Bendemeer Solar Farm

Environmental Impact Statement

7 July 2023

Project No.: 0657132

The business of sustainability

ERM

Document details	
Document title	Bendemeer Solar Farm
Document subtitle	Environmental Impact Statement
Project No.	0657132
Date	7 July 2023
Version	6.0
Author	Elohanna Levi, Meg Coles
Client Name	Athena Energy Australia (Holdings) Pty Ltd

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	01	E. Levi	D. Munro	M. Davey	17.02.2023	Draft for client review
Draft	02	E. Levi	M. Davey	M. Davey	12.04.2023	Draft for REAP Review
Final Draft	03	E. Levi, M. Coles	M. Davey	M. Davey	07.06.2023	Final Draft for client review
Final Draft	04	E. Levi	M. Davey	M. Davey	07.06.2023	Final Draft for REAP review
Final Draft	05	E. Levi	M. Davey	M. Davey	09.06.2023	Final for DPE review
Final	06	E. Levi	M. Davey	M. Davey	07.07.2023	Final for Submission

Signature Page

7 July 2023

Bendemeer Solar Farm

Environmental Impact Statement

Elohanna Levi
Environmental Consultant

Tom Parry
Project Manager

Mark Davey
Partner

Environmental Resources Management Australia Pty Ltd
Level 14, 207 Kent Street
Sydney NSW 2000

REAP DECLARATION

Project details	
Project name	Bendemeer Solar Farm
Application number	SSD-36651552
Address of the land on which the infrastructure is to be carried out	4409-4461 Oxley Highway, Bendemeer, NSW 2355
Applicant details	
Applicant name	Athena Energy Australia (Holdings) Pty Ltd
Applicant address	Unit 1, 403 Peel Street, Tamworth, NSW 2340
Details of person by whom this EIS was prepared	
Name	Mark Davey
Address	Environmental Resources Management Australia Pty Ltd Level 14, 207 Kent Street, Sydney NSW 2000
Professional qualifications	PhD, Masters, Bachelor of Applied Science
Declaration by Registered Environmental Assessment Practitioner	
Name	Dianne Munro BSc MEnvLLB
Registration number	Registered Planner 100073
Organisation registered with	Planning Institute of Australia
Declaration	The undersigned declares that this EIS: ■ Has been prepared in accordance with Schedule 2 and Part 10 of the Environmental Planning and Assessment Regulation 2021; ■ Contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates; ■ Does not contain information that is false or misleading; ■ Addresses the Planning Secretary's Environmental Assessment Requirements (SEARs) for the project; ■ Identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments; ■ Has been prepared having regard to the Department's State Significant Infrastructure Guidelines - Preparing an Environmental Impact Statement; ■ Contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development; ■ Contains a consolidated description of the project in a single chapter of the EIS; ■ Contains an accurate summary of the findings of any community engagement; and ■ Contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.
Signature	
Date	7 July 2023

CONTENTS

List of Appendices

List of Tables

List of Figures

SUMMARY

S.1 Introduction

This Environmental Impact Statement (EIS) has been prepared for Athena Energy Australia (Holdings) Pty Ltd ('Athena' or 'Applicant') to assess environmental matters relating to the development of the Bendemeer Solar Farm (Project).

The Project is proposed to be located 1.8 kilometres (km) east of the Bendemeer village centre, represented by the Bendemeer Hotel, and is located 46 km (by road) north-east of the Tamworth Post Office to the Project access. The Project is entirely located within the Tamworth Regional Local Government Area (LGA) in the New England Region of New South Wales (NSW), on land that is predominately used for agricultural activities.

The Project Area extends across approximately 606.4 hectares (ha), over three freehold land parcels and includes a photovoltaic (PV) solar facility, a battery energy storage system (BESS), electrical reticulation and associated and ancillary facilities. The Disturbance Footprint of the Project covers 476.6 ha.

The Project is declared State Significant Development (SSD) under Part 2.2, clause 2.6 and Schedule 1 of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) and therefore requires development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Environmental Resources Management Australia Pty Ltd (ERM) has prepared this EIS on behalf of the Applicant to support the SSD Application for the Project.

Athena was founded in Australia in 2019 and is a subsidiary of Athena Energy Holdings Pte Ltd, wholly owned by Metis Energy Limited (Metis). Metis develops, finances, constructs, owns and operates its projects as a fully integrated renewable energy company, with a genuine long-term approach. Metis currently has more than 2 gigawatts (GW) in renewables projects under development or operational in the Asia-Pacific (APAC) region and aims to be a central participant in Australia's energy transition, whilst contributing to a global net zero future and greener society.

S.2 Project Summary

The Project will involve the construction, operation and decommissioning of a PV solar facility with a targeted electricity generating capacity of approximately 280 megawatts (MW) Direct Current (DC), BESS with a capacity of approximately 150 MW/ 300 MW hour (MWh), and associated infrastructure. The Project will supply electricity to the national electricity grid via the existing electricity transmission network and participate in the National Electricity Market (NEM).

The Project is part of the Bendemeer Renewable Energy Hub, which includes the Project and a wind farm with up to 58 wind turbine generators (WTGs). Athena proposes to develop the solar and wind farms as two separate viable development applications.

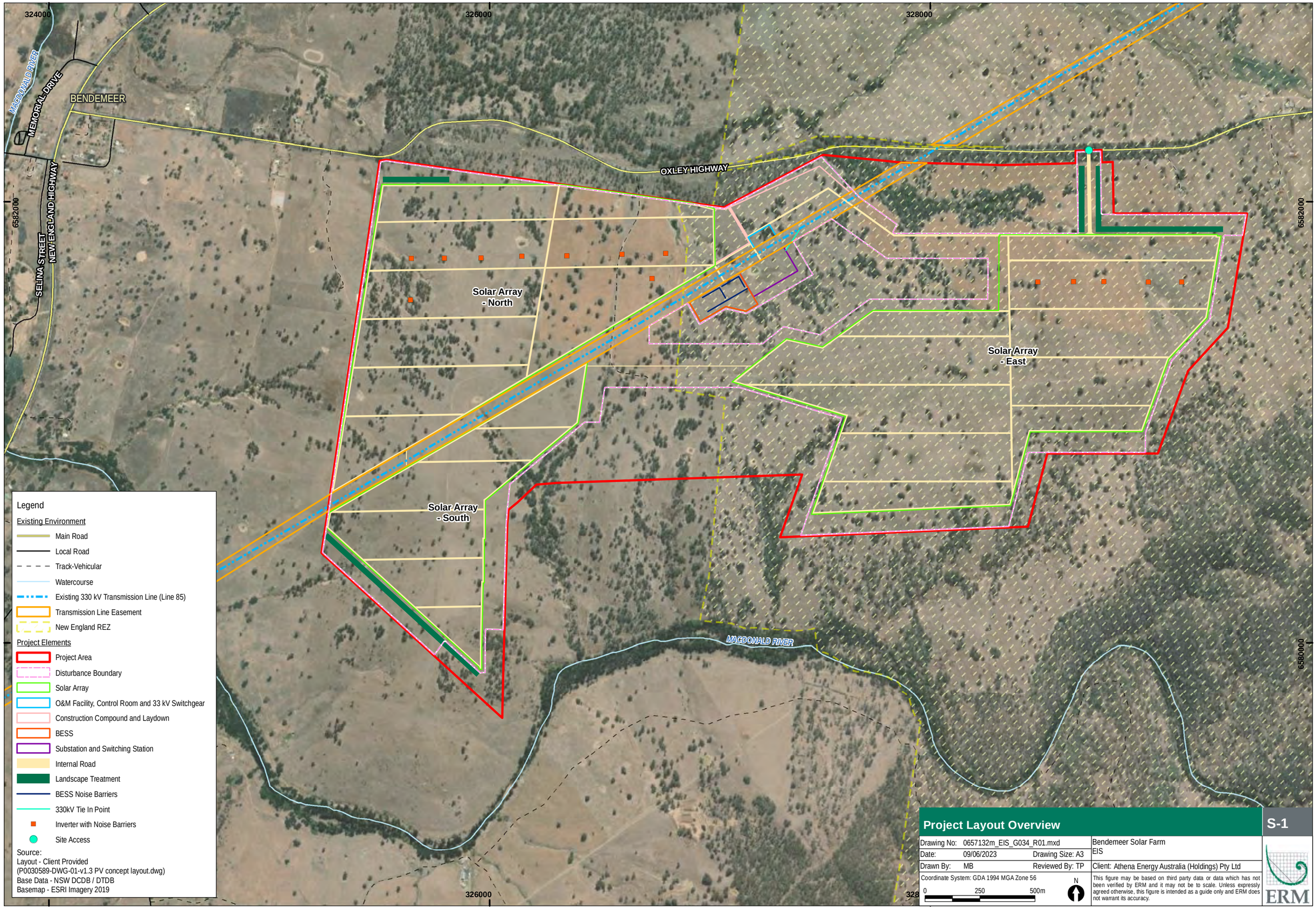
The Project has been revised and refined over time in response to the identification and assessment of environmental limitations, constructability requirements, and consideration of the outcomes of government agency, landowner, and community consultation.

The key components of the Project are:

- Solar Arrays with a capacity of approximately 280 MW DC;
- BESS with a capacity of approximately 150 MW/ 300 MWh;
- Approximately 60 Power Conversion Units (PCU);
- One 33/330 kV collector substation and associated structures;
- A switching station;

- Electrical reticulation infrastructure, including internal underground high-voltage (HV) cables between solar arrays, BESS and transformers and overhead 330 kV conductors;
- On-site Permanent Supporting Infrastructure, including:
  - Site access road and entry; and
  - Operations and Maintenance (O&M) Facility containing a control room, meeting facilities, storage facilities, SCADA facilities, workshop, parking, ablutions buildings, septic, static water supply, waste management facilities, lighting and maintenance facility, fencing and asset protection zones;
- Off-site Supporting Infrastructure, including:
  - Waste disposal facilities;
  - Existing public road and communications network; and
  - Minor external road upgrades.

The Project layout overview is provided in **Figure S-1**.


324000
326000
328000
6582000
6580000
MACDONALD RIVER
MEMORIAL DRIVE
BENDEMEER
NEW ENGLAND HIGHWAY
SELINA STREET
OXLEY HIGHWAY
Solar Array - North
Solar Array - East
Solar Array - South
MACDONALD RIVER
Legend
Existing Environment
Main Road
Local Road
Track-Vehicular
Watercourse
Existing 330 kV Transmission Line (Line 85)
Transmission Line Easement
New England REZ
Project Elements
Project Area
Disturbance Boundary
Solar Array
O&M Facility, Control Room and 33 kV Switchgear
Construction Compound and Laydown
BESS
Substation and Switching Station
Internal Road
Landscape Treatment
BESS Noise Barriers
330kV Tie In Point
Inverter with Noise Barriers
Site Access
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Project Layout Overview
S-1
Drawing No: 0657132m_EIS_G034_R01.mxd
Date: 09/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

S.3 Stakeholder Engagement

The Applicant has been actively engaging with the community and stakeholders to inform the design of the Project such that environmental and social impacts were minimised and benefits to the community and stakeholders were maximised. The Applicant is committed to effective and genuine engagement with stakeholders and the local community in order to seek feedback on and to help inform the Project. Engagement will continue through subsequent phases of the Project. The range of stakeholders that have been, and will continue to be engaged is extensive, and includes various NSW and Commonwealth Government agencies, local council, neighbouring landholders, local community, community groups, Aboriginal parties, and infrastructure owners.

Engagement with stakeholders regarding the Project commenced in 2018, when the Applicant attended monthly Kentucky Landholder Group (KLG) community meetings. The KLG was formed in 2016 by over 30 landholders across Bendemeer and Kentucky with the goal to establish renewable energy projects in the region in partnership with developers that shared the same values. Engagement with the community continued during the early feasibility stages of the Project, and in preparation of the Scoping Report. Early consultation provided an opportunity to understand key stakeholder sentiment toward the Project and feedback relating to environmental and social aspects required to be addressed as part of the EIS.

As part of the preparation of the Scoping Report, a Stakeholder Engagement Plan (SEP) was prepared to guide ongoing consultation and engagement throughout the development of the EIS, and through subsequent phases of development of the Project. Engagement for the Project has been led by communication specialists' C7EVEN Communications, based in Tamworth.

All interactions with stakeholders were captured in a Stakeholder Register including stakeholder details, interactions details and follow up actions. Several tools were used to engage with and seek feedback from stakeholders including community pop-up sessions, face-to-face and virtual meetings, phone and email interactions, community events, community survey, Project website, briefing, factsheets, newsletters, media releases, social media and site visits.

Feedback from stakeholders and the community included both positive and negative views on a range of aspects of the Project. Overall, engagement has demonstrated that the Project is well supported by a significant number of the local community in Bendemeer and surrounds, who have recognised the benefits of the Project as a source of employment opportunities and generation of clean energy. Stakeholders were interested in understanding how local business could be involved with the Project and how the benefits could be shared within the community. The Applicant has considered the issues raised and incorporated these, where relevant, into the Project design.

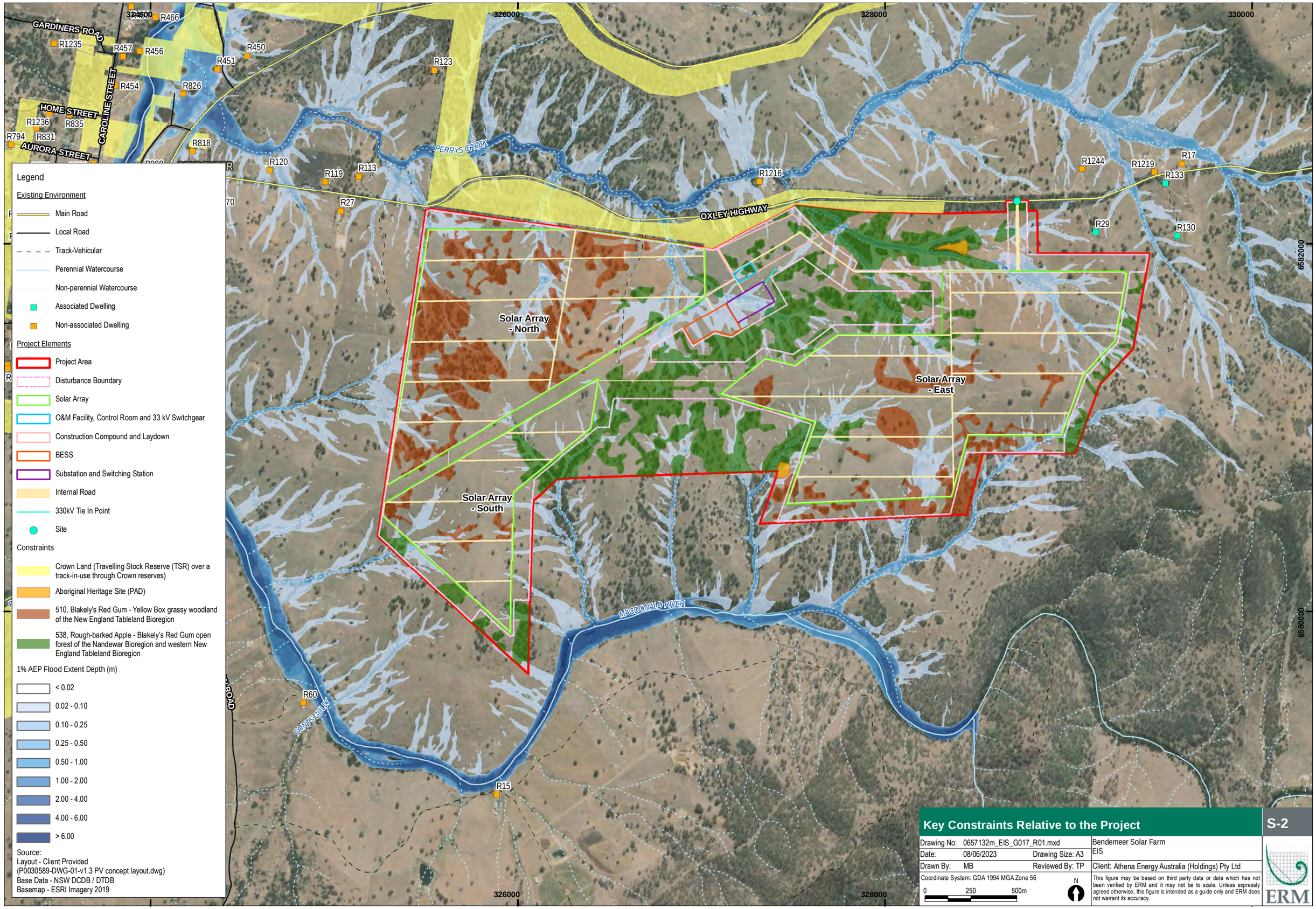
The Applicant has also proposed a Community Benefit Fund (CBF) that will be administered by a dedicated committee, the Bendemeer Community Benefit Fund Committee, and will constitute the Voluntary Planning Agreement (VPA) proposal currently under consideration by the Tamworth Regional Council. The CBF will provide ongoing benefit-sharing with the community during the life of the Project to support local and meaningful community development and/or other neighbourhood-level initiatives with strong community support.

S.4 Environmental and Social Impact Assessments

This EIS includes a detailed assessment of the potential environmental, social and economic outcomes of the Project and proposes, where required, mitigation measures to manage adverse environmental, social and economic aspects. A summary of the key findings for each aspect is provided below. Each assessment has been prepared for this EIS in consideration of relevant guidelines, Project's SEARs and stakeholder engagement.

