brought to market faster than a wind farm project, which is considered to be the only viable alternative given current technology costs and availability of debt and equity finance.

1.5.3 Alternative locations and configurations

Alternative locations were considered by UPC as part of the site identification process described in Section 1.4.1. The New England region was selected due to its suitability for large-scale solar PV and relatively lower level of large scale solar PV development compared with other suitable regions. UPC also considered areas west of the New England Highway and north of the township of Uralla. Due to less favourable topography, high levels of remnant vegetation and higher concentration of small-acre residential blocks, these areas were considered to be less suitable than the initial project investigation area for a large-scale solar development (refer Figure 1.3).

As noted in Section 1.4.1, the project investigation area was the subject of planning and environmental constraints analyses, which identified the key risks and constraints to the project based on preliminary design considerations, the planning and assessment framework and the environment both within and surrounding the project investigation area. The results of these analyses informed the basis for subsequent surveys and assessment.

Subsequent biodiversity field surveys, preliminary Aboriginal cultural and historical heritage assessments and consultation with regulatory, industry and community stakeholders further informed the site selection process and resulted in the site boundary presented as part of the PEA.

Since the submission of the PEA, the design and location of the development footprint within the site boundary has undergone a number of significant revisions in response to ongoing stakeholder engagement, environmental constraints identification and engineering assessment. The development footprint reflects the most appropriate area for the project infrastructure based on functional requirements and the environmental assessments undertaken to date.

1.6 Purpose of report

This EIS accompanies a DA for the project under Part 4 of the EP&A Act and NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) and addresses the SEARs (Appendix A) and matters raised during engagement with stakeholders. As noted within the SEARs (Appendix A), UPC is seeking development consent for the New England Solar Farm, which includes:

- the construction and operation of photovoltaic energy facility with an estimated capacity of up to 800 MW;
- development of associated infrastructure, including a substation and battery storage facilities; and
- a temporary construction accommodation facility.

This EIS has been prepared by EMM on behalf of UPC.

1.7 Secretary's environmental assessment requirements

As required under Section 4.12 of the EP&A Act, this EIS has been prepared to address the SEARs for the project, which were issued by the Director Resource and Energy Assessments (as nominee of the Secretary of DPE) on 8 May 2018 (reference SSD 9255).

Revised SEARs were issued for the project on 11 October 2018 in response to UPC's request for a revision to the project description to include a temporary construction accommodation village (should it be required). The revised SEARs are provided in Appendix A.

The revised SEARs and where they are addressed in this EIS are summarised in Table 1.1 (revisions to the SEARs are highlighted in **bold** text).

Table 1.3 Secretary's environmental assessment requirements

Assessment requirements	Reference in EIS
General requirements	
The Environmental Impact Statement (EIS) for the development must comply with the requirements in Schedule 2 of the Environmental Planning and Assessment Regulation 2000.	
• a stand-alone executive summary	Executive summary
• a full description of the development, including: – details of construction, operation and decommissioning; – a site plan showing all infrastructure and facilities (including any infrastructure that would be required for the development, but the subject of a separate approvals process); and – a detailed constraints map identifying the key environmental and other land use constraints that have informed the final design of the development.	Chapter 2 Note: Constraints maps provided in Chapter 1 (refer Figure 1.4, 1.5 and 1.6.
• a strategic justification of the development focusing on site selection and the suitability of the proposed site with respect to potential land use conflicts with existing and future surrounding land uses (including other proposed or approved solar farms, rural residential development and subdivision potential);	Section 3.1 Section 7.2
• an assessment of the likely impacts of the development on the environment, focusing on the specific issues identified below, including: – a description of the existing environment likely to be affected by the development; – an assessment of the likely impacts of all stages of the development (which is commensurate with the level of impact), including any cumulative impacts of the site and existing or proposed developments (including the approved Metz solar project), taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice; – a description of the measures that would be implemented to avoid, mitigate and/or offset the impacts of the development (including draft management plans for specific issues as identified below); and – a description of the measures that would be implemented to monitor and report on the environmental performance of the development;	Chapter 5 Note: Consideration of cumulative impacts provided in Section 5.16.
• a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS;	Chapter 6
• the reasons why the development should be approved having regard to: – relevant matters for consideration under the EP&A Act, including the objects of the Act and how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the development; – the suitability of the site with respect to potential land use conflicts with existing and future surrounding land uses; and – feasible alternatives to the development (and its key components), including the consequences of not carrying out the development.	Chapter 7
• a detailed consideration of the capability of the project to contribute to the security and reliability of the electricity system in the National Electricity Market, having regard to local system conditions and the Department's guidance on the matter.	Section 3.1.2
• the EIS must also be accompanied by a report from a suitably qualified person providing: – a detailed calculation of the capital investment value (CIV) (as defined in clause 3 of the Regulation) of the proposal, including details of all assumptions and components from which the CIV calculation is derived; and – certification that the information provided is accurate at the date of preparation.	Provided separate to the EIS
• the development application must be accompanied by the consent in writing of the owner/s of the land (as required in clause 49 (1)(b) of the Regulation).	Provided separate to the EIS

Table 1.3 Secretary's environmental assessment requirements

Assessment requirements	Reference in EIS
Biodiversity	
• an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the *Biodiversity Conservation Act 2016 (NSW)* the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless OEH and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values;	Section 5.2 Appendix C
• the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM; and	Section 5.2 Appendix C
• an assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the *Fisheries Management Act 1994*, and a description of the measures to minimise and rehabilitate impacts.	Section 5.2 Appendix C Note: Potential impacts to surface water resources also considered in Section 5.9 and Appendix H.
Heritage	
• an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.	Section 5.3 and Appendix D (Aboriginal cultural heritage) Section 5.4 and Appendix E (historic heritage)
Land	
• an assessment of the impact of the development on agricultural land (including possible cumulative impacts on agricultural enterprises and landholders) and flood prone land, an assessment of any impacts to Crown lands (including Crown Reserve 95655), a soil survey to consider the potential for erosion to occur, and paying particular attention to the compatibility of the development with the existing land uses on the site and adjacent land (eg operating mines, extractive industries, mineral or petroleum resources, exploration activities, aerial spraying, dust generation, and biosecurity risk) during operation and after decommissioning, with reference to the zoning provisions applying to the land, including subdivision;	Section 5.5 (land) Section 5.9 (water) Appendix G Appendix H
• an assessment of potential land use conflicts, including completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's *Land Use Conflict Risk Assessment Guide*; and	Section 5.5 Appendix F
• measures to remediate the land following decommissioning in accordance with State Environmental Planning Policy No 55 - Remediation of Land.	Section 3.2.1 Section 5.6
Visual	
• an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences **(including the Sunhill Dairy Goats property)**, scenic or significant vistas, air traffic and road corridors in the public domain; and	Section 5.6 Appendix I
• a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners.	Figure 4.2 of Appendix I

Table 1.3 Secretary's environmental assessment requirements

Assessment requirements	Reference in EIS
Noise	
• an assessment of the construction noise impacts and cumulative impacts of the development in accordance with the *Interim Construction Noise Guideline* (ICNG) and operational noise impacts in accordance with the *NSW Noise Policy for Industry* (NPI); and	Section 5.7 Appendix J
• a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria.	Refer Section 5.7 for proposed management measures to mitigate potential construction noise impacts.
Transport	
• an assessment of the site access route (including **Barleyfields Road**, Big Ridge Road, Saumarez War Service Road, Munsies Road, Elliots Road, The Gap Road, Carlon Menzies Road, Gostwyck Road, Hillview Road, Salisbury Plains Road, Thunderbolts Way and the New England Highway), site access points, rail safety issues (including the adjacent Main Northern Railway) and likely transport impacts (including peak and average traffic generation, over-dimensional vehicles and construction worker transportation) of the development on the capacity and condition of roads (including on any Crown land);	Section 5.8 Appendix K
• a description of the measures that would be implemented to mitigate any impacts during construction (including cumulative impacts from nearby developments); and	Section 5.8 Appendix K
• a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required).	Section 5.8 Appendix K
Water	
• an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Salisbury Waters, Cook Station Creek, Saumarez Creek, Dog Trap Gully, Atchesons Gully, Julia Gully, Lambing Gully, Dangars Lagoon, Racecourse Lagoon, drainage channels, wetlands, riparian land, farm dams, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts;	Section 5.9 Appendix H
• details of water requirements and supply arrangements for construction and operation; and	Section 5.9 Appendix H
• a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004).	Section 5.5 Appendix G Section 5.9 Appendix H
Hazards and Risks	
• a preliminary risk screening in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and *Applying SEPP 33* (DoP 2011a), and if the preliminary risk screening indicates the development is "potentially hazardous", a Preliminary Hazard Analysis (PHA) must be prepared in accordance with *Hazard Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis* (DoP 2011b) and *Multi-Level Risk Assessment* (DoP 2011c); and	Section 5.10 Appendix L
• an assessment of potential hazards and risks including but not limited to bushfires, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure (including the proposed transmission line and substations) against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) *Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields*.	Section 5.10 Appendix L Section 5.11 Appendix M

Table 1.3 Secretary's environmental assessment requirements

Assessment requirements	Reference in EIS
Socio-Economic	
• an assessment of the likely impacts social and economic impacts of the development (including the workers accommodation facility), paying particular attention to the: – **local community;** – **demand for the provision of local infrastructure and services; and** – **benefits of the development for the State and region.**	Section 5.12 and Appendix N (social) Section 5.13 and Appendix O (economic)
Waste	
• **identify, quantify and classify the likely waste stream to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.**	Section 5.15
Consultation	
• During the preparation of the EIS, consultation is required with relevant local, State or Commonwealth Government authorities, infrastructure and service providers, community groups, affected landowners, exploration licence holders, quarry operators and mineral title holders; • In particular, you must undertake detailed consultation with affected landowners surrounding the development and Uralla Shire Council; and • The EIS must describe the consultation process and the issues raised, and identify where the design of the development has been amended in response to these issues. Where amendments have not been made to address an issue, a short explanation should be provided.	Chapter 4 Appendix B

1.8 Structure of the EIS

This EIS consists of the main EIS document and supporting appendices and is structured as follows:

- Chapter 1 – Introduction

  Provides an introduction to the project, including an overview of the project, the proponent and project objectives, information about the project history (including site selection and project refinement), alternatives considered during the site selection and project design process, the purpose and structure of this EIS and the SEARs.

- Chapter 2 – Project description

  Provides a detailed outline of the project.

- Chapter 3 – Strategic and statutory context

  Provides strategic justification in the context of Commonwealth and State Government policies, initiatives and regional plans and information on the legislative framework and approval process for the project under relevant legislation and environmental planning instruments.

- Chapter 4 – Engagement

  Provides an overview of stakeholder engagement activities undertaken for the project and a summary of the results of this engagement.

- Chapter 5 – Environmental impact assessment

  Provides an assessment of the likely impacts of the project, including consideration of management measures to be implemented.

- Chapter 6 – Mitigation measures

  Provides a summary of the management and mitigation measures.

- Chapter 7 – Evaluation and conclusion

  Provides a justification for the project.

- Appendices

  The appendices to the EIS which support the main document, including copies of all technical assessments.

  - Appendix A – SEARs;
  - Appendix B – Stakeholder engagement materials;
  - Appendix C – Biodiversity development assessment report (BDAR);
  - Appendix D – Aboriginal cultural heritage assessment report (ACHAR);
  - Appendix E – Historic heritage assessment and statement of heritage impact (HHA and SoHI);
  - Appendix F – Land use conflict risk assessment (LUCRA);
  - Appendix G – Soil erosion assessment (SEA);
  - Appendix H – Surface water assessment (SWA);
  - Appendix I – Visual impact assessment (VIA);
  - Appendix J – Noise and vibration impact assessment (NVIA);
  - Appendix K – Traffic impact assessment (TIA);
  - Appendix L – Hazards and risks assessment;
  - Appendix M – Bushfire hazard assessment (BHA);
  - Appendix N – Social impact assessment (SIA); and
  - Appendix O –Economic impact assessment (EIA).

2 Project description

2.1 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 provided on Figure 2.1 and Figure 2.2 incorporates the land required for:

- the three solar array areas;
- up to three internal solar array substations and a single grid substation;
- 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 three array areas (including ETLs and underground or overhead cabling); and
- a new internal road network to enable access from surrounding local roads to the three array areas during construction and operations.

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

During the preparation of the EIS, the development footprint within the project boundary has been refined on the basis of environmental constraints identification, stakeholder engagement, community consultation and design of project infrastructure with the objective of developing an efficient project that avoids and minimises environmental impacts (refer Section 1.4).

The project will have a targeted 'sent out' electricity generating capacity of up to 720 MW (AC) and up to 200 MW (AC) two-hour energy storage. The final number of PV modules within the three 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 (refer Figure 2.1 and Figure 2.2). There are two options for the project layout currently under consideration, incorporating connection to the grid via a new grid substation to be constructed within either the northern or central array.

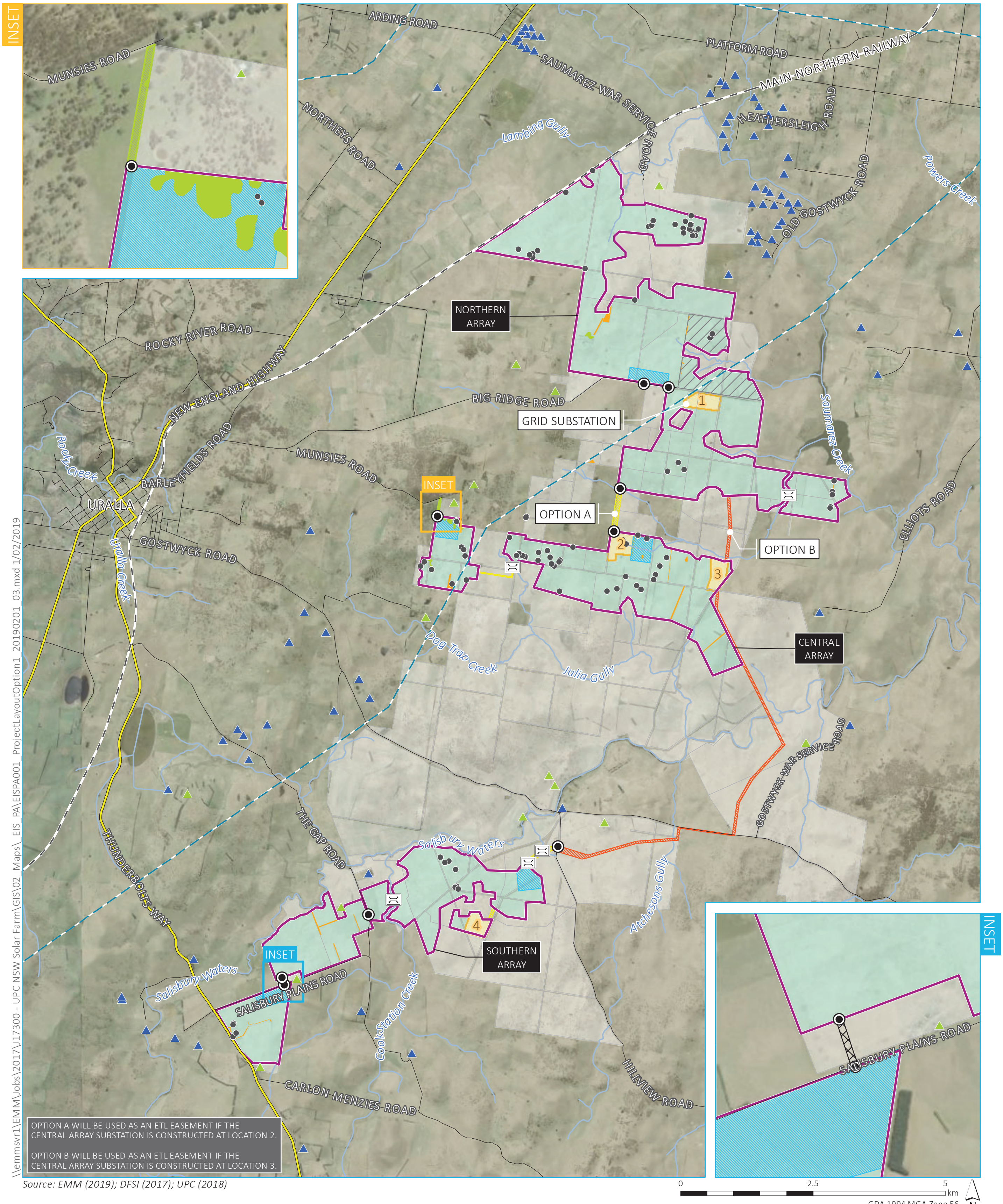
i Option 1

Figure 2.1 presents Option 1, which assumes the grid substation will be constructed in the northern array area. Should the grid substation be constructed within the northern array area (referred to as Location 1 on Figure 2.1), the substation within the central array will be constructed in one of two potential locations (referred to as Locations 2 and 3 on Figure 2.1). Should the central array substation be constructed at Location 2, the electricity transmission line corridor labelled 'Option A' will be used to connect the central array substation to the grid substation in the northern array area. Should the central substation be constructed at Location 3, the electricity transmission line corridor labelled 'Option B' will be used to connect the central substation to the grid substation in the northern array area.

ii Option 2

Figure 2.2 presents Option 2, which assumes the grid substation will be constructed in the central array area. Should the grid substation be constructed within the central array area (referred to as Location 2 on Figure 2.2), the northern array substation will be constructed at Location 1 (refer Figure 2.2).

Further details about the proposed solar array substations and network connection are provided in Section 2.3.2 and Section 2.3.3, respectively.



Source: EMM (2019); DFSI (2017); UPC (2018)

KEY

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

Development footprint

- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential laydown area / site compound
- Potential substation/BESS footprint (location number)
- Potential electrical cabling/site access corridor
- Potential creek crossing
- Proposed primary site access point
- Potential site for construction accommodation village

Plant community types requiring offsets

- PCT 510 planted
- PCT 1174 woodland
- Paddock trees requiring offsets

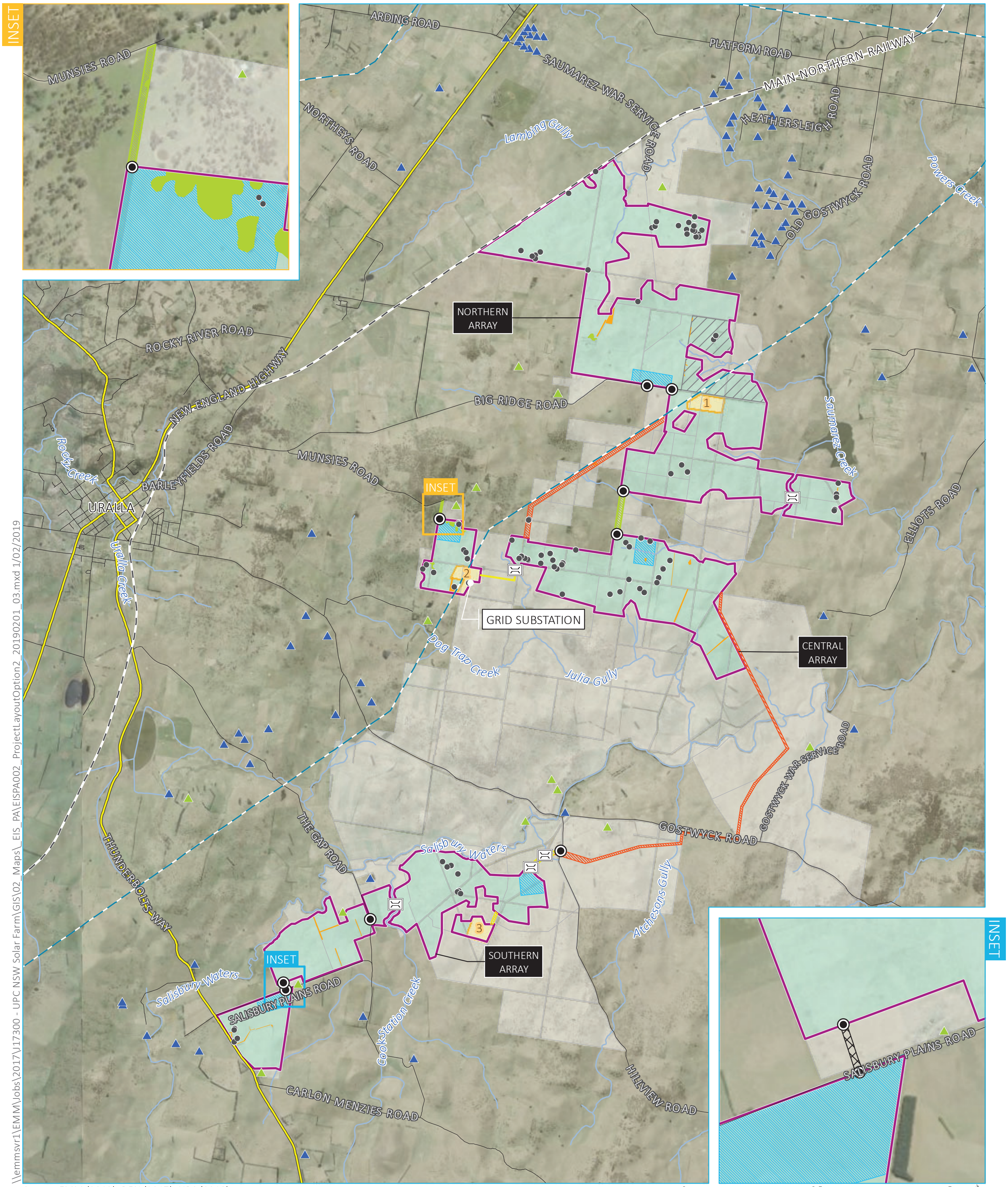
Sensitive receptors

- Associated
- Non-associated

Project layout - option 1

New England Solar Farm
Environmental impact statement
Figure 2.1

creating opportunities



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Source: EMM (2019); DFSI (2017); UPC (2018)

0 2.5 5 km

GDA 1994 MGA Zone 56

N

KEY

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

Development footprint
- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential laydown area / site compound
- Potential substation/BESS footprint (location number)
- Potential electrical cabling/site access corridor

- Potential creek crossing
- Proposed primary site access point
- Potential site for construction accommodation village

Plant community types requiring offsets
- PCT 510 planted
- PCT 1174 woodland
- Paddock trees requiring offsets

Sensitive receptors
- Associated
- Non-associated

Project layout - option 2

New England Solar Farm
Environmental impact statement
Figure 2.2

EMM
creating opportunities

2.2 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 (refer to Figure 1.1).

The project boundary, consisting of the full extent of the involved landholder lots, encompasses a total area of 8,380 ha. The project boundary intersects land legally described and identified in Table 2.1 and Figure 2.3. Based on the current design and lease agreements between UPC and the project landholders, no subdivision is proposed on the lots identified within Table 2.1 with the exception of land required for the grid substation (refer to Section 2.3.3 and Table 2.3).

A number of Crown roads are located in the project boundary, which are currently either subject to closure or will be closed as required in consultation with the NSW Department of Industry – Lands & Water (DoI Lands and Water) in parallel with the planning assessment and approval process for the project. Portions of Salisbury Waters in the vicinity of the project are Crown waterway; however, no project infrastructure is proposed to cross Salisbury Waters, with the exception of the proposed ETL alignment to connect the southern and central array areas, the proposed location of which is not mapped as Crown waterway. Refer Section 5.5.2 for further discussion.

Table 2.1 Involved lots within the project boundary

Project infrastructure component	Lot	Deposited plan (DP)	Label (refer Figure 2.3)
Northern - PV module array	2	DP567937	1
Northern - PV module array	79	DP755814	7
Northern - PV module array	89	DP755827	11
Northern - PV module array	103	DP755827	12
Northern - PV module array	101	DP755827	13
Northern - PV module array	102	DP755827	14
Northern - PV module array	90	DP755827	15
Northern - PV module array	91	DP755827	17
Northern - PV module array Central - Potential ETL easement	92	DP755827	21
Northern - PV module array	4	DP172594	28
Northern - PV module array	B	DP172594	29
Northern - PV module array	78	DP755814	30
Northern - PV module array	84	DP755814	31
Northern - PV module array	83	DP755814	32
Northern - PV module array	2	DP127777	37
Northern - PV module array	1	DP127777	38
Northern - PV module array	39	DP755827	39
Northern - PV module array	38	DP755827	40
Northern - PV module array	5	DP127777	41
Northern - PV module array	1	DP405515	42

Table 2.1 Involved lots within the project boundary

Project infrastructure component	Lot	Deposited plan (DP)	Label (refer Figure 2.3)
Northern - PV module array	37	DP755827	43
Northern - PV module array	221	DP755814	46
Northern - PV module array Northern – Proposed site for construction accommodation village (should it be required)	2	DP174053	48
Northern - PV module array Central - Potential ETL easement	6	DP172594	52
Northern - PV module array	21	DP1167870	58
Northern - PV module array	23	DP1171290	59
Northern - PV module array	24	DP1171290	60
Central - Potential ETL easement	82	DP755814	2
Central - Potential ETL easement	202	DP755814	8
Central - Potential ETL easement	109	DP755827	9
Central - Potential ETL easement	111	DP755827	18
Central - Potential ETL easement	110	DP755827	19
Central - Potential ETL easement	93	DP755827	20
Central - Potential ETL easement	98	DP755827	22
Central - Potential ETL easement Central - PV module array	122	DP755827	23
Central - Potential ETL easement	80	DP755814	33
Central - Potential ETL easement	97	DP755827	36
Central - Potential ETL easement Central - PV module array	8	DP173619	50
Central - Potential site access/ETL easement Central - PV module array	183	DP755827	5
Central - Potential site access/ETL easement	108	DP755827	10
Central - Potential site access/ETL easement	113	DP755827	16
Central - Potential site access/ETL easement Central - PV module array	181	DP755827	34
Central - PV module array	154	DP755827	6
Central - PV module array	123	DP755827	24
Central - PV module array	125	DP755827	25
Central - PV module array	124	DP755827	26
Central - PV module array	126	DP755827	27
Central - PV module array	182	DP755827	35
Central - PV module array	296	DP755827	44

Table 2.1 Involved lots within the project boundary

Project infrastructure component	Lot	Deposited plan (DP)	Label (refer Figure 2.3)
Central - PV module array	1	DP227322	49
Southern - Potential ETL easement	201	DP755827	4
Southern - Potential ETL easement	237	DP755835	47
Southern - Potential ETL easement	3	DP1122757	54
Southern - Potential ETL easement Southern - Potential site access/ETL easement Southern - PV module array	2	DP1122757	55
Southern - Potential ETL easement	1	DP1206278	61
Southern - Potential site access/ETL easement Southern - PV module array	1	DP1122757	56
Southern - Potential electrical cabling/site access corridor Southern - PV module array	142	DP1135106	57
Southern - PV module array	2	DP11311	3
Southern - PV module array	214	DP755836	45
Southern - PV module array	2	DP1018290	51
Southern - PV module array	6	DP1122757	53

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 Chapter 5 and supporting technical assessments). The development footprint encompasses a total area of 2,787 ha, which includes 1,418 ha within the northern array area; 625 ha within the central array area; and 653 ha within the southern array area. Within the development footprint, approximately 1,000 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 three array areas as well as land required for new internal roads to enable access to the three 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.

Based on the targeted generating capacity for the project (ie 720 MW) it is not anticipated that the development footprint in its entirety (ie 2,787 ha) will be required. This area provides enough flexibility for UPC to respond to any further constraints identified during detailed design. For example, detailed geotechnical investigations could identify specific areas that are not suitable for the installation of PV modules.

Within the development footprint for the southern array area, a right of carriageway exists over Lot 142 of DP 1135106 (refer Figure 2.4). The right of carriageway is 10 m in width and extends over Lot 142 of DP 1135106 from Salisbury Plains Road in the south to Lot 141 of DP 1135106 in the north. UPC will continue to consult with the landholder of Lot 141 of DP 1135106 during the detailed design stage of the project. To avoid impacts to the right of carriageway during construction and operations, two site access points are proposed for the section of the development footprint for the southern array area that is bound by Salisbury Plains Road to the south, Salisbury Waters to the north and The Gap Road to the east (ie one to the west and one to the east of the right of carriageway, respectively) (refer Figure 2.4).

Source: EMM (2018); DFSI (2017); UPC (2018)

0 2.5 5 km
GDA 1994 MGA Zone 56

KEY

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

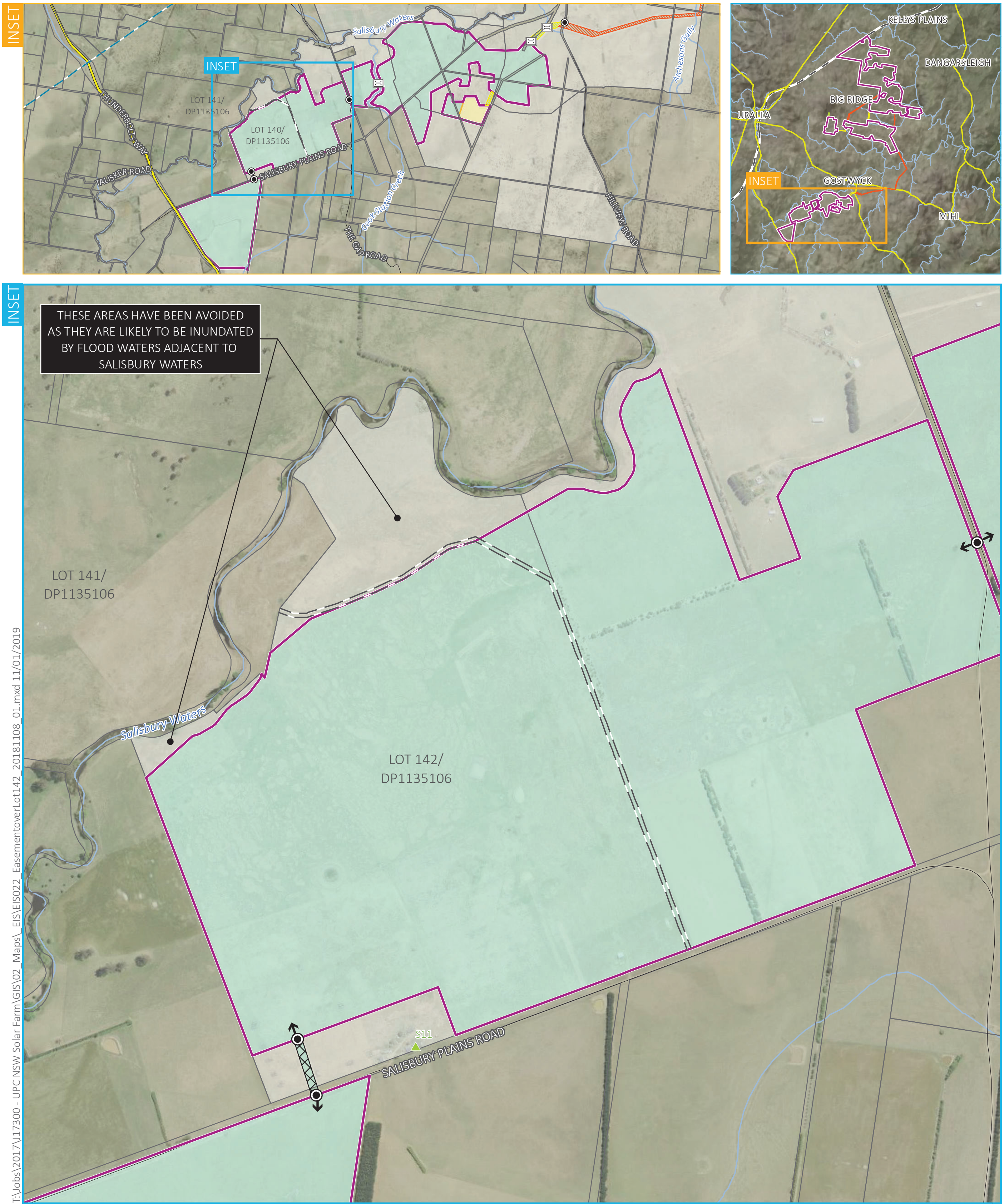
Development footprint
- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential substation/BESS footprint
- Potential electrical cabling/site access corridor
- Potential creek crossing

- Proposed primary site access point
- Potential site for construction accommodation village

Cadastral details

New England Solar Farm
Environmental impact assessment
Figure 2.3

EMM
creating opportunities



Source: EMM (2018); DFSI (2017); UPC (2018)

0 250 500 m

GDA 1994 MGA Zone 56

N

KEY

— Local road
— Watercourse/drainage line
Cadastre
Project boundary

Development footprint
Solar array
Potential ETL easement
Potential site access/ETL easement
Potential substation/BESS footprint
Potential electrical cabling/site access corridor

Proposed primary site access point
Access direction
Existing easement (10 m wide)

Sensitive receptors
Project-related

Right of carriageway over Lot 142 / DP1135106

New England Solar Farm
Environmental impact statement
Figure 2.4

EMM
creating opportunities

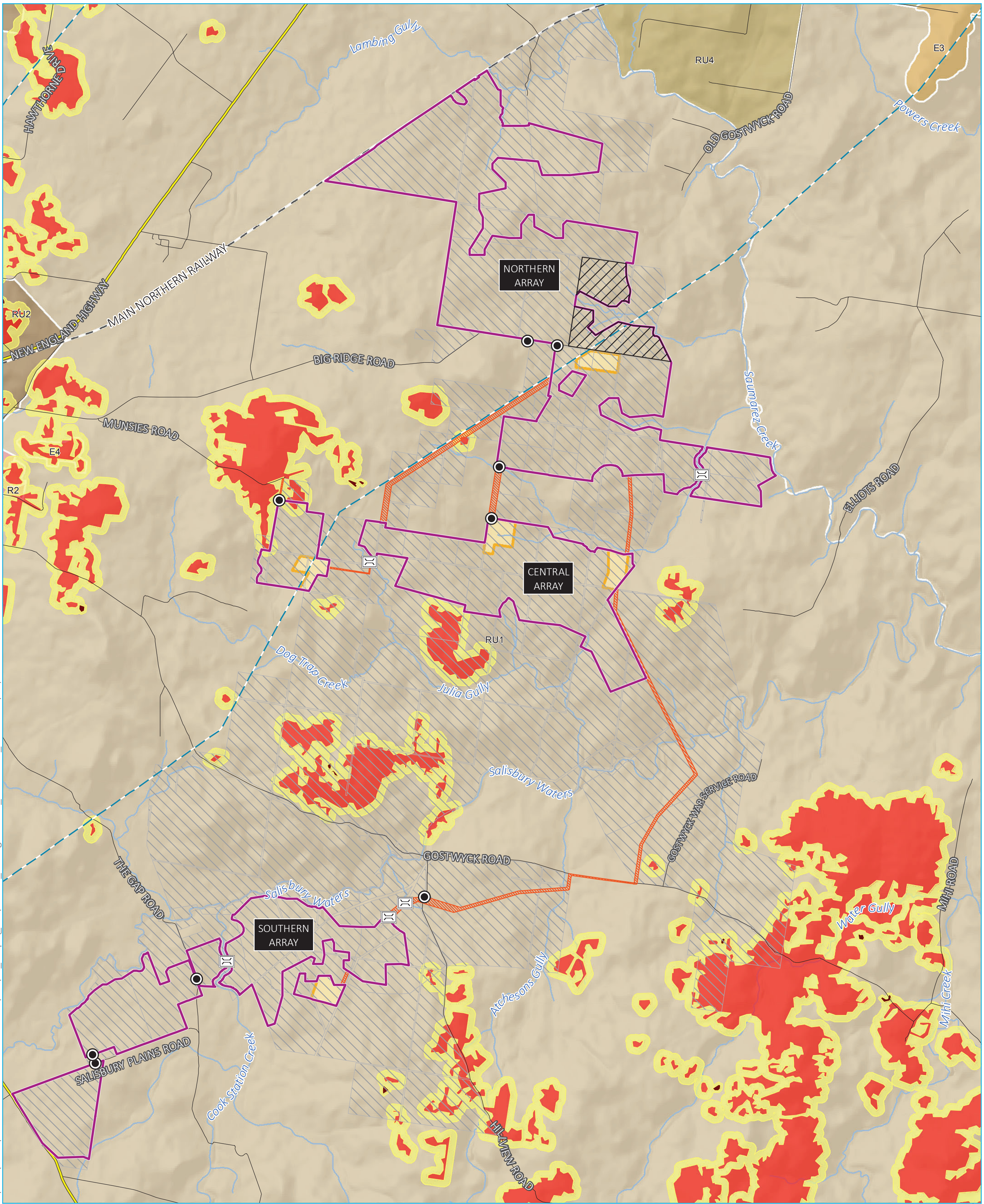
The land within the project boundary is zoned RU1 Primary Production under the Uralla LEP (Figure 2.5). As identified within Table 2.1, the project boundary encompasses 61 lots, the majority of which have been modified by historical land use practices and past disturbances associated with land clearing, 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 (approximately 12 ha or 0.4%) is mapped bushfire prone by Uralla Shire Council (refer Figure 2.5).

The project is ideally located close to Transgrid’s 330 kilovolt (kV) transmission line, which passes through the northern and central array areas (Figure 2.1). It also has access to the regional road network; including the New England Highway and Thunderbolts Way (Figure 2.1).

A number of local roads traverse the array areas and their surrounds, including Gostwyck Road; Salisbury Plains Road; The Gap Road; Carlon Menzies Road; Munsies Road; Saumarez War Service Road; Hillview Road; Elliots Road and Big Ridge Road, and will provide access to the three array areas from the regional road network throughout the construction and operation of the project (Figure 2.1).

The primary site access points will be from The Gap Road, Salisbury Plains Road, Hillview Road, Munsies Road and Big Ridge Road (refer Figure 2.1). Emergency access points may also be required, which will be determined during detailed design.



T:\Jobs\2017\J17300 - UPC NSW Solar Farm\GIS\02_Maps_EIS\EIS005_ZoningBushfire_20181005_01.mxd 11/01/2019

Source: EMM (2018); DFSI (2017); UPC (2018)

0 2.5 5 km

GDA 1994 MGA Zone 56

N

KEY

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

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential site for construction accommodation village
- Potential substation/BESS footprint
- Potential creek crossing
- Proposed primary site access point

Land zoning *(Uralla LEP)*

- E3 Environmental Management
- E4 Environmental Living
- R2 Low Density Residential
- RU1 Primary Production
- RU2 Rural Landscape
- RU4 Primary Production Small Lots

Bushfire prone land

- Vegetation category 1
- Vegetation category 2
- Vegetation buffer

Land use zoning and bushfire prone land

New England Solar Farm
Environmental impact assessment
Figure 2.5

EMM
creating opportunities

2.3 Project infrastructure

2.3.1 Solar arrays, PV modules, medium voltage cable network and power control units

The project will involve the development of three separate arrays of PV modules and PCUs. The number of PV modules and PCUs required will be dependent on the final detailed design of the project; however, based on a 720 MW (AC) facility, 30% oversizing and 350 W panels, it is anticipated that there will be approximately 2.6 million PV modules. Should the Schneider 4 MW PCU block be utilised across the three array areas, it is anticipated that there will be approximately 180 PCUs.

PV modules will be installed in a series of rows to maximise the energy yield that is achievable given the solar resource and the ground area available within the three array areas. The modules will be fixed to, and supported by, a ground-mounted framing structure, aligned in rows. It is highly likely that single axis tracking technology will be used for the project, based on the technology choices currently available in the market and the recent reductions in the costs associated with this technology. Assuming single axis tracking technology is implemented, the rows of PV modules will be aligned in a north-south direction and spaced out approximately 5-8 m apart. The use of single axis tracking technology would enable the PV modules to rotate from east to west during the day tracking the sun's movement. An example of rows of PV modules utilising single axis tracking technology is provided in Photograph 2.1.

Photograph 2.1 PV module row with single axis tracking technology (Source: NexTracker 2018)

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, UPC may consider installing a section of the solar farm 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 Figure 2.5. 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 Figure 2.5). 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.

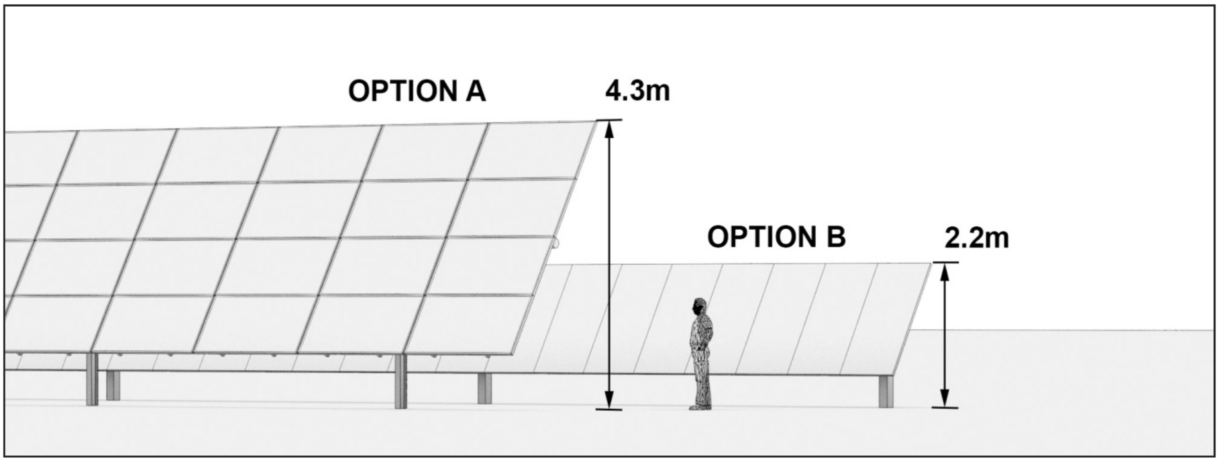


Figure 2.6 Example of PV module configurations under consideration for the project

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 three array areas. The exact model used will be determined as part of detailed design.

Photograph 2.2 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 three arrays. If underground, cables of either 11 kV, 22 kV or 33 kV will be installed at a depth of at least 600 millimetres (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 substations (up to three in total) or the grid connection substation.

A small corridor for MV cabling may be required between two land parcels in the southern array area. The indicative alignment of this cabling is presented in Figure 2.1 and Figure 2.2. The exact alignment will be determined during detailed design.

New overhead transmission lines, with anticipated voltage of 132 kV, will be required to transport electricity from each of the solar array substations to the grid substation and will traverse the solar array areas (refer Section 2.3.3). The exact route of these overhead transmission lines within the solar array areas has not yet been determined and will be dependent on the final locations selected for the grid substation and solar array substations illustrated in Figure 2.1 and Figure 2.2.

2.3.2 Solar array substations

Up to three substations will be required (potentially one within each of the three solar arrays) to step the MV up to HV. Based on preliminary designs, each substation will require transformers to step up from 33 kV to 132 kV. Each substation will likely consist of an indoor switch room to house MV circuit breakers, and an outdoor switch yard to house the transformer(s), gantries and associated infrastructure. The total pad area for each solar array substation is likely to be in the order of approximately 3-4 ha.

Table 2.2 lists the lot and DPs currently under consideration for the placement of the solar array substations. The indicative locations for the solar array substations are provided in Figure 2.1 and Figure 2.2. 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. Subject to detailed design, PV modules and ancillary infrastructure may also be placed within the substation/BESS footprints identified on Figure 2.1 and Figure 2.2.

Table 2.2 Involved lots considered for solar array substations

Lot	DP	Label	Array area
B	172594	1 (Option 2 only – refer Figure 2.2)	Northern
84	755814		
83	755814		
8	173619	2 (Option 1 only – refer Figure 2.1)	Central
8	173619	3 (Option 1 only – refer Figure 2.1)	Central
1	1122757	4 in Option 1 (refer Figure 2.1); 3 in Option 2 (refer Figure 2.2)	Southern

2.3.3 Collector network and grid substation

Up to three new overhead transmission lines will transport electricity from each of the internal solar array substations to the grid substation. Based on preliminary designs, the anticipated voltage is 132 kV.

The alignment of the overhead transmission lines and 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 will be dependent on the type of structure selected but is likely to be approximately 45 m in width. The distance between each structure will also be dependent on the type of structure selected. Where possible, structures will avoid identified constraints on the land parcels between the three array areas. Complete clearance of vegetation within each of the proposed easements may be required.

Indicative alignments for each of the overhead transmission line corridors that will extend between the solar array areas are presented in Figure 2.1 and Figure 2.2. The exact route of the transmission lines within the solar array areas has not yet been determined so this is not shown in the figures. This will be determined during the detailed design stage of the project.

As illustrated in Figure 2.1, should the grid substation be constructed in the northern array, there are two options being considered for the transmission line between the northern and central array areas. Option A extends over approximately 840 m from the south-western corner of the northern array area to the northern boundary of the central array area. Option B extends over approximately 1.2 km from the southern boundary of the northern array area to the north-eastern corner of the central array area.

As illustrated in Figure 2.2, should the grid substation be constructed in the central array, the transmission line between the northern and central array areas will extend over approximately 3.6 km and will run parallel to TransGrid's existing 330 kV transmission line for approximately 3 km.

The indicative alignment to connect the southern array area to the central array area extends over approximately 9.5 km and covers land owned by two of the project landholders, as well as the southern road reserve of a 1 km section of Gostwyck Road. During detailed design, UPC will continue to liaise with Uralla Shire Council with regards to the potential use of this road reserve.

The grid substation will be adjacent to TransGrid's 330 kV transmission line, which traverses the northern and central array areas (Figure 2.1 and Figure 2.2). At the grid substation, the electricity generated by the three solar arrays will be stepped up to 330 kV and injected into the electricity grid via TransGrid's 330 kV transmission line. The grid substation will be within the indicative area of 10 ha that is shown on Figure 2.1 and Figure 2.2 and will require a pad area of approximately 4 ha. The indicative areas provided on Figure 2.1 and Figure 2.2 provide flexibility for the final design and siting of the grid substation.

Two separate areas, one in the northern array (Option 1 – refer Figure 2.1) and one in the central array (Option 2 – refer Figure 2.2), are currently being considered for the grid substation. Table 2.3 lists the lot and DPs currently under consideration for the placement of the grid substation. Footprints providing adequate flexibility for design and siting of the grid substation at these two locations are provided on Figure 2.1 and Figure 2.2. The exact dimensions will be refined during the detailed design stage of the project and in consultation with TransGrid.

Table 2.3 Involved lots considered for the grid substation

Lot	DP	Label	Array area
B	172594	1 (Option 1 – refer Figure 2.1)	Northern
84	755814		
83	755814		
181	755827	2 (Option 2 – refer Figure 2.2)	Central
182			

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 (refer Figure 2.5), with associated minimum lot sizes of 200 ha. The subdivision of the lot(s) that is selected for the grid substation from those lots listed in Table 2.3 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.

Once the location of the grid substation is determined, the proposed subdivision will be the subject of ongoing discussion with Uralla Shire Council, DPE and the project landholders.

2.3.4 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 three BESS facilities (one at the grid substation and two at the internal solar array substations).

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.

Each of the footprints presented on Figure 2.1 and Figure 2.2 provide adequate flexibility for design and siting of the applicable BESS at each location. The approximate dimensions for each of the potential BESS structures described above include:

- small enclosure facility: 218 m by 171 m by 2.9 m;

- cabinet facility: 231 m by 116 m by 2.3 m; and/or
- large buildings: 318 m by 232 m by 5.5 m.

These dimensions should be considered indicative only. Exact dimensions will be refined during the detailed design stage of the project.

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 three 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.

2.3.5 Construction accommodation village

A construction accommodation village for non-local construction employees may be established as part of the early stages of the project's construction. If constructed, the construction accommodation village may accommodate up to 500 workers (subject to demand). A significant proportion of the project's non-local construction workers may be required to reside at the construction accommodation village while they are rostered on so as to mitigate the potential impact on tourist accommodation in the surrounding area and reduce potential impacts on the local road network.

i Proposed site for the construction accommodation village

The construction accommodation village will be on part of Lot 2 of DP 174053 in the northern array area (refer to Figure 2.1). Photograph 2.3 and Photograph 2.4 illustrate the general condition of Lot 2 of DP 174053.

Photograph 2.3 General condition of Lot 2 of DP 174053 looking south-west

Photograph 2.4 General condition of Lot 2 of DP 174053 looking south-east

Lot 2 of DP 174053 is currently primarily used for sheep grazing for production of wool and lambs and is zoned RU1 Primary Production under the Uralla LEP. It is accessible from Big Ridge Road (refer Figure 2.1). The exact location of the construction accommodation village within Lot 2 of DP 174053 will be determined during the detailed design stage of the project.

Lot 2 of DP 174053 is mostly cleared with dominant vegetation of low diversity native pasture. A limited number of scattered native trees are present, including Blakely's Red Gum (*Eucalyptus blakelyi*) and Rough-barked Apple (*Angophora floribunda*). Historically, the vegetation present on Lot 2 of DP 174053 would have likely been representative of PCT 510 - Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion. A number of planted wind breaks are also present, mostly comprising exotic species. There is also a planted native wind break composed of both indigenous and non-indigenous species.

ii Considerations for detailed site selection

Identification of the proposed location for the construction accommodation village has considered a range of constraints and issues identified and informed by field survey and assessment work undertaken to date in support of preparation of the EIS. Further consideration in determining placement of the construction accommodation village within Lot 2 of DP 174053 will include, but not be limited to the following criteria:

- setback from watercourses and associated riparian corridors (where required);
- setback from TransGrid's existing 330 kV transmission line;
- proximity to existing services;
- setback from sensitive receptors (ie neighbouring dwellings);
- avoiding potential impacts on native vegetation, land mapped as BSAL and/or identified items of Aboriginal cultural heritage and historic heritage significance;
- accessibility from Big Ridge Road; and
- detailed design of the project, namely placement of PV modules and associated infrastructure.

iii Construction and operation requirements

To build the construction accommodation village, topsoil will be stripped where necessary, hardstand constructed and walkways and car parks constructed. The size of the carpark will be subject to demand.

It may contain facilities such as a dining hall, gym, library and games room. A sewerage treatment plant (STP) will also be installed, which may also service any nearby O&M facilities. The STP would be designed and installed in accordance with the relevant design standards and regulatory requirements, and in consultation with DPE, Uralla Shire Council, NSW Environment Protection Authority (EPA), DoI Lands and Water and NSW Office of Environment and Heritage (OEH), which may include a requirement to obtain a licence to operate.

The construction accommodation village will also include a water treatment plant (chlorine dosing) and storage tanks. Potable water for the construction accommodation village will be imported (trucked in) to site. Based on similar facilities currently operating in Australia, it is anticipated that potable water usage will be approximately 250 litres (l) per person per day.

It is anticipated that up to six diesel generator skids may be required to service the power requirements of the construction accommodation village. Each skid is likely to consume approximately 500 litres of diesel per day, which equates to a total of approximately 3,000 litres per day.

Subsequently, storage of diesel will be required within the development footprint and will likely be positioned on Lot 2 of DP 174053 as part of the construction accommodation village or within proximity of O&M facilities or the construction site office. Storage of diesel will not exceed 20,000 l and will be in a different store location/bund to other flammable materials that may be required on-site (eg gasoline). Storage of diesel within the development footprint will conform with AS 1940:2017 The storage and handling of flammable and combustible liquids and consider best practice safety measures. Diesel storage will be placed away from environmentally sensitive areas, where possible.

The construction accommodation village will be managed by an experienced operator (most likely to be a contractor to the lead contractor appointed for the construction of the project).

Provided reliability, quality and financial competitiveness can be satisfied, local businesses will be engaged to supply goods and services to the construction accommodation village. This will typically consist of laundry, cleaning and catering.

The construction accommodation village is expected to be dismantled and its footprint rehabilitated once the project is built and it moves into the operational stage. The site of the construction accommodation village may be utilised for PV modules and ancillary infrastructure once the village is removed.

Further consideration of the management of waste and wastewater generated by the construction accommodation village is provided in Section 5.15 and Section 5.9, respectively.

Potential bushfire hazards associated with the construction accommodation village have also been considered in Section 5.11 and Appendix A of Appendix M.

2.3.6 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 three array areas from the surrounding road network including The Gap Road, Salisbury Plains Road, Hillview Road, Munsies Road and Big Ridge Road (refer Figure 2.1);
- emergency access points to enable access to the three 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 three 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 (refer Figure 2.1 and Figure 2.2). 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 three 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 three array areas are provided on Figure 2.1 and Figure 2.2.

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.

2.4 Construction

2.4.1 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 three array areas, which are already mostly cleared of vegetation, have been selected. Civil works will be required to prepare the three array areas, which includes installing fencing, internal access tracks, and minor earth works.

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.

Should it be required, the installation of the construction accommodation village on Lot 2 of DP 174053 may also occur as part of the site establishment works and preparation for construction.

2.4.2 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, medium voltage and high voltage cables;
- installation of PCUs;
- complete substation augmentation;
- establishment of the BESS compound; and
- test and commission project infrastructure.

2.4.3 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.

2.4.4 Delivery of construction materials and infrastructure

Construction materials and infrastructure will be transported to the three array areas via road. Heavy vehicles up to 25 m in length will require access to the three array areas. Construction materials and infrastructure delivered to the three 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 six vehicles for the delivery of the 33 kV/132 kV transformers that will be located at the solar array substations and the 33 kV/132 kV/330 kV transformers that will be located at the grid substation. 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 (ie to remove the transformers). No over-dimensional vehicle movements are anticipated during operations.

The potential impacts of project-related vehicle movements on the local and regional road network have been assessed as part of the TIA (refer Section 5.8 and Appendix K).

2.4.5 Construction staging, duration and hours

Construction of the project will take approximately 36 months from the commencement of site establishment works to commissioning of the three 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 southern 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.

It should be noted that 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 engineering, procurement and construction (EPC) contractor is selected and the detailed construction schedule is confirmed. The timeframes assumed as part of this EIS and supporting technical assessments are indicative only and reflect a conservative upper limit of potential impacts from the project.

Construction activities will be undertaken from 6am to 6pm Monday to Sunday. Exceptions to these hours may be required on limited occasions. Uralla Shire Council and surrounding landholders will be notified of any exceptions.

2.4.6 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. As noted in Section 2.4.3, Stage 2 includes the complete construction of the central and southern array areas, 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 UPC and the EPC contractor.

The remaining 50% of the project's peak construction workforce are anticipated to originate from outside of these LGAs. A significant proportion of the project's non-local construction workforce may be required to reside at the construction accommodation village during the peak period of construction.

2.5 Services

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

2.6 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 will be likely to be offered to local contractors wherever available.

UPC is currently in discussions with a number of the landholders to enable sheep grazing to resume on portions of the three 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 three 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 three array areas and project infrastructure. Perimeter security cameras may be utilised to assist with monitoring the three array areas.

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, 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.

UPC 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.

2.8 Environmental management

An environmental management strategy 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 this EIS;
- 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.

Chapter 6 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 this EIS.

3 Strategic and statutory context

3.1 Strategic context

This section provides the strategic justification of the project in the context of Commonwealth and State Government policies, initiatives and regional plans, as well as international agreements.

3.1.1 National context

Once constructed, the project will be an eligible generation category under the Commonwealth Government's RET scheme and will help meet the objectives of the international climate change agreements to which Australia is a party, including the United Nations Paris Agreement on Climate Change (Paris Agreement).

Since January 2011, the Commonwealth Government's RET scheme has operated in two parts, of which, the large-scale renewable energy target (LRET) is relevant. The primary objective of the LRET scheme is to ensure that at least 33,000 GWh of Australia's electricity is derived from renewable sources by 2020. In 2016, a total of approximately 17,500 GWh of renewable energy was generated in Australia, less than 55% of the 33,000 GWh LRET target (Clean Energy Council 2016). Significant developments occurred in 2017 with more than 4,000 MW of new projects being committed, towards a requirement of approximately 7,000 MW which is needed to meet the 2020 target. In 2017, renewable energy contributed approximately 17% of Australia's total electricity generation (Clean Energy Council 2018). Figure 3.1 tracks renewable energy developments since 2016 and includes probable, committed and accredited projects.

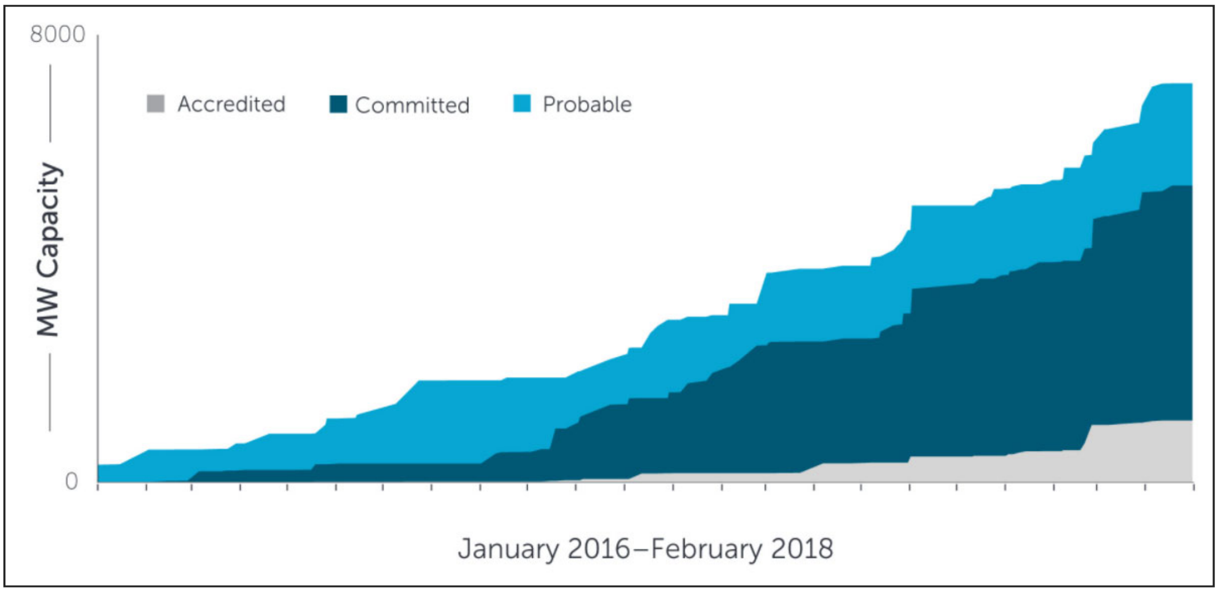


Figure 3.1 Renewable energy project pipeline progress (Source: Clean Energy Regulator 2018)

Once operational, the project will generate up to approximately 2,000 GWh of electricity annually. Under the LRET scheme, this will result in the order of 2,000,000 large-scale generation certificates being created annually, which will make significant contributions towards meeting the established targets.

In addition, the electricity generated by the project will contribute to Australia's targets as part of its commitments under the Paris Agreement. As part of the Paris Agreement, Australia will seek to reduce emissions by 26-28% below 2005 levels by 2030.

It is noted that an emissions reduction trajectory consistent with the Paris Agreement's aim to limit global mean temperature rise to 2°C above 1990 levels will require far more aggressive emissions reductions from Australia's national power sector. A number of carbon market and energy analysts acknowledge that the current policy setting within Australia is inadequate and will not meet the required emissions reductions (Campbell 2017; Shah 2017). For example, the Commonwealth Government's RET scheme only requires 23.5% of Australia's electricity to be generated by renewable sources from 2020-2030. It is widely recognised by energy and climate change academics and independent research institutions that decarbonisation of Australia's economy over the longer term requires the electricity sector to fully transition to renewable energy, since several sectors of the economy have relatively limited alternative technology options by comparison (eg agriculture and heavy industries such as cement and steel production).

It is estimated that, once operational, the project will contribute to annual GHG emissions reductions in the order of 1–1.5 million tonnes per annum (Mtpa). 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.

The project will make considerable contributions towards meeting not only the RET target but also towards Australia's broader climate change goals.

3.1.2 Energy market context

i Closure of coal-fired generators

Recent media coverage has emphasised the high risk that the closure of coal-fired generators presents to energy security in NSW (Packham 2018; Potter 2018). As noted by the Australian Energy Market Operator (AEMO) in the *Integrated System Plan Consultation* (AEMO 2017), approximately 70% of Australia's existing coal generation fleet, with a generation capacity of 16 GW, will approach the end of its intended operating life by 2040. Within the next 15 years, more than 9 GW of coal-fired generators are scheduled to close, which includes more than 6 GW in NSW (ie Liddell, Vales Point and Eraring).

As noted by AEMO (2017), prior to the withdrawal of material amounts of electricity generation from coal-fired generators, new supply resources and transmission assets are required in order to deliver continued power system reliability and security. The development of large-scale renewable energy projects has potential to fill the need for replacement power as ageing coal-fired generators encounter an increasing number of failures (particularly during the hotter summer months). The development of such projects will take considerable time and, subsequently, needs to proceed well in advance of the impending closure of coal-fired generators.

Of particular relevance to the project, recent media coverage has indicated that the closure of AGL Energy's Liddell Power Station, a coal-fired generator in the Hunter region of NSW with capacity of 1,680 MW, is anticipated to take place in 2022 and could contribute to large-scale blackouts across NSW households unless further commitments to replace the capacity of the outgoing facility are made (MacDonald-Smith & Ludlow 2018; Packham 2018). It has been reported that there is currently insufficient interconnector capability to replace the capacity loss from the closure of Liddell Power Station via supply from other regions into NSW. Therefore, to eliminate the identified shortfall, a significant increase in power generation within NSW will be required. As has been widely reported in the media, all this increase is likely to come from renewable energy projects, specifically wind and solar, as these represent the lowest cost options today. The NSW Transmission Infrastructure Strategy will aim to accelerate the development of four priority transmission projects that will help support a number of renewable energy zones identified by the NSW Government, which includes the New England region, and is intended to accelerate the investment required to make up the lost capacity of a number of coal-fired generators scheduled for closure in NSW (Potter 2018).

Due to the difference in capacity factors of the relative technologies, the replacement of coal-fired generators with wind and solar renewable energy projects means that for every MW of coal-fired electricity generation that is retired, approximately 2–3 MW of wind and solar energy generation is required.

ii Integrated System Plan and Renewable Energy Zones

Aligning with the *New England North West Regional Plan 2036* (NSW Government 2017) and the vision for accelerated renewable energy development in the region, the New England region has also been identified by AEMO in the *Integrated System Plan Consultation* (AEMO 2017) as having high potential for a renewable energy zone (REZ).

Energy zones have been proposed to help unlock the pipeline of generation projects, support more competition in the energy market and help deliver low-cost energy for NSW consumers. These zones are across the state, covering renewable energy sources of wind, solar, hydro and biomass. NSW has a significant pipeline of proposals for renewable generation projects that are either in the planning system or already approved.

It is anticipated that the NSW Transmission Infrastructure Strategy, which aims to improve transmission links with neighbouring states, will address congestion problems that are holding up connection of new renewable energy projects in NSW (Potter 2018). It is estimated that within the three REZs identified by AEMO and the NSW Government, there are approximately 17,700 MW of new generation vying for connection to the grid (Potter 2018).

As noted within the *Integrated System Plan Consultation* (AEMO 2017), REZs are areas where clusters of large-scale renewable energy projects can be developed to promote economies of scale in higher-resource areas. TransGrid's *Renewable Energy Hub Sharing Report* (TransGrid 2016) also identified the potential for the New England region to become a REZ. In addition, the NSW Government's submission on AEMO's *Integrated System Plan Consultation* (AEMO 2017) emphasised the New England region's suitability as a REZ given the availability of outstanding energy resources within the region, reduced environmental and planning constraints and proximity to existing transmission and distribution infrastructure and load centres (NSW Government 2018).

UPC identified the New England region as a suitable location for the project as other regions with favourable characteristics for large-scale solar projects have already experienced a significant level of solar development with several approved projects and projects under development and construction. This increases the risks relating to grid connection and power evacuation when compared with the New England region.

The construction of the project with up to 200 MW (AC) two-hour energy storage will contribute to the future development of the New England region as a REZ.

iii National Electricity Market system security and reliability

a Security of supply

The project will enhance the security of the electricity system through the provision of new generating capacity in advance of when it is needed to meet demand – commonly referred to as 'security of supply'. Due to a range of long-lead items encountered during project development, investment in energy generating capacity must occur years in advance of when new capacity is needed to meet supply.

The project will connect to the 330 kV transmission system that is owned and operated by TransGrid. The National Electricity Market (NEM) is based on an interconnected transmission system connecting all the states and territories of Australia (except for Western Australia and Northern Territory). Local homes and businesses (or 'loads') are connected via the distribution network which receives electricity supply from the transmission network at substations that contain transformers, protection systems and communications for the safe and reliable operation of the overall electricity network.

The energy generated by the project will thus flow to loads through a variety of means:

- Via the proposed 330 kV cut-in on the TransGrid line through the Armidale and Tamworth substations into the local distribution network, which will contribute to satisfying the local peak demand of approximately 26 MW at Armidale substation (winter peak load) and 112 MW at Tamworth substation (summer peak load) (Essential Energy 2017).

- Into the broader TransGrid 132 kV and 330 kV transmission network which runs north and east from Armidale and south, west and north-west from Tamworth. From there, the energy will flow to meet demand supplied via the local Essential Energy and Ausgrid distribution networks that are connected to TransGrid's network at multiple locations throughout NSW, supplying loads with power.

- Subject to the capacity of the interconnection between NSW and Queensland, and NSW and Victoria, respectively; losses in transmission; and the direction of interregional flows at any particular point in time, some of the energy may eventually flow across the borders via the interconnectors to meet loads located interstate.

Due to its target size of 720 MW it is anticipated that most of the output from the project will flow into TransGrid's transmission network. Should the project start generating electricity in 2021-2022, it will come online in time to contribute to the replacement of output from a number of major fossil fuel fired power stations, that are scheduled to exit the market. This includes, but may not be limited to:

- Torrens Island A Power Station (South Australia) – 480 MW, scheduled to exit in 2019-2021;

- Liddell Power Station (NSW) – 1,800 MW, scheduled to exit in 2022;

- Vales Point Power Station (NSW) - 1,320 MW, scheduled to exit in 2028; and

- Eraring Power Station (NSW) - 2,880 MW, scheduled to exit in 2032.