Figure S-2 provides a visual representation of the key constraints relative to the Project elements.

The Project will be constructed and operated in accordance with all conditions imposed by the development consent and will implement the mitigation measures summarised in **Appendix B**.



Legend

Existing Environment

- Main Road
- Local Road
- Track-Vehicular
- Perennial Watercourse
- Non-perennial Watercourse
- Associated Dwelling
- Non-associated Dwelling

Project Elements

- Project Area
- Disturbance Boundary
- Solar Array
- O&M Facility, Control Room and 33 kV Switchgear
- Construction Compound and Laydown
- BESS
- Substation and Switching Station
- Internal Road
- 330kV Tie In Point
- Site

Constraints

- Crown Land (Travelling Stock Reserve (TSR) over a track-in-use through Crown reserves)
- Aboriginal Heritage Site (PAD)
- 510, Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 538, Rough-barked Apple - Blakely's Red Gum open forest of the Nandewar Bioregion and western New England Tableland Bioregion

1% AEP Flood Extent Depth (m)

- < 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 4.00
- 4.00 - 6.00
- > 6.00

Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019

Key Constraints Relative to the Project

S-2

Drawing No:	0657132m_EIS_G017_R01.mxd		Bendemeer Solar Farm EIS
Date:	08/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 250 500m

N

ERM

Biodiversity

A Biodiversity Development Assessment Report (BDAR) was prepared to identify the potential impacts of the Project on biodiversity. The assessment included vegetation and habitat mapping and flora and fauna surveys.

The Subject Land[1] assessed by the BDAR contains two NSW Plant Community Types (PCTs):

- PCT 538 Rough-barked Apple – Blakely's Red Gum open forest of the Nandewar Bioregion and western New England Tableland Bioregion; and
- PCT 510 Blakely's Red Gum – Yellow Box grassy woodland of the New England Tablelands Bioregion.

Both PCTs have been confirmed to meet the definition of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, commonly known as Box Gum Woodland.

These PCTs have been delineated into three vegetation zones based on vegetation integrity scores:

- Vegetation Zone 1: PCT 538 – Moderate;
- Vegetation Zone 2: PCT 510 – Moderate; and
- Vegetation Zone 3: PCT 510 – Low.

Field surveys were undertaken throughout 2021, 2022 and 2023 to assess habitat suitability and to carry out targeted surveys for threatened species.

No threatened flora species were recorded within the Subject Land and no *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed threatened flora species were determined to have potential habitat within the Subject Land.

No threatened fauna species were recorded within the Subject Land; however, following a review of habitat suitability and survey effort, a precautionary approach has been applied based on potential habitat that was mapped and is associated with the following threatened fauna species:

- Squirrel Glider listed as vulnerable under the *Biodiversity Conservation Act 2016* (BC Act);
- Eastern Pygmy-Possum, listed as vulnerable under the BC Act; and
- Tusked Frog listed as endangered under the BC Act.

No EPBC Act listed threatened fauna species were determined to have potential habitat within the Subject Land.

The Project layout and Disturbance Footprint have undergone substantial refinements during the impact assessment phase to avoid and minimise impacts to biodiversity values, including:

- Reduction in impacts to native vegetation and threatened species habitat by 40% from 155.8 ha to 93.6 ha;
- Reduction in area of impact to EPBC Act listed Box Gum Woodland TEC by 39% from 97.4 ha to 59.8 ha; and
- Reduction in area of impact to BC Act listed Box Gum Woodland TEC by 33% from 154.5 ha to 103.4 ha.

Based on the impacts to the PCTs and the habitat of the threatened species assumed present, the ecosystem credits and candidate species credits required are detailed in **Table S-1** and **Table S-2**. Box Gum Woodland is also a critically endangered EPBC Act listed TEC and offset obligations will be addressed through the NSW Biodiversity Offset scheme.

[1] The BDAR uses the term Subject Land as per the BAM. The Subject Land refers to the area defined as the Project Area throughout the rest of this EIS.

Table S-1 Impacts that Require an Offset-Ecosystem Credits

Vegetation Zone	PCT	TEC/EC	Impact area (ha)	Number of ecosystem credits required
1	538_Mod	Box Gum Woodland	32.5	967
2	510_Mod	Box Gum Woodland	56.2	1,965
3	510_Low	Box Gum Woodland	14.6	276

Table S-2 Impacts that Require an Offset-Species Credits

Common Name	Scientific Name	Loss of habitat (ha)	Number of species credits required
Squirrel Glider	*Petaurus norfolcensis*	32.5	773
Eastern Pygmy-Possum	*Cercartetus nanus*	32.5	773
Tusked Frog (endangered population)	*Adelotus brevis*	28.8	1,208

Mitigation measures will be implemented during construction and operation of the Project to minimise residual biodiversity impacts. These include provisions for biodiversity offsets, monitoring and adaptive management measures.

Aboriginal Cultural Heritage

An Aboriginal Cultural Heritage Assessment Report (ACHAR) has been prepared as part of this EIS.

A search of the Aboriginal Heritage Information Management System (AHIMS) database found there were no Aboriginal sites located within the Project Area. Engagement was conducted in accordance with the 'Aboriginal Cultural Heritage Consultation Requirements for Proponents' (DECCW, 2010b). A survey was completed with archaeologists accompanied by representatives from two Registered Aboriginal Parties (RAPs) - the Tamworth Local Aboriginal Land Council (LALC) and Aaron Talbott (AT) Gomilaroi Cultural Consultancy.

The results of the survey identified two previously unrecorded potential archaeological deposits (PADs), within the Project Area. Avoidance of Aboriginal cultural heritage values were a key consideration of the project refinement process, and the results of the survey were used to refine the Disturbance Footprint. Subsequently, these two new PADs are located outside of the Disturbance Footprint and will not be impacted.

An Aboriginal Cultural Heritage Management Plan (ACHMP) will be developed prior to the commencement of construction of the Project. The ACHMP will detail measures to protect Aboriginal heritage sites outside the area of disturbance, and an unexpected finds procedure and other contingency and reporting procedures.

Historic Heritage

A Statement of Heritage Impact (SOHI) was completed as part of this EIS.

There are no historic heritage items within the Project Area that are listed on the National or Commonwealth Heritage Listings, State Heritage Listings or Tamworth Regional Local Environmental Plan (LEP). However, 16 heritage items listed in the Tamworth LEP are within 5 km of the Project Area.

'Bendemeer Station' is the closest heritage listed site to the Project Area, located 760 m to the west. However, given the topographic and natural visual barriers present between the Project Area and 'Bendemeer Station', it is considered unlikely that the Project will indirectly impact the significance of the item, particularly given its significance is not due to aesthetic values.

Surveys completed of the Project Area confirmed one historic site within the Project Area (Riverside-HS01), which consists of a shearing shed and stock yard. Riverside-HS01 has been assessed as having no heritage significance under relevant guidelines and thus, no management measures are required for Riverside-HS01.

No locations within the Project Area were assessed as having potential to contain significant historic subsurface archaeological deposits.

An unanticipated finds protocol will be implemented in the instance that any previously unrecorded or unanticipated historic objects are encountered during construction.

Noise

A Noise Impact Assessment (NIA) was prepared to assess the potential noise impacts associated with the Project.

Construction works will occur during standard hours Monday to Friday (7:00 am to 6:00 pm) and on Saturdays from 8:00 am to 1:00 pm. Construction outside these hours will be undertaken in accordance with the 'Interim Construction Noise Guideline' (ICNG) (DECC, 2009), or if activities are inaudible at non-associated dwellings, and with agreement by the Department.

During construction of the Project, compliance with the ICNG *Highly Affected* Management Levels is expected at all Sensitive Receivers. The ICNG *Noise Affected* Management Levels are likely to be exceeded at times at 32 Sensitive Receivers within 1,500 m of the Project Area, under a worst-case construction noise scenario. The predicted noise levels and duration of exceedances are variable due to the intermittent operation of construction equipment and the changing separation distances between mobile construction noise sources and sensitive receivers. As per standard practice for any construction activities in NSW, a Construction Noise Management Plan (CNMP) containing noise mitigation and management measures will be prepared and implemented for the construction phase of the Project to reduce potential exceedances of ICNG Noise Affected Management Levels. A Draft CNMP is provided in the NIA.

During operation of the Project, no non-associated receivers are predicted to exceed NPI Project Trigger Noise Levels.

Initial noise modelling undertaken for the Project has informed the Project layout refinement, which included BESS relocation and capacity reduction from 200 MW/ 400 MWh to 150 MW/ 300 MWh. Noise mitigation measures have been incorporated into the Project design to enable NPI PTNL compliance to be achieved at non-associated receivers. The noise mitigation measures are as follows:

- Construction of noise walls within the BESS compound area; and
- Construction of noise barriers next to 14 inverters in a CNMP containing noise mitigation and management measures will be prepared and implemented for the construction phase of the Project. A Draft CNMP is provided in Appendix B of the NIA.

Construction and operational traffic noise impacts were also assessed, with compliance with 'Road Noise Policy 2011' (NSW RNP, 2011) (RNP) criteria predicted at all non-associated Receivers.

Further, the NIA assessed the cumulative noise impact of the Project and nearby SSDs (proposed and operational) at the nearest Sensitive Receivers to the Project. The additional cumulative noise impact of the Project is expected to be negligible.

Visual

A Landscape and Visual Impact Assessment (LVIA) included an assessment of the likely impacts of the Project on the existing visual amenity and landscape character, and viewpoints within the private and public domain.

Fieldwork was undertaken for the Project to assess and identify the existing landscape character of the LVIA Study Area[2]. The dominant landscape features include large areas of vegetation on ridgelines, grazing paddocks, undulating topography, roadside vegetation and vegetation associated with rivers or creek lines. Considering the landscape extent of existing vegetation in the area and the undulating topography, the Project could be constructed with minimal impact on the existing landscape character or upon its defining features.

The preliminary assessment tool was applied to the Project layout which identified 90 non-associated dwellings within 4 km of the Project Area and 9 viewpoints from public roads and rail lines within 2.5 km that required assessment. A total of 12 representative dwellings were selected for detailed analysis an additional 14 isolated non-associated dwellings in proximity to the Project were assessed to evaluate potential visual impact.

A Wireframe Analysis (worst case scenario not considering any intervening vegetation) with the application of the Visual Magnitude Tool and photomontage was prepared for these 26 dwellings. The wireframe analysis identified 25 dwellings as having a 'low' visual impact rating, and one dwelling having a 'moderate' visual impact rating. The photomontage for this dwelling verified that the visual impact was 'low' due to the intervening vegetation that will filter views to most of the Project. All public viewpoints were identified as having a 'very low' visual impact rating. Therefore, no mitigation is required according to 'Technical Supplement - Landscape and Visual Impact Assessment' (DPE, 2022b).

The potential for cumulative impact of the Project and nearby SSDs (proposed and operational) was also assessed considering publicly available information on energy and infrastructure projects in proximity to the Project. It was determined that, considering the generally low visibility of the Project, it is unlikely to contribute to cumulative impacts from public viewpoints and private dwellings.

A glint and glare assessment was undertaken to evaluate glare resulting from the Project's solar array at residential dwellings, aviation, roads and rail lines based on proximity, orientation and specifications of the PV modules. Three different scenarios of tracking and stowing angle of PV panel were considered in the assessment. Glare modelling of 2 scenarios resulted in minimal glare at non-associated dwellings surrounding the Project and scenario 3 was deemed to have no glare impacts. The Applicant is committed to operational controls (as specified in scenario 3) to eliminate potential glare of the Project. This scenario allows operation of the panels under normal tracking at all times except during the hours of 11:45 am to 12:15 pm between approximately mid-June and late-June.

Soils and Agriculture

A Soil and Agricultural Impact Statement (SAIS) and a Land Use Conflict Risk Assessment (LUCRA) were prepared to identify and evaluate the impacts associated with the construction and operation of the Project on land capability, soil erosion, sedimentation, agricultural resources and agricultural production.

Agricultural activities will be maintained within the Project Area (as much as possible) for the duration of the construction and operational phases of the Project. The SAIS determined that the impacts of the Project on agriculture will be minimal, temporary, and limited to the Project Area. These impacts can be summarised as the following:

- Temporary removal of 606.4 ha from agricultural land use within the Project Area during the 12-month peak construction phase of the Project, assuming grazing will be re-introduced prior to the 18-month construction program;
- Permanent removal of 14.8 ha of agricultural land within the Project Area to accommodate permanent infrastructure of the Project (e.g., BESS, substation, switching station, O&M facility);

[2] The LVIA Study Area represents the Project Area plus a 5 km buffer in all directions.

- Temporary removal of potential agricultural primary productivity to the estimated value of up to $249,861 during the construction phase of one year and $53,214 per year of the operational phase; and
- Temporary impacts on soil resources within the Project Area where surface disturbance occurs.

Despite the long-term (est. minimum 30 years) operating life of the Project, following decommissioning the land zoning will not be modified and agricultural activities can continue. It is anticipated that by adopting the principles of impact avoidance and minimisation during Project construction and operation and implementing effective decommissioning and rehabilitation at the end of Project life, the Project will have no permanent negative impacts on agricultural resources or enterprises.

Additionally, the cumulative impact of the Project and SSDs (proposed and operational) on agriculture for the region is low.

Water Resources, Hydrology and Flooding

A Water Resources Assessment, Flooding and Hydrology Assessment and a Conceptual Soil and Water Management Plan (SWMP) have been prepared.

The Project Area is located within the Namoi River Catchment, which forms part of the greater Murray-Darling Basin. Water resources within the catchment are governed by the 'Namoi and Peel Unregulated Rivers Water Sources 2012 Plan' and the 'New England NSW Murray Darling Basin Fractured Rock Groundwater Source 2020 Plan'.

Key potential impacts to water resources due to the Project relate to increased risk of erosion and sedimentation within the Project Area because of construction activities. A detailed SWMP will be developed prior to construction to manage potential erosion and sedimentation impacts from the Project. As part of the SWMP, Erosion and Sediment Controls Plans (ESCP) will be developed during construction to adequately manage the risks on an area-by-area basis. The staging of works to minimise areas of disturbance at any one time, and progressive rehabilitation during construction will further mitigate these impacts.

An assessment of the number and type of Groundwater Dependent Ecosystems (GDEs) within and adjacent to the Project Area was conducted through a review of the GDE Atlas (BoM, 2022). There are no aquatic or subterranean GDEs mapped within the Project Area. Below is a summary of terrestrial GDEs present within the Project Area.

- Low potential terrestrial GDEs are predominantly mapped across the Project Area;
- Small scatterings of high potential terrestrial GDEs are present within the Project Area; and
- High potential terrestrial GDEs are mapped along MacDonald River.

Impacts to GDEs are not anticipated, as the maximum construction depth is not anticipated to intersect groundwater.

A Flood Impact Assessment was carried out to quantify the impact of the proposed development on flood behaviour. The assessment included modelling of 5%, 1%, 0.5%, and 0.2% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF) and determined that an increase in flood levels and velocities will not be significant (compared to existing flood levels) following Project development. Sensitivity to climate change was also assessed, with no significant impacts identified. Surface water runoff can be mitigated by maintaining ground cover and implementing appropriate erosion and sediment controls.

Traffic

A Traffic Impact Assessment (TIA) was undertaken for this EIS to evaluate the potential traffic impacts, and the access arrangements of the Project.

Access to the Project Area will occur via a new site access on Oxley Highway. Most of the construction workforce are expected to transit to and from the Project Area from either Tamworth

(south) or Armidale (north) with smaller proportions from other localities. Construction plant and equipment are expected to be delivered to the Project Area from the Port of Newcastle and the Port of Brisbane.

The TIA determined the following:

- The Project is expected to generate up to 110 vehicle movements per day during peak construction times, including 62 truck movements;
- The road network can accommodate the traffic generated by the Project during the construction, operation and decommissioning stages. Further, the cumulative impact of the site traffic with nearby developments is expected to be minimal;
- The proposed transport route for construction plant and equipment from the Port of Newcastle or the Port of Brisbane to the Project Area is a designated B-Double route and as such can accommodate the loads and type of vehicle movements to be generated during construction of the Project;
- Some oversize and overmass (OSOM) vehicles will be required to deliver larger plant and equipment to the Project Area (e.g., substation transformer and earthmoving equipment). The OSOM vehicles are subject to specific road permits that will be applied for by the contractor once the precise dimensions of the load and the specific delivery vehicle are known;
- A swept path assessment has been undertaken for a similar OSOM vehicle transporting the transformer, which is the largest component of the Project. The assessment indicates the OSOM vehicle can travel from the intersection of New England Highway and Oxley Highway to the Project Area without any road upgrades;
- OSOM vehicles are anticipated to be able to travel to the intersection of the New England Highway and Oxley Highway without any road upgrades, given the routes have been utilised by several other renewable projects in the wider area or more detailed route assessments have been provided for larger OSOM vehicles; and
- The site access from the Oxley Highway is proposed to be provided with a Basic Right Turn (BAR) treatment which has been provided with adequate sight distance to allow vehicles to safely enter and exit the Project Area from the Oxley Highway. The BAR treatment will be located outside the Project Area and Disturbance Footprint. This external works is within the designated road reserve and is considered minor, on land previously disturbed through the construction of the Oxley Highway. Based on technical assessments, no impact to biodiversity, historic and Aboriginal sites are expected.

To mitigate the impacts of the development during construction, a Traffic Management Plan (TMP) will be prepared prior to construction, which will include the recommendations from the TIA to ameliorate the impacts of site traffic generated along the proposed transport route.

Preliminary Hazard Analysis

A Preliminary Hazard Analysis (PHA) was completed for the Project to identify the potential hazards and risks associated with the Project's operations and storage of materials and determine risk acceptability from a land use perspective.

The expected hazardous materials to be stored or handled on site include batteries, transformer oils, and diesel fuel. A review of these materials identified that the relevant screening thresholds of Applying SEPP 33 will not be exceeded.

Hazards identified in the PHA for the Project include fire impacts, explosion, toxicity, property damage and accidental propagation and societal risk. The qualitative review of potential incidents associated with these hazards indicates that offsite impacts are not expected to occur. Therefore, no scenarios were carried forward for qualitative analysis.

Based on the analysis conducted for the lithium-ion batteries proposed to be used as part of the Project (either Lithium-Iron-Phosphate (LFP) or Nickel-Manganese-Cobalt (NMC) chemistries), it was concluded that the risks at the boundary of the Project Area will not exceed the acceptable risk criteria. Hence, the Project will only be classified as potentially hazardous and will be permitted within the current land zoning.

Mitigation measures will be implemented in the final Project layout to include the required separation distances within the BESS area to minimise hazards and risks associated with the Project.

Bushfire

The Bushfire Assessment Report (BFAR) identified that the Project Area is located on land designated bushfire prone by Tamworth Regional Council and the NSW Rural Fire Service (NSW RFS). As such a range of bushfire protection measures have been required including designation of asset protection zones (APZs) surrounding Project infrastructure, adequate site access and water supply, and the development of a Bushfire Emergency Management and Operations Plan (BFEMOP) to provide an acceptable level of protection.

Additionally, a Strategic Bushfire Study Assessment has been prepared for the Project which confirms the 'Planning for Bush Fire Protection' (PBP 2019) strategic issues have been addressed by the Project.

Air Quality

The air quality assessment concluded that air quality impacts associated with the Project will be temporary and minor during the construction phase, primarily associated with dust and vehicle emissions. Appropriate measures will be included in the Environmental Management Strategy (EMS) to minimise the potential for offsite air quality impacts resulting from construction.

During the operation phase, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. The Project will contribute to the improvement of air quality through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations.

The Project will abate the production of up to 420,000 tonnes CO_2 equivalent per annum (t-CO_2-^{e} pa) which is a substantial contribution towards the reduction of anthropogenic generated greenhouse gases (GHGs) emitted to the atmosphere, and a significant contribution towards the NSW and Australian Government commitments of net zero by 2050.

Waste Management

The waste management assessment confirmed the Project will produce various waste streams during the construction, operation, and decommissioning stages. All wastes produced by the Project will be classified, handled, and managed in accordance with the 'NSW EPA Waste Classification Guidelines – Part 1: classifying waste' (NSW EPA, 2014a) and Addendum (NSW EPA, 2016).

A Waste Management Plan (WMP) will be prepared prior to construction. The WMP will detail appropriate measures to be incorporated to avoid potential contamination to land and water, and impacts to human health and wildlife. The Project will separate waste streams to maximise recycling and emphasise reuse of any excess spoil and vegetative matter in accordance with 'NSW EPA Waste Avoidance and Resource Recovery Strategy 2014-2021' (WARR Strategy) (NSW EPA, 2014b);

A key objective of the WMP will be to work with local waste management facilities with an aim to not disadvantage local businesses and, more generally, the local community, access to these facilities.

Economic

An Economic Assessment was completed for the Project to assess the potential economic impacts of the construction and operation of Project on the regional and NSW economy. The Study Area encompasses the combined LGAs of Tamworth Regional, Armidale Regional, Uralla Shire and Walcha Shire.

While the Project would result in a minor and insignificant contraction of economic activity from agricultural activity within the Project Area and, more specifically, the Disturbance Footprint, the Economic Assessment determined that overall, the Project would have a net positive impact on the level of economic activity in the Study Area and NSW economy.

Annual direct construction employment (full time equivalent) from the Project is estimated at an average of 260 workers for the 12-month peak construction periods. The average construction impacts of the Project on the regional economy for one year are estimated at up to:

- $162M in annual direct and indirect output;
- $60M in annual direct and indirect value-added;
- $33M in annual direct and indirect household income; and
- 444 direct and indirect jobs.

The average annual construction impacts of the Project on the NSW economy are estimated at up to:

- $290M in annual direct and indirect output;
- $126M in annual direct and indirect value added;
- $80M in annual direct and indirect household income; and
- 880 direct and indirect jobs.

The Project is estimated to make the following maximum total annual contribution to the regional economy during operation:

- $32M in annual direct and indirect regional output;
- $21M in annual direct and indirect regional value-added;
- $3M in annual direct and indirect household income; and
- 35 direct and indirect jobs.

The Project operation is estimated to make the following maximum total annual contribution to the NSW economy:

- $44M in annual direct and indirect output;
- $27M in annual direct and indirect value-added;
- $7M in annual direct and indirect household income; and
- 71 direct and indirect jobs.

To maximise the benefits of the projected economic growth in the Study Area and minimise the impacts of the Project, a range of economic impact mitigation and management measures will be employed.

Social

The Social Impact Assessment (SIA) Utilised consultation activities to inform the development of the SIA. Regular and ongoing stakeholder engagement activities provided Project feedback and sentiment from the Project's neighbouring landholders, local community, community groups and RAPs.

SIA-focused stakeholder engagement interviews were undertaken during February 2023 with a targeted sample group including the associated landowner, neighbouring landowners, community groups, RAPs, emergency services and local government. These engagements indicated that community values most strongly resonated with environment (flora and fauna), farming, community and family. Respondents particularly noted the value of the natural landscape, rolling hills and Macdonald River.

The key drivers of social change that may affect communities in proximity to the Project were found to include:

- Increased economic activity for local businesses and employment opportunities for the local workforce;
- Opportunities for diversification of income streams for host land owners;
- Disruptions due to construction related activities (noise, dust, transportation of materials and workers.);
- Accommodation arrangements for construction workforce; and
- Visual amenity and other land use and landscape changes due to altered landscapes.

Among the range of mitigation and management measures proposed, the Applicant commits to developing and implementing a Local Employment Plan to maximise local employment and regional business opportunities.

A monitoring framework will be adopted for the social impact management measures during construction and operation phases of the Project. The monitoring framework aims to verify the predicted impacts and identify any other impacts that may arise, confirm that management measures are being implemented as planned, and assess the effectiveness of the management measures.

S.5 Justification and Evaluation

The Project is critical in respect to the national and global response to combatting anthropogenic climate change. It will contribute positively to the energy sector-wide transition from traditional fossil fuel energy generation to wholesale renewable energy generation. In doing so the Project will contribute to NSW and Commonwealth Government GHG emissions reduction commitments. Further, the Project aligns with government objectives for energy security and reliability and will contribute to the continued growth of renewable energy generation and storage capacity.

The Project is located within the New England Renewable Energy Zone (REZ). The New England region has been identified as one of five REZs to be created in NSW, with the aim to combine wind, solar, hydroelectric and energy storage, together with high-voltage transmission lines, to generate and deliver clean, renewable energy. The New England REZ encompasses some of Australia's best natural energy resources. The location of the New England REZ was selected based on detailed geospatial mapping, which identified areas of high renewable energy resource potential (e.g., solar irradiance wind speeds), proximity to existing transmission infrastructure, and compatible interactions with existing land uses. The Project Area is shown in **Figure S-1** and is strategically located within and aligns with the strategic objectives of the New England REZ.

The Project is consistent with the Ecologically Sustainable Development (ESD) principles as it is in the public interest and provides public benefits. The employment and economic opportunities created by the Project have been supported by the community during engagement.

The Project:

- Will deliver renewable, low-cost energy to the national grid and contribute to the NSW and Australian Government's net zero emissions targets, providing new generation capacity that is required to replace coal-fired power station retirements planned over the next decade;

- Will primarily be developed on agricultural land which has been previously disturbed and/or historically cleared. Solar farms are compatible with existing farming operations as landowners can continue normal grazing beneath or cropping activities surrounding solar arrays;
- Layout has been designed to maximise the use of existing disturbed areas and refined to avoid or minimise environmental and social impacts, particularly those relating to biodiversity and Aboriginal cultural heritage values, in line with the avoid-minimise-mitigate-offset design hierarchy;
- Will generate material employment of up to 307 Full Time Equivalent (FTE) jobs through the construction period, and up to 15 FTE jobs during operations (across general site labour, trades, professional, scientific and technical industry sector);
- Wil deliver economic benefits to NSW, regional and local communities, including (approximately):
    - During construction: $290 million (M) in annual direct and indirect output, $126M in annual direct and indirect value added, $80M in annual direct and indirect household income and 880 direct and indirect jobs;
    - During operations: $44M in annual direct and indirect NSW economic output, $27M in annual direct and indirect NSW economic value added, $7M in annual direct and indirect household income and 71 direct and indirect jobs;
    - Providing a diversified income stream for rural landholders through payments to associated landholders; and
    - Provide benefits to regional infrastructure and services through the establishment of a ‘Community Benefit Fund’ (CBF).

The Applicant will plan and manage construction to minimise disturbance and impacts through:

- Regular and ongoing communication with the community;
- Working during standard construction hours as much as possible;
- Communicating with affected stakeholders where it may be necessary to work outside standard hours, or where work is expected to be disruptive;
- A rigorous safety culture; and
- Conducting environmental monitoring.

Through the implementation of best practice management, the potential environmental impacts associated with the Project can be appropriately managed, which will also address the community concerns and associated social impacts identified during the stakeholder engagement process.

Given the net benefit and commitment from the Applicant to appropriately manage the potential environmental impacts associated with the Project, it is considered that the Project will result in a net benefit to the Bendemeer village, New England Region, and broader NSW community and as such is open to a positive determination by the Minister.

1. INTRODUCTION

This section provides an overview of the Project, details of the Applicant, objectives, background, design strategies, related developments, and restrictions as each relates to the Project.

1.1 Introduction

Athena Energy Australia (Holdings) Pty Ltd ('Athena' or 'Applicant') proposes to construct, operate, maintain, and decommission the Bendemeer Solar Farm (Project) near Bendemeer, New South Wales (NSW).

The Applicant is seeking State Significant Development (SSD) consent for the Project under Part 4, Division 4.7 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). Athena engaged Environmental Resources Management Australia Pty Ltd (ERM) to prepare an Environmental Impact Statement (EIS) for the Project, as part of the SSD consent process.

This EIS covers all aspects of planning, construction, operation, decommissioning, rehabilitation, and environmental management for the Project. These aspects address the:

- Project-specific Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning and Environment (DPE) (SSD-36651552, dated 15 March 2022), and supplementary SEARs (dated 11 April 2023);
- Requirements of other State Government agencies;
- Requirements of Commonwealth government agencies; and
- Issues raised during the stakeholder consultation and community engagement process.

Specific requirements and where each are addressed in this EIS are presented within **Appendix A**.

Appendix B provides a concise summary of all management and mitigation measures from this EIS.

1.2 The Applicant

Athena was founded in Australia in 2019 and is a subsidiary of Athena Energy Holdings Pte Ltd, wholly owned by Metis Energy Limited (Metis). Headquartered in Singapore, Metis's core business spans a range of renewable energy generation technologies, including solar, wind and energy storage projects. Metis develops, finances, constructs, owns, and operates its projects as a fully integrated renewable energy company, with a genuine long-term approach.

Metis's core focus in Australia is long-term, created through project development and delivery of a sustainable pipeline of projects. Metis aims to deliver world-class projects to meet growing energy demands, supplying renewable energy at a competitive cost. Metis has a deep understanding of the sector through proven delivery of renewable energy across the Asia-Pacific (APAC) region. As a responsible company with a long-term vision, demonstrated through a sustainable growth strategy and strong financing capabilities, underpinned by community engagement, Metis is committed to integrating internationally recognised environmental, social and governance (ESG) standards into its business practices.

As a key player in the low-carbon energy transition, Metis currently has more than 2 GW in renewables projects under development or operational in the APAC region. Metis's goal is to own and operate a portfolio of renewable energy production in Australia to support the Australia's energy transition, whilst contributing to a global net zero future and greener society.

Athena's Australian Business Number (ABN) and address are listed below:

- **ABN**: 69 630 577 418; and
- **Address**: Unit 4, 9-11 Fitzroy Street, Tamworth, NSW 2340.

1.3 Project Overview

The Project is situated about 1.8 kilometres (km) east of the Bendemeer village centre, represented by the Bendemeer Hotel, and is located 46 km (by road) north-east of the Tamworth Post Office to the Project access. The Project is entirely located within the Tamworth Regional Local Government Area (LGA) in the New England Region of NSW, on land that is predominately used for agricultural activities. The Project Area extends across approximately 606.4 hectares (ha), over three freehold land parcels.

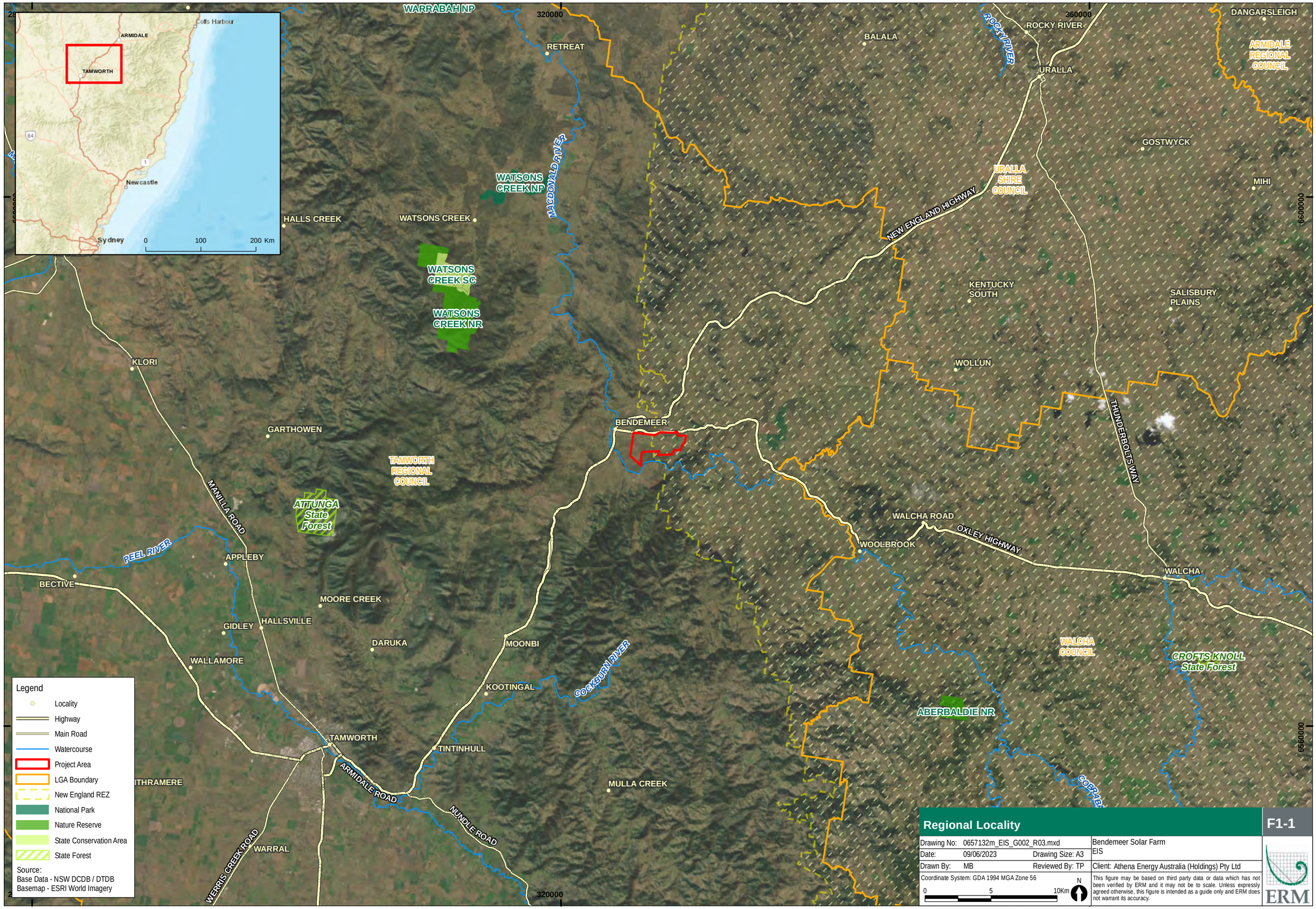
Figure 1-1 shows the Project locality in a regional setting.

The Project involves the construction, operation and where relevant decommissioning of:

- Photovoltaic (PV) solar facility with an estimated capacity of up to 280 MW Direct Current (DC);
- Battery energy storage system (BESS) with a capacity of approximately 150 MW/ 300 MW hour (MWh);
- Electrical reticulation; and
- Associated and ancillary facilities.

The 330 kilovolt (kV) Armidale-Tamworth overhead line (OHL) (Line 85) traverses the Project Area in a southwest-north east direction. The transmission line is owned and operated by TransGrid. The line has available network capacity and provides a suitable grid connection point for the Project. Details of consultation undertaken to date with TransGrid regarding the Project connecting to Line 85 are provided in **Section 5.2**.

The Project Layout is provided in **Figure 1-2**.