AEMO is responsible for forecasting reliability of the NEM to meet the reliability standard, which it does each year in the Electricity Statement of Opportunities (ESOO) report. The most recent ESOO published in August 2018 highlights that after the retirement of Torrens Island and Liddell, the level of unserved energy (USE) is projected to increase significantly without further development of the NEM (AEMO 2018). The NEM reliability standard is an economic planning and risk metric that requires expected USE to not exceed 0.002% of consumption per region in any financial year. Primarily as a result of scheduled plant closures, AEMO forecasts reliability risks to continue in NSW and Victoria for the rest of the outlook period to 2027-28 if there is not enough new investment beyond committed projects (AEMO 2018).

b Enhancing system security and reliability through storage

The Finkel Report and subsequently AEMO in its latest ESOO also highlighted the need for enhancing system reliability by complementing utility-scale renewable energy generation with storage, which is consistent with the proposed project. The project may include incorporation of a BESS of up to 200 MW (AC) two-hour energy storage. While the final size of the BESS for the project will be dependent on a range of commercial and design considerations, even a relatively small-scale BESS can contribute to system security and reliability for example through the provision of Frequency Control Ancillary Services (FCAS), reactive power support or firming the active power output of the solar farm facility. The introduction of grid connected battery systems in South Australia has shown that utility scale BESS projects can lower the cost of provision of these services to consumers. In the longer term, there is the potential for a BESS to provide fast frequency response and/or synthetic inertia services if a market for these services emerges in the NEM.

If constructed, a BESS of the size contemplated for the project would be among the biggest currently being considered in the NEM and would greatly contribute to the demonstration of how the reliability of utility-scale renewable energy generation can be enhanced with storage. Further information about the BESS is provided in Section 2.3.4.

c Generator performance standards

It is noted that any major generator proposed to connect to the NEM must submit a connection application with the relevant network service provider (NSP), in this case TransGrid, under Clause 5.3 of Version 110 of the National Electricity Law (NEL). The application is assessed by AEMO and TransGrid and part of the requirements of the NEL are that the generator must satisfy a range of safety, reliability and security standards, the Generator Performance Standards (GPS), which include, but are not limited to:

- the reactive power capability of a generating system at its connection point, which assists in the maintenance of a suitable power system voltage profile;
- the quality of the electricity generated by a generating system at its connection point that can have a detrimental effect on other network users;
- the response of the generator to frequency disturbances at the connection point and the conditions for which the generator will/will not remain connected;
- the response of the generator to voltage disturbances at the connection point and the conditions for which the generator will/will not remain connected;
- the response of the generating system to all disturbances, including network faults, and credible contingency events;
- the quality of supply with respect to voltage fluctuations, harmonic voltage distortion and voltage unbalance at the connection point for which a generating system is required to remain connected;
- the performance of protection systems and frequency control systems;
- the impact of the generating system on inter-regional, and intra-regional transfer capability;
- the performance of the voltage control system, and the ability of the generating system to increase or decrease its reactive power output in response to a power system incident; and
- the ability of a generating system to increase or decrease its active power transfer in response to a dispatch instruction from AEMO.

UPC confirms that it has assessed the performance of the proposed project against all of the relevant GPS as part of its application to connect to the network. The project will only obtain an offer to connect if it can be demonstrated that it is able to satisfy the requirements of the NEL with respect to the GPS. This must be to the satisfaction of AEMO and TransGrid as the relevant authorities responsible for matters of system reliability, safety and security. Compliance with the NEL and TransGrid and AEMO's requirements will ensure the project will meet the relevant requirements for safe, reliable and secure connection to the electricity system.

3.1.3 State context

The NSW REAP, prepared by the NSW Government in 2013, continues to play an important role in the State's energy future, seeking to increase the diversity of the State's energy mix by encouraging investment in renewable energy sources, including large-scale grid-connected solar farms. The NSW REAP aims to facilitate the sustainable transition of electricity generation in NSW to a more reliable, more affordable and cleaner energy future. One of the defined targets within the NSW REAP is to increase the proportion of electricity derived from renewable sources in NSW by up to 20% by 2020. In 2016, the proportion of electricity derived from renewable sources in NSW was approximately 20% (McDonald 2017).

As noted in Section 3.1.1, once operational, the project will generate up to 2,000 GWh of electricity annually, depending on its final capacity, thus helping the State to meet its policy objectives. This is the equivalent of the electricity required to power up to 250,000 NSW households.

3.1.4 Local and regional context

i New England North West Regional Plan 2036

The New England North West region encompasses a total of 12 LGAs in regional NSW including the Uralla Shire LGA. The intent of the *New England North West Regional Plan 2036* (NSW Government 2017) is to guide the NSW Government's land use planning priorities and decisions in the New England North West region to 2036.

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. Large-scale renewable energy projects, such as the New England Solar Farm, have potential to generate new employment opportunities and investment from construction, operation and connection to the State's electricity grid.

The plan 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 region has potential sources of solar energy, receiving 1920 megajoules daily of solar exposure, making it the second highest solar penetration region in NSW (NSW Government 2017). As noted previously, the three array areas have favourable conditions for a solar PV power generation project having high solar irradiance and elevation of more than 1,000 MASL.

The project will contribute to the diversification of the energy sector while strengthening the New England North West region's economy.

ii Northern Inland Regional Plan 2016-2019

Regional Development Australia (RDA) is an Australian Government initiative, with a network of 55 committees working with all levels of government, business and communities to support the development of regional Australia. The Uralla Shire LGA sits within RDA's northern inland (NI) region, which consists of 12 LGAs. The region is dominated by resource-based agricultural activities and is concentrated around the regional cities of Tamworth and Armidale (RDANI 2016).

As noted within the *Northern Inland Regional Plan 2016-2019*, RDANI's primary objective is to, "ensure the long-term sustainable growth and development of the region by driving and contributing to initiatives that will support economic development and jobs" (RDANI 2016). One of the opportunities identified within the plan to help achieve this objective is the development of renewable energy industries with regional economic benefits (RDANI 2016). As acknowledged within the plan, the region has a number of favourable conditions to facilitate the development of renewable energy, namely, land, sunshine, wind and agricultural/forestry/municipal residues. The renewable energy sector will also bring positive economic and environmental outcomes to the region (RDANI 2016).

The *Northern Inland Regional Plan 2016-2019* also identifies priorities for local councils within the NI region, of which the increased use of renewable/green energy is identified. Uralla Shire Council's *Community Strategic Plan 2017-2027* (USC n.d.) does not make any direct reference to the renewable energy sector. However, it does define Uralla Shire Council's mission and the values of the Uralla Shire LGA community, which include references to job opportunities for a wide range of skills and aptitudes, a diverse economy, and sustainability. As noted in Section 1.1, the project will provide a number of direct and indirect social, economic and environmental benefits that align with these values, including the creation of employment opportunities, diversification of revenue streams and significant reductions in GHG emissions.

3.2 Regulatory context

3.2.1 NSW Environmental Planning and Assessment Act 1979

i Approval process

The EP&A Act and the EP&A Regulation provide the framework for environmental planning and assessment in NSW. Part 4 of the EP&A Act relates to development assessment; Part 4, Division 4.1 relates to the assessment of development deemed to be significant to the State (State Significant Development or SSD).

Section 4.36 (2) of the EP&A Act states that a:

> ...State environmental planning policy may declare any development, or any class or description of development, to be State significant development.

The project is declared to be SSD by the provisions of the SRD SEPP.

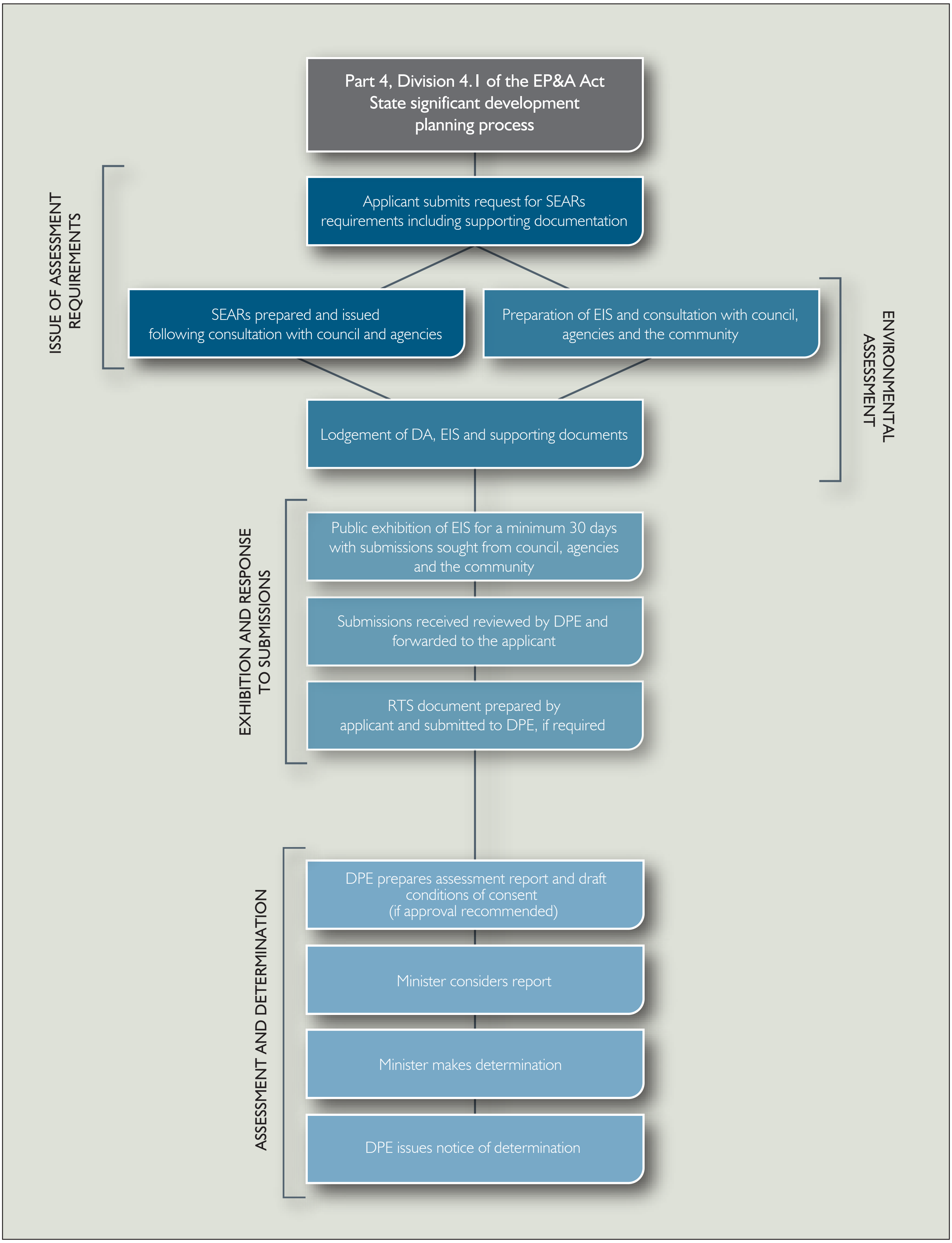
Under Section 4.38 of the EP&A Act, the NSW Minister for Planning is the consent authority for SSD. However, pursuant to Section 2.4 of the EP&A Act, the Minister may delegate the consent authority function to the Independent Planning Commission (IPC), the Secretary or to any other public authority.

A DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Before preparing an EIS, an applicant must request SEARs which specify what must be addressed in an EIS. The SEARs for the project were originally issued on 8 May 2018. As noted in Section 1.7, revised SEARs were issued for the project on 11 October 2018 in response to UPC's request for a revision to the project description to include a temporary construction accommodation village (should it be required). The revised SEARs are provided in Appendix A.

The EIS will be placed on public exhibition for a minimum of 30 days by DPE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPE will be reviewed and forwarded to UPC to consider and respond to (via a response to submissions (RTS) report).

Following receipt of the RTS report, DPE will prepare its assessment report considering this EIS, all submissions received during the exhibition process, and the RTS report. DPE's assessment report is forwarded to the consent authority for consideration before determining the DA.

The planning approval process for SSD (under Division 4.1 of Part 4 of the EP&A Act) can be seen in Figure 3.2. It should be noted that process presented in Figure 3.2 does not account for the approval process should the IPC be determined the consent authority for the project. If the IPC is the consent authority, DPE are still responsible for the administrative arrangements, which include charging the application fee, publicly exhibiting the application and preparing a report to the IPC about the application. However, DPE's report is not binding on the IPC.



EMM creating opportunities

Planning approval process for SSD
New England Solar Farm
Environmental impact statement
Figure 3.2

ii Matters for consideration

When assessing a DA for SSD, the consent authority is required to take into consideration the matters outlined in Section 4.15 of the EP&A Act. These matters are addressed in Table 3.1.

Table 3.1 Matters for consideration – Section 4.15 of the EP&A Act

Provision	Consideration
Any environmental planning instrument.	Relevant planning instruments are addressed in Section 3.2.
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.	There are no proposed instruments relevant to the project.
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.	There are no planning agreements relevant to the project.
The regulations (to the extent that they prescribe matters for the purposes of this paragraph).	The requirements of the EP&A Regulation are addressed in Section 3.2.1 (v).
The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	This EIS comprehensively describes the likely impacts of the project based on the SEARs, including environmental impacts on both the natural and built environments, and social and economic impacts in the local area, region and State. It also describes commitments proposed by UPC to mitigate and manage these impacts. These descriptions are based on technical studies prepared by specialists, which are appended to this EIS and summarised in Chapter 5. The technical studies were prepared using the most recent and accurate scientific data relevant to the project in consideration of current policies and legislation. In addition, the technical studies adopted conservative assumptions to enable the upper limit of likely impacts to be assessed.
The suitability of the site for the development.	It is considered that the development footprint for the project is suitable for a solar farm for a number of reasons, which are detailed in Chapter 1. Existing land use, zoning and characteristics are described in Section 5.5, along with consideration of potential impacts and land use conflicts associated with the project.
Any submissions made in accordance with this Act or the regulations.	This EIS will be placed on public exhibition for a minimum of 30 days by DPE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPE will be reviewed and forwarded to UPC to consider and respond to (via a RTS report). Following receipt of the RTS report, DPE will prepare its assessment report considering this EIS, all submissions received during the exhibition process and the RTS report.
The public interest.	To assist the consent authority in determining whether the project is in the public interest, this EIS provides a justification for the project (refer to Chapters 1 and 7), taking into consideration its potential environmental impacts, and the suitability of the development footprint for project infrastructure. It also considers the project against the principles of ecologically sustainable development (ESD). The consent authority will also be required to consider all submissions received during the public exhibition of the EIS.

iii Approvals not required or ones which cannot be refused

Under Section 4.41 of the EP&A Act, the following authorisations are not required for SSD:

a) (repealed);

b) a permit under Section 201, 205 or 219 of the NSW *Fisheries Management Act 1994*;

c) an approval under Part 4, or an excavation permit under Section 139, of the NSW *Heritage Act 1977*;

d) an Aboriginal heritage impact permit under Section 90 of the NSW *National Parks and Wildlife Act 1974*;

e) (repealed);

f) a bush fire safety authority under Section 100B of the NSW *Rural Fires Act 1997*; and

g) a water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the NSW *Water Management Act 2000*.

Further, Section 4.42 of the EP&A Act lists authorisations which cannot be refused and are to be substantially consistent with a development consent for SSD. Relevant to the project, consent under Section 138 of the NSW *Roads Act 1993* (Roads Act) may be required for the proposed access intersections to connect the three array areas to the local road network. Should the project obtain development consent, approval under the Roads Act cannot be refused and will be consistent with conditions of approval.

iv Environmental planning instruments

The following environmental planning instruments are relevant to the project:

- SRD SEPP;
- State Environmental Planning Policy (Infrastructure) 2007 (the Infrastructure SEPP);
- State Environmental Planning Policy No 33—Hazardous and Offensive Development (SEPP 33);
- State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55);
- State Environmental Planning Policy (Rural Lands) 2008 (Rural Lands SEPP);
- State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44); and
- Uralla LEP.

The relevant provisions of the above instruments to the project are discussed in the following sections.

a State Environmental Planning Policy (State and Regional Development) 2011

The SRD SEPP identifies development that is SSD. Clause 8 of the SRD SEPP states:

(1) Development is declared to be State significant development for the purposes of the Act if:

(a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and

(b) the development is specified in Schedule 1 or 2.

Schedule 1 of the SRD SEPP defines the following as SSD:

(2) Electricity generating works and heat or co-generation:

(3) Development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) that:

(a) has a capital investment value of more than $30 million.

The project is a development for the purpose of electricity generation using a solar energy source, and will have a capital investment value of more than $30 million.

Permissibility of the project is given under clause 34 (7) of the Infrastructure SEPP as detailed further below.

The project meets both the requirements of clause 8 of the SRD SEPP as it is not permissible without development consent and is development specified in Schedule 1. Therefore, the project is SSD for the purposes of the EP&A Act.

b State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP provides development controls for infrastructure and services. Clause 34 (7) of the SEPP provides provisions for development that is permitted with consent. It states:

(7) Solar energy systems

Except as provided by subclause (8), development for the purpose of a solar energy system may be carried out by any person with consent on any land.

Subclause (8) limits the use of photovoltaic electricity generating systems with a capacity to generate more than 100 kW in residential zones. The development footprint for the project is not within a residential zone and, therefore, is not affected by this subclause.

Therefore, the project is permissible with development consent.

c State Environmental Planning Policy No 33 – Hazardous and Offensive Development

Under SEPP 33 a preliminary hazard assessment (PHA) prepared in accordance with the current circulars or guidelines must be submitted for potentially hazardous or offensive development. The guideline *Applying SEPP 33* (DoP 2011) includes a checklist and a risk screening procedure to determine whether a development is potentially hazardous or offensive.

A review of Applying SEPP 33 has identified that the project is not potentially hazardous, as it will not exceed the screening threshold for any of the hazardous material identified in Applying SEPP 33 (refer Section 5.10 and Appendix L). Further, the project will not pose a significant risk to or have a significant adverse impact on human health, life, property or the biophysical environment (see Chapter 5). The project is not a potentially hazardous or offensive industry and therefore, a PHA is not required.

d State Environmental Planning Policy No 55 – Remediation of Land

SEPP 55 was enacted to provide a state wide planning approach to the remediation of contaminated land and aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human and environmental health.

Clause 7 of SEPP 55 requires that a consent authority take into consideration whether the land is contaminated. The contaminated land planning guidelines *Managing Land Contamination Planning Guidelines: SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning 1998) identifies activities with the potential to cause contamination. These guidelines list 'agricultural/horticultural activities' as an activity which potentially causes contamination. Agricultural activities have occurred on and in the vicinity of the development footprint. However, construction of the project will require limited site preparation and civil works. Subsequently, the level of surface disturbance will be minimal.

The development footprint will be removed from agricultural use; however, land management practices 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. 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, as has been agreed with the project landholders.

A search of the EPA's contaminated land public record of notice and list of sites notified to the EPA under Section 60 of the NSW *Contaminated Land Management Act 1997* (CLM Act) did not return any information on reported contamination or any regulatory notices issued for the land within the project boundary (EPA 2018).

A search of the contaminated land record of notices revealed one site within the Uralla Shire LGA that has been issued notices. Each of these notices applied to a parcel of land approximately 22 km south-west of the development footprint for the southern array area.

e State Environmental Planning Policy (Rural Lands) 2008

The rural lands SEPP aims to, among other objectives, facilitate the orderly and economic use and development of rural lands for rural and related purposes, to identify rural planning principles so as to assist the proper management of rural lands, reduce land use conflicts and identify State significant agricultural land to ensure its ongoing viability.

Clause 7 of the rural lands SEPP identifies rural planning principles as follows:

a) the promotion and protection of opportunities for current and potential productive and sustainable economic activities in rural areas,

b) recognition of the importance of rural lands and agriculture and the changing nature of agriculture and of trends, demands and issues in agriculture in the area, region or State,

c) recognition of the significance of rural land uses to the State and rural communities, including the social and economic benefits of rural land use and development,

d) in planning for rural lands, to balance the social, economic and environmental interests of the community,

e) the identification and protection of natural resources, having regard to maintaining biodiversity, the protection of native vegetation, the importance of water resources and avoiding constrained land,

f) the provision of opportunities for rural lifestyle, settlement and housing that contribute to the social and economic welfare of rural communities,

g) the consideration of impacts on services and infrastructure and appropriate location when providing for rural housing,

h) ensuring consistency with any applicable regional strategy of the Department of Planning or any applicable local strategy endorsed by the Director-General.

The project has been sited and designed having regard for these principles and is considered to be an orderly use of the rural lands encompassed by the project boundary, for the reasons outlined in Sections 1.4 and 1.5. Potential impacts to biodiversity, heritage, land use and water resources are considered in Chapter 5.

Clause 13 of the rural lands SEPP identifies land as being State significant agricultural land if it is listed in Schedule 2, however, Schedule 2 does not identify any land as State significant agricultural land. As noted in Section 1.4.4, parts of the development footprint are mapped as BSAL.

As noted in Section 1.4.2, the development footprint has been refined throughout the project design process to avoid identified environmental constraints. In addition to avoiding environmental constraints, revisions to the extent of the three array areas have also reduced the project's impacts on BSAL and agricultural production operations on parcels of land within and adjacent to the project boundary.

On balance, the project is considered to be an acceptable use of rural lands, in consideration of the social, economic and environmental interests of the community.

f State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44)

SEPP 44 encourages the proper conservation and management of areas of natural vegetation that provide habitat for koalas. It applies to areas of native vegetation greater than 1 ha and in LGAs listed in Schedule 1 of SEPP 44. The development footprint is in the Uralla Shire LGA, which is listed in Schedule 1, therefore Koala habitat was considered within the BDAR.

One Koala feed tree species (Ribbon Gum), as defined within Schedule 1 of SEPP 44, was identified within the development footprint. Ribbon Gum comprises considerably less than 15% of the tree species within the development footprint, which has been verified during vegetation mapping, plots (performed in accordance with the *Biodiversity Assessment Method* (BAM)) and paddock tree assessments. Of the 275 trees identified during paddock tree assessments, 10 were Ribbon Gum (approximately 3.6%).

Therefore, the vegetation within the development footprint is not considered potential Koala habitat as defined under SEPP 44. Furthermore, patch sizes of woodland within the development footprint are very small and poorly connected. Scat surveys (SAT tests) in the most optimal areas did not reveal any evidence of Koala and the species is not anticipated to occur within the development footprint.

Further discussion of the potential impacts of the project on koala habitat is provided in Appendix C.

g Uralla Local Environmental Plan

The land within the project boundary is zoned RU1 Primary Production pursuant to the Uralla LEP (refer Figure 2.5). The objectives of the RU1 zone are:

- to encourage sustainable primary industry production by maintaining and enhancing the natural resource base;

- to encourage diversity in primary industry enterprises and systems appropriate for the area;
- to minimise the fragmentation and alienation of resource lands;
- to minimise conflict between land uses within this zone and land uses within adjoining zones; and
- to permit development of non-agricultural land uses that are compatible with the character of the zone.

The project will harness a natural resource, namely solar energy. While the development of this project will impact the availability of land for other primary production, it will allow for and encourage diversity in the area's land use and will provide economic stimulus and support to rural communities.

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, clause 34 (7) of the Infrastructure SEPP 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 project boundary with development consent.

v Environmental Planning and Assessment Regulation 2000

As previously stated, a DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Schedule 2 of the EP&A Regulation stipulates:

- requirements of the Director-General and approval bodies in relation to EISs (ie. the SEARs); and
- general provisions relating to EISs.

The general provisions specify the form (clause 6) and the content (clause 7) of an EIS. The clause 6 and 7 requirements and where they are addressed in the EIS are set out in Table 3.2.

Table 3.2 Schedule 2 requirements for an EIS

Requirement	Where contained in the EIS
Name, address and professional qualifications of the person(s) who prepared the EIS.	Certification page at the front of this EIS.
Name and address of the responsible person (the applicant).	Certification page at the front of this EIS.
Address of land.	Table 2.1
Description of development.	Chapter 2
Assessment of the environmental impact.	Chapter 5
Declaration that the EIS has been prepared in accordance with this Schedule, contains all available information that is relevant to the environmental assessment of the development and that the information contained in the statement is neither false nor misleading.	Certification page at the front of this EIS.
Summary of the EIS.	Executive summary
A statement of the objectives of the development.	Section 1.3

Table 3.2 Schedule 2 requirements for an EIS

Requirement	Where contained in the EIS
An analysis of feasible alternatives, having regard to its objectives, including the consequences of not carrying out the development.	Section 1.5
A full description of the development.	Chapter 2
A general description of the environment likely to be affected by the development.	Section 2.2 Chapter 5
The likely impact on the environment of the development.	Chapter 5
A full description of the measures proposed to mitigate any adverse effects of the development.	Chapter 5 Chapter 6
A list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out.	Section 3.2.5 and Table 3.3
A compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv) (a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment).	Chapter 6
The reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development.	Section 1.3 Section 7.1

3.2.2 Other state legislation

i NSW Crown Lands Act 1989

The NSW *Crown Lands Act 1989* (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. The NSW Department of Industry – Lands & Water (DoI Lands and Water) is responsible for administering the CL Act.

There is a small parcel of Crown land (Crown reserve 95655 – refer Figure 1.6) adjacent to Salisbury Waters and within proximity of the development footprint for the southern array area. The reserve covers an area of 5.18 ha and is split between two grazing licences/permissive occupancies. The project will not impact this Crown reserve 95655.

As part of consultation with DoI Lands and Water, a number of Crown roads have been identified within the development footprint for the three array areas. Applications to close a number of these roads have already been lodged with DoI Lands and Water and, subsequently, no further action is required for these. Crown roads that remain within the development footprint will require closing, which will be undertaken in consultation with DoI Lands and Water in parallel with the planning assessment and approval process for the project.

Portions of Salisbury Waters in the vicinity of the project are identified as Crown waterway. No project infrastructure is proposed to cross Salisbury Waters, with the exception of the proposed ETL alignment to connect the southern and central array areas (refer Figure 2.1 and Figure 2.2); however, Salisbury Waters is not mapped as Crown waterway at the location of this proposed crossing. Further, due to the nature of the proposed infrastructure (poles and wires) no impacts to Salisbury Waters as a result of the proposed ETL alignment are anticipated.

DoI Lands and Water provided landowner's consent for lodgement of this DA on 8 January 2019 (refer Appendix B).

ii NSW Protection of the Environment Operations Act 1997

The NSW Protection of the Environment Operations Act 1997 (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 and include the following premise-based activities that apply to the project:

> 17 Electricity generation
>
> (1) ...general electricity works, meaning the generation of electricity by means of electricity plant that, wherever situated, is based on, or uses, any energy source other than wind power or solar power.
>
> (2) Each activity referred to in Column 1 of the Table to this clause is declared to be a scheduled activity if it meets the criteria set out in Column 2 of that Table.

The project involves the generation of electricity from solar energy. Therefore, it is not a scheduled activity and an EPL is not required.

iii NSW Water Management Act 2000

The NSW *Water Management Act 2000* (WM Act) regulates the use and interference with surface and groundwater in NSW where a water sharing plan has been implemented. Two Water Sharing Plans are relevant to the project boundary, namely:

- Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016; and
- Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.

The WM Act provides for basic landholder rights, which enable landholders to extract water from an aquifer underlying their properties for domestic and stock purposes without the need for a licence.

The WM Act also contains provisions relating to harvestable rights. Harvestable rights allow landholders to collect a proportion of the runoff from their property. Any runoff harvested from the development footprint would be within the volume permitted under harvestable rights.

A water use approval under Section 89 of the WM Act is not required for the project by virtue of Section 89J of the EP&A Act.

Water demands for the project during both construction and operation will be met via potable water trucked to the three array areas. Water contained within existing farm dams to be removed may be able to be used for non-potable construction purposes to minimise use of imported water, which would be undertaken in accordance with the harvestable rights provisions.

No further consideration of the WM Act is warranted on this basis.

iv NSW Rural Fires Act 1997

The NSW *Rural Fires Act 1997* (RF Act) aims to prevent, mitigate, and suppress bush and other fires in local government areas of the State. Section 63(2) of the RF Act requires the owners of land to prevent the ignition and spread of bushfires on their land. Under Section 4.41 of the EP&A Act, a bush fire safety authority under Section 100B of the RF Act is not required for SSD that is authorised by a development consent.

A very small part of the land within the development footprint (approximately 12 ha or 0.4%) is mapped bushfire prone by Uralla Shire Council (refer Figure 2.5) and the project will potentially be exposed to bushfire threat in the form of grassfire and has the potential to cause unplanned ignition of surrounding grassland. Therefore, bushfire risks associated with the project have been assessed in accordance with *Planning for Bushfire Protection* (PBP) (RFS 2006), where applicable to the project.

Further discussion of the potential bushfire risk associated with the project as well as potential fire hazards are detailed in Section 5.10, Section 5.11, Appendix L and Appendix M.

v NSW Roads Act 1993

The NSW *Roads Act 1993* (Roads Act) is administered by RMS, local government or NSW Land and Property Information (NSW LPI). The RMS 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.

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 RMS or local council, depending upon classification of the road.

The New England Highway/Barleyfields Road (north) intersection and New England Highway/Barleyfields Road (south) including Wood Street intersection both require left and right turn traffic lanes (CHR/CHL), currently as the combination of major road and minor road peak hourly volume is within the range for this type of intersection. These intersection upgrade works are required at these intersections currently and the need will become more apparent when the proposed project construction traffic is operating. In addition, the project will require the construction of a number of new intersections to connect the project to the local road network.

UPC will be required to lodge a Section 138 Certificate (Work on Public Lands) for approval before any future road work for the intersection improvement or any new intersections is carried out. Under the provisions of the EP&A Act, an approval under Section 138 or Part 9, Division 3 of the Roads Act cannot be refused if it is necessary for carrying out a SSD authorised by a development consent (refer to Section 3.2.1 iii).

vi NSW National Parks and Wildlife Act 1974

The NSW National Parks and Wildlife Act 1974 (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.

The project design has avoided impacts to Aboriginal heritage sites as far as practicable. The preliminary study area (refer Figure 1.3) was the subject of the archaeological survey effort as part of the ACHA. A clear way to emphasise the measures employed to minimise harm to sites of Aboriginal archaeological and cultural significance is to note that all 96 sites identified during the survey of the preliminary study area were previously within the proposed area of impact. Through the project refinement process, all sites of high significance and most sites of moderate significance have been avoided (refer Section 1.4.2).

Only sites of low and moderate significance will be impacted by the project. Impacts to these sites will be managed as part of the AHMP.

Further discussion of the potential impacts to Aboriginal heritage sites resulting from the project are detailed in Section 5.3 and Appendix D.

vii NSW Biodiversity Conservation Act 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act) commenced on 25 August 2017, which repealed the following:

- NSW Threatened Species Conservation Act 1995;
- sections of the NPW Act; and
- NSW Native Vegetation Act 2003.

The BC Act establishes a new 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 BAM.

The BC Act is also supported by the Biodiversity Conservation Regulation 2017 and the Biodiversity Conservation (Savings and Transitional) Regulation 2017, which outline the methods to be used in applying the BAM, and specific considerations for transitional projects immediately following commencement of the new framework.

Detailed ecological assessments have been undertaken by EMM between January and September 2018 in accordance with the BAM. Assessments have included mapping of native vegetation, collection of plot/transect data and targeted threatened species surveys. This data has been used to refine the extent of the development footprint to avoid and minimise impacts to biodiversity.

Measures to avoid and minimise impacts to native vegetation were considered during the initial design stages of the project, resulting in avoidance of significant biodiversity values and minimisation of impacts on other areas of native vegetation. Particular efforts were made to avoid woodland areas with larger patches and greater connectivity to other areas of habitat. Remaining areas of moderate biodiversity value include patches of remnant woodland and planted native wind breaks.

Impacts to native vegetation that require offsetting in accordance with the BAM are limited to:

- direct impacts on 15.3 ha of PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (planted);
- direct impacts on 5.7 ha of PCT 1174-Silvertop Stringybark open forest of the New England Tableland Bioregion (woodland);
- direct impacts to 86 paddock trees assigned to PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion; and
- direct impacts to 6 paddock trees assigned to PCT 1174-Silvertop Stringybark open forest of the New England Tableland Bioregion.

Based on both habitat assessments and field surveys, the development footprint is not likely to be important habitat for either threatened flora or fauna species, and no species credits are required to offset the project.

Further discussion of the potential impacts of the project on native vegetation and threatened species listed under the BC Act is provided in Section 5.2 and Appendix C.

viii NSW Heritage Act 1977

The NSW *Heritage Act 1977* (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.

The project will not impact any items of State, National or World heritage significance identified on the SHR, Uralla LEP or Australian Heritage Database.

Uralla Shire Council recognises its rich historical heritage by listing a number of items on Schedule 5 (environmental heritage) of the Uralla LEP. Three Uralla LEP listed heritage items occur within or immediately adjacent to the project boundary (refer Figure 5.4), including:

- Gostwyck Memorial Chapel and Precinct (I10 – within);
- Deeargee Woolshed (I11 – within); and
- Salisbury Court (I14 – adjacent).

An overarching strategy to protect the significance of heritage items within the development footprint has been followed to date and will continue as needed through adoption of a precautionary approach. This will continue to be applied for all activities that could impact on heritage items or potential heritage items within the development footprint. That is, the items will either be completely excluded from the development footprint or its heritage values will be investigated and recorded prior to the works if its removal is appropriate.

Further discussion of the potential heritage impacts of the project are detailed in Section 5.4 and Appendix E.

ix NSW Biosecurity Act 2015

The NSW *Biosecurity Act 2015* (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.

The BS 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 project 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 development footprint for the three array areas during construction. In addition, pest animals may also be encouraged by food sources from construction works and general disturbance.

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 three array areas. Sheep grazing within the three array areas would also maintain a multi-purpose land use throughout the life of the project.

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.

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.

Further discussion of the potential biosecurity impacts of the project are detailed in Section 5.2, Section 5.5 and Appendix C.

x NSW Local Land Services Act 2013

The NSW *Local Land Services Act 2013* (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.

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 ESD. The four principles of ESD and the project's compatibility with each are considered in Section 7.5. Resources within the development footprint 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.

The development footprint 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.

The site is part of the Northern Tablelands LLS region. As part of the consultation process for the project, EMM has attempted to engage with representatives from Northern Tablelands LLS on a number of occasions. Details of this consultation are provided in the consultation register in Appendix B.

3.2.3 Commonwealth legislation

The EPBC Act aims to protect matters of national environmental significance (MNES) including:

- world heritage properties;
- national heritage places;
- Ramsar wetlands of international importance;
- nationally threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- a water resource, in relation to coal seam gas development and large coal mining development.

If an action would, or is likely to, have a significant impact on any MNES, it is deemed to be a 'controlled action' and requires approval from the Commonwealth Minister for the Environment and Energy or the Minister's delegate.

To determine whether a proposed action will or is likely to be a controlled action, a Referral or Proposed Action is submitted to the Commonwealth Department of the Environment and Energy (DoEE).

A search of the Commonwealth Protected Matters Search Tool indicates that there are no World Heritage Properties or National Heritage Places within the vicinity of the development footprint.

An assessment of the impacts of the project on MNES within the development footprint was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. Matters of MNES relevant to the development footprint are summarised in Table 7.1 of Appendix C.

Five assessments of significance have been completed for three threatened species, namely Regent Honeyeater, Painted Honeyeater and Swift Parrot, and two migratory species; White-throated Needletail and Fork-tailed Swift (refer Appendix F of Appendix C). All assessments concluded that no significant impacts on threatened entities are predicted to result from the project.

The project is unlikely to have a significant impact on MNES and is, therefore, not required to be referred the Commonwealth Minister for the Environment for approval.

3.2.4 Strategic policies

i New England North West Regional Plan 2036

The New England North West region encompasses a total of 12 LGAs in regional NSW including the Uralla Shire LGA. The New England North West Regional Plan 2036 (NSW Government 2017) will guide the NSW Government's land use planning priorities and decisions in the New England North West region to 2036.

One of the primary goals of the New England North West Regional Plan 2036 is to develop a strong and dynamic regional economy within the region. The region's economy has historically been dependent on agricultural productivity (NSW Government 2017). In the short term, the focus of the plan is on supporting cities, important farmland, renewable energy projects and tourism opportunities to help diversify the region's economy. To achieve this goal, the plan defines nine directions, one of which is to grow New England North West as the renewable energy hub of NSW. Large-scale renewable energy projects have potential to generate new employment opportunities and investment from construction, operations and connection to the State's electricity grid.

As noted within the New England North West Regional Plan 2036, the NSW Government is to work with local councils to deliver the directions and actions set out within this plan to grow the New England North West region as a renewable energy hub of NSW. The plan also establishes priorities for each council to guide further investigations and implementation. One of the priorities identified for Uralla Shire Council is to identify and promote wind, solar and other renewable energy production.

The region has potential sources of solar energy, receiving 19-20 megajoules daily of solar exposure, making it the second highest solar penetration region in NSW (NSW Government 2017).

The three array areas and, more generally, Uralla Shire LGA, experience a consistently high availability of solar radiation making them ideal for large scale solar developments. The project will create employment opportunities and have direct and indirect benefits to the local and regional economy during the life of the project. In addition, the project's proximity to TransGrid's 330 kV transmission line is beneficial and has been an important element of site selection, minimising the length of connection infrastructure required to connect the project to the electricity network. The project will contribute to the diversification of the energy sector while strengthening the New England North West region's economy.

ii New England North West Strategic Regional Land Use Plan

The New England North West Strategic Regional Land Use Plan (NSW Government 2012) is an important component of the State government's Strategic Regional Land Use Policy (SRLUP), which comprises multiple initiatives to address land use conflict in regional areas, particularly focused on managing coal and coal seam gas issues. The plan identifies areas of strategic agricultural land, which includes both land with unique natural resource characteristics, known as BSAL, and clusters of significant agricultural industries that are potentially impacted by coal seam gas or mining development, known as critical industry clusters (NSW Government 2012).

As noted in Table 1.2, approximately 1,100 ha of land within the PEA site boundary is mapped as BSAL as defined by Strategic Agricultural Land Map – New England North West regional mapping presented in the Mining SEPP. Significant reductions to the extent of the northern and southern array areas have reduced the extent of BSAL within the development footprint for the three array areas by 40% to approximately 670 ha (refer Figure 5.5).

In addition to reducing the extent of BSAL within the development footprint, UPC has designed the project to minimise impacts on agricultural land, wherever possible. As part of the LUCRA (refer Section 5.5 and Appendix F), impacts to neighbouring agricultural operations (including agricultural haulage activities and lambing) have been considered.

iii NSW Renewable Energy Action Plan

The REAP, prepared by the NSW Government in 2013 guides NSW's renewable energy development and supports the achievement of national renewable energy targets. The NSW Government's vision is for a secure, reliable, affordable and clean energy future for the State. The REAP positions NSW to increase the use of energy from renewable sources.

The REAP sets out a number of actions to achieve its vision, under the following three goals:

- Goal 1 – attract renewable energy investment;
- Goal 2 – build community support; and
- Goal 3 – attract and grow renewable energy expertise.

The project will assist in achieving the NSW Government's goals of increasing renewable energy generation in NSW to help achieve renewable energy targets. Through creating new solar employment opportunities, the project will contribute to growing expertise in renewable energy technologies.

3.2.5 Summary of licences, approvals and permits

Table 3.3 contains a summary of the licences, approvals and permits that are likely to be required for the project.

Table 3.3 Summary of required licences, approvals and permits

Legislation	Authorisation	Consent or approval authority
EP&A Act	Development consent	Minister for Planning or delegate
	Construction certificate required prior to construction of certain structures	Uralla Shire Council or private certifier
	Occupation certificate required prior to use of certain buildings	Uralla Shire Council or private certifier
Roads Act	Section 138 permits for works involving a public road	Uralla Shire Council

Should it be required, the STP installed as part of the construction accommodation village may also require a licence to operate. The size of the STP will be dependent on the number of workers housed within the construction accommodation village and will be designed and installed in accordance with the relevant design standards and regulatory requirements, and in consultation with DPE, Uralla Shire Council, EPA, DoI Lands and Water and OEH.

4 Engagement

4.1 Introduction

This chapter provides an overview of the engagement activities carried out before and during the preparation of the EIS.

As part of the project refinement process and preparation of the EIS, consultation has been, and will continue to be, undertaken with a range of stakeholders including various local and NSW Government agencies, the local community and neighbouring landholders.

Stakeholder engagement commenced in February 2018 and has been led by UPC with the support of EMM. This chapter of the EIS describes the consultation process that has been undertaken to date and addresses the SEARs as they relate to consultation. This chapter includes:

- the project's consultation objectives (Section 4.2);
- an overview of the project's stakeholder engagement strategy (Section 4.3);
- a summary of the engagement activities performed with regulatory, community, industry and other stakeholders (Section 4.4);
- a record of media coverage of the project (Section 4.5);
- a summary of the community benefit sharing initiative (CBSI) (Section 4.6); and
- next steps in terms of ongoing stakeholder engagement (Section 4.7).

Further details on stakeholder engagement activities are provided in Appendix B, which contains a copy of the following materials:

- stakeholder engagement strategy;
- a summary of the consultation register, which provides a record of all consultation undertaken as part of the preparation of the EIS and provides key outcomes of this consultation;
- a copy of the *Community Benefit Sharing Initiative: Options Paper* prepared by Community Power Agency (CPA 2018), which provides a summary of the CBSI and lists the recommendations;
- copies of community consultation materials (including community fact sheets, information boards, posters and flyers) presented to the local community;
- copies of government and regulatory agencies consultation (where relevant); and
- copies of media coverage.

4.2 Consultation objectives

UPC's objectives of engagement for the project undertaken to date have been to ensure identified stakeholders have a sufficient understanding of:

- the project and UPC;
- how the project may affect them;
- how engagement contributes to the overall approval process for the project;
- how they can participate in the approval process and be informed and consulted;
- collect qualitative and quantitative data and insights for scoping the EIS and relevant technical assessments to maximise diversity and representativeness;
- understand the interests that stakeholders have in the project, and how potential impacts are predicted to be experienced from their perspective; and
- consider the views of stakeholders in a meaningful way and using these insights to inform project refinement (refer Section 1.4.2) and, if required, mitigation and management measures.

4.3 Stakeholder engagement strategy

Expectations from both regulators and community for meaningful stakeholder engagement have increased in recent years. In response to this, EMM and UPC developed a stakeholder engagement strategy for the project in February 2018 (Appendix B). The purpose of this strategy was to:

- identify stakeholders relevant to the project;
- describe the overall objective for consultation with each stakeholder (or stakeholder group);
- recommend timing, methods, and key matters to be discussed/resolved with each stakeholder; and
- consider the potential impacts on the stakeholder engagement strategy of the *Draft Community and Stakeholder Engagement Guidelines*, which form part of the draft environmental impact assessment (EIA) guidance series being developed by DPE as part of the EIA improvement project, as well as the *Draft Large-Scale Solar Energy Guideline* (DPE 2017) (Draft Solar Guideline).

At the time of writing the stakeholder engagement strategy, it was noted that both the Draft Solar Guideline (DPE 2017) and the *Draft Community and Stakeholder Engagement Guidelines* recommended significant upfront focus and effort with regards to consultation with key stakeholders (including the local community) during preparation of a PEA. This model was adopted by EMM and UPC (refer Section 4.4).

The stakeholder engagement strategy also defined the key messages to be addressed in all consultation for the project, which are reflected in the consultation objectives defined in Section 4.2. Methods for consultation with stakeholders, which included face-to-face meetings, community information sessions, distribution of community fact sheets, a dedicated project website, an online feedback form and community information line, were also identified and the strengths of their application described.

As part of the stakeholder engagement strategy, a consultation program and register were produced. The consultation program identified the major stakeholder groups for each stage of the approvals process. The consultation register was populated each week as consultation occurred and was used to detail the outcomes and actions resulting from consultation. A summary of the consultation register is provided in Appendix B. A summary of the stakeholders identified within the consultation program and their potential interests in relation to the project is provided in Table 4.1.

Table 4.1 Stakeholders and their potential interests in relation to the project

Stakeholder		Interests relevant to the project
Regulatory	DPE	Project introduction, assessment pathway and timing. Approach to community and stakeholder engagement.
	DPE DRG (including GSNSW)	Impacts to exploration and mining of significant mineral resources. Demonstrate how the project will avoid/minimise impacts on exploration activities.
	Office of Environment and Heritage (OEH)	Biodiversity and offsets. Aboriginal cultural heritage. Historic heritage. Water and soil impacts. Flooding.
	Environment Protection Authority (EPA)	Potential impacts on noise, odour, water and air quality.
	Department of Primary Industries (DPI)	Impacts on agricultural production, neighbouring agricultural operations and land mapped as BSAL. Opportunities for the project to co-exist with agricultural production. Potential for land use conflicts. Flooding. Water supply. Soil erosion.
	Roads and Maritime Services (RMS)	Impacts on roads under RMS jurisdiction (namely New England Highway and Thunderbolts Way). Potential for distraction of, and for glare impacts on, passing motorists.
	Northern Tablelands Local Land Services (LLS)	Property vegetation plans (PVPs). Land management. Impacts to native vegetation. Soil and land capability (including potential for soil degradation, erosion and off-site sedimentation, weed invasion, altered land use and management). Biosecurity risks.
	DoI Lands and Water	Impacts on Crown land, Crown roads and Crown waterways. Impacts on mapped watercourses and associated riparian corridors.
	Forestry Corporation of NSW (Forestry NSW)	Management of timber reserves on Crown land.

Table 4.1 Stakeholders and their potential interests in relation to the project

Stakeholder		Interests relevant to the project
	Uralla Shire Council	Project introduction, assessment pathway and timing. Approach to community and stakeholder engagement. Impacts on roads under Uralla Shire Council jurisdiction. Impacts on the local community, infrastructure and services. Cumulative impacts with other major projects. Waste management. Water supply. Project benefits and opportunities.
	Armidale Regional Council	Impacts on the local community, infrastructure and services (including potential muster points for construction workforce transportation). Cumulative impacts with other major projects. Waste management.
	Tamworth Regional Council	Impacts on the local community, infrastructure and services (including potential muster points for construction workforce transportation). Cumulative impacts with other major projects. Waste management.
	Commonwealth Government Department of Environment and Energy	MNES as defined under the EPBC Act.
Community	Neighbouring landholders	Project introduction, assessment pathway and timing. Potential concerns about the project (eg visual amenity, traffic, construction noise, health and safety). Impacts to neighbouring agricultural operations and land use conflicts. Proposed mitigation and management measures to address impacts.
	Interested members of the local community	Project introduction, assessment pathway and timing. Project benefits and opportunities. Impacts on the local community, infrastructure and services. Proposed mitigation and management measures to address impacts.
	Local businesses	Project introduction, assessment pathway and timing. Project benefits and opportunities (including involvement in construction works and accommodation supply). Impacts on the local community, infrastructure and services. Proposed mitigation and management measures to address impacts.
	Local radio, television and newspaper	Project introduction, assessment pathway and timing. Impacts on the local community, infrastructure and services. Proposed mitigation and management measures to address impacts.
	Special interest groups (eg Zero Net Energy Town (Z-Net))	Project introduction, assessment pathway and timing. Impacts on the local community, infrastructure and services. Project benefits and opportunities.
	Aboriginal community	Project introduction, assessment pathway and timing. Consultation regarding the Aboriginal cultural heritage values of the development footprint.

Table 4.1 Stakeholders and their potential interests in relation to the project

Stakeholder		Interests relevant to the project
Industry and other stakeholders	NSW Rural Fire Service (RFS)	Impacts on bushfire prone land and implementation of appropriate bushfire protection measures. Consideration of asset protection zones (APZs).
	Civil Aviation Safety Authority (CASA)	Impacts on air traffic and Armidale Airport.
	Fire & Rescue NSW	Fire or hazardous material incident response.
	Members of Parliament	Project introduction, assessment pathway and timing. Impacts on the local community, infrastructure and services. Project benefits and opportunities.
	NSW Renewable Energy Advocate	Renewable energy opportunities in NSW. Project introduction, assessment pathway and timing.
	Electricity network operators (ie TransGrid and Essential Energy)	Project introduction, assessment pathway and timing. Grid capacity and detailed design of the grid connection. Impacts on existing infrastructure and easements.
	University of New England (UNE)	Biodiversity. Aboriginal cultural heritage. Historic heritage.
	John Holland (Country Regional Network)	Interactions with level crossings on Barleyfields Road, Gostwyck Road and Thunderbolts Way and potential upgrade requirements. Impacts on the Main Northern Railway Line.

4.4 Engagement with stakeholders

4.4.1 Regulatory

i Overview

Engagement with key regulatory stakeholders commenced in February 2018 and included face-to-face meetings with Uralla Shire Council, DPE and the NSW Renewable Energy Advocate, as well as teleconferences with OEH and DPI. The purpose of these activities was to provide a general introduction to the project and identify the current area of investigation. This early engagement formed part of the scoping stage of the project and informed the content of the PEA.

As key workstreams progressed, SEARs for the project were released and potential impacts were identified, engagement with regulatory stakeholders expanded to include DRG-GSNSW, EPA, RMS and LLS. The purpose of this consultation was primarily to respond to the input provided by regulators on the SEARs and provide opportunities for further input into the assessments performed as part of the EIS.

A brief summary of the engagement activities undertaken with key regulatory stakeholders, including Uralla Shire Council, DPI, OEH and DoI Lands and Water is provided below. Records of consultation with other regulatory stakeholders (refer Table 4.1) are provided in the consultation register in Appendix B.

ii Uralla Shire Council

UPC commenced engagement with Uralla Shire Council staff in February 2018. Since this time, UPC has maintained open lines of communication with Uralla Shire Council staff and elected Councillors. This has included detailed presentation and question and answer sessions at Uralla Shire Council's meetings of 10th April and 30th October 2018; targeted face-to-face meetings with Uralla Shire Council staff to discuss local infrastructure, the CBSI and other matters; teleconferences; and invitations to the project's four community information and feedback sessions, which took place at venues within the township of Uralla in May, June, August and October (refer Section 4.4.2).

Where possible, UPC has responded to matters raised by Uralla Shire Council staff and elected Councillors as part of the EIS. This includes consideration of the project's potential impacts on the local road network (Section 5.8), the local community, infrastructure and services (Section 5.12) and waste management (Section 5.15). Where the level of detail requested by Uralla Shire Council staff was not available for inclusion in the EIS (eg in relation to the quantity of waste generated by the project), UPC will continue to liaise with relevant staff from Uralla Shire Council during the detailed design stage of the project. For example, UPC will continue to liaise with Uralla Shire Council as part of preparation of the project's waste management plan, which will be finalised prior to commencement of construction.

iii Department of Primary Industries

UPC and EMM commenced engagement with DPI in February 2018 to discuss the project's potential impacts on agricultural production within the investigation area and, more generally, on neighbouring agricultural operations. As part of this engagement, a representative from DPI's Northwest Resource Management team attended a site inspection, which included field assessment of accessible areas within the PEA site boundary and discussion of agricultural production practices within the investigation area and how these related to soil profiles within the landscape.

To address the SEARs, this EIS includes consideration of erosion potential within the development footprint (Appendix G) and potential for land use conflicts with the project's closest neighbours, including rural residences and neighbouring agricultural operations (Appendix F). In response to feedback from DPI, as part of the preparation of the LUCRA, the focus has been on identifying issues that have arisen during consultation with surrounding landholders, listing the mitigative measures that have been considered to address these issues or concerns, and quantifying the residual risk.

The outcomes presented within the LUCRA (Appendix F) demonstrate how the project design has been informed by consultation. For example, project-related vehicle movements will not turn off The Gap Road directly from Thunderbolts Way to avoid road traffic noise, dust and safety concerns raised by landholders with rural residential and small-scale agricultural operations along this unsealed local road corridor.

Where required, UPC will continue to engage with DPI as part of the preparation of the construction environmental management plan (CEMP).

iv Office of Environment and Heritage

At the completion of preliminary vegetation mapping and on-site investigations within the PEA site boundary in February 2018, UPC and EMM commenced engagement with OEH to discuss the key outcomes of the preliminary field survey effort and propose the biodiversity assessment methodology for the project moving forward.

Ongoing consultation with OEH throughout the preparation of the BDAR (Appendix C) has focused on field survey methodology and assessment approaches for targeted flora surveys of Bluegrass (*Dichanthium setosum*) and Hawkweed (*Picris evae*).

As noted in Section 3.2.3, an assessment of the impacts of the project on MNES within the development footprint was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. A referral is required if a project is, or likely to have, a significant impact on a MNES. According to DoEE:

> A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on the environment.
>
> (Australian Government Department of Environment 2013, p.2)

The assessment for this project concluded that no significant impacts on threatened entities are predicted to result from the project and the project is unlikely to have a significant impact on MNES. Therefore, the project is not required to be referred to the Commonwealth Minister for the Environment for approval.

UPC and EMM will continue to consult with relevant assessment officers at OEH as part of the preparation of the project's biodiversity offset strategy. All unavoidable impacts will be offset in accordance with NSW Government policy.

In addition to discussion of the project's impacts on biodiversity, engagement with OEH also focused on Aboriginal cultural heritage as part of preparation of the ACHAR (Appendix D). Regular updates on archaeological field survey (including coverage and extent) have been provided and guidance has been sought on the proposed approach to test excavation and additional scar tree survey and scar tree verification during the public exhibition period and preparation of the RTS report.

UPC and EMM will continue to consult with relevant assessment officers at OEH as part of determination of potential impacts to identified areas of PAD and preparation of the AHMP prior to commencement of construction.

v Department of Industry –Lands and Water

Consultation with various officers at DoI Lands and Water has been ongoing throughout the preparation of this EIS, particularly in relation to the project's potential impacts on Crown land, Crown roads and waterways, and mapped watercourses within the project boundary and, more specifically, the development footprint for the three array areas.

A small parcel of Crown land (Crown reserve 95655 – refer Figure 1.6) adjacent to Salisbury Waters and within proximity of the development footprint for the southern array area was identified as part of DoI Lands and Water's input on the SEARs. The project will not impact Crown reserve 95655.

As part of consultation with DoI Lands and Water, several Crown roads have been identified within the development footprint for the three array areas. Applications to close a number of these roads have already been lodged with DoI Lands and Water and, subsequently, no further action is required for these. Crown roads that remain within the development footprint will require closing and this process will be undertaken in parallel with the planning assessment and approval process for the project and prior to construction.

Consultation with DoI Lands and Water around watercourse impacts was undertaken over the period of July to September 2018, and this resulted in key watercourses of interest being identified for more detailed consideration. More detailed assessment was undertaken on the basis of drone footage and photos taken during fieldwork by EMM and UPC throughout this period. The project's potential impacts on key watercourses of interest to DoI Lands and Water have been considered in Section 5.9 and Appendix H.

As noted in Section 1.4.2, the development footprint has been designed to minimise impacts on watercourses within the three array areas and their surrounds. In a number of instances, the irregular shape of the three array areas is a result of avoidance of higher order watercourses (refer Figure 1.3).

4.4.2 Community

i Targeted engagement with neighbouring landholders

The stakeholder engagement strategy noted the importance of consultation with several neighbouring landholders within proximity of the three array areas prior to the submission of the PEA and the project going public through DPE's Major Projects register.

In the first instance, a letter was distributed to eight neighbouring landholders in February 2018 to introduce UPC, provide a high-level discussion of the project and assessment process and offer an invitation to meet and discuss the project further. The first round of letters were distributed to several residences closest to the PEA site boundary. Subsequently, a series of face-to-face meetings were held with these adjoining landholders, particularly residents along The Gap Road and Gostwyck Road, throughout March and April.

As part of these meetings, several residents along The Gap Road raised concerns over both the proximity of their properties to the area of investigation presented to them (ie the PEA site boundary on Figure 1.3) and subsequent visibility of project infrastructure, as well as the potential volume of project-related vehicles accessing The Gap Road direct from Thunderbolts Way during the project's construction period. Consultation with residents living at an elevated position on Gostwyck Road with views to the southern array area also raised concerns about visual amenity impacts of the project's southern array area and the original solar array substation and ETL alignment that had been proposed in the PEA.

In response to feedback received from residents along The Gap Road and Gostwyck Road during targeted engagement, significant revisions have been performed to greatly reduce the extent of the development footprint in the southern array area (Figure 1.3). As part of this refinement process, an area of approximately 585 ha north of Salisbury Waters has been excluded from the development footprint for the southern array area. In addition, project-related vehicles will not access The Gap Road direct from Thunderbolts Way during the project's construction period. The location of the solar array substation and the alignment of the proposed ETL between the southern and central array areas have also been revised in response to feedback received from neighbouring landholders.

Additional letters were distributed to neighbouring landholders in the suburbs of Kellys Plains, Armidale, Dangarsleigh, Gostwyck and Uralla. This included the cluster of smaller residential landholdings north and north-east of the development footprint for the northern array area (Figure 5.6). Invitations to the project's community information and feedback sessions and project updates were also distributed to these landholders during the preparation of the EIS.

Commencing in February 2018, UPC and EMM have been engaged in targeted engagement with S9. S9 is the closest non-project related rural residential property to the development footprint for the southern array area. A small-scale agricultural business also operates here. Engagement with the property owners at S9 has included multiple inspections of the property and surrounds, five separate face to face meetings involving detailed discussions of potential impacts and mitigation and management measures, email and phone communications and regular project updates. Engagement between S9 and UPC is ongoing.

As part of the significant refinements to the development footprint for the southern array area, approximately 40 ha of land south of Salisbury Waters, adjacent to S9 has been excluded from the southern array area. This exclusion increased the buffer between S9 and the development footprint for the remaining part of the southern array area from approximately 50 m to 240 m and has also restricted the placement of project infrastructure to the east and south of S9 (Figure 5.6). It is also noted that the refinements to the southern array area that involved the removal of all of the proposed development on the northern side of the Salisbury Waters and revisions to the proposed location of the solar array substation and revisions to the ETL alignment to connect the southern and central array areas were partly due to the strong feedback received from S9.

A detailed description of the potential visual amenity impacts from S9 is provided in Section 5.6 and Appendix I (refer text regarding Viewpoint 2). In addition, photomontages have been produced to demonstrate the potential visibility of project infrastructure from two locations within the property boundary. Landscaping is proposed at two locations to address the potential visibility of project infrastructure from within the property boundary (refer Figure 4.2 of Appendix I). The final location and extent of landscaping will be determined during detailed design and following subsequent discussions between UPC, the project landholders and the property owners of S9 as part of preparation of the EMP.

Since the commencement of engagement with the property owners of S9, UPC has continued to provide regular project updates and maintain open lines of communication and has tried to accommodate the feedback provided by the landholders wherever practicable. Additional concerns raised by the property owners of S9 have also been addressed within the EIS, which include but are not limited to:

- noise generated during construction (refer Section 5.7);
- dust associated with construction and operations (refer Section 5.14);
- impacts on birds and wildlife using Dangars Lagoon, Salisbury Waters and surrounds (refer Section 5.2);
- pest management (refer Section 5.5 and Appendix F);
- visual amenity impacts (refer Section 5.6);
- adequacy of vegetation screening (refer Section 5.6);
- glare and reflectivity from PV modules (refer Section 5.6);
- decreased land and property value (refer Section 4.4.2 ii);
- traffic impacts and vehicle numbers along The Gap Road (refer Section 5.8);
- impacts to their agricultural business, including visitor numbers (subject to ongoing discussions between UPC and S9);
- timing and extent of peak construction works in the southern array area (subject to ongoing discussions between UPC and S9); and
- night lighting impacts during operation (refer Section 5.6).

Targeted engagement has also been undertaken with the property owner at N1, a residence off Old Gostwyck Road, within proximity of the northern array area (refer Figure 5.6). Due to proximity to residences along Heathersleigh Road, Corey Road, Burns Road and Hariet Gully Road; the results of a preliminary viewshed analysis; and targeted engagement with the property owner at N1, significant revisions have also been made to the northern extent of the northern array area to increase the distance between the development footprint and neighbouring residences. As part of this refinement, an area of approximately 315 ha has been excluded from the development footprint for the northern array area (refer Figure 1.3).

Other matters raised during engagement with the property owner at N1 have also been addressed within the EIS, including, but not limited to:

- weed and pest management (refer Section 5.5 and Appendix F);
- noise generated during construction (refer Section 5.7);

- dust associated with construction and operations (refer Section 5.14);
- safety and security (refer Section 5.5 and Appendix F);
- visual amenity impacts (refer Section 5.6);
- decreased land and property value (refer Section 4.4.2 ii); and
- night lighting impacts during operation (refer Section 5.6).

UPC acknowledges the extended environmental assessment and approval process that has been, and continues to be, undertaken in seeking development consent for the project. UPC are seeking approval through the required legal process pursuant to the provisions of the EP&A Act and associated regulations and supporting guidelines. Considerable time has been spent considering feedback received during stakeholder engagement with all the project's neighbouring landholders; including S9 and N1, analysing the results of relevant assessments and preparing detailed technical studies so as to present a robust and comprehensive EIS for consideration by relevant stakeholders and government agencies.

As part of the preparation of the EIS and supporting technical assessments, namely the VIA (Appendix I) and NVIA (Appendix J), potential impacts on the tenants of a rental property owned by one of the project landholders within the southern array area (S11) have also been considered. UPC met with the tenant of the property in July 2018 and provided a detailed introduction to the project and confirmed that the land adjacent to the property would likely form part of the development footprint for the southern array area. During this consultation, the tenant raised concerns around the potential impacts of the project on their pigeons. There is no evidence to suggest the project will have an impact on their pigeons. As noted within Section 5.6 and Section 5.7, it is recommended that potential visual amenity and noise impacts be discussed with the tenants and landholders to identify appropriate mitigation to be adopted at this property.

A summary of the consultation with neighbouring landholders are provided in the consultation register in Appendix B. In addition, copies of the photomontages used to demonstrate the potential visible extent of project infrastructure from a number of adjoining landholders with views towards the development footprint for the three array areas are provided in Appendix C of Appendix I. As noted previously, consultation with neighbouring landholders will continue throughout the public exhibition of the EIS and mitigation and management measures to address the project's residual impacts, where required, will be described within the EMP.

As part of ongoing engagement with adjoining landholders, valuable inputs have also been provided on how UPC could improve their engagement with the broader community, including suggestions on appropriate locations for future community information and feedback sessions; how to better advertise upcoming sessions; and how to increase awareness about the project more generally within the Uralla Shire LGA. This feedback will be used to inform future engagement activities with the local community.

ii Community information and feedback sessions

A series of four community information and feedback sessions have been held at various locations within the township of Uralla between May and October 2018 (refer Photograph 4.1 and Photograph 4.2). Each session was well attended, and feedback received was generally positive about the project. In addition, community workshops have also been held as part of the development of the CBSI (refer Section 4.6.3). Employment opportunities and economic benefits were highlighted throughout community stakeholder engagement as key positives for the local community. Concerns that were raised by the community at the community information and feedback sessions were often practical questions that primarily related to the construction stage of the project. In addition, questions about employment opportunities were also common.

Photograph 4.1 Community information and feedback session – 12 June – Uralla Memorial Hall

Photograph 4.2 Community information and feedback session – 15 August – The Alternate Root

Prior to each session, invitations were distributed to near neighbours including residents within the suburbs of Uralla, Kellys Plains, Gostwyck, Dangarsleigh, Salisbury Plains and Armidale. Invitations included details of upcoming community information and feedback sessions, general project updates and information about the community benefit sharing initiative. In addition to personalised invitations (distributed to 4065 residents), flyers advertising the upcoming community information and feedback sessions were posted at local businesses within the township of Uralla, as well as at Uralla Shire Council, the local library and visitor information centre. Newspaper advertisements within the Armidale Express and Armidale Express Extra were also used to inform a wider audience about the upcoming sessions.

Each community information and feedback session has been well attended by a collective of the project's neighbouring landholders, residents of Uralla, local business owners and other interested parties. In response to feedback received following the first community information and feedback session, the second, third and fourth sessions were advertised in the local media (including the Armidale Express), as well as online (community Facebook accounts) and with flyers in local businesses to increase local awareness. Though each session varied slightly in terms of the delivery of information to attendees, in each instance, attendees received an update on the project and were given an opportunity to interact with representatives of the project team, including UPC and EMM. This allowed the community to provide feedback directly to the project team, which has been considered as part of the project refinement process (Section 1.4.2). In addition, attendees had the opportunity to complete hard copy feedback forms at each session.

Table 4.2 outlines the feedback and matters raised by the local community during the community information and feedback sessions, and where (if applicable to the project) they have been addressed within the EIS. It should be noted that the feedback and matters raised across each of the four community information and feedback sessions were generally consistent.