Regional Locality

F1-1

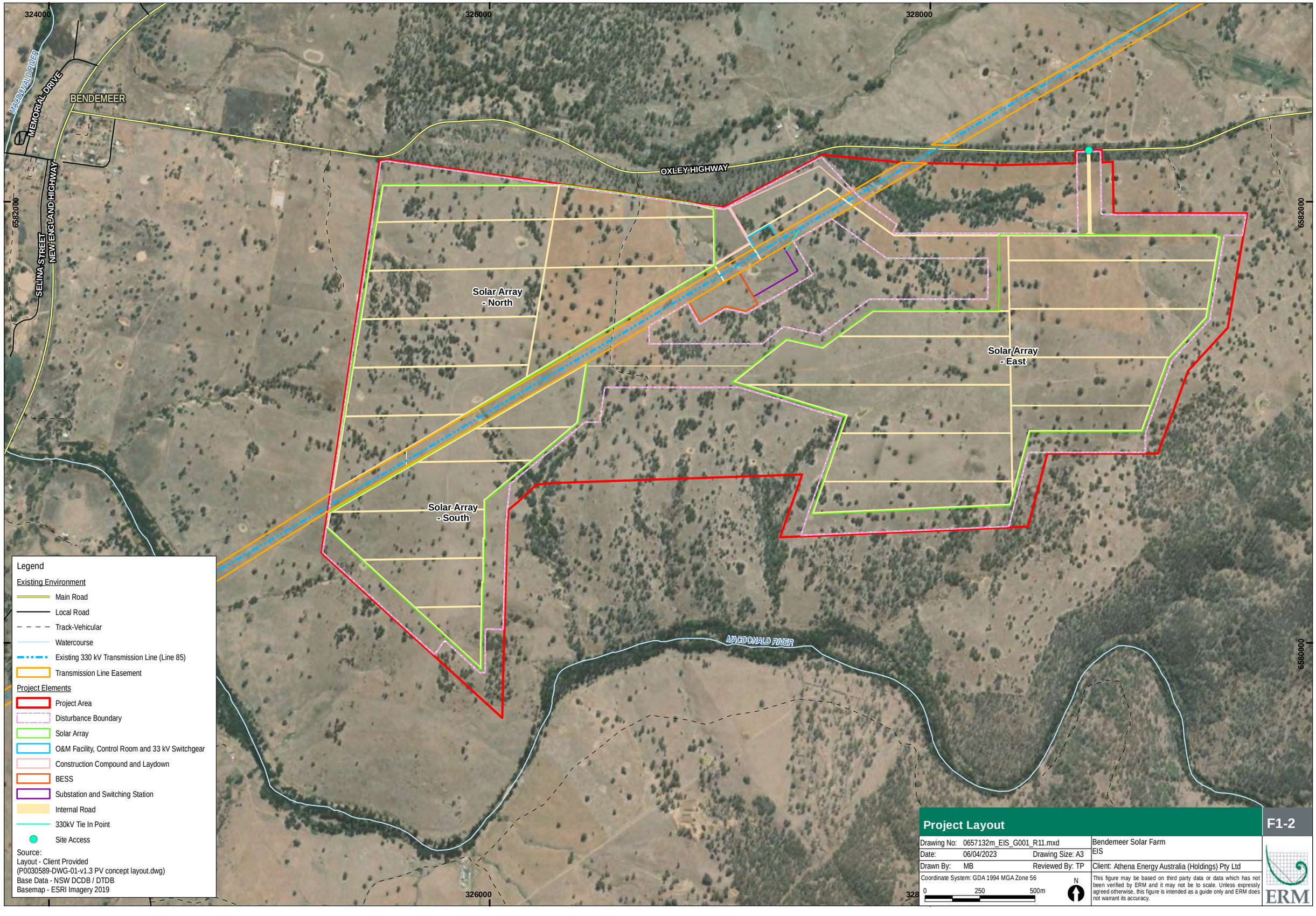
Drawing No:	0657132m_EIS_G002_R03.mxd		Bendemeer Solar Farm
Date:	09/06/2023	Drawing Size: A3	EIS
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 5 10Km N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM


324000
326000
328000
6582000
MACDONALD RIVER
MEMORIAL DRIVE
BENDEMEER
OXLEY HIGHWAY
SELINA STREET
NEW ENGLAND HIGHWAY
Solar Array - North
Solar Array - East
Solar Array - South
MACDONALD RIVER
Legend
Existing Environment
Main Road
Local Road
Track-Vehicular
Watercourse
Existing 330 kV Transmission Line (Line 85)
Transmission Line Easement
Project Elements
Project Area
Disturbance Boundary
Solar Array
O&M Facility, Control Room and 33 kV Switchgear
Construction Compound and Laydown
BESS
Substation and Switching Station
Internal Road
330kV Tie In Point
Site Access
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Project Layout
F1-2
Drawing No: 0657132m_EIS_G001_R11.mxd
Bendemeer Solar Farm
EIS
Date: 06/04/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
N
0
250
500m
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

1.4 Project Objectives

The Project has the following social, economic, and environmental objectives:

- Support the transition in the energy sector away from a centralised system of large fossil fuel generation, towards a decentralised system of widely dispersed, renewable energy generation;
- Provide alternative, renewable energy production to offset the forecast retirement of NSW coal-fired power stations, including the 1,260 MW Liddell Power Station (closed in 2023), the 2,922 MW Eraring Power Station (scheduled to close in 2025), the 1,320 MW Vales Point Power Station (scheduled to close in 2029), the 2,640 MW Bayswater Power Station (scheduled to close between 2030 and 2033), and the 1,400 MW Mount Piper Power Station (scheduled to close in 2040);
- Contribute to meeting increasing energy demand in NSW and throughout the National Electricity Market (NEM);
- Provide dispatchable energy through the proposed grid-scale BESS;
- Contribute to greenhouse gas (GHG) emissions reductions in the order of 420,000 tonnes CO_2 equivalent per annum (t-CO_2-^{e} pa), supporting the NSW and Australian Government commitments of net zero by 2050;
- Contribute materially to NSW and Federal Government's renewable energy targets;
- Deliver economic benefits to NSW, regional and local communities, including (approximately):
  - During construction: $290 million (M) in annual direct and indirect output, $126M in annual direct and indirect value added, $80M in annual direct and indirect household income and 880 direct and indirect jobs;
  - During operations: $44M in annual direct and indirect NSW economic output, $27M in annual direct and indirect NSW economic value added, $7M in annual direct and indirect household income and 71 direct and indirect jobs;
  - Material employment of up to 307 Full Time Equivalent (FTE) jobs through the construction period, and up to 15 FTE jobs during operations (across general site labour, trades, professional, scientific and technical industry sector);
  - Providing a diversified income stream for rural landholders through payments to associated landholders; and
  - Provide benefits to regional infrastructure and services through the establishment of a 'Community Benefit Fund' (CBF);
- Minimise adverse environmental impacts and offset residual impacts;
- Recycle and reuse materials where practical and economically feasible;
- Ensure quality, safety and environmental standards are maintained; and
- Liaise and work proactively with the community and all potentially affected stakeholders in the identification, mitigation and/or monitoring of environmental impacts.

1.5 Project Background

1.5.1 Project History

Bendemeer Solar Farm was originally proposed by the Kentucky Landholder Group (KLG). The KLG was formed in 2016 by over 30 landholders across Bendemeer and Kentucky with the goal to establish renewable energy projects in the region in partnership with developers that shared the same values. These values include continuous involvement with the KLG and the community through development, construction, operation and decommissioning of the project. Throughout 2018 and 2019 the Applicant attended monthly KLG community meetings.

In 2019 a southern subset of the KLG, the Kentucky South Landowner Group (KSLG) was formed. KSLG approached the Applicant to collaborate on the development of the Project, leading to the commencement in 2020 of investigations into its feasibility. The investigations confirmed the Project Area contained positive attributes for the development of a solar farm, including:

- Proximity to the existing 330 kV line for grid connection;
- Suitable topography;
- Previously cleared land;
- Suitable distance and limited viewpoints from the main Bendemeer village, noting there is a small number of dwellings on RU1 Primary Production and RU4 Primary Production Small Lots land in the vicinity of the Project;
- Site accessibility and ownership; and
- Community and stakeholder acceptance.

A solar irradiance assessment further confirmed that Lots 1, 2 and 3 of DP1211502 (freehold) were the most suitable for a solar development. The option deed for a lease agreement for these land parcels was signed in December 2020.

1.5.2 Key Strategies to Avoid, Minimise or Offset Impacts

A multivariable and iterative design approach has been adopted for the Project, taking into consideration a range of technical, environmental, social, and economic opportunities and constraints.

Design iterations for the solar arrays and ancillary facilities have progressed with key drivers measured to minimise and avoid environmental and social impacts in line with the Avoid-Minimise-Mitigate-Offset design hierarchy:

- Avoid – in the first instance, all efforts were made to avoid potential environmental and social impacts;
- Minimise – where potential impacts could not be avoided, design principles aimed to minimise environmental and social impacts, as far as feasibly possible;
- Mitigate – mitigation strategies will be implemented to manage the extent and severity of remaining environmental and social impacts; and
- Offset – environmental and social offsets shall be used only as applicable, following all efforts to first avoid, minimise and mitigate environmental impacts.

Design evolution and impact minimisation is outlined in **Section 2.5.3.**

1.6 Related Development

The Project is part of the Bendemeer Renewable Energy Hub, which includes a 280 MW (DC) solar farm and BESS, and a wind farm with up to 58 wind turbine generators (WTGs). Athena proposes to develop and progress the solar and wind farms separately. Specifically:

- The Project, including the BESS, which is located to the south of the Oxley Highway (the subject of this EIS), is expected to be progressed first; and
- The Bendemeer Wind Farm, located to the east of the New England Highway and on both sides of the Oxley Highway, will form part of a separate development application and approval process, and is subject to further design.

While the Project will operate independently, the Bendemeer Wind Farm may utilise infrastructure developed as part of the Bendemeer Solar Farm, subject to the timing of construction and approvals' processes. Shared infrastructure may include (but is not limited to):

- Substation;
- Electrical reticulation and associated infrastructure;
- Internal access tracks;
- BESS; and
- Water and related infrastructure system/s.

1.7 Restrictions or Covenants

A title search has been undertaken for the Project Area and the following restriction applies to the Project Area:

- O800782 easement for transmission line 60.96 metre(s) wide, now vested in TransGrid.

This easement is shown in **Figure 1-2** and has been considered in the Project design for which approval is sought, as described in **Section 3**.

2. STRATEGIC CONTEXT

This section identifies the key strategic issues that are relevant to the assessment of the Project. It includes the site setting and surrounding land use, how the Project aligns with International, Federal Government, and State Government policies and strategic goals, alternatives to the Project and modifications made to the proposed design during development of the Project.

2.1 Security of Energy Supply

The Project would provide 280 MW (DC) of renewable energy supply into NSW, including a 150 MW/ 300 MWh BESS to regulate the supply of energy to the grid.

The Australian Energy Market Operator (AEMO) Integrated System Plan (ISP) (AEMO, 2022a) highlights the planned retirement of all of NSW existing coal fired electricity generation by 2040; however, three of these, accounting for over 6 GW is planned to retire before 2030. Specifically, these include:

- AGL's Liddell power station (1.26 GW) closed in April 2023;
- Origin's Energy Eraring power station (2.92 GW) is scheduled to close in August 2025, seven years ahead of its previously planned retirement;
- Vales Point B power station (1.32 GW) is expected to close in 2029;
- AGL's Bayswater power station (2.64 GW) is expected to close between 2030 and 2033, and
- Mount Piper (1.4 GW), the youngest of NSW's coal-fired power stations, expected to operate until 2040.

Traditionally, across Australia, coal-fired generation and some gas peaking power plants have met electricity needs. Over the past decade, this trend has started to shift. In 2021, coal-fired generation supplied 71% of the total electricity generated in Australia (-5% compared to 2020) and renewables supplied 29% of Australia's total electricity generation (+5% compared to 2020) (DCCEEW, 2022).

The ISP (AEMO, 2022a) states that given the imminent retirement of a significant portion of NSW coal fired power generation, and the relative lower capacity factors of wind and solar compared to coal, almost nine-fold renewable energy generation and three times the firming capacity is needed across the NEM to replace coal fired power stations.

With the time it takes for wind and solar projects to become operational in NSW (e.g., to obtain development consent, and progress through construction) there is an urgent need for additional renewable energy development in NSW over the next seven years to offset the planned retirement of coal fired power and ensure a reliable energy supply.

The AEMO's 2022 Electricity Statement of Opportunities (AEMO, 2022b) report notes the substantial pipeline of future renewable projects in various stages of development. These projects total 165 GW and are spread across all regions, including NSW. **Figure 2-1** illustrates proposed generation pipeline – existing, committed, anticipated, and proposed (AEMO, 2022b).

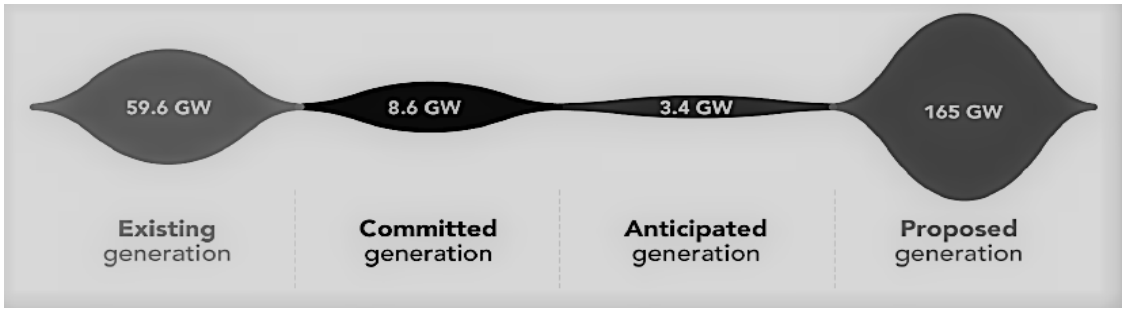


Figure 2-1 Proposed Projects Beyond Those Already Committed

The ISP 2022 identified the locations of proposed Renewable Energy Zones (REZs) in Australia that can connect to existing transmission networks, and that these REZ have 'the potential to foster a more holistic approach to regional employment, economic opportunity and community participation' (AEMO, 2022a).

The Project is located within the New England REZ, as shown in **Figure 1-1**, which was identified as a proposed REZ in the ISP 2020 and NSW Electricity Infrastructure Roadmap. The Project will respond to Phase 2 of the ISP: "Renewable generation development to replace energy provided by retiring coal-fired generators and supported by the actionable ISP projects". Phase 2 will be achieved through the development of Variable Renewable Energy (VRE) in the New England REZ.

The Project will help to meet the projected nine-fold increase in utility-scale variable renewable energy required to meet the optimal development pathway for the NEM. The Project will connect to an existing 330 kV transmission line and will include a BESS that will provide dispatchable energy capabilities including potential energy arbitrage, demand management and ancillary services opportunities. The Project will therefore contribute to augmenting the security and reliability of the electricity system in the NEM, through consistent energy generation and energy storage.

2.2 Government Strategies, Policies and Plans

Increased adoption of renewable energy generation will assist Australia to transition away from traditional fossil fuel energy production, which is linked to anthropogenic climate change, atmospheric pollution, water pollution, land pollution and human health impacts. Critically, reducing carbon emissions through replacement of traditional energy sources with renewable energy will assist to minimise the effects of climate change, benefitting current and future generations in line with the principles of Ecologically Sustainable Development (ESD).

In addition to achieving the objectives outlined in **Section 1.4**, the Project will assist to achieve objectives of the following International, Federal Government, and State Government policies strategic goals as described below.

2.2.1 United Nations Sustainable Development Goals

The *United Nations 2030 Agenda for Sustainable Development* includes global Sustainable Development Goals (SDG) to build a more sustainable and resilient future. The 17 SDG and 169 individual targets cover measures towards improvements to economic, social, and environmental sustainability. All Member States of the United Nations agreed to work towards achieving the SDGs by 2030. Of relevance to the Project are:

- Goal 7: 'Ensure access to affordable, reliable, sustainable and modern energy for all', Target 7.2 states '*By 2030, increase substantially the share of renewable energy in the global energy mix'*; and
- Goal 11: Sustainable Cities and Communities, Target 11.6 states: '*By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management'.*

The Project will provide a source of renewable energy, increasing the proportion of renewable energy generation in Australia. Further, it will assist to reduce reliance on fossil fuels for energy generation, resulting in reduction of GHG emissions and improved air quality.

2.2.2 United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties 26 (COP26)

COP26 was the 26th climate change COP held in Glasgow in late 2021. A key outcome of COP26 was agreement to "revisit and strengthen…2030 targets (Paris Agreement targets) in nationally determined contributions…by the end of 2022" (UNFCCC, 2021). The Federal Government committed to achieving net zero greenhouse gas emissions by 2050.

The Project will contribute to meeting Australia's commitments through the generation of renewable solar energy and resultant annual reduction in greenhouse gas emissions.

2.2.3 UNFCCC COP21

The United Nations Paris Agreement on climate change (Paris Agreement) outlines a framework for all countries to take climate action from 2020 and builds upon the existing international efforts in the period up to 2020. The aim of the Paris Agreement is to limit emissions globally to net zero in the second half of this century. Australia is one of 195 countries that signed on to the Paris Agreement and has set a target to reduce emissions by 26-28% below 2005 levels by 2030. This builds on the 2020 target of reducing emissions by 5% below 2000 levels (PoA, 2017).