Table 4.2 Community feedback and matters raised

Environmental aspect	Matters raised	Where addressed in the EIS
Social and economic	Change in land use resulting in increased pedestrian and vehicle traffic on-site during the project's construction period and potential for theft and vandalism at neighbouring properties.	Appendix F (LUCRA)
	Devaluation of neighbouring properties due to proximity to and visibility of project infrastructure.	Appendix F (LUCRA)
	Impacts to the council rates of neighbouring properties due to the change in land use within the development footprint.	Appendix F (LUCRA)
	Availability of existing services and infrastructure in the local community.	Section 5.12 Appendix N (SIA)
	Impacts on rural lifestyles.	Section 5.12 Appendix N (SIA)
	Impact of project construction on town infrastructure and finding the balance between use and overuse.	Section 5.12 Appendix N (SIA)

Table 4.2 Community feedback and matters raised

Environmental aspect	Matters raised	Where addressed in the EIS
Traffic and transport	Safety of children, horses, wildlife and livestock due to increased vehicle movements along the local road network.	Section 5.8 Appendix K (TIA) Appendix F (LUCRA)
	Increased vehicle movements along the local road network during construction and subsequent impacts on accessibility and commute times.	Section 5.8 Appendix K (TIA)
	Impact of vehicle movements on school bus route accessibility and commute times.	Section 5.8 Appendix K (TIA)
	Potential conflicts between project-related construction vehicle movements and stock movements.	Appendix F (LUCRA) Appendix K (TIA)
Visual amenity	Visibility of project infrastructure from residences and the local road network.	Section 5.6 Appendix I (VIA)
	Inadequacy of vegetation at screening project infrastructure during ongoing operations.	Section 5.6 Appendix I (VIA)
	Glare/reflectivity from PV modules and other project infrastructure.	Section 5.6 Appendix I (VIA)
	Potential for night lighting from the project to impact neighbouring properties.	Section 5.6 Appendix I (VIA)
Water	Water supply arrangements for the project	Section 5.9 Appendix H (SWA)
Noise	Construction noise and associated impacts on residents and livestock.	Section 5.7 Appendix J (NVIA))
	Operational noise and associated impacts on residents and livestock.	Section 5.7 Appendix J (NVIA)
	Noise from increased vehicle movements on local roads during construction and associated impacts on residents and livestock.	Section 5.7 Appendix J (NVIA)
Land management	Impacts to neighbouring agricultural operations.	Section 5.5 Section 5.8
	Increased distribution of weeds during construction as a result of increased vehicle and pedestrian movements.	Section 5.3 Appendix C (BDAR) Section 5.5 Appendix F (LUCRA)
	Increased presence of pest animals during construction as a result of increased food waste.	Section 5.5 Appendix F (LUCRA)
	Removal of high quality agricultural land from production.	Section 5.5
	Reduced agricultural productivity of land under project infrastructure.	Section 5.5
	Impacts on seasonal/campaign-based agricultural transport activities during construction (eg livestock or product cartage).	Section 5.5 Appendix F (LUCRA) Section 5.8 Appendix K (TIA)
Heritage	Impacts on culturally significant areas and those of historical significance.	Section 5.4 Appendix E

Table 4.2 Community feedback and matters raised

Environmental aspect	Matters raised	Where addressed in the EIS
Biodiversity	Reduction in suitable environment for kangaroos and other native animals.	Section 5.2 Appendix C (BDAR)
Air quality	Dust from vehicle movements along access roads and unsealed local roads.	Section 5.14 Appendix F (LUCRA)
	Dust from sheep moving across paddocks on-site once operational.	Appendix F (LUCRA)
Health	Potential health impacts due to proximity to project infrastructure.	Section 5.10 Appendix L (Hazards and risks assessment)
Waste	Availability of waste management facilities within the local community during construction and operations of the project.	Section 5.15 Appendix N (SIA)
Other	What will happen to project infrastructure after the project is finished?	Section 2.7
	Where will the project workers come from?	Section 2.4.6
	What benefits will there be for residents within Uralla Shire LGA and surrounds?	Section 4.6 (CBSI) Section 5.12 Section 5.13
	Will there be opportunities for tourism (eg views areas or signage for the project)?	Not addressed in this EIS.
	How do locals find out about or express their interest in being involved with the project?	Section 4.4.2 (iii)

Note: Table 4.2 also includes matters raised by the community through other avenues of communication including online feedback forms, as part of face-to-face meetings with the project team, emails to the info@newenglandsolarfarm.com.au and the community information line.

A set of mitigation and management measures will be put in place that have been designed to address specific impacts associated with the project. Periodic monitoring of the effectiveness of the proposed measures will occur and these measures will be revised as necessary throughout construction and operations.

Questions regarding the project's impact on the value of surrounding properties have been raised by the local community. There is currently no empirical evidence or detailed academic studies in an Australian setting (eg quantitative research or economic assessments) that considers whether an increase in large-scale solar PV developments in an area is associated with a decline or increase in surrounding property values. However, it is appreciated that this is an issue of concern to the local community. While economic analyses for the industry in relation to valuation and pricing of land is not yet existing, and there are many factors that influence land values, inference can be drawn from one key factor, which is amenity and specifically, the impacts to the amenity of neighbouring properties and the locality. Generally, it is noted that impacts related to visual amenity are the more prevalent matters driving concerns of loss of property value for neighbouring residential properties. Similar concerns have also been raised by a small number of landholders who have future plans for the development of residential dwellings on land that is currently used for farming. Neighbouring properties that are currently used for agricultural production are also concerned with potential impacts associated with surface water flow paths and weed and pest management. The EIS and supporting technical assessments have considered potential amenity impacts from the project's construction and operations.

Construction impacts will be temporary in nature and are therefore considered unlikely to have a lasting impact on the amenity of the locality. The residual impacts associated with the ongoing operation of the project (ie after the implementation of proposed management and mitigation measures, such as landscaping) are predicted to be minimal. For example, once operational, project-related vehicle movements on the local road network will be minimal. In addition, the levels of noise generated by project infrastructure during operations will be minimal. As part of the detailed design process, potential noise-generating infrastructure associated with the ongoing operation of the project (including substations and BESSs) will be positioned within the development footprint with a view to maximising distance between this infrastructure and nearby residences, where practicable. Subsequently, amenity impacts post-construction at surrounding properties are not predicted to be significant. Further detail on potential impacts to the local community and amenity are provided in Section 5.6 (visual), Section 5.7 (noise), Section 5.8 (traffic) and Section 5.12 (local infrastructure and services).

iii Community engagement materials

To provide an opportunity for the local community to find out more about the project and engage with the project team, UPC launched the New England Solar Farm web page, community information line and email account in April 2018.

The project web page will remain active throughout the assessment process and provides a general introduction to the project and progress updates to a wide audience.

Both the community information line and email account will also remain active and provide an avenue through which the community can stay up-to-date on the project and continue to share their views, concerns and ideas with the project team.

Through the project web page, a mailing list has also been established, which provides regular project updates to the community, including details of upcoming community information and feedback sessions.

There are also opportunities for local contractors and suppliers to register expressions of interest in the project at a general level and these contacts will be considered by UPC prior to commencement of construction.

iv Aboriginal stakeholders

Aboriginal stakeholders were identified and consulted in accordance with *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a). A detailed description of consultation is presented in Appendix D and Section 5.3.

4.4.3 Industry and other stakeholders

Engagement with industry and other stakeholders, including RFS, CASA and John Holland (Country Regional Network), has been consistent with the guidance provided by the project's stakeholder engagement strategy and focused on their interests relevant to the project as listed in Table 4.1. Each of the matters raised by RFS, CASA and John Holland (Country Regional Network) have been considered as part of the BHA (Section 5.11 and Appendix M), VIA (Section 5.6 and Appendix I) and TIA (Section 5.8 and Appendix K), respectively. A summary of this consultation is provided in the consultation register in Appendix B.

Regular project updates and invitations to the project's community information and feedback sessions have also been provided to the Honourable Adam Marshall, State Government Member for Northern Tablelands. As part of this engagement, Adam has commented in person and in the media more broadly that he is supportive of renewable energy projects in the Northern Tablelands region, in particular, when the community is kept well-informed by the proponent.

In addition, as part of the preparation of the BDAR (Appendix C), ACHAR (Appendix D) and HHA and SoHI (Appendix E), academic staff from UNE provided valuable inputs and local knowledge on the existing natural and cultural environment within the New England region.

4.5 Media coverage

The project has been the subject of media coverage, including newspaper articles within the Armidale Express and stories from local television news providers, including PRIME7 and NBN News. Links to online content are provided in Table 4.3 below.

Table 4.3 Media coverage of the project

Source	Date	Title	Link to online content
Armidale Express	11-May-18	*Sunhill Dairy Goats farm Uralla concerned it will be hit hard by a potential New England Solar Farm development*	https://www.armidaleexpress.com.au/story/5394476/sunhill-concerned-it-could-be-swarmed-by-solar-farm-development/
PRIME7 News North West	4-Jun-18	*Solar surge across the region*	https://www.prime7.com.au/news/2427-solar-surge-across-the-region
Armidale Express	7-Aug-18	*Proposed New England Solar Farm plan community meeting*	https://www.armidaleexpress.com.au/story/5568914/community-meeting-planned-for-proposed-uralla-based-solar-farm/?cs=471
Armidale Express	18-Oct-18	*Solar farm community funding for Uralla reference group ideas*	https://www.armidaleexpress.com.au/story/5709515/solar-farm-to-support-reference-group-ideas/
NBN News North West	18-Oct-18	*Landholders welcome New England solar proposal*	https://www.nbnnews.com.au/2018/10/18/landholders-welcome-new-england-solar-proposal/
PRIME7 News North West	18-Oct-18	*Solar farm for Uralla*	https://www.prime7.com.au/news/4497-solar-farm-for-uralla

4.6 Community benefit sharing initiative

4.6.1 Overview

Throughout community engagement as part of the preparation of the EIS, UPC has demonstrated their intention to establish a positive, long-term connection with the local community. As part of this, UPC has already committed to contribute $250 per year for every MW (AC) of solar power installed over a period of 25 years. This contribution will start at a baseline of $50,000 during construction and increase as the project is installed and becomes operational. This commitment has been communicated to the local community during ongoing engagement as the project's community benefit sharing initiative (CBSI).

After an initial research and consultation period, Community Power Agency (CPA) was contracted by UPC to design and facilitate the CBSI community engagement process that would seek to involve the community in the definition of the CBSI including its general principles, geographic scope and the types of activities that should be eligible to receive funding.

Local people have contributed their ideas and considerations about the CBSI through one-on-one meetings; a community workshop; submission of online feedback forms; and via the Community Reference Group (CRG) which was set up by UPC and CPA specifically for this purpose. The CRG generated its own ideas, considered the ideas and inputs received from the broader community and produced a detailed options paper containing their recommendations for the CBSI (refer Appendix B).

Should the project receive approval, UPC will further assess the feasibility of the recommendations of the CRG and complete the design of the CBSI in preparation for its implementation to align with the commencement of construction. Ongoing engagement with the community around the CBSI will continue and additional feedback will also be sought during the feasibility and design periods. It is anticipated there will be a role for the community or its representatives in administering the CBSI throughout the life of the project.

4.6.2 Background

UPC conducted extensive research into various community benefit sharing initiatives in Australia in order to gain an understanding of what is the current practice is in the solar industry and renewable energy industry more generally. In addition to this research, UPC liaised with several community organisations, consultants, community-focused electricity retailers and local and State government representatives with experience working with both local communities and developers on community benefit sharing initiatives. As part of the community information and feedback sessions, the local community were also invited to provide input on the CBSI.

Based on this research, preliminary community feedback and guidance from CPA and other stakeholders, UPC formed a plan for the CBSI, which listed principles for the CBSI, detailed UPC's intent in terms of its design and implementation and outlined the level of financial commitment required.

4.6.3 Community input on the CBSI

CPA, an independent, not-for-profit organisation that works with communities to support them to participate in, and benefit from, the renewable energy transition, has acted as an independent intermediary to date, facilitated community workshops and was responsible for collating the community feedback presented within the CBSI options paper (refer Appendix B).

To gather community ideas and input, CPA established the CRG with eight members of the local community representing a range of interests and demographics. In addition, community workshops, one-on-one meetings with local organisations and local business owners, feedback submitted to CPA and UPC through the community information and feedback sessions, direct correspondence and feedback forms also provided input into the CBSI.

The CRG met three times to generate ideas, review input provided by the broader community and develop the recommendations described in the options paper. The CRG also met with UPC to discuss the outcomes of the CRG process, their recommendations and the next steps for the CBSI.

Photograph 4.3 Community workshop – 15 September – Uralla Community Centre

4.6.4 Recommendations provided through the CBSI

The CRG recommended the CBSI should be based on the vision that the community adjacent to the solar farm and the broader Uralla Shire community share in the benefits from the existence of the New England Solar Farm.

The CRG also provided a detailed list of governance principles that focused on achieving transparency, fairness, efficient allocation of funds and flexibility. These can be seen in more detail in Appendix B.

The CRG recommended that the CBSI be comprised of three activities. These three activities and their sub-components are presented in Figure 4.1 and described in detail in Appendix B.

The CBSI will be open to all residents of the Uralla Shire LGA, as well as Kelly's Plains and Dangarsleigh.

4.6.5 Next steps

UPC intends to undertake further detailed feasibility assessment of the options presented in Figure 4.1 and may proceed to implementation of one or more of the proposed activities post-approval. UPC sees an ongoing role for the CRG (or similar) and the local community in the feasibility, design, delivery and administration of the CBSI. UPC will also provide further consideration of the mechanisms, resources and partners required to successfully deliver the CBSI successfully.

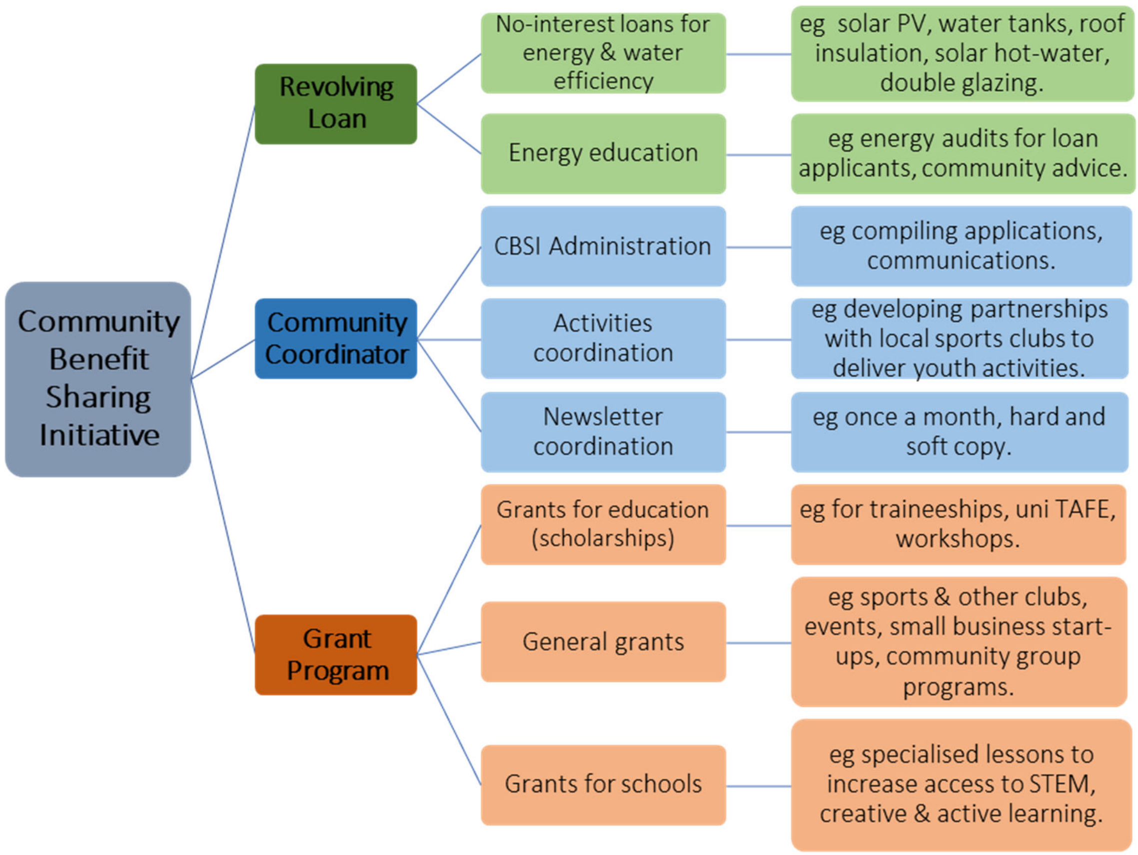


Figure 4.1 Recommended activities as part of the CBSI (Source: CPA 2018)

4.7 Ongoing stakeholder engagement

Stakeholder engagement on the New England Solar Farm has been comprehensive to date and reflects the importance UPC places on this aspect to its business. Following the submission of the EIS, the stakeholder engagement strategy will be updated to provide a framework for ongoing stakeholder engagement as the project progresses. As such, UPC will continue to work with all stakeholders as the approval process for the project progresses and detailed design and approval schedule for the project is better defined.

4.8 Letters of support

To date, letters of support for the project have been provided by the following stakeholders and local community organisations (copies of which have been provided in Appendix B):

- CPA (dated 31 October 2018);
- Farming the Sun (a community solar energy collaboration led by Starfish Initiatives) (dated 1 November 2018);
- Z-NET Uralla (a community-based organisation) (dated 31 October 2018); and
- two members of the CRG (dated 1 November 2018).

5 Environmental impact assessment

5.1 Introduction

A preliminary assessment of biophysical, social and economic matters was included as part of the request for SEARs (April 2018). That assessment informed the SEARs which have identified the key matters for assessment in this chapter of the EIS, as follows:

- biodiversity;
- heritage;
- land;
- visual;
- noise;
- transport;
- water;
- hazards and risks;
- socio-economic;
- waste; and
- cumulative impacts.

In addition to the key matters identified in the SEARs, considerations of impacts to air quality have also been included in this chapter.

Where relevant, technical reports have been prepared and appended (refer to Appendices C to O). A summary of mitigation and management measures is included in Chapter 6.

5.2 Biodiversity

5.2.1 Overview

A biodiversity development assessment report (BDAR) was prepared in accordance with the following legislation and policy:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act);
- NSW Environmental Planning and Assessment Act 1979 (EP&A Act);
- NSW Biodiversity Conservation Act 2017 (BC Act);
- NSW Fisheries Management Act 1994 (FM Act), and
- NSW Biosecurity Act 2015 (BS Act).

This meets the biodiversity requirements of the SEARs to include:

- an assessment of the biodiversity values and the likely biodiversity impacts of the project in accordance with Section 7.9 of the Biodiversity Conservation Act 2016 (NSW) the Biodiversity Assessment Method (BAM) and documented in a Biodiversity Development Assessment Report (BDAR), unless OEH and DPE determine that the proposed development is not likely to have any significant impacts on biodiversity values;
- the BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM; and
- an assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the Fisheries Management Act 1994, and a description of the measures to minimise and rehabilitate impacts.

In addition, OEH had separate requirements, which included:

- Biodiversity impacts are to be assessed in accordance with the Biodiversity Assessment Method (BAM, OEH 2017) and documented in a biodiversity development assessment report (BDAR).
- The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM.
- The BDAR must include details of the measures proposed to address the offset obligations as follows:
  - the total number and classes of biodiversity credits required to be retired for the development/project;
  - the number and classes of like-for-like biodiversity credits proposed to be retired;
  - the number and classes of biodiversity credits proposed to be retired in accordance with the variation rules;
  - any proposal to fund a biodiversity conservation action;
  - any proposal to conduct ecological rehabilitation (if a mining project); and

- any proposal to make a payment to the Biodiversity Conservation Fund (Fund).

- If seeking approval to use the variation rules, the BDAR must contain detail of all reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.

- The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix 11 of the BAM.

- The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the BAM Order 2017 under Section 6.10 of the BC Act.

The BDAR also assessed the impacts of the project on MNES within the development footprint. This was in order to determine whether referral of the project to the Commonwealth Minister for the Environment was necessary to meet the requirements of the EPBC Act.

The study area for the BDAR represents the site boundary as presented as part of the PEA to support the request for SEARs (refer Figure 1.3). Native vegetation was mapped within a 1,500 m buffer of the development footprint.

5.2.2 Existing environment

i Landscape features

The project is within an over-cleared landscape of agricultural land. Treed areas are limited to small patches and there are no connectivity features present within or adjacent to the development footprint. 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 development footprint.

There are no areas of geological significance or areas of outstanding biodiversity as declared by the Minister in the study area.

a Bioregions

The study area is in the New England Tablelands Bioregion, which covers an area of more than 3,000,000 ha. Over 95% of the bioregion is within NSW, extending north into Queensland. In NSW, the boundary extends from north of Tenterfield to south of Walcha and includes towns such as Armidale and Guyra. The majority of the development footprint is within the Armidale Plateau IBRA subregion, which will be used for the purposes of the assessment. A very small portion of the western-most part of the development footprint extends into the Yarrowyck-Kentucky Downs Interim Biogeographic Regionalisation for Australia (IBRA) subregion.

The majority of the development footprint occurs on the Uralla Basalts and Sands Mitchell landscape with a slightly smaller proportion occurring within the Moonbi - Walcha Granites Mitchell landscape.

b Watercourses

The development footprint is in the catchment of the Macleay River, and the catchment landscape is described as rolling hills that are frequently dissected by drainage networks and their adjacent floodplains terraces and foot slopes. Perennial watercourses within the study area are:

- Salisbury Waters and Cook Station Creek (6th and 5th order streams, respectively) near the southern array area; and

- Dog Trap Creek and Julia Gully (both 4th order streams) located south of the central array area.

Refinements to the development footprint have excluded higher order streams (ie 3rd order and above) including all perennial streams. Lower order watercourses within the development footprint are ephemeral, highly modified and in some cases undiscernible due to modifications such as dams and retention banks (refer Section 5.9 and Photograph 5.2 and 5.3).

ii Native vegetation

a Overview

The extent and type of native vegetation was assessed by a review of regional vegetation and habitat mapping as well as a site survey, carried out in accordance with the BAM guidelines and tools. Surveys were undertaken by EMM between January and September 2018. The study area was predominantly traversed on foot or by vehicle, with vegetation mapped and aligned with NSW PCTs and vegetation zones. Following the assignation of vegetation zones, native vegetation integrity and function was assessed.

The land within the development footprint is currently primarily 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 native vegetation within the development footprint is considered intact. Native remnant canopy vegetation is limited to paddock trees and small patches of woodland with no midstorey or canopy species. The ground cover is heavily grazed, typically with a high coverage of exotic (non-native) grasses. Canopy dieback is highly prominent across the landscape; in many cases more dead than living trees are present (refer Photograph 5.1).

Photograph 5.1 Canopy dieback within the development footprint

Planted native wind breaks are present on several properties, with a mixture of canopy and midstorey species that do not reflect any PCT. The groundcover is mainly exotic grasses. Exotic vegetation within the development footprint includes exotic pasture, cropping and exotic wind breaks.

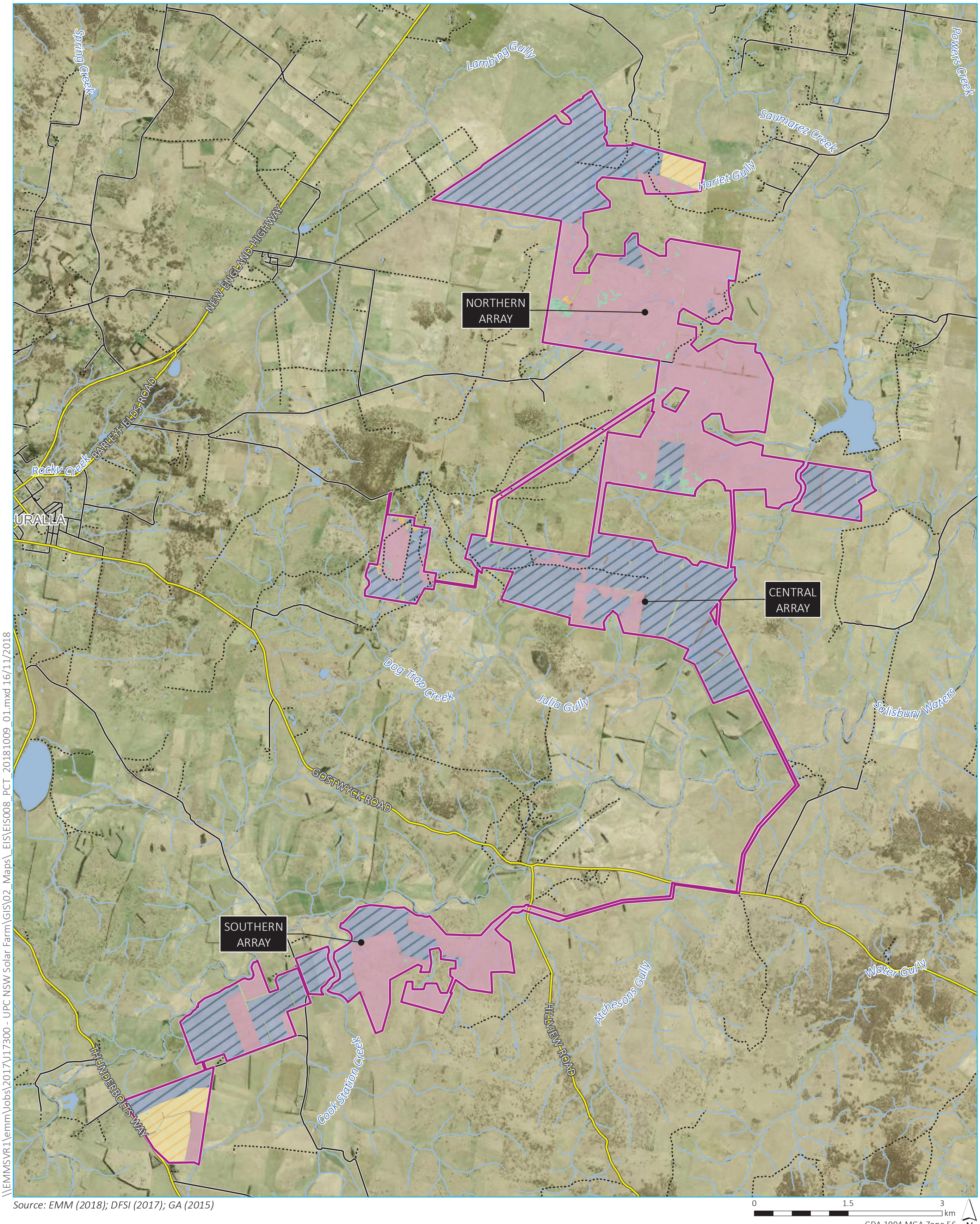
The percentage of native vegetation cover within the study area is approximately 8%, however this is significantly reduced to approximately 2% within the development footprint as the project has been refined to avoid areas of native vegetation where practicable.

b Plant community types

Two PCTs and four vegetation zones were identified within the development footprint from vegetation mapping and site surveys. These are presented in Table 5.1 and shown in Figure 5.1.

Table 5.1 Vegetation zones mapped within the development footprint

Plant community type	Condition class	Area (ha)	Status
510 - *Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion*	Woodland	38.20	Not listed under the EPBC Act. Listed under the NSW BC Act - White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community (EEC). Vegetation integrity score: 8.1
510 - *Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion*	Pasture	1,302.53	Not listed under the EPBC Act. Listed under the NSW BC Act - White Box Yellow Box Blakely's Red Gum Woodland EEC. Vegetation integrity score: 12.6
510 - *Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion*	Planted	15.26	Not listed under the EPBC Act or the NSW BC Act. Vegetation integrity score: 28.8
1174 - *Silvertop Stringybark open forest of the New England Tableland Bioregion*	Woodland	5.67	Not listed under the EPBC Act or the NSW BC Act. Vegetation integrity score: 24



Source: EMM (2018); DFSI (2017); GA (2015)

KEY

- Main road
- Local road
- Vehicular track
- Watercourse / drainage line
- Development footprint

Plant community type

- PCT 1174 woodland
- PCT 510 pasture
- PCT 510 planted
- PCT 510 woodland
- Exotic - trees
- Exotic - grassland
- Exotic - cropping
- Dam

Plant community types in the development footprint

New England Solar Farm
Environmental impact statement
Figure 5.1

creating opportunities

iii Habitat assessment

A habitat assessment was undertaken at the same time as the vegetation mapping to identify potential fauna habitats within the development footprint such as hollow-bearing trees, flowering shrubs and feed trees.

The assessment determined that the majority of the development footprint is highly disturbed, and only supports fauna species which are able to persist in highly modified agricultural landscapes.

The majority of lower order streams (1st and 2nd order) within the development footprint have been so extensively modified by the construction of dams and retention banks that no original channel or surface water features are evident. These watercourses are considered defunct from a fauna habitat perspective. Further consideration of the project's potential impacts on surface water resources is provided in Section 5.9 and Appendix H.

iv Threatened species

A search of DoEE's *Protected Matters Search Tool* (PMST) for MNES, including threatened species likely to occur within the development footprint 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. The presence of most of the relevant threatened species was able to be ruled out due to the lack of suitable habitat or based on species distribution.

The following key species were identified as having the potential to be present in the development footprint:

- Bluegrass (*Dichanthium setosum*);
- northern blue box (*Eucalyptus magnificata*);
- narrow-leaved black peppermint (*Eucalyptus nicholii*);
- hawkweed (*Picris evae);* and
- koala *(Phascolarctos cinereus).*

Targeted flora and fauna surveys were undertaken to identify the presence or absence of these key species in the development footprint. No threatened species were recorded within the development footprint opportunistically or during targeted surveys.

5.2.3 Assessment of impacts

i Potential direct and indirect impacts

The main direct impacts of projects are generally associated with direct impacts arising from the clearing of native vegetation and loss of species habitat and associated indirect impacts. Potential direct impacts that could arise from the project, prior to any avoidance, minimisation or mitigation, include:

- clearing of native vegetation and threatened species habitat; and
- disturbance of river/creek beds and banks during crossing construction.

The project also has the potential to result in minor direct or indirect impacts, which could include:

- fauna vehicle strike;

- impacts to water quality and quantity due to sediment runoff and/or contaminant runoff into adjacent watercourses;
- fragmentation of habitats and associated impacts to connectivity and fauna movement;
- increased noise, vibration and dust levels;
- artificial lighting impacting nocturnal species behaviour; and
- increase in weeds and pathogens.

Increased vehicle movements associated with the project have the potential to result in increased fauna vehicle strike and associated fauna mortality. The risk of significant impacts is considered very minor given the lack of threatened fauna recorded and the low general fauna abundance.

Construction activities that take place in the vicinity of watercourses have the potential to impact on aquatic ecology by the release of sediment-laden water that could arise on-site following mobilisation of soils/sediments. Mobilisation of soils/sediments may occur during inclement weather over disturbed soils and sediments in areas where vegetation has been cleared and/or areas where soil and construction material has been stockpiled. Reduction in watercourse bank stability following any nearby construction and any clearing of riparian vegetation could also result in bank erosion and input of sediments into watercourses.

With the exception of diesel, the project does not require large inputs or storage of chemicals/liquids which pose a risk to groundwater contamination. Potential impacts are limited to low volume sources such as fuel and oil from construction equipment. Up to six diesel generator skids may be required to service the power requirements of the construction accommodation village (should it be required). Storage of diesel within the development footprint will conform with AS 1940:2017 The storage and handling of flammable and combustible liquids and will be placed away from environmentally sensitive areas where possible.

The project is not likely to impact groundwater during construction, operation and decommissioning due to the estimated depth to groundwater within the project boundary and the limited amount of subsurface disturbance activities required during the installation and decommissioning of project infrastructure. The main activities that involve subsurface disturbance are the driving, drilling or screwing of the steel piles for the foundations (typically 1.5-3 m depth or more depending on geotechnical conditions and specific tracker design); the digging of the MV cable trenches (to a depth of approximately 1,000 mm or more); and the preparation of the substation/BESS pad areas. Further consideration of the project's potential impacts on groundwater resources is provided in Section 5.9 and Appendix H.

The removal of native vegetation has the potential to result in fragmentation of fauna habitat, with resultant effects on fauna species movement, reproduction and gene flow. The impact of vegetation clearance on fragmentation is anticipated to be negligible, given that no significant fauna movement corridors currently exist within the development footprint, owing to high existing fragmentation and small patch sizes.

Construction activities may result in increased levels of noise and vibration. No significant impacts are anticipated as the fauna abundance is low across the development footprint and largely limited to highly mobile species. No threatened species are anticipated to rely on any of the habitats currently present and no sensitive receptors have been identified.

The project will require limited permanent night lighting, most likely for the O&M buildings and substations or the construction accommodation village (should it be required). Temporary, localised night lighting may be required during general maintenance activities conducted during the operation stage of the project. Lighting has the potential to impact species behaviour. Any impacts are anticipated to be highly localised and are not anticipated to be significant given the low diversity and abundance of fauna recorded within the development footprint.

Increased movement of vehicles has the potential to transport weeds and pathogens into the development footprint and adjacent vegetation. Given the high levels of disturbance within the development footprint, there is also the risk that weeds may be transported off-site.

Infection of native plants by *Phytophthora cinnamomi* is a key threat which can lead to death of trees and shrubs, resulting in devastation of native ecosystems. *P. cinnamomi* is known in the Northern Tablelands region; however, it remains unknown if it currently exists within the development footprint and surrounds. High levels of tree die back have been recorded throughout the development footprint; however, it is unknown if *P. cinnamomii* is responsible, or if there are other causes.

ii Serious and irreversible impacts

White Box Yellow Box Blakely's Red Gum Woodland is considered a potential entity to meet the serious and irreversible impacts principle (refer *Appendix 3 - Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017b)).

Two zones of PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion (PCT510_woodland and PCT510_pasture) meet the TEC listing of White Box Yellow Box Blakely's Red Gum Woodland.

PCT 510_pasture and PCT 510_woodland have vegetation integrity scores of 11.7 and 11 respectively, which are below the threshold condition regarding serious and irreversible impacts and therefore need no further consideration.

iii Impacts requiring offsets

Some impacts will require offsetting in accordance with Section 10 of the BAM.

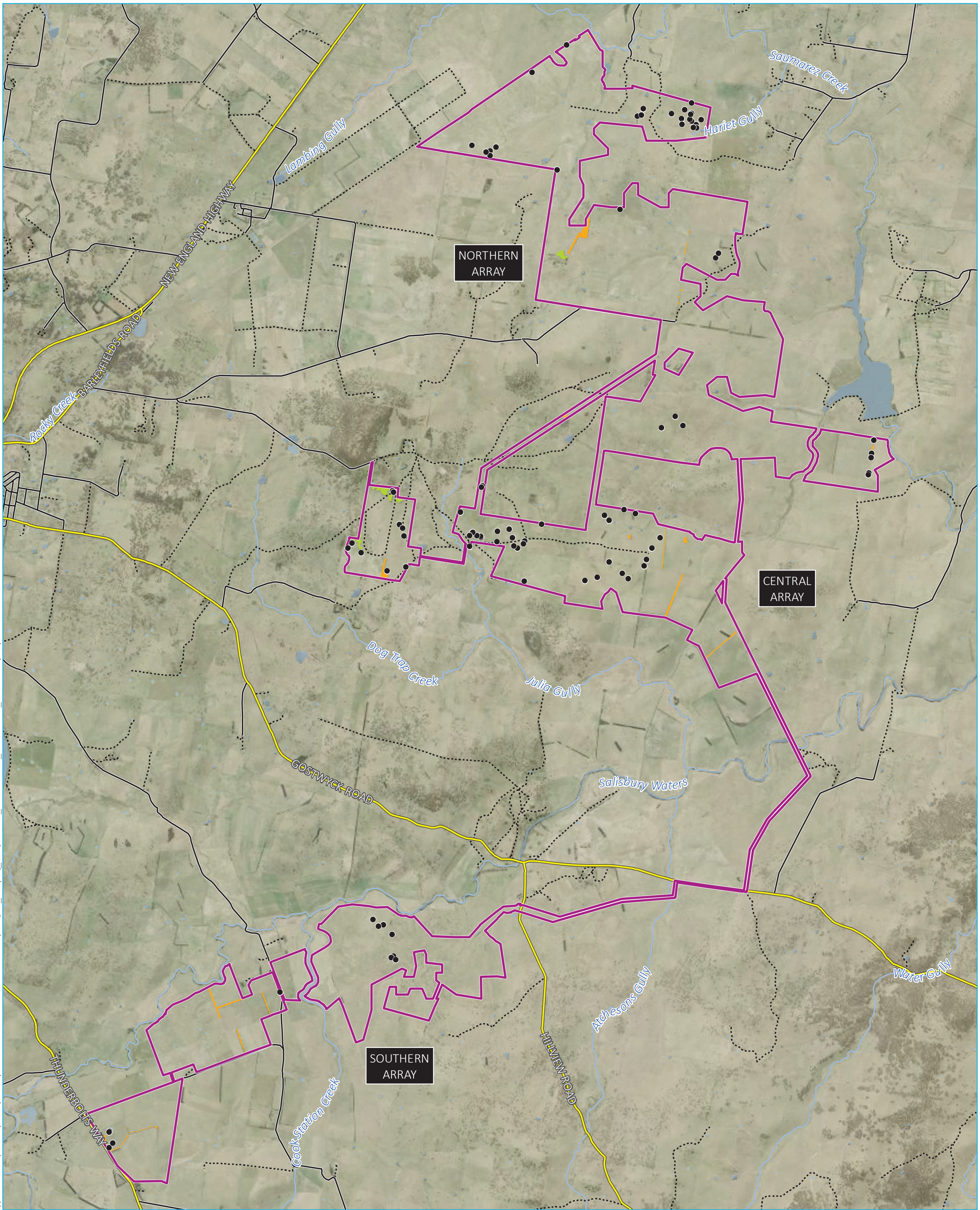
Impacts to native vegetation requiring offsets include:

- direct impacts on 15.26 ha of PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion_planted;
- direct impacts on 5.67 ha of PCT 1174-Silvertop Stringybark open forest of the New England Tableland Bioregion_woodland;
- direct impacts to 86 paddock trees assigned to PCT 510-Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion; and
- direct impacts to 6 paddock trees assigned to PCT 1174-Silvertop Stringybark open forest of the New England Tableland Bioregion (noting this is exclusive of one paddock tree which did not require offsets as it was assigned to class 1).

Native vegetation (including PCTs and paddock trees) requiring offsets is identified on Figure 5.2.

A total of 393 ecosystem credits are required to offset the residual impacts of the project. A credit report for area offsets and paddock trees is provided in Appendix D of the BDAR (Appendix C).

Offsets will be provided in accordance with the biodiversity offset framework outlined in the BDAR undertaken by an accredited person, as required by the SEARs.



Source: EMM (2019); DFSI (2017); GA (2015)

KEY

- Main road
- Local road
- Vehicular track
- Watercourse / drainage line
- Waterbody
- Development footprint
- Paddock trees requiring offsets

Plant community types requiring offsets

- PCT 510 planted
- PCT 1174 woodland

Plant community types and paddock trees requiring offsets

New England Solar Farm
Environmental impact statement
Figure 5.2

EMM
creating opportunities

iv Matters of national and state environmental significance

An assessment of impacts of the project on matters of national environmental significance (MNES) was undertaken to determine whether referral of the project to the Commonwealth Minister for the Environment is required. Matters of MNES relevant to the development footprint are summarised in Table 5.2.

Table 5.2 Assessment of the project against the EPBC Act

MNES	Project specifics	Potential for significant impact
Threatened species	Eleven flora species and 14 fauna species have been recorded or are predicted to occur within the locality. The majority of these species are considered unlikely to occur within the development footprint owing to the high levels of disturbance present. 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 project.
Threatened ecological communities	No threatened ecological communities, as listed under the EPBC Act, were recorded within the development footprint. PCT 510_woodland has the potential to meet the critically endangered aligned White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland, Critically Endangered Ecological Community (CEEC). However, the community within the development footprint is considered too degraded and is no longer a viable part of the ecological community, therefore not meeting the listing.	Significant impact unlikely to result from the project.
Migratory species	Thirteen migratory species have been recorded or are predicted to occur within the locality. The development footprint does not provide important habitat for an ecologically significant proportion of any of these species.	Significant impact unlikely to result from the project.
Wetlands of international importance	The development footprint does not flow directly into a Ramsar site and the project is not likely to result in a significant impact. The nearest Ramsar wetland is the Gwydir wetlands, approximately 224 km, north-west of the development footprint.	Significant impact unlikely to result from the project.

A likelihood of occurrence assessment considering each entity individually is provided in Appendix E of the BDAR. Five assessments of significance have been completed for three threatened species; Regent Honeyeater, Painted Honeyeater and Swift Parrot and two migratory species; White-throated Needletail and Fork-tailed Swift. All assessments concluded that no significant impacts on threatened entities are predicted to result from the project. Referral of the project to the Commonwealth Minister for the Environment for assessment is not required.

The MNES assessment performed as part of the BDAR (Appendix C) found there are no predicted significant impacts on threatened entities.

5.2.4 Mitigation measures

Significant steps have been taken to avoid, minimise and mitigate impacts through the following processes:

- identification of biodiversity values through comprehensive, rigorous and thorough biodiversity surveys;

- communication of identified values to the project team, including UPC;
- consultation between the design team and project ecologists to consider direct and indirect impacts and work through an iterative design process, with multiple iterations of design footprint to achieve a feasible project with least biodiversity impact; and
- consultation with OEH (refer Section 4.4.1 and Appendix B), to seek input and discuss measures proposed to avoid and minimise impacts.

This has resulted in a project development footprint that avoids higher quality vegetation and habitat that may support threatened species.

Additional mitigation measures which bring the residual risk to an acceptable level are presented in Table 5.3.

Table 5.3 Recommended mitigation measures for direct impacts and indirect impacts

Impact	Action and outcome	Responsibility	Timing
Direct impact/prescribed impact			
Clearing of native vegetation - PCT 510 (woodland), PCT 510 (planted) and PCT 1174 (woodland).	Avoid and minimise clearing impacts to these PCTs where possible. Clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development site. Tree clearing and disturbance will be limited to the development site. Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed. Identify the location of any 'No Go Zones' in site inductions.	Construction site manager.	Prior to and during vegetation clearing.
Clearing of hollow bearing trees/habitat trees, resulting in fauna injury and mortality	Limit removal of trees (including dead trees) to that required within the development site in support of the installation of project infrastructure. A clearing procedure will be implemented during the clearing of the development site, as follows: preclearance surveys will be completed to determine if any nesting birds are present; and 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. Installation of appropriate exclusion fencing around trees and woodland to be retained within the development site whilst construction is occurring. The radius of tree protection zone (TPZ) is calculated for each tree by multiplying its diameter at breast height (DBH) by 12 in accordance with the Standards Australia Committee (2009). Appropriate education should be provided to site personnel in site inductions regarding the purpose of exclusion fencing or no go zones.	Construction site manager and suitably trained fauna handler.	Prior to and during tree clearing.
Vehicle collision with fauna	Speed limits within the development footprint will be limited to 40 km/hr and stated in the CEMP	Construction site manager.	During construction and operation.

Table 5.3 Recommended mitigation measures for direct impacts and indirect impacts

Impact	Action and outcome	Responsibility	Timing
Disturbance of river/creek beds and banks during crossing construction (including construction of creek crossings).	Source controls, such as mulching, matting and sediment fences, will be utilised where appropriate. An erosion and sediment control (ESC) plan will be prepared in accordance with *Managing Urban Stormwater: Soils and Construction – Volume 2A Installation of Services (DECC 2008)* prior to commencement of construction. Disturbed areas will be stabilised and rehabilitated as soon as possible to reduce the exposure period. A specific creek crossing sub-plan will be included as part of the CEMP. All creek crossings are to comply with the *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI 2003).	Construction site manager.	Design stage, during vegetation clearing and construction.
Indirect impact			
Transfer of weeds and pathogen to and from site.	Appropriate wash down facilities will be available to clean vehicles and equipment prior to arrival and when leaving the work areas. In particular ensure soils and seed material isn't transferred in accordance with the measures outlined in the CEMP.	Construction site manager.	Design stage, during vegetation clearing and construction.
Artificial lighting impacting fauna behaviour	Lighting to comply with Australian standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting.	Construction site manager	During construction and operation

5.3 Aboriginal cultural heritage

5.3.1 Overview

An Aboriginal cultural heritage assessment report (ACHAR) was prepared in accordance with NSW guidelines, including the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011), the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b), as well as the principles of the Australia International Council on Monuments and Sites (ICOMOS) *Burra Charter* (ICOMOS 2013). This meets the Aboriginal cultural heritage requirements in the SEARs to include:

- an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.

The ACHAR was undertaken by EMM to fulfil the following objectives:

- 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 project on identified Aboriginal cultural heritage values; and
- propose appropriate management measures for potentially impacted Aboriginal cultural heritage values in response to their assessed significance.

The study area for the ACHA represents the site boundary as presented as part of the PEA to support the request for SEARs (refer Figure 1.3). The survey area represents the geographic extent of survey completed for the ACHA. The survey area generally represents an area slightly larger than the development footprint. The development footprint represents the survey area after it was refined to avoid environmental constraints including identified Aboriginal cultural heritage sites.

5.3.2 Consultation

EMM undertook consultation in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a) and included the following stages.

i Stage 1 — notification and registration of Aboriginal parties

This included contact with relevant government agencies, including OEH North East Branch, Armidale Local Aboriginal Land Council (LALC), Uralla Shire Council, Northern Tablelands LLS, National Native Title Tribunal, The Office of the Registrar of Aboriginal Owners and the Native Title Service Provider for Aboriginal Traditional Owners (NTSCorp).

A notification was placed in the Armidale Express on 13 April 2018 detailing the project name, proponent, location, description and a request for Aboriginal knowledge holders to register interest in the project.

Aboriginal parties identified by government agencies were invited to register their interest in the project. Of these, eight Aboriginal parties registered their interest, and are listed in Table 5.4.

Table 5.4 List of registered Aboriginal parties for the project

Organisation	Contact
Armidale Local Aboriginal Land Council	Tom Briggs
Nunawanna Aboriginal Corporation	Colin Ahoy
Armidale and New England Gumbaynggirr Descendents	Hazel Green
Les Townsend	Les Townsend
Steven Ahoy Consultants	Steven Ahoy
Culturally Aware	Cheryl Kitchener
Nyakka Aboriginal Culture Heritage Corporation Archaeological and Cultural Heritage Consultants	Rhonda Kitchener
Aaron Broad	Aaron Broad
Nganyawana Clan Group	Les Ahoy

ii Stages 2 and 3 – presentation of information and gathering cultural information

EMM issued a letter to all relevant RAPs which included an overview of the project, the proposed assessment methods and the consultation process, as well as the results of the PEA.

UPC and EMM held an on-site consultation meeting with RAPs on 21 May 2018 before starting the archaeological survey. The purpose of the meeting was to present information about the project and assessment methods, to allow Aboriginal parties to identify, raise and discuss their cultural concerns, perspectives and assessment requirements, and to gather any cultural information prior to the survey that may guide the fieldwork. Following consultation, an additional Aboriginal field worker was engaged (ie three Aboriginal field workers instead of two) in response to RAP suggestions relating to the survey area.

EMM discussed various assessment and management options with RAPs during the fieldwork program to gauge the suitability of certain measures. After the survey program was completed, the topics discussed informally in the field were summarised and issued to RAPs with the aim of receiving preliminary feedback so that UPC could further refine their development footprint based on potential Aboriginal site management options. The primary topics for consideration were:

- Determining the suitability of collecting stone artefact sites of low significance within potential impact areas (ie the development footprint). RAPs supported this approach and noted the value it would provide if placed in a keeping place as an educational tool.

- Les Ahoy provided an email emphasising the importance of the Aboriginal community maintaining a cultural connection to the local area (dated 6 August 2018). Les requested further discussion about providing RAPs with access arrangements to certain sites of high cultural significance.

iii Stage 4 – review of draft Aboriginal cultural heritage assessment

A draft version of the ACHAR, which included all background information, results, draft significance assessments and draft management recommendations, was issued to all RAPs for review. The draft report included highlighted text indicating sections where RAP input was sought in regard to Aboriginal heritage values, input into significance assessment and management measures.

Additionally, EMM provided access to an interactive web map to accompany the draft ACHAR. The web map is an interactive online resource that allowed RAPs to view Aboriginal site information additional to the figures provided in the draft ACHA. The web map provided RAPs with a better understanding about specific site contents, location and their proposed management.

In addition, a meeting was held on 19 October 2018 to provide a summary of the results of the ACHAR, outline the impact assessment and discuss the management measures presented in the draft ACHAR. A summary of the key discussion points and outcomes relating to the ACHAR is presented in Section 2.4.2 of Appendix D.

5.3.3 Existing environment

The environmental characteristics of an area influenced the way Aboriginal people used the landscape. In the past, the availability of resources such as water, flora, fauna, stone material and topography played a substantial role in the choice of camping, transitory movement and ceremonial areas used by Aboriginal people. Understanding these environmental factors assists with predicting where Aboriginal sites are likely to occur. Additionally, natural and cultural (human-made) site formation processes that occur after the deposition of archaeological material influence the way archaeological material is distributed and preserved across a landscape.

i Landscape

The landscape in the study area is characterised by an undulating hilly plateau at an elevation of approximately 1,100 m AHD. It has a stepped landscape across basalt flows with broad valleys which steepen to the east at the head of the Great Escarpment Gorges. The majority of the development footprint occurs on the Uralla Basalts and Sands Mitchell landscape with a slightly smaller proportion occurring within the Moonbi - Walcha Granites Mitchell landscape.

ii Geology and geomorphology

The study area is part of the New England fold belt in the north-east of NSW and is composed of sedimentary rocks of Carboniferous and Permian age that were extensively faulted during a period of rapid continental plate movement associated with granite intrusions in the late Carboniferous age. Much of the bedrock is now overlain by Tertiary basalt flows rarely exceeding 100 m in thickness that overlie river gravels and sands or lake sediments. In certain areas, the basalt has been eroded and exposed the underlying sedimentary layer. The geology has a considerable influence on the topography and vegetation of the landscape, as well as providing the raw materials for tools.

iii Hydrology

The study area is part of 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.

The main drainage features of the study area and its surrounds comprise:

- Salisbury Waters and its tributary Cook Station Creek (6^{th} and 5^{th} order streams in accordance with the Strahler system of stream order, respectively) that intersect the southern array area; and

- Julia Gully and its tributary Dog Trap Creek (both 4^{th} order streams) that form in the western part of the central array area and continue to the south of it before flowing into Salisbury Waters.

iv Soil landscape

The study area contains a number of soil landscapes which are defined in the *Soil Landscapes of Armidale* (King 2009). Soil landscape information builds on the underlying geology of the study area and describes what soils overlie the geology and where soils are likely to have been eroded or missing, exposing bedrock or where they have built up. Table 3.1 of Appendix D presents the soil landscapes relevant to the development footprint in combination with other observations, including landform elements, slope and relief and geology.

v Land use and disturbance

The majority of the study area 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 a number of mature trees that have survived since colonial settlement for use as shade for livestock. The properties that make up the study area are currently primarily used for sheep grazing for production of wool and lambs, with some cattle grazing for beef production. Areas with significant outcropping bedrock have also been historically cleared of vegetation; however, depending on the nature and extent of bedrock, are likely to have been avoided from repeated cropping due to inaccessibility from farming machinery. The magnitude and extent of previous disturbance affects the likelihood of discovering intact heritage deposits, with significant deposits more likely to be found in undisturbed areas.

vi Ethno-history

The study area falls within the Aboriginal language group boundary of the Nganyaywana; also known as the Anaiwan. The first historical references of the Anaiwan language were from the Europeans during 1880s. The Encyclopaedia of Aboriginal Australia (AIATSIS) classifies the language spoken as Nganyaywana which was coined by linguist Terry Crowley. Crowley identified that the Nganyaywana had two dialects: Himberong spoken to the south in the Walcha district and Iuwon spoken in the areas of Armidale, Uralla and Bundarra. It is likely that people in the study area spoke the Inuwon dialect of the Nganyaywana.

Ethnographic and historical accounts of the local Aboriginal population are only provided in fragmented accounts and typically represented what interested new settlers. By the mid-1800s, the Aboriginal population of the New England was already estimated at only five or six hundred people. Although literature is sparse, ethno-historical accounts centre on seasonal movement to gather resources and to avoid the cold in certain areas during winter.

Shelter at open camp sites would have involved the construction of temporary timber-framed huts, often near the trunks of existing trees. The temporary or semi-permanent nature of the huts suggests there was relatively frequent movement throughout the landscape. Archaeological evidence shows that Aboriginal people also used large stone arrangements and rock overhangs for camping and shelter but there is limited ethno-graphic information related to this.

Ethno-historical accounts indicate that Aboriginal people of the Tablelands typically disposed of their dead by burial. Accounts of burial practices include references to burials being marked by carved trees, stone mounds known as cairns and earth mounds covered by sticks or logs to deter wild dogs.

The Tablelands have a high number of ceremonial sites including Bora rings, stone pathways, carved trees and rock art. The area is spiritually linked to Baimai (creator god), Birrahgnooloo (his emu-wife) and Daramulan (son of Baimai).

Male initiation ceremonies were closely linked to Daramulan and Baiami and performed with a Bora ring between August and September. A description of a ceremony at Black Mountain (40 km north of the study area) includes emu tracks being used to mark the track toward the Bora ring. Within the Tablelands, ceremonies are reported to have continued until the early 1880s. An 1871 account of the Bora ground mentions a circle of eight to ten yards in diameter surrounded by numerous carved trees. Mt Yarrowyck was at times a meeting place for many of these ceremonies; located approximately 30 km north-west of the study area.

Research at an initiation site near Uralla identified site features such as a stone structure (partially collapsed), stone tool grinding grooves and a rock enclosure told to be where the initiation starts. The site looked to be occupied by both men and women; however, further into the initiation; men would walk to the Bora ground 7 km to the west of that site. The location has not yet been verified during this assessment.

Ethno-historical information lists an array of tools and weapons and also mentions areas of raw material procurement. Many items are unlikely to have survived as artefacts in the archaeological record because they are susceptible to decomposition, such as items made of wood. Ethnographic accounts of tools in the Tablelands focus on spears, clubs, waddies (a type of hunting stick) and boomerangs among wooden artefacts and on axes and stone tools. Rugs and cloaks were made of kangaroo and possum skins with the aid of bone needles and animal sinews for thread. Wood, bark and animal materials were also used to make items like bags, fishing nets and wooden vessels.

vii Post-contact period

Surveyor-General John Oxley explored the region in 1818, after which the land was developed for grazing of sheep and cattle. Aboriginal people often worked as stockmen on the stations. By 1851, the town of Armidale had a population of over 500 which expanded to over 4,000 during the next decade. At around the same time, the number of Aboriginal people in the Tablelands New England was estimated to be approximately 600 but difficult to estimate due to their nomadic nature. The impact of disease and sheep (in diminishing macropod numbers) on the Aboriginal population was also noted at this time.

Tensions between Aboriginal people and settlers mounted throughout the early to mid nineteenth century. During the 1830s, the government's Mounted Police were often responsible for the escalation of armed conflict and violence in rural districts. However, violence extended outside the law which is exemplified by the atrocities carried out by a dozen or so stockmen in what is known as the Myall Creek massacre in 1838. Twenty eight Aboriginal men, women and children who were camped peacefully were slaughtered and after two trials, seven of the eleven perpetrators were hanged.

By the mid-nineteenth century, it was clear that European settlement had removed much of the land and resources necessary for traditional Aboriginal life. One response by Europeans was an attempt to 'settle' the Aboriginal people in a similar way to Europeans. In 1851, Commissioner Massie reported that:

> "...a reserve for use by Aborigines of 350 acres had been put aside, which contained good cultivation ground, good water and every essential requisites for the permanent location of the Aborigines, should they feel disposed to forget their migratory habits."
>
> (Massie 1851)

Aboriginal segregation became more institutionalised by the late nineteenth century and between 1883 and 1908, 16 Aboriginal reserves were established in the Macleay, Nambucca and Bellinger valleys. By 1910, there were said to be only 262 Aboriginal people in the Tablelands (including what were then called 'half castes') (Jordan 2006, p.123). However, by the 1950s there were nearly 1,000. Today, over 5% of the regional population is of Aboriginal descent. Aboriginal people have made considerable headway in regaining their lost voice from centuries of adversity. The Aboriginal people of the Tablelands today are a testament that traditional authority, structures and legitimacies of Aboriginal law and culture have survived and continue to grow into the 21st century.

viii Previously recorded sites

A search of the AHIMS register identified 36 Aboriginal sites within a 25 km x 25 km area centred on the study area. Only one site is registered as being located within the project boundary, which is a scarred tree (AHIMS ID number 21-4-0046). However, following the preliminary site inspection by an archaeologist, this site was found to be not located within the project development area, but located 1.4km north-east of the central array area and development footprint. There are no sites in the study area currently or previously listed on the Commonwealth Heritage List, the National Heritage List or the Register of National Estate.

5.3.4 Assessment of impacts

i Site predictive modelling

A model was formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist throughout the study area and where they are more likely to be located. This model is based on:

- landscape features in the study area and its surrounds;
- pre-colonial period ecological conditions;
- advice from Aboriginal knowledge holders including RAPs;
- ethno-historical information about Aboriginal life and material culture; and
- the type and distribution of Aboriginal sites described in previous reports and AHIMS data.

The predictive model assessed the potential for certain Aboriginal heritage sites to be present within the development footprint as shown in Table 5.5.

Table 5.5 Predictive model of site location

Site type	Predictions for study area
Open artefact sites and isolated finds	Open stone artefact scatters and isolated finds are the site types most likely to occur in the study area. These may occur anywhere as background scatter, but are most likely to occur close to reliable sources of water (generally within 200 m). Although stone artefact sites may be present in these areas, their detection is dependent on favourable ground surface visibility conditions. Further, more recent ground disturbance, for instance through farming or flooding, will have an effect on the accuracy of the predictive model. High sensitivity for open stone artefact sites includes level to gently inclined, elevated landforms near high order streams including crests, spurs, terraces and lower slopes/foot slopes that were above regular inundation and provided good outlook. Smaller and lower density artefact scatters and isolated artefacts may occur near the ephemeral tributaries (3rd order and below). Isolated artefacts or small artefact scatters may occur anywhere away from watercourses. These are most likely to be identified on level to gently inclined terrain but not moderately inclined areas that would have been too steep for occupation or on low-lying floodplains where regular inundation would have prevented focussed activities.
Scarred trees	Scar trees may occur where native vegetation has been preserved. This has largely been cleared across all three areas that make up the study area; however, a review of aerial imagery indicates that clusters of trees and individual trees are distributed across the landscape. Closer inspection would clarify if there are native mature trees with potential or younger regrowth or exotic trees that have no potential.
Carved trees	Carved trees may occur in association with burials, ceremonial sites or as indicators of 'dreaming' tracks and pathways. As such, they may occur only where native vegetation has been preserved, but their location within the landscape is difficult to predict without the aid of cultural knowledge.

Table 5.5 Predictive model of site location

Site type	Predictions for study area
Grinding grooves and grind stones	There are outcroppings of silcrete on the Ironstone and Saumarez soil landscape in the northern array area that may feature grinding grooves. Elsewhere grinding grooves on bedrock are unlikely to occur as other types of outcropping geology is probably unsuitable for grinding. However, outcropping of suitably fine-grained granite may have been used for grinding grooves. Furthermore, portable grinding grooves may occur in the landscape, most likely adjacent to watercourses and possibly part of larger open camp site assemblages.
Hearths	The extent of historical land use (primarily vegetation clearance) has led to widespread disturbance, which is likely to have removed or destroyed archaeological traces of this site type. Soil landscapes information indicates that topsoils generally comprise shallow duplex soil profiles and therefore deeper stratified deposits suitable for the preservation of hearths are unlikely to exist.
Burials	Burials can occur anywhere in the landscape but their identification is rare. Generally, they would be identified by mounds of earth, carved trees or stone markers. Theoretically they are more likely to occur in areas with cobble and small boulder rock outcrops such as crests and upper slopes of the Harnham Hill and Uralla soil landscapes (outside of the development footprint), the Bald Knob soil landscape (found in parts of the southern and northern array areas) and Gostwyck soil landscape (found in parts of the central and northern array areas). Equally, these soils may have been too shallow and rocky for interment.
Stone arrangements	Stone arrangements are most likely to occur on elevated and relatively flat landforms (eg crests, terraces, ridges) nearby sources of outcropping cobbles or small boulders capable of being moved manually. However, it is very likely that they have been disturbed and/or destroyed by historical land use practices. The area's most likely to feature suitable stones are the Harnham Hill and Uralla soil landscapes (outside of the development footprint but within study area), the Bald Knob soil landscape (found in parts of the southern and northern array areas) and Gostwyck soil landscape (found in parts of the central and northern array areas).
Quarries (stone or ochre)	Quarries of volcanic material and vitric tuffs have a moderate to high likelihood of occurring on the crests and upper slopes of the Harnham hill soil landscape; however, this is outside the development footprint but within the study area. Resources of basalt, chert and greywacke in the Powers Creek soil landscape may occur but only if rock floaters are exposed, possibly in stream channels. The crests and upper slopes of the Bald Knob and Fairfield soil landscape may feature quarries of basalts or metabasalts but only if the material is of a suitable quality. The occasional outcrop or locally significant outcrops of surface basalt on the Kellys Plains soil landscape may feature basalt resources. Quarries of chert, jasper and greywacke may occur on crests, spurs and hill slopes on areas of Fairfield soil landscape. Any outcropping metasediments (metamorphic sedimentary rocks) in areas of the Julia Gully soil landscape have some potential to have been used as a quarry. Field inspection would clarify what types of metasediments occur, if any. Silcrete quarries may occur in the areas mapped as the Ironstone and Saumarez soil landscapes. Quarries of chert, jasper and greywacke may occur on crests, spurs and hill slopes on areas of Fairfield soil landscape. Resources of basalt, chert and greywacke in the Powers Creek soil landscape may occur but only if rock floaters are exposed, possible in stream channels.
Rock art, shelters and engravings	Rock shelters and/or rock art and engravings may occur in areas with large granite tors, comprising the Gostwyck soil landscape (parts of the central and northern array areas) and Uralla soil landscape (outside the development footprint but within the study area). Tor fields are visible from aerial imagery which indicates they occur most obviously in the discrete pockets of the Gostwyck variant a soil landscape in the east of the central array area and south of the northern array area. Tor fields are not obvious on aerial imagery in the Uralla soil landscape (outside the development footprint but within the study area), but ground verification is warranted.
Middens	Middens of bone, charcoal, stone and freshwater shells may occur along extensive and reliable river systems. However, they are rare in the local landscape and are likely to have been disturbed or removed by historical land use. If present, they are most likely to occur in association with open camp sites.

ii Aboriginal cultural heritage field survey

A field survey of the study area was undertaken by EMM with the assistance of RAP site officers in two stages between 21 May and 28 August 2018. The survey comprised 155 transects and was completed over a total of 19 days. The survey area was a refinement and reduced portion of the study area which focused on areas highlighted by background research and the predictive modelling.

The survey effort within the three array areas was weighted towards the areas most likely to feature archaeological sites with the aims to verify the accuracy of the predictive model and identify where sites occur. A lower intensity of survey effort was designated to areas unlikely to feature archaeological sites to support predictions of low archaeological potential. These predictions were continually refined during fieldwork based on observations about site distribution made in the field.

The survey team identified 96 sites during the 19 days of archaeological field survey. Sites were labelled sequentially with an NE prefix standing for New England. The 96 sites comprise 95 Aboriginal sites and a historical site with unverified potential to be an Aboriginal site (NE57). The site types and their frequencies are listed in Table 5.6 and shown on Figure 5.3.

Table 5.6 Site results summary

Site type	Site frequency	Percentage of total sites
Artefact scatter	16	17%
Artefact scatter, PAD	9	9%
Grinding groove	1	1%
Grinding groove, artefact scatter, PAD	4	4%
Grinding groove, PAD	1	1%
Historical site – dry stone wall	1	1%
Isolated find	43	45%
Isolated find, PAD	3	3%
Quarry, artefact scatter, PAD	5	5%
Scarred tree	13	14%
Total	**96**	**100%**

The most frequent and widely distributed Aboriginal objects are stone artefacts which are present in 80 out of the 96 sites (83%) including artefact scatters, isolated finds, quarries and grinding groove sites.

Twenty-two sites were considered to have areas of potential archaeological deposits (PAD) and featured surface evidence in quarries, artefact scatters, isolated finds and grinding grooves with artefact scatters. Less common site types identified were scarred trees, grinding grooves and quarries.

Aboriginal sites were typically found on hill crests (57%) and slopes (30%), with the most significant found on hill crests. Approximately 25% of the Aboriginal sites were subject to low levels of disturbance. These are sites that have been historically cleared, and subject to livestock movement, but are among stone outcrops that have protected them from continued pasture improvement.

A total of 25 stone artefact scatters, comprising a total of 238 surface artefacts were found in the survey area, with numbers ranging from 1 to 19 artefacts per scatter location, however more than 50% of the sites were isolated finds. Several stone artefact cores were identified, indicating that much of the raw material for stone tool manufacture was sourced locally.

Six grinding groove sites were identified during the survey, three of which were in the northern array area, with the remainder between the northern and central array area. The most significant site was NE09 on the southern boundary of the northern array area, where over 100 grooves were found across the width of the crest on outcropping bedrock. At this particular location it is likely that there are more grinding grooves present where soil and vegetation currently obscure the bedrock surface.

Thirteen possible scarred trees were recorded across the three array areas. Aboriginal tree scarring can be difficult to distinguish from natural scarring. This is particularly true in instances where the subject trees are dead and have decayed, often leaving scars and scar dry-faces cracked, splintered and decomposed. Further assessment is required to verify if the scars are of Aboriginal origin, prior to any management measures other than avoidance.

Five open stone artefact sites which are considered to be Aboriginal stone quarries were identified. Two were silcrete quarries, two were basalt quarries, and one was a greywacke quarry.

Two irregular structures thought to be dismantled dry stone walls are present in the southern array area. After further historical research, these structures were identified as the remnants of a dry stone wall, probably built during the mid-1800s. These sites are detailed in the historical heritage assessment (refer discussion of HNE11 and HNE 12 in Section 5.4 and Appendix E).

iii Interpretation

The archaeological investigation provided an informative and representative example of the widespread occupation of Aboriginal people in the survey area. The type of sites identified also support the theory that the landscape was used more intensively and in more utilitarian ways than previously thought.

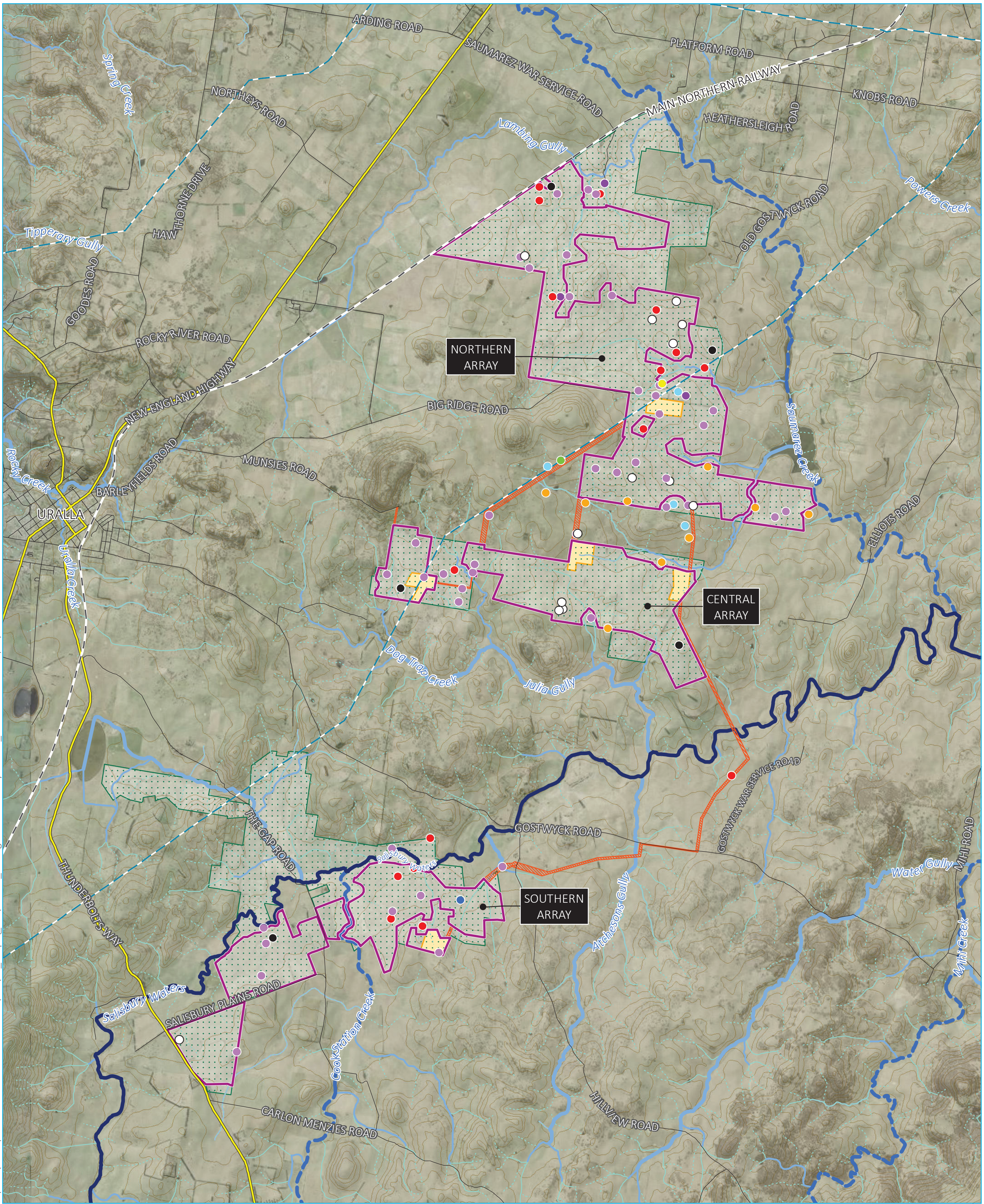
Although the survey area features some significant finds, it would be erroneous to view it in isolation. The AHIMS search results along with background research show that the survey area is only a small snapshot of a much broader and more dynamic cultural landscape. The presence of Bora rings, quarries, scarred trees, grinding grooves and open stone artefact sites and lagoons within the broader AHIMS search area indicates that the finds within the survey area are representative of a continuous archaeological character, and that many more sites are likely to be found in similar landscape contexts throughout pastoral properties in the Tablelands.

iv Significance assessment

The heritage values were assessed based on their cultural significance, which is defined by the Burra Charter as:

> "Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Places may have a range of values for different individuals or groups."
>
> (ICOMOS 2013)

The purpose of this assessment is to examine various aspects of the identified Aboriginal cultural heritage values for the purpose of assessing possible development impacts associated with the project. This assessment focuses on two main types of significance values: socio-cultural and historic values (significance for the Aboriginal community) and scientific values.



Source: EMM (2018); DFSI (2017); UPC (2018)

KEY

330 kV transmission line
Main road
Local road
Rail line
Contour (10 m)
Study area

Development footprint
Solar array
Potential site access/ETL easement/electrical cabling
Potential substation/BESS footprint

Strahler stream order
1
2
3
4
5
6

Site type
Artefact scatter
Artefact scatter, PAD
Grinding groove
Grinding groove, PAD
Grinding groove, artefact scatter, PAD
Historical site - unverified
Isolated find
Isolated find, PAD
Quarry, artefact scatter, PAD
Scarred tree

Aboriginal cultural heritage field survey results

New England Solar Farm
Environmental impact statement
Figure 5.3

EMM
creating opportunities

a Socio-cultural and historic value: significance for the Aboriginal community

'Non-archaeological Aboriginal heritage values' refer to places which have meaning in accordance with memory or tradition, but are not necessarily associated with cultural objects. These sorts of places are described as 'intangible sites' and include any socio-cultural or historic values related to historically important persons, events, phases or activities in the Aboriginal community.

The project RAPs were consulted to determine whether any socio-cultural or historic heritage value relates specifically to the study area more broadly regardless of archaeological evidence. Throughout the consultation process and during fieldwork, RAPs communicated that their Elders had spoken about Aboriginal occupation of the broader landscape including the localities of Uralla, Kellys Plains, Gostwyck and Salisbury Plains and mentioned that it was pleasing to see the archaeological evidence related to such occupation. The general consensus was that, prior to the survey, RAPs did not know of the location of specific sites within the broader study area, but were told by their Elders that such site types may exist within the landscape. RAPs acknowledged that this was partly due to the physical and cultural dislocation from the landscape faced by local Aboriginal people after colonial settlement.

The Aboriginal community has identified that heritage values in the study area are directly linked with the Aboriginal sites identified during the survey. No specific historical connection has been linked to the identified sites apart from a broader notion that the study area may have formed part of what was known as 'Oorala' a local Anaiwan word meaning 'camp', 'meeting place' or 'place where people come together'. As such, each site in the ACHAR has not been attributed with a specific socio-cultural or historic significance rating.

Aboriginal sites with archaeological evidence are all of value to the Aboriginal community through the tangible connection that they represent with pre-colonial Aboriginal land use. Although all Aboriginal sites have significance to the Aboriginal community, RAPs repeatedly emphasised the importance of grinding groove and open camp site NE09 primarily for its high aesthetic and educational values and also the prominent tangible link it provides the Aboriginal community with their ancestors.

b Scientific value

The following scientific values are identified as 'low', 'moderate' or 'high' for each identified Aboriginal site with an overall rating identified based on the results of each individual assessment. The significance criteria are outlined below:

Research potential: the potential of a site to contribute to the present understanding of society and the human past. This is commonly linked to rarity, representativeness, site integrity, research themes and the potential extent of data retrievable for further analysis and interpretation. The research potential of archaeological sites is often only realised through archaeological investigation methods. A site with high research potential would be able to provide information about the past that is not obtainable from any other source, or supplements written and oral sources.

Rarity and representativeness: the frequency of a site type and how the sites relate to the wider archaeological record. The significance may be due to sites being uncommon because of the related activity that created them, or preservation, or they are uncommon now because of ongoing site destruction through development and change. Sites with high representative value would typically need to be a pivotal example of its type that demonstrates the principle characteristics of a site.

Integrity: the level of disturbance or intactness of a site and how this may affect research potential. For example, artefacts identified in heavily cultivated areas would be unsuited to addressing research questions of site structure, but it may still be useful to characterise the artefact types and raw materials used in the region.

Educational value: the potential of a site to be used as an educational tool. This usually includes sites with easily identifiable and accessible characteristics that are good representative examples. Sites with high educational value can have aesthetically distinctive or iconic qualities.

The frequency of sites falling within each significance category is summarised in Table 5.7. The significance values listed in the following tables are based on assessed scientific and education values.

Table 5.7 Scientific significance frequency by type

	Significance level				
Site type	**High**	**Moderate**	**Low**	**Undetermined**	**Total**
Artefact scatter		4	13		17
Artefact scatter, PAD		8			8
Grinding groove		1			1
Grinding groove, artefact scatter, PAD	3	1			4
Grinding groove, PAD	1				1
Historical site - unverified				1	1
Isolated find		1	42		43
Isolated find, PAD		3			3
Quarry, artefact scatter, PAD		5			5
Scarred tree		8	5		13
Total	**4**	**31**	**60**	**1**	**96**

The four sites of high significance are grinding groove sites located in the northern array area close to the ETL options connecting the northern and central array areas. These grooves have research potential related to the type of groove created, the location of the grooves and the material the grooves are on.

The 31 sites of moderate significance predominantly relate to artefact scatters, quarries and scarred trees. Although they have the potential for scientific significance, they have been disturbed by cultivation.

The 60 sites that have low significance are generally sites that do not have the same capacity to inform about past Aboriginal life, typically due to highly disturbed conditions. Notwithstanding the limited scientific potential of some sites, each site is of cultural significance to the Aboriginal community.

v Potential sources of impact

The following ground disturbance activities proposed as part of the project have the potential to disturb Aboriginal objects identified within the development footprint:

- installation of the PV modules (ie driving or screwing piles into the ground);
- trenching for underground cabling;
- clearing for internal access tracks and PCU placement;
- the construction of up to three solar array substations and BESSs, the locations of which will be confirmed during the detailed design stage of the project;
- the construction of a grid substation and BESS, the location of which will be confirmed during the detailed design stage of the project;

- installation of supporting infrastructure (eg O&M buildings, temporary laydown areas, a site office, parking areas and landscaping);

- the construction of a temporary construction accommodation village (if required);

- installation of overhead transmission lines (anticipated to be supported by single concrete, wood or steel pole structures) along the proposed ETL options; and

- installation of new internal roads to enable access to the three array areas from the surrounding road network.

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.

Outside of the development footprint, ground disturbance activities with the potential to disturb Aboriginal objects will be limited to the installation of security fencing. Security fencing will be restricted to land within the project boundary. The exact alignment of security fencing with respect to the development footprint will be determined by UPC in close consultation with each of the project landholders.

vi Definition of impact types

Impacts to Aboriginal heritage values can include disturbance and loss. Disturbance means Aboriginal sites and objects will be disrupted and moved a short distance through the displacement of ground. Partial disturbance occurs where a portion of a site will be disturbed. Total disturbance is when the entirety of the Aboriginal site will be disturbed, and total loss is where the artefacts are removed or destroyed.

vii Impacts and site significance

Impacts to Aboriginal sites are summarised according to their level of significance in Table 5.8. No sites of high significance will be impacted by the project. This comprises the four grinding groove site types of high significance.

Table 5.8 Scientific significance and levels of impact

Site significance/site type	None	Partial disturbance	Total disturbance	Total loss	Undetermined	Other	Total
High							**4**
Grinding groove, artefact scatter, PAD	3						3
Grinding groove, PAD	1						1
Moderate							**31**
Artefact scatter	2				1		3
Artefact scatter, PAD	7				2		9
Grinding groove	1						1
Grinding groove, artefact scatter, PAD	1						1
Isolated find	1						1
Isolated find, PAD	2				1	1	3
Quarry, artefact scatter, PAD	4				1		5
Scarred tree	6				2		8

Table 5.8 Scientific significance and levels of impact

Site significance/site type	None	Partial disturbance	Total disturbance	Total loss	Undetermined	Other	Total
Low							**60**
Artefact scatter	6	1	6			1	13
Isolated find	12		26	4			42
Scarred tree	2				3		5
Not applicable							**1**
Historical site – (NE57)	1						1
Total	**47**	**1**	**32**	**4**	**10**	**2**	**96**

No sites of moderate significance are currently designated for impact by the project. However, there are seven sites of moderate significance (NE15 [artefact scatter], NE27 [artefact scatter, PAD], NE33 [quarry, PAD], NE45 [scarred tree], NE61 [scarred tree], NE70 [artefact scatter, PAD] and NE83 [isolated find, PAD]) where impacts are currently undetermined. UPC are exploring opportunities to maximise the flexibility of the final PV array layout and associated infrastructure and therefore are in the process of investigating whether impacts to one or more of these sites is appropriate (refer to Section 5.3.5). The final outcomes for these sites will be determined prior to project approval in accordance with the assessment approach described in Section 5.3.5 of this ACHA.

The 37 sites currently designated for impact by the project are all of low scientific significance. This comprises a total of 30 isolated artefacts and seven artefact scatters. The impact to three scarred trees of low scientific significance (NE47, NE49 and NE67) is currently undetermined as expert assessment is needed to confirm whether they are Aboriginal made and require management. Depending on the outcomes of expert assessment, UPC may look to remove and mitigate impacts to these sites to maximise the development footprint, wherever possible (refer to Section 5.3.5). It should be noted that these trees are in poor condition. NE47 is a partially felled tree (cut in half) but still standing and NE49 is a felled tree that has its scar cut in half. NE67 has an ambiguous scar and may not be of Aboriginal origin.

viii Potential impacts to unidentified sites

Stone artefacts may occur sporadically within the development footprint in areas outside the transect paths and may be impacted by the project. The project is unlikely to impact other site types such as quarries or grinding groove sites as the survey specifically targeted landform features predicted to contain such sites. Unknown artefacts may occur in existing moderately to highly disturbed areas, predicted to be of low scientific significance.

Although the development footprint covers a broad area, the nature of the main impact type is representative of impacts already experienced through historical vegetation clearance and pasture improvement.

EMM acknowledges that it is possible that not all scar trees have been identified within the development footprint and therefore potential impacts to unknown scar trees are not currently determined (refer Section 5.3.5).

5.3.5 Management and mitigation measures

i Overview

A summary of the number of sites to be addressed by each management measure is provided in Table 5.9.

Table 5.9 Site management summary

Management measure/site type	Count
Avoidance	**47**
Artefact scatter	7
Artefact scatter, PAD	7
Grinding groove	1
Grinding groove, artefact scatter, PAD	4
Grinding groove, PAD	1
Historical site – unverified	1
Isolated find	13
Isolated find, PAD	1
Quarry, artefact scatter, PAD	4
Scarred tree	8
Surface collection	**39**
Artefact scatter	8
Isolated find, PAD	1
Isolated find	30
Expert assessment/possible relocation	**5**
Scarred tree	5
Undetermined – test excavation if site cannot be avoided	**5**
Artefact scatter	1
Artefact scatter, PAD	2
Isolated find, PAD	1
Quarry, artefact scatter, PAD	1
Total	**96**

ii Aboriginal heritage management plan

An AHMP will be developed in consultation with DPE, the RAPs and OEH. It will provide details of:

- all Aboriginal sites identified during the archaeological investigation for the project;
- management measures and their progress towards completion;
- measures to ensure ongoing consultation and involvement of project RAPs;

- RAP access arrangements for a selection of significant sites for educational purposes;
- protocols for newly identified sites;
- protocols for educating staff and contractors of their obligations relating to Aboriginal cultural heritage values through a site induction process;
- protocols for suspected human skeletal materials;
- protocols for the ongoing care of salvaged Aboriginal objects within a keeping place; and
- provisions for review and updates of the AHMP.

The AHMP will be prepared after project approval, and in addition to the points above, will address all relevant conditions of approval. The AHMP will provide the details of the management measures outlined in the sections below and referenced in further detail in Section 9.2 of Appendix D.

iii Avoidance

Avoidance of Aboriginal sites is a preferred management option as it ensures that Aboriginal sites, and their landscape information, will be preserved for future generations.

A total of 47 sites out of 96 sites will be avoided by the project. It should be noted that this will be confirmed based on the outcomes of the 10 sites where impacts are currently undetermined. 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. A construction buffer of at least 20 m will be applied to the demarcated boundaries of these sites. A suitably qualified archaeologist accompanied by a RAP representative will demarcate site locations and where the poles, roping, markers or similar should be erected.

The exception to the general rule is protection measures for grinding groove sites NE09 and NE68 which occur either within (NE68) or nearby (NE09) the northern array area. These sites hold high cultural value and therefore warrant a greater visual buffer so that they can be appreciated in context with the natural landscape.

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. During Stage 2 of the field survey, RAP field officers were shown the indicative buffer applied to NE09 and agreed that it was a suitable distance.

All sites identified within the ETL options surveyed as part of the ACHA will be avoided during detailed design. This will be achieved through spacing supporting structures to avoid site impacts. A buffer of at least 20 m will be given to all sites near the ETL options.

The suitability and nature of more permanent protection measures after project construction will be discussed during the preparation of the AHMP.

If there are sites identified for collection that are later determined not to be impacted, but are within 50 m of the development footprint, such sites will become sites to which avoidance and protection management measures are applied.

Sites that occur over 20 m from the development footprint will be passively avoided without protection, apart from site NE09, which will be buffered by at least 100 m and avoided with protection (refer above).

iv Collection

All surface artefact sites (artefact scatters and isolated finds) impacted by the project will be collected. This will involve collecting the entire visible contents of 30 isolated artefacts and seven artefact scatters.

The collection will be undertaken by qualified archaeologists and RAP representatives in accordance with the methodology provided in Section 9.2.4 of the ACHAR (Appendix D).

v Special procedures

The ACHAR details the special procedures to be followed as part of the management of Aboriginal cultural heritage, including:

- Aboriginal keeping place - A keeping place is a designated long-term secure area for the purpose of storing and curating Aboriginal cultural materials and their associated documentation. RAPs have nominated that the recovered objects be kept at the Armidale and Region Aboriginal Cultural Centre and Keeping Place. UPC 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 during consultation with the RAPs as part of the preparation of the AHMP.

- 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 (refer Section 9.3.2 of Appendix D).

- Aboriginal ancestral remains – In the event that known or suspected human remains are encountered during the project's construction, the procedure detailed in Section 9.3.3 of Appendix D will be followed as soon as the suspected remains are discovered.

- Discovery of new Aboriginal sites – In the event of discovery of new Aboriginal sites within the development footprint, the procedure detailed in Section 9.3.4 of Appendix D 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, consistent with the management measures provided for similar sites (refer Chapter 9 of Appendix D).

vi Additional assessment requirements

a Aboriginal modified tree assessment and management

Eight of the 13 identified scarred trees will be avoided without further assessment or investigation. However, there are five scar trees, two of moderate significance (NE45 and NE61) and three of low significance (NE49, NE47 and NE67), that occur within the development footprint and pose a considerable constraint to the placement of continuous rows or blocks of PV modules. Due to the common ambiguity between natural scars and scars of Aboriginal origin, and following consultation with the RAPs at the second meeting on 9 October 2018, UPC proposes to seek expert assessment of these sites to determine appropriate management measures. Expert assessment and the subsequent provision of management measures will be completed during either public exhibition or the preparation of the RTS report.

In addition, further survey is required to identify any scarred trees not identified as part of the archaeological survey effort to date and to assess project impacts and propose suitable management measures. This is important as Aboriginal scarred trees are rare, have high value to the Aboriginal community and therefore warrant conservation or appropriate management. This survey was unable to be completed during the preparation of the ACHAR due to timing of submission of the EIS. After consultation with the RAPs it was agreed that this task will be completed during either public exhibition or the preparation of the RTS report. Further information on this scope of work is provided in Section 9.4.1 of Appendix D.

The results of these additional assessments, proposed management measures, and evidence of RAP and OEH consultation will be provided in the RTS report to ensure DPE can consider any new information prior to project approval.

b Undetermined impacts to sites with PAD

There are parts of the development footprint where the exact nature and extent of project ground disturbance is not currently determined. For example, where an area is considered to be suitable for PV module installation at this stage, but the exact location of infrastructure placement is subject to further detailed design considerations by UPC and its contractors. This work is unlikely to have been completed prior to the conclusion of the public exhibition of the EIS. UPC is seeking as much flexibility as possible to complete the detailed design work and construct the project within the development footprint.

There are five sites where impacts are currently undetermined that would warrant test excavation. This comprises four stone artefact sites (NE15, NE27, NE70 and NE83) and one quarry site (NE33). If UPC want to explore opportunities to develop all or parts of any of these sites, then test excavation would be required to characterise the archaeological deposit and contribute to updated significance assessments and appropriate management measures. Based on the outcomes of the test excavation and significance of the finds, management options may include conservation, salvage excavation or unmitigated impacts.

To explore opportunities to maximise the development footprint, a test excavation program will be completed during either public exhibition of the EIS or preparation of the RTS report. The scope of test excavation and the selection of sites listed above for sampling (NE15, NE27, NE70, NE83 and NE33) will be determined in consultation with the RAPs and OEH. The results of excavation and subsequent management measures derived from the results will be formulated in consultation with RAPs and will be provided prior to or as part of the RTS report so that DPE and OEH can consider any new information prior to project approval.

5.4 Historic heritage

5.4.1 Overview

A historic heritage assessment (HHA) and Statement of Heritage Impact (SoHI) were prepared in accordance with NSW guidelines and policies, including the *NSW Heritage Manual* (Heritage Office 1996), as well as the principles of the Australia ICOMOS (2013) *Burra Charter*. This meets the historic heritage requirement in the SEARs to include:

- an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, including adequate consultation with the local Aboriginal community.

In addition, OEH's Heritage Division had additional requirements which included:

- The EIS must provide a heritage assessment including but not limited to an assessment of impacts to State and local heritage including conservation areas, natural heritage areas, place of Aboriginal heritage value, buildings, works, relics, gardens, landscapes, views, trees should be assessed. Where impacts to state or locally significant heritage items are identified, the assessment shall:
  - outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the *NSW Heritage Manual* (1996);
  - be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria);
  - include a statement of heritage impact for all heritage items (including significance assessment);
  - consider impacts including, but not limited to, vibration, demolitions, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant), and
  - where potential archaeological impacts have been identified develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations (terrestrial and maritime as relevant) and include the results of these test excavations.

The HHA and SoHI were undertaken by EMM to fulfil the following objectives:

- to investigate the potential for items of historic heritage value, including relics, to exist within the development footprint;
- to assess the significance of historic heritage items within the project boundary, which encompasses the development footprint and its surrounds;
- to assess the potential impacts of the project on items of historic heritage in the project boundary; and
- to formulate management measures for the protection of historic heritage items in the development footprint.

The study area for the HHA and SoHI represents the site boundary as presented as part of the PEA to support the request for SEARs (refer Figure 1.3).

5.4.2 Existing environment

Section 5.3.3 of this EIS provides relevant information on landscape, geology, hydrology, land use and Aboriginal heritage. The ensuing section provide greater context to the existing environment as it relates to historic heritage.

i Historical context

The earliest official exploration of the New England Tablelands was carried out in 1818 by the Surveyor-General John Oxley who identified much of the land he observed as suitable for settlement. In the early 1830s, the areas near Uralla and Armidale were settled with the lightly-timbered grassland considered ideal for sheep grazing. Land ownership in these areas was prohibited, and the land was occupied by squatters who would graze their sheep on the land, but not building permanent homes until ownership was secured following the Robertson Land Acts in 1861.

During the 1830s, a period of hostility characterised the spread of pastoral concerns within the colony. There were frequent conflicts between shepherds and Aboriginal people, who stole sheep and attacked shepherds, probably to defend territory. Shepherds would take Aboriginal women and kill Aboriginal people in retaliation for real and perceived offences. (Pickard 2008). The local Anaiwan people were effectively displaced from their land and other traces of former custodianship of the land were eroded by the renaming of much of the topography and local watercourses.

The pastoral run of Gostwyck on Salisbury Waters was established in 1831. The pastoral runs remained unfenced during the 1850s and 1860s, and sheep were managed by shepherds who would herd flocks of between 200 to 3000 sheep (Pickard 2008).

Larger pastoral stations such as Gostwyck, owned by the Dangar family, were self-sufficient and had their own stores selling local produce as well as food and goods imported from the Hunter region. Gostwyck had woolsheds, workers' cottages and other buildings, creating a village pattern which housed up to 120 people. Other pastoral stations within the project boundary include Salisbury Court (part of southern array area) and Saumarez Station (part of northern array area).

ii Heritage listings

No heritage items listed on the National Heritage List (NHL) or Commonwealth Heritage List (CHL) occur adjacent to or within the project boundary. Several items identified on the State Heritage Register (SHR) and Section 170 Registers occur to the west of the project boundary. No State listed heritage items occur within the project boundary.

Uralla Shire LGA lists a number of items on Schedule 5 (environmental heritage) of the Uralla LEP. Many of the Uralla Shire LGA's heritage items are centred on the township of Uralla. Two Uralla LEP listed heritage items occur within the project boundary and one lies adjacent to it (refer Figure 5.4), including:

- Gostwyck Memorial Chapel and Precinct (I10 - within);
- Deeargee Woolshed (I11 - within); and
- Salisbury Court (I14 - adjacent).

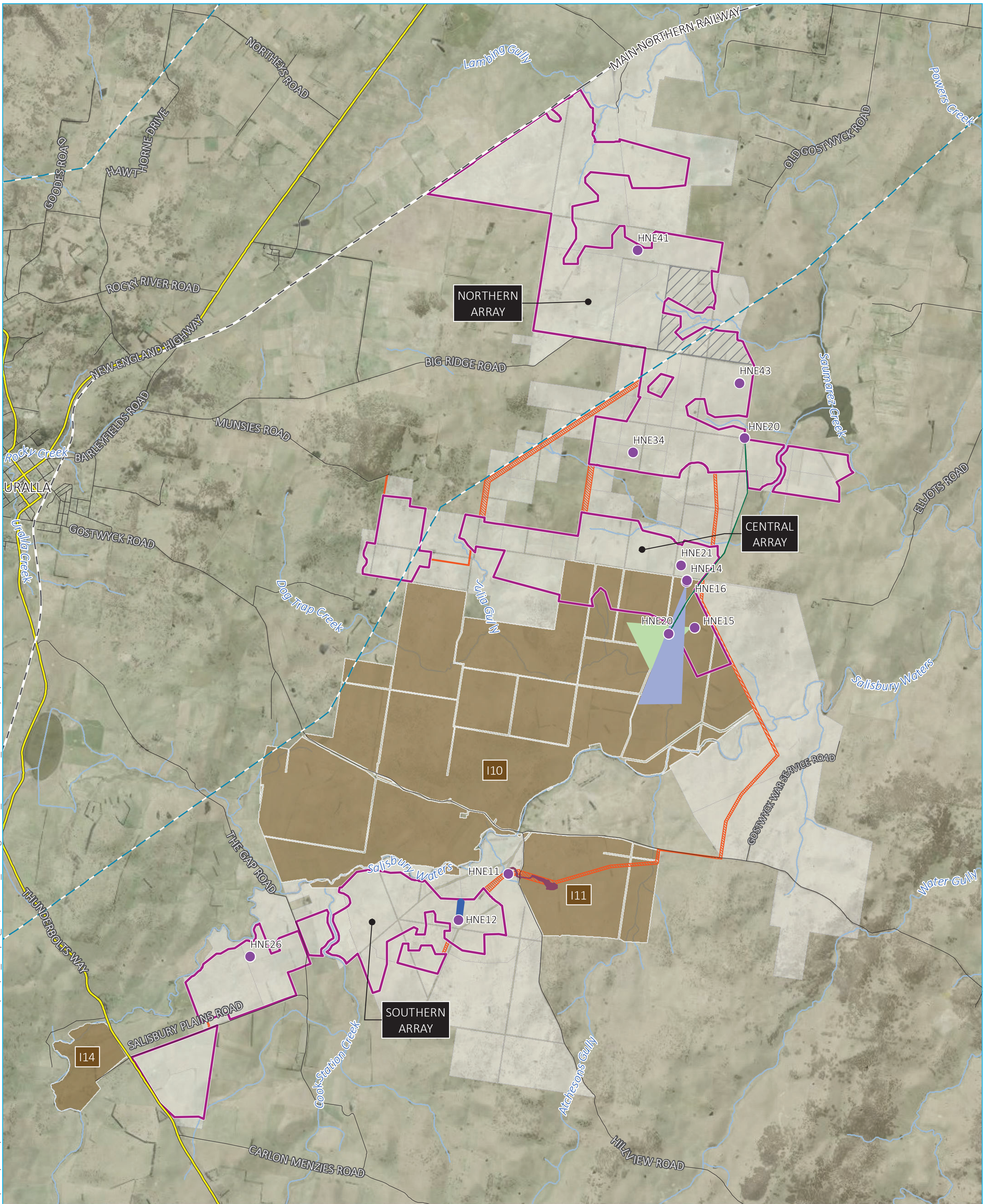
iii Heritage items in development footprint

As part of the preparation of the HHA and SoHI, field surveys were undertaken by EMM. In total, three days were spent on targeted historical survey and an additional 10 days were spent as part of field assessments based on landform units during which Aboriginal archaeological sites were recorded.

Several heritage items were identified within the development footprint. These included:

- remains of two basalt walls (HNE11 and HNE12);
- granite tors (stone outcrop) (HNE14);
- remnant fence lines (HNE21 and HNE43);
- rows of poplars (HNE41);
- old road alignment (HNE20);
- former stockyards (HNE26 and HNE34); and
- the cultural landscape (HNE37), including views through Gostwyck Station (HNE15) and from granite tors (HNE16).

The heritage items and heritage listings in the development footprint are presented in Figure 5.4.



T:\Jobs\2017\J17300 - UPC NSW Solar Farm\GIS\02_Maps_EIS\EIS014_HeritageItems_20181018_01.mxd 11/01/2019

Source: EMM (2018); DFSI (2017); UPC (2018)

0 1.5 3 km

GDA 1994 MGA Zone 56

N

KEY

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

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential site for construction accommodation village
- Uralla LEP listing - item

Indicative site boundary

- HNE11
- HNE12
- HNE15
- HNE16
- HNE20
- Historic heritage survey item

Note: HNE37 is not shown as a point as it is representative of the cultural landscape

Heritage items and listings in the development footprint

New England Solar Farm
Environmental impact assessment
Figure 5.4

EMM
creating opportunities

5.4.3 Assessment of impacts

The project will have impacts on heritage items and locations within the development footprint, as well as the cultural landscape in the region as listed below:

- partial impacts to the old alignment of Old Gostwyck Road (HNE20);
- removal of HNE21 and HNE43, two former fence lines within the development footprint for the northern array area;
- removal of HNE34, a former stockyard within the development footprint for the northern array area;
- impacts to a small portion of HNE37, the cultural landscape in the region (including views and vistas experienced at HNE15 and HNE16) and features in the landscape, including HNE34 and some wind-breaks) that contribute to the cultural landscape, but which don't possess significance outside of this context; and
- removal, if it exists and UPC want to explore opportunities to develop at this location, of HNE26, the potential archaeological resources of a former stockyard (southern array area).

Redesign has also removed potential impacts to the dismantled dry-stone wall in the southern array area, HNE12, where an exclusion zone will be set around the wall to define it as a significant item and to protect it from inadvertent impacts.

Similarly, potential impacts to HNE11, another dismantled dry-stone wall in the southern array area, will be avoided through application of physical and procedural barriers.

While there are Uralla LEP listed heritage sites within and adjacent to the project boundary (refer 5.3), physical impacts to these sites, which include Gostwyck Memorial Chapel and Precinct, Deeargee Woolshed and Salisbury Court, will not occur as a result of the project. Potential visual amenity impacts at these listed heritage sites have been considered as part of the VIA (refer Section 5.6 and Appendix I).

Overall, it is anticipated that the project will have a low-to-moderate negative effect on the historical heritage significance of the rural character of the region and a moderate affect within the development footprint, predominantly by obscuring the significant cultural landscape rather than destroying it. It is noted that the majority of sites and views within the development footprint are not accessible by the general public.

The positive aspects of the project will be that the activities that commenced in the early historical period of the colony, namely wool production, will continue on the land surrounding the development footprint. Further, this project has provided opportunity to assess these early squatting runs in the field, which will provide a substantial amount of information that can be put to use to open up areas of investigation that were not available previously.

5.4.4 Mitigation measures

i General mitigation measures

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 and unexpected finds for the duration of the project. The relevant measures in the HHMP will be incorporated into the project's CEMP and OEMP to avoid accidental impacts during the construction and operational stage of the project. The HHMP will include management measures and identify locations for photographic archival recording.

Avoidance zones will be created for heritage items that will be protected. An active protection zone, clearly identified by high visibility flagging and heavy bollards, will be used for any item identified for protection that will be within 50 m of project activities. A passive protection zone, clearly identified during the project induction and toolbox talks as project exclusion zones, will be used for areas that are 51 m or more from any of the project activities.

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.

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 photographic record will focus on the development footprint with views to and from a selection of landmark features (general landscape) and detailed photographs of archaeological sites and natural features using land-based and aerial (eg drone) photography. The primary sites that this management measure applies to are identified in Table 5.10. A number of archival quality digital photographs were taken during the assessment phase, which should be used as part of the archival record. 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).

LiDAR survey has been completed for the project and where possible the information from this survey can be incorporated into the archival record.

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.

Tree line wind breaks will be retained where practicable (ie where they are located to the south of PV module rows to avoid shading impacts and where they do not pose additional risks from a bushfire, pest or vegetation management perspective).

ii Site specific mitigation measures

Site specific management measures will be implemented for specific heritage sites within the development footprint. These are presented in Table 5.10.

Table 5.10 Site specific mitigation measures

Site ID	Name	Mitigation measures
HNE11	Remnant of basalt wall 1	Detailed digital photographic archival recording. Topographic survey. Physical impacts to HNE11 as a result of the proposed ETL will be avoided through involvement of an archaeologist in the detailed design of the ETL alignment and during pole placement within the corridor, if the exclusion zone shown in Figure 5.4 cannot be avoided altogether. The 'gateway' that is currently used for farm access will be protected from impacts by all project-related vehicle movements. Heavy bollards will be placed to allow a 13 m width for vehicle circulation, and project personnel will be informed of the significance of this site as part of site induction and daily toolbox talks. Modifications permitted in the vicinity of HNE11 will be limited to the preparation of the access track surface, where relevant, the laydown of gravel or similar, and minor excavation of drainage swales on either side of the track only
HNE12	Remnant of basalt wall 2	Detailed digital photographic archival recording. Topographic survey. Provide a curtilage of 10 m around the entire wall and define with sturdy bollards to protect from accidental impacts.
HNE20	Old Gostwyck Road alignment	Where the alignment can be identified, Include in general landscape digital photographic archival record.
HNE21	Remnant fence line	Detailed digital photographic archival recording. Topographic survey.
HNE26	Former stockyard	Investigate as part of the Aboriginal archaeological excavation (refer Section 8.3.8 of Appendix E). Include in general landscape digital photographic archival record.
HNE34	Former stockyard	Detailed digital photographic archival recording. Topographic survey. If possible, avoid this item.
HNE37 (including HNE15 and HNE16)	Cultural landscape and views	Selected archival digital photographic recording of development footprint and immediate surrounds will be taken prior to impacts. The development footprint and its surrounds are part of a larger significant cultural landscape, which will be partially physically impacted. Views will also be affected. Details of locations and subjects of photographs to be included in the HHMP.
HNE41	Rows of poplars	Include in general landscape digital photographic archival record.

5.4.5 Conclusion

Impacts to heritage, largely to the visual aspect of the cultural landscape, will occur. If managed carefully, these impacts will not be significant as all known significant archaeological sites have been excised from the development footprint.

5.5 Land

5.5.1 Overview

An assessment of the project's potential impacts on land within development footprint and surrounds has been undertaken, including a soil survey and review and assessment of relevant publicly available information. Consultation with the project landholders, neighbouring landholders and members of the local community has also been undertaken (refer to Section 4.4.2). Specialist technical studies performed as part of this assessment include the LUCRA (Appendix F) and SEA (Appendix G). The impact of the project on surface water resources and flooding is addressed further in Section 5.9 and Appendix H.

This meets the land requirements of the SEARs to include:

- an assessment of the impact of the development on agricultural land (including possible cumulative impacts on agricultural enterprises and landholders) and flood prone land, an assessment of any impacts to Crown lands (including Crown Reserve 95655), a soil survey to consider the potential for erosion to occur, and paying particular attention to the compatibility of the development with the existing land uses on the site and adjacent land (eg operating mines, extractive industries, mineral or petroleum resources, exploration activities, aerial spraying, dust generation, and insecurity risk) during operation and after decommissioning, with reference to the zoning provisions applying to the land, including subdivision;
- an assessment of potential land use conflicts, including completion of a Land Use Conflict Risk Assessment in accordance with the Department of Industry's *Land Use Conflict Risk Assessment Guide*; and
- measures to remediate the land following decommissioning in accordance with SEPP 55 – Remediation of Land.

This section includes an assessment of potential impacts on agricultural land and Crown land (including Crown roads) with particular attention to the compatibility of the project with the existing land uses within the project boundary and adjacent land during operation and decommissioning.

The study area for the SEA and used more generally in this section of the EIS, represents the site boundary as presented as part of the PEA to support the request for SEARs (refer Figure 1.3).

5.5.2 Existing environment

i Zoning

The development footprint is zoned RU1 Primary Production under the Uralla LEP (refer to Figure 2.5). The objectives of this zone are discussed in Section 3.2.1.

It is noted that the Uralla LEP permits development with consent for the purpose of electricity generation in land zoned RU1 Primary Production.

The project will alter the current land use of the development footprint, being agriculture, to electricity generation by solar energy. The project will also impact the availability of land for other primary production. However, it will allow for and encourage diversity in the area's land use, and will provide economic stimulus and support to rural communities. Co-existence with sheep grazing activities is being explored with a number of the landholders involved in the project which would reduce the impact on primary production.

ii Geology, soils and land capability

a Geology

The development footprint is within the New England Tableland IBRA bioregion, and encompasses parts of the MacIntyre, Clarence, Gwydir, Macleay, Namoi and Manning River catchments (OEH 2016a). The majority of the development footprint is within the Armidale Plateau subregion at an elevation of approximately 1,100 m. Locally, the development footprint is characterised by gently undulating plains with long gentle slopes intersected by drainage lines and depressions.

The surface geology of the development footprint is characterised by sedimentary rocks of Carboniferous and Permian age (OEH 2016b). Much of the bedrock is now overlain by Tertiary basalt flows rarely exceeding 100 m in thickness that lie on river gravels and sands or on lake sediments. In certain areas basalt has eroded and exposed the underlying sedimentation layer. These tend to occur along drainage lines. The geology of the development footprint generally contains fine-grained Permo-Carboniferous sedimentary rocks, granites and Tertiary basalt flows.

b Soils

Due to the size and location of the development footprint and the area's underlying geology and topography, there are a variety of soil orders represented across the landscape. As part of the soil erosion assessment, a survey was completed to examine the soil and landform properties of the development footprint and inform erosion potential. This included taking main representative soil samples for further laboratory analysis. The main soil types representative of the development footprint are vertosols, dermosols, tenosols and texture contrast soils.

The laboratory results identified that the soils ranged from slightly acidic to neutral across the development footprint, with a trend of slight acidity in the surface progressing to neutral in the subsoils. Soil salinity was very low across the development footprint. Three sites were identified as having sodic subsoils. On the basis of these parameters, it is considered that there is a low to moderate risk of dispersion (to air or water) based on soil type if the soil is significantly disturbed or overworked during construction, especially if works occur during or immediately following rain events.

The central array area's tenosol soil type displays a higher subsoil erodibility compared to the southern and northern array areas. This is where existing sheet and gully erosion was observed where the subsoil had been exposed. The vertosol soils are generally stable while the dermosol and sodosol surface soils have moderate erodibility when exposed.

There are no known occurrences of acid sulphate soils within the development footprint.

In addition to the SEA, a desktop assessment was undertaken using existing information on soils and soil environments within the study area, with a focus on the development footprint. The desktop analysis was sourced from:

- *NSW soil and land information system (SALIS)* (CSIRO 2018)*;*
- *Soil profile attribute data (eSPADE) online database* (OEH 2018)*;*
  - great soil group mapping of NSW;
  - land and soil capability classes mapping;
  - Australian soil classification system soil type mapping of NSW; and
  - hydraulic soil group mapping.

Relevant extracts from the desktop analysis are summarised below in Table 5.11.

Table 5.11 Summary of desktop analysis environmental data for the development footprint

Dataset	Environmental data
Australian Soil Classification scheme (Isbell 2016)	This state-wide mapping identified that the study area encompasses seven soil orders, namely Dermosols, Kurosols (natric), Ferrosols, Kurosols, Rudosols, Vertosols and Kandosol. The orders are described in Appendix G.
Great soil group mapping of NSW	An older soil classification system, indicating that the soils within the study area fall under seven soil orders including Siliceous sands (SS), Soloths (SH), Red podzolic soils – less fertile (RPl), Chocolate soils (C), Euchrozems (E), Red podzolic soils – more fertile (RPm) and Black earths (BE). The orders are described in Appendix G.
eSPADE	The eSPADE soil profile database (OEH 2018) has been used to find soil profiles surveyed in the region that have been submitted to the SALIS database. No profiles occur directly within the study area. sSPADE soil profiles within proximity of the study area include Dermosol, Ferrosol and Chromosol and are described in Table 3.4 of Appendix G.
Hydraulic soil group	All four possible soil hydraulic groups (A, B, C and D, as defined in Section 3.5.4 of Appendix G) occur within the study area (OEH 2018), with soil hydrology ranging from soils with very slow infiltration rates through to high infiltration rates.

Notes: 1.Refer to SEA in Appendix G for further information.

c Land and soil capability

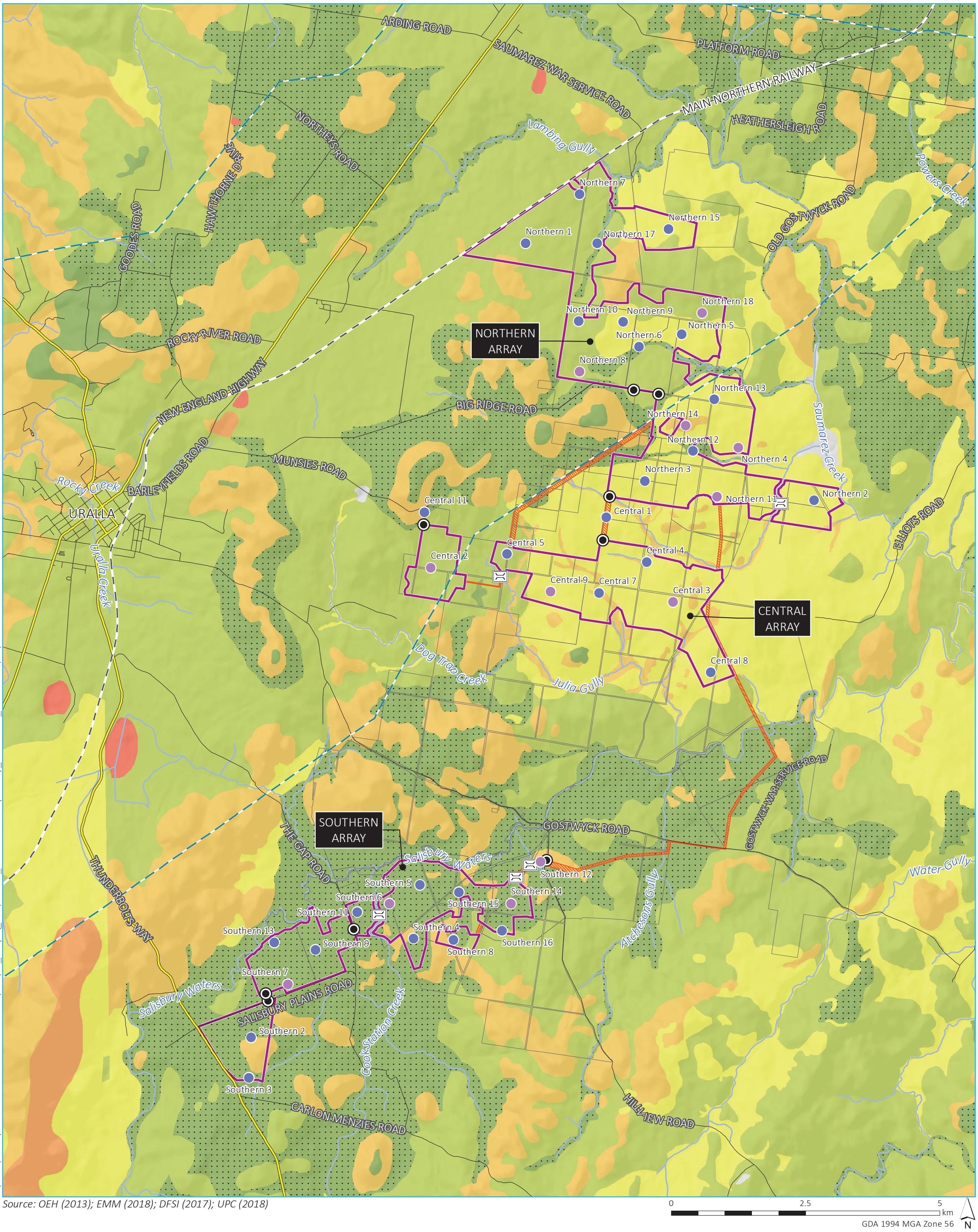
Land and soil capability is the inherent physical capacity of the land to sustain a range of land uses and management practices in the long term without degradation to soil, land, air and water resources (OEH 2012). The land and soil capability class gives an indication of the land management practices that can be applied to a parcel of land without causing degradation to the land and soil. Failure to manage land in accordance with its capability risks degradation of resources, leading to a decline in natural ecosystem values, agricultural productivity and infrastructure functionality. As land capability decreases, the management of hazards requires an increase in knowledge, expertise and investment.

Land and soil capability within the development footprint ranges from Class 3 (moderate limitations) through to Class 6 (very severe limitations) (Figure 5.5). Class 6 occurs in isolated patches generally associated with areas of higher elevation within the development footprint. The analysis undertaken as part of the SEA cannot be used to conclusively verify the inherent fertility or land capability within the development footprint; however, the soil survey and analysis results generally align with the existing broad-scale mapping.

iii Contaminated land

A search of the EPA's contaminated land public record of notice and list of sites notified to the EPA under Section 60 of the NSW *Contaminated Land Management Act 1997* (CLM Act) did not return any information on reported contamination or any regulatory notices issued for the land within the project boundary (EPA 2018).

A search of the contaminated land record of notices revealed one site within the Uralla Shire LGA that has been issued notices. Each of these notices applied to a parcel of land approximately 22 km south-west of the development footprint for the southern array area.



Source: OEH (2013); EMM (2018); DFSI (2017); UPC (2018)

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KEY

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

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential creek crossing
- Proposed primary site access point

- Soil survey location
- Laboratory analysed soil survey location
- Biophysical Strategic Agricultural Land

Land and soil capability class

- 3
- 4
- 5
- 6
- 7
- 8

Land and soil capability

New England Solar Farm
Environmental impact assessment
Figure 5.5

EMM
creating opportunities

Clause 7 of SEPP 55 requires that a consent authority take into consideration whether the land is contaminated. The contaminated land planning guidelines, *Managing Land Contamination Planning Guidelines: SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning 1998), identify activities with the potential to cause contamination. These guidelines list 'agricultural' and 'horticultural activities' as activities which can potentially cause contamination. Agricultural activities have occurred on and near the development footprint, however no potentially contaminative locations were found during the desktop and site surveys for the heritage assessments. Construction of the project will require limited site preparation and civil works, therefore, the level of surface disturbance, and likelihood of exposing unknown contaminated land will be minimal.

iv Agricultural land

The project is within the Uralla Shire LGA, which covers an area of 3,215 km^2 in inner north-east NSW. The development footprint represents approximately 0.87% of the total land area within the Uralla Shire LGA. The Uralla Shire LGA is one of twelve LGAs in the New England North West region of NSW, which is one of Australia's most productive agricultural areas, with a significant share of the State's beef, cotton, sorghum and tomato production (NSW Government 2017). Cattle and sheep grazing for wool, breeding stock and meat dominate agricultural activities within the project boundary and its immediate surrounds.

Parts of the development footprint (predominantly in the southern array) are mapped as BSAL as defined by the Strategic Agricultural Land Map – New England North West regional mapping presented in the Mining SEPP. 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 ha of BSAL has been identified and mapped at a regional scale across NSW and includes land capable of sustaining high levels of productivity (NSW Government 2012).

The development footprint presented on Figure 5.5 encompasses an area of approximately 2,787 ha, which includes 1,418 ha within the northern array area; 625 ha within the central array area; and 653 ha within the southern array area. Of the land within the three array areas, approximately 670 ha are mapped as BSAL (refer Figure 5.5). This represents approximately 0.02% of the total land area mapped as BSAL within NSW.

The majority of the development footprint has been modified by historical land use practices and past disturbances associated with land clearing, cropping and 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.

The *Northern Tablelands Local Strategic Plan 2016-2021* was prepared in 2016 by the Northern Tablelands LLS and identifies the Uralla Shire LGA as sitting within Thunderbolts Country and Cool Country, which are characterised by sheep and cattle production and grazing (Northern Tablelands LLS 2016). The development footprint falls within the Cool Country region. Table 5.12 lists the selected priorities for each of the two regions that include Uralla Shire LGA within the Northern Tablelands.

Table 5.12 Northern Tablelands LLS selected priorities for Uralla Shire LGA

Thunderbolts Country	Cool Country
Manage total grazing pressure	Manage and consolidate native vegetation
Improve riparian stability and instream habitat	Link producers to latest research and development
TSR management	Fox management

Source: *Northern Tablelands Local Strategic Plan 2016-2020* (Northern Tablelands LLS 2016)

v Crown land

There is a small parcel of Crown land (Crown reserve 95655 – refer Figure 1.6) adjacent to Salisbury Waters and within proximity of the development footprint for the southern array area. The reserve covers an area of 5.18 ha and is split between two grazing licences/permissive occupancies. The project will not impact this Crown reserve 95655.

As part of consultation with DoI Lands and Water, a number of Crown roads have been identified within the development footprint for the three array areas. Applications to close a number of these roads have already been lodged with DoI Lands and Water and, subsequently, no further action is required for these. Crown roads that remain within the development footprint will require closing.

Salisbury Waters has been identified as a Crown waterway. With the exception of the proposed ETL alignment to connect the southern and central array areas, no project infrastructure is proposed to cross Salisbury Waters (refer Figure 2.1). Of note, the section of Salisbury Waters where the proposed ETL alignment crosses this watercourse was not identified as a Crown waterway during consultation with DoI Lands and Water (refer Appendix B). Further, no impacts to Salisbury Waters as a result of the proposed ETL alignment are anticipated.

As noted in Section 2.3.3, the indicative alignment for the ETL to connect the southern array area to the central array area extends over approximately 9.5 km and covers land owned by two of the project landholders, as well as the southern road reserve of a 1 km section of Gostwyck Road (refer Figure 2.1). As part of consultation with DoI Lands and Water, this section of Gostwyck Road has not been identified as a Crown road. During detailed design, UPC will continue to liaise with Uralla Shire Council with regards to the potential use of the southern road reserve. Should it be required, UPC will lodge a Section 138 Certificate (Work on Public Lands) prior to the commencement of any works in the identified road reserve.

vi National parks and reserves

Oxley Wild Rivers National Park is approximately 20 km east of the development footprint at its closest point and covers approximately 1,452 km^2.

No parks or nature reserves are to be impacted by the project, and thus they are not discussed further in this EIS.

vii Biosecurity

Invasive species, which include pest animals and weeds, are among the biggest threats to biodiversity in NSW (Eco Logical Australia 2015). Pest animals can cause significant economic losses to agricultural production, pose a risk of exotic diseases, threaten the survival of native species and contribute to environmental degradation (LLS Riverina 2017). Weeds can cause significant impacts to agricultural productivity activities including cropping and grazing and threaten approximately 40% of vulnerable and endangered species in NSW (Eco Logical Australia 2015).

Northern Tablelands LLS actively work to protect the Northern Tablelands region from invasive animal and plant species, and livestock and plant diseases that may damage landscapes, industries, markets and production (Northern Tablelands LLS 2016). As noted in Table 5.12, The *Northern Tablelands Local Strategic Plan 2016-2021* identified fox management as one of the select priorities for Cool Country region which extends over the development footprint. The plan notes that due to its proximity to Queensland, the coast and the plains, the Northern Tablelands region is at risk of the introduction and export of animal pest and disease and plant pest and disease through the movement of livestock, commodities and other goods (Northern Tablelands LLS 2016).

Additionally, there is a high incidence of vertebrate pests impacting on the agricultural sector and environment, such as feral pigs, wild rabbits, wild dogs, European red fox and wild deer (Northern Tablelands LLS 2016). The most common weeds are Blackberry and African Lovegrass.

viii Surface water resources and flooding

The project boundary is in the upper reaches of the Macleay River catchment. The catchment covers a total area of 11,450 km^2 and includes extensive areas of the Northern Tablelands (NSW Government n.d.) The Macleay River rises in the Northern Tablelands east of the project boundary at the confluence of the Gara River, Salisbury Waters and Bakers Creek, and flows south-east though a coastal floodplain, where it meets the Pacific Ocean. Perennial watercourses within the project boundary include Salisbury Waters and Cook Station Creek (6th and 5th order streams, respectively) and Dog Trap Creek and Julia Gully (both 4th order streams).

The development footprint is outside of the flood planning area as mapped under the Uralla LEP. However, flood modelling was undertaken as part of the SWA to improve understanding of this potential constraint and to inform project design and the refinement process (refer Section 1.4.2).

As part of the preparation of the SWA, the 1% AEP event (ie 1 in 100 year flood) was modelled and the following key observations were made:

- flooding generally follows the alignment of watercourses, with no substantial overbank flooding or breakouts evident; and
- floodways and areas of higher flow velocity and flood hazard are typically confined within watercourses.

Further information on surface water and flooding is presented in Section 5.9 and Appendix H.

ix Mining and minerals

No mining tenements within the project boundary were identified in a search of the DPE DRG's DiGS database. The closest mineral tenements are exploration licenses (ELs) issued under the NSW *Mining Act 1992*, including:

- EL6918 held by Kokong Holdings Pty Ltd, north of the township of Uralla, approximately 2.5 km west of the northern array area at its closest point; and
- EL6483 held by Biacil Holdings Pty Ltd, west of the township of Uralla, approximately 4.7 km west of the southern array area at its closest point.

As part of the submission made by GSNSW –DRG, an area of higher mineral significance was identified within the southern area of the site presented as part of the PEA (refer to Figure 1.6). During consultation with GSNSW-DRG, it was noted that this area had been identified based on an educated assessment of the New England region and a recently commissioned prospective analysis.

x Property vegetation plans

A property vegetation plan (PVP) is a voluntary, legally binding agreement between a landholder and LLS. A public register of PVPs is maintained by the Land Property Management Authority under the repealed NSW *Native Vegetation Act 2003* (NV Act). Information was extracted from the Public Register of Approved Clearing PVPs under the repealed NV Act for the Northern Tablelands LLS region from 1 October 2015 to 24 August 2017 (the latest records available on the register). The dataset showed that the closest PVP (ie Offset 1PVP00065) is approximately 18 km west of development footprint.

As indicated by the dataset, there are no PVPs that will be affected by the project. PVPs are therefore not discussed further in this EIS.

5.5.3 Assessment of impacts

i Overview

As described in Section 2.4, the need for heavy civil works such as grading/levelling and compaction will be minimised as much as practicable. The flattest land areas within the three array areas are mostly cleared of vegetation and have been selected to minimise impacts to land within the development footprint.

Direct disturbance of the land within the development footprint during site establishment will primarily be limited to:

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

Upon completion of the site establishment and pre-construction activities described above, construction activities will include:

- drive or screw piles;
- install mounting structures and tracker tubes;
- secure PV modules to tracker tubes;
- installation of medium voltage and high voltage cables;
- installation of PCUs;
- complete substation augmentation;
- establishment of the BESS compound; and
- test and commission project infrastructure.

With a single axis tracking row configuration there will still be significant area (approximately 60-70%) between the rows of modules to allow water to fall or run off onto the ground, as currently occurs. The potential for surface water impacts associated with hydrologic changes due to increased run off rates from PV modules is considered negligible. PV modules shed runoff directly to the ground, which will be stabilised and vegetated to promote retention and infiltration.

The project will also result in an increase in vehicle movements to and from the three array areas during construction. Subsequently, the project may result in increased levels of soil erosion. It is noted that certain areas where existing erosion has been identified have been avoided, most notably in the central array.

An erosion and sediment control (ESC) plan will be established for the project and is outlined in Section 5.5.4).

ii Rural residential development and subdivision

a Rural residential development

All land surrounding the development footprint for the three array areas is zoned RU1 Primary Production under the Uralla LEP, with associated minimum lot sizes of 200 ha, and therefore would not support rural residential development in the immediate vicinity of the development footprint under the current land zoning provisions.

The closest concentration of receptors is the township of Uralla, approximately 6 km west of the central array, and the regional city of Armidale, approximately 10 km north of the northern array. The area surrounding the three arrays is sparsely populated, with the exception of land north-east of the northern array area within the suburb of Kellys Plains. In addition, a small cluster of rural residential and small-scale agricultural operations is also located approximately 3 km north-west of the boundary of the southern array on The Gap Road.

As part of the project refinement process, the design and location of the development footprint within the project boundary has undergone a number of significant revisions in response to ongoing stakeholder engagement and environmental constraints identification. Potential impacts to the closest non-project related receptors have been considered in a number of technical assessments prepared as part of this EIS, including consideration of potential visual amenity (Section 5.6), noise (Section 5.7) and traffic (Section 5.8) impacts.

b Subdivision

The land on which the grid substation is constructed is likely to require subdivision. 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 (refer Figure 2.5), with associated minimum lot sizes of 200 ha. The subdivision of the lot(s) that is eventually selected for the grid substation, which will be one or more of the lots listed in Table 2.3 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.

Once the final location of the grid substation is determined, the proposed subdivision will be the subject of ongoing discussion with Uralla Shire Council, DPE and the project landholders.

iii Geology, soils and land capability

As noted above, the project may result in increased levels of soil erosion, primarily during construction when the ground disturbance activities take place. Once the construction is completed and the ground vegetation cover is able to re-establish itself significant impacts relative to the existing land uses are not expected. The susceptibility of soils to erosive forces is dependent on their inherent properties, namely texture, structure and dispersibility (Charman 1978).

The SEA found soil erodibility to be low to moderate across the development footprint. Management for erosion potential as well as rehabilitation will be incorporated as part of the standard ESC management practices during construction and operations and will be detailed within the EMP.

Land and soil capability (including the extent of BSAL) within the development footprint is presented in Figure 5.5.

iv Agricultural production and land use impacts

The project will result in a change to the current land use within the development footprint for the three array areas, being agriculture, to electricity generation. However, the majority of the landholders currently intend to continue with farming activities when the project proceeds, as the land area to be occupied by project infrastructure only accounts for a portion of their landholdings. Throughout the life of the project, the income generated through the lease agreements between UPC and the project landholders will also serve to 'drought-proof' their ongoing agricultural operations for the next generation of farmers.

The project will reduce the total area of land under agricultural production in the Uralla Shire LGA and more generally within the New England North West region through the establishment of the solar arrays and associated infrastructure. However, the loss of agricultural land represents a very small fraction of the agricultural output of both the Uralla Shire LGA and New England North West region. Relative to its size, the project will have a relatively minor effect in terms of displacing agricultural production within the Uralla Shire LGA.

As part of the project refinement process, the area within the development footprint that is mapped as BSAL has reduced from approximately 1,100 ha (within the PEA site boundary) to approximately 670 ha (within the development footprint for the three array areas presented on Figure 5.5), which represents a reduction of 40%.

Given that the development footprint represents approximately 0.87% of the total land area within the Uralla Shire LGA, the utilisation of agricultural land by the project will only result in a temporary negligible reduction in the overall agricultural productivity of the Uralla Shire LGA and the New England North West region.

Land management practises will avoid or minimise potential impacts to neighbouring agricultural operations that have been identified during engagement with the local community and as part of the LUCRA (Appendix F). The outcomes presented within the LUCRA (Appendix F) demonstrate how the project design has been informed by consultation. For example, no vehicles associated with the construction of the project will turn off onto the Gap Road directly from Thunderbolts Way in order to avoid road traffic noise, dust and safety concerns raised by landholders with rural residential and small-scale agricultural operations along this unsealed local road corridor.

Neoen Australia Pty Ltd (Neoen) is seeking to develop the Uralla Solar Farm (SSD 18_9534) within the Uralla Shire LGA, approximately 4.9 km north-west of the project. SEARs for the Uralla Solar Farm were not available at the time of writing; however, based on the information provided within the PEA, it is understood that if constructed, the proposed Uralla Solar Farm would cover an area of up to 1,800 ha and have a targeted capacity of around 400 MWac (GHD 2018). The proposed site for the Uralla Solar Farm is identified on Figure 1.1. Consideration of potential cumulative impacts from the project and the Uralla Solar Farm is provided in Section 5.16 of this EIS.

v Land Use Conflict Risk Assessment Guide

A LUCRA has been developed for the project using DPI's *Land Use Conflict Risk Assessment Guideline* (2011) (LUCRA Guideline). DPI defines the LUCRA as a system to identify and assess the potential for land use conflict to occur between neighbouring land uses (DPI 2011). The LUCRA assists with the assessment of the possibility for and potential level of future land use conflict between different parties.

DPI has identified that land use conflicts occur when one land user is perceived to infringe upon the rights, values or amenity of another (DPI 2011). In rural settings, this often occurs between different agricultural enterprises and other primary industries (DPI 2011).

Using the risk ranking matrix provided by DPI as a guide, a LUCRA was developed for the project and is provided in Appendix F. Potential land use conflicts identified as part of this process have been informed by engagement with the project's near neighbours, surrounding agricultural operations, project landholders, Uralla Shire Council and the local community.

The risk ranking matrix provided within the LUCRA Guideline defines a risk ranking from 1-25 with a score of 1 representative of the lowest risk and a score of 25 representative of the highest risk. Risk rankings are calculated by determining the probability of the potential conflict (as defined in **Error! Reference source not found.**13) and identifying the consequences of the potential conflict, which include:

- Level 1: Severe;
- Level 2: Major;
- Level 3: Moderate;
- Level 4: Minor; and
- Level 5: Negligible.

Table 5.13 LUCRA probability table

Level	Descriptor	Description
A	Almost certain	Common or repeating occurrence
B	Likely	Known to occur, or 'it has happened'
C	Possible	Could occur, or 'I've heard of it happening'
D	Unlikely	Could occur in some circumstances, but not likely to occur
E	Rare	Practically impossible

Source: DPI (2011)

As part of the preparation of the LUCRA (Appendix F), 37 potential conflicts have been considered, including potential for conflict as a result of:

- changes to the spread and distribution of weeds and increased presence of pest animals;
- removal of agricultural land and subsequent reduction in productivity;
- impacts to mineral resources;
- impacts to neighbouring agricultural operations, property values, council rates and local infrastructure and services;
- amenity impacts during construction and operation (eg noise, dust, visual and traffic);
- increased soil erosion and impacts to surface water resources; and
- risks associated with the project (eg security, safety, health and fire).

Under the unmitigated scenario (ie without the implementation of the proposed management strategies), the risk ranking matrix identified potential for 18 high risk conflicts (ie those with a risk ranking score of greater than 10). Through the implementation of the proposed management strategies described in Appendix F, the number of high risk conflicts reduced to seven, which reflects a reduction of greater than 60%.

Potential conflicts with a revised risk ranking of greater than 10 were limited to removal of agricultural land and subsequent reduction in productivity, visual amenity impacts during operation and risks associated with the project (namely in relation to safety and fire). It should be noted that although the probability of potential conflicts in relation to safety and fire are considered unlikely, the major consequence that correlated with the associated events maintained the revised risk ranking score at 14.

Performance targets have been proposed to ensure that the proposed methods of control identified within the LUCRA continue to be effective at addressing the identified potential conflicts. This includes:

- to reduce potential impacts on the future agricultural productivity of the land within the development footprint, rehabilitation objectives and strategies (including performance measures) will be established in the decommissioning and rehabilitation plan;
- to reduce the extent of potential visual amenity impacts experienced at S9, the landscaping plan will include a program to monitor and report on the effectiveness of the proposed landscaping;
- the TMP will include a complaint resolution and disciplinary procedure as a mechanism to address any issues identified by the local community and other roads users in relation to safety;
- the FMP will be reviewed after incidents of bushfire or other fire as well as annually at the end of each bushfire season and will be amended after the review process, if required, to increase its effectiveness; and
- the ERP will be reviewed after emergencies as well as annually and will be amended after the review process, if required, to increase its effectiveness.

vi Biosecurity

The project 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 development footprint during construction if not adequately managed. In addition, pest animals may also be encouraged by food sources from construction works and general disturbance.

The project may contribute to further encroachment of invasive exotic weed species which could lead to loss of habitat and suppression of native seedling establishment resulting in changes to vegetation communities over time.

vii Surface water resources and flooding

Impacts to surface water resources and flooding are considered in Section 5.9 and Appendix H.

viii Crown Land

The project will not impact Crown reserve 95655 (refer Figure 1.6)

Impacts to Crown roads within the development footprint will be limited to the ground disturbance activities described in Section 5.5.3 (i). Impacts to Crown roads outside of the development footprint but within the project boundary will be limited to installation of security fencing and creek crossings (should they be required).

ix Mining and minerals

As part of the project refinement process, the area of higher mineral significance identified by GSNSW – DRG has been removed from the development footprint for the southern array (refer Figure 1.6). The project will not impact this area or exploration activities within areas outside of the project boundary.

5.5.4 Mitigation measures

i Agency and landholder engagement

As already noted, UPC has engaged with neighbouring landholders and DPI during project scoping and preparation of this EIS and will continue to engage with local landholders and DPI as part of ongoing stakeholder engagement to clarify potential issues around the project and its potential impacts on neighbouring agricultural operations (refer Appendix F). Ongoing engagement has informed the assessment and impact justification in this EIS.