The Project will contribute to meeting Australia's commitments under the Paris Agreement through the generation of renewable solar energy and resultant annual reduction in greenhouse gas emissions by approximately 420,000 t-CO_2^{-e} pa.

2.2.4 Government's Renewable Energy Target

The Renewable Energy Target (RET) is a Federal Government scheme which has been in operation since 2001. It is designed to reduce emissions of GHG in the electricity sector and encourage the additional generation of electricity from sustainable and renewable sources.

The RET operates as two schemes – small- and large-scale renewable projects, of which the Large-scale Renewable Energy Target (LRET) is relevant for the Project. The LRET encourages investment in large-scale renewable energy projects and incentivises the development of renewable energy power stations through a market for the creation and sale of Large-scale Generation Certificates (LGCs) to achieve 33,000 GWh of additional renewable electricity generation (Clean Energy Regulator, 2022).

This is relevant for the Project as, once constructed, it will contribute toward the LRET and will be an eligible large-scale generator under the RET.

The Project will supply 577,000 megawatt hours (MWh) per year of clean, renewable energy, enough to power more than 74,000 NSW homes on average. The Project will deliver renewable, low-cost energy to the national grid, offsetting the generation that will be lost with the closure of coal-fired power stations and contributing to the NSW Government's net-zero emissions by 2050 target.

2.2.5 Climate Change Act 2022

The Federal Government *Climate Change Act 2022* outlines Australia's greenhouse gas emissions reduction targets of a 43% reduction from 2005 levels by 2030 and reducing Australia's net greenhouse gas emissions to zero by 2050. The Project will assist in achieving this target by providing an estimated reduction in greenhouse gas emissions of approximately 420,000 t CO_2^{-e} pa.

If approved, the Project could be constructed and operational well before 2030, which is the year that many nations have pledged significant greenhouse gas emissions reductions relative to 2005 levels.

2.2.6 Net Zero Plan Stage 1: 2020-2030

The 'NSW Government Net Zero Plan Stage 1: 2020–2030' (DPIE, 2020a) sets the foundation for action on climate change and how the NSW Government will deliver on its objective to achieve net zero emissions by 2050, as outlined in the NSW Climate Change Policy Framework (OEH, 2016). The Net Zero Plan Stage 1: 2020–2030 is the NSW Government's overarching strategy to reduce emissions and mitigate the impacts of climate change.

In September 2021, the NSW Government announced ambitious new emission reductions targets to reduce emissions by 50% below 2005 levels by 2030 (Net Zero Plan Stage 1: 2020 – 2030 Implementation Update – September 2021). In December 2022, the NSW Government introduced a new goal to achieve a 70% reduction on 2005 levels by 2035 (Net Zero Plan Stage 1: 2020 – 2030 Implementation Update – December 2022).

The Project will contribute to the Net Zero Plan, including the NSW Government's updated 2030 target by providing an estimated reduction in GHG emissions of approximately 420,000 t CO_2^{-e} pa.

2.2.7 NSW Electricity Strategy

The 'NSW Electricity Strategy' (DPIE, 2019a) is the NSW Government's plan to achieve reliability, affordability, and sustainability for the NSW electricity system, and will support an estimated $10.7 billion in private investment, approximately 830 operational jobs, and 1250 construction jobs through the establishment of the New England REZ (EnergyCo, 2023).

An aim of the NSW Government's Electricity Strategy is to improve the efficiency and competitiveness of the NSW electricity market by reducing risk, cost, and government-caused delays, and to encourage investment in new price-reducing generation and energy saving technologies. The Strategy identifies the NSW Government's commitment to energy security, including additional capacity increases via interconnector projects and the rolling out of REZs. The Strategy aligns closely with the NSW Government's *Net Zero Plan Stage 1: 2020 – 2030*, and supports a new affordable and reliable energy system by:

- Delivering the coordinated Renewable Energy Zone in the New England region;
- Saving energy via the Energy Security Safeguard;
- Supporting the development of new electricity generators;
- Setting a target to increase the state's energy resilience; and
- Making it easier to do energy business in NSW.

The Project is consistent with the Strategy as it provides renewable energy generation and storage capacity that, together with other renewable generation projects, is expected to result in lower cost of energy in the NEM. The Project will also contribute to greater energy resilience using BESS stabilisation technology and the future supply of electricity to the NEM with the impending closure of coal fired power stations over the next 20 years.

The Project's proximity to the REZ is shown in **Figure 1-1**.

2.2.8 NSW Transmission Infrastructure Strategy

The *NSW Transmission Infrastructure Strategy* (DPE, 2018) is the NSW Government's plan to unlock private sector investment in priority energy infrastructure projects, which can deliver least-cost energy to customers. The Strategy forms part of the government's broader plan to make energy more affordable, secure investment in new power generation and network infrastructure and ensure new technologies deliver benefits for consumers.

The Strategy seeks to help meet future energy needs by facilitating new transmission that could support up to 17,700 MW of new electricity generation. Other benefits include improved energy reliability, security, timely project delivery, increased affordability, and access to cheaper electricity.

The Project will include connection to an existing 330 kV line and will contribute to the development of the New England REZ, which will result in an overall increase to NSW's energy capacity.

2.2.9 NSW Electricity Infrastructure Roadmap

The *NSW Electricity Infrastructure Roadmap* (Roadmap), released in November 2020 is the NSW Government's plan to transform the NSW electricity sector into one that is clean, cheap, and reliable.

The Roadmap builds on the *NSW Electricity Strategy* (DPIE, 2019a) and the *NSW Transmission Infrastructure Strategy* (DPE, 2018). It sets NSW on a plan to replace its ageing coal-fired power stations with a coordinated portfolio of generation, storage, and network investment.

The Roadmap emphasises the need to transition to renewable energies, noting four of the State's five coal fired power stations are expected to close within the next decade as discussed in **Section 2.1**. These power stations currently provide around three quarters of NSW's electricity supply and two thirds of the firm capacity needed during heat waves (DPIE, 2020d).

Enabled by the *Electricity Infrastructure Investment Act 2020* (NSW), the Roadmap sets out a coordinated framework to support $32 billion in private investment in at least 12 GW of renewable energy generation infrastructure and at least 2 GW of long-duration storage infrastructure by 2030 (DPIE, 2020d).

The Roadmap seeks to reduce GHG emissions from NSW electricity generation by 90 million tonnes by 2030, helping deliver on NSW's emissions targets (DPIE, 2020d).

The Project will provide a significant amount of renewable energy annually to help offset the retirement of coal-fired power stations in NSW. The Project will assist in meeting the NSW Government's emissions reduction targets, and NSW's energy generation and storage requirements. The Project will also contribute to the development of the New England REZ, which will add to the regional growth and investment.

2.2.10 New England Renewable Energy Zone

The *NSW Electricity Strategy* (DPIE, 2019a) and Electricity Infrastructure Roadmap (DPIE, 2020d) establishes the framework to deliver the state's first five REZs in strategic areas across the state, including in the New England region. The REZ will play a significant role in delivering renewable energy generation and storage to help replace existing fossil fuel power stations as they come to their end of operational life.

The new England region has been identified as one of five REZs to be created in NSW, with others being declared/proposed in the Central-West Orana, Illawarra, South-West and Hunter-Central Coast regions of NSW. REZs combine wind, solar, hydroelectric and energy storage, and high-voltage transmission lines, to generate and deliver clean, renewable energy. By connecting multiple generators and storage in the same area, REZs capitalise on economies of scale to deliver cheap, reliable, and clean electricity for homes and businesses in NSW.

The objectives of REZs are to:

- Deliver affordable energy into the future;
- Diversify the NSW energy mix;
- Expand electrical transmission capabilities; and
- Open new parts of the NEM for energy generation in locations that can benefit from diverse weather patterns.

Most of the Project is strategically located within the New England REZ as shown in **Figure 1-1**, which aligns with the strategic objectives of the New England REZ. The Project will deliver affordable energy, contribute to the diversification of the NSW energy sector, and facilitate the expansion of electrical transmissions capabilities and the opening of new parts of the NEM for energy generation.

2.3 Land Use Planning

2.3.1 New England North West Regional Plan 2041

The *New England North West Regional Plan 2041* (Regional Plan) applies to the Project Area. The Regional Plan sets a 20-year strategic land use planning framework for the region and covers all facets of land use planning, including employment areas, town centres, housing and related infrastructure, the natural environment, and future hazards. It also provides guidance for councils in preparing local strategic plans, local plans, and planning proposals, as well as setting direction for state agencies to support the objectives of the Regional Plan.

Table 2-1 summaries the strategies of the Regional Plan relevant to the Project.

Table 2-1 Regional Plan Strategies Relevant to the Project

Regional Plan Strategies	Project Response
2.1: Minimise land use conflict that may restrict the use of important agricultural land	The Project allows for ongoing agricultural activity through planned continued use of the Project Area for grazing, preventing fragmentation of agricultural land in the region.
8.4: Encourage sustainable and resilient building design and materials (such as forest products) including the use of renewable energy to displace carbon intensive or fossil fuel intensive options	The Project's proposed renewable solar energy and battery development would increase the renewable generation in the region and assist with replacing fossil energy sources.
9.1: Support the development of renewable energy storage options and distributed energy systems that are located close to their point of use	The Project will provide renewable energy generation and storage capacity that will contribute to the creation of a new renewable energy generation industry within the Tamworth region and in proximity to the existing Line 85.
9.2: Identify and mitigate impacts on views, local character, and heritage where appropriate and undertake detailed hazard studies	The Project has undertaken technical studies to identify, avoid and mitigate impacts associated with the development of Project. Additionally, appropriate measures will be adopted to protect heritage sites in consultation with relevant stakeholders.
10.1: Support the development of circular economy, hubs, infrastructure, and activities and consider employment opportunities that may arise from circular economies and industries that harness or develop renewable energy technologies and will aspire towards an employment profile that displays a level of economic self-reliance, and resilience to external forces	The Project will provide renewable energy and generate employment opportunities. The Project is anticipated to create up to 307 FTE jobs during construction and 15 FTE jobs during long-term operations.

2.3.2 Tamworth Regional Local Environmental Plan 2010

The Project is located within the Tamworth Regional Council LGA and is therefore subject to the relevant provisions of the 'Tamworth Regional Local Environmental Plan' (Tamworth LEP) 2010.

Aims of the Tamworth LEP (Clause 1.2(2)) of relevance to the Project include:

> *"(a) to encourage the orderly management, development and conservation of natural and other resources within the Tamworth region";*
>
> *"(d) to promote ecologically sustainable urban and rural development"; and*
>
> *"(e) to secure a future for agriculture by expanding Tamworth's economic base and minimising the loss or fragmentation of productive agricultural land".*

The Project Area is zoned RU1 (Primary Production) as shown in **Figure 2-2**. Objective of the RU1 zone relevant to the Project 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", and "to minimise the fragmentation and alienation of resource lands"* (Land Use Table, zone RU1 objectives).

The Project is consistent with the objectives of the Tamworth LEP including land zone RU1, particularly in relation to meeting, encouraging, and managing ecologically sustainable development as further detailed in **Section 7.7**. Additionally, the Project will continue to provide upgraded access for ongoing agricultural activities and further provide a diversified income stream through the CBF. The income provided to landowners hosting Project infrastructure can help make farms more resilient to the impacts of droughts, fires, and commodity price fluctuations.

2.3.3 Tamworth Regional Development Control Plan 2010

The Tamworth Regional Development Control Plan 2010 (Tamworth DCP) does not apply to the Project, commensurate with the *State Environmental Planning Policy (Planning Systems) 2021* as follows:

State Environmental Planning Policy (Planning Systems) 2021, (Clause 2.10(a)) states:

> *"Development control plans (whether made before or after the commencement of this Chapter) do not apply to—*
>
> *(6) State significant development…"*

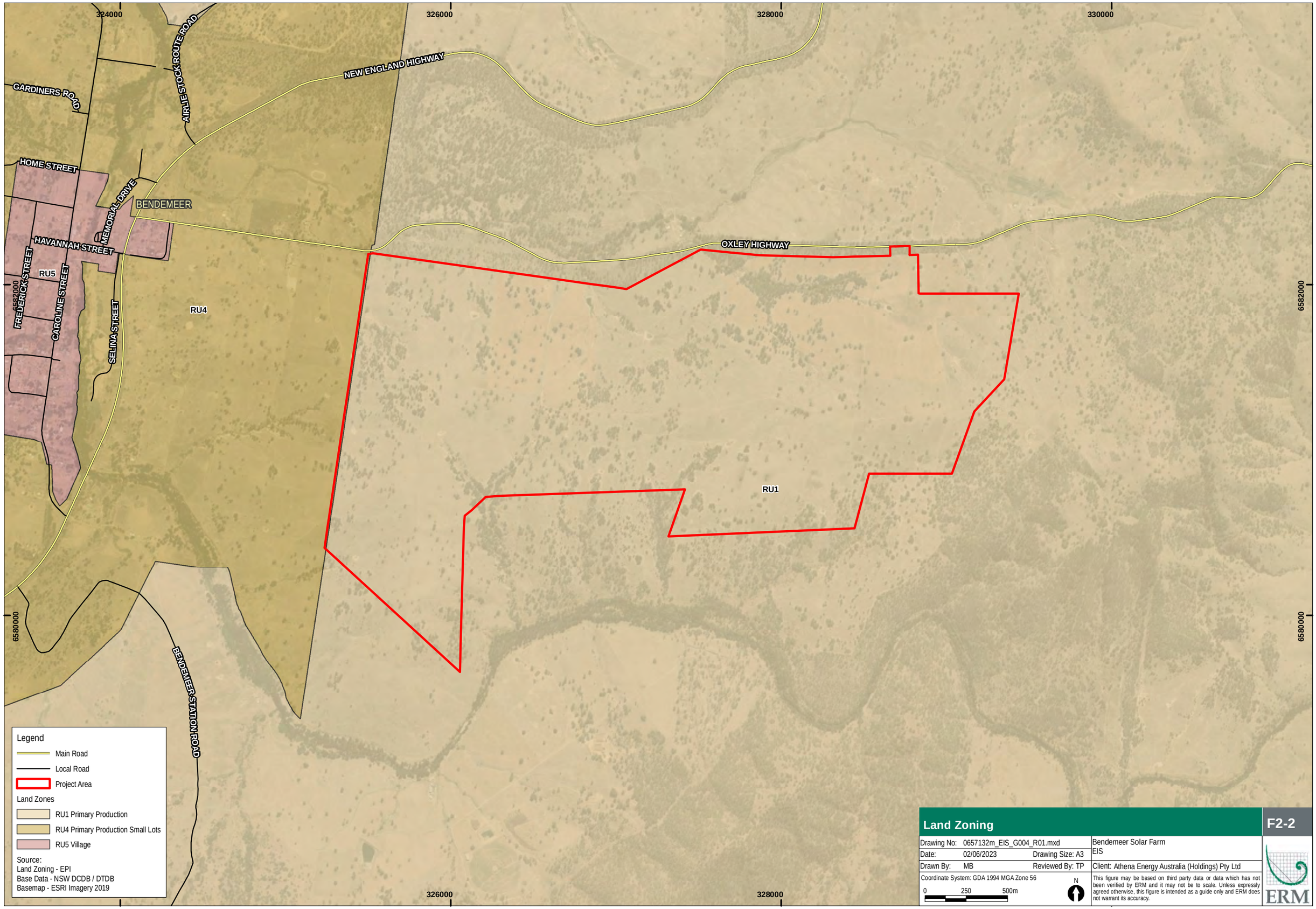
2.3.4 Tamworth Regional Blueprint 100

Tamworth Regional Council has adopted the 'Tamworth Blueprint 100', which consists of a series of plans that will provide a strategic direction and action plan to better deliver on Community Strategic Plan (CSP) outcomes. The relevant priority themes and focus areas of Blueprint 100 plans to the Project are summarised in **Table 2-2**.

Table 2-2 Tamworth Blueprint 100 Priority Themes and Focus Areas Relevant to the Project

Tamworth Blueprint 100	Project Response
Part 1 Priority Themes	
3. Create a prosperous region	The Project will create up to 307 FTE jobs during the construction phase and approximately 15 FTE operational jobs. Where practicable, the Applicant will prioritise hiring from within the region, which includes the LGAs of Tamworth Regional, Armidale Regional, Uralla and Walcha.
6. Design with nature	The Project will contribute to the creation of a new renewable energy generation industry within the Tamworth region.
8. Strengthen our proud identity	The Project will strengthen the region's identity by supporting local innovation and investment through renewable energy generation. The Project will diversify the energy market, reduce dependence on fossil energy source, contribute to managing affordability and attract new residents to the region.
Part 2 (Local Strategic Planning (LSPS)) Priority Themes	
5. Design with nature	The Project is consistent with Priority Theme 5 as it will Integrate waste minimisation considerations to assist with waste reduction and recycling.
6. Celebrate culture and heritage	The Project is consistent with Priority Theme 6 as it will adopt appropriate measures in planning strategies and local plans to protect Aboriginal heritage sites and artefacts, in consultation with the local Aboriginal community.

Tamworth Blueprint 100	Project Response
Community Plan Focus Area	
Focus Area 3 Prosperity and Innovation	The Project is consistent with Focus Area 3 as it is anticipated to create up to 307 FTE jobs during construction phase. Over the long-term, approximately 15 FTE jobs will be created during operations.
Focus Area 4 Resilient and Diverse Communities	The Project is consistent with Focus Area 4 as it will provide a diversified income stream to the landowner hosting Project's infrastructure through the CBF. It will help make farms more resilient to the impacts of droughts, fires and commodity price fluctuations.
Focus Area 6 Working with and Protecting Our Environment	The Project is consistent with Focus Area 6 as it will contribute to the creation of a new renewable energy generation industry within the Tamworth region and will deliver low-cost renewable energy to the national grid.