The project's stakeholder engagement strategy (refer to Section 4.3) encourages initiation and maintenance of open lines of communication with members of the local community for the duration of the project. Additionally, UPC will continue to engage with Uralla Shire Council and DPI to identify potential impacts on agricultural operations and develop appropriate mitigation measures to address local land use concerns.

ii Construction

An EMP will be prepared to address land management within the development footprint and will detail measures to minimise impacts to agricultural land with reference to the DPI's publication, *Infrastructure proposals on rural land* (Kovac and Briggs 2013).

To address the potential impacts of the project on rural land, measures that may be implemented during construction, include:

- Potential seasonal/campaign-based agricultural transport activities will be identified during further consultation with project landholders and nearby landholders. 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.

- Project-related and nearby landholders may move stock between paddocks and across roads proposed to be utilised for access to the three array areas, therefore there is potential for conflict with project-related construction traffic movements. Potential stock crossing locations will be identified through further consultation with project-related and nearby landholders. 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 for the project.

- A site access protocol may be developed that lists the relevant landholder's contact details and includes measures to minimise adverse impacts, such as maintaining safe speed limits (typically 40 km/h) to minimise disturbance to livestock, crops and pastures.

An ESC plan in accordance with *Managing Urban Stormwater: Soil & Construction* (Landcom 2004) may also be prepared. The plan could include measures such as:

- installing ESC measures (if required) prior to and during construction;

- regularly inspecting ESCs, particularly following large rainfall/wind events;

- minimising tracking of sediment from vehicles, plant and equipment on the surrounding local road network; and

- minimising the total area of disturbance from excavation and compaction, where practicable.

The EMP may also include weed management protocols, such as measures for the identification, management and ongoing monitoring of weeds within the development footprint.

The EMP would also likely include spill clean-up procedures which would be implemented during construction and throughout the project's operations to avoid potential for contamination.

iii Operation

During the project's operations, a number of land management and mitigation measures may be implemented to reduce the potential impact of the project on:

- land and soil capability within the development footprint, including land mapped as BSAL;
- neighbouring agricultural operations;
- regional biosecurity;
- erosion; and
- surface water runoff.

In consultation with the project landholders, land management will include consideration of the viability of sheep grazing and manual and/or machine vegetation management as a means of vegetation maintenance throughout the life of the project. Sheep are considered an appropriate means of managing grassland between and underneath PV modules with research suggesting that overall production levels can be maintained at levels sustained on open grassland under similar conditions (BRE 2014).

To mitigate impacts to biosecurity, vehicle movements would likely be restricted to the formed access tracks. In addition, if implemented, sheep grazing within the development footprint would help maintain weed levels while maintaining a multi-purpose land use throughout the life of the project.

Soil erodibility is considered to be low to moderate across the development footprint. Disturbed areas will be stabilised and rehabilitated as construction is completed and the project moves into the operational phase. Ongoing ESC practices to be implemented during construction will be detailed within the OEMP.

The potential for surface water impacts associated with hydrologic changes due to increased runoff rates from PV modules is considered negligible because PV modules shed runoff directly to the ground, which will be stabilised and vegetated to promote retention and infiltration.

iv 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.

During decommissioning, all above ground facilities will be removed from the development footprint.

Any underground cabling below 500 mm will remain in-situ following project decommissioning. Only deep-rooting trees, such as those associated with horticultural practices, would be likely to disturb the electrical conduit trenches and their respective cabling (Burges et al. 2008). However, based on the historical uses of the land, horticultural practices involving deep-rooting trees are unlikely to be a viable future land use; as such, it is unlikely that cables, if left in situ, would impinge on any future agricultural production within the development footprint.

The access tracks within the development footprint may be retained if requested by the landholders at the time of decommissioning.

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, as has been agreed with the project landholders.

5.6 Visual

5.6.1 Overview

A visual impact assessment (VIA) was undertaken in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with the relevant government agencies.

There are no Commonwealth, NSW or local government planning policies, guidelines or standards directly applicable to this assessment. The VIA was prepared with reference to the methods outlined in:

- *Guidelines for Landscape and Visual Impact Assessment Third Edition* (2013) (the GLVIA), prepared by the Landscape Institute and Institute of Environmental Management and Assessment; and

- *Wind Energy: Visual Assessment Bulletin AB 01 For State significant wind energy development* (2016a) prepared by the NSW Department of Planning and Environment (the VA Bulletin).

It is noted that the VA Bulletin specifically relates to assessment of visual impacts of wind farms in NSW; however, a number of the methods for describing visual sensitivity and landscape character are considered to be relevant to this assessment. In the absence of other directly applicable guidelines/standards, the relevant elements from the VA Bulletin have been adopted for this assessment.

This meets the visual impact requirements of the SEARs to include:

- an assessment of the likely visual impacts of the development (including any glare, reflectivity and night lighting) on surrounding residences (including the Sunhill Dairy Goats property), scenic or significant vistas, air traffic and road corridors in the public domain, including a draft landscaping plan for on-site perimeter planting, with evidence it has been developed in consultation with affected landowners.

To inform preparation of the SEARs, DPE invited other government agencies to recommend matters to be addressed in the EIS. RMS) and DPI raised matters relevant to the VIA, which included:

- consideration of potential glare/reflectivity generated from on-site infrastructure towards public roads (RMS); and

- completion of a LUCRA, including identification of potential land use conflict, in particular relating to separation distances and management practices to minimise dust, noise and visual impacts from sensitive receptors (DPI).

As part of the project's stakeholder engagement strategy (Section 4.3), UPC has consulted with a number of the project's neighbouring landholders and, more generally, the local community. The VIA responded to a number of the matters raised during this engagement, including:

- potential visibility of project infrastructure from neighbouring residences and the local road network;

- potential for glare and reflectivity from PV modules;

- potential for night lighting impacts from project infrastructure; and

- adequacy of any proposed vegetation screening.

5.6.2 Existing environment

The project's development footprint 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.

Uralla is the largest township in the Uralla Shire LGA, with a population of 2,743. It is also the Uralla Shire LGA's commercial and administrative centre. The town is approximately 6 km west of the central array. In addition to Uralla, a number of small villages also surround the three array areas, including Kellys Plains and Saumarez (north of the northern array area); Gostwyck and Dangarsleigh (east and south of the central array area, respectively); and Salisbury Plains (south of the southern array area). The regional city of Armidale is approximately 8.6 km north of the northern array area.

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 (MASL).

The majority of the land surrounding the development footprint is zoned RU1 primary production under the Uralla LEP (Figure 2.5). Land uses surrounding the three 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.

No listed scenic or significant vistas near the development footprint have been identified.

i Sensitive receptors

a Rural dwellings

A number of non-project related dwellings have been identified in the landscape surrounding the project boundary and, more specifically, the three array areas. Non-project related dwellings considered as part of the VIA are identified on Figure 5.6 and include:

- approximately 40 dwellings within 4 km of the northern array area, including dwellings within the suburbs of Kellys Plains, Dangarsleigh, Armidale, Arding and Saumarez;
- six dwellings within 2 km of the central array area, including dwellings within the suburbs of Uralla, Dangarsleigh and Gostwyck; and
- approximately 20 dwellings within 4.5 km of the southern array area, including dwellings within the suburbs of Uralla, Gostwyck and Salisbury Plains.

The closest non-project related dwelling is S9, approximately 240 m from the development footprint for the southern array area.

A key consideration of the project refinement process has been potential visibility of project infrastructure from rural dwellings. Significant revisions to the southern and northern array areas have been performed to increase the distance between the development footprint and non-project related rural dwellings and therefore reduce potential visibility of project infrastructure (refer Figure 5.6).

Two rural dwellings owned by project landholders have also been considered as part of this assessment as they are currently leased to members of the local community, namely S11 (Viewpoint 1) and N40 (Viewpoint 6). Except for these two dwellings, no project-related dwellings have been considered as part of the VIA.

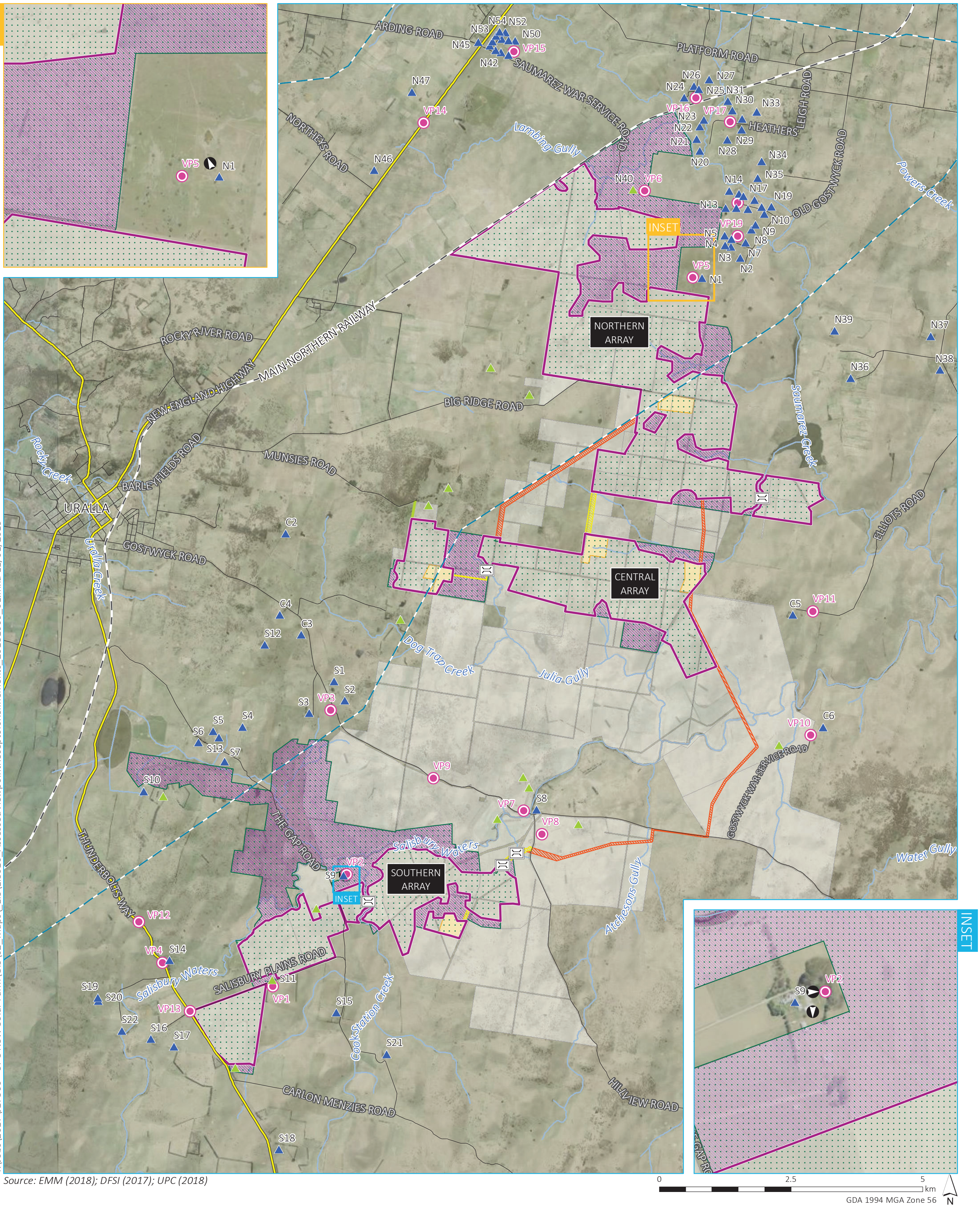
b Heritage listings

Gostwyck Memorial Chapel and Precinct (I10 – within the project boundary), Salisbury Court (I14 – adjacent to the project boundary) and Deeargee Woolshed (I11 – within the project boundary) are recognised as places of local environmental heritage significance within the Uralla LEP. One of the objectives of the Uralla LEP is:

> to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views.

Views of project infrastructure from Gostwyck Memorial Chapel and Precinct (Viewpoint 7), Salisbury Court (Viewpoint 13) and Deeargee Woolshed (Viewpoint 8) have been considered as part of the VIA.

The HHA and SoHI (refer Section 5.4 and Appendix E) provides further consideration of these heritage items. The HHA and SoHI include consideration of the cultural landscape within the project boundary and its surrounds. As noted within the HHA and SoHI, the aesthetic significance of the cultural landscape within the project boundary is apparent to the viewer as it retains many of the forms that existed in the earliest days of settler occupation. Visually, the land within the project boundary and its surrounds retains the rural character of the area and has features associated with both Aboriginal cultural and historical heritage values.



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Source: EMM (2018); DFSI (2017); UPC (2018)

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Site boundary presented as part of the PEA
- Areas to exclude project infrastructure
- Project boundary

Development footprint

- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential substation/BESS footprint
- Potential creek crossing

- Viewpoint location
- Photograph location and direction

Sensitive receptors

- Project-related
- Non-project related

Assessed viewpoints, sensitive receptors and project refinements

New England Solar Farm
Environmental impact statement
Figure 5.6

EMM
creating opportunities

5.6.3 Assessment of impacts

i Visual elements of the project

a Site selection and project refinement

The site selection and refinement process considered a range of factors, including the placement of infrastructure to minimise the visual impact on landholders and other sensitive receptors. In response to feedback received from neighbouring landholders and the local community during targeted engagement, significant revisions were undertaken to greatly reduce the extent of the southern array area. This has increased the distance between several receptors and the development footprint for the southern array area, which has subsequently reduced the significance of visual amenity impacts on a number of sensitive receptors.

An area of approximately 585 ha north and 40 ha south of Salisbury Waters has been excluded from the development footprint for the southern array area. This has increased the buffer between the development footprint and the nearest sensitive receptor (S9) from 50 m to 240 m. The removal of the area north of Salisbury Waters was also in response to concerns raised by residents along The Gap Road and Gostwyck Road regarding potential impacts on views experienced from their residences.

In addition, approximately 315 ha has been removed from the development footprint for the northern array area to reduce the impact on N1, as well as residences along Heathersleigh Road, Corey Road, Burns Road and Hariet Gully Road.

b Construction

The site selection and design process will reduce the need for heavy earthworks as much as practicable by using the flatter areas of land which are mostly cleared of vegetation for infrastructure placement. Some civil works will be required to prepare the disturbance area for construction and for certain project infrastructure such as the laying of any underground cabling and the substation/BESS pads. 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.

Following site preparation, construction will typically include the following activities:

- drive or screw piles;
- install mounting structures and tracker tubes;
- secure PV modules to tracker tubes;
- install medium voltage and high voltage cables;
- install PCUs;
- complete substation augmentation;
- establish the BESS compound; and
- test and commission project infrastructure.

A construction accommodation village for non-local construction employees (where skills cannot be sourced locally) may also be established as part of the early stages of the project's construction.

Construction of the project will take approximately 36 months from the commencement of site establishment works to the commissioning of the three array areas.

c Project infrastructure

There will be three separate arrays of PV modules and PCUs. The exact number of PV modules and PCUs will be confirmed during the detailed design stage of the project. The rows of PV modules will be aligned in a north-south direction and spaced 5-8 m apart.

As described in Section 2.3.1, 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, which is based on the PV module configuration illustrated in Option A of Figure 2.5. This configuration features a table with four PV modules in landscape orientation or two modules in portrait orientation. The most 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 Figure 2.5). Should this configuration be selected, the height of the PV modules at their maximum tilt angle would likely be 2-3 m.

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.

Up to three array substations will be required, potentially one for each array. These will consist of an indoor switch room, outdoor switch yard, transformers, gantries and associated infrastructure.

A grid substation will be required for the project adjacent to TranGrid's 330 kV transmission line, which traverses the northern and central array areas. The grid substation will be similar to the array substations, but larger, using a pad area of up to 10 ha. The exact location for the grid substation will be decided during detailed design.

The BESSs will be adjacent to one or more of the proposed substations within the development footprint.

MV electrical cables between the arrays and their substations will be installed underground or overhead. Overhead transmission lines will be required to transport the electricity generated by each solar array from the array substations to the grid substation. The alignment and design of the overhead transmission lines and the structures required to support them will be determined during the detailed design stage; however, it is unlikely that the height of the structures will exceed 45 m. Where possible, structures will avoid identified environmental constraints on the land parcels between the three array areas.

The project will also need additional supporting infrastructure, such as one or more O&M buildings, internal roads to access the three array areas from the local road network, parking, fencing and landscaping.

ii Assessed viewpoints

A total of 19 representative viewpoints were identified and ground-truthed as part of the visual impact assessment. The locations of the viewpoints and their rationale for selection are described in Table 5.14 and illustrated in Figure 5.6.

Table 5.14 Assessed viewpoints, receptors and rational for selection

Assessment location	Viewpoint type(s)	Representative receptors	Rationale for selection
Viewpoint 1	Dwelling	S11*	Views are representative of a receptor (ie dwelling) on Salisbury Plains Road, S11, adjacent to the southern array area. At its closest point, the development footprint for the southern array area is approximately 40 m from S11.
Viewpoint 2	Dwelling	S9	Views are representative of a receptor (ie dwelling) on The Gap Road, S9, within proximity of the southern array area. At its closest point, the development footprint for the southern array area is approximately 240 m from S9.
Viewpoint 3	Dwellings	S3; S1; S2	Views are representative of a receptor (ie dwelling) on Gostwyck Road, S3, within proximity of the southern array area. At its closest point, the development footprint for the southern array area is approximately 2.9 km from S3. Viewpoint 3 is close to S1 and S2. S1, S2 and S3 are also within proximity of the development footprint for the central array area, at 2.1 km, 2.3 km and 2.8 km, respectively.
Viewpoint 4	Dwelling	S14	Views are representative of a receptor (ie dwelling) on Thunderbolts Way, S14, within proximity of the southern array area. At its closest point, the development footprint for the southern array area is approximately 1,070 m from S14.
Viewpoint 5	Dwelling	N1	Views are representative of a receptor (ie dwelling) on Old Gostwyck Road, N1, within proximity of the northern array area. At its closest point, the development footprint for the northern array area is 350 m from N1.
Viewpoint 6	Dwelling	N40*	Views are representative of a receptor (ie dwelling) on Saumarez War Service Road, N40, within proximity of the northern array area. At its closest point, the development footprint for the northern array area is approximately 390 m from N40.
Viewpoint 7	Local heritage item	Uralla LEP listing I10 S8	Views are representative of Gostwyck Memorial Chapel and Precinct, an item of local heritage significance listed on the Uralla LEP, within proximity of the southern array area. At its closest point, the development footprint for the southern array area is approximately 1,100 m from Gostwyck Memorial Chapel. At its closest point, the potential site access and ETL corridor from Hillview Road into the southern array area is approximately 700 m south of Gostwyck Memorial Chapel. Viewpoint 7 is close to S8.
Viewpoint 8	Local heritage item Motorists	Uralla LEP listing I11	Views are representative of Deeargee Woolshed, an item of local heritage significance listed on the Uralla LEP, within proximity of the southern array area. At its closest point, the development footprint for the southern array area is approximately 970 m from Deeargee Woolshed. The potential site access corridor from Hillview Road into the southern array area is approximately 330 m south of Deeargee Woolshed. Views are also representative of those experienced by motorists travelling along Hillview Road.
Viewpoint 9	Motorists	-	Views are representative of those experienced by motorists travelling along Gostwyck Road.
Viewpoint 10	Dwelling Motorists	C6	Views are representative of a receptor (ie dwelling) on Gostwyck War Service Road, C6, within proximity of the central array area. At its closest point, the development footprint for the central array area is approximately 2.3 km from C6. The potential ETL easement between the southern and central array areas is approximately 1.3 km south-west of C6 (at its closest point).

Table 5.14 Assessed viewpoints, receptors and rational for selection

Assessment location	Viewpoint type(s)	Representative receptors	Rationale for selection
Viewpoint 11	Dwelling Motorists	C5	Views are representative of a receptor (ie dwelling) on Elliots Road, C5, within proximity of the central array area. At its closest point, the development footprint for the central array area is approximately 1.7 km from C5.
Viewpoint 12	Motorists	-	Views are representative of those experienced by motorists travelling along Thunderbolts Way. At its closest point, Viewpoint 12 is approximately 1.9 km from the development footprint for the southern array area.
Viewpoint 13	Local heritage item Dwellings Motorists	Uralla LEP listing I14 S16; S17; S19; S20; S22	Views are representative of Salisbury Court, an item of local heritage significance listed on the Uralla LEP, within proximity of the southern array area. At its closest point, the development footprint for the southern array area is approximately 75 m from the road frontage of Lot 1 of DP 1030870, which makes up the listing for Salisbury Court. At its closest point, the Salisbury Court homestead on Lot 1 of DP 1030870 (S16) is approximately 900 m from the development footprint for the southern array area. Viewpoint 13 is within proximity of S17, S19, S20 and S22, and is representative of views experienced by motorists travelling along Thunderbolts Way. Views are also representative of those experienced by motorists turning into Salisbury Plains Road from Thunderbolts Way and entering/exiting the driveway to Salisbury Court.
Viewpoint 14	Motorists	-	Views are representative of those experienced by motorists travelling along the New England Highway. At its closest point, Viewpoint 14 is approximately 2.4 km from the development footprint for the northern array area.
Viewpoint 15	Dwellings Motorists	N41; N42; N43; N44	Views are representative of dwellings on Saumarez War Service Road. At its closest point, Viewpoint 15 is approximately 2.4 km from the development footprint for the northern array area. Views are also representative of those experienced by motorists travelling along Saumarez War Service Road.
Viewpoint 16	Dwellings	N24; N25; N26; N27	Views are representative of dwellings on Burns Road. At its closest point, Viewpoint 16 is approximately 2.5 km from the development footprint for the northern array area.
Viewpoint 17	Dwellings	N20; N21; N22; N23; N28	Views are representative of dwellings on Heathersleigh Road. At its closest point, Viewpoint 17 is approximately 2.1 km from the development footprint for the northern array area.
Viewpoint 18	Dwellings	N10; N11; N12; N13; N14; N15; N16; N17; N18; N19	Views are representative of dwellings on Harriet Gully Road. At its closest point, Viewpoint 18 is approximately 1.1 km from the development footprint for the northern array area.
Viewpoint 19	Dwellings	N2; N3; N4; N5; N6; N7; N8; N9	Views are representative of dwellings on Corey Road. At its closest point, Viewpoint 19 is approximately 1 km from the development footprint for the northern array area. Viewpoint 19 is also within proximity of N8 and N9 on Old Gostwyck Road.

Notes: *These are rental properties owned by two of the project landholders and are therefore considered project-related receptors.

iii Construction impacts

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

The most significant visual impact will be experienced by residents of nearby dwellings who have an uninterrupted view of the project development footprint. Motorists travelling along the local and regional road network will also experience views of the array areas 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 (ie 36 month construction period), the site establishment works and construction activities are considered unlikely to have any significant visual impacts on passing motorists or nearby receptors greater than those during operation. Subsequently, temporary landscaping is not proposed to mitigate visual impacts during construction.

Construction activities will be undertaken from 6am to 6pm Monday to Sunday. Exceptions to these hours may be required on limited occasions. Uralla Shire Council and surrounding landholders will be notified of any exceptions.

A temporary construction accommodation village for non-local construction employees may be established as part of the early stages of the project's construction. If constructed, the construction accommodation village would accommodate up to 500 workers (subject to demand) and would be located on part of Lot 2 of DP 174053 in the northern array area (refer Figure 1.2). The construction accommodation village will be dismantled and its footprint rehabilitated once construction is complete and the project moves into operations.

The closest viewpoint to Lot 2 of DP 174053 is Viewpoint 5, which is approximately 890 m north of the northern boundary of Lot 2 of DP 174053. Viewpoint 5 is representative of views from a rural dwelling (N1). As part of a site inspection at N1, it was noted that the primary aspect from the dwelling (including from both the front porch and garden and within the dwelling itself) is to the north. Any views from the dwelling looking south towards the proposed location of the construction accommodation village are interrupted by remnant vegetation within the landscape between this dwelling and Lot 2 of DP 174053.

This vegetation is unlikely to provide complete screening of the construction accommodation village (should it be required). However, given the distance to Lot 2 of DP 174053 and the temporary nature of this infrastructure (should it be required), no management measures are proposed to mitigate potential visual impacts resulting from the construction accommodation village during the project's 36 month construction period.

iv Operation impacts

a Visibility

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 are included in Appendix A of the VIA (Appendix I).

As noted above, the focus of the viewshed analysis was on PV modules, which were conservatively assumed to be constructed at a height of 4.3 m. Other project infrastructure, including BESSs, have not been considered as part of the viewshed analysis as the exact location and design of this infrastructure within the development footprint is more difficult to specify at this stage of the project's development and will be determined during the detailed design stage of the project.

When considering the topography within the development footprint, the results of the viewshed analysis indicate that project infrastructure will be visible to varying degrees from 17 of the 19 viewpoints assessed. As identified by the 5 m contours presented on Figure 5.2 (northern array), Figure 5.3 (central array) and Figure 5.4 (southern array) of the VIA (Appendix I), the landform pattern within and surrounding the development footprint can be described as a mix of low rolling hills. At a number of the selected viewpoints, undulation within the landscape limits the extent of the visual landscape affected by project infrastructure.

By accounting for potential shielding features within the landscape within the development footprint and surrounding area, the number of viewpoints anticipated to experience views of project infrastructure reduces from 19 to 14. However, there are limitations to relying on the results of a viewshed analysis that includes consideration of a DSM as vegetation may only provide partial shielding. The viewshed analysis indicates the potential for shielding features in the landscape to reduce the visibility of project infrastructure from a number of the selected viewpoints. This is largely due to scattered remnant vegetation, planted wind breaks and extensive vegetation screens around the boundaries of rural residential dwellings.

The presence of vegetation (including scattered and dense vegetation, and planted wind breaks) between the three array areas and several rural dwellings, means that views to the array areas are typically partially obstructed from most locations, with the exception of views of the development footprint from passing motorists travelling along the local and regional road network. Potential views of project infrastructure within the development footprint for the southern array area from Thunderbolts Way (over a distance of up to 3 km), Salisbury Plains Road (over a distance of up to 3 km) and The Gap Road (over a distance of up to 2 km) would also be partially obstructed by remnant vegetation, roadside vegetation and planted wind breaks. Examples of vegetation screening around nearby receptors (ie dwellings) are provided in Appendix B of the VIA (Appendix I).

Project infrastructure in the southern array area may also be visible from the Gostwyck Memorial Chapel and Precinct (Viewpoint 7), Deeargee Woolshed (Viewpoint 8) and Salisbury Court (Viewpoint 13). Remnant and planted vegetation in the landscape between Gostwyck Memorial Chapel and Precinct (Photograph B.14 – refer Appendix B of Appendix I) and Deeargee Woolshed (Photograph B.16 and Photograph B.17 – refer Appendix B of Appendix I) and the development footprint for the southern array area will limit views of project infrastructure from both locally listed heritage items.

As part of the preparation of the VIA and engagement with S9, S3 and N1, photomontages were prepared for viewpoints 2, 3 and 5, respectively. The photomontages conservatively assume the height of the dominant project infrastructure, the PV modules, will be 4.3 m. This is a highly conservative assumption which is based on the PV module configuration illustrated in Option A within Figure 2.5.

As noted previously, the PV modules will likely be constructed in a single axis tracking configuration, which will allow the PV modules to rotate from east to west during the day tracking the sun's movement. The most typical configuration using single axis tracking is currently a single PV module mounted on the tracker tube in portrait (refer Option B in Figure 2.5). Therefore, the maximum height of the PV modules from the ground to the tip at the maximum tilt angle of 60^{o} is more likely to be in the range of approximately 2-3 m.

Consequently, since the results of the photomontages are based on the less likely 4.3 m high configuration (ie Option A in Figure 2.5), it is likely that the actual visible extent of project infrastructure from S9, S3 and N1 will be less than the areas shown the photomontages (refer Appendix C of Appendix I).

Based on field investigations and a review of aerial imagery, in the majority of cases, it is anticipated that views of the proposed BESSs will be at least partially screened from all of the selected viewpoints (particularly if the small enclosure or cabinet facilities are utilised). This is primarily due to undulation and remnant vegetation in the landscape combined with distance to the potential BESS footprints. Regardless of the housing selected during the detailed design stage of the project, the BESSs 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 large agricultural sheds that currently exist in the landscape within the three array areas and their surrounds.

A summary of the results of the analysis of visual impacts for each of the 19 viewpoints is provided in Table 5.15. In addition to consideration of the potential visual impacts from the 19 viewpoints listed in Table 5.15, Table 5.22 of the VIA (refer Appendix I) provides a summary of the predicted visual impact from the 39 non-project related residences identified within 2 km of the development footprint for the three array areas.

Table 5.15 Summary of results of visual impacts at each viewpoint

Viewpoint	Distance to closest array area	Closest array area	Representative receptors	Residential or public	Project infrastructure visible based on viewshed analysis	Magnitude of change	Visual sensitivity	Evaluation of significance	Significant impact	Additional mitigation proposed	Potential for cumulative impacts with Uralla Solar Farm
Viewpoint 1	40 m*	Southern	S11**	Residential	Yes	High	Moderate	Moderate/ substantial	Yes	No***	No
Viewpoint 2	240 m*	Southern	S9	Residential	Yes	Moderate	Moderate	Moderate	No	Yes	No
Viewpoint 3	2.9 km*	Southern	S3; S1; S2	Residential	Yes	Low	Moderate	Slight/ moderate	No	No	No
Viewpoint 4	1,070 m*	Southern	S14	Residential	Yes	Low	Moderate	Slight/ moderate	No	No	No
Viewpoint 5	350 m*	Northern	N1	Residential	Yes	Moderate	Moderate	Moderate	No	No****	No
Viewpoint 6	380 m	Northern	N40**	Residential	Yes	Moderate	Moderate	Moderate	No	No**	No
Viewpoint 7	1.1 km	Southern	Uralla LEP listing I10 S8	Public	Yes	Low	High	Moderate	No	No	No
Viewpoint 8	970 m	Southern	Uralla LEP listing I11 Motorists	Public	Yes	Low	High	Moderate	No	No	No
Viewpoint 9	1.3 km	Southern	Motorists	Public	Yes	Low	Low	Slight	No	No	No
Viewpoint 10	2.3 km*	Central	C6 Motorists	Public	Yes	Low	Moderate	Slight/ moderate	No	No	No
Viewpoint 11	1.7 km*	Central	C5 Motorists	Public	Yes	Low	Moderate	Slight/ moderate	No	No	No
Viewpoint 12	1.9 km	Southern	Motorists	Public	Yes	Low	Low	Slight	No	No	No

Table 5.15 Summary of results of visual impacts at each viewpoint

Viewpoint	Distance to closest array area	Closest array area	Representative receptors	Residential or public	Project infrastructure visible based on viewshed analysis	Magnitude of change	Visual sensitivity	Evaluation of significance	Significant impact	Additional mitigation proposed	Potential for cumulative impacts with Uralla Solar Farm
Viewpoint 13	25 m (Thunderbolts Way)	Southern	Motorists	Public	Yes	Moderate	Low	Slight/ moderate	No	No	No
	900 m (Salisbury Court – S16)	Southern	Uralla LEP listing I14 S19; S20; S22	Residential	N/A****	Low	High	Moderate	No	No	No
	600 m (S17)	Southern	S17	Residential	N/A****	Low	Moderate	Slight/ moderate	No	No	No
Viewpoint 14	2.4 km	Northern	Motorists	Public	Yes	Low	Low	Slight	No	No	Yes
Viewpoint 15	2.4 km	Northern	N41; N42; N43; N44 Motorists	Public	Yes	Low	Moderate	Slight/ moderate	No	No	Yes
Viewpoint 16	2.5 km	Northern	N24; N25; N26; N27	Public	Yes	Low	Moderate	Slight/ moderate	No	No	No
Viewpoint 17	2.1 km	Northern	N20; N21; N22; N23; N28; N29; N30; N31; N32; N33	Public	Yes	Low	Moderate	Slight/ moderate	No	No	No
Viewpoint 18	1.1 km	Northern	N10; N11; N12; N13; N14; N15; N16; N17; N18; N19	Public	No	Negligible	Moderate	Slight	No	No	No
Viewpoint 19	1 km	Northern	N2; N3; N4; N5; N6; N7	Public	No	Negligible	Moderate	Slight		No	No

*Distance from closest representative receptor (ie dwelling).
**Rural dwellings owned by one of the project landholders that are currently leased to a member of the local community.
***Mitigation measures will be subject to discussions between UPC, the project landholder and the tenant.
****Discussions between UPC and N1 are ongoing and will include consideration of options for landscaping to address the potential visibility of project infrastructure from the southern aspect of the dwelling at Viewpoint 5, should it be required.
*****A viewshed analysis has not been performed from Salisbury Court homestead or S17.

b Reflectivity and glare

The potential impacts of reflectivity on receptors from solar PV modules are commonly referred to as “glint” and “glare”. The receptors considered are primarily dwellings within proximity of the development footprint, motorists travelling along the local and regional road network and visitors to items of local heritage significance within proximity of the southern array area.

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 potential for glare associated with non-concentrating PV solar systems is relatively limited, and typically, as little as 2% of the light received is reflected by PV modules. PV modules will not generally create noticeable glare when compared with an existing roof or building surface (NSW Department of Planning 2010). Put simply, PV modules are designed to absorb solar energy and convert it to electrical energy, not to reflect solar energy.

The PV modules will rotate from east to west during the day, tracking the sun’s movement, so glint and glare viewed from a particular receptor would 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.

Armidale Airport is approximately 5.4 km north of the development footprint for the northern array area. Armidale Airport’s primary runway is positioned in an approximate south-west to north-east orientation. Due to the distance between the Armidale Airport and the development footprint, it is unlikely that aircraft using this facility will pass directly over the three array areas during the critical phases of flight (ie approach and landing). CASA reviewed the PEA and advised that potential glare was not a hazard to air navigation and didn’t require a glare analysis for the project. It is also noted that the buildings forming part of Armidale Airport have a substantial rooftop PV system installed. Solar farms are also being installed at several airports in Australia, such as Darwin, and internationally, such as Osaka (Kansai) in Japan.

The potential for low angled reflected sunlight to cause a distraction to drivers travelling along the local and regional road network was considered as part of the traffic impact assessment for the project. Due to the low level of reflectivity of PV modules, as well as the possibility of other features becoming more common in modern PV module designs, such as anti-reflective coatings, the PV modules are not expected to cause a distraction to motorists travelling along the local and regional road network.

During consultation with nearby landholders, as well as the wider local community, concerns were raised about the potential impacts of glare from the PV modules. Where 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 three array areas, potential impacts from glint or glare are not expected to be significant.

5.6.4 Mitigation measures

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. The significant refinements to the northern and southern array areas have also reduced the overall visibility of the project.

i Landscaping

A conceptual landscaping plan is shown in Figure 4.2 of Appendix I, which presents the option for landscaping at two locations within proximity of S9 (Viewpoint 2), including:

- along the eastern property boundary to address the potential visibility of project infrastructure to the east of S9; and
- within proximity of the southern property boundary to address the potential visibility of project infrastructure to the south of S9.

The proposed landscaping will reduce the visibility of project infrastructure from the dwelling at S9 and within the property boundary.

The final location and extent of landscaping will be determined during detailed design and following subsequent discussions with the project landholders and the property owners of S9 as part of preparation of the EMP.

Vegetation species used during landscaping will be subject to consultation with NSW Rural Fire Service (RFS), project landholders, S9 and local suppliers. Examples of tall trees, large shrubs, medium shrubs and hardy low shrubs are provided in Table 4.1 of Appendix I.

In addition to proposed landscaping at S9, discussions between UPC, the relevant project landholder and the tenant at S11 will inform requirements for landscaping to mitigate views at Viewpoint 1.

Discussions between UPC and N1 are ongoing and include consideration of options for landscaping to address the potential visibility of project infrastructure from the southern aspect of the dwelling at Viewpoint 5, should it be required.

ii Materials

Where possible, suitable colours will be chosen for project infrastructure to minimise visual impacts, including in particular the O&M buildings/facilities and the 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 three arrays. In addition, if practicable, the PCUs may be painted in a neutral colour (eg khaki, beige, green or similar) rather than white, so as to better blend in with the local rural landscape.

iii Night lighting

The project will require limited permanent night lighting, most likely for the O&M buildings and substations or the construction accommodation village (should it be required). Temporary, localised night lighting may be required during general maintenance activities conducted during the operation stage of the project. If required, lighting will be managed to minimise impacts on surrounding areas.

All external lighting will be installed as low intensity lighting (except where required for safety or emergency purposes) and will comply with Australian Standard AS 4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting. In addition, all external lighting will not shine above the horizontal.

5.6.5 Conclusion

The refinement of the development footprint and implementation of the recommended mitigation measures will ensure that the project will not generate significant visual impacts during construction or operation.

5.7 Noise

5.7.1 Overview

A noise and vibration impact assessment (NVIA) was prepared with reference to the methods outlined in:

- NSW Department of Environment and Climate Change (DECC) 2009, *Interim Construction Noise Guideline* (ICNG);
- NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry* (NPfI);
- NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP);
- NSW Department of Environment and Conservation (DEC) 2006, *Assessing Vibration: a technical guideline*; and
- Australian Standard AS 2436-2010 Guide to Noise and Vibration Control on Construction, Maintenance and Demolition Sites.

This meets the noise requirements of the SEARs to include:

- an assessment of the construction noise impacts of the development in accordance with the Interim Construction Noise Guideline (ICNG), operational noise impacts in accordance with the NSW Noise Policy for Industry 2017 and a draft noise management plan if the assessment shows construction noise is likely to exceed applicable criteria.

5.7.2 Existing environment

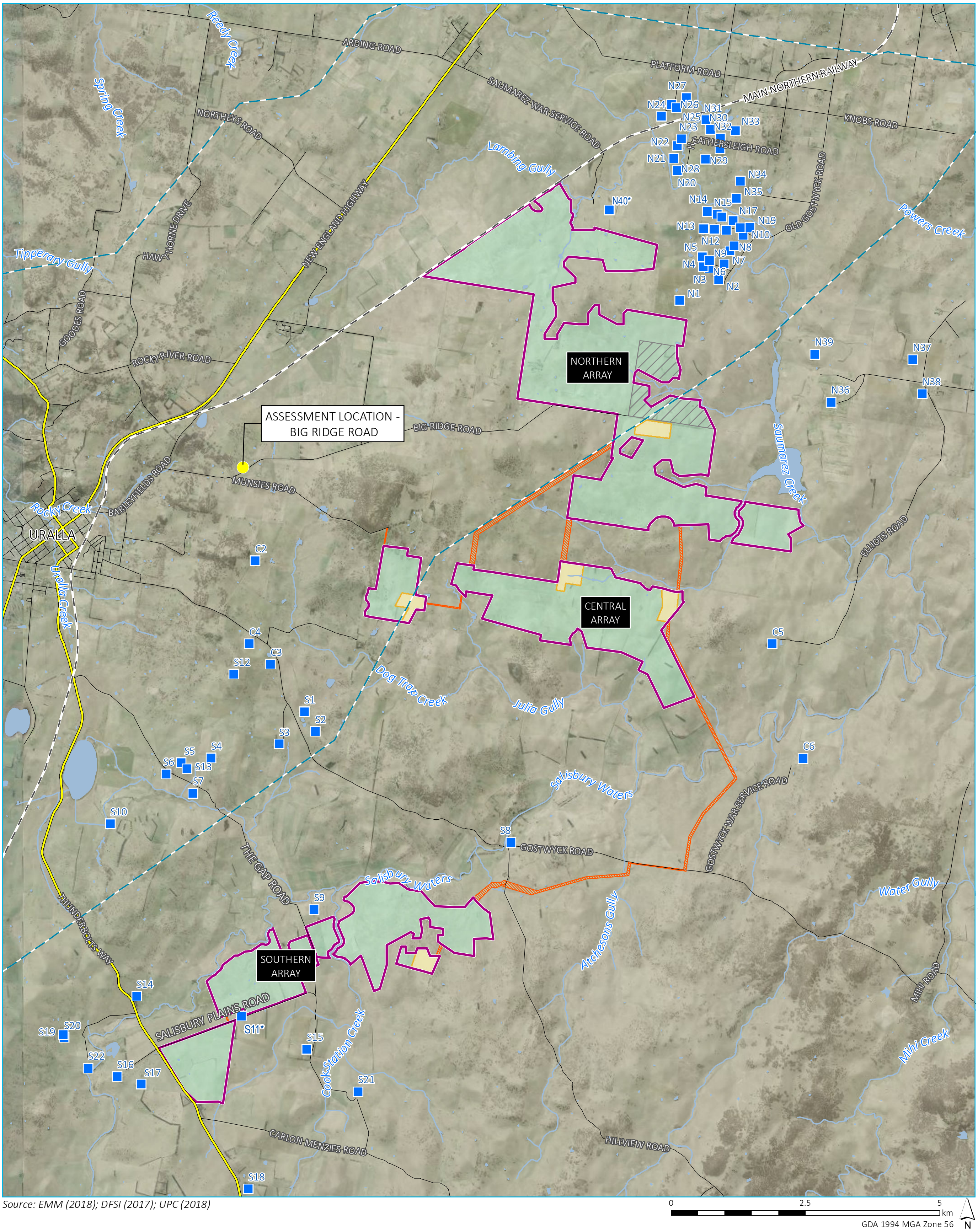
i Ambient noise

Land uses are primarily agricultural as described in Section 1.4.4. Given the area and surrounding agricultural land uses, existing ambient noise levels at assessment locations are likely to be dominated by rural noise sources and road traffic noise. The rating background noise levels (RBLs) at assessment locations are expected to be low (30 decibels (dB) or below). 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 period, respectively.

ii Assessment locations

The closest assessment locations to the three array areas are residential dwellings. The closest non-project related dwelling, S9, is approximately 240 m north of the development footprint in the southern array area. A further 39 assessment locations are within approximately 2 km of the three array areas (refer Figure 5.7). The majority of these dwellings are within proximity of the northern array area within the suburb of Kellys Plains (refer Figure 5.7).

It is considered that if noise criteria can be satisfied at the assessment locations closest to the development footprint, then noise criteria will be satisfied at other assessment locations that are further from the development footprint.



Source: EMM (2018); DFSI (2017); UPC (2018)

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KEY

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

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential site for construction accommodation village
- Potential substation/BESS footprint

- Noise assessment locations*
- Road traffic noise assessment location

*Noise assessment locations are rental properties owned by project landholders.

Noise assessment locations

New England Solar Farm
Environmental impact statement
Figure 5.7

EMM
creating opportunities

iii Meteorology

Noise propagation over distance can be affected by the prevailing weather conditions. Of most interest are source to receiver winds as these conditions can enhance received noise levels.

Meteorological data from the nearest Bureau of Meteorology (BoM) Automatic Weather Station (AWS) at Armidale Airport was analysed, and identified that, based on the criteria provided within the NPfI (EPA 2017), no winds were found to be a feature of the area during the day, evening or night periods. Winds are only considered to be a feature if they occur at least 30% of the time or more in any assessment period (day, evening, night) in any season. Accordingly, only calm meteorological conditions were adopted for the construction noise modelling.

5.7.3 Assessment of impacts

i Noise criteria

a Construction noise criteria

The ICNG (DECC 2009) sets out noise management levels (NMLs) for residential and other noise-sensitive receivers and how they are to be applied.

The construction NMLs for the project have been based on the adopted NPfI minimum RBL of 35 dB in accordance with the ICNG (DEC 2009). The NMLs are shown in Table 5.16.

Table 5.16 Construction noise management levels

Assessment locations	ICNG hours	Period	Adopted RBL, dB(A)	NML, $L_{Aeq,15\ minute}$
C2-C6 S1-S22 N1-N40	Standard hours	Day	35	45 75 (highly affected)
	Outside of standard hours	Day	35	40 75 (highly affected)
		Evening/Night	30	35 75 (highly affected)

Notes: 1. Standard hours as per the ICNG are Monday to Friday from 7 am to 6 pm, Saturday from 8 am to 1 pm, no work on Sundays and public holidays.
2. NPfI periods are Day: 7 am to 6 pm Monday to Saturday, 8 am to 6 pm Sundays to public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays.

The ICNG requires a strong justification for construction works outside of standard construction hours. It is proposed that construction hours of 6am to 6pm Monday to Sunday be adopted for the project. It is of note that periods of this fall outside of the ICNG (DECC 2009) standard hours, which are Monday to Friday 7 am to 6 pm and Saturday 8 am to 1 pm, with no construction work on Sundays or public holidays.

Utilising every day in the week will significantly shorten the construction program, thereby reducing the project's potential impacts to the local community and demands on local infrastructure. While the lead contractors selected for construction will ultimately determine the extent to which Sundays will be used, approval is being sought for this flexibility should it be required.

Furthermore, as noted in Section 2.3.5, a construction accommodation village may be constructed in the development footprint for the northern array area. In order for a large proportion of the project's non-local construction workforce to be housed in the construction accommodation village, the mobilised workforce would need to be utilised as efficiently as possible (ie over a seven day working week).

Without this flexibility, it is anticipated that the economic viability of the construction accommodation village would be questionable as there would be higher up-front costs involved.

An influx of a significant number of workers during the project's construction period has the potential to impact social characteristics within the local community such as accommodation, local infrastructure and local businesses, including community services and facilities. As noted in the social impact assessment (Appendix N), if required, the construction accommodation village will be scalable and flexible to ensure that it can respond to demand and would mitigate potential for adverse impacts to be experienced within the local community.

As noted in Section 5.7.4, buffer zones are proposed during out of hours (OOH) periods with the aim of minimising impacts and reducing construction noise levels to below the relevant criteria at select assessment locations. In addition, as part of the preparation of the CEMP, consideration will be given to the construction activities proposed to be undertaken during OOH periods.

b Sleep disturbance criteria

The project is proposing construction hours between 6am and 6pm Monday to Sunday, a small part of which (ie 6am to 7am) falls within the NPfI designated night-time period (10pm to 7am). Therefore, assessment of sleep disturbance is required in accordance with the NPfI. Table 5.17 provides the maximum noise level event screening criteria for the residential assessment locations.

Table 5.17 Maximum noise level event screening criteria

Assessment locations	Adopted RBL, dB[1]	Maximum noise level event screening criteria, dB	
		$L_{Aeq,15\ minute}$	L_{Amax}
C2-C6 S1-S22 N1-N40	30	40	52

Notes: 1. RBLs calculated in accordance with the NPfI procedures.
2. Minimum assumed RBL for night-time period as per NPfI procedures.

c Construction vibration criteria

Environmental Noise Management – Assessing Vibration: a technical guideline (DEC 2006) is based on guidelines contained in BS 6472 – 2008, Evaluation of human exposure to vibration in buildings (1-80Hz) (BSI 2008). The guideline presents preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques.

The guideline defines three vibration types and provides direction for assessing and evaluating the applicable criteria. Table 2.1 of the guideline provides examples of the three vibration types and has been reproduced in Table 5.18.

Table 5.18 Examples of types of vibration

Continuous vibration	Impulsive Vibration	Intermittent Vibration
Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, eg occasional dropping of heavy equipment, occasional loading and unloading.	Trains, intermittent nearby construction activity, passing heavy vehicles, forging machines, impact pile-driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer these would be assessed against impulsive vibration criteria.

The most relevant to the proposed construction activities are continuous and intermittent vibration. Criteria for exposure to continuous and intermittent vibration are outlined in Chapter 5 of the NVIA (Appendix J).

Additionally, structural vibration should be assessed at the foundation of a building structure. The German Standard *DIN 4150 – Part 3: 1999* (DIN 1999) provides guideline levels of vibration velocity for evaluating the effects of vibration in structures. The limits presented in this standard are generally recognised to be conservative. Structural damage guideline values of vibration velocity are presented in Table 5.4 of the NVIA (Appendix J).

d Road traffic noise criteria

The principle guidance for assessing the impact of road traffic noise on assessment locations is in the RNP (DECCW 2011).

It is anticipated that road trucks will deliver all equipment and material (eg piles, frames, cables, PV modules, PCUs, etc) to the three array areas. As mentioned above, the project will be constructed in two stages. The Stage 1 and Stage 2 vehicle movement routes are described as follow:

- Stage 1:
  - Route A (1A): Barleyfields Road (north) turning onto Big Ridge Road and travelling to the primary site access points for the northern array. Light vehicles travelling south along the New England Highway from Armidale and all heavy vehicles from the north and south that require access to the northern array area will travel via Barleyfields Road (north); and
  - Route B (1B): Woods Street turning onto Barleyfields Road (south) and then onto Big Ridge Road and travelling on to the primary site access points the northern array. Only light vehicles that require access to the northern array area travelling north along the New England Highway from Uralla will travel via Woods Street and Barleyfields Road (south).
- Stage 2:
  - Route A (2A): Barleyfields Road (north) turning onto Big Ridge Road and then onto Munsies Road for access to the central array. Light vehicles travelling south along the New England Highway from Armidale and all heavy vehicles from the north and south that require access to the central array area will travel via Barleyfields Road (north);
  - Route B (2B): Wood Street turning into Barleyfields Road (south) and then onto Big Ridge Road and Munsies Road for access to the central array. Only light vehicles that require access to the central array area travelling north along the New England Highway from Uralla will travel via Woods Street and Barleyfields Road (south).

- Route C (2C): Vehicle movements via Barleyfields Road (north and south) will be the same as described above for Route A (1A) and Route B (1B). Vehicles will travel from the Big Ridge Road site access points for the northern array to the central array via an internal site access road between the northern and central array areas (this route also accounts for light vehicle movements from the construction accommodation village and heavy vehicle deliveries for the BESS).

- Route D (2D): Thunderbolts Way turning onto Salisbury Plains Road to access the primary site access points for the southern array on Salisbury Plains Road or The Gap Road.

- Route E (2E): Gostwyck Road (originates at East St) and turning right onto Hillview Road to access the primary site access point for the southern array.

For the purposes of the road traffic noise assessment, it is assumed that 20% of the peak construction workforce will travel from both Armidale and Tamworth, respectively, and 10% will travel from within the township of Uralla and surrounds. For the purposes of this assessment, it has been assumed that, the remaining 50% will be from outside of these areas and will be accommodated in the construction accommodation village.

During the average construction period, it is assumed that the non-local workforce, which will be smaller, will be able to reside within available temporary accommodation within the Armidale (40%), Tamworth (40%) and Uralla Shire (20%) LGAs and will commute to and from these areas on a daily basis.

For heavy vehicles, it is assumed that 50% will originate from Brisbane and 50% will originate from Sydney, with all heavy vehicles travelling to the three array areas via the New England Highway.

It is of note that throughout the construction of the project, all project-related heavy vehicles will access Big Ridge Road via the northern intersection of Barleyfields Road and the New England Highway. No heavy vehicles are proposed to utilise Barleyfields Road (south) via Wood Street to access Big Ridge Road. The only exception to this could be in the unforeseeable need to access the northern and central array areas during an emergency or other temporary road closure of Barleyfields Road (north) (eg as part of local road maintenance or improvement works), for which an alternative access approval will be sought.

The sections of the New England Highway, Gostwyck Road and Thunderbolts Way within proximity of the three array areas are classified (as per the RNP) as freeway/arterial road and sub-arterial roads, while Barleyfields, Big Ridge, Munsies, Salisbury Plains, Hillview and The Gap Roads are classified as local roads.

Table 5.19 presents the road noise assessment criteria for these road categories, which are reproduced from Table 3 of the RNP (DECCW 2011). It should be noted that such criteria apply to permanent situations and is therefore conservative for the temporary nature of the construction activities proposed as part of the project.

Table 5.19 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria, dB(A)	
		Day (7 am to 10 pm)	Night (10 pm to 7 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)

Table 5.19 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria, dB(A)	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
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)

The RNP states that where existing road traffic noise criteria area already exceeded, any additional increase in total traffic noise level should be limited to 2 dB.

ii Construction noise assessment

Construction noise levels were modelled using Brüel and Kjær 'Predictor' software. 'Predictor' calculates total noise levels at assessment locations from the concurrent operation of multiple noise sources. The model has considered factors such as location, distance, ground effects, atmospheric absorption, topography, and applicable meteorological conditions. Predicted noise levels over a typical worst case 15-minute scenario were modelled and assessed for comparison against the relevant NMLs. The construction noise impact assessment has adopted sound power levels from the EMM noise database for plant and equipment items used on similar projects. Plant and equipment items, sound power levels and quantities adopted in the noise modelling are provided in Appendix J.

Modelling results indicate site preparation works will have the most potential for noise impacts.

Predicted construction noise levels for the site preparation works are presented in Table 5.20. Assessment locations where the relevant NMLs are predicted to be exceeded during any time period have been highlighted in grey and **bolded**.

Two assessment locations, S11 and N40 (refer to Figure 5.7) are rental properties owned by project landholders. At the time of writing this EIS, there were no formal negotiated noise agreements in place between the tenants at S11 and N40, the relevant project landholders and UPC. As such, noise impacts on these properties have been considered as part of the NVIA.

Table 5.20 Construction noise predictions

Assessment locations	Land use	Distance to the development footprint (km)	Predicted construction noise level, dB	Construction NML, dB		
				Standard hours	Out of hours	
				Day[1]	Day	Night
C2	Residential	2.1	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
C3	Residential	2.1	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
C4	Residential	2.2	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
C5	Residential	1.7	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
C6	Residential	2.3	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
N1	Residential	0.3	45 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	**40 $L_{Aeq,15\ minute}$**	**35 $L_{Aeq,15\ minute}$**
N2	Residential	1.0	36 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	**35 $L_{Aeq,15\ minute}$**
N3	Residential	1.0	36 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	**35 $L_{Aeq,15\ minute}$**
N4	Residential	0.9	38 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	**35 $L_{Aeq,15\ minute}$**
N5	Residential	0.9	38 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	**35 $L_{Aeq,15\ minute}$**

Table 5.20 Construction noise predictions

Assessment locations	Land use	Distance to the development footprint (km)	Predicted construction noise level, dB	Construction NML, dB		
				Standard hours	Out of hours	
				Day[1]	Day	Night
N6	Residential	1.0	37 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	**35 $L_{Aeq,15 minute}$**
N7	Residential	1.2	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N8	Residential	1.3	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N9	Residential	1.3	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N10	Residential	1.6	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N11	Residential	1.3	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N12	Residential	1.1	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N13	Residential	0.9	37 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	**35 $L_{Aeq,15 minute}$**
N14	Residential	1.1	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N15	Residential	1.3	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N16	Residential	1.3	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N17	Residential	1.5	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N18	Residential	1.6	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N19	Residential	1.8	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N20	Residential	1.4	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N21	Residential	1.6	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N22	Residential	1.8	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N23	Residential	2.0	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N24	Residential	2.1	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N25	Residential	2.4	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N26	Residential	2.4	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N27	Residential	2.7	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N28	Residential	1.8	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N29	Residential	2.1	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N30	Residential	2.4	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N31	Residential	2.5	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N32	Residential	2.3	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N33	Residential	2.6	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N34	Residential	1.9	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N35	Residential	1.7	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N36	Residential	2.2	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N37	Residential	3.9	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N38	Residential	3.9	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N39	Residential	2.2	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
N40**	Residential	0.3	43 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	**40 $L_{Aeq,15 minute}$**	**35 $L_{Aeq,15 minute}$**
S1	Residential	2.1	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
S2	Residential	2.3	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$
S3	Residential	2.8	<35 $L_{Aeq,15 minute}$	45 $L_{Aeq,15 minute}$	40 $L_{Aeq,15 minute}$	35 $L_{Aeq,15 minute}$

Table 5.20 Construction noise predictions

Assessment locations	Land use	Distance to the development footprint (km)	Predicted construction noise level, dB	Construction NML, dB		
				Standard hours	Out of hours	
				Day[1]	Day	Night
S4	Residential	3.4	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S5	Residential	3.6	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S6	Residential	3.5	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S7	Residential	2.8	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S8	Residential	0.7	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S9	Residential	0.2	45 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	**40 $L_{Aeq,15\ minute}$**	**35 $L_{Aeq,15\ minute}$**
S10	Residential	3.3	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S11**	Residential	<0.1	51 $L_{Aeq,15\ minute}$	**45 $L_{Aeq,15\ minute}$**	**40 $L_{Aeq,15\ minute}$**	**35 $L_{Aeq,15\ minute}$**
S12	Residential	2.6	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S13	Residential	3.4	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S14	Residential	1.0	39 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	**35 $L_{Aeq,15\ minute}$**
S15	Residential	1.0	38 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	**35 $L_{Aeq,15\ minute}$**
S16	Residential	0.9	39 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	**40 $L_{Aeq,15\ minute}$**	**35 $L_{Aeq,15\ minute}$**
S17	Residential	0.6	42 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	**40 $L_{Aeq,15\ minute}$**	**35 $L_{Aeq,15\ minute}$**
S18	Residential	1.7	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S19	Residential	1.8	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S20	Residential	1.8	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S21	Residential	1.8	<35 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$
S22	Residential	1.4	37 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	**35 $L_{Aeq,15\ minute}$**

Notes: 1. Standard hours only: Monday to Friday 7 am to 6 pm, Saturday 8 am to 1 pm and no construction work on Sundays or public holidays.
**The residences at these locations are owned by the project landholders and rented out to members of the local community.

Construction noise levels are predicted to satisfy the recommended NMLs at most locations during ICNG standard hours. The exception to this is S11, where an exceedance of the recommended NMLs is predicted. Outside of ICNG standard hours, exceedance of the recommended NMLs during the NPfI defined daytime period are predicted at five locations (N1, N40, S9, S11 and S17); and 15 locations (N1-N6, N13, N40, S9, S11, S14-S17, S22) during the NPfI defined night-time shoulder period (6am to 7am Monday to Saturday, 6am to 8am Sundays and public holidays). This is not an uncommon finding for construction projects and implies feasible and reasonable mitigation practices should be considered and applied.

Further, given that the predictions assume simultaneous operation of plant and equipment at the nearest locations to the relevant sensitive receptors, it is considered likely that actual construction noise levels may be less than those predicted. This assessment is therefore considered conservative.

iii Maximum noise level event assessment

The predicted L_{Amax} noise levels from the construction of project at the nearest assessment locations are presented in Table 6.5 of the NVIA.

Typical maximum noise level events, including truck air brakes, excavator/dozer activities and other various activities have been assessed. A worst case maximum noise level event of L_{Amax} 125 dB was adopted to cover any of these possible events.

Assessment locations where the relevant noise levels are predicted to be exceeded are summarised from Table 6.4 of the NVIA as follows:

- N1 - **60 dB L_{Amax}** for predicted noise levels;
- N40 - **54 dB L_{Amax}** for predicted noise levels;
- S9 - **63 dB L_{Amax}** for predicted noise levels;
- S11 - **72 dB L_{Amax}** for predicted noise levels; and
- S17 - **53 dB L_{Amax}** for predicted noise levels.

In accordance with the NPfI, sleep disturbance impacts were only assessed at residential assessment locations. Noise modelling predicts that, during construction, the L_{Amax} sleep disturbance screening criteria will be satisfied at most assessment locations. The exceptions are assessment locations N1, N40, S9, S11 and S17 which are predicted to be above the L_{Amax} sleep disturbance screening criteria.

It is of note that exceedances of the L_{Amax} screening criteria occur during the NPfI morning shoulder period (6am to 7am) only. Nonetheless, noise mitigation measures and application of good practice noise management have been considered and are discussed in Section 5.7.4.

iv Road traffic noise assessment

The proposed construction works will generate traffic movements associated with the construction workforce as well as the delivery of all construction materials by road trucks.

Construction of the project will take approximately 36 months from the commencement of site establishment works to commissioning of the three array areas. However, the road traffic noise predictions are based on peak construction traffic volumes during the concurrent construction of Stage 1 and Stage 2 of the project and, as such, provide a highly conservative assessment. Based on the staging approach considered as part of the TIA (refer Section 5.8), peak construction traffic volumes are anticipated to occur across two four month periods separated by approximately 6 months, which is relatively short when comparing to the overall project construction period. Outside of these times, it is likely that road traffic noise levels will satisfy the RNP criteria.

Daily average (and peak) traffic movements generated by construction deliveries and the construction workforce are summarised in Table 5.21. Project-related vehicle movements will likely be travelling as per the routes described above and in Section 4.4 of the NVIA (Appendix J).

Table 5.21 Daily average traffic movements during construction

Route	Daily heavy vehicles movements		Daily workforce movements (light vehicles)		Total daily movements	
	Average	Peak	Average	Peak	Average	Peak
1A	45	60	64	129	109	189
1B	0	0	86	171	86	171
2A	9	12	12	24	21	36
2B	0	0	18	36	18	36
2C	30	40	100	200	130	240
2D	15	20	50	100	65	120
2E	15	20	50	100	65	120

It is expected that 50% of the construction activities will originate from Sydney and arrive from the south via the New England Highway, and 50% will originate from Brisbane and arrive from the north via the New England Highway.

It is of note that throughout the construction of the project, all project-related heavy vehicles will access Big Ridge Road via the northern intersection of Barleyfields Road and the New England Highway. No heavy vehicles are proposed to utilise Barleyfields Road (south, ie the section close to Uralla town centre) to access Big Ridge Road.

For the purposes of this assessment, approximately 65% of the project's construction workforce is assumed to originate from within the township of Uralla and surrounds. This assumption is based on the use of a construction accommodation village to house the majority of the project's non-local construction workforce. The remaining construction workforce (35%) is assumed will be based in either the township of Tamworth and surrounds (15%) or the township of Armidale and surrounds (20%).

Table 5.22 outlines the potentially most-affected residences on routes proposed to be utilised by project-related traffic.

Table 5.22 Potentially most affected residences on project routes

Road	Location	Distance from road (m)	Posted speed limit (km/h)	Location
New England Highway	North of Uralla	≥20	80	13 km north of the northern array area
New England Highway	South of Uralla	≥15	50	55 km south west of the southern array area
Thunderbolts Way	South of Hillview Road	≥20	50	5.5 km west of the central array area
Barleyfields Road	North of Big Ridge Road	≥90	50	4.5 km west of the central array area
Barleyfields Road	South of Big Ridge Road	≥18	50	5 km west of the central array area
Big Ridge Road	East of Munsies Road	≥60	100	3 km west of the central array area
Munsies Road	East of Big Ridge Road	≥50	100	3 km west of the central array area
Gostwyck Road	West of Hillview Road	≥20	50	5 km west of the central array area
The Gap Road	East of Thunderbolts Way	≥20	100	3.5 km north west of the southern array area
Salisbury Plains Road	North of Thunderbolts Way	≥18	100	<0.1 km from the southern array area**

Notes: **The residence at this location is owned by one of the project landholders and is rented out to a member of the local community.

There are no privately-owned residential receivers located along Salisbury Plains Road or Hillview Road along the proposed routes to be utilised by project-related vehicles. As noted previously, the residence on Salisbury Plains Road (S11) is owned by one of the project landholders and rented out to a member of the local community.

Road traffic noise levels during construction works are predicted to be below the relevant criteria at the majority of the affected residential dwellings on the surrounding road network, as shown in Table 5.23. Assessment locations where the relevant noise levels are predicted to be exceeded have been highlighted in grey and **bolded**.

Table 5.23 Predicted road traffic noise during peak construction

Road	Period	Road traffic noise level, dB			Criteria, dB
		Calculated existing	Predicted project generated[1]	Future	
Munsies Road	Day	35 $L_{Aeq,1\ hour}$	51 $L_{Aeq,1\ hour}$	51 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$
	Night	<30 $L_{Aeq,1\ hour}$	41 $L_{Aeq,1\ hour}$	42 $L_{Aeq,1\ hour}$	50 $L_{Aeq,1\ hour}$
Big Ridge Road	Day	42 $L_{Aeq,1\ hour}$	57 $L_{Aeq,1\ hour}$	**57 $L_{Aeq,1\ hour}$**	55 $L_{Aeq,1\ hour}$
	Night	35 $L_{Aeq,1\ hour}$	47 $L_{Aeq,1\ hour}$	47 $L_{Aeq,1\ hour}$	50 $L_{Aeq,1\ hour}$
Barleyfields Road North of Big Ridge Road	Day	41 $L_{Aeq,1\ hour}$	51 $L_{Aeq,1\ hour}$	51 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$
	Night	33 $L_{Aeq,1\ hour}$	41 $L_{Aeq,1\ hour}$	42 $L_{Aeq,1\ hour}$	50 $L_{Aeq,1\ hour}$
Barleyfields Road South of Big Ridge Road	Day	50 $L_{Aeq,1\ hour}$	54 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$
	Night	43 $L_{Aeq,1\ hour}$	45 $L_{Aeq,1\ hour}$	49 $L_{Aeq,1\ hour}$	50 $L_{Aeq,1\ hour}$
The Gap Road	Day	35 $L_{Aeq,1\ hour}$	52 $L_{Aeq,1\ hour}$	52 $L_{Aeq,1\ hour}$	55 $L_{Aeq,1\ hour}$
	Night	<30 $L_{Aeq,1\ hour}$	42 $L_{Aeq,1\ hour}$	42 $L_{Aeq,1\ hour}$	50 $L_{Aeq,1\ hour}$
Salisbury Plains Road**	Day	38 $L_{Aeq,1\ hour}$	57 $L_{Aeq,1\ hour}$	**57 $L_{Aeq,1\ hour}$**	55 $L_{Aeq,1\ hour}$
	Night	<30 $L_{Aeq,1\ hour}$	48 $L_{Aeq,1\ hour}$	48 $L_{Aeq,1\ hour}$	50 $L_{Aeq,1\ hour}$
Gostwyck Road	Day	39 $L_{Aeq,15\ hour}$	42 $L_{Aeq,15\ hour}$	44 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$
	Night	32 $L_{Aeq,15\ hour}$	35 $L_{Aeq,15\ hour}$	37 $L_{Aeq,15\ hour}$	55 $L_{Aeq,15\ hour}$
Thunderbolts Way	Day	51 $L_{Aeq,15\ hour}$	42 $L_{Aeq,15\ hour}$	51 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$
	Night	43 $L_{Aeq,15\ hour}$	35 $L_{Aeq,15\ hour}$	44 $L_{Aeq,15\ hour}$	55 $L_{Aeq,15\ hour}$
New England Highway North of Uralla	Day	61 $L_{Aeq,15\ hour}$	45 $L_{Aeq,15\ hour}$	61 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$
	Night	54 $L_{Aeq,15\ hour}$	38 $L_{Aeq,15\ hour}$	54 $L_{Aeq,15\ hour}$	55 $L_{Aeq,15\ hour}$
New England Highway South of Uralla	Day	59 $L_{Aeq,15\ hour}$	46 $L_{Aeq,15\ hour}$	59 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$
	Night	52 $L_{Aeq,15\ hour}$	39 $L_{Aeq,15\ hour}$	52 $L_{Aeq,15\ hour}$	55 $L_{Aeq,15\ hour}$

Notes: 1. Based on the peak workforce movements and construction delivery movements.
2. For the purposes of this assessment, it is assumed that the daily traffic volumes are 90% during the daytime period (7 am-10 pm) and 10% during the night-time period (10 pm-7 am).
**The residence at this location is owned by one of the project landholders and is rented out to a member of the local community.