324000
326000
328000
330000
6582000
6580000
NEW ENGLAND HIGHWAY
OXLEY HIGHWAY
GARDINERS ROAD
AIRLIE STOCK ROUTE ROAD
HOME STREET
MEMORIAL DRIVE
BENDEMEER
HAVANNAH STREET
FREDERICK STREET
CAROLINE STREET
SELINA STREET
RU5
RU4
RU1
BENDEMEER STATION ROAD
Legend
Main Road
Local Road
Project Area
Land Zones
RU1 Primary Production
RU4 Primary Production Small Lots
RU5 Village
Source:
Land Zoning - EPI
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Land Zoning
F2-2
Drawing No: 0657132m_EIS_G004_R01.mxd
Bendemeer Solar Farm
EIS
Date: 02/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
N
0 250 500m
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

2.3.5 *Tamworth Regional Community Strategic Plan: Keychange 2017- 2027*

The *Tamworth Regional Community Strategic Plan: Keychange 2017- 2027* (Tamworth CSP) outlines the directions and strategies for the Tamworth region over the next ten years, based on aspirations and priorities of the Tamworth community. The Tamworth CSP is grouped around five key themes and specific objectives for each theme (Tamworth Regional Council, 2016a).

Tamworth Regional Council is currently preparing to review the Tamworth CSP, which will include a community engagement process.

The objectives of the Tamworth CSP relevant to the Project are summarised in **Table 2-3**.

Table 2-3 Tamworth CSP: Keychange 2017 – 2027 Objectives Relevant to the Project

Tamworth CSP Objectives	Project Response
P1 – A strong and diverse economic base	The Project is consistent with Objective P1 as jobs will be created throughout construction and operation of the Project.
F2 – To promote sustainable living to protect and support our environment, heritage, and resources.	The Project is consistent with Objective F2 as it will contribute to the creation of a new renewable energy industry and sustainable practices for the Tamworth region.
L2 – Our region is well led and managed	The Project is consistent with Objective L2 as it will support local innovation strategies through renewable energy generation and contribute to managing affordability and attract new investors and residents to the region.

2.3.6 *Tamworth Regional Council Our Environmental Sustainability Strategy & Action Plan 2022 – 2026*

The Tamworth Regional Council Our Environmental Sustainability Strategy & Action Plan 2022 – 2026 (Sustainability Strategy) was developed in response to the Environmental Sustainability Community Survey, and consultation outcomes from the Tamworth CSP. It provides an integrated and coordinated approach to advancing sustainability in the Tamworth region (Tamworth Regional Council, 2022). The Sustainability Strategy has eight priority themes for action developed in alignment with the Blue Print 100 Focus Areas.

The relevant goals to the Project are summarised in **Table 2-4**.

Table 2-4 Sustainability Strategy Objectives Relevant to the Project

Sustainability Strategy Objectives	Project Response
E2. Reduce Tamworth Regional Council's carbon emissions from energy use	The Project will generate renewable energy to contribute to the uptake of proven emissions reduction technologies and support the replacement of retiring coal fired generators in NSW. The Project will reduce greenhouse gas emissions by approximately 420,000 t CO_2-^{e} pa.
E4. Guide land use planning to encourage an increase in renewables, energy efficiency, and a reduction in carbon emissions from the built form	The Project will contribute to the sustainable practices by generating renewable energy and increasing efficient use of natural resources for the Tamworth region.
CE2. Attract sustainable and alternative events and business opportunities to Tamworth LGA, including in the villages and regions	The Project will provide cleaner reliable energy generation to assist with meeting current load demand while simultaneously reducing greenhouse gas emissions.
WE1. Encourage the separation of unrecovered resources into useful components and establish markets for their beneficial reuse	The Project will adopt waste minimisation and strategies to assist with waste reduction and recycling. Solar panels and batteries used in the Project will be recycled when they have reached the end of their life, where recycling opportunities exist.

2.3.7 Tamworth Tomorrow 2022-2026

Tamworth Tomorrow 2022-2026 (Tamworth Tomorrow) recognises opportunities for investment through existing infrastructure, while addressing current challenges identified through extensive engagement with the community and key stakeholders across the region. The Tamworth Tomorrow is based around eight economic priorities which will activate and drive economic long-term growth (Tamworth Regional Council, 2016b).

The priorities and strategies relevant to the Project that will help the region achieve its longer-term economic aspirations and objectives are summarised in **Table 2-5**.

Table 2-5 Tamworth Tomorrow Strategies Relevant to the Project

Tamworth Tomorrow Strategies	Project Response
Housing Affordability and Availability	The Project will help the region reduce whole-of-life housing costs and manage affordability by contributing to the creation of a new renewable energy generation industry within the Tamworth region and delivering low-cost renewable energy to the national grid.
Education, Skills, and Training	The Project will increase the capacity and experience of local workforce, contractors and service providers and enhance employment pathways to retain skilled people that will support the Project during construction and operations.
Innovation and Future Industries	The Project will support local innovation and investment in alignment with Blueprint 100 through renewable energy generation, energy market diversity, and by reducing dependence on fossil energy source.
The Renewable Economy	The Project will broaden the region's 'green economy' by providing renewable generating capacity, reliability and security to the electricity grid and firming capacity in the transition from fossil energy source. The Project will generate employment opportunities through engagement of local contractors and materials and service providers.
Economic Principles	The Project will provide renewable energy that will assist the Tamworth region to build sustainable business strategies for major infrastructure developments that contribute to their ongoing sustainability and the local economy. The Project will provide a diversified income stream through the CBF and lead to local business stimulus generating local opportunity and attractiveness to the region.

2.4 Site Setting and Surrounding Land Use

The Project Area is zoned RU1 (Primary Production) as shown in **Figure 2-2**.

The area surrounding the Project Area is generally zoned RU1 (Primary Production); however, adjacent to the Project Area to the west is zoned as RU4 (Primary Production Small Lots) and the Bendemeer village is zoned RU5 (Village), which is located 1.2 km to the west of the Project at its closest. The Bendemeer Hotel, located in the town centre, is approximately 1.8 km from the Project Area. Between the town centre and the Project Area are a mixture of land uses, including rural, residential, commercial, industrial, and public recreation.

Land uses in the Tamworth LGA are predominantly agricultural, which resulted in large areas within the region to be cleared for agricultural uses. Livestock grazing activities represent 89% of the agricultural land use, followed by cropping at 10%, and forestry and other land uses totalling less than 1% (ABS, 2022).

Table 2-6 provides a summary of surrounding land use, which is further illustrated in **Figure 2-3**.

Table 2-6 Surrounding Land Use

Land use	*Summary*
Conservation areas	Watsons Creek National Park is about 23 km to the north-east of the Project. This is a relatively small national park covering about 335 ha along Watsons Creek, which offers hiking. Warrabah National Park is a larger park that surrounds a portion of the Namoi River about 39 km north-east of the Project. This park offers camping, hiking, and picnic facilities. The Oxley Wild Rivers National Park is about 60 km to the east.
Catchments	The Project is located within the New England Tablelands Interim Biogeographic Regionalisation of Australia (IBRA) Bioregion and Eastern Nandewars IBRA subregion. The New England Tablelands IBRA Bioregion includes parts of the MacIntyre River catchment, Clarence River catchment, Gwydir River catchment, Macleay River catchment, Namoi River catchment and Manning River catchment. In addition to the above rivers, the bioregion is traversed by the Peel River, Macdonald River, and Severn River. The Project Area falls within the Namoi River catchment, which covers an area of about 42,000 km^2. The Project Area is located north of the Macdonald River, a 7^{th} order stream. The catchment leading to the village of Bendemeer has an area of approximately 1140 km^2, the shape of the catchment is unusually narrow, and dominated by rural landscapes including farmland and forested areas. The river flows through the village of Bendemeer and then to the north and west, where it joins the Namoi River before flowing into Keepit Dam, which is located approximately 65 km west of the Project. The Project Area is located on generally low flood hazard land (refer **Section 6.8**). Hydrology and hydraulic modelling of the developed case concluded that flood hazard increase is typically minor or insignificant across the Project Area and the study catchment, and generally not expected to create any significant impact on flood behaviour.
Mineral resources	A search of the NSW DPE MinView mapping tool was undertaken in January 2023. The search indicated that there is no Exploration Licence (EL) within the Project Area.
Tourism and viewpoints	Ridgelines within the New England Tableland, where the Project is located, is associated with the Great Dividing Range, Thunderbolts Ridge, Flaggy Range, Nandewar Range and Moonbi Range. Mount Pleasant is located approximately 1.4 km north-east of the Project. Moonbi Lookout is approximately 11 km south-west of this Project and is a popular lookout and recreational area, particularly to the south across plains and ridgelines. The Macdonald River is another key landscape feature within the 5 km of the Project Area. Other significant features include the Bendemeer Camping Grounds and Bendemeer Showgrounds located along the Macdonald River and within the Bendemeer village. Other features include Mount Bendemeer and Sugarloaf Mountain, located 6.5 km north-west and 6 km west of the Project, respectively. However, there are no formal recreational areas associated with these peaks.
Existing electricity transmission network	An existing 330 kV line is located within the boundary of the Project Area. The transmission line is the Armidale-Tamworth OHL referred to as Line 85. Line 85 is owned and operated by TransGrid. The Project will connect to the existing TransGrid network through Line 85 and a new switching station located within the Project Area.
Quarries	There are 14 operating quarries less than 100 km from the Project, which are further discussed in **Section 3.4.7**.

The development of a solar farm and ancillary infrastructure does not present any conflicts with its current, or potential future land uses. The Project Area is zoned RU1 (Primary Production) and the land is currently used for grazing. Solar farms and agricultural production, specifically sheep grazing, can co-exist, and it is the intent of the Applicant that the majority Project Area will remain available for sheep grazing during operation.

2.4.1 Land Details

Associated Dwellings

The land within the Project Area is primarily freehold as shown in **Table 2-7**. A small portion north of Lot 3 DP 1211502 is 'Road Corridor', where the site access will be located (refer **Figure 2-4**).

The Applicant has entered "Option to Lease" Agreements with one landholder/ entity hosting the Project. Cadastral boundaries are shown in **Figure 2-4**.

Table 2-7 Land Titles of the Project Area

Lot	DP	Title
1, 2, 3	1211502	Freehold

Crown Lands

Crown land refers to any land which is held by the Crown and is not held in freehold by another person. Crown land is regulated by relevant State government legislation, principally the *Crown Land Management Act 2016* (NSW) and the *Roads Act 1993* (NSW) and certain requirements must be met before Crown land can be dealt with by, for example, being leased or sold. There is no Crown land within the Project Area; however, there is a TfNSW Road Reserve, as shown in **Figure 2-4**.

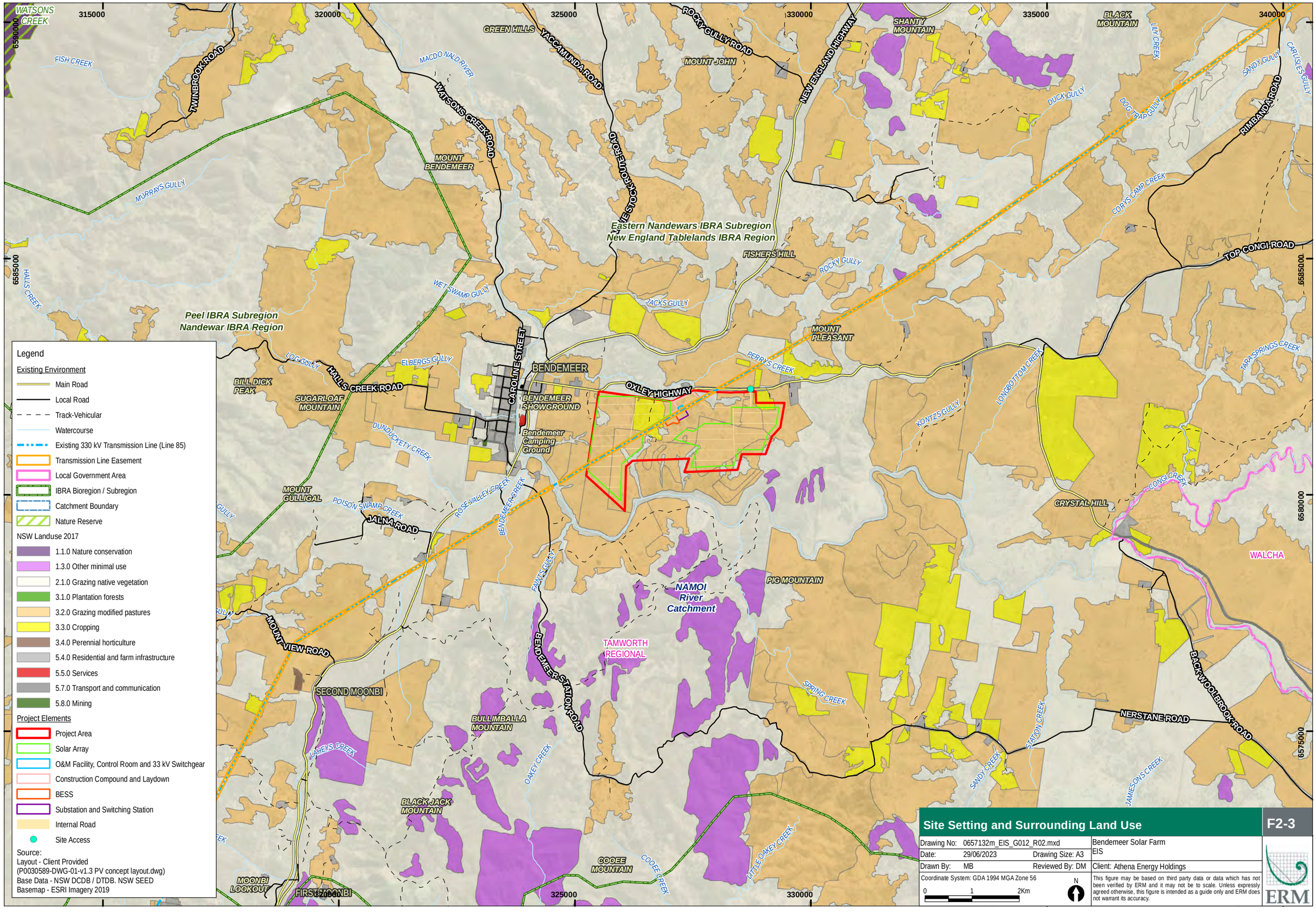
Residential Dwellings

For the purposes of this EIS, dwellings whose owners are hosting Project infrastructure or have entered into an agreement in relation to the Project are referred to as 'associated' dwellings with all other dwellings within the relevant assessment area (4 km of the Project Area) referred to as 'non-associated' dwellings.

There are:

- 0 associated dwellings located within the Project Area;
- 3 associated dwellings outside of the Project Area but within the associated land titles; and; and
- 126 non-associated dwellings within 2 km of the Project Area, and 60 non-associated dwellings between 2 km and 4 km from the Project Area.

Figure 2-4 shows the location of associated and non-associated dwellings in relation to the Project Area and **Appendix C** provides the dwelling type, coordinates, and distance to the Project Area.



Legend

Existing Environment
- Main Road
- Local Road
- Track-Vehicular
- Watercourse
- Existing 330 kV Transmission Line (Line 85)
- Transmission Line Easement
- Local Government Area
- IBRA Bioregion / Subregion
- Catchment Boundary
- Nature Reserve

NSW Landuse 2017
- 1.1.0 Nature conservation
- 1.3.0 Other minimal use
- 2.1.0 Grazing native vegetation
- 3.1.0 Plantation forests
- 3.2.0 Grazing modified pastures
- 3.3.0 Cropping
- 3.4.0 Perennial horticulture
- 5.4.0 Residential and farm infrastructure
- 5.5.0 Services
- 5.7.0 Transport and communication
- 5.8.0 Mining

Project Elements
- Project Area
- Solar Array
- O&M Facility, Control Room and 33 kV Switchgear
- Construction Compound and Laydown
- BESS
- Substation and Switching Station
- Internal Road
- Site Access

Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB. NSW SEED
Basemap - ESRI Imagery 2019

Site Setting and Surrounding Land Use

F2-3

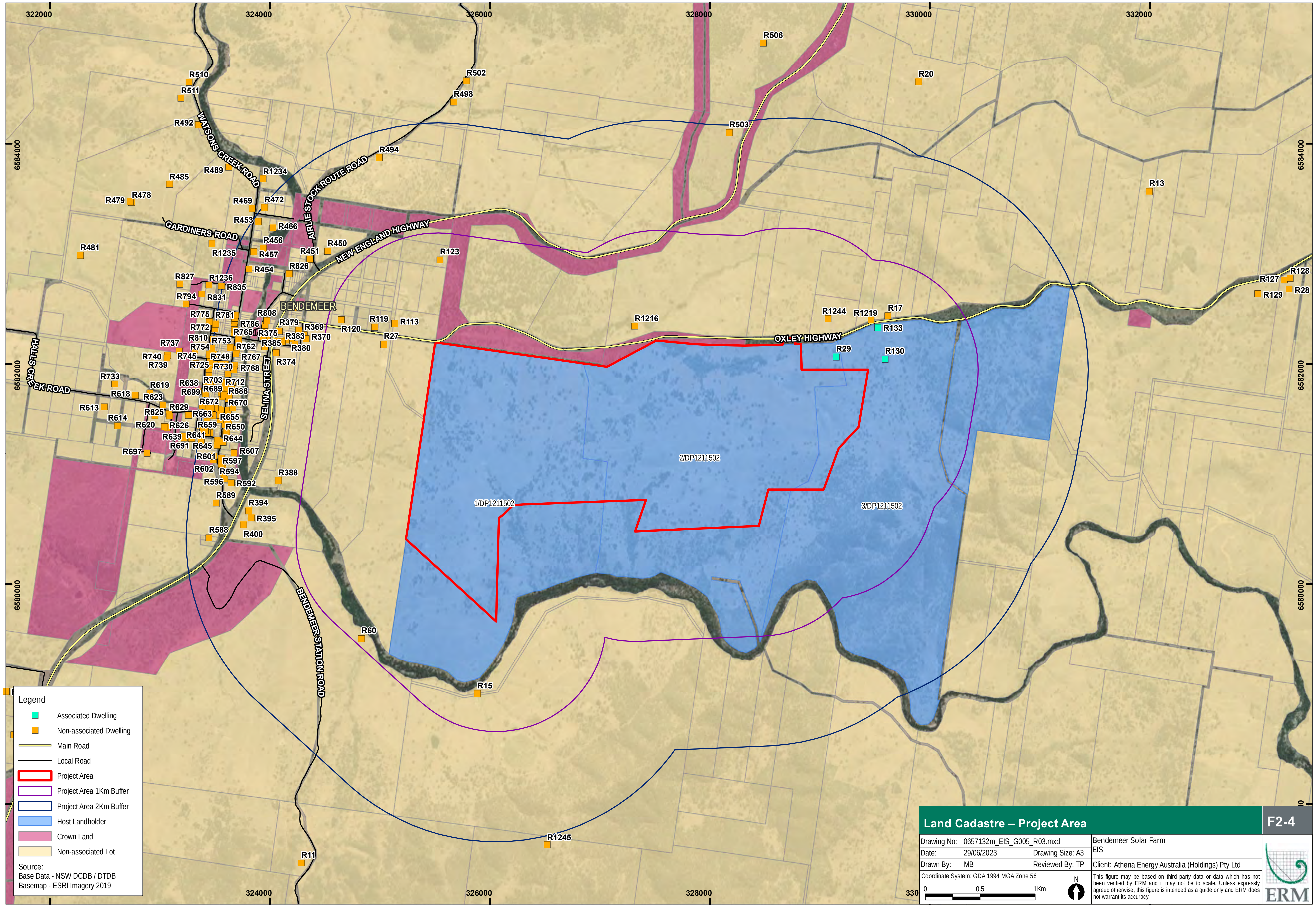
Drawing No:	0657132m_EIS_G012_R02.mxd		Bendemeer Solar Farm EIS
Date:	29/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: DM	Client: Athena Energy Holdings

Coordinate System: GDA 1994 MGA Zone 56

0 1 2Km

N

ERM



Land Cadastre – Project Area
F2-4
Drawing No: 0657132m_EIS_G005_R03.mxd
Date: 29/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0
0.5
1Km
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM
Legend
Associated Dwelling
Non-associated Dwelling
Main Road
Local Road
Project Area
Project Area 1Km Buffer
Project Area 2Km Buffer
Host Landholder
Crown Land
Non-associated Lot
Source:
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
322000
324000
326000
328000
330000
332000
6584000
6582000
6580000
BENDEMEER
NEW ENGLAND HIGHWAY
OXLEY HIGHWAY
WATSONS CREEK ROAD
GARDINERS ROAD
AIRLIE STOCK ROUTE ROAD
HALLS CREEK ROAD
SELINA STREET
BENDEMEER STATION ROAD
1/DP1211502
2/DP1211502
3/DP1211502
R506
R20
R502
R498
R510
R511
R492
R503
R494
R1234
R489
R485
R478
R479
R13
R469
R472
R453
R466
R456
R457
R1235
R450
R451
R123
R481
R454
R826
R827
R1236
R835
R794
R831
R128
R127
R129
R28
R17
R1244
R1219
R133
R1216
R775
R781
R808
R379
R369
R120
R119
R113
R786
R772
R765
R375
R383
R370
R27
R810
R753
R385
R380
R737
R754
R762
R29
R130
R740
R745
R748
R767
R374
R739
R725
R730
R768
R733
R703
R712
R638
R689
R686
R619
R699
R618
R623
R672
R670
R613
R629
R625
R663
R655
R614
R620
R626
R659
R650
R639
R641
R644
R691
R645
R697
R607
R601
R597
R602
R594
R388
R596
R592
R589
R394
R395
R588
R400
R60
R15
R1245
R11

2.4.2 Environmental Setting

The Project Area has historically been used for agricultural purposes and is currently used for cattle and sheep grazing. Due to a long history of agriculture use, the Project Area is highly modified. The land is dominated by a mixture of grazing modified pastures, grazing native vegetation areas and contains isolated areas of native trees on hill crests, lower slopes and drainage lines.

2.4.3 Nearby SSD Projects

The Project Area is within proximity to several SSD projects, which are identified as proposed, under construction, or operational. These include, but are not limited to, wind farms, solar farms, BESS facilities, and a pumped hydro energy storage project.

Section 6.16 provides a discussion of the cumulative impacts of the Project in accordance with the 'Cumulative Impact Assessment Guidelines for State Significant Projects' (CIA Guidelines) (DPIE, 2021d).

2.5 Project Alternatives

2.5.1 No Project

The 'No Project' option needs consideration as it represents the status quo, avoids development impacts but does not realise the Projects benefits. Doing nothing would avoid potential impacts associated with the development and operation of the Project and retain the current land use – agricultural production.

The potential impacts that could be avoided include construction and operational noise, traffic, dust, visual, biodiversity, and Aboriginal heritage impacts. **Section 6** provides further discussion of these impacts and the accompanying mitigation and management measures. This EIS section concludes that with appropriate mitigation and management measures, the Project will not have a significant negative impact on environmental or social aspects.

Not proceeding with the Project would forgo the benefits outlined in **Section 2.2**, particularly those relating to federal, state, and regional policies, and strategies to decarbonise the NEM. Should the Project not proceed, the estimated 420,000 t CO_2-e pa reduction in GHG emissions would not be realised. Similarly, not proceeding with the project would forgo the social and economic benefits detailed in this EIS, including the provision of direct and indirect employment and economic stimulus.

2.5.2 Site Selection

The Project Area is identified as a highly suitable site for the proposed solar farm development as identified in **Section 2.4**.

During the site selection process for the Project, various criteria were considered, including:

- Proximity and access to existing 330 kV line;
- Accessibility to the Project via a major road;
- An area that would avoid or limit the need to remove native vegetation or impact on other environmental values;
- A site with topographical features that would require minimal earthworks/ soil disturbance;
- A site with minimal flooding or bushfire risk;
- Minimal impact on surrounding privately or publicly owned land; and
- Minimal environmental impacts.

The Applicant considered several alternative sites that did not meet these criteria. The site location for the Project was selected as it ranked highest in each of these criteria.

2.5.3 Design Evolution and Impact Minimisation

Since the conception of the Project, the design has evolved through consideration of technical, environmental, social, and commercial limitations. A significant aspect of this design refinement was done through engagement with landowners, neighbours to the Project, the broader community, local government, State and Federal Agencies, and business and stakeholder groups as described in **Section 5.2.** This engagement, along with technical studies undertaken, has helped to shape the indicative Project layout presented in this EIS.

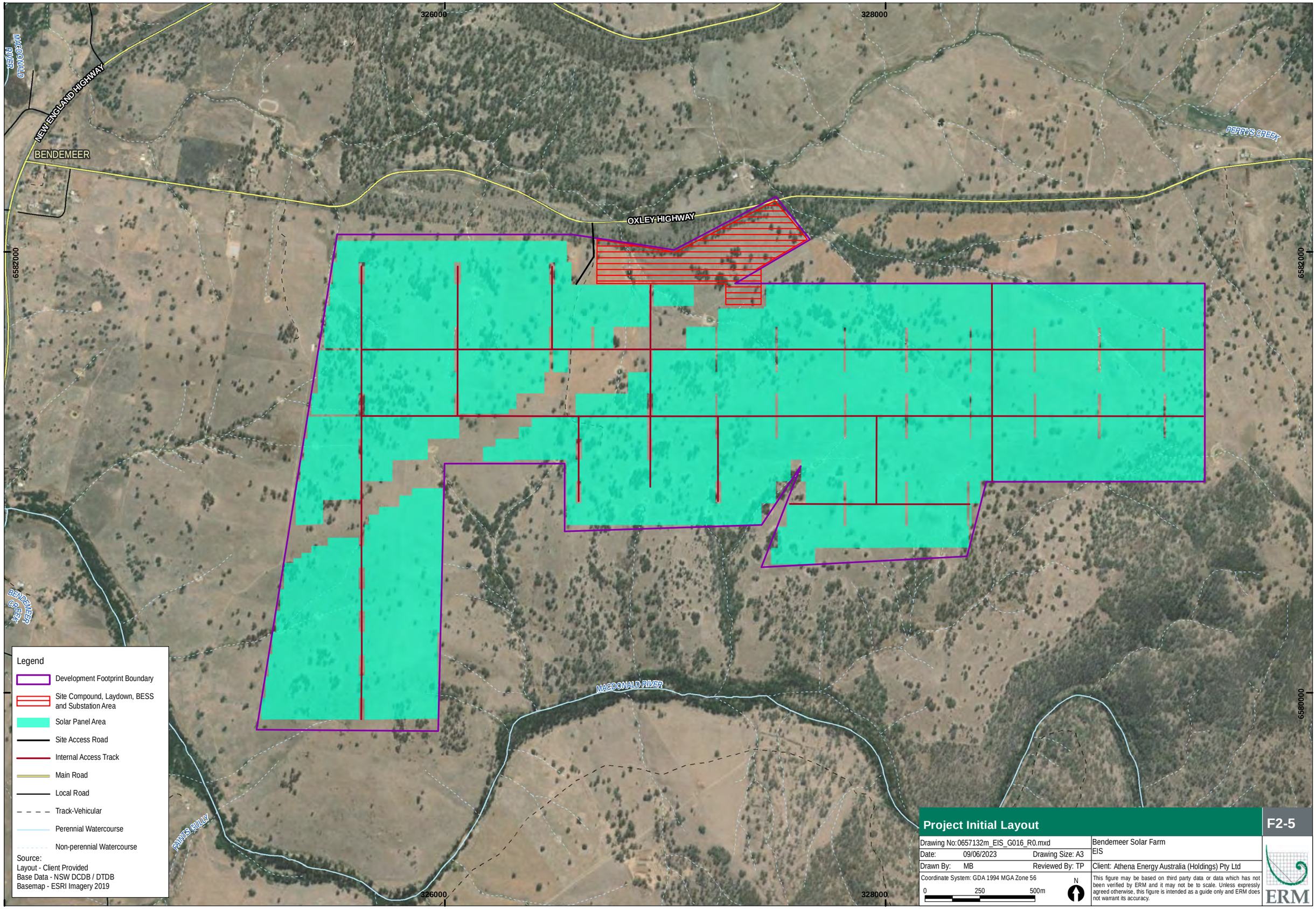
The Project design has been revised and refined for the EIS based on further detailed assessments and in response to the identification and assessment of environmental limitations, constructability requirements, and consideration of the outcomes of agency, landowner, and community consultations.

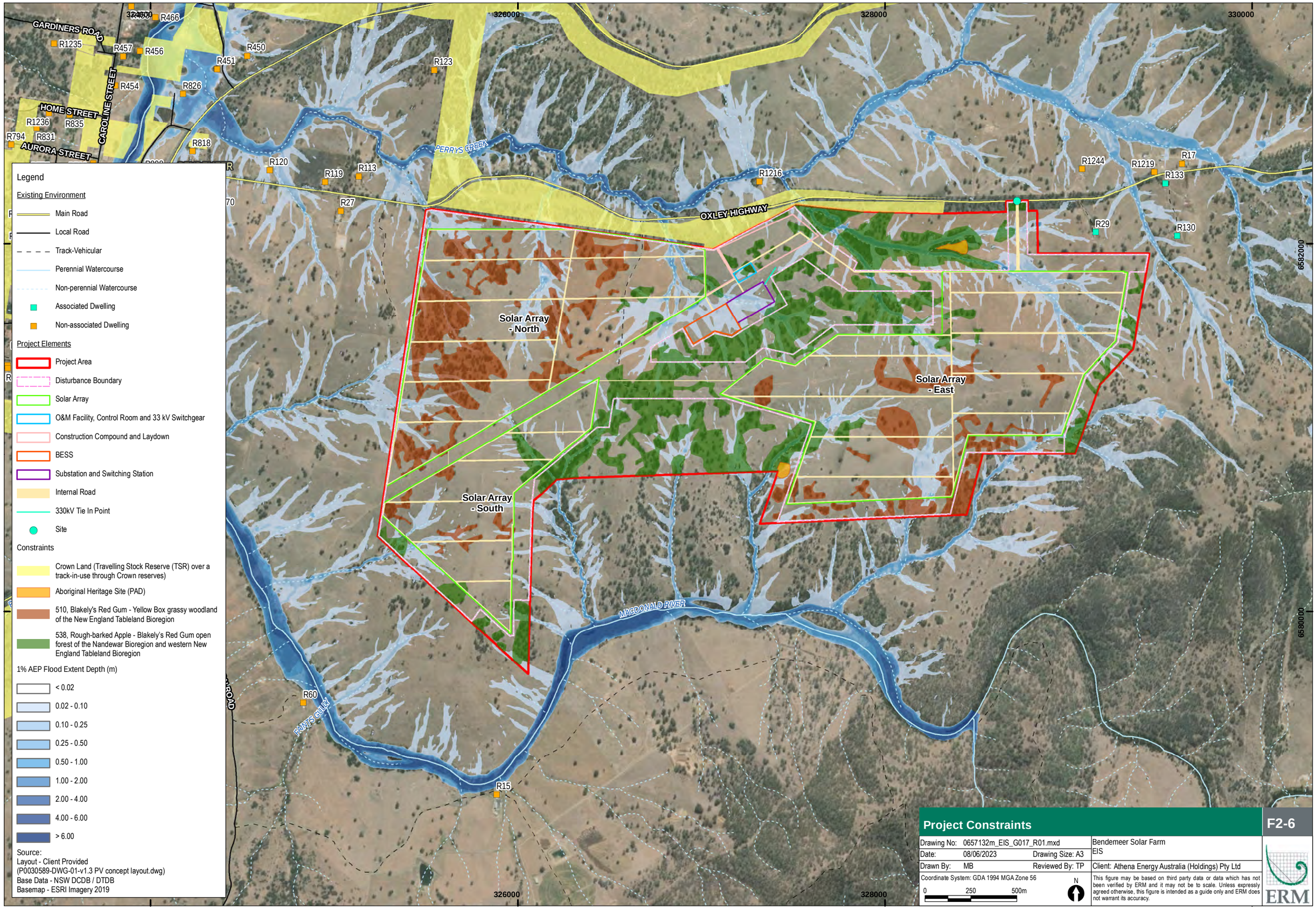
Table 2-8 describes the evolution of the Project layout since the scoping phase, and the amendment responses to key environmental and other land use limitations identified. **Figure 2-5** shows the Initial Layout and **Figure 2-6** includes a high-quality detailed Project constraints map that have informed the final design of the Project.