Table 5.23 shows that marginal exceedances of 2 dB are predicted during the daytime period at the most affected residence on Big Ridge Road and Salisbury Plains Road (ie S11) (refer Figure 5.7).

The road traffic noise predictions are based on peak construction traffic volumes during the concurrent construction of Stages 1 and 2 of the project and, as such, provide a highly conservative assessment. There is potential for approximately 12 months of concurrent construction and outside of these times, but due to the considerably lower level of intensity it is likely that road traffic noise levels will satisfy the RNP criteria.

v Operational noise impacts

Noise impacts during operation of the project were assessed at each of the assessment locations. Noise sources considered during the operational stage of the project included inverters with integrated transformers, tracker motors, substation transformers, BESS components and light vehicle movements. 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).

The semi-qualitative assessment identified that the $L_{Aeq,15\ minute}$ noise levels from the project would satisfy the minimum daytime and evening/night-time NPfI trigger levels of 40 dB and 35 dB, respectively at all assessment locations.

vi Vibration assessment

The majority of vibration generating activities associated with the proposed construction work utilise a roller and a piling rig. As a guide, safe working distances for typical items of vibration intensive plant are listed in Table 5.24. The safe working distances are quoted for both 'Cosmetic Damage' (refer British Standard BS 7385) and 'Human Comfort' (refer British Standard BS 6472-1).

Table 5.24 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's Construction Noise Strategy (Rail Projects), November 2007.

Notes: 1. Plant items shown are indicative to illustrate safe working distances, not all plant items will be used.

The nearest receptor, S11, is approximately 40 m from the development footprint in the southern array area. Given that large vibratory rollers are not expected to be working within 100 m of S11, if at all, it is unlikely that vibration impacts will occur throughout the construction of the project.

In addition, there are three items of local heritage significance (as listed on the Uralla LEP) within proximity of the southern array area that have been considered as part of this construction vibration assessment, namely:

- Gostwyck Memorial Chapel and precinct (Uralla LEP listing I10) – at its closest point, Gostwyck Memorial Chapel is approximately 1.1 km from the development footprint for the southern array area;
- Deeargee Woolshed (Uralla LEP listing I11) – approximately 970 m from the development footprint for the southern array area; and
- Salisbury Court (Uralla LEP listing I14) – at its closest point, the primary dwelling is approximately 920 m from the development footprint for the southern array area.

Given the distances between the development footprint for the southern array area and the items of local heritage significance listed above greatly exceed the minimum safe working distance for cosmetic damage and human comfort, the assessment predicts no vibration impacts will occur throughout the construction of the project.

5.7.4 Mitigation measures

The NVIA outlined, during limited OOH periods, predicted construction noise levels and maximum event noise levels are above the relevant criteria at a number of the assessment locations considered as part of the construction noise and construction sleep disturbance assessments.

The project's CEMP will include management and mitigation measures consistent with the best practice requirements outlined in the ICNG (DECC 2009).

The following sections provide site-specific noise and vibration mitigation and management measures that are to be considered during construction works, general good practice noise management recommendations and the implementation of buffer zones during OOH periods to maintain compliance with relevant NMLs at surrounding assessment locations.

i Site-specific mitigation and management

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:

- 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;
- minimise the number of plant items operating concurrently when in close proximity to surrounding receivers;
- planning deliveries and access to occur quietly and efficiently and organising parking only within designated areas away from nearby receivers (where possible); and
- appropriate respite periods to be implemented after high noise and vibration-generating activities are carried out in continuous blocks.

ii Adoption of general noise and vibration management practices

AS 2436-2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites sets out numerous practical recommendations to assist in mitigating construction noise emissions. Examples of strategies that could be implemented during construction are listed below.

Universal work practices will include:

- regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration;
- regular identification of noisy activities and adoption of improvement techniques;
- developing locations for parking of vehicles to minimise noise;
- minimising the movement of materials and plant and unnecessary metal-on-metal contact;

- minimising truck movements; and
- scheduling respite periods for intensive works including consultation with potentially affected neighbours.

Additional measures for plant and equipment include:

- choosing quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks;
- operating plant and equipment in the quietest and most efficient manner; and
- 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.

Additional measures for work scheduling include:

- 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);
- scheduling work during OOH periods to exclude work within OOH buffer zones outlined in Section 9.3 of this report;
- 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; and
- optimising the number of deliveries to site by amalgamating loads where possible.

iii Buffer zones

The use of buffer distances around these assessment locations is recommended during OOH periods. These buffer distances should be implemented during construction works with the aim of minimising impacts and reducing construction noise levels to below the relevant criteria.

Table 5.25 below outlines the proposed buffer distance for each affected assessment location during periods when construction is occurring outside of ICNG standard hours and differentiates between the various stages of construction listed in Table 6.1 of the NVIA (Appendix J).

In addition, at S11 (a rental property owned by project landholders), construction noise levels are predicted to be exceeded during ICNG standard hours. At the time of writing, there were no formal negotiated noise agreements in place between the tenants at S11, the relevant project landholder and UPC. It is recommended that potential noise impacts be discussed with the tenants and landholders to identify appropriate mitigation to be adopted at this residence.

Table 5.25 Buffer zones for affected assessment locations

Assessment location	Period	Required buffer distances per construction stage				Criteria	
		Site Preparation	Pile driving and foundations	PV module installation	Other	NML	L_{Amax}
N1	OOH Day	600 m	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	1.15 km	600 m	470 m	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
N2	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
N3	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
N4	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
N5	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
N6	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
N13	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
N40**	OOH Day	600 m	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	975 m	550 m	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
S9	OOH Day	600 m	350 m	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	1 km	600 m	450 m	350 m	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
S11**	OOH Day	700 m	350 m	200 m	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	1.1 km	600 m	450 m	340 m	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
S14	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
S15	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
S16	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
S17	OOH Day	700 m	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	1 km	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}
S22	OOH Day	Nil	Nil	Nil	Nil	40 $L_{Aeq,15\ minute}$	Nil
	OOH Night	See Note 2	Nil	Nil	Nil	35 $L_{Aeq,15\ minute}$	52 L_{Amax}

Notes: 1.OOH Day: Saturday: 1:00 pm to 6:00 pm, Sunday: 8:00 am to 6:00 pm; Night: Monday to Saturday: 10:00 pm to 7:00 am, Sunday/Public Holidays: 10:00 pm to 8:00 am.

2. If the buffer distances for nearest assessment locations are adopted, noise levels at these locations will comply with the relevant criteria.

**The residences at these locations are owned by the project landholders and rented out to members of the local community.

If the proposed buffer distances outlined in Table 5.25 above are adopted during the relevant periods, noise levels during construction are predicted to comply with the relevant criteria at all assessment locations.

5.7.5 Conclusion

The NVIA undertaken for the project has demonstrated that noise levels during peak construction are predicted to satisfy the recommended NMLs at most locations during ICNG standard hours, with the exception of one location. Outside of ICNG standard hours, construction noise levels are predicted to be above the recommended NMLs at five locations during the NPfI defined daytime period and at 15 locations during limited times in the NPfI defined night-time period (ie 6am to 7am Monday to Saturday, 6am to 8am Sundays and public holidays). Night-time maximum noise level events are predicted to be above the recommended L_{Amax} sleep disturbance screening criteria at five assessment locations.

Operational noise levels are shown to satisfy the NPfI noise trigger levels at all assessment locations during the daytime, evening and night-time periods for the entirety of the project's operations. Vibration associated with the proposed construction works is not expected to generate impacts at the nearest assessment location. Traffic generated by the project is expected to comply with the relevant RNP criteria at the majority of the assessment locations.

Notwithstanding, with effective implementation of the mitigation and management measures outlined in Section 5.7.4, construction noise levels and maximum noise level events are predicted to comply with the relevant criteria at all assessment locations, with the exception of S11.

At S11 (a rental property owned by project landholders), construction noise levels are predicted to be exceeded during ICNG standard hours. At the time of writing, there were no formal negotiated noise agreements in place between the tenants at S11, the relevant project landholder and UPC. It is recommended that potential noise impacts be discussed with the tenants and landholders to identify appropriate mitigation to be adopted at this residence.

5.8 Transport

5.8.1 Overview

A traffic impact assessment (TIA) was undertaken in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with relevant government agencies.

The assessment is based on the following general scope for matters to consider in a TIA, which is defined by RMS, *Guide to Traffic Generating Developments* (RTA 2002):

- the existing locality and surrounding land uses;
- the existing road network and intersections;
- traffic and car parking generation characteristics of the project;
- traffic and car parking impacts of the project; and
- a summary of the assessed traffic impacts and any traffic management or mitigation measures.

The TIA has also considered the following Austroads Guides:

- *Austroads Guide to Road Design* (Austroads 2015)*;* and
- *Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development* (Austroads 2016).

This meets the requirements of the SEARs to carry out:

- an assessment of the site access route (including Barleyfields Road, Big Ridge Road, Saumarez War Service Road, Munsies Road, Elliots Road, The Gap Road, Carlon Menzies Road, Gostwyck Road, Hillview Road, Salisbury Plains Road, Thunderbolts Way, Barleyfields Road and the New England Highway), site access points, rail safety issues (including the adjacent Main Northern Railway) and likely transport impacts (including peak and average traffic generation, over-dimensional vehicles and construction worker transportation) of the development on the capacity and condition of roads (including on any Crown land), a description of the measures that would be implemented to mitigate any impacts during construction (including cumulative impacts from nearby developments), and a description of any proposed road upgrades developed in consultation with the relevant road and rail authorities (if required).

To inform preparation of the SEARs, DPE invited other government agencies to recommend matters to be addressed in the EIS. RMS raised matters relevant to the TIA. The matters raised include:

- Traffic Impact Assessment (TIA) prepared by a suitably qualified person in accordance with the *Austroads Guide to Traffic Management Part 12*, the complementary *Roads and Maritime Supplement* and *RTA Guide to Traffic Generating Developments*, which addresses:
    - the total impact of existing and proposed development on the road network with consideration for a 10-year horizon;
    - the volume and distribution of traffic generated by the proposed development and existing land uses;
    - sight distances at key intersections along primary access routes;

- provide details of turning paths of the largest vehicle that will use the access routes;
- details of proposed improvements to affected intersections;
- impact of rail corridors on the road network and details of proposed interface treatments;
- review of crash records along the proposed access routes;
- details of existing, proposed site access standards, servicing and parking arrangements;
- impact on public transport (public and school bus routes) and consideration for alternative transport modes such as walking and cycling;
- impacts of road traffic noise and dust generated along the primary access routes;
- details of a transport management plan to identify and manage impacts of construction and operational traffic on the safety and efficiency of the affected road network. The TMP may include temporary measures such as Traffic Control Plans to address construction related traffic at specific locations;
- TMP to include a Driver Code of Conduct, which may include, but not limited to the following:
  - a map of the primary access routes highlighting critical locations;
  - safety initiatives for transport through residential areas and/or school zones;
  - consideration for coordination of construction traffic with seasonal agricultural haulage;
  - an induction process for vehicle operators & regular toolbox meetings;
  - a complaint resolution and disciplinary procedure;
  - any community consultation measures for the peak construction period;
  - targeted Road Safety Audit undertaken by suitably qualified persons.

This TIA has been prepared with consultation and contribution from the following government agencies:

- Uralla Shire Council;
- John Holland – Country Rail Network; and
- RMS.

5.8.2 Existing environment

i Road network

The main transport routes that connect the township of Uralla to a range of other areas throughout regional NSW are shown in Figure 1.1.

a New England Highway

The New England Highway (HW9) is the state's inland north-south corridor, which connects the Hunter region at its southern end starting from the Pacific Highway at Hexham via Maitland, Singleton, Muswellbrook, Murrurundi, Wallabadah, Tamworth, Uralla, Armidale, Glen Innes and Tenterfield to the Queensland border at Wallangarra.

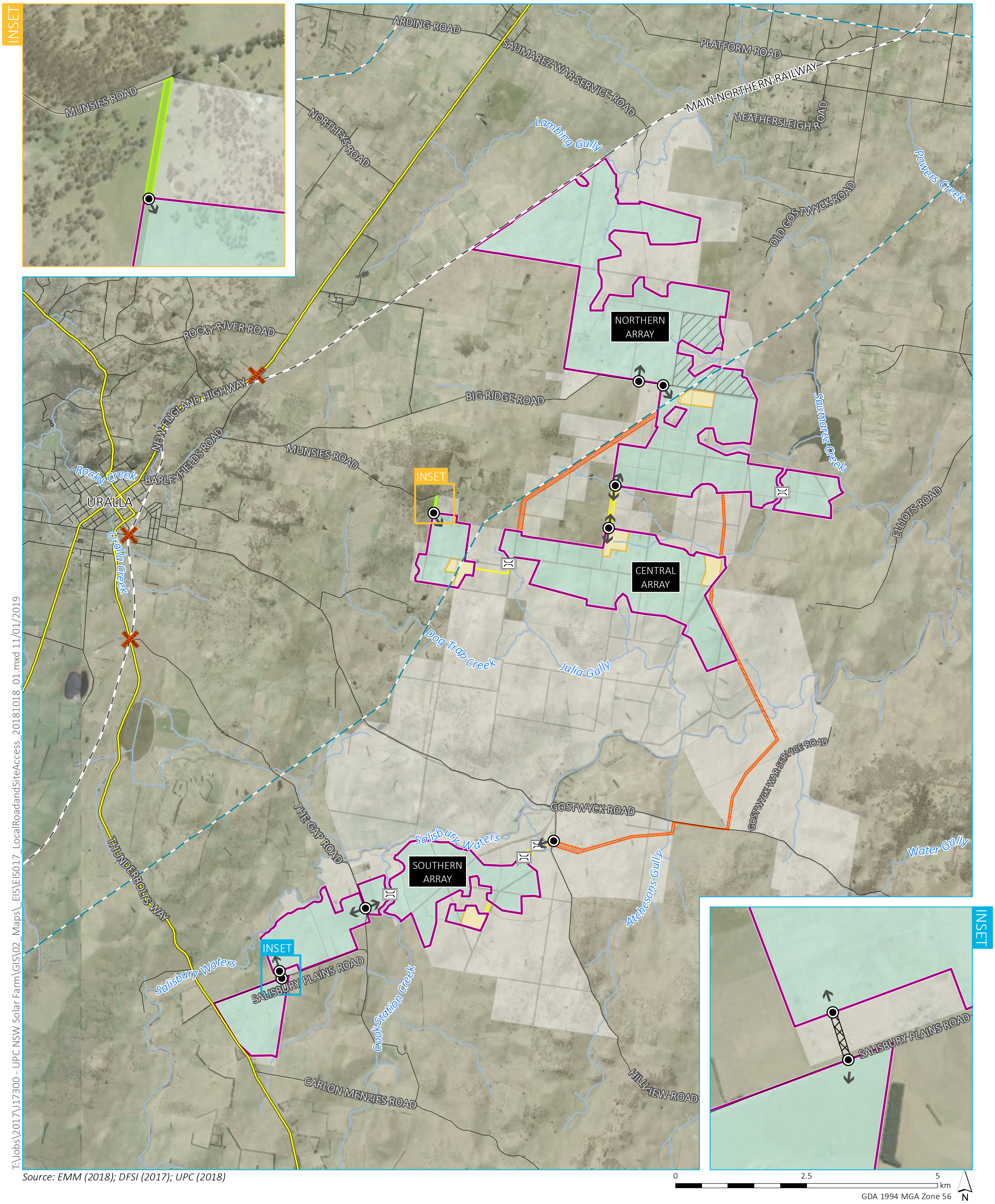
The New England Highway has a two-lane sealed 11 m wide carriageway with a speed limit of 100 km/h generally on the rural sections and 50 km/h when entering the township of Uralla from both the northern and southern ends. It has a relatively straight and level alignment between Uralla, Armidale and Tamworth, with good visibility on most sections. Both the centre line and edge lines of the road are marked on all sections. Overtaking is permitted intermittently on certain sections of the highway.

b Site access from local road network

There will be several access points for project-related traffic from the local road network to the northern, central and southern array areas. The local road network and site access is presented in Figure 5.8. These will be from the following local roads:

- Barleyfields Road on to Big Ridge Road (northern array);
- Barleyfields Road on to Big Ridge Road then Munsies Road (central array);
- Gostwyck Road on to Hillview Road (southern array);
- Thunderbolts Road on to Salisbury Plains Road (southern array); and
- Thunderbolts Road on to Salisbury Plains Road then The Gap Road (southern array).

Emergency access points may also be required. The locations of these access points will be determined during detailed design.



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Source: EMM (2018); DFSI (2017); UPC (2018)

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Project boundary
- Potential site for construction accommodation village

Development footprint

- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential substation/BESS footprint
- Potential electrical cabling/site access corridor
- Potential creek crossing

- Proposed primary site access point
- Access direction
- Level crossing

Local road network and access points

New England Solar Farm
Environmental impact assessment
Figure 5.8

EMM
creating opportunities

c Local road network

Barleyfields Road is a two-way 6.4 m wide local road connecting the New England Highway at the north-eastern end to Wood Street at the south-western end. The entire length of the road is approximately 3 km and is fully sealed. All intersections on Big Ridge Road are basic T-intersections generally to access other rural residential properties.

Big Ridge Road is a two-way 6.6 m wide local road connecting from Barleyfields Road to the access points for the northern array. The centre line and edge lines of the road are not marked. The road is sealed from the intersection with Barleyfields Road for approximately 3.8 km to the east. The sealed section of Big Ridge Road finishes approximately 3 km west of the access points for the northern array. All intersections on Big Ridge Road are basic T-intersections generally to access other rural residential properties.

Munsies Road is a two-way 3.4 m wide local road connecting from Big Ridge Road to one of the project landholder’s properties. The centre line and edge lines of the road are not marked. The road is only sealed at the intersection of Big Ridge Road/Munsies Road, and then unsealed for approximately 3.3 km until the proposed access point. All intersections on Munsies Road are to other rural residential properties and are basic T-intersections.

Gostwyck Road is a two-way 5.8 m wide local road connecting from East Street at Uralla to Mihi Road at Mihi. The centre line and edge lines of the road are not marked. The road is sealed for the entire traffic route from the Gostwyck Road/Hillview Road intersection through to the township of Uralla, over a distance of approximately 10 km. There are a number of residential dwellings along Gostwyck Road between East Street and the intersection with Hillview Road. All intersections on Gostwyck Road are basic T-intersections.

Hillview Road is a two-way unsealed local road connecting from Gostwyck Road, south-east to the intersection of Hillview Road/Gills Road, then continuing south and west to Thunderbolts Way.

Thunderbolts Way is an approximately 290 km two-way 9 m wide country road connecting Copes Creek, Uralla, Walcha and Gloucester. The road is fully sealed and the centre line and edge lines are generally marked. It passes through thickly forested mountain areas with many nearby national parks and nature reserves.

Salisbury Plains Road is a two-way 4.5 m wide local road connecting Thunderbolts Way to The Gap Road. The road is unsealed and centre line and edge lines are not marked.

The Gap Road is a two-way 4.5 m wide unsealed local road connecting from Salisbury Plains Road, north-west to Thunderbolts Way, and south to Carlon Menzies Road.

All local roads outside of the township of Uralla have a speed limit of 100 km/hr, unless signposted otherwise.

ii Traffic volumes and capacity

Baseline daily traffic volumes for the main project access routes have been determined from published RMS daily traffic surveys for the years where the data is available which are mainly between 2007 to 2011. To establish base 2018 daily traffic volumes, it is standard practice in most rural areas of NSW to add +1% annual (linear) traffic growth to the most recent annual survey. This is summarised in Table 5.26.

Table 5.26 Historic and projected daily traffic volumes

Station ID	Road (NB – northbound) (SB – southbound)	2007	2008	2011	2018 projected daily traffic volume[1]	Approximate peak hourly volume	Average proportion of heavy vehicle
92060	New England Highway (Arding) – NB	2,912	-	3,079	3,295[1]	330	10%[1]
	New England Highway (Arding) – SB	2,930	-	3,049	3,262[1]	330	10%[1]
92502	Bridge Street (Uralla) – NB	3,804	-	3,935	4,210[1]	420	-
	Bridge Street (Uralla) – SB	4,159	-	4,158	4,449[1]	440	-
92503	Bridge Street (Uralla) – NB	-	-	-	-		-
	Bridge Street (Uralla) – SB	-	3,040	-	3,344[1]	330	-
92057	New England Highway (Kentucky) – NB	1,475	2,111	-	2,322[1]	230	18%[1]
	New England Highway (Kentucky) – SB	1,523	1,512	-	1,663[1]	170	18%[1]
92677	Thunderbolts Way (Walcha) – NB	436	-	-	484[1]	48	10%[1]
	Thunderbolts Way (Walcha) – SB	457	553	-	608[1]	61	10%[1]

Notes: 1. +1% annual (linear) traffic growth has been adopted, which gives a growth factor x 1.07 from the 2011 volumes, x 1.10 from the 2008 volume and x 1.11 from the 2007 volumes.
Source: RMS Traffic Volume Viewer

The RMS traffic data is very limited for minor rural roads. However, traffic count data relating to the following intersections was surveyed by EMM during the morning and afternoon traffic peak hours over 14-17 August 2018. Based on the hourly traffic count data, estimates of daily traffic volumes for rural roads have been calculated. This data is presented in Table 5.27.

Table 5.27 Daily traffic volume at minor roads

Road	Location	Total vehicles	Heavy vehicles	% of heavy vehicles
Barleyfields Road	North of Big Ridge Road	645	60	9.30%
Barleyfields Road	South of Big Ridge Road	740	80	10.81%
Big Ridge Road	East of Barleyfields Road	175	20	11.43%
Big Ridge Road	East of Munsies Road	115	45	39.13%
Munsies Road	East of Big Ridge Road	25	5	20%
Hillview Road	South of Gostwyck Road	55	0	0%
Gostwyck Road	West of Hillview Road	115	5	4.35%
Gostwyck Road	East of Hillview Road	60	5	8.33%
Gostwyck Road*	Near McCrossin Street*	218*	39*	18%

Table 5.27 Daily traffic volume at minor roads

Road	Location	Total vehicles	Heavy vehicles	% of heavy vehicles
Salisbury Plains Road	East of Thunderbolts Way	25	5	20%
The Gap Road*	Approximately 2 km from the Thunderbolts Way intersection*	46*	4*	8%
Thunderbolts Way**	North of Salisbury Plains Road**	880**	65**	7.39%

Note: *Uralla Shire Council Traffic Survey (+1% annual (linear) traffic growth adopted).
**Major road included in EMM traffic survey.

Of the nine roads that will be used by the project, only two roads (Thunderbolts Way and New England Highway) meet the current Austroads design and width standards based on their current daily traffic volumes.

Rural intersection operations are assessed from the combination of the peak hourly through and turning traffic movements that are occurring at each intersection. This determines the need for additional intersection turning lanes in accordance with the current Austroads intersection design standards. All local roads have appropriate intersection design standards for their current traffic levels.

iii Rail services

Uralla is situated on the Sydney to Armidale (NP23 and NP24) regional trains network, which utilises the Main Northern Railway line. The train route travels from Sydney to Armidale via Uralla. The train operates daily from Central to Armidale, leaving Central at 9:30 am and arriving at Armidale approximately 5:35 pm, stopping at Uralla at 5:12 pm. The opposite direction service (Armidale to Sydney) also operates daily, leaving Armidale at 8:40 am, stopping at Uralla 8:56 am and arriving at Central approximately 4:45 pm. Both of these run one service per day.

The other rail services user is John Holland, who runs maintenance trains as required, and hi-rail inspections every 72 hours. These are not timetabled. Freight trains may also operate in the harvest season using the same rail track for transportation of agricultural products.

iv School buses

There are two schools in the township of Uralla, namely St Joseph's Catholic School and Uralla Central School. The main school bus route is Route 480. Operating hours for the school bus service are from 8:00 am to 8:50 am (morning) and 3:30 pm to 3:50 pm (afternoon) on school days.

Route 480 travels on main roads in the township of Uralla, particularly on the New England Highway, Thunderbolts Way, Duke Street, Salisbury Street and Rowan Avenue. These local roads, aside from Rowan Avenue, also form part of the project's heavy vehicle routes when travelling through the township of Uralla and cannot be avoided.

Another rural school bus operator travels along The Gap Road and operates between 7:55 am to 8:10 am (morning) and 3:55 pm to 4:10 pm (afternoon) on school days.

Mitigation strategies to address shared use of local roads with the school bus operators described above are proposed as outlined in Section 5.8.4 and Chapter 6 of Appendix K.

v Traffic safety

Traffic safety conditions in the vicinity of the township of Uralla and along the New England Highway are considered to be acceptable, with good intersection visibility at all locations along the New England Highway and the assessed local roads.

The general traffic safety conditions on the New England Highway, Thunderbolts Way and the local roads in the Uralla Shire LGA such as Gostwyck Road and Hillview Road were reviewed for the most recent five year accident history (for the years 2013 to 2017 inclusive) using the Transport for NSW (TfNSW) interactive accident history database.

The results show that heavy vehicle accidents occurred predominantly on the section of the New England Highway south from the township of Uralla towards Tamworth. None of the heavy vehicle accidents identified were fatal. There were four fatal accidents reported across the area, two of which involved speeding and the others were related to driver fatigue. None involved heavy vehicles.

There were a total of 19 reported traffic accidents on the New England Highway in the Uralla Shire LGA over the five year period. When considering this is a 28 km route length, it represents 1.47 accidents per km of road. Of the 19 reported accidents, four resulted in fatalities (21%). This is a relatively high proportion of fatal accidents in comparison with Uralla Shire LGA and NSW state averages. However, these fatal accidents involved either speeding or fatigue, which are driver behaviour factors. Also, the delays in persons receiving medical treatment after road accidents due to the remoteness of some rural locations is a contributory factor in the high proportion of fatal traffic accidents which have occurred in recent years on the Uralla Shire LGA sections of the New England Highway. Where driver behaviour has caused accidents, this can potentially be avoided.

vi Road conditions and future road improvement works

Road conditions in the area are typically good. However, a number of future road improvement works will be carried out on the New England highway, between Uralla and Armidale. These include:

- installation of a new roundabout at Armidale Airport;
- widening centreline of the Highway from the new roundabout near Armidale Airport to Uralla;
- widening of the bridge over Saumarez Creek;
- additional northbound overtaking lane on the Highway, between Arding Road and Northeys Road;
- a right hand turning lane for Northeys Road (southbound);
- additional southbound overtaking lane on the Highway, between Northeys Road and Rocky River Road;
- a designated left hand turning lane for Barleyfields Road (southbound);
- a right hand turning lane for Kliendienst Road (southbound), this is under investigation; and
- road widening and drainage improvement directly east of Uralla (New England Highway).

5.8.3 Traffic demands for the project

i Access routes

There will be several primary access points for project-generated traffic which are shown in Figure 5.8. The proposed vehicle routes to these access points are via the following local roads:

- two access points to the northern array area via Barleyfields Road (north or south), then onto Big Ridge Road;
- one access point to the central array area via Barleyfields Road (north or south), then onto Big Ridge Road and turning right onto Munsies Road (the access points for the northern array area will also be used by vehicles that require access to the central array area as part of Stage 2);
- one access point to the southern array area via Gostwyck Road, then turning right onto Hillview Road;
- one access point with dual access to the southern array area via Thunderbolts Way then onto Salisbury Plains Road; and
- one access point with dual access to the southern array area via Thunderbolts Way, then onto Salisbury Plains Road and turning left onto The Gap Road.

The sight distances for approaching traffic along the above roads at each nominated access point are generally good. The access roads are straight and level at all locations with excellent visibility. Photographs of local roads that will be used to access the three array areas are provided in Appendix B of Appendix K.

Appropriate locations for emergency access points will be determined during detailed design.

ii Traffic generating activities

Construction of the project will take approximately 32 to 36 months from the commencement of site establishment works to commissioning of the three array areas. It is anticipated that the project will be constructed in two stages (refer Section 2.4.5).

Stage 1 and Stage 2 vehicle movement routes are described as follows:

- Stage 1:
    - Route A (1A): Barleyfields Road (north) turning onto Big Ridge Road and travelling to the primary site access points for the northern array. Light vehicles travelling south along the New England Highway from Armidale and all heavy vehicles from the north and south that require access to the northern array area will travel via Barleyfields Road (north); and
    - Route B (1B): Woods Street turning onto Barleyfields Road (south) and then onto Big Ridge Road and travelling on to the primary site access points the northern array. Only light vehicles that require access to the northern array area travelling north along the New England Highway from Uralla will travel via Woods Street and Barleyfields Road (south).
- Stage 2:
    - Route A (2A): Barleyfields Road (north) turning onto Big Ridge Road and then onto Munsies Road for access to the central array. Light vehicles travelling south along the New England Highway from Armidale and all heavy vehicles from the north and south that require access to the central array area will travel via Barleyfields Road (north);

- Route B (2B): Wood Street turning into Barleyfields Road (south) and then onto Big Ridge Road and Munsies Road for access to the central array. Only light vehicles that require access to the central array area travelling north along the New England Highway from Uralla will travel via Woods Street and Barleyfields Road (south).
- Route C (2C): Vehicle movements via Barleyfields Road (north and south) will be the same as described above for Route A (1A) and Route B (1B). Vehicles will travel from the Big Ridge Road site access points for the northern array to the central array via an internal site access road between the northern and central array areas (this route also accounts for light vehicle movements from the construction accommodation village and heavy vehicle deliveries for the BESS).
- Route D (2D): Thunderbolts Way turning onto Salisbury Plains Road to access the primary site access points for the southern array on Salisbury Plains Road or The Gap Road.
- Route E (2E): Gostwyck Road (originates at East St) and turning right onto Hillview Road to access the primary site access point for the southern array.

Light and heavy vehicle movements using each route across the two stages are provided in Table 5.28.

Table 5.28 Light and heavy vehicle movements across construction stages

Stage	Average daily light vehicle movements	Peak daily light vehicle movements	Average daily heavy vehicle movements	Peak daily heavy vehicle movements
1A	64	129	45	60
1B	86	171	0	0
2A	12	24	9	12
2B	18	36	0	0
2C	100	200	30	40
2D	50	100	15	20
2E	50	100	15	20

Light and heavy vehicle movements during the construction schedule are presented in Figure 5.9.

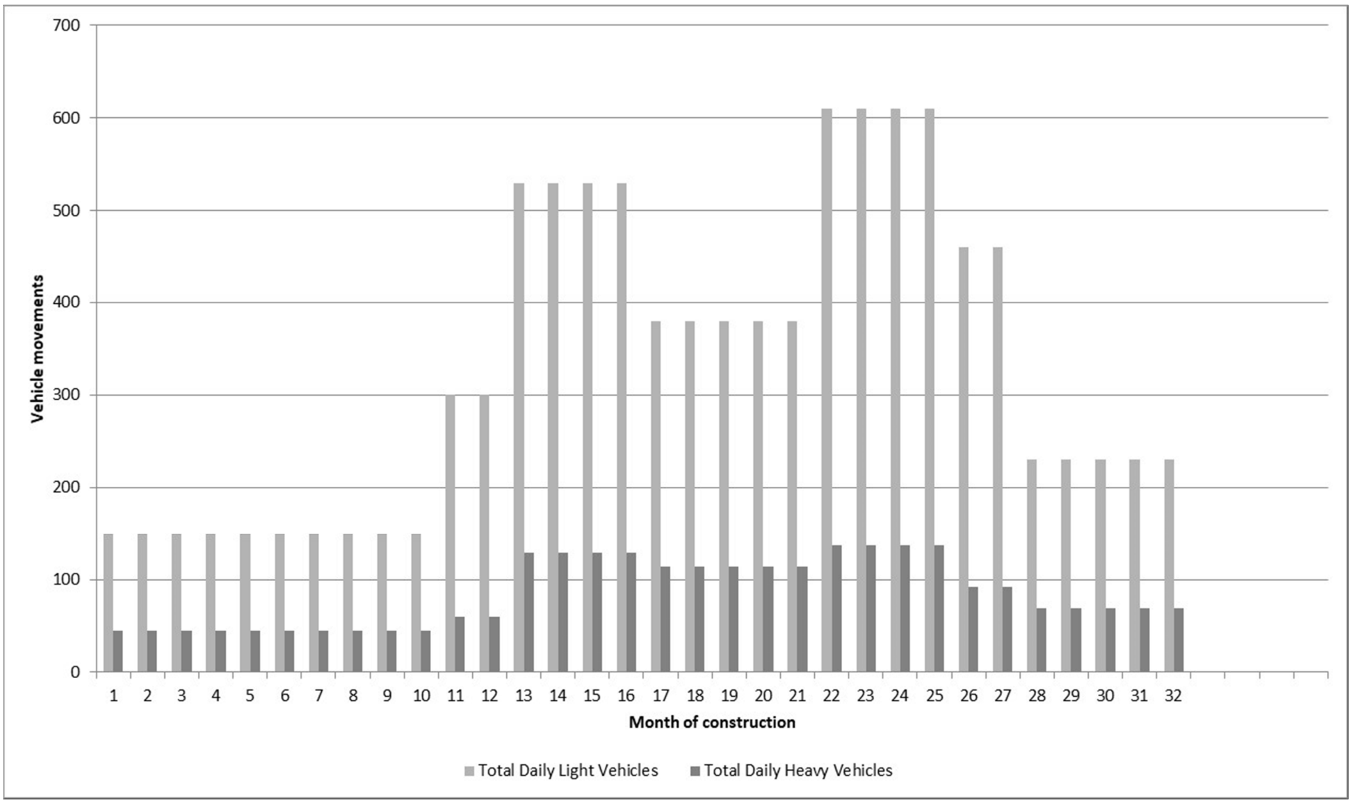


Figure 5.9 Vehicle movements during construction

During operation, there will be much lower daily traffic movements, which are estimated to be an average of 30 daily vehicle movements, all of which will be light vehicle traffic movements. Heavy vehicles will only be required for infrequent repairs and maintenances (eg replacement of inverters). The frequency of heavy vehicles is predicted to be very low compared to the number of light vehicles during operation.

During project decommissioning, the project generated daily and peak hourly traffic movements will be similar to those generated during the construction stage.

In summary, it is anticipated that the maximum number of daily vehicle movements generated by the project will be in the order of:

- 610 light vehicles, 137 heavy vehicles and 6 over-dimensional vehicles during construction; and
- 30 light vehicles and 5 heavy vehicles during operations.

iii Traffic distribution

Overall project traffic distribution during construction will be as follows:

- for light vehicle traffic during the average construction period:
  - 40% originating in Armidale and travelling south along the New England Highway (this will include both cars/utes and shuttle buses from selected accommodation locations and/or a designated muster point);

- 40% originating in Tamworth and travelling north along the New England Highway (this will include both cars/utes and shuttle buses from selected accommodation locations and/or a designated muster point); and
- 20% originating in Uralla (this will include both cars/utes and shuttle buses from selected accommodation locations and/or a designated muster point);

- for light vehicle traffic during the peak construction period:
  - 38% originating in Armidale and travelling south along the New England Highway (this will include shuttle buses from a muster point);
  - 38% originating in Tamworth and travelling north along the New England Highway (this will include shuttle buses from a muster point);
  - 19% originating in Uralla (this will include shuttle buses from a muster point); and
  - 5% originating from the construction accommodation village (this traffic will primarily be shuttle buses).
- for heavy vehicle traffic during the average and peak construction periods:
  - 50% originating from the Port of Brisbane and travelling to site along the New England Highway north of Uralla; and
  - 50% originating from the Port of Sydney and travelling to site along the New England Highway south of Uralla.

Subject to further investigation, project infrastructure may also be delivered via the Port of Newcastle. Should this occur, heavy vehicles would likely use a combination of either the Pacific Highway or Hunter Expressway and the New England Highway to travel to Uralla and the three array areas. Should project infrastructure be delivered via the Port of Newcastle, the split of heavy vehicles between the Port of Brisbane and Port of Sydney would subsequently be revised.

Both the average and peak traffic distributions will have greater traffic flows travelling to and from the northern and southern arrays. Stage 1 will complete the northern array, hence the greater traffic numbers. During Stage 2, there are multiple traffic routes to access the southern array, therefore traffic flows to and from the southern array will be greater. Traffic flows to and from the central array will have the lowest flow for the route using Munsies Road. As noted above, vehicles will travel from the Big Ridge Road site access points for the northern array to the central array via an internal site access road between the northern and central array areas. Notably, during Stage 2, there will still be traffic flows to and from the northern array via the same route as Stage 1, which include light vehicle movements associated with the construction accommodation village and heavy vehicle deliveries for the BESS.

During the operational stage, the overall project traffic is predicted to be evenly distributed between Uralla, Tamworth and Armidale.

5.8.4 Assessment of impacts

i Traffic volumes on the road network

a Construction traffic

Table 5.29 summarises the current baseline traffic conditions within the local road network and includes the predicted future average daily traffic and peak construction traffic during the combined Stage 1 and Stage 2 construction stages of the project.

Table 5.29 Future daily traffic assessment for project average and peak construction traffic

Project related traffic route	Projected baseline daily traffic volume (year 2018)	Baseline Austroads rural daily traffic volume standard	Meets design standard (baseline only)	Average construction traffic			Peak construction traffic			Future Austroads rural daily traffic volume standard
				Average daily traffic from the project	Future total daily traffic	Percent traffic increase	Peak daily traffic from the project	Future total daily traffic	Percent traffic increase	
New England Highway (north of Uralla)	6,557	> 3,000 daily vehicles	Yes	205	6,762	+3.13%	365	6,947	+5.95%	> 3,000 daily vehicles
Bridge Street (Uralla)	8,659	> 3,000 daily vehicles	Yes	339	8,998	+3.92%	605	9,289	+7.28%	> 3,000 daily vehicles
New England Highway (south of Uralla)	3,985	> 3,000 daily vehicles	Yes	205	4,190	+5.14%	365	4,350	+9.16%	> 3,000 daily vehicles
Barleyfields Road (north of Big Ridge Road)	645	500 – 1,000 daily vehicles	No	192	837	+29.77%	325	1,000	+55.04%	500 – 1,000 daily vehicles
Barleyfields Road (south of Big Ridge Road)	740	500 – 1,000 daily vehicles	No	168	908	+22.70%	329	1,089	+47.16%	1,000– 3,000 daily vehicles
Big Ridge Road (east of Barleyfields Road)	175	150 – 500 daily vehicles	No	364	539	+208%	654	879	+402%	500 – 1,000 daily vehicles
Big Ridge Road (east of Munsies Road)	115	1 – 150 daily vehicles	No	325	440	+283%	585	750	+552%	500 – 1,000 daily vehicles
Munsies Road (east of Big Ridge Road)	25	1 – 150 daily vehicles	No	39	64	+156%	69	94	+276%	1 – 150 daily vehicles
Gostwyck Road (near McCrossin Street)	218	150 – 500 daily vehicles	No	65	283	+29.82%	120	338	+55%	150 – 500 daily vehicles
Gostwyck Road (west of Hillview Road)	115	1 – 150 daily vehicles	No	65	180	+56.21%	120	235	+104%	150 – 500 daily vehicles
Hillview Road (south of Gostwyck Road)	55	1 – 150 daily vehicles	No	65	120	+118%	120	175	+218%	150 – 500 daily vehicles

Table 5.29 Future daily traffic assessment for project average and peak construction traffic

Project related traffic route	Projected baseline daily traffic volume (year 2018)	Baseline Austroads rural daily traffic volume standard	Meets design standard (baseline only)	Average construction traffic			Peak construction traffic			Future Austroads rural daily traffic volume standard
				Average daily traffic from the project	Future total daily traffic	Percent traffic increase	Peak daily traffic from the project	Future total daily traffic	Percent traffic increase	
Thunderbolts Way (north of Salisbury Plains Road)	880	500 – 1,000 daily vehicles	Yes	65	945	+7.40%	120	1,000	+14%	500 – 1,000 daily vehicles
Salisbury Plains Road (east of Thunderbolts Way)	25	1 – 150 daily vehicles	No	65	90	+260%	120	145	+480%	1 – 150 daily vehicles
The Gap Road (north of Salisbury Plains Road)	46	1 – 150 daily vehicles	No	22	68	+47.83%	40	86	+87%	1 – 150 daily vehicles

The highest proportional average daily traffic increases from the project will be on Big Ridge Road east of Munsies Road (+283%), followed by Salisbury Plains Road (+260%), Big Ridge Road east of Barleyfields Road (+208%), Munsies Road (+156%) and Hillview Road (+118%).

The highest proportional peak daily traffic increases from the project will be on Big Ridge Road east of Munsies Road (+552%), followed by Salisbury Plains Road (+480%), Big Ridge Road east of Barleyfields Road (+402%), Munsies Road (+276%), Hillview Road (+218%), Gostwyck Road west of Hillview Road (+104%) and The Gap Road (+87%).

The predicted traffic increases in Table 5.29 will cause the following roads to move into a higher band in the Austroads rural daily traffic volume capacity standards during peak construction:

- Big Ridge Road (east of Munsies Road) (from 1–150 to 500-1,000);
- Gostwyck Road (west of Hillview Road) (from 1–150 to 150–500);
- Hillview Road (south of Gostwyck Road) (from 1–150 to 150–500).
- Big Ridge Road (east of Barleyfields Road) (from 150-500 to 500-1,000);
- Barleyfields Road (south of Big Ridge Road) (from 500 – 1,000 to 1,000 – 3,000); and
- Thunderbolts Way (north of Salisbury Plains Road) (from 500 – 1,000 to 1,000 – 3,000).

While the forecast traffic increases in Table 5.29 are proportionally quite significant, they would only be temporary and apply for the peak construction periods (which are anticipated to be during months 13-16 and 22-25).

Generally, with the exception of the New England Highway and certain sections of Thunderbolts Way, the average and peak construction stage traffic capacity standards for the assessed routes in Table 5.28 will not be within the Austroads (2015) rural road design and capacity standards. However, the forecast traffic increases should not have a significant long-term effect on the future traffic capacity, level of service or traffic safety for these roads.

b Operation traffic

During operations, there will be much lower daily traffic movements, which are estimated to be an average of 30 daily vehicle movements, conservatively assuming 15 FTEs on-site everyday, which would generally all be light vehicle traffic movements. Heavy vehicles may be required for infrequent repairs and maintenance, for example to deliver inverters when replacement is required. However, the frequency of heavy vehicles is predicted to be very low compared to numbers of light vehicles during operations.

The operation traffic will not cause any roads to move into a higher band in the Austroads rural daily traffic volume capacity standards.

ii Traffic impact at intersections

There are four relevant rural intersections in the locality of the three array areas, namely:

- New England Highway/Barleyfields Road (north);
- New England Highway/Barleyfields Road (south) including Wood Street;
- Barleyfields Road/Big Ridge Road; and
- Thunderbolts Way/Salisbury Plains Road.

Each of these intersections have been assessed for the future peak construction peak hourly traffic volumes under the Austroads warrant design charts for rural intersection turning lanes.

The New England Highway/Barleyfields Road (north) intersection requires additional left and right turn traffic lanes (CHR/CHL) as the combination of major road and minor road peak hourly traffic volumes are within the range for this type of intersection. Importantly, it is noted that this widening is also a requirement of the existing peak hourly traffic movements using the intersection (ie regardless of whether or not the project were to proceed). In addition, for the future ease of right turning traffic movements by long trucks at this intersection, it may be desirable to temporarily convert this intersection to a seagull type intersection priority (with a right turning acceleration lane for northbound traffic), particularly during the peak times of construction. This approach will be discussed in consultation with RMS and Uralla Shire Council during preparation of the TMP prior to the commencement of construction.

The New England Highway/Barleyfields Road (south) and Wood Street intersection requires additional left and right turn traffic lanes (CHR/CHL) on the New England Highway, as the combination of major road and minor road peak hourly traffic volumes are within the range for this type of intersection. However, this widening is also a requirement of the existing peak hourly traffic movements using the intersection (ie regardless of whether or not the project were to proceed).

The current configuration of the intersections of both Barleyfields Road/Big Ridge Road and Thunderbolts Way/Salisbury Plains Road are acceptable without additional left or right turn lanes based on future peak daily traffic volume estimates.

A swept path analysis will be performed at relevant intersections as part of the preparation of the traffic management plan (TMP). Additional sealed or gravel shoulder widening may need to be provided at all of the identified intersections to facilitate the turning movements for large vehicles to and from each road. Any proposed shoulder widening will accommodate the swept path turning requirements for the largest type of vehicle that would be required to utilise the relevant route. Generally, during the construction period, the largest vehicles which are anticipated to require access to the three array areas for construction deliveries on a regular basis will be 25 m long semi-trailers.

iii Site access traffic impact

There are five local roads connecting the primary access points for the three array areas to the local road network. It is anticipated that the daily vehicle volumes along each of these roads will be:

- Big Ridge Road (east of Munsies Road) - 635 peak daily vehicle movements during Stage 1 and Stage 2 combined;
- Munsies Road - 69 peak daily vehicle movements during Stage 2 construction period;
- Hillview Road - 115 peak daily vehicle movements during State 2 construction period;
- Salisbury Plains Road - 120 peak daily vehicle movements during Stage 2 construction period; and
- The Gap Road (section near the corner of Salisbury Plains Road) - 40 peak daily vehicle movements during Stage 2 construction period.

For these daily traffic volumes, a variable lane width, unsealed rural road is usually acceptable. However, for the currently unsealed sections of Big Ridge Road, where future maximum daily traffic volumes of up to 635 vehicle movements are predicted to occur, more intensive traffic management measures will be required, including travel speed restrictions for both light and heavy vehicles and regular watering of the unsealed section of this road near residences (or other dust suppression treatments) throughout the project construction period.

iv Emergency access points

Emergency access points to enable access to the three array areas from the local road network may be required. The exact location of these access points will be determined during detailed design.

Consultation with emergency service providers (including RFS and F&R NSW will be required as part of the finalisation of the TMP for the project.

v Rail safety

An active railway line (Main Northern Railway) originating from Tenterfield, travels south through Armidale and Uralla and onto Tamworth. This is the only railway line that would potentially be affected by project-generated traffic movements.

The project-generated traffic routes assessed as part of the TIA will cross at three existing railway level crossings for the Main Northern Railway (refer Figure 5.8), including:

- Barleyfields Road – active crossing with flashing lights;
- Gostwyck Road – passive crossing with stop signs; and
- Thunderbolts Way – active crossing with flashing lights.

Consultation with John Holland as part of the preparation of the TIA indicated no alterations to any of these level crossings are warranted.

UPC recognises the importance of driver's wellbeing and level of awareness at level crossings. Relevant safety tips by TfNSW for heavy vehicles using level crossings will be utilised as a guideline in the Driver Code of Conduct to be implemented as part of the TMP. Given the low level of utilisation of the Main Northern Railway line, with adequate driver awareness training, the level crossings identified above are not anticipated to present a material safety risk to project-related vehicles.

vi Construction workforce transportation

Shuttle buses will be provided for construction workers from Armidale, Tamworth and Uralla, and will be scheduled to arrive on-site before commencing work at 6:00am, and to leave site after 6:00pm. These schedules will avoid peak traffic times on local and regional roads.

UPC has consulted with Armidale Regional Council, Tamworth Regional Council and Uralla Shire Council with regards to potential pick up/muster points for shuttle bus services operating to and from Armidale, Tamworth and Uralla, respectively. The exact locations of these muster points will be determined in consultation with the relevant council and DPE prior to the commencement of construction.

vii Driver distraction from glare

The potential for low angled reflected sunlight to cause a distraction to drivers travelling either northbound or southbound along the local and regional road network was considered. This included consideration of:

- the New England Highway, which is approximately 1.9 km from the development footprint for the northern array area at its closest point;
- Thunderbolts Way, which is within proximity of the southern array area; and
- a number of local roads, including Big Ridge Road, Hillview Road, Gostwyck Road, The Gap Road and Salisbury Plains Road.

Due to the low level of reflectivity of the PV modules, they are not expected to cause a distraction to motorists travelling along the local and regional road network.

Visual impacts of the project are addressed in Section 5.6 and Appendix I. The visual impact assessment includes consideration of impacts on motorists along the local and regional road network. Undulation within the landscape, favourable topography and existing remnant vegetation in the landscape (including planted wind breaks and roadside vegetation) will reduce both the duration and location from project infrastructure may be visible.

5.8.5 Mitigation measures

i Traffic management plan

A TMP and Driver Code of Conduct consistent with RMS and Council requirements will be prepared prior to commencement of construction, which will include:

- a dilapidation survey to be conducted to assess condition of the proposed vehicle routes - this survey should be prepared by a qualified person in consultation with RMS and Uralla Shire Council, and include consideration of haulage weights and potential impacts on bridges and culverts;
- a swept path analysis of the following intersections:
  - New England Highway/Barleyfields Road (primarily for vehicles turning right onto Barleyfields Road);
  - Barleyfields Road/Big Ridge Road;
  - Thunderbolts Way/Salisbury Plains Road;
  - New England Highway/Salisbury Street and then onto Duke Street (for vehicles coming from the south turning right onto Salisbury Street from the New England Highway and for vehicles coming from the north turning left onto Salisbury Street from the New England Highway); and
  - potential alternate heavy vehicle routes that could alleviate the volume of project-related vehicles travelling through the township of Uralla (should it be required);
- a map of the primary access routes highlighting critical locations;
- 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 northern and central array areas;

- safety initiatives for transport through residential areas and/or school zones;
- consideration for coordination of construction traffic with seasonal agricultural haulage;
- an induction process for vehicle operators and regular toolbox meetings;
- a complaint resolution and disciplinary procedure; and
- community consultation measures for the peak construction period.

In addition to the above requirements and in order to minimise impacts on traffic flow in the township of Uralla and surrounds during the operation of school bus services, the project's construction material deliveries and other heavy vehicle movements will avoid peak hour and school bus times, whenever possible.

UPC is also mindful of the safety of drivers at level crossings in the Uralla Shire LGA and, subsequently, additional RMS tips and safety guidelines will be included in the Driver Code of Conduct as part of the TMP.

Due to the significant increase of vehicles travelling on Barleyfields Road, there is potential for queuing to occur over the level crossing at Barleyfields Road (north) during peak construction. The level crossing is located approximately 115 m south of the New England Highway intersection. It is recommended that temporary traffic control be considered during peak construction. This level crossing should also be included in driver inductions and the Driver Code of Conduct.

Generally, during the construction period, the largest vehicles which are anticipated to require access to the three array areas for construction deliveries on a regular basis will be 25 m long semi-trailers.

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. At this stage it is anticipated that approximately five 90 t deliveries and two 220 t deliveries may be required for the transformers that will form part of the solar array and grid substations, respectively. These will be delivered under permit and in consultation with RMS and Uralla Shire Council.

ii Impacts on neighbouring agricultural operations

Potential seasonal/campaign-based agricultural transport activities will be identified during further consultation with involved landholders and adjacent landholders. 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 for the project.

Involved and nearby landholders may move stock between paddocks and across roads proposed to be utilised for access to the three array areas, therefore there is potential for conflict with project-generated construction traffic movements. Potential stock crossing locations will be identified through further consultation with involved and nearby landholders. 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 for the project.

iii Intersection improvements

The New England Highway/Barleyfields Road (north) intersection and New England Highway/Barleyfields Road (south) including Wood Street intersection both require left and right turn traffic lanes (CHR/CHL), currently as the combination of major road and minor road peak hourly volume is within the range for this type of intersection.

These intersection upgrade works are required at these intersections currently and the need will become more apparent when the proposed project construction traffic is operating.

Additionally, the TMP will consider the temporary conversion of the New England Highway/Barleyfields Road (north) intersection to seagull type operation during the peak construction period to ease right turning movements by large trucks entering and departing from Barleyfields Road (north).

For the current unsealed sections of Big Ridge Road, where future maximum daily traffic volumes of up to 672 vehicle movements are predicted to occur, it is recommended that consideration be given to temporary travel speed reduction and regular watering of the unsealed section of the road. This is also applicable to Munsies Road where two residential properties are in close proximity to the road. UPC may consider speed limits, dust suppression with water spraying or localised sealing or treatment of the road with dust suppression polymers adjacent to the residential properties along these roads.

The Thunderbolts Way/Salisbury Plains Road intersection does not require additional left or right turn traffic lanes as the forecast future peak hourly traffic volumes satisfy the standard AUR/AUL intersection design requirement without additional left or right turn traffic lanes. However, following the construction swept path analysis for the largest vehicles using this intersection, some improvement works may be required for the safe operation of the project construction traffic in combination with existing road users. This may include additional gravel shoulder widening at the intersection.

UPC will be required to lodge a Section 138 Certificate (Work on Public Lands) for approval before any future road work for the intersection improvement is carried out.

iv Road maintenance program

During the project's construction period, which is estimated to continue for approximately 36 months, a road maintenance program will be implemented for the affected local roads near the development footprint for the three array areas.

The program will be based around bi-monthly route inspections of all the affected roads and may include items such as:

- regrading of the road surface to repair potholes and road corrugations at regular intervals and in response to identified serviceability and safety concerns; and
- a commitment by UPC to restore the road surfaces to their pre-construction condition at the completion of construction.

The road maintenance program will be prepared in consultation with Uralla Shire Council and its effectiveness will be reviewed during the construction period.

Should it be required, UPC will also regularly treat the road surface of the unsealed sections of a number of local roads to reduce potential dust impacts by project-related traffic during the construction period.

5.9 Water

5.9.1 Overview

A surface water assessment (SWA) was undertaken in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with the relevant government agencies. The SWA also took into account the SEA (refer Appendix G) and BDAR (refer Appendix C), which consider erosion potential and aquatic impacts, respectively.

Key guidelines, policies and plans that were considered as part of the SWA include:

- Uralla LEP and Uralla Development Control Plan 2011 (Uralla DCP);
- *Floodplain Development Manual* (NSW Government 2005);
- *Guidelines for Controlled Activities on Waterfront Land* (NOW 2012a);
- *Guidelines for Watercourse Crossings on Waterfront Land* (NOW 2012b);
- *Managing Urban Stormwater: Soils & Construction* (Landcom 2004).

This meets the requirements of the SEARs to carry out:

- an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources (including Salisbury Waters, Cook Station Creek, Saumarez Creek, Dog Trap Gully, Atchesons Gully, Julia Gully, Lambing Gully, Dangars Lagoon, Racecourse Lagoon, drainage channels, wetlands, riparian land, farm dams, groundwater dependent ecosystems and acid sulfate soils), related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts;
- details of water requirements and supply arrangements for construction and operation; and
- a description of the erosion and sediment control measures that would be implemented to mitigate any impacts in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom 2004).

The SWA was prepared with consultation and contribution from the DoI Lands and Water specifically in relation to the potential interaction of the project with existing watercourses and associated riparian corridors. DoI Lands and Water highlighted several mapped watercourses of interest, with a view to consistency with the *Guidelines for Controlled Activities on Waterfront Land* (NOW 2012a), and assessment of these identified watercourses is included in the SWA.

The study area for the SWA represents the site boundary as presented as part of the PEA to support the request for SEARs (Figure 1.3).

5.9.2 Existing environment

i Regional hydrology

The project boundary is located in the upper reaches of the Macleay River catchment, which borders the Clarence and Bellinger catchments to the north, Gwydir and Namoi catchments to the west and the Hastings and Manning catchments to the south. The catchment covers a total area of 11,450 km^2 and includes extensive areas of the northern tablelands, a sparsely populated escarpment area and a coastal area ranging from foothills to coastal plains (NSW Government n.d.).

The Macleay River rises in the Northern Tablelands east of the project boundary at the confluence of the Gara River, Salisbury Waters and Bakers Creek, and flows south-east through a coastal floodplain, where it ultimately flows into the Pacific Ocean.

ii Local hydrology, watercourses and riparian corridors

The local hydrologic context relevant to the development footprint and broader study area is shown on Figure 5.10. Key features shown include watercourses and assessed stream order, as well as the extent of the Salisbury Waters catchment to Stream Gauge 206205. Sub-catchments contributing to runoff in Salisbury Waters and its tributaries adjacent to each of the three array areas are also identified.

The landform pattern within and surrounding the project boundary is low rolling hills that are frequently dissected by drainage networks and their adjacent floodplains, terraces and foot slopes. Named watercourses within the study area and surrounds are shown on Figure 5.11 and include:

- Salisbury Waters and Cook Station Creek (6^{th} and 5^{th} order streams, respectively) that traverse the study area close to the southern array area and flow generally to the north-east;
- Dog Trap Creek and Julia Gully (both 4^{th} order streams) that are to the south of the central array area and flow generally to the east; and
- Lambing Gully, Hariet Gully and Saumarez Creek (3^{rd}, 2^{nd} and 5^{th} order streams, respectively) that are close to the northern array area and flow generally to the east and then south.

Most watercourses within the development footprint are ephemeral and, with the exception of a small number of watercourses that are likely to be spring-fed, were dry during site investigations. The ephemeral waterways within the development footprint are lower order streams (ie 1^{st} and 2^{nd} order only) and, in most cases, do not have a discernible channel, lack aquatic vegetation and are dominated by grass species prevalent across the project boundary. Examples of the current condition of lower order streams within the development footprint are provided in Photograph 5.2 and Photograph 5.3.

iii Water bodies and wetlands

There are several existing farm dams used primarily for stock watering within the development footprint for the three array areas. Field investigations performed as part of the SWA and BDAR indicate that these man-made features have limited habitat or other environmental value.

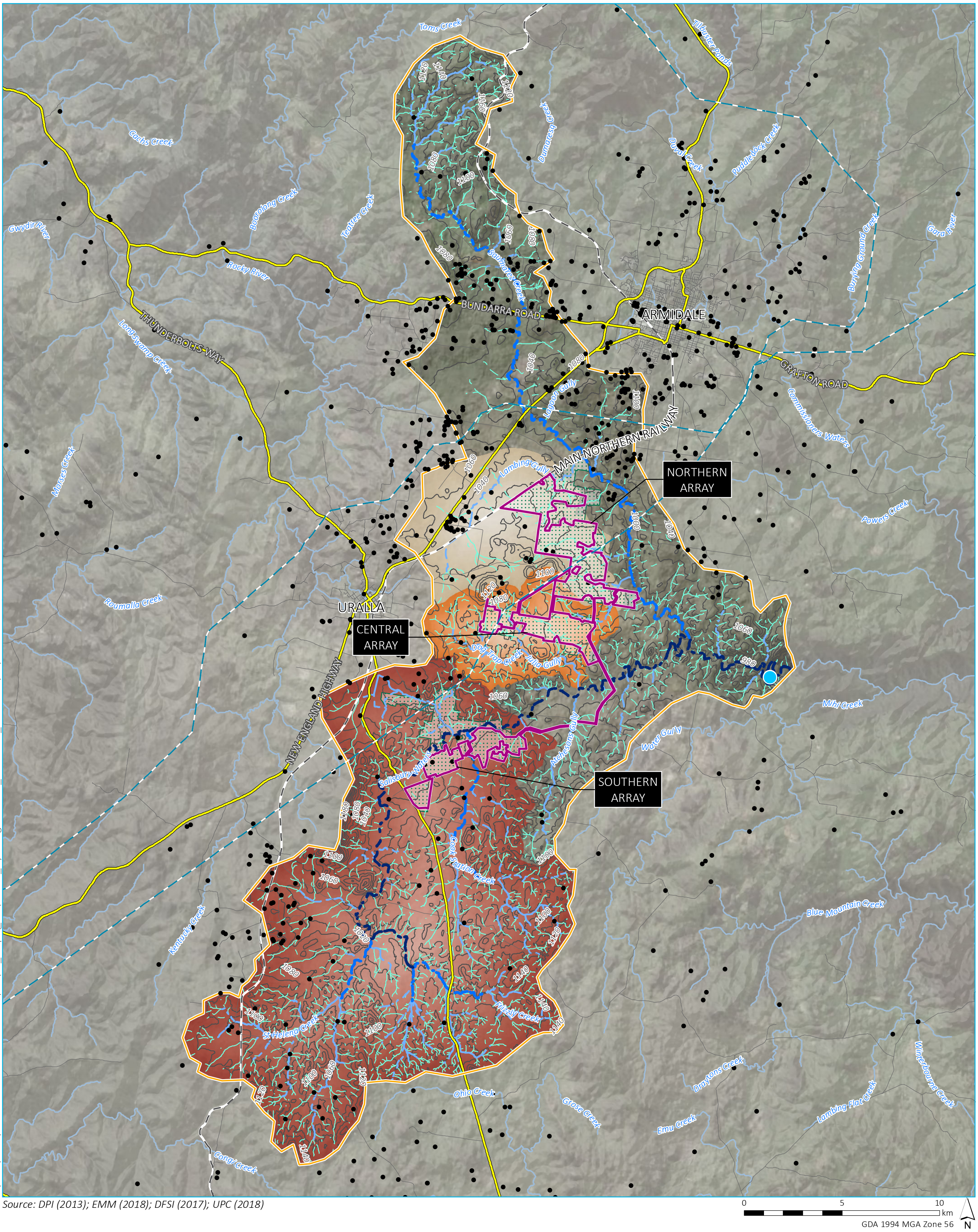
Other nearby water bodies include:

- Dangars Lagoon, which lies approximately 5 km west of the development footprint for the southern array area;
- Racecourse Lagoon, which lies further to the west of Dangars Lagoon; and
- a large farm dam that captures water from Saumarez Creek, approximately 200 m north-east of the northern array area at its closest point in the far south-east corner of the northern array.

There are no Ramsar wetlands or other significant wetlands within or downstream of the development footprint.

Photograph 5.2 Example of a 2nd order watercourse in the southern array area

Photograph 5.3 Example of a 2nd order watercourse in the southern array area



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KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- 20 m contour
- Named watercourse
- Development footprint
- Study area
- Salisbury Waters catchment
- Northern array catchment
- Central array catchment
- Southern array catchment
- Stream gauge 206025 Salisbury waters near Dangar Falls
- Licensed groundwater bore

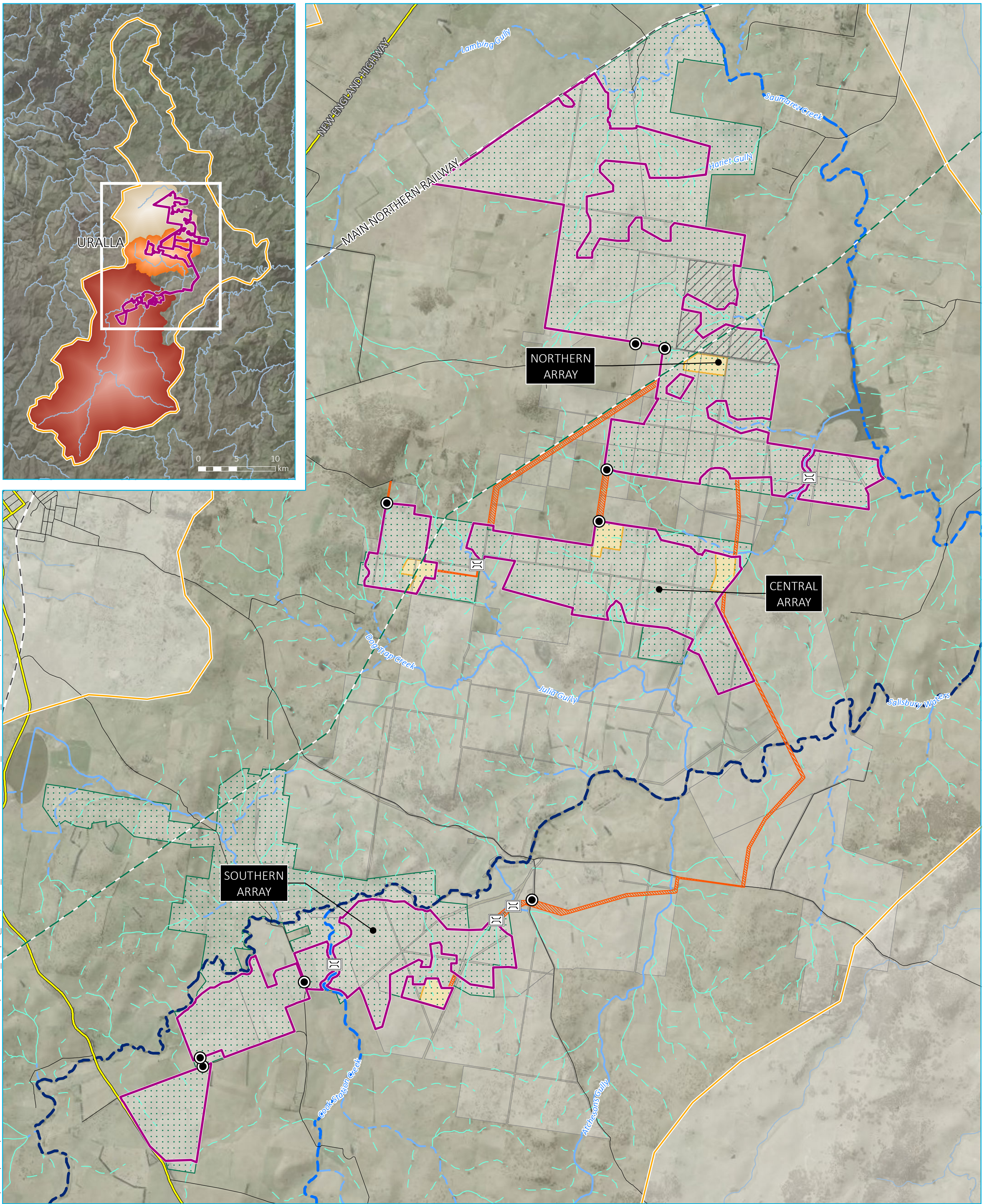
Strahler stream order (riparian buffer distance)

- 1st order (10 m)
- 2nd order (20 m)
- 3rd order (30 m)
- 4th order (40 m)
- 5th order (40 m)
- 6th order (50 m)

Hydrologic context

New England Solar Farm
Environmental impact statement
Figure 5.10

EMM
creating opportunities



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Source: DPI (2013); EMM (2018); DFSI (2017); UPC (2018)

0 1.5 3 km

GDA 1994 MGA Zone 56 N

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Named watercourse
- Salisbury Waters catchment
- Northern array catchment
- Central array catchment
- Southern array catchment
- Project boundary
- Study area

Development footprint

- Solar array
- Potential site access/ETL easement/electrical cabling
- Potential site for construction accommodation village
- Potential substation/BESS footprint
- Proposed primary site access point
- Potential creek crossing

Strahler stream order (riparian buffer distance)

- 1st order (10 m)
- 2nd order (20 m)
- 3rd order (30 m)
- 4th order (40 m)
- 5th order (40 m)
- 6th order (50 m)

Watercourses and stream order

New England Solar Farm
Environmental impact assessment
Figure 5.11

EMM
creating opportunities

iv Water quality

No known water quality monitoring data was available for the watercourses within the study area, nor for downstream sites that are likely to be representative of these watercourses. It is expected that Salisbury Waters and its major tributaries are likely to be of relatively good water quality, although degraded to some extent by existing agricultural land use and management practices in the surrounding area.

v Existing water use and infrastructure

The locations of existing groundwater bores are included in Figure 5.10, which shows numerous bores within the development footprint for the three array areas and surrounds. The main use of groundwater is likely associated with stock and domestic purposes, which is typical for rural/agricultural areas. There may be a number of unlisted bores in addition to those shown in the figure.

A number of existing farm dams, which are used for stock watering and are fed by surface runoff are also within the development footprint.

vi Flooding

The project boundary is outside of the flood planning area as mapped under the Uralla LEP. Exclusion from the LEP does not imply that certain areas within the project boundary are not flood prone, rather that flooding has not previously been considered in this area or is not significant enough to warrant flood-related development controls.

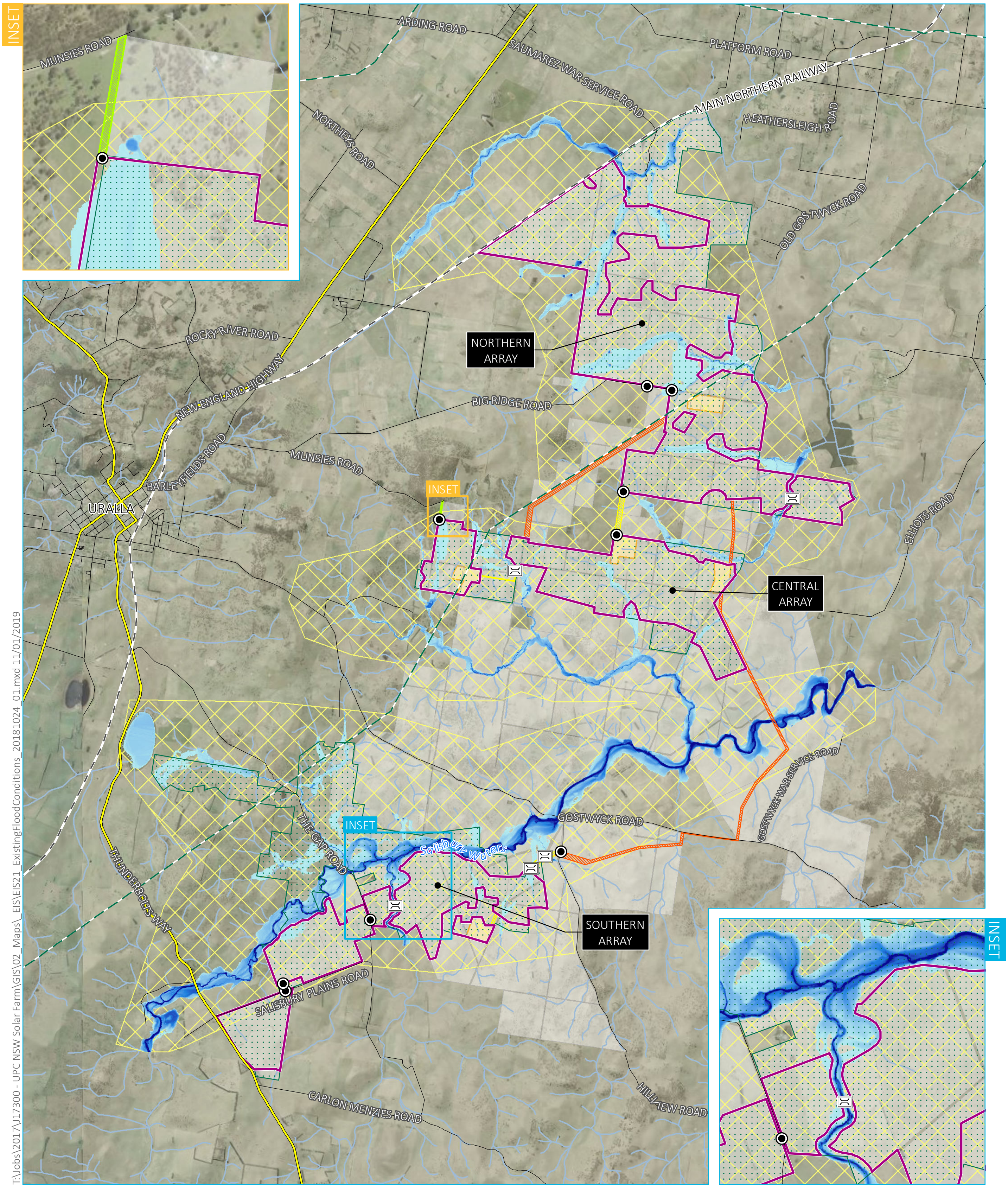
Flood modelling has been undertaken to improve understanding of this potential constraint and to inform the project design development process (refer Appendix H). The combined extent of the hydraulic models within which mainstream flooding along the various watercourses has been defined is shown in the inset on Figure 5.11. Overland flooding was not considered a major constraint nor risk to development and was not investigated in detail.

The 1% AEP event (ie 1 in 100 year flood) has been adopted as a basis for considering flood risk to project infrastructure within the development footprint for the three array areas and the potential for adverse off-site flooding impacts to occur as a result of the project.

Figure 5.12 shows indicative extents and depths of flooding for the 1% AEP event. The following key observations are made:

- flooding generally follows the alignment of watercourses, with no substantial overbank flooding or breakouts evident; and
- floodways and areas of higher flow velocity and flood hazard are typically confined within watercourses.

Flood modelling encompassed major watercourses within and adjacent to the development footprint, typically extending to all third and higher order watercourses (including Lambing Gully, Dog Trap Creek, Julia Gully, Salisbury Waters and Cook Station Creek) along with a selected number of unnamed second order watercourses (particularly within the northern and central array areas) (refer Section 3.4 of Appendix H). Based on the results presented in Figure 5.12, within the development footprint, approximately 213 ha (or 7.6%) would be subject to mainstream flooding as a result of a 1% AEP event. Within the broader project boundary, approximately 758 ha (or 9.1%) would be subject to mainstream flooding as a result of a 1% AEP event.



Source: EMM (2018); DFSI (2017); UPC (2018)

0 2.5 5 km

GDA 1994 MGA Zone 56

N

KEY

- 330 kV transmission line
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Project boundary
- Study area

Development footprint

- Solar array
- Potential ETL easement
- Potential site access corridor
- Potential site access/ETL easement
- Potential electrical cabling/site access corridor
- Potential substation/BESS footprint
- Potential creek crossing

- Proposed primary site access point
- Combined TUFLOW model extents

1% AEP - indicative flood depth

10 m

0 m

Existing flooding conditions - 1% AEP indicative flood extents and depths

New England Solar Farm
Environmental impact statement
Figure 5.12

EMM
creating opportunities

5.9.3 Assessment of impacts

i Watercourses and riparian corridors

The development footprint has been refined to minimise impacts to water resources within the project boundary and, more specifically, the development footprint to the greatest extent practicable. This includes the exclusion of higher order streams (ie 3rd order and above) from the development footprint, reduction in the number of watercourse crossings needed, and increasing the setback of the southern array area from Salisbury Waters.

Subject to the detailed design of project infrastructure, creek crossings may be required across the following higher order streams that traverse the landscape outside of the development footprint:

- Cook Station Creek (5th order stream) adjacent to two land parcels that form part of the development footprint for the southern array area;
- two unnamed 3rd order streams that are tributaries to Salisbury Waters and intersect the proposed site access corridor and ETL easement for the southern array area within proximity of the Hillview Road site access location;
- an unnamed 3rd order stream that is a tributary to Julia Gully and intersects the proposed site access corridor and ETL easement between two land parcels that form part of the development footprint for the central array area; and
- an unnamed 3rd order stream adjacent to two land parcels that form part of the development footprint for the northern array area.

With the exception of the creek crossings described above, a minimum setback of 30 m from 3rd order streams and higher will be applied across the development footprint. A watercourse crossing plan will be prepared for each 3rd order or above creek crossing and will provide the detailed design of the proposed creek crossing prior to commencement of construction.

The development footprint includes a number of 1st and 2nd order streams which will be impacted by the by the project. The majority of these mapped lower order watercourses do not have a discernible channel and therefore are considered unlikely to satisfy the definition of 'waterfront land' established within the WM Act. Riparian vegetation and the riparian zones adjacent to the 1st and 2nd order streams that traverse the development footprint have been modified and degraded by historical land use practices and past disturbances associated with land clearing, cropping and intensive livestock grazing. In some cases, the water that would have flowed through these streams has been diverted by the project landholders through the establishment of contour banks.

Project-related infrastructure proposed outside of the development footprint includes land required for connection infrastructure (ie ETLs) between the three array areas as well as land required for new internal roads to enable access to the three array areas from the surrounding road network and internal access tracks. Security fencing may also be required on land outside of the development footprint but within the project boundary. Watercourse crossings and placement of structures associated with ETLs and security fencing within 1st and 2nd order streams within the broader project boundary will be minimised, where possible.

The proposed alignment for the ETL between the southern and central array areas crosses both Atchesons Gully (4th order stream) and Salisbury Waters (6th order stream) (refer Figure 5.11). Design of structures associated with this infrastructure will span these higher order streams to minimise potential impacts.

ii Water bodies

Existing farm dams within the development footprint may be filled in and removed as part of the construction of the project.

Given the limited habitat value afforded by these dams, the potential for adverse impact associated with dam removal is considered negligible provided appropriate ESC measures are used and the disturbed areas are stabilised and rehabilitated.

Where feasible, and in accordance with harvestable rights provisions, any water contained within dams to be removed may be used for non-potable construction purposes to minimise wastage and use of imported water.

iii Water quality

The primary risk to water quality during construction will occur as a result of ground disturbance during earthworks and other site activities (eg installation of PV modules, trenching for services, grading for new internal roads, construction of the temporary construction accommodation village if required, etc). There is potential that these works will lead to exposure of soils and potential erosion and mobilisation of sediment into receiving watercourses. Contamination of surface water as a result of accidental spillage of materials such as fuel, lubricants, herbicides and other chemicals used to support construction activities could also adversely impact water quality.

The primary risk to water quality during operation will occur as a result of poor ground cover revegetation or stabilisation leading to exposure of soils and potential erosion and mobilisation of sediment into receiving watercourses. Contamination of surface waters as a result of accidental spillage of materials such as fuel, lubricants, herbicides and other chemicals used to support operational activities could also adversely impact water quality.

The construction accommodation village will require installation of a sewerage treatment plant (STP), which may also service any nearby O&M facilities. The STP would be designed and installed by the lead contractor in accordance with the relevant design standards and regulatory requirements, and in consultation with DPE, Uralla Shire Council, the EPA, DoI Lands and Water and OEH. Any required licence to operate would also be obtained.

Impacts to water quality during construction and operations are considered minor and manageable with proposed management measures in place, further details of which are provided in Section 5.9.4.

iv Water use

During construction, it is estimated that approximately 150 kilolitres (kL) of water per month will be required, equating to 1.8 megalitres (ML) per year over the three-year construction period. Most of this water will be required for dust suppression, with other minor uses including site amenities, fire protection and washing of equipment and plant. The water demands during construction will be satisfied by potable water trucked in to site. The project will not impact adjacent licensed water users or basic landholder rights during construction.

The construction accommodation village will also include a water treatment plant (chlorine dosing) and storage tanks. Potable water for the construction accommodation village will be imported (trucked in) to site. Based on similar facilities currently operating in Australia, it is anticipated that potable water usage will be approximately 250 l per person per day.

It is estimated that approximately 5 ML of water per year will be required to sustain operations over 30 years. The majority of this water will be required for washing of PV modules. As for construction, the water demands during operation will be satisfied by water imported (trucked in) to site. The project therefore will not impact adjacent licensed water users or basic landholder rights during ongoing operations.

In summary, project water requirements are anticipated to be:

- construction (assuming 3 year construction period and no construction accommodation village) = 5.4 ML;
- construction (assuming 3 year construction period and 500 people residing in the construction accommodation village) = 142.275 ML; and
- operations (assuming 30 year operational life) = 150 ML.

v Flooding

During construction, there is the potential for inundation of site works, compounds, storage areas and plant/equipment if these are located close to or within flood prone areas. This could present a hazard to site workers and potentially lead to plant/equipment damage and materials being washed into watercourses.

Preliminary design has considered flooding constraints and makes appropriate responses in terms of locating heavier earthworks and flood-sensitive facilities (eg substations and BESSs) away from watercourses and areas of high hazard flooding.

Array areas have also adopted appropriate setbacks from mainstream flooding, in particular for the southern array area adjacent to Salisbury Waters. Detailed design of the project will need to consider location-specific flood levels when setting floor levels and flood protection levels for key site infrastructure. As noted, the results of flood modelling suggest that overland flooding is not a major constraint nor risk to development.

Adverse flooding impacts within and downstream of the development footprint for the three array areas will be avoided as part of the detailed design of the project, which will avoid placement of permanent works in areas that could obstruct and divert floodwaters.

The potential for surface water impacts associated with hydrologic changes due to increased runoff rates from PV modules is considered negligible because PV modules shed runoff directly to the ground, which will be stabilised and vegetated to promote retention and infiltration. It is noted that single axis tracking technology would allow for approximately 60-70% of the available land within the three array areas to remain free of project infrastructure.

vi Groundwater

The typical depth of installation for piles to support PV modules is anticipated to be approximately 1.5-3 m but may be greater depending on geotechnical conditions and specific tracker design. The depth of required ground preparation works for other project infrastructure and civil works are expected to be also within this range.

Given depth to groundwater levels across the project boundary are on average approximately 20 m, to a minimum of approximately 3 m in selected areas, the project is unlikely to intersect nor impact groundwater during construction, operation and decommissioning.

The project will not require access to groundwater resources within or outside of the project boundary as water demands during construction and operation will be satisfied by water imported (trucked in) to the three array areas.

5.9.4 Mitigation measures

A summary of the proposed surface water mitigation and management measures is provided in Table 5.30.

Table 5.30 Summary of proposed mitigation and management measures

Aspect	Proposed mitigation measures
Construction	
Watercourses and riparian corridors	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 DoI Lands and Water prior to commencement of construction. Placement of PV modules and ancillary infrastructure (i.e. footings and pilings) within 1st and 2nd order streams will be minimised to the extent practicable. Watercourse crossings of 1st and 2nd order streams for internal access tracks and electrical cabling will be minimised to the extent practicable.
Water quality	Implementation of ESC measures in accordance with Landcom (2004). The SEA (Appendix G) outlines a range of potential measures that could be adopted. Proposed measures will be considered further and formalised as part of detailed design and documented in the CEMP. Progressive revegetation or stabilisation of disturbed areas to minimise exposed soils to the extent possible. Implementation of procedures for hazardous material storage and spill management to be prepared and documented within the CEMP.
Flooding	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. 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.
Water use	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.
Operations	
Watercourses and riparian corridors	Monitoring of watercourse and VRZ condition for all retained watercourses where these run through or immediately adjacent to the development footprint will be undertaken, with maintenance as required to minimise scouring and erosion and ensure waterway health and stability.
Water quality	Monitoring and maintenance of ground cover vegetation and other stabilised surfaces throughout operation to limit erosion and transport of sediment to watercourses. Implementation of procedures for hazardous material storage and spill management to be prepared and documented within the OEMP.

5.10 Hazards and risks

5.10.1 Overview

A hazard and risk assessment was undertaken by Sherpa (refer Appendix L) to meet the hazard and risk requirements of the SEARs including:

- A preliminary risk screening in accordance with State Environmental Planning Policy No.33 (SEPP 33) - Hazardous and Offensive Development. If the preliminary risk screening indicates the development is 'potentially hazardous', a Preliminary Hazard Analysis (PHA) must be prepared in accordance with NSW Department of Planning and Environment (DPE) Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 – Guidelines for Hazard Analysis and Multi-Level Risk Assessment.

- An assessment of all potential hazards and risks including but not limited to bushfires, spontaneous ignition, electromagnetic fields or the proposed grid connection infrastructure (including the proposed transmission line and substations) against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.

5.10.2 Screening level assessment: potentially hazardous industry

SEPP 33 defines potentially hazardous industry as:

> "a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:
>
> (a) to human health, life or property; or
>
> (b) to the biophysical environment, and:
>
> includes a hazardous industry and a hazardous storage establishment."

The risk screening process in the Applying SEPP 33 guideline (NSW Department of Planning 2011) (SEPP 33 guideline) considers the type and quantity of hazardous materials to be stored on site, distance of the storage area to the nearest site boundary, as well as the expected number of transport movements.

'Hazardous materials' are defined within the SEPP 33 guideline as substances that fall within the classification of the Australian Dangerous Goods Code (ADGC), ie have a Dangerous Goods (DG) classification.

Risk screening is undertaken by comparing the storage quantity and the number of road movements of the hazardous materials with the screening threshold specified in the SEPP 33 guideline. The screening threshold presents the quantities below which it can be assumed that significant off-site risk is unlikely.

A review of the expected types and quantities of hazardous materials to be stored or handled within the development footprint identified that none of the relevant SEPP 33 screening thresholds will be exceeded. This included consideration of liquified petroleum gas (LPG), refrigerant, gasoline, diesel and batteries that may be housed within the BESS (refer Table 3.1 of Appendix L).

A review of the expected types and quantities of hazardous materials to be transported to-and-from the development footprint identified that none of the risk screening thresholds will be exceeded. This included consideration of LPG, refrigerant, gasoline, diesel and batteries that may be housed within the BESS (refer Table 3.2 of Appendix L).

Other materials considered as part of the SEPP 33 risk screening include:

- transformer oil – not classified as hazardous material and excluded from risk screening; and
- MCPA (2-methyl-4-chlorophenoxyacetic acid) (for use as herbicide/pesticide) – not classified as hazardous material and excluded from risk screening.

These materials will not be stored with other flammable materials and hence are not considered to be potentially hazardous under SEPP 33.

Appendix 2 of the SEPP 33 guideline outlines other risk factors for consideration to identify hazards outside the scope of the risk screening method. A review of these risk factors identified that the project would not involve:

- storage or transport of incompatible materials (ie hazardous and non-hazardous) - hazardous materials will be stored in dedicated areas and storage protocols in accordance with standard and guidelines will be followed;
- generation of hazardous waste;
- possible generation of dusts within confined areas;
- type of activities involving hazardous materials with potential to cause significant offsite impacts;
- incompatible, reactive or unstable materials and process conditions that could lead to uncontrolled reaction or decomposition;
- storage or processing operations involving high (or extremely low) temperature and/or pressures; or
- hazardous materials and processes with known past incidents (or near misses) that resulted in significant offsite impacts at similar solar farm developments.

Appendix 3 of the SEPP 33 guideline provides a list of industries that may be potentially hazardous and potentially offensive. It is noted that this list is illustrative rather than exhaustive. The current edition of the guideline does not include solar farm or power generation facilities in the example industry listings that may fall within SEPP 33 or be considered as potentially hazardous.

The SEPP 33 risk screening assessment concluded:

- the storage and transport of hazardous materials for the project will not exceed the relevant risk screening thresholds;
- there is no other risk factor identified that could result in significant offsite impacts; and
- the project is not considered as ‘potentially hazardous’ with respect to storage and transportation within the meaning of SEPP 33 and does not require a PHA.

5.10.3 Screening level assessment: potentially offensive industry

SEPP 33 defines potentially offensive industry as:

> 'a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.'

The minimum test for a 'potentially offensive industry' is based on two factors:

1. Does the proposal require a license under any pollution control legislation?
2. If a pollution control instrument is not required, will the proposal cause any offence having regard to the sensitivity of the receiving environment?

The NSW EPA advised EMM in a letter dated 23 April 2018 that an EPL for the project is not required. In addition, with respect to point 2 above, the proposal will not cause any offensive emissions resulting from dust, odour, surface water run-off and noise during operation. During construction, any potential impacts resulting from emissions to air, land and waterways will be controlled via environmental mitigation and management. These measures, included in this EIS, have been designed to respond to the specific impacts predicted and the sensitivity of the receiving environment to ensure that impacts are avoided altogether, minimised or ameliorated to below any level of significance.

As such, the project is not a potentially offensive industry.

5.10.4 Hazard identification

Hazard Identification (HAZID) aims to identify all reasonably foreseeable hazards and risk events associated with the 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.

Events with the potential to result in major consequence impacts to people (injury and/or fatality), the environment and the asset were identified. The identified hazards and events for the project are presented in Table 5.31.

Table 5.31 Identified hazards and events

Hazard	Event
Electrical	Exposure to voltage
Arc flash	Release of energy
EMF	Exposure to EMF
Fire	Infrastructure fire
Chemical	Release of hazardous materials
Reaction	Battery thermal runaway
External factors	Bushfire, vandalism, lightning storm

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 fire event which may result from a variety of causes (eg release of flammable materials, battery thermal runaway, transformer fire, etc). These fires may have the potential to initiate bushfire to surrounding grasslands.
- Likelihood: The highest likelihood rating for the identified events is Unlikely (ie could occur in the next 10 years). The associated event relates to unauthorised personnel access to the development footprint resulting in vandalism/asset damage to the project infrastructure.
- Risk analysis: A total of 18 risk events were identified. The breakdown of these events according to their risk ratings are as follows:
  - 14 Medium risk events; and
  - 4 Low risk events.

  Based on the risk acceptance criteria used for the study, the risk profile for the project was considered to be tolerable if so far as reasonably practicable (SFARP).

  The majority of the Medium risk events relate to fire events resulting from a variety of causes and so the study identified proposed prevention controls to reduce the likelihood of these fire events and mitigation controls to contain the fires and prevent escalation. Based on the size of the development footprint; proposed location for project infrastructure within the development footprint; proposed controls; and separation distance to neighbouring land uses (including neighbouring properties and agricultural operations), the study noted that the exposure to fire events will primarily be to the project's construction and operations workforce and offsite impacts will be minimal.

- Risk assessment: The risk assessment concluded that there is no potential for offsite fatality or injury identified and therefore the project meets the land use planning criteria. Risk events identified are onsite impacts and assessed against the NSW *Work Health and Safety Act 2011* requirements to reduce risk to SFARP. Risks were assessed by the project as tolerable if SFARP.

5.10.5 Electromagnetic fields

Electric and magnetic fields (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 is also produced wherever electricity or electrical equipment is in use (eg household appliances, powerlines).

Electric fields are created where there is flow of electricity. Electric fields are related to and directly proportional to voltage (ie higher the voltage higher the electric field). Electric field is often described in terms of its strength and commonly expressed in volts per metre (V/m) or kilo volts per metre (kV/m).

Use of electricity means that people are exposed to EMF as part of daily life. The background electric and magnetic fields in the home are typically 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 (eg powerlines).

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 typical exposure levels to EMF for the proposed project infrastructure have been assessed against the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.

The following controls to limit exposure to EMF have been identified:

- design, selection and procurement of electrical equipment for the project will comply with relevant international and Australian standards for exposure to EMF;
- location selection for project infrastructure (ie accounting for separation distance to surrounding land uses) and fencing along 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; and
- duration of exposure to EMF for personnel on-site will be transient.

The hazard assessment related to EMF concluded that:

- EMF created from the project will not exceed the ICNIRP occupational exposure reference level; and
- as the strengths of EMF attenuate rapidly with distance, 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.

5.10.6 Mitigation measures

The Hazard Register (Table 5.6 of Appendix L) identified a range of controls that are required to ensure that hazard consequence and/or the likelihood is reduced or maintained. These measures include, but are not limited to implementation of the following during subsequent stages of the project:

- fire management plan (FMP);
- emergency response plan (ERP);

- design and procurement procedures;
- testing and maintenance procedures;
- signage and personal protective equipment; and
- appropriate boundaries and fencing.

5.11 Bushfire

As noted in the Section 5.10, the SEARs required assessment of the potential risk of bushfire. A bushfire hazard assessment (BHA) was undertaken by EMM for the project, and a supplementary preliminary bushfire report was prepared by Australian Bushfire Protection Planners Pty Ltd (ABPP) for specific consideration of the construction workforce accommodation village (refer Appendix M). This section of the EIS provides a summary of the findings from these assessments.

5.11.1 Overview

A very small part of the land within the development footprint (approximately 12 ha or 0.4%) is mapped bushfire prone by Uralla Shire Council (refer Figure 2.5). The land mapped bushfire prone is in the western portion of the central array area and within Option A of the potential ETL alignment between the northern and central array areas. The project will potentially be exposed to bushfire threat in the form of grassfire and has the potential to cause unplanned ignition of surrounding grassland. Therefore, bushfire risks associated with the project have been assessed in accordance with *Planning for Bushfire Protection* (PBP) (RFS 2006), where applicable to the project.

For the purposes of the BHA and in keeping with PBP, the project is considered 'other development', therefore, the Australian Standard 3959 - 2009 Construction of Buildings in Bushfire-prone Areas (AS 3959 - 2009) and associated asset protection zones (APZs) do not apply as a set of 'deemed to satisfy' provisions, and only the aim and objectives of the PBP apply.

5.11.2 Existing environment

Fire Danger Index (FDI) is based upon the LGA and Fire Weather District, as determined by RFS, where the development is to be located. The project is in the Uralla Shire LGA, therefore an FDI of 80 (New England Fire Weather District) has been used to inform bushfire behaviour on land within the project boundary (RFS 2017a). The project is within the New England Bush Fire Management Committee (BFMC) area, which ascribes the following regional weather characteristics:

- the typical/average climate is temperate to cool climate;
- summers are warm with uniform rainfall generally occurring in the summer; and
- the bushfire season generally runs from August to March.

Prevailing weather conditions associated with the bushfire season in the New England BFMC area are west to north-westerly winds, moderate to high daytime temperate and low relative humidity. Frosts in winter can create low fuel moisture contents and dry lightning storms occur in the bushfire season (New England BFMC 2017).

The New England BFMC area has on average 95 bushfires per year, of which 12 on average can be considered major fires (New England BFMC 2017).

The main sources of ignition of unplanned fires in the New England BFMC area are reported to be:

- escaped private burns;
- lightning strikes; and
- arson/fire setting (New England BFMC 2017).

The predominant vegetation classification, as per PBP, is woodland and grassland.

Grassland is the most prevalent of the vegetation classification within the development footprint. The 1,302.53 ha of mapped grassland that is derived from PCT 510 is highly modified and used for grazing of livestock including cattle and sheep, with canopy species either absent or limited to scattered trees. The ground cover here is typically a mixture of native and exotic grasses, with the composition variable due to the proceeding management intensity and the timeframe since significant intervention (refer Appendix C). The 1,288.83 ha of exotic grassland mapped within the development footprint is dominated by exotic grass species. Typically, these areas have been ploughed, sown with exotic pasture species and improved with fertiliser.

The vegetation within the site of the construction accommodation village is mostly cleared, with dominant vegetation of low diversity native pasture with a limited number of scattered native trees. The topography within the site is dominated by a gently undulating landscape with some areas of steeper slopes associated with low hills and various permanent and ephemeral watercourses.

Uralla Shire Council mapping confirmed that the site for the construction accommodation village is not recorded as containing bushfire prone vegetation, nor is it within 100 m of vegetation that is lawfully recorded on a bushfire prone land map as being "bushfire prone vegetation" (refer Figure 2.5).

However, the *Guideline for Bush Fire Prone Land Mapping* (RFS 2015) requires councils to record grassland vegetation as being bushfire prone and Australian Standard A.S. 3059 – 2009 also includes grassland vegetation as bushfire prone vegetation.

5.11.3 Assessment of impacts

Fire is capable of damaging the structures associated with the project and consequently impacting upon the safety of staff and contractors on the project. Fire emanating from the project poses a human safety and property threat within the locality, as well as threatening native flora, fauna and ecosystems within the locality of the project.

Woodland fragments are sparse within the development footprint. Throughout the project refinement process UPC has adopted a preference for avoidance of woodland areas; however, the risk of grassland fire remains. The main potential sources of ignition of unplanned fires during construction and decommissioning of the project are likely to be:

- diesel generators (namely to service the power requirements of the construction accommodation village);
- storage of flammable liquids (eg fuel storage);
- vehicle and machine movement over long grass;
- sparks generated from hot works (eg welders and grinders); and
- human error, such as non-compliance of hot works procedures or incorrect disposal of cigarette butts.

The main potential sources of ignition of unplanned fires from the operation of the project are likely to be the same as those listed above, with the addition of fire risks associated with electrical equipment associated with the operation of the project (eg PCUs, BESSs, substations and connection infrastructure). Due to the electrical hazards associated with any power generation facility, including large-scale PV installations, there are additional health and safety considerations for the implementation of effective and appropriate risk control measures when managing an emergency incident that involves an electrical fire.

The construction accommodation village site is mostly cleared with dominant vegetation of low diversity native pasture with no ignition sources. However, as grassland vegetation is present on Lot 2 of DP 174053, Appendix A of Appendix M has assumed the presence of bushfire prone vegetation and considers the provisions of PBP.

If required, the construction accommodation village could represent a bushfire hazard, particularly with respect to the spread of bushfire from an offsite ignition source.

5.11.4 Mitigation measures

Detailed mitigation measures are outlined in Section 5.3 of the BHA and Section 3 of the preliminary bushfire report for the construction accommodation village in Appendix A of the BHA (refer Appendix M). This section provides a summary of those measures:

- **Defendable space**: At least a 10 m defendable space 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 Inner Protection Area (IPA). This will be in the form of mown or grazed grass or similar suitable ground cover maintained to the standard of an IPA (see *Standards for Asset Protection Zones* (RFS 2005)).

- **Fuel load**: 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 site.

- **Access**: The primary site access points will be from Big Ridge Road, Munsies Road, Salisbury Plains Road, The Gap Road and Hillview Road. Emergency access points may also be required and will be identified as part of the project's ERP. The primary site access points and emergency access points will comprise of a combination of sealed and unsealed roads that meet the criteria set out in Section 5.3 of the BHA in Appendix M.

- **Location and adequacy of services**: The objective is to provide adequate supplies of water for the protection of infrastructure during and after the passage of bushfire and to locate electricity so as not to contribute to the risk of fire. There are a number of farm dams located in the vicinity of the project that may be accessible to fire fighting vehicles. However, due to potential access constraints associated with dam water supply, these are detailed design stage considerations (refer Section 5.4 of Appendix M).

  A FMP will be prepared for the project and 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). The ERP for the project will also detail the locations of the water supply.

- **Location of hazardous materials and ignition sources**: The FMP for the project will include provisions for diesel generators and associated fuel storage tanks to be designed, housed and maintained so as not serve as a risk to surrounding grassland as well as provisions for specific measures and procedures to prevent ignition of grassland from hot works or from vehicles driving over long grass. Diesel is a combustible liquid and will be stored away from other flammable materials (eg gasoline). Storage of diesel within the development footprint will conform with AS 1940:2017 The storage and handling of flammable and combustible liquids and consider best practice safety measures.

- **Construction standard and design**: 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.

- **Bushfire preparedness and procedures**: Specific management actions will be undertaken to ensure suitable bushfire preparedness is undertaken as part of the project and ahead of the bushfire season, including:

  - maintenance of buildings, roads, fuel reduction and water supply;

- appropriate work procedures, so as to limit the potential of ignition of surrounding grassland;
- monitoring and review of the FMP to maintain its effectiveness; and
- maintenance of fire awareness through inductions, briefings, pre bushfire season drills, formal meetings, standard operating procedures and ongoing monitoring.

- **Emergency planning:** An ERP will be required for the project and should incorporate all relevant safety procedures and normative management recommendations detailed in the relevant acts, regulations and AS. The ERP as a minimum (but not necessarily limited to) will:
  - include the requirements for pre-bushfire season and continual fire awareness of staff and contractors;
  - include the requirements for immediate notification to the local RFS and FRNSW of accidental ignition of surrounding grassland;
  - 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;
  - 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;
  - 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);
  - identify the circumstances under which different evacuation types are to be implemented, in response to a bushfire or fire emergency;
  - include a mechanism for the early relocation of staff in the event of a bushfire in the locality;
  - contain detailed plans of all Emergency Assembly Areas including 'on-site' and 'off-site' arrangements;
  - include requirements for appropriate on-site refuge area signage and communications;
  - contain details of infrastructure layout within the three array areas that show all relevant information (ie access points, fences, locked gates, water supply, areas of electrical hazard);
  - include transportation arrangements (eg number of vehicles required), designated assembly points and time required to have transportation available;
  - identify the specific structure and role of emergency control on-site (eg fire wardens);
  - include the requirements for training in preparation for response to an emergency;
  - 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;
  - include the requirements for egress and communication in the scenario that persons are leaving the project as emergency services are attending;

- include details on appropriate egress routes from the different array areas;
- 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 three array areas;
- 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
- 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 three array areas.

The hazards and risks assessment prepared by Sherpa Consulting (refer Appendix L of 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:

- A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan (NSW RFS 2014); and
- Australian Standard 3745-2010 Planning for emergencies in facilities (Standards Australia 2010).

• **Construction accommodation village (should it be required):**
  - a 50 m wide APZ around the perimeter of the construction accommodation village, with specific vegetation management measures within the construction accommodation village site, associated APZ, and corridors on both sides of the access driveway and any internal service roads to reduce the potential for grass fires;
  - buildings will be constructed to comply with AS 3959 – 2009 Construction of Buildings in Bushfire Prone Areas and Addendum Appendix 3 of PBP (RFS 2006) and will incorporate non-combustible external cladding and specific measures to reduce the potential for ember attack;
  - construction of the main entrance road and internal road network to cater for fire fighting equipment and activities;
  - provision of a static water supply within the construction accommodation village; and
  - preparation of an ERP that provides advice and protocols on the evacuation of the construction accommodation village during emergencies that may impact the construction accommodation village and its occupants.

5.12 Social

5.12.1 Overview

A social impact assessment (SIA) was prepared with reference to the methods outlined in the *Social impact assessment guideline for State Significant mining, petroleum production and extractive industry development* (DPE 2017). This meets the social requirement in the SEARs to include:

- an assessment of the likely social and economic impacts of the development (including the workers accommodation facility), paying particular attention to the:
  - local community;
  - demand for the provision of local infrastructure and services; and
  - benefits of the development for the State and region.

The SIA was undertaken to fulfil the following objectives:

- identify the area of social influence for the project (ie where the social impacts may be felt);
- examine the profile of the community and social indicators;
- describe social trends and changes impacting the community;
- identify what matters to the community (attitudes, values, customs, concerns, way of life, aspirations);
- analyse the outlook for key economic fundamentals (eg housing, employment);
- describe local social governance, infrastructure and institutions;
- consider the likelihood, scale and distributive equity of potential social impacts of the project, both positive and negative, including the potential for cumulative impacts; and
- provide management and monitoring recommendations, where required.

The study area for the SIA was defined as the LGAs that are likely to experience social impacts from the project, which include the following:

- Uralla Shire LGA;
- Armidale Regional LGA; and
- Tamworth Regional LGA.

The SIA examined a wide range of social factors and these, by necessity, require analysis of data such as demographics and economic indicators. The data alone, while essential to understand the characteristics of the community, does not reveal the community's voice about the project. The SIA therefore applies both quantitative and qualitative measures to achieve a realistic examination of how and why the project may bring positive, negative or neutral impacts to the communities in the area of social influence for the project.

5.12.2 Existing environment

i Social and cultural setting

Uralla is a medium sized rural town on the New England Highway approximately 2.5 hours drive from Coffs Harbour and approximately 22 km from the nearest major regional centre, Armidale, to the north.

Uralla portrays itself as a thriving community with a notable reputation for decorative arts such as pottery, and an emerging food and local produce industry, set amongst an historic and pastoral landscape. There are several cultural events held regularly in or near Uralla including the Thunderbolts Festival (October) which includes a street parade and other festivities; and the Lantern Parade (March).

ii Population and demographics

Uralla Shire LGA had a population of 6,016 at the 2016 census (ABS 2016a), which is similar to its 2011 population, indicating that the population is static. However, the township of Uralla had a population of 2,743 at the 2016 census with a significant increase of 13% from the 2011 census. Uralla Shire LGA has an ageing population, with 20.5% of the population aged 65 and over, and 19.3% of the population aged under 14. The median age is 46. 11% of Uralla Shire LGA's population identifies as Aboriginal and/or Torres Strait Islander.

In 2016, within Uralla Shire LGA, 30.6% of the population were attending an educational institution. Of these, 29.7% were in primary school, 21.5% in secondary school and 14.3% in a tertiary or technical institution. Most businesses within the Uralla Shire LGA are associated with agriculture, forestry and fishing, which contribute to more than $100 million, or 25% of the Uralla Shire LGA's gross regional product (RDANI 2016b). The importance of agriculture to the Uralla Shire LGA's economy is further reflected by the area's employment statistics, which indicate that approximately 400 employees or 30% of employment within the Uralla Shire LGA is supported by agriculture, forestry and fishing.

The demographics of Armidale and Tamworth LGAs are broadly similar to Uralla Shire LGA, but with populations of 29,449 and 77,029 respectively (ABS 2016a; 2016b; 2016c).

iii Industry and land use

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 New England North West region encompasses a total of 12 LGAs in regional NSW including Uralla, Tamworth and Armidale LGAs. In 2016-2017, the gross value of agricultural production in the New England North West region was $3 billion, which was 21% of the total gross value of agricultural production in NSW. The New England North West region has a diverse agricultural sector. The major commodities in the region based on gross value of production are cattle and calves ($687 million) and wheat ($482 million) (ABS 2016a; 2016b; 2016c). The agricultural properties that make up the development footprint are primarily used for sheep grazing for the production of wool and lambs, with some cattle grazing for beef production.

Tourism is a key industry in Uralla Shire LGA, bringing in approximately 17,000 visitors and $6 million per year. Galleries and antique shops, food and wine, fossicking, cultural heritage and festivals are key attractions.

iv Housing and accommodation

There are 86, 876 and 768 rooms (within hotels, bed and breakfasts and caravan parks) in Uralla, Tamworth and Armidale LGAs respectively. Average occupancy rates in Uralla and Armidale LGAs are typically around 55% but go as high as 100% during peak periods. Average occupancy rates in Tamworth are consistently around 50%.

Peak occupancy periods typically relate to Queensland and NSW school holidays, UNE graduation periods and local and regional events such as the Thunderbolts Festival and Tamworth Country Music Festival.

v Health

There is a medical clinic and a GP practice in Uralla Shire LGA, with a wider variety of medical services across the study area, including hospitals in Tamworth and Armidale.

vi Community values

The people of the Uralla Shire LGA have a strong connection to the area's cultural heritage. The community is renowned for its arts and crafts, particularly pottery, wool crafts, theatre and fine arts. The local community has a high volume of volunteers that create ongoing events, community groups, attractions and other services that are strongly supported. The community is proud of the area's rich history. Uralla has more than 50 buildings and sites of heritage significance. Volunteering is seen as a significant contributor to social cohesion and sense of place for the local community.

Local concerns and issues of community interest include road upgrades and maintenance, flood risk, water quality and availability (including drought), regional tourism and visitor economy. Responses to other solar farms or similar developments in the study area have been mixed.

5.12.3 Assessment of impacts

i Workforce

Construction is anticipated to commence in mid-2019 and, depending on staging, could extend to up to 36 months. The construction of the project will generally require a workforce which begins at a modest level, the workforce then progressively builds over several months to a peak of up to 700 people, and then declines relatively quickly.

The first six months of the project will generally require less than 100 workers on-site at a given time. The growth in worker numbers is then anticipated to increase to a peak period around months 22 to 25 when over 600 workers are required. The workforce is then anticipated to reduce to less than 100 within a period of approximately five months and is anticipated to remain under 100 for the remainder of the project's construction.

Based on this scenario, and considering external factors such as likely accommodation availability, the main period of potential impact is when worker numbers exceed 500. This is expected to be generally between month 18 and month 26. This risk is to be managed through the proposed staging of construction and the provision of on-site accommodation at the construction accommodation village (should it be required).

Half of the project's construction workforce is assumed to originate from Uralla Shire LGA (10%), Armidale LGA (20%) and Tamworth LGA (20%). This ratio of around half the construction workforce coming from the surrounding region where the solar farm project is located is broadly consistent with other projects in Australia. It is, however, acknowledged that the projects constructed to date in Australia have typically been up to 100 MW in size. The remaining workforce is likely to originate from outside of these LGAs and may be required to reside at the construction accommodation village during peak construction periods.

Depending on the availability of local workers and given the large number of workers required at peak time, there may be a need to accommodate more outside workers than was originally anticipated and this will be assessed as the construction progresses.

During operations, a workforce of up to 15 FTEs will be required.

a Accommodation

The project will have both positive and negative impacts on accommodation in the study area, dependant on the extent to which accommodation demand exceeds the level of occupancy for existing accommodation in the study area.

Accommodation for construction workers is likely to be sourced from nearby centres, such as Armidale, Uralla, Walcha and Tamworth, either workers residing in their own homes or through temporary accommodation, or through the construction accommodation village, which may be established within the northern array area, or via a combination of these two approaches.

An influx of workers requiring accommodation to facilitate the construction of the project could place pressure on local short-term accommodation and other services within the regional centre of Armidale and the township of Uralla, which may have adverse flow-on effects. For example, construction workers may restrict the availability of supply of short-term accommodation to other users during peak tourist periods such as school holidays and the region’s major festivals and annual events.

b Industry

The project’s potential impacts on the agricultural industry arise from the occupation of agricultural land by a non-agricultural facility. This will be mitigated in part by the project layout and designing to allow for sheep grazing to continue on land on which the PV modules are located. The income for the project landholders will also serve to drought-proof their ongoing farming operations for the next generation of farmers. There are not expected to be any constraints on the current or potential agricultural uses of nearby land. At the end of the project’s operational life, project infrastructure will be decommissioned, and the development footprint can be returned to its pre-existing condition suitable for agricultural land use.

Local businesses will benefit from sub-contracting opportunities during construction and operations (eg fencing installation and maintenance, vegetation management and pest control), as well as indirect economic benefits for food outlets, accommodation providers, service stations and local tradespeople (eg electricians and plumbers). This will also have multiplier effects for economic activity as local businesses contracting or servicing the demand generated by the project will themselves require secondary and support services.

The Uralla Shire LGA snapshot for the Northern Inland Development Plan identifies the benefits of investment in local renewable energy technologies. This includes the opportunity of ‘renewable energy tourism’ as a driver for the local visitor economy and educational tours servicing schools from across the region. The Uralla Shire LGA notes the opportunity presented by renewable energy facilities to open up ancillary services in the renewable energy value chain and to create a more stable and resilient economic base for the regional economy.

Employment in the Uralla Shire LGA is dominated by the agriculture, forestry and fishing sector. The input of the project to other sectors, particularly construction and subsequently technical services, will assist in the diversification of the local economic base.

c Travel and access

The project will use local and regional roads for the transport of people, plant, materials and consumables. There may be some impacts on the normal availability of transport modes (eg flights) or contribution to road congestion.

Construction materials and infrastructure will be transported to the three array areas via road. Heavy vehicles up to 25 m in length will require access to the three array areas. Over-dimensional vehicle movements should be limited to a total of six vehicles for the delivery of the 33 kV / 132 kV transformers that will be located at the solar array substations and the 33 kV / 132 kV / 330 kV transformers that will be located at the grid substation.

A large proportion of the project's construction workforce that originate in the Tamworth and Armidale LGAs will use shuttle buses from the regional centres of Armidale and Tamworth to commute to Uralla. In addition, a shuttle bus service will operate from the township of Uralla to the relevant array area. The shuttle buses will most likely be operated by local operators on behalf of UPC. The availability of shuttle buses as a main source of transport for the majority of the project's construction workforce will reduce impacts on transport and access.

d Equity of impacts

The social impacts, positive and negative, of any development are unlikely to be allocated in a uniform way across communities.

There is potential for the non-resident workforce to create inequities in local communities through a gender imbalance, income difference, 'fly over' effects, demand on limited social services, and disruption of social cohesion. The impact of a non-resident workforce will be experienced most acutely in Uralla Shire LGA. In addition, the proportion of Aboriginal households renting in the study area is approximately 30% higher than non-Aboriginal households, therefore in the event of a rental squeeze due to an incoming workforce, Aboriginal households may be proportionally more exposed to impacts.

e Community benefits

As noted in Section 4.6, throughout community engagement as part of the preparation of the EIS, UPC has demonstrated their intention to establish a positive, long-term connection with the local community. As part of this, UPC has already committed to contribute $250 per year for every MW (AC) of solar power installed over a period of 25 years. This contribution will start at a baseline of $50,000 during construction and increase as the project is installed and becomes operational. This commitment has been communicated to the local community during ongoing engagement as the project's CBSI.

As noted in Section 4.6, should the project receive approval, UPC will further assess the feasibility of the recommendations of the CRG and complete the design of the CBSI in preparation for its implementation to align with the commencement of construction. Ongoing engagement with the community around the CBSI will continue and additional feedback will also be sought during the feasibility and design periods. It is anticipated there will be a role for the community or its representatives in administering the CBSI throughout the life of the project.

f Summary of workforce impacts

The project is expected to have several positive impacts and limited negative impacts. The project will provide employment opportunities during construction. During operation, there will be up to 15 ongoing employment opportunities, several contracting opportunities and flow-on benefits to the community as a result of the CBSI (refer Section 4.6).

Based on the stakeholder engagement, there is a positive attitude and general community support for the project, despite some specific concerns about getting the balance right between utilising local businesses (such as accommodation providers and food outlets) and not overwhelming or exhausting local businesses, services and/or infrastructure. Through the provision of additional economic stimulus, employment opportunities and benefits and investment in infrastructure and services, the net community benefit of the project is considered to be positive.

Employment opportunities generated by the project could also be taken up by younger generations. Youth unemployment in the Uralla Shire, Tamworth and Armidale LGAs is 14.3%, 12.2% and 17.9%, respectively, which is greater than the NSW state average (10.2%).

ii Other impacts

This EIS addresses the SEARs and matters raised during engagement with stakeholders. It includes consideration of the potential biophysical, social and economic impacts of the project. In particular, Section 4.4.2 outlines the feedback and matters raised by the local community during the community information and feedback sessions and, more generally, as part of ongoing community engagement, and where these matters have been addressed in the EIS.

A set of mitigation and management measures will be put in place that have been designed to address specific impacts associated with the project. Periodic monitoring of the effectiveness of the proposed measures will occur and these measures will be revised as necessary throughout construction and operations.

Generally, it is considered that impacts related to visual amenity seem to be the more prevalent concern driving fears of loss of property value for neighbouring residential properties. Adjoining landholders whose properties are primarily used for agricultural production are logically more likely to be concerned with potential impacts to surface water flow paths, soil erosion and weed and pest management. Concerns have also been raised by a small number of adjoining and neighbouring landholders regarding the theoretical impact of the project on the future value of their properties for residential use and/or subdivision, should this be permissible under the Uralla LEP.

This EIS and supporting technical assessments have considered potential amenity impacts from the project's construction and operations. Construction impacts will be temporary in nature and are therefore considered unlikely to have a lasting impact on the amenity of the locality. The residual impacts associated with the ongoing operation of the project (ie after the implementation of proposed management and mitigation measures) are predicted to be minimal.

Further detail on potential impacts to the local community and amenity are provided in Section 5.6 (visual), Section 5.7 (noise) and Section 5.8 (traffic).

5.12.4 Mitigation measures

The key impacts associated with the project will occur during construction, and predominantly relate to the presence of the construction workforce. Impacts can be reduced with the application of the following mitigation measures.

i Workforce size

The project schedule has been staged to reduce the peak workforce numbers; this means that the peak employment period for Stage 1 is separated from the peak employment period of Stage 2 by approximately five months.

This is the most effective way to mitigate the overall impact of the project's construction workforce and was driven in part by feedback received in early community consultation. The deliberate separation of peaks in demand for the two stages has been proposed to mitigate the impact on local communities and also as an effective way for UPC to maintain a level of work availability for the workforce across the two stages (ie avoiding demobilisation and remobilisation). The latter also benefits those people in the local community who are employed by the project by enabling greater continuity in employment.

As noted in Section 2.4.5, 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.

ii Workforce accommodation

Despite the staging of workforce numbers, there will be a greater demand for accommodation than can reasonably be met by local towns and regional centres.

A construction accommodation village may be constructed within the northern array area during the construction period. There may be a need to house approximately 250-500 workers on-site at the busiest periods. If constructed, it is anticipated that the construction accommodation village could be scaled up or down, depending on the need to absorb or shed surplus demand.

Accommodation on-site will be scaled to allow benefit to flow to local individuals and businesses with short term and long term accommodation available to rent, but to absorb accommodation demand once local vacancy rates reach the 2-3% range, which is generally considered a healthy range for rental property. The on-site accommodation might therefore conceivably only commence once local accommodation reaches a comfortable level, and then be expanded or reduced in scale as the size of the workforce builds and declines, including at times of high visitor numbers.

Regular engagement by UPC with the CRG (refer Section 4.6) or similar body will enable local communities to advise UPC of adjustments that may need to be made, for example, to accommodate more or less workers within the construction accommodation village (if required).

iii Workforce transportation

The movement of workers to and from the three array areas will be most pronounced when shifts commence or finish, although there may be demand at other times as well. The traffic implications of this impact on local roads will be mitigated by providing shuttle bus services, operated by or on behalf of UPC, between the three array areas and Uralla, and between Uralla and other centres for worker accommodation such as Armidale and Tamworth.

iv Local businesses

UPC proposes to procure and to encourage its contractors to procure goods and services, as far as possible, from local businesses. Logically, if the same standard of goods and services are available at competitive prices there is no reason to procure them from further afield. This will favour local businesses in any services or goods where reduced transport costs offer a competitive advantage or where costs are comparable with non-locally sourced goods and services.

v Community services

The potential demand on medical and well-being services in Uralla, which has only two GPs, can be alleviated by the provision of medical support within the construction accommodation village (if required) or on-site. This might comprise qualified nursing or related support services. This would enable less serious medical issues, such as minor injuries, to be attended without reference to local Uralla GPs.

vi Indigenous support and development

Local indigenous communities have a specific exposure to any distortions in the current rental accommodation market, and also have a generally lower employment status in terms of both security of tenure, pay and skills base. While no commitments have been made, UPC and the RAPs are in ongoing discussions about the potential for employment opportunities associated with the construction and operational stages of the project.

There is an opportunity to include an indigenous development plan as part of the overall construction and operation of the project. The construction period, being approximately 36 months, provides sufficient time for the project to include a program aimed at increasing indigenous training and employment.

The CBSI is also an opportunity for funds to be allocated to indigenous support programs, as appropriate.

vii Feedback mechanism

There is a residual risk of occasional incidents or trends that may cause concern to individuals or groups in the local communities. A publicly accessible system will be created, using a website 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 negative feedback can be investigated and resolved.

viii Construction workforce management plan

A primary means of planning and managing potential impacts to the local community (including availability of accommodation, infrastructure and services) will be through implementation of a construction workforce management plan (CWMP) or similar, which will likely include (but not be limited to):

- local workforce numbers and locations;
- transient workforce accommodation locations;
- 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;
- consultation frameworks with local providers to ensure fairness, open communication and forward planning, and grievance mechanisms;
- 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;
- a Code of Conduct for the project's workers (particularly to avoid anti-social behaviour at peak construction times); and
- how the CWMP will be managed and audited.

A key aim of the CWMP will be to achieve the best mix of benefits for the local community without placing pressure on accommodation and other local services.

5.12.5 Conclusion

The project will have the potential to cause both positive and negative impacts to local and regional communities, with most impacts occurring during construction.

There is a potential for the construction workforce to overwhelm the rental and temporary accommodation markets as well as community services such as GPs. However, this can be managed by the implementation of a construction schedule that avoids the peaks of the first and second stages overlapping and through the use of a construction accommodation village and ancillary services such as a medical post, management of which can be planned through implementation of a CWMP or similar prior to commencement of construction.

The project is likely to be welcomed by the community because of the considerable economic opportunities and the potential adverse social impacts associated with a large construction workforce can be managed to an acceptable level through a range of mitigation measures.

5.13 Economic

5.13.1 Overview

An economic impact assessment (EIA) was prepared by Gillespie Economics (refer Appendix O) in accordance with the requirements of the DPE as set out in the SEARs to include:

- an assessment of the likely social and economic impacts of the development (including the workers accommodation facility), paying particular attention to the:
  - local community;
  - demand for the provision of local infrastructure and services; and
  - benefits of the development for the State and region.

The study area for the EIA was defined as the LGAs that are likely to experience economic impacts from the project, which include:

- Uralla Shire LGA;
- Armidale Regional LGA; and
- Tamworth Regional LGA.

5.13.2 Existing environment

i Demographics and population trends

In 2016, the study area had a population of 95,160 and a labour force of 43,725, with Tamworth Regional LGA being the largest. The populations of Uralla, Tamworth and Armidale LGAs have grown by 5.5%, 11.3% and 6.7% respectively since 2006, and are forecast to grow further.

An indication of the health of an economy can be gained from population changes. This theory of regional economic growth suggests that places that are able to attract population immigration create increased demand for goods and services and thus more jobs. This growth leads to increasing local multiplier effects, scale economies and an increase in the rate of innovation and capital availability (Sorensen 1990). Conversely, population losses can contribute to a 'vicious cycle' of decline whereby reductions in the population results in closure of services, which in turn makes it difficult to attract immigration.

Due to trends in regional economies in NSW, there has been declining population in many rural LGAs in non-coastal areas in NSW. There has also been a decline in the population of smaller towns even in regions where the population has been growing.

Against this backdrop, it is evident that the population of the study area has grown relatively strongly, at a rate of 9.5% since 2006. This growth has been strongest in Tamworth Regional LGA.

ii Employment and industry

The Uralla Shire, Armidale and Tamworth LGAs have a population which typically experiences an unemployment rate of approximately 6-8%. In 2016, there were 2,786 people unemployed with the majority of these located in Tamworth Region LGA although the unemployment rate was highest in Armidale Regional LGA.

Youth unemployment in the Uralla Shire, Tamworth and Armidale LGAs is 14.3%, 12.2% and 17.9%, respectively, which is greater than the NSW state average (10.2%).

The main occupations of residents were professionals followed by managers (which includes farm managers). The percentage of usual residents employed as professionals was greatest in Armidale Regional LGA and Tamworth Regional LGA, while the percentage of usual residents employed as managers was greatest in Uralla Shire LGA.

The main industry sectors in which residents were employed in 2016 were beef cattle and sheep farming sectors for residents of Uralla Shire LGA, while hospitals and higher education are significant sectors of employment for residents of Tamworth Regional LGA and Armidale Regional LGA, respectively.

The Gross Regional Product (GRP) of the study area was estimated at $5,293 million for 2018.

The region is a net importer, with exports out of the region of $1,961 million and imports into the region of $3,343 million. The largest exporting industries by value are:

- meat and meat product manufacturing ($503M);
- sheep, grains, beef and dairy cattle farming ($380M);
- finance ($110M); and,
- technical, vocational and tertiary education ($109M).

Exporting sectors are considered to be key drivers of economies that are based on a region's endowments and competitive advantages.

Conversely, the largest importing industries in the region are:

- sheep, grains, beef and dairy cattle farming ($194M);
- construction services ($160M);
- wholesale trade ($102M); and
- professional, scientific and technical services ($91M).

5.13.3 Assessment of impacts

An input-output (IO) analysis was undertaken, which identifies the economic impact of a project on the economy in terms of four main indicators:

- gross regional output – the gross value of business turnover;
- value-added – the difference between the gross value of business turnover and the costs of the inputs of raw materials, components and services bought in to produce the gross regional output. These costs exclude income costs;
- income – the wages paid to employees including imputed wages for self-employed and business owners; and
- employment – the number of people employed (including self-employed, full-time and part-time).

As well as providing an indication of gross economic activity in a region, IO analysis can have important links to social impact assessment since changes in income and employment levels can impact population levels and their ability to maintain community infrastructure (schools, hospitals, housing etc), broader community and cultural value systems and inter-relationships.

i Construction

Economic activity associated with the project construction is estimated to mainly occur within three sectors of the economy:

- the heavy and civil engineering construction sector, which includes businesses involved in road construction, assembly of electrical machinery from prefabricated components etc;
- the construction services sector, which includes businesses involved in site preparation services, concreting services, structural steel erection services, electrical services, hire of construction machinery with operator etc; and
- the electrical equipment manufacturing sector, which includes the manufacturing of electricity transmission equipment, switchgear, transformers, etc.

Given the largely specialist nature of capital equipment and the relatively small size of the regional economy, for the purpose of the analysis an assumption is made that all such purchases are made outside the regional economy. For example, there is only one Australian manufacturer of transformers, Wilson, which manufactures its product in Victoria. Regional economic activity during construction primarily relates to the heavy and civil engineering construction sector and construction services sector.

The average annual construction workforce required for the project during construction is estimated at 140 in year 1, 515 in year 2 and 193 FTEs in year 3. Based on the IO analysis of the combined heavy and civil engineering construction sector and construction services sector in the regional economy, the level of expenditure required in these sectors to generate this level of employment is $64M, $236M and $89M, respectively.

The direct and indirect regional economic impact of this level of expenditure in the local and regional economy is reported in Tables 5.32, 5.33 and 5.34.

Table 5.32 Economic impacts of the construction workforce in the study area (Year 1)

	Direct	Production induced	Consumption induced	Total flow-on	Total effect	Adjusted total effect
OUTPUT ($M)	64	37	22	59	123	116
VALUE ADDED ($M)	23	15	13	28	50	46
INCOME ($M)	13	8	6	14	27	25
EMPL. (No.)	140	106	102	208	348	314

Notes: Totals may have minor discrepancies due to rounding.

Table 5.33 Economic impacts of the construction workforce in the study area (Year 2)

	Direct	Production induced	Consumption induced	Total flow-on	Total effect	Adjusted total effect
OUTPUT ($M)	236	136	80	216	452	425
VALUE ADDED ($M)	83	55	47	102	185	169
INCOME ($M)	48	31	21	52	99	92
EMPL. (No.)	515	389	377	766	1,281	1,155

Notes: Totals may have minor discrepancies due to rounding.

Table 5.34 Economic impacts of the construction workforce in the study area (Year 3)

	Direct	Production induced	Consumption induced	Total flow-on	Total effect	Adjusted total effect
OUTPUT ($M)	89	51	30	81	169	159
VALUE ADDED ($M)	31	21	17	38	69	63
INCOME ($M)	18	12	8	19	37	35
EMPL. (No.)	193	146	141	287	480	433

Notes: Totals may have minor discrepancies due to rounding.

The IO analysis indicates that construction is most likely to directly impact the heavy and civil engineering construction sector and construction services sector. Flow-on impacts from the construction of the project are likely to affect a number of different sectors of the regional economy. The sectors most impacted by output, value-added, income and employment flow-ons are likely to be heavy and civil engineering construction, construction services, professional, scientific and technical services, wholesale and retail trade, food and beverage services and road transport.

ii Operations

The main income to the region during operations relates to wages, equipment hire, vegetation maintenance, the proposed CBSI (refer Section 4.6) and lease payments to project landholders. It was conservatively assumed that lease payments to project landholders were not reinvested in the region.

The project is estimated to make up to the following total annual contribution to the regional economy for 30 years (in 2018 dollars):

- $86M in annual direct and indirect regional output or business turnover;
- $26M in annual direct and indirect regional value added;
- $3M in annual direct and indirect household income; and
- 39 direct and indirect jobs.

The flow-on impacts are likely to affect a number of different sectors of the local and regional economy, predominantly agriculture, forestry and fishing support services, rental and hiring services and retail trade.

iii Agricultural impacts

The land within the project boundary is predominantly used for sheep grazing. During construction, agricultural production within the development footprint will be limited. Following the completion of construction activities during the operation of the project, there will be opportunities for sheep to graze parts of the array areas.

While there is some loss of agricultural activity to the region (in the order of 0.2-0.3%), this is a private economic decision made by the project landholders for which they are compensated. Annual foregone revenue during construction and operations is estimated to be in the order of $1.8M and $1.2M, respectively. For the purposes of modelling, it was conservatively assumed that there would be no agricultural activity during construction, which is likely to have overstated the potential impacts.

The regional economic activity impacts of foregone agricultural activity are less than those of the construction and operation of the project. Therefore, as well as the project landholders being better-off than they were before, in terms of economic activity, the regional economy will also be better-off.

Impacts on agricultural activity during project operations will be reduced when compared with construction as there will be an opportunity for the grazing of sheep between the rows of PV modules to help manage vegetation growth. In addition, the majority of the project landholders will continue with their existing agricultural operations on the land surrounding the three array areas.

The project is not anticipated to impact the capability of the land for future agricultural production. The soil will be rested from intensive grazing and cropping activities. 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.

5.13.4 Mitigation measures

A range of general economic impact management measures are proposed and will include:

- ensuring regional residents are made aware of employment opportunities and lead contractors are encouraged to hire regional residents where they have the required skills and experience and are able to demonstrate a cultural fit with the organisation;
- participation in business group meetings, events or programs in the regional community designed to make regional businesses aware of upcoming contracting opportunities and requirements;
- encouraging lead contractors to purchase local non-labour inputs to production, where local producers can be cost and quality competitive, to support local industries; and
- project design to enable continued sheep grazing within the three array areas will reduce level of agricultural impacts throughout project operations.

5.13.5 Conclusion

The construction and operation of the project will have a net positive impact on the level of economic activity in the study area. UPC will work with local stakeholders including the local community and the relevant LGAs to maximise benefits and minimise negative impacts.

The proposed CBSI (refer Section 4.6) will contribute an annual payment that can be directed to a range of community infrastructures and programs.

5.14 Air quality

5.14.1 Overview

The SEARs do not require an assessment of the project's potential air quality impacts. However, to address concerns raised by the neighbouring landholders in relation to dust generated during construction, a qualitative assessment of the project's potential air quality impacts has been undertaken.

The three array areas are in a rural setting, with the closest concentration of receptors in the town of Uralla, approximately 6 km west of the central array, and the regional city of Armidale, approximately 8.6 km north of the development footprint for the northern array.

The area surrounding the three array areas is sparsely populated, with the exception of land north-east of the northern array area within the suburb of Kellys Plains (refer Figure 5.6). There is a cluster of rural dwellings in this location; however, as noted within the VIA (Appendix I), visibility of the development footprint at these dwellings will be limited due to local topography and the presence of remnant and planted vegetation.

The primary industries within the Uralla Shire LGA are agriculture, forestry and fishing, followed by education and construction. These industries are unlikely to have a significant influence on local and regional air quality.

Many homes within the Uralla Shire LGA use wood burners in the winter months as the primary source of household heating, which can have a negative effect on air quality (Uralla Shire Council 2018c).

5.14.2 Existing environment

Existing sources of air pollution close to the development footprint are limited and typically comprise dust and vehicle exhaust emissions associated with transport and agricultural activities. Bushfires can also be a source of seasonal dust generation.

There is one facility within the Uralla Shire LGA that is required to report its emissions as part of the National Pollution Inventory (NPI) (DoEE 2018). This is the Phoenix Foundry, approximately 6.2 km west of the central array area. The Phoenix Foundry creates bronze memorial plaques and emits a small amount (29 g) of copper compounds to the air per year.

i Rural dwellings

A number of non-project related dwellings have been identified in the landscape surrounding the project boundary and, more specifically, the three array areas (Figure 5.6). Non-project related dwellings considered as part of this assessment are identified on Figure 5.6 and include:

- approximately 40 dwellings within 4 km of the northern array area, including dwellings within the suburbs of Kellys Plains, Dangarsleigh, Armidale, Arding and Saumarez;
- six dwellings within 2 km of the central array area, including dwellings within the suburbs of Uralla, Dangarsleigh and Gostwyck; and
- approximately 20 dwellings within 4.5 km of the southern array area, including dwellings within the suburbs of Uralla, Gostwyck and Salisbury Plains.

The closest non-project related dwelling is S9, approximately 240 m from the development footprint for the southern array area (Figure 5.6).

5.14.3 Assessment of impacts

i Construction

Emissions to the atmosphere from the project during construction will be temporary and restricted to dust caused by land disturbance and vehicle, plant and equipment exhaust emissions. Construction of the project will take approximately 36 months from the commencement of site establishment works.

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 three array areas which are already mostly cleared of vegetation have been selected. Civil works will be required to prepare the construction laydown area and the three array areas by installing fencing, internal access tracks, and undertaking minor earth works. In addition, there will be excavation of the trenches for the medium voltage and high voltage cable network that may be buried (minimum 600 mm) underground.

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 noted in Section 2.3.5, a construction accommodation village may also be established. To build the construction accommodation village, topsoil will be stripped where necessary, hardstand constructed and walkways and car parks constructed.

During construction, surface disturbance works will include:

- construction of access tracks and boundary fencing;
- driving or screwing piles to provide support for the mounting frameworks required for the PV modules;
- installation of DC cabling to connect the PV modules to the PCUs;
- installation of the MV cable reticulation network to transport electricity around each of the arrays;
- preparation of foundations for the substations and BESSs;
- construction of the BESS and relevant infrastructure;
- construction of transmission infrastructure between the solar array substations, the grid substation and TransGrid's 330 kV transmission line; and
- installation of permanent fencing and security.

Exhaust emissions will also be generated by the plant and equipment required for the construction of the project. These will include:

- vehicles travelling to and from the three array areas;
- 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 BESSs; and
- water trucks for dust suppression.

During decommissioning, no additional air quality impacts to those described above are anticipated. Total vehicle movements to and from the three array areas during decommissioning will be similar to those experienced during construction. However, it is anticipated that the length of the decommissioning stage will be shorter than the construction stage and therefore emissions to the atmosphere will also be experienced over a shorter period of time.

ii Operation

Ongoing maintenance of the three array areas and project infrastructure will be required during operation. The infrastructure maintenance activities listed in Section 2.6 will result in minor, localised vehicle emissions and generation of dust from vehicles travelling along the internal, unsealed access roads. Provided the recommended mitigation measures are implemented, predicted impacts will be adequately managed.

5.14.4 Mitigation measures

UPC will apply appropriate mitigation strategies to reduce potential dust generation by the project-related construction traffic. This may include measures within the TMP such as speed reduction along the unsealed portions of these local roads as well as consideration of localised sealing of the road adjacent to any residential property (eg Munsies Road near the corner of Big Ridge Road).

The project will not generate significant air quality impacts during construction, operation or decommissioning provided the following mitigation measures are implemented:

- use of a water truck(s) during construction for dust suppression along internal, unsealed access roads and disturbed areas;
- vehicle movements will be minimised where possible;
- all vehicles, plant and equipment will be cleaned and washed regularly;
- all vehicles, plant and equipment will be regularly inspected and maintained to ensure that they are operating efficiently;
- regular maintenance of unsealed access roads will be undertaken to minimise wheel generated dust; and
- dust suppression requirements during construction will take into consideration weather and the likelihood of extended dry periods which could exacerbate impacts.

The implementation of the recommended mitigation measures will ensure that the project will not generate significant air quality impacts during construction, operation or decommissioning.

5.15 Waste management

5.15.1 Overview

As part of the preparation of the EIS, consideration has been made as to how the project's waste will be managed in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with Uralla Shire Council.

This meets the requirements of the SEARs to:

- identify, quantify and classify the likely waste streams to be generated during construction and operation, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste.

The project will produce a number of waste streams during the 36 month construction period. Minor quantities of waste will also continue to be generated by the day-to-day operation of the project. Waste will also be generated as part of decommissioning at the end of the project's operational life (refer Section 2.7).

5.15.2 Assessment of impacts

Waste streams likely to be generated during the construction and ongoing operation of the project will include:

- cardboard packaging, plastic wrapping, plastic ties, wood pallets and other timber offcuts (eg wood separators to prevent damage to PV modules) for PV modules and tracker components;
- general waste from the O&M buildings;
- comingled recycling;
- oily rags, filters and drums (primarily during construction);
- waste batteries; and
- confidential documents.

Waste generated by the construction accommodation village (should it be required) will likely include putrescible waste, recyclable and general waste. Putrescible waste is generally food scraps that are generated by the main kitchen. Recyclable waste includes cardboard, paper, glass, bottles and cans. General waste is considered anything that can be recycled or reused.

A detailed summary of the waste types, classification, proposed management methods, and estimated annual quantities of wastes produced during the construction and ongoing operation of the project will not be available until the detailed design stage of the project has been completed. These will be included in the project's detailed waste management plan (WMP) prior to construction. The WMP will be prepared in consultation with Uralla Shire Council and DPE. In addition, UPC may also consult with neighbouring councils (eg Armidale Regional Council or Tamworth Regional Council) should the need for access to additional waste management facilities within the greater New England region be required.

Notwithstanding the need to consider specific issues as part of the preparation of the WMP, based on practical experiences with other solar farm projects the following can be anticipated:

- arrangements will be put in place between the EPC contractor selected for the project, a licensed waste management company and, where available, local sub-contractors (or similar);

- a significant proportion of the waste generated during construction is likely to be the cardboard packaging used for the PV modules and tracker components, which can be recycled (the volume of this waste stream may be in the order of several thousand kilograms per week during peak delivery periods);
- wooden pallets will be another significant waste stream during peak delivery periods and these can be reused if in good condition or sold for wood chip if damaged (the volume of this waste stream may be in the order of 1,000-2,000 units per week during peak delivery periods);
- PCUs will typically be self-contained (containerised) or pre-assembled on a skid or concrete mounted platform and will generate limited waste materials; and
- skip bins will typically be implemented on-site to encourage waste separation (eg separate skip bins for cardboard recycling and timber collection) and general waste bins will be provided for disposal of materials that cannot be cost-effectively recycled.

Potential impacts from poor management of waste include contamination of land and water, and human and animal health impacts.

Following consultation with Uralla Shire Council, it was noted that Uralla Landfill and Recycling Centre has some capacity to accept waste for landfill, and to process several different material types for recycling. The Uralla Landfill and Recycling Centre can accept metals, plastics, general waste, wood waste, cardboard, batteries, tyres, polystyrene and e-waste; however, the facility's capacity to accept each waste stream will be dependent on the volume provided and how it is provided (ie co-mingled or segregated wastes). It is anticipated that the volumes generated will exceed the capacity of the waste management facilities within the Uralla Shire LGA.

As part of consideration of how the project's waste will be managed, input from Armidale Regional Council and Tamworth Regional Council has been sought to determine the capacity of the waste management facilities within these two neighbouring LGAs to accept the project's waste during construction. Representatives from both Armidale Regional Council and Tamworth Regional Council noted that both councils do not typically accept waste from outside of their LGA. Armidale Regional Council is in the process of building a new landfill site, which will likely be operational prior to the commencement of construction. During consultation with Armidale Regional Council, it was noted that if there is sufficient capacity once this facility is built, Armidale Regional Council may consider waste from outside the LGA subject to a commercial agreement being established with UPC or the EPC contractor.

As part of the preparation of the WMP, UPC and the EPC contractor for the project will engage in further discussions with Armidale Regional Council and Tamworth Regional Council to determine whether there is potential for project waste to be disposed of at waste management facilities within their LGA.

5.15.3 Mitigation measures

To encourage the efficient use of resources and reduce potential environmental impacts from the project, all waste will be managed in accordance with the NSW *Protection of the Environment Operations Act 1997* (POEO Act), the NSW *Waste Avoidance and Resource Recovery Act 2001* and the following hierarchy, which is listed in order of preference:

- reduce waste production;
- recover resources; and
- dispose of waste appropriately.

All wastes produced by the project will be classified, stored and handled in accordance with the *Waste Classification Guidelines – Part 1: Classifying Waste* (EPA 2014). A detailed WMP will be prepared prior to construction commencing. This plan will include consideration of the following:

- measures to reduce the types and volumes of waste generated during construction;
- 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;
- a breakdown of anticipated waste streams and volumes;
- evidence of consultation with Uralla Shire Council, neighbouring councils and licensed waste management facilities to confirm the capacity of nearby facilities and their availability to manage the project's waste;
- on-site waste management measures in line with relevant guidelines; and
- commitments around disposal of project assets at the completion of operations.

A key objective of the WMP will be to ensure that any use of local waste management facilities does not disadvantage local businesses and, more generally, the local community, by exhausting any available capacity at these facilities. Consultation with Uralla Shire Council, neighbouring councils and licensed waste management facilities will continue throughout the implementation of the WMP.

The WMP will also include appropriate consultation frameworks with Uralla Shire Council, neighbouring councils and licensed waste management facilities to ensure maintain communication and forward planning and provide a grievance mechanism through which any identified adverse impacts can be addressed.

Should it be required, the WMP will also include a waste strategy for the construction accommodation village to ensure waste streams generated by this facility are managed appropriately. It is likely that the construction accommodation village will be managed by a contractor to the lead EPC contractor with considerable experience in managing similar facilities. All wastes produced at the construction accommodation village will be classified, stored and handled in accordance with the *Waste Classification Guidelines – Part 1: Classifying Waste* (EPA 2014).

General waste management measures at the construction accommodation will likely include:

- working with suppliers to reduce overall packaging as much as possible;
- bundling cardboard packaging and recyclable containers and storing them on-site until a scheduled collection with a licensed recycling contractor; and
- storage of general waste in vermin proof bins until a scheduled collection from a licensed contractor.

Biowaste reactors may also be used to transform putrescible waste to a soil additive, thereby eliminating demand for disposal.

As noted in Section 2.7, as part of decommissioning, UPC will attempt to recycle all dismantled and decommissioned infrastructure and equipment, where possible. For example, steel piles to support PV modules, tracker components and copper used in electrical conductors may be sold for scrap metal. In addition, materials in PV modules will be recycled, wherever possible. At the time of writing, there were no dedicated PV module recycling facilities established in Australia. However, it is anticipated that a high percentage of the materials within the PV modules will be able to be recovered and recycled during project decommissioning as the industry will have had time to develop. Structures and equipment that cannot be recycled will be disposed of at an appropriately licensed waste management facility.

5.15.4 Conclusion

The project will produce a number of different types of waste during construction, operations and decommissioning. All wastes produced by the project will be classified, stored and handled in accordance with the *Waste Classification Guidelines – Part 1: Classifying Waste* (EPA 2014).

A WMP will prepared and implemented in consultation with Uralla Shire Council and DPE. A key objective of the WMP will be to ensure that any use of local waste management facilities does not disadvantage local businesses and, more generally, the local community, by exhausting any available capacity at these facilities.

5.16 Cumulative impacts

5.16.1 Overview

The SEARs require an assessment of the likely stages of the development, including any cumulative impacts of the project and existing or proposed developments (including the approved Metz solar project).

Cumulative impacts can occur as the result of concurrent construction projects, as well as then the operation of any projects in what has become the 'new' existing environment. It is important to assess other potential projects to avoid seeing each project in isolation. This could lead to inadequate understanding of cumulative impacts on the local community and environment, and thereby failure to develop mitigation measures that appropriately address aggregated effects.

There are a number of projects either planned or already approved within the immediate region.

As noted in Section 5.5, Neoen is seeking to develop the Uralla Solar Farm (SSD 18_9534) within the Uralla Shire LGA, approximately 4.9 km north-west of the project (refer Figure 1.1).

Based on a review of DPE's Major Projects register and consultation with both Armidale Regional Council and Uralla Shire Council, it is understood that there are a number of other projects likely to be constructed within close proximity of the township of Uralla and the three array areas. These projects are concentrated in the Armidale Regional LGA and include:

- Metz Solar Farm (SSD 16_7931) – Clenergy proposes to develop a 100 MW PV solar farm at Metz, approximately 18 km east of Armidale (Figure 1.1) – the project was approved by the Minister for Planning on 18 July 2017.
- Tilbuster Solar Farm (SSD 18_9619) – Enerparc proposes to develop the Tilbuster Solar Farm within the Armidale Regional LGA, approximately 22 km north of the project. SEARs for the Tilbuster Solar Farm were released on 12 October 2018. Based on the information provided within the PEA, it is understood that if constructed, the proposed Tilbuster Solar Farm would cover an area of up to 150 ha and have a targeted capacity of around 300 MW (NGH 2018).
- Armidale High School's redevelopment – a proposed redevelopment of the existing high school to establish a new, purpose-built high school with a capacity of approximately 1,580 students.
- Continued expansion of UNE's Armidale campus to accommodate additional colleges and a small-scale solar farm (including construction of the Wright Block – three new residential blocks and associated infrastructure).
- Armidale Regional Airport's industrial park development, which will include a multi-purpose commercial land development, a business park, highway service centre and fully-serviced aviation related lots.
- Sustained upgrades to Armidale Regional Airport.

Due to the distance between the development footprint for the northern array area and the sites for the Metz and Tilbuster solar farms, an assessment of potential cumulative land use, traffic, visual and noise impacts from the concurrent construction of the Metz and Tilbuster solar farms and the project is not warranted.

5.16.2 Potential cumulative impacts

i Agricultural production and land use impacts

The land in the development footprint is zoned RU1 Primary Production under the Uralla LEP and is predominantly used for agricultural purposes. The majority of the land in the development footprint has been modified by historical land practices and past disturbances associated with land clearing, cropping and intensive livestock grazing.

The project is within the Uralla Shire LGA, which covers an area of 3,215 km^2 in inner north-east NSW. The development footprint represents approximately 0.87% of the total land area within the Uralla Shire LGA.

Parts of the development footprint for the project are mapped as BSAL as defined by the Strategic Agricultural Land Map – New England North West regional mapping presented in the Mining SEPP (refer Figure 5.5). As part of the project refinement process, the area within the development footprint that is mapped as BSAL has reduced from approximately 1,100 ha (within the PEA site boundary) to approximately 670 ha (within the development footprint for the three array areas presented on Figure 5.5), which represents a reduction of 40%. The project's residual impact on land mapped as BSAL represents approximately 0.02% of the total land area mapped as BSAL within NSW.

The proposed site for the Uralla Solar Farm is approximately 1,800 ha and is currently used for agricultural purposes, with the primary use being grazing with some historical cropping on parts of the site (GHD 2018). The proposed site for the Uralla Solar Farm is also part mapped BSAL. At the time of writing, it is unknown how much of the proposed site for the Uralla Solar Farm will be utilised for project infrastructure.

Assuming that the proposed site for the Uralla Solar Farm is utilised in its entirety, the combined area of the two projects would represent approximately 1.43% of the total land area within the Uralla Shire LGA.

The utilisation of agricultural land by the project and the Uralla Solar Farm will only result in a temporary negligible reduction in the overall agricultural productivity of the Uralla Shire LGA and the New England North West region.

It is acknowledged that the development of the project will reduce the utilisation of the land within the development footprint for agricultural production; however, this impact will be mitigated by a number of factors including:

- choice of PV module technology – the anticipated use of single axis tracking PV modules involves a typical row spacing of 5-8 m, which would leave a significant area of land (typically 60% or more within the fence line) that could still be utilised for sheep grazing during the project's operations;
- site selection – the three array areas have been strategically placed so that primary production can continue within the immediate surrounds and to reduce potential impacts on the use of neighbouring farm lands for primary production purposes; and
- return to agricultural land – the development footprint can be returned to agricultural land use at the completion of the project's operations.

Land management practises will avoid or minimise potential impacts to neighbouring agricultural operations that have been identified during engagement with the local community and as part of the LUCRA (Appendix F).

ii Traffic

The proposed site for the Uralla Solar Farm is approximately 11 km north of Uralla and lies between the New England Highway to the east and Mount Butler Road to the west. The proposed site for the Uralla Solar Farm and the project's northern array area is separated by approximately 4.9 km, which includes the New England Highway. If both projects are constructed, the common regional road used for the two projects will be the New England Highway.

Construction of the Uralla Solar Farm is expected to take 12-16 months and the project is expected to have a peak construction workforce of 500-600 with the majority accommodated in, and travelling to and from, Armidale.

As part of the TIA, a cumulative assessment, which assumed the peak stage of construction for both projects may occur simultaneously was performed (Appendix K). The only shared road network route between the project and the Uralla Solar Farm is the New England Highway. Therefore, cumulative traffic impacts have only considered potential impacts on the New England Highway.

The TIA assumed a maximum of 360 daily vehicle movements from the Uralla Solar Farm, conservatively assuming a similar number of vehicles as the project's construction vehicle volumes.

The results of the assessment concluded the potential daily traffic increases from the concurrent construction result in a 8.69% to 13.68% increase in traffic volumes on the New England Highway. These traffic increases are considered of minimal impact as the New England Highway is a well-constructed sealed 11 m wide carriageway. The New England Highway is constructed and designed to accommodate heavy vehicle movements. Furthermore, the projected peak daily traffic increase of between 8.69% to 13.68% will only occur for up to 12-16 months and under a concurrent construction scenario for the two projects (which is considered unlikely). Thereafter, it will return to a peak daily traffic increase of between 5.95% to 9.16% (ie project-generated construction vehicle movements only).

iii Noise

The NVIA (Appendix J) included consideration of potential cumulative construction impacts under a concurrent construction scenario for the project and the Uralla Solar Farm. The assessment found that the total cumulative construction noise level from both developments is expected to satisfy the NMLs during ICNG standard hours at the identified assessment locations. Therefore, cumulative noise from the project and the Uralla Solar Farm is not anticipated to cause an impact at the assessment locations considered as part of the NVIA (refer Figure 5.7).

The NVIA also assessed impacts from cumulative road traffic movements from both the project and the Uralla Solar Farm with a focus on road sections potentially common to both projects (ie the New England Highway). Road traffic volumes for the Uralla Solar Farm were conservatively predicted as similar to the project. In reality, the Uralla Solar Farm is a smaller project than the New England Solar Farm and actual road traffic noise levels would likely be much lower. However, using the higher, more conservative numbers, the total cumulative road traffic noise levels are predicted to be below the relevant RNP criteria during a concurrent construction scenario for the project and the Uralla Solar Farm.

iv Social

Social impacts can have a different sphere of influence than traffic and noise. The potential impacts can occur at many different sources at much greater distances and so for this reason, the SIA (Appendix N) considered the potential cumulative effects of a number of the projects listed in Section 5.16.1, with a focus on the Uralla Solar Farm. The majority of these projects will be constructed in the Armidale Regional LGA.

Cumulative construction impacts could result from the concurrent construction of the projects listed in Section 5.16.1. Staging of construction is therefore important. It is anticipated that the EIS for the Uralla Solar Farm and Tilbuster Solar Farm will take this project into account within their respective considerations of potential cumulative impacts.

A key challenge will be in the size of the workforce during the construction period, the workforce skills requirements and the material and services required for the construction of a number of these projects.

There could be pressure on Uralla and Armidale that benefits the local communities and economy with increased demand for resources, but also represent potentially negative impacts if peak workforces overlap. There may be some benefit to employment continuity if the projects are able to maintain a relatively steady level of demand by 'bookending' the peak periods of worker demand.

The other major projects (not related to renewable energy production) are located in or close to Armidale. A primary cumulative effect is potentially one of accommodation. It is unlikely that the Armidale projects will spill demand to towns such as Uralla given the availability of existing accommodation options in and near Armidale. Those projects may, however, displace accommodation demand associated with the project to areas other than Armidale if the availability of accommodation in Armidale is constrained.

The most likely means of absorbing that displaced demand will be through accommodation in Tamworth, where capacity may be available, or through the proposed construction accommodation village within the northern array area. As noted elsewhere, the capacity for accommodation at the construction accommodation village will be scalable to enable some responsiveness to accommodation issues. This is important given the number of variables which may influence the availability of accommodation at any given stage of construction for the project and other proposed developments.

As discussed in Section 5.12.4, a primary means of planning and managing potential impacts to the local community (including availability of accommodation, infrastructure and services) will be through implementation of a CWMP or similar. The CWMP will also assist with the management of potential cumulative impacts should concurrent construction of the project and a number of other developments within the immediate region occur.

It will also be important to implement the CWMP alongside a community engagement framework, which would likely form an addition to the project's stakeholder engagement strategy (refer Section 4.3). A community liaison officer or similar role will be required during construction. This may be the locally-based project manager employed by the EPC contractor or a specialist role.

If required, a community advisory group (similar to the CRG), which includes representatives from Uralla Shire Council, local business owners and key stakeholders could be established to meet on an as needs basis to discuss construction and workforce-related issues during the construction stage of the project. This will allow UPC and/or the EPC contractor to communicate the timing of upcoming construction activities, provide local businesses with advance notice of resource needs and allow the businesses to plan for material needs and peaks and troughs in demand. It could also provide community representatives with a forum for voicing concerns.

Concurrent operation of the projects listed in Section 5.16.1 is not likely to represent a substantive impact, whether considered individually or as a cumulative impact.

In terms of social impacts, concurrent operation of the project and other proposed solar farm developments (including Tilbuster, Uralla and Metz) is unlikely to be material, given the limited operational workforce required for large-scale solar projects. Local sub-contractors are likely to be able to adapt to the scale of demand for services during the operations stages of multiple projects, with this representing a positive opportunity.

v Visual

Due to distance between the project and the other projects listed in Section 5.16.1, cumulative visual impacts have only been considered between the project and the Uralla Solar Farm.

During construction, the landscape within the development footprint for the project and the Uralla Solar Farm will undergo a number of physical changes, namely through the installation of project infrastructure, which will add new features to the visual landscape.

Views of the two projects during construction may be possible for motorists travelling along the New England Highway; however, based on separation distances, it is anticipated that these views will be of only one project at any given time.

Views of the development footprint for both projects during construction may be possible from a limited number of receptors (ie rural residential dwellings). This may include dwellings within proximity of Viewpoint 14 on the New England Highway and dwellings within proximity of Viewpoint 15 on Saumarez War Service Road, Tuberosa Road, Wattle Drive and Arding Road (refer Figure 5.6). Both of these viewpoints are a distance of approximately 2.4 km from the development footprint of the northern array. Further, a review of aerial imagery indicates that there is vegetation present around each of these dwellings, which would act to further screen views of both projects during construction.

Due to their temporary nature, the site establishment works and construction activities for the project are considered unlikely to have any significant visual impacts on dwellings within proximity of Viewpoint 14 and Viewpoint 15.

Once operational, both projects may be visible to motorists travelling along the New England Highway; however, based on separation distances, it is anticipated that these views will be of only one project at any given time. At its closest point, the development footprint for the northern array area is approximately 1.9 km from the New England Highway. The distance to the development footprint will limit the scale of change and degree of contrast for views from this location. Further, it is assumed the focus of these motorists will be in line with their direction of travel along this major road corridor.

A limited number of receptors (ie rural residential dwellings within proximity of Viewpoint 14 and Viewpoint 15 – refer Figure 5.6) may experience combined distant views of the project infrastructure from both projects. However, spatial separation between the development footprint for the northern array area and the proposed site for the Uralla Solar Farm, variable elevation and undulation within the landscape between the two projects, the presence of significant transport infrastructure within the landscape between the two projects and vegetation present around these receptors, will limit potential for cumulative visual impacts to occur.

5.16.3 Mitigation measures

Mitigation measures for predicted effects are noted within each section above. However, in summary with specific reference to potential cumulative effects, proposed mitigation measures include:

- preparation of a CWMP; and
- development and implementation of a community engagement framework as part of the project's stakeholder engagement strategy.

With regards to the project's potential impacts on agricultural land, as noted in Section 5.5, 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. 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, as has been agreed with the project landholders.

6 Mitigation measures

6.1 Avoidance and minimisation through project design

During the preparation of the EIS, the development footprint within the project boundary has been refined on the basis of environmental constraints identification, stakeholder engagement, community consultation and design of project infrastructure with the objective of developing an efficient project that avoids and minimises environmental impacts (refer Section 1.4). In a number of instances, the irregular shape of the three array areas is a result of avoidance of identified impacts.

Key achievements in the project refinement process have been:

- Biodiversity – areas of PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tableland Bioregion particularly in the south-east of the southern array area (refer Figure 1.6) and the north-east of the northern array area (refer Figure 1.4) have been avoided as these areas were considered to have the largest patch size, highest density of trees remaining and the highest level of connectivity.

- Aboriginal cultural heritage – all 96 sites identified during the field survey performed as part of the preparation of the ACHA were previously within the proposed area of impact. Through the project refinement process, all sites of high significance and most sites of moderate significance have been avoided (refer Section 5.3).

- Historic heritage – reductions to the extent of the southern and central array areas have reduced the area of the development footprint within the modern extent of Gostwyck Station by approximately 234 ha (refer Figure 1.5 and Figure 1.6). Refinements to the central and northern array areas have also avoided potential impacts to a number of sites of historic heritage significance.

- Visual – in response to feedback received from neighbouring landholders (including S9 and N1) and the local community (particularly residents on The Gap Road and Gostwyck Road), significant revisions have been performed to greatly reduce the extent of the development footprint in the southern and northern array areas. This has reduced the level of potential visual amenity impact on a number of receptors. An area of approximately 585 ha north of Salisbury Waters has been excluded from the development footprint for the southern array area and an area of approximately 315 ha has been excluded from the development footprint for the northern array area (refer Figure 5.6).

- Land use – an area identified by GSNSW –DRG as an area of higher mineral significance has been removed from the southern array area (refer Figure 1.6). In addition, significant reductions to the extent of the northern and southern array areas have reduced the extent of BSAL within the development footprint for the three array areas by 40% to approximately 670 ha.

- Water - the development footprint provides appropriate setbacks from all 3rd order streams and higher. Project refinements have also reduced the number of creek crossings required as part of the project's internal access tracks. Placement of PV modules and ancillary infrastructure within 1st and 2nd order watercourses within the development footprint will be minimised to the extent practicable.

Opportunities to further avoid and minimise impacts through detailed design and construction will be investigated. Key areas for consideration in the detailed design and construction process include:

- minimising surface disturbance within the development footprint through refinements to the proposed layout and placement of infrastructure;
- choice of laydown areas and construction methods to minimise disturbance, where practicable; and
- continuing to consult with relevant stakeholders (including both regulatory and community) to ensure desired management outcomes are understood.

6.2 Environmental management and mitigation measures

As noted in Section 2.8, an environmental management strategy will be implemented to provide the strategic framework for environmental management of the project. The strategy will:

- incorporate the EMP, all other required plans, protocols, management and mitigation measures proposed in this EIS;
- 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 neighbouring landholders, the local community and relevant agencies, including Uralla Shire Council, about the operation and environmental performance of the project; and
- establish procedures for handling of complaints, disputes, non-compliances and emergency response.

The mitigation measures outlined in this EIS will be incorporated into the detailed design and construction of the project and into the EMP or sub-plans as relevant. A summary of mitigation measures is provided in Table 6.1.

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
Biodiversity	• Additional measures to avoid and minimise direct impacts will be outlined in the CEMP and OEMP and will include: – avoid and minimise clearing impacts to PCTs, where possible; – clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development footprint; – appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed; – identify the location of any 'No Go Zones' in site inductions; – limit removal of trees (including dead trees) to that required within the development footprint in support of the installation of project infrastructure; – a clearing procedure will be implemented during the clearing of the development footprint, as follows: – preclearance surveys will be completed to determine if any nesting birds are present; and – 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; – installation of appropriate exclusion fencing around trees and woodland to be retained within the development footprint whilst construction is occurring; – 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; – appropriate education should be provided to site personnel in site inductions regarding the purpose of exclusion fencing or no go zones; – speed limits within the development footprint will be limited to 40 km/hr and stated in the CEMP and OEMP; – source controls, such as mulching, matting and sediment fences, will be utilised where appropriate; – an ESC plan will be prepared in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) prior to commencement of construction; – disturbed areas will be stabilised and rehabilitated as soon as possible to reduce the exposure period; – a specific creek crossing sub-plan will be included as part of the CEMP; and – all creek crossings are to comply with the *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI 2003). • Additional measures to avoid and minimise indirect impacts will be outlined in the CEMP and OEMP and will include: – 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 – lighting to comply with Australian standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting.
Aboriginal cultural heritage	• An Aboriginal Heritage Management Plan (AHMP) will be developed in consultation with DPE, the RAPs and OEH. It will provide details of: – all Aboriginal sites identified during the archaeological investigation for the project; – management measures and their progress towards completion; – measures to ensure ongoing consultation and involvement of project RAPs; – RAP access arrangements for a selection of significant sites for educational purposes; – protocols for newly identified sites;

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	– protocols for educating staff and contractors of their obligations relating to Aboriginal cultural heritage values through a site induction process; – protocols for suspected human skeletal materials; – protocols for the ongoing care of salvaged Aboriginal objects within a keeping place; and – provisions for review and updates of the AHMP. The AHMP will be prepared after project approval, and in addition to the points above, will address all relevant conditions of approval. The AHMP will provide the details of the management measures outlined in full in Appendix D. • Aboriginal sites identified as part of archaeological survey will be managed in accordance with the management strategies presented in Table 9.2 of Appendix D. • 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. A construction buffer of at least 20 m will be applied to the demarcated boundaries of these sites. A suitably qualified archaeologist accompanied by a RAP representative will demarcate site locations and where the poles should be erected. • 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. • A semi-permanent or permanent boundary fence will be erected around site NE09 to protect it from livestock or other accidental damage. UPC 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. • All sites identified within the ETL options surveyed as part of the ACHAR will be avoided during detailed design. This will be achieved through spacing supporting structures to avoid site impacts. A buffer of at least 20 m to poles will be given to all sites near the ETL options. • Sites that occur over 20 m from the development footprint will be passively avoided without protection. • All surface artefact sites (artefact scatters and isolated finds) impacted by the project will be collected. This will involve collecting the entire visible contents of 30 isolated artefacts and seven artefact scatters. The collection will be undertaken by qualified archaeologists and RAP representatives in accordance with the methodology provided in Section 9.2.4 of the ACHAR (Appendix D). • The ACHAR details the special procedures to be followed as part of the management of Aboriginal cultural heritage, including: – Aboriginal keeping place - RAPs have nominated that the recovered objects be kept at the Armidale and Region Aboriginal Cultural Centre and Keeping Place. UPC 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. – 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 (refer Section 9.3.2 of Appendix D). – Aboriginal ancestral remains – In the event that known or suspected human remains are encountered during the project’s construction, the procedure detailed in Section 9.3.3 of Appendix D will be followed as soon as the suspected remains are discovered. – Discovery of new Aboriginal sites – In the event of discovery of new Aboriginal sites within the development footprint, the procedure detailed in Section 9.3.4 of

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	Appendix D 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. • Further survey targeting any mature trees not already inspected as part of the ACHA is required during the public exhibition period. Any new scarred or carved trees identified will be recorded, assessed and managed in a manner consistent with the ACHAR. • Impacts to 10 sites identified during archaeological survey and the management of those sites is currently unknown. Additional assessment requirements, proposed management measures, and evidence of RAP and OEH consultation will be provided prior to or as part of the RTS report to ensure DPE can consider any new information prior to project approval. Additional assessment will involve expert assessment of five scar trees that are possibly naturally made rather than Aboriginal made. • To explore opportunities to maximise the development footprint, a test excavation program will be completed during either public exhibition of the EIS or preparation of the RTS report. The scope of test excavation and the selection of sites for sampling (NE15, NE27, NE70, NE83 and NE33) will be determined in consultation with the RAPs and OEH. The results of excavation and subsequent management measures derived from the results will be formulated in consultation with RAPs and will be provided prior to or as part of the RTS report so that DPE and OEH can consider any new information prior to project approval
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. • 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. • 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. • 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). • 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. • 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). • Physical impacts to HNE11 as a result of the proposed ETL will be avoided through involvement of an archaeologist in the detailed design of the ETL alignment and during pole placement within the corridor, if the exclusion zone shown in Figure 5.4 cannot be avoided altogether. • The 'gateway' that is currently used for farm access through HNE11 will be protected from impacts by all project-related vehicle movements. Heavy bollards will be placed to allow a 13 m width for vehicle circulation, and project personnel will be informed of the significance of this site as part of site induction and daily toolbox talks. Modifications

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	permitted in the vicinity of HNE11 should be limited to the preparation of the access track surface, where relevant, the laydown of gravel or similar, and minor excavation of drainage swales on either side of the track only. • Protection from inadvertent impacts to HNE12 will be employed through active management with the use of sturdy bollards set on its perimeter. A curtilage of 10 m will be provided to the dry-stone wall. • The former stockyard HNE26 may be investigated as part of the Aboriginal archaeological test excavation proposed at the location of this site, as it is predicted that, at most, post holes will survive. If post holes are found, they will be recorded using archival quality digital photographic techniques and a site plan will be drawn as part of the record. Test excavation at this site as part of the ACHA will only occur if UPC want to explore opportunities to develop at this location. • 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. Appropriate management measures range from do nothing to archaeological excavation.
Land	• An ESC plan will be prepared in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) prior to commencement of construction and will include: – site specific ESC plans will be developed for use during site preparation works, construction and operations; – ESCs will be installed, with priority given to sloped areas and areas adjacent to drainage lines; – 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; – 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; – where practicable, UPC will minimise the disturbance of soils (especially subsoil) or stockpiles at times immediately following significant rainfall events (eg 25 mm in 24 hours); – disturbed areas will be stabilised and progressively rehabilitated as quickly as possible; and – 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. • 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. • 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. • 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. • To address concerns raised by surrounding landholders in relation to security during construction: – a zero tolerance policy on theft will be implemented on-site throughout the project's construction period; – criminal background checks on all staff, contractors, sub-trades and security guards will be performed;

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	– surrounding landholders, project landholders and law enforcement will be provided with the primary contractor's contact information; – surveillance cameras and signs will be implemented to deter vandalism and theft; – the temporary construction site compound will be established in a fenced-off area within the development footprint; – chain mesh security fencing will be installed within the project boundary around the perimeter of the three array areas to control access; and – should it be required, surveillance cameras and signs will be implemented at the construction accommodation village to deter vandalism and theft and security fencing will be installed around the construction accommodation village to control access.
Visual	• Landscaping is proposed to reduce visibility of project infrastructure from the dwelling at S9 and within the property boundary. The final location and extent of landscaping will be determined during detailed design and following subsequent discussions with the project landholders and property owners of S9. • Landscaping to mitigate views of project infrastructure at Viewpoint 1 and Viewpoint 5 will be considered in consultation with project landholders and the tenant at S11 and the property owners of N1, respectively. • 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 three arrays. • All external lighting will be installed as low intensity lighting (except where required for safety or emergency purposes) and will comply with Australian Standard AS 4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor.
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: – 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; – minimise the number of plant items operating concurrently when in close proximity to surrounding receivers; – planning deliveries and access to occur quietly and efficiently and organising parking only within designated areas away from nearby receivers (where possible); and – appropriate respite periods to be implemented after high noise and vibration-generating activities are carried out in continuous blocks. • Universal works practices during construction will include: – regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration; – regular identification of noisy activities and adoption of improvement techniques; – developing locations for parking of vehicles to minimise noise; – minimising the movement of materials and plant and unnecessary metal-on-metal contact; – minimising truck movements; and – scheduling respite periods for intensive works including consultation with potentially affected neighbours. • Additional measures for plant and equipment will include: – choosing quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks;

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	– operating plant and equipment in the quietest and most efficient manner; and – 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. • Additional measures for work scheduling include: – 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); – scheduling work during OOH periods to exclude work within OOH buffer zones outlined in Section 9.3 of Appendix J; – 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; and – optimising the number of deliveries to site by amalgamating loads where possible.

Transport	• A TMP and Driver Code of Conduct will be prepared prior to commencement of construction and will include the following requirements:
	– a dilapidation survey to be conducted to assess condition of the proposed vehicle routes;
	– a swept path analysis of the following intersections:
	  – New England Highway/Barleyfields Road (primarily for vehicles turning right onto Barleyfields Road);
	  – Barleyfields Road/Big Ridge Road;
	  – Thunderbolts Way/Salisbury Plains Road;
	  – New England Highway/Salisbury Street and then onto Duke Street; and
	  – potential alternate heavy vehicle routes that could alleviate the volume of project-related vehicles travelling through the township of Uralla (should it be required);
	– a map of the primary access routes highlighting critical locations;
	– 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 northern and central array areas;
	– safety initiatives for transport through residential areas and/or school zones;
	– consideration for coordination of construction traffic with seasonal agricultural haulage;
	– an induction process for vehicle operators and regular toolbox meetings;
	– a complaint resolution and disciplinary procedure; and
	– community consultation measures for the peak construction period.
	• 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.

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	• 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. • To minimise impacts on traffic flow in the township of Uralla and surrounds during the operation of school bus services, the project's construction material deliveries and other heavy vehicle movements will avoid peak hour and school bus times, whenever possible. • UPC is also mindful of the safety of drivers at level crossings in the Uralla Shire LGA and, subsequently, additional RMS tips and safety guidelines will be included in the Driver Code of Conduct as part of the TMP. • 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. • 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 RMS and Uralla Shire Council. • The following road and intersection improvement works, which will be confirmed in consultation with RMS 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 three array areas: – New England Highway/Barleyfields Road (north) and New England Highway/Barleyfields Road (south) including Wood Street intersections require left and right turn traffic lanes (CHR/CHL), particularly during periods of peak construction activity. The TMP will also consider the temporary conversion of the New England Highway/Barleyfields Road (north) intersection to seagull type operation to ease right turning movements by large trucks entering and departing from Barleyfields Road (north). – Consider implementation of temporary traffic control at the Barleyfields Road level crossing, particularly during the peak construction period. – Gravel shoulder widening at the Thunderbolts Way/Salisbury Plains Road intersection, pending the results of the swept path analysis of this intersection during the preparation of the TMP. • UPC will be required to lodge a Section 138 Certificate (Work on Public Lands) for approval before any future road work for the intersection improvement is carried out. • Consideration will be given to temporary travel speed reduction and regular watering of the unsealed section of Big Ridge Road and Munsies Road. UPC may consider speed limits, dust suppression with water spraying or localised sealing or treatment of the road with dust suppression polymers adjacent to the residential properties along these roads. • During construction, a road maintenance program will be implemented for the affected local roads near the development footprint for the three array areas. The program will be based around bi-monthly route inspections of all the affected roads and may include items such as: – regrading of the road surface to repair potholes and road corrugations at regular intervals and in response to identified serviceability and safety concerns; and – a commitment by UPC to restore the road surfaces to their pre-construction condition at the completion of construction. – The road maintenance program will be prepared in consultation with Uralla Shire Council and its effectiveness will be reviewed during the construction period. • Should it be required, UPC will also regularly treat the road surface of the unsealed sections of a number of local roads to reduce potential dust impacts by project-related traffic during the construction period.

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
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 DoI Lands and Water prior to commencement of construction. • Placement of PV modules and ancillary infrastructure (ie footings and pilings) within 1st and 2nd order streams will be minimised to the extent practicable. • Watercourse crossings of 1st and 2nd order streams for internal access tracks and electrical cabling will be minimised to the extent practicable. • 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. • Progressive revegetation or stabilisation of disturbed areas to minimise exposed soils to the extent possible. • Implementation of procedures for hazardous material storage and spill management to be prepared and documented within the CEMP. • 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. • 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. • 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. • Monitoring of watercourse and VRZ condition for all retained watercourses where these run through or immediately adjacent to the development footprint will be undertaken, with maintenance as required to minimise scouring and erosion and ensure waterway health and stability. • Monitoring and maintenance of ground cover vegetation and other stabilised surfaces throughout operation to limit erosion and transport of sediment to watercourses. • Implementation of procedures for hazardous material storage and spill management to be prepared and documented within the OEMP. • If required, a STP to service the construction accommodation village would be designed and installed by the lead contractor in accordance with the relevant design standards and regulatory requirements, and in consultation with DPE, Uralla Shire Council, the EPA, DoI Lands and Water and OEH. Any required licence to operate would also be obtained.
Hazards and risks	• An ERP will be required for the project and should incorporate all relevant safety procedures and normative management recommendations detailed in the relevant acts, regulations and AS. The ERP as a minimum (but not necessarily limited to) will: – include the requirements for pre-bushfire season and continual fire awareness of staff and contractors; – include the requirements for immediate notification to the local RFS and FRNSW of accidental ignition of surrounding grassland; – 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; – 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; – 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);

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	– identify the circumstances under which different evacuation types are to be implemented, in response to a bushfire or fire emergency; – include a mechanism for the early relocation of staff in the event of a bushfire in the locality; – contain detailed plans of all Emergency Assembly Areas including 'on-site' and 'off-site' arrangements; – include requirements for appropriate on-site refuge area signage and communications; – contain details of infrastructure layout within the three array areas that show all relevant information (ie access points, fences, locked gates, water supply, areas of electrical hazard); – include transportation arrangements (eg number of vehicles required), designated assembly points and time required to have transportation available; – identify the specific structure and role of emergency control on-site (eg fire wardens); – include the requirements for training in preparation for response to an emergency; – 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; – include the requirements for egress and communication in the scenario that persons are leaving the project as emergency services are attending; – include details on appropriate egress routes from the different array areas; – 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 three array areas; – 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 – 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 three array areas. The hazards and risks assessment prepared by Sherpa Consulting (refer Appendix L) 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: – A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan (NSW RFS 2014); and – Australian Standard 3745-2010 Planning for emergencies in facilities (Standards Australia 2010).
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). • 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.

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	• The primary site access points will be from Big Ridge Road, Munsies Road, The Gap Road, Salisbury Plains Road, and Hillview Road. Emergency access points may also be required and will be identified as part of the project's ERP. 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: – minimum carriageway width of 4 m; – the capacity for fire fighting vehicles to pass by; – avoiding grades greater than 15 degrees (°) if sealed and 10° if unsealed; – minimum vertical clearance of 4 m to any overhanging obstructions, including tree branches; – will not have a cross fall of more than 10°; – the capacity to carry a fully loaded fire fighting vehicle (which may be up to 28 tonne); – appropriate drainage and erosion controls; and – all weather access is provided. • 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. • 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. • 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. • 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: – maintenance of buildings, roads, fuel levels and water supply; – appropriate work procedures, so as to limit the potential of ignition of surrounding grassland; – monitoring and review of the FMP to maintain its effectiveness; and – maintenance of fire awareness through inductions, briefings, pre bushfire season drills, formal meetings, standard operating procedures and ongoing monitoring. • Should the construction accommodation village be required: – a 50 m wide APZ around the perimeter of the construction accommodation village, with specific vegetation management measures within the construction accommodation village site, associated APZ, and corridors on both sides of the access driveway and any internal service roads to reduce the potential for grass fires; – buildings will be constructed to comply with AS 3959 – 2009 Construction of Buildings in Bushfire Prone Areas and Addendum Appendix 3 of PBP (RFS 2006) and will incorporate non-combustible external cladding and specific measures to reduce the potential for ember attack; – construction of the main entrance road and internal road network to cater for fire fighting equipment and activities; – provision of a static water supply within the construction accommodation village; and

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	– preparation of an ERP that provides advice and protocols on the evacuation of the construction accommodation village during emergencies that may impact the construction accommodation village and its occupants.
Social	• Shuttle bus services, operated by or on behalf of UPC, between the three 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. • UPC proposes to procure goods and services, as far as possible, from local businesses. • 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. • A CWMP, or similar, will be prepared, which will likely include (but not be limited to): – local workforce numbers and locations; – transient workforce accommodation locations; – 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; – consultation frameworks with local providers to ensure fairness, open communication and forward planning, and grievance mechanisms; – 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; – a Code of Conduct for the project's workers (particularly to avoid anti-social behaviour at peak construction times); and – how the CWMP will be managed and audited. • The potential demand on medical and well-being services in Uralla, which has only two GPs, can be alleviated by the provision of medical support within the construction accommodation village (should it be required) or on-site.
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. • Participating, as appropriate, in business group meetings, events or programs in the regional community. • 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. • Vehicle movements will be minimised where possible. • All vehicles, plant and equipment will be cleaned and washed regularly. • All vehicles, plant and equipment will be regularly inspected and maintained to ensure that they are operating efficiently. • Regular maintenance of unsealed access roads will be undertaken to minimise wheel generated dust. • Dust suppression requirements during construction will take into consideration weather and the likelihood of extended dry periods which could exacerbate impacts.
Waste management	• All waste will be managed in accordance with the NSW Protection of the Environment Operations Act 1997 (POEO Act), the NSW Waste Avoidance and Resource Recovery Act 2001 and the following hierarchy, which is listed in order of preference: – reduce waste production;

Table 6.1 Summary of management and mitigation measures

Key issue	Proposed management and mitigation measure
	– recover resources; and – dispose of waste appropriately. • All wastes produced by the project will be classified, stored and handled in accordance with the Waste Classification Guidelines – Part 1: Classifying Waste. • A detailed WMP will be prepared prior to construction commencing. This plan will include consideration of the following: – measures to reduce the types and volumes of waste generated during construction; – 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; – a breakdown of anticipated waste streams and volumes; – evidence of consultation with Uralla Shire Council, neighbouring councils and licensed waste management facilities to confirm the capacity of nearby facilities and their availability to manage the project's waste; – on-site waste management measures in line with relevant guidelines; and – commitments around disposal of project assets at the completion of operations.
Cumulative impacts	• Preparation of a CWMP. • Development and implementation of a community engagement framework as part of the project's stakeholder engagement strategy.

7 Evaluation and conclusion

7.1 Introduction

The Secretary's Environmental Assessment Requirements (SEARs) require the environmental impact statement (EIS) to address the reasons why the development should be approved having regard to the relevant matters for consideration under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), including the objects of the act and how the principles of ecologically sustainable development (ESD) have been incorporated in the design, construction and future operation of the project. This chapter presents the overall impacts and benefits of the project, with regard to strategic need, biophysical, social and economic impacts.

7.2 Strategic need

As demonstrated in detail in Section 3.1, the development of the project is consistent with Commonwealth and NSW Government strategic planning and policy objectives, initiatives and regional plans, the priorities of the Australian Energy Market Operator (AEMO) in planning for the future energy mix, as well as international agreements to which Australia is a signatory.

The project will support the Commonwealth and NSW governments to achieve their respective renewable energy and greenhouse gas (GHG) emission reduction targets. The production of renewable energy directly aligns with the objectives of the NSW Government's Renewable Energy Action Plan (REAP) and the project will contribute to increased energy security through valuable contributions to a more diverse energy mix.

As discussed in Section 3.1, the development of the project, in conjunction with other large-scale renewable energy projects, has potential to fill the need for replacement power as ageing coal-fired generators face closure and continue to encounter failures. The construction of the project will also contribute to the future development of the New England region as a 'renewable energy zone' (REZ) as identified by TransGrid, the NSW Government and AEMO.

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. The project is permissible with development consent and is consistent with the objectives of the RU1 zone. The project will harness a natural resource, namely solar energy. While the development of this project will impact the availability of land for other primary production, it will allow for and encourage diversity in the area's land use and will provide economic stimulus and support to rural communities. The project will not fragment or alienate any resource lands during its operation and could be easily returned to agricultural land following decommissioning. Further, sheep grazing for vegetation management may occur during operations. Co-existence with sheep grazing activities would reduce the project's impact on primary production and maintain a multi-purpose land use throughout the life of the project.

The values of the community within the Uralla Shire local government area (LGA) include references to job opportunities for a wide range of skills and aptitudes, a diverse economy and sustainability. The project will provide a number of direct and indirect social, economic and environmental benefits that align with these values, including the creation of employment opportunities, diversification of revenue streams and significant reductions in GHG emissions. UPC has engaged with key stakeholders including NSW Department of Planning and Environment (DPE), the NSW Renewable Energy Advocate (REA) and Uralla Shire Council regarding the project with the objective of integrating appropriate standards and guidelines into the development, construction and operation of the project.

Should the project not proceed (ie the 'do nothing' scenario), the potential project benefits described within the EIS 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.

The construction of several major renewable energy projects will be necessary to replace the output lost from the retirement of ageing coal plants in NSW in the next five to ten years.

7.3 Design development and assessment principles

The project has been designed to avoid and minimise impacts where possible. During the preparation of the EIS, the development footprint within the project boundary has been refined on the basis of environmental constraints identification, stakeholder engagement, community consultation and design of project infrastructure with the objective of developing an efficient project that avoids and minimises environmental impacts.

Throughout the project refinement process (refer to Section 1.4.2), UPC has made considerable effort to avoid potential environmental impacts, where possible. In those instances where potential impacts cannot be avoided, UPC's design principles have sought to minimise environmental impacts and/or implement mitigation measures to manage the extent and severity of any residual environmental impacts. The proposed mitigation measures that will be implemented for each of the key environmental matters assessed in this EIS are summarised in Section 6.2.

The development footprint reflects the most appropriate area for the project infrastructure based on inputs provided during consultation activities with regulatory, community, industry and other stakeholders (refer Section 4.4), environmental assessments undertaken to date (refer Chapter 5) and the functional requirements of project infrastructure. In a number of instances, the irregular shape of the three array areas is a result of avoidance of identified impacts.

During detailed design and prior to the commencement of construction, it is anticipated that the placement of infrastructure and extent of construction activities described in Section 2.4 will be further refined to ensure avoidance and minimisation objectives are met.

7.4 Biophysical, social and economic impacts

7.4.1 Biophysical

The biophysical aspects of the project are assessed in Chapter 5. Biophysical impacts of the project include:

- Biodiversity – removal of native vegetation within the development footprint and other indirect biodiversity impacts (including risk of encroachment of weeds and temporary noise impacts). The project has been designed to avoid and minimise impacts to biodiversity. To compensate for unavoidable disturbance of native vegetation, biodiversity offsets are proposed.

- Aboriginal cultural heritage – sites of low and moderate significance will be impacted by the project. 96 sites were identified during archaeological survey effort as part of the Aboriginal cultural heritage assessment (ACHA). Through the project refinement process, all sites of high significance and most sites of moderate significance have been avoided. Impacts to sites within the development footprint will be managed as part of the Aboriginal cultural heritage management plan (AHMP).

- Historic heritage – the project will have a minor negative effect on the historical heritage significance of the rural character of the region and a moderate effect within the development footprint, predominantly by obscuring the cultural landscape rather than destroying it. Specific management measures for historic heritage sites within the development footprint are described in Section 5.4.

- Land – temporary change of land use for land within the development footprint, currently primarily used for sheep grazing with some cattle grazing. Land management will include consideration of the viability of sheep grazing throughout the life of the project.

  Land management practises will avoid or minimise potential impacts to neighbouring agricultural operations and ensure that the development footprint is not precluded from being returned to a productive agricultural use at the end of operations.

- Visual – the development of the project will result in some changes to the landscape. Visual impacts will occur during the construction and operational stages of the project. A conceptual landscaping plan to screen views of project infrastructure from one of the project's nearest receptors (S9) has been developed and will be refined in consultation with the relevant landholders and the property owners of S9 (refer Figure 4.2 of Appendix I). Landscaping will reduce the visibility of project infrastructure.

- Water – the development footprint includes a number of mapped 1st and 2nd order watercourses. The majority of these watercourses do not have a discernible channel and riparian zones and associated vegetation have been modified and degraded by historical land use practices. Placement of PV modules and ancillary infrastructure within 1st and 2nd order watercourses within the development footprint will be minimised to the extent practicable. Watercourse crossing plans detailing the design of proposed crossings of higher order watercourses (ie 3rd order and above) outside of the development footprint will be prepared in consultation with NSW Department of Industry – Lands and Water (DoI Lands and Water).

7.4.2 Social

The social impacts of the project are assessed in Section 5.12 and Appendix N. The project is justified on social grounds for three principal reasons:

- it is broadly supported by the local community (refer Section 4.4.2);
- it will contribute to the local and regional economy (refer to Section 5.13 and Appendix O); and
- it will provide indirect benefits through the use of services and facilities both locally and regionally.

Subject to their availability, the project is likely to utilise existing community services and facilities. As identified within Section 5.12, an influx of a significant number of workers during the project's construction period has the potential to impact social characteristics within the local community such as accommodation, local infrastructure and local businesses, including community services and facilities.

Construction staging is intended to spread the workforce demand and reduce the aggregate peak construction workforce. Should it be required, the construction accommodation village will be scalable and flexible to ensure that it can respond to demand.

During construction, the project will have potential to cause noise and vibration and traffic impacts and impacts to visual amenity. Where potential impacts or exceedances of relevant assessment criteria have been identified, mitigation measures have been proposed to manage identified impacts (refer Section 6.2). Consultation with affected residents will be undertaken prior to commencement of construction to discuss the proposed mitigation measures.

The potential traffic impacts will be largely short-term (during project construction) and can be managed in accordance with conditions for requiring adherence to specific construction hours, maintenance of local roads and implementation of a comprehensive traffic management plan (TMP).

Public safety risks, including bushfire, hazards and risks associated with project infrastructure, and emergency access and evacuation will be mitigated through design of buildings, construction areas and other assets to include appropriate bushfire protection standards and emergency access and evacuation protocols will be developed as part of the emergency response plan.

7.4.3 Economic

The economic impacts of the project are assessed in Section 5.13 and Appendix O. The project is justified economically due to the economic benefits and stimulus it will provide to the local region.

The peak construction year (Year 2) of the project is estimated to make up to the following total contribution to the regional economy:

- $425 million in annual direct and indirect output;
- $169 million in annual direct and indirect value added;
- $92 million in annual direct and indirect household income; and
- 1,155 direct and indirect jobs.

Throughout operations, the project is estimated to make up to the following total annual contribution to the regional economy:

- $86 million in annual direct and indirect output;
- $26 million in annual direct and indirect value added;
- $3 million in annual direct and indirect household income; and
- 39 direct and indirect jobs.

UPC will work in partnership with Uralla Shire Council and the local community to ensure that, as far as possible, the benefits of the projected economic growth in the region are maximised and impacts minimised.

7.5 Objects of the EP&A Act

The project's consistency with the relevant objects of the EP&A Act is considered below. The overall conclusion is that the project is consistent with the objects of the EP&A Act either wholly or in the majority.

i To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources

Resources within the project boundary and, more specifically, the development footprint, include land that is being used for agricultural production and land which has biodiversity, Aboriginal cultural and historic heritage values. This constitutes the 'natural resources', which must be properly managed, developed or conserved.

It is acknowledged that the development of the project will reduce the utilisation of the land within the development footprint for agricultural production; however, this impact will be mitigated by a number of factors including:

- choice of PV module technology – the anticipated use of single axis tracking PV modules involves a typical row spacing of 5-8 m, which would leave a significant area of land (typically 60% or more within the fence line) that could still be utilised for sheep grazing during the project's operations;
- site selection – the three array areas have been strategically placed so that primary production can continue within the immediate surrounds and to reduce potential impacts on the use of neighbouring farm lands for primary production purposes; and
- return to agricultural land – the development footprint can be returned to agricultural land use at the completion of the project's operations.

Land management practises will avoid or minimise potential impacts to neighbouring agricultural operations that have been identified during engagement with the local community and as part of the land use conflict risk assessment (LUCRA) (Appendix F).

The biodiversity values and Aboriginal cultural and historic heritage resources that will be impacted by the project will be mitigated or offset.

For the reasons given above, the project will maintain 'social and economic welfare' and achieve 'a better environment'.

ii To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment

Under Section 516A of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Commonwealth organisations have a statutory requirement to report on their environmental performance and how they accord with, and advance, the principles of ESD.

Australia's *National Strategy for Ecologically Sustainable Development* (1992), which was prepared by the ESD Steering Committee, defines ESD as: "using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased".

The principles of ESD, for the purposes of the EP&A Act, are provided in Clause 7(4) of Schedule 2 of the NSW Environmental Planning and Assessment Regulation 2000 (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.
- I**mproved valuation and pricing of environmental resources.** Improved valuation, pricing and incentive mechanisms should be promoted

The project has been designed to avoid impacts where possible. Where impacts are unavoidable, the project has been designed to reduce the impacts to a level which is as low as is reasonably practicable. This includes consideration of site suitability based on design needs, existing infrastructure and environmental conditions. Appropriate management measures have been identified to mitigate any residual impacts (refer Section 6.2).

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

iii To promote the orderly and economic use and development of land

The project provides an opportunity for orderly and economic use and development of land with benefits to the local region. The project's planning and design process, including site selection (refer Section 1.4.1) and project refinement (refer Section 1.4.2), has taken into account potential impacts associated with the construction and ongoing operation of the project and incorporates measures to avoid, minimise, manage or offset these impacts. Thus, it will be an orderly development undertaken in accordance with further detailed design processes, conditions of consent and strict parameters as set out in management plans and operating procedures.

iv To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats

Measures to avoid and minimise impacts to vegetation were considered during the initial design stages of the project, resulting in avoidance of significant biodiversity values and minimisation of impacts on other areas of native vegetation. Particular efforts were made to avoid those woodland areas with larger patch size and greater connectivity to other areas of habitat outside of the development footprint.

All unavoidable impacts will be offset in accordance with NSW Government policy. Establishing offsets would enhance biodiversity values in the medium to short term.

v To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage)

Measures to avoid and minimise impacts to built and cultural heritage were considered during the initial design stages of the project and as part of the project refinement process described in Section 1.4.2. In a number of instances, the irregular shape of the three array areas is a result of avoidance of identified built and cultural heritage sites.

Through the project refinement process, all archaeological sites of high significance and most sites of moderate significance identified as part of the ACHA have been avoided. Impacts to sites within the development footprint will be managed as part of the AHMP. Specific management measures for built and cultural heritage sites within the development footprint are described in Section 5.3 (Aboriginal cultural heritage) and Section 5.4 (historic heritage).

vi To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants

Public safety risks, including bushfire, hazards and risks associated with project infrastructure, and emergency access and evacuation will be mitigated through design of buildings, construction areas and other assets to include appropriate bushfire protection standards and emergency access and evacuation protocols will be developed as part of the emergency response plan.

Should it be required, the construction accommodation village will be designed, constructed and maintained in accordance with relevant Australian Standards. Detailed plans for the construction accommodation village will be prepared in consultation with Uralla Shire Council and DPE.

vii To promote the sharing of responsibility for environmental planning and assessment between the different levels of government in the State

The project is declared to be classed as a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). Under Section 4.38 of the EP&A Act, the NSW Minister for Planning is the consent authority for SSD.

However, pursuant to Section 2.4 of the EP&A Act, the Minister may delegate the consent authority function to the Independent Planning Commission (IPC), the Secretary or to any other public authority.

The EIS has been prepared in consultation with key regulatory stakeholders and with input from various levels of government, including Uralla Shire Council, DPE and other State government agencies (eg NSW Office of Environment and Heritage (OEH), NSW Department of Primary Industries (DPI) and DoI Lands and Water).

The EIS will be placed on public exhibition for a minimum of 30 days by DPE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPE will be reviewed and forwarded to UPC to consider and respond to.

viii To provide increased opportunity for community participation in environmental planning and assessment

As part of the preparation of the EIS, UPC has actively sought to involve the community in the planning and assessment process (refer to Section 4.4.2). The project's stakeholder engagement strategy (refer Section 4.3) includes significant upfront focus and effort with regards to consultation with key stakeholders (including the local community) during project scoping and preparation of the preliminary environmental assessment (PEA).

Feedback from neighbouring landholders and the local community contributed to the project refinement process and inputs provided during engagement with these stakeholders has informed the selection of the development footprint.

Engagement activities undertaken to date include multiple community information and feedback sessions, face-to-face meetings, phone calls, email correspondence, mail outs and informal discussions, thus providing opportunity for public involvement and participation in environmental planning and assessment.

7.6 UPC's commitments

As a signatory to the Clean Energy Council's *Best Practice Charter for Renewable Energy Developments*, UPC has demonstrated their intention to:

- engage respectfully with the communities in which they plan and operate projects;
- be sensitive to environmental and cultural values; and
- make a positive contribution to the regions in which they operate.

Stakeholder engagement on the New England Solar Farm has been comprehensive to date and reflects the importance UPC places on this aspect of its business. UPC will continue to work with all stakeholders as the approval process for the project progresses and detailed design and approval schedule for the project is better defined.

The environmental management strategy will 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 (refer Chapter 6).

Throughout community engagement as part of the preparation of the EIS, UPC has also demonstrated their intention to establish a positive, long-term connection with the local community. As part of this, UPC has already committed to contribute $250 per year for every MW (AC) of solar power installed over a period of 25 years (refer Section 4.6).

7.7 Conclusion

The project has been designed to avoid and minimise adverse biophysical, social and economic impacts where possible. The residual impacts have been identified and assessed. While there are some unavoidable impacts, principally during the project's construction period, the project will provide a number of longer-term benefits to the local community, New England region and State.

The project is considered to be justified and in the public interest because:

- It is suitably located:
  - in a region with ideal climatic and physical conditions for large-scale solar energy generation;
  - within close proximity of existing infrastructure with adequate capacity to receive the energy proposed to be generated; and
  - adjacent to agricultural land uses that are compatible with large-scale solar energy generation.
- The design of the project has been an iterative design and environmental assessment process to ensure impacts have been avoided and minimised as much as possible. This has included refining the design in consultation with neighbouring landholders, registered Aboriginal parties and the local community.
- The project will not result in significant biophysical, social or economic impacts and the EIS has identified that any residual impacts can be appropriately managed and/or offset in accordance with NSW Government policy.
- The benefits of the project are in the public interest and will provide renewable energy, increased energy security and direct and indirect economic benefits, through the creation of employment opportunities and benefits to the local and regional economy through income and expenditure during the life of the project.
- UPC is committed to the long-term environmental management of the land within the development footprint. At the end of the project's investment and operational life, the development footprint will be returned to its pre-existing agricultural land use or another land use as agreed by the project owner and the landholder at that time.

The project is in line with the objects of the EP&A Act and will enable the orderly and logical use of natural, physical and human resources existing within the local area and greater New England North West region. 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.

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

Abbreviations

AC	alternating current
ACHAR	Aboriginal cultural heritage assessment report
AEMO	Australian Energy Market Operator
AEP	annual exceedance probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHMP	Aboriginal heritage management plan
APZ	asset protection zone
ARI	average recurrence interval
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASC	Australian Soil Classification
BAM	biodiversity assessment method
BCA	Building Code of Australia
BC Act	NSW *Biodiversity Conservation Act 2016*
BDAR	biodiversity development assessment report
BESS	battery and energy storage system
BHA	bushfire hazard assessment
BoM	Bureau of Meteorology
BSAL	biophysical strategic agricultural land
CASA	Civil Aviation Safety Authority
CBSI	community benefit sharing initiative
CEEC	critically endangered ecological community
CEMP	construction environmental management plan
CL Act	NSW *Crown Land Act 1989*
CSEP	community stakeholder engagement plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation

CWMP	construction workforce management plan
DA	development application
DC	direct current
DoEE	Commonwealth Department of Environment and Energy
DoI Land and Water	Department of Industry - Lands and Water Division
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DRG	NSW Department of Planning and Environment – Division of Resources and Geoscience
DRE	NSW Department Planning and Environment – Division of Resources and Energy
EIA	economic impact assessment
EIS	environmental impact statement
ELF	extremely low frequency
EMF	electric and magnetic fields
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
EPA	NSW Environment Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPC	engineering, procurement and construction
EPL	environment protection licence
ERP	emergency response plan
ESC	erosion and sediment control
ESD	ecologically sustainable development
ESOO	Electricity Statement of Opportunities
ETL	electricity transmission line
FMP	fire management plan
FTE	full-time equivalent

GHG	greenhouse gas
GHI	global horizontal irradiance
GPS	Generator Performance Standards
GSNSW	Geological Survey of NSW
GWh	gigawatt hours
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
ICNIRP	International Commission on Non-Ionising Radiation Protection
ICOMOS	Australia International Council on Monuments and Sites
Infrastructure SEPP	State Environmental Planning Policy (Infrastructure) 2007
ILUA	Indigenous Land Use Agreement
IPP	independent power producer
km	kilometre
kW	kilowatt
LALC	Local Aboriginal Land Council
LGA	local government area
LiDAR	light detection and ranging
LLS	Local Land Services
LPG	liquified petroleum gas
LPI	NSW Land and Property Information
LRET	large-scale renewable energy target
LUCRA	land use conflict risk assessment
MASL	metres above sea level

Mining SEPP	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.
MNES	matters of national environmental significance
Mtpa	million tonnes per annum
MV	medium voltage
MW	megawatt
MWh	megawatt hours
NEL	National Electricity Law
NEM	National Electricity Market
NMLs	noise management levels
NNTT	National Native Title Tribunal
NPfI	*Noise Policy for Industry*
NPI	National Pollution Inventory
NPW Act	NSW *National Parks and Wildlife Act 1974*
NSW	New South Wales
NSP	network service provider
NTSCORP Limited	NSW Native Title Services Corporation Limited
NVIA	noise and vibration impact assessment
OEH	NSW Office of Environment and Heritage
OEMP	operational environmental management plan
OOH	out of hours
O&M	operations and maintenance
PADs	potential archaeological deposits
PBP	Planning for Bushfire Protection
PCT	plant community type
PCU	power conversion unit
PEA	preliminary environmental assessment
PMST	Protected Matters Search Tool
POEO Act	NSW *Protection of the Environment Operations Act 1997*

PV	photovoltaic
PVP	property vegetation plan
RAP	registered Aboriginal party
RBL	rating background noise level
RDANI	Regional Development Australia Northern Inland
REA	Renewable Energy Advocate
REAP	Renewable Energy Action Plan
RET	renewable energy target
REZ	renewable energy zone
RF Act	NSW *Rural Fires Act 1997*
RFS	NSW Rural Fire Service
RMS	NSW Roads and Maritime Services
RNP	Road Noise Policy
RTS	response to submissions
Rural Lands SEPP	State Environmental Planning Policy (Rural Lands) 2008
SCADA	supervisory control and data acquisition
SEA	soil erosion assessment
SEARs	Secretary's environmental assessment requirements
SEED	Sharing and Enabling Environmental Data
SEPP 33	State Environmental Planning Policy No 33 - Hazardous and Offensive Development
SEPP 55	State Environmental Planning Policy No 55 - Remediation of Land
SHR	State Heritage Register
SIA	social impact assessment
SoHI	statement of heritage impact
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2011
SSD	State significant development
SRLUP	NSW Strategic Regional Land Use Policy
STP	sewage treatment plant
SWA	surface water assessment

TEC	threatened ecological community
TfNSW	Transport for NSW
TIA	traffic impact assessment
TMP	traffic management plan
UNE	University of New England
UPC	UPC Renewables Australia Pty Ltd
Uralla LEP	Uralla Local Environmental Plan 2012
USE	unserved energy
VIA	visual impact assessment
VRZ	vegetated riparian zone
WM Act	NSW *Water Management Act 2000*
WMP	waste management plan
µT	microtesla

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