Table 2-8 Project Amendments

Project Element	Initial Layout	Project (EIS)	Environmental Benefits
Project Area	■ > 1,370 ha	■ 606.4 ha	■ Amendments to the Project elements allowed for the retention of an ecological corridor through the centre of the Project Area, with a vegetated link between the Macdonald River in the south and retained vegetation around the Oxley Highway. These amendments reduce potential impact on areas containing two PCTs associated with a CEEC Box Gum Woodland, which may constitute a serious and irreversible impacts (SAII) to the vegetation community, and threatened fauna (**Section 6.2**) ■ Amendments to the Disturbance Footprint avoided impacts to the two areas of PAD (Riverside-PAD1 and PAD2) recorded in the Aboriginal Cultural Heritage Assessment (ACHAR) (**Section 6.3.4**) ■ Relocation of BESS allowed for noise compliance at closest sensitive receivers (**Section 6.5**), further reduce potential impact on areas containing two PCTs and reduce visual impact from Oxley Highway (**Section 6.6**). ■ Access road moved further from Bendemeer village to avoid impacts to the Travelling Stock Reserve (TSR) over a track-in-use through Crown reserves. ■ Implementation of noise suppression barriers to reduce noise impacts from battery units, transformers and inverters on nearby sensitive receivers (**Section 6.5**).
Solar Arrays	■ > 500,000 PV modules ■ Up to 322 MW AC ■ 1,370 ha to 352 ha	■ 430,000 PV modules ■ 280 MW DC ■ 350.8 ha	
Disturbance Footprint	■ 680 ha	■ 476.6 ha	
Disturbance Footprint with potential to impact EPBC Act listed species habitat	■ 155.8 ha	■ 103.9 ha	
Disturbance Footprint with potential to impact EPBC Act and BC Act listed Box Gum woodland TEC	■ 97.4 ha	■ 60.3 ha	
Disturbance Footprint with potential to impact BC Act listed Box Gum woodland TEC	■ 154.5 ha	■ 103.9 ha	
BESS	■ 200 MW/ 400 MWh ■ North of existing 330kV transmission line.	■ 150 MW/ 300 MWh ■ Relocated to south of existing 330kV transmission line and to the west of Project's substation	

Project Element	Initial Layout	Project (EIS)	Environmental Benefits
Substation	■ South and north of existing 330kV transmission line.	■ Relocated to south only of existing 330kV transmission line	■ Amendment to Disturbance Footprint to include Asset Protection Zones (APZs) (**Section 6.11**). A bushfire APZ of 10 m has been incorporated for clusters of PV modules, 17 m APZ for BESS and substation and 12 m APZ for associated infrastructures.
Site access road	■ From Oxley Highway via the existing access to 'Riverside'	■ Site access road from Oxley Highway relocated 2 km further east	


326000
328000
6582000
6580000
MACDONALD RIVER
NEW ENGLAND HIGHWAY
BENDEMEER
OXLEY HIGHWAY
PERRYS CREEK
BENDEMEER CREEK
MACDONALD RIVER
FAINTS GULLY
Legend
Development Footprint Boundary
Site Compound, Laydown, BESS and Substation Area
Solar Panel Area
Site Access Road
Internal Access Track
Main Road
Local Road
Track-Vehicular
Perennial Watercourse
Non-perennial Watercourse
Source:
Layout - Client Provided
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Project Initial Layout
F2-5
Drawing No: 0657132m_EIS_G016_R0.mxd
Date: 09/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM



Legend

Existing Environment

- Main Road
- Local Road
- Track-Vehicular
- Perennial Watercourse
- Non-perennial Watercourse
- Associated Dwelling
- Non-associated Dwelling

Project Elements

- Project Area
- Disturbance Boundary
- Solar Array
- O&M Facility, Control Room and 33 kV Switchgear
- Construction Compound and Laydown
- BESS
- Substation and Switching Station
- Internal Road
- 330kV Tie In Point
- Site

Constraints

- Crown Land (Travelling Stock Reserve (TSR) over a track-in-use through Crown reserves)
- Aboriginal Heritage Site (PAD)
- 510, Blakely's Red Gum - Yellow Box grassy woodland of the New England Tableland Bioregion
- 538, Rough-barked Apple - Blakely's Red Gum open forest of the Nandewar Bioregion and western New England Tableland Bioregion

1% AEP Flood Extent Depth (m)

- < 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 4.00
- 4.00 - 6.00
- > 6.00

Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019

Project Constraints

F2-6

Drawing No:	0657132m_EIS_G017_R01.mxd		Bendemeer Solar Farm EIS
Date:	08/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 250 500m

N

ERM

2.6 Key Potential Risks

Key potential risks of the Project on environmental and social aspects are investigated in detail in **Section 6**. Those that have an increased risk of impacts as a result of the Project a are summarised in **Table 2-9**.

As demonstrated in **Section 6** the key aspects and risks have been assessed and can be managed with standard safeguards.

Table 2-9 Project Key Risks or Hazards

Key Risks/ Hazards	Summary
Biodiversity	Solar Farms typically require access to relatively flat or gently sloping land in sunny areas within proximity to electricity transmission networks. Land suitable for solar energy generation is typically clear of large stands of trees, has been historically used for livestock grazing, and therefore biodiversity impacts can be avoided or minimised. This often means that land which has been previously cleared or zoned for agricultural use is well-situated to host solar farm developments, as is the case for the Project Area. Measures to avoid or minimise impacts to biodiversity values were considered throughout the development of the Project, which has resulted in the avoidance of significant biodiversity values. A primary design refinement principal was to locate infrastructure in already cleared areas and avoid, where possible, impacts to high-quality native vegetation. The original Project Area covered more than double the area of the current Project Area. The reduction in area (56%) was largely driven by the need to avoid identified threatened ecological communities (TECs), specifically White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland, that is a candidate for SAII. A range of mitigation measures will be adopted for the Project to mitigate the impacts to native vegetation and habitat that are unable to be avoided. These include a range of measures to be undertaken before and during construction to limit the impact of the Project.
Agriculture, Soils and Land Uses	The Project Area was assessed in accordance with the Land and Soil Capability (LSC) Assessment Scheme (Office of Environment and Heritage, 2012) and verified using soil surveys (**Section 6.7**). The Project Area comprises LSC class 6 (412 ha of the Project Area), LSC class 4 (112.5 ha) and LSC class 5 (81.9 ha). Based on this assessment the Project Area has a low to moderate agricultural capability rating, with limitations to agriculture identified relating to waterlogging and soil erosion risks. Solar farms require careful consideration to protect soils from erosion mainly beneath the solar arrays. The Project was designed to be able to move sheep easily and efficiently between the solar array areas and other paddocks. This will accommodate flexibility for construction/ maintained works and fluctuations in vegetation growth.
Noise	Ancillary infrastructure required for solar farms emit a noise, which can be audible for sensitive receivers in proximity to the Project. As part of the design refinement, noise-generating infrastructure has been located within the Project Area to maximise the distance between the infrastructure and residential dwellings. Noise modelling was undertaken to understand noise levels from the Project. Initial noise modelling showed that compliance with relevant noise criteria could not be achieved at several non-associated dwellings. This forced further design refinements as detailed in **Table 2-8**. Modelling of noise levels resulting from the Project elements and design as detailed in this EIS demonstrates compliance with relevant noise criteria (**Section 6.5**).
Landscape and Visual	Minimising visual impact was a key consideration of the design refinement. Where possible, infrastructure siting considered potential visual impacts, and vegetation providing screening from adjacent residences and transport corridors was maintained. The Landscape and Visual Impact Assessment (LVIA) (**Section 6.6**) has assessed the Project relative to potential impacts to nearby private and public viewpoints. All viewpoints that were identified in the preliminary assessment as requiring a detailed assessment were deemed to have a low visual impact.

Key Risks/ Hazards	Summary
Traffic and Transport	Site access has utilised the existing Project Area access, with no requirement to construct alternate site access points, thus minimising impacts to the public road network. The internal access track network has been designed to minimise environmental and social impacts, utilising existing tracks, and avoiding the need for significant waterway crossing where possible. The Project has also considered the potential transport routes to bring construction components, equipment, plant and machinery to site, with the objective of minimising impacts to the road network, and road users.
Aboriginal Heritage	An Aboriginal Cultural Heritage Assessment Report (ACHAR) was prepared for the Project. The survey resulted in two potential archaeological deposits (PADs) being recorded (Riverside-PAD1 and PAD2) within the Project Area. Both newly recorded sites are located outside the Disturbance Footprint and will be avoided by the Project (**Section 6.3.4**).
Hazards and Risks	A review and assessment of potential incidents, as identified through the development of a hazard identification table, concluded that there would be no offsite impacts, and that risks at the site boundary were not considered to exceed acceptable risk criteria.
Water	The Disturbance Footprint has, where possible, been designed to minimise impacts on watercourses. Very few watercourses occur across the Project Area. Most are first order, ephemeral streams that drain into watercourses that are adjacent the Project Area. The majority of first and second order watercourses within the Disturbance Footprint have no discernible channel. Nonetheless, the placement of Project infrastructure within the Disturbance Footprint will avoid first and second order streams, where possible. Flood modelling outputs indicted that the Project would not create any significant adverse impacts to flood behaviour, either within the Project Area, or to downstream properties or floodplains.
Social and Economic	Overall, the Project was assessed to have a net positive benefit on regional and state-wide economics, through capital investment and the provision of employment (**Sections 6.14** and **6.15**). Social considerations were also assessed and will be used to guide the development, to benefit local and regional businesses, and minimise societal impacts.

2.7 Potential Cumulative Impacts

Most of the Project is in the New England REZ. The objectives of the REZs are to facilitate the coordinated development of renewable energy generation projects, energy storage and transmission. This means that the region is planned to have a significant number of renewable energy developments, as well as other major projects that may lead to cumulative impacts relating to noise, landscape and visual, agricultural and land use conflicts, traffic, social and economic. Potential cumulative impacts of the Project are investigated further in **Section 6.16**.

3. PROJECT DESCRIPTION

This section presents a detailed description of the construction, operation, maintenance and decommissioning phases of the Project and provides a detailed overview of the solar farm layout and infrastructure components. It also describes the Community Benefit Fund.

3.1 Overview

The Project will involve the construction, operation and decommissioning a PV solar facility with a targeted electricity generating capacity of approximately 280 MW DC, BESS with a capacity of approximately 150 MW/ 300 MWh, and associated infrastructure. The Project will supply electricity to the national electricity grid via the existing electricity transmission network.

The Capital Investment Value (CIV) of the Bendemeer Solar Farm, including the BESS, is approximately $465,810,357 as described in **Appendix F**.

The Project description is summarised in **Table 3-1** and layout in **Figure 3-1**.

No separate approvals are required for additional infrastructure for the Project (e.g., it is stand-alone; however, the Bendemeer Wind Farm may utilise infrastructure developed as part of the Project, as described in that separate application).

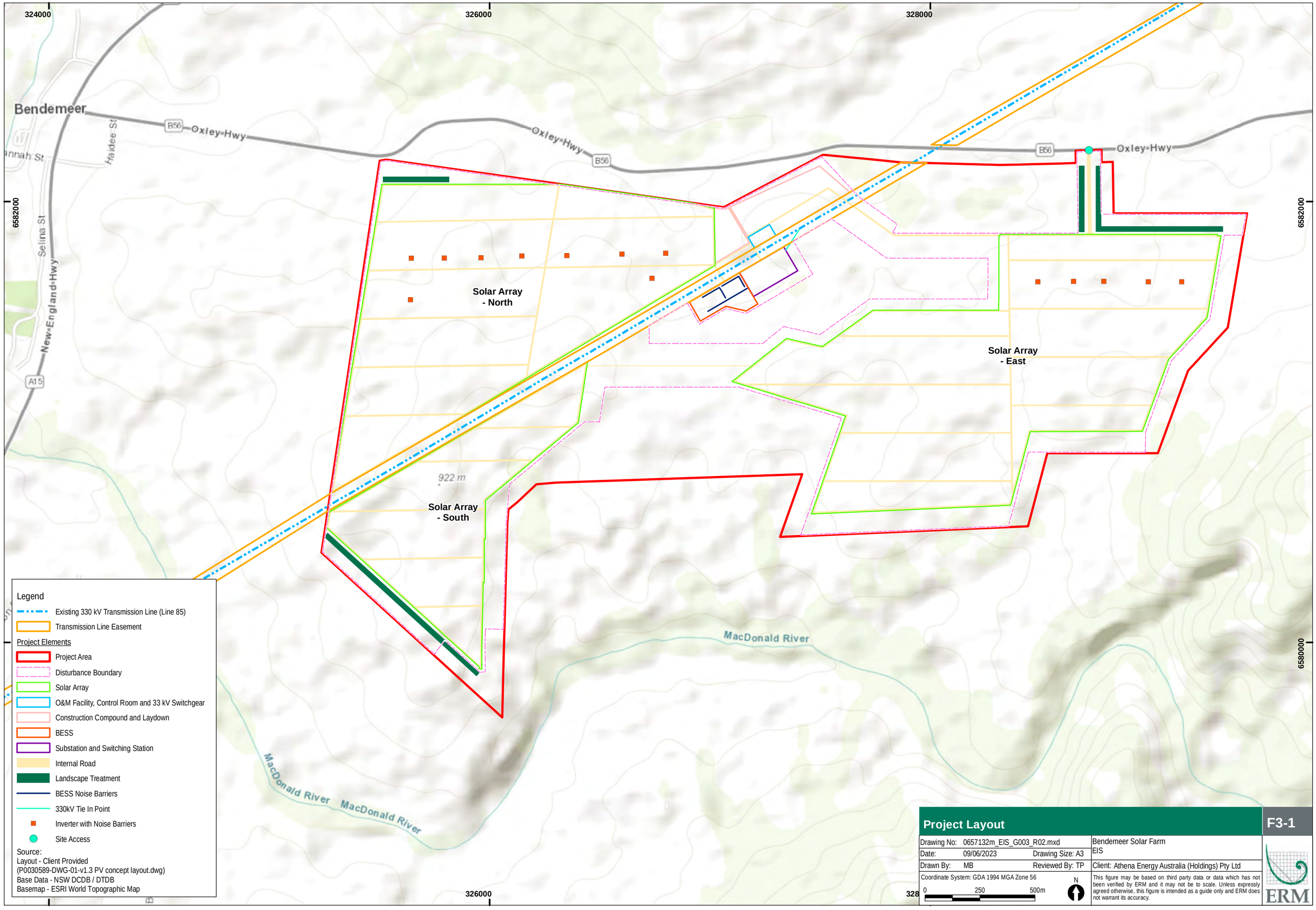
Further detail on the project description is provided in the following sections.

Table 3-1 Project Summary

Project Terminology	Summary
Project	Bendemeer Solar Farm
Applicant	Athena Energy Australia (Holdings) Pty Ltd
Project Area	Red boundary to which the Application applies of approximately 606.4 ha
Study Area	Subject Area for individual assessments will differ commensurate with the relevant legislation and guidelines for individual aspects.
Disturbance Footprint	Maximum directly impacted area by Project construction and operation up to 476.6 ha
Temporary Disturbance	The maximum area of land that will be temporarily disturbed during construction of the Project, and later rehabilitated up to 476.6 ha
Permanent Disturbance	The area of land that will be subject to permanent disturbance because of construction and operation of the Project until decommissioning which is estimated to be up to 14.8 ha
Capital Investment Value	$465,810,357
Project Elements	
Solar Arrays	■ Capacity of approximately 280 MW DC ■ Up to 350.8 ha
BESS	■ Capacity of approximately 150 MW/ 300 MWh ■ Lot 2 DP 1211502 ■ Approximately 40 PCUs
Solar PV Power Conversion Units (PCU)	■ Approximately 60 PCUs ■ Lots 1, 2 and 3 of DP 1211502
Substation	■ One 33/330 kV collector substation and associated structures ■ Lot 2 DP 1211502
Switching station	■ 330 kV

Project Terminology	Summary
Electrical Reticulation Infrastructure	■ Internal underground high-voltage (HV) cables between solar arrays, BESS and transformers and overhead 330 kV conductors ■ Approximately 100 m distance between the switching station and existing 330 kV line ■ Direct grid connection to existing 330 kV line
On-site Permanent Supporting Infrastructure	■ Site access road and entry ■ Operations and Maintenance (O&M) Facility including control room, meeting facilities, storage facilities, SCADA facilities, workshop, parking, ablutions buildings, septic, static water supply, waste management facilities, lighting and maintenance facility, fencing and asset protection zones
Off-site Supporting Infrastructure	■ Waste disposal facilities ■ Existing public road and communications network ■ External Road upgrades
Construction[3]	
Construction Duration	Approximately 18 months
Construction Hours	As per standard daytime construction working hours (or in accordance with the 'Interim Construction Noise Guideline' (DECC, 2009))
Construction Workforce	Peak workforce of approximately 307 Full Time Equivalent (FTE) (some additional contractor personnel) and average annual workforce of 260 FTE for the peak 12-month of construction of the Project
On-site Temporary Infrastructure	Construction compound including offices, car parking, amenities, laydown area, storage, fencing, power supply, access, and communications
Services and Utilities	Adjustment, protection or relocation of existing utilities
Ancillary Activities	Import of external gravel, aggregate and sand to site for on-site construction use
Transport Route	■ Main equipment deliveries via Port of Newcastle or Port of Brisbane ■ Associated external road upgrades (also used for operational maintenance or decommissioning activities)
Operations	
Duration	■ Development Consent in perpetuity ■ Infrastructure life minimum of 30 years
Hours of Operation	24 hours a day, seven days a week
Operational Workforce	Approximately 15 FTE

[3] Only stipulated where different from operations.


324000
326000
328000
6582000
6580000
Bendemeer
B56 Oxley Hwy
Oxley Hwy
B56
B56 Oxley Hwy
Hadee St
Selina St
New England Hwy
A15
Solar Array
- North
Solar Array
- East
922 m
Solar Array
- South
MacDonald River
MacDonald River
MacDonald River
Legend
Existing 330 kV Transmission Line (Line 85)
Transmission Line Easement
Project Elements
Project Area
Disturbance Boundary
Solar Array
O&M Facility, Control Room and 33 kV Switchgear
Construction Compound and Laydown
BESS
Substation and Switching Station
Internal Road
Landscape Treatment
BESS Noise Barriers
330kV Tie In Point
Inverter with Noise Barriers
Site Access
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI World Topographic Map
Project Layout
F3-1
Drawing No: 0657132m_EIS_G003_R02.mxd
Date: 09/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Coordinate System: GDA 1994 MGA Zone 56
0 250 500m
N
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

3.2 Project Area

3.2.1 Disturbance Footprint

The Project Area extends across 606.4 ha over 3 freehold land parcels and one parcel of 'Road Corridor' (refer **Section 2.4.1.1**). The Disturbance Footprint represents the maximum impacts associated with the construction and operation of the Project. It encompasses an area of 476.6 ha, as shown in **Figure 3-1**, consisting of:

- Temporary Disturbance Footprint, which is the area of land that will be temporarily disturbed during construction of the Project with areas to be rehabilitated following construction; and
- Permanent Disturbance Footprint is the area of land that will remain disturbed throughout the operational life of the Project and will not be suitable for agricultural use. This will include infrastructure areas such as the BESS, switchyard, substation and associated facilities (laydown area, control building).

Relevant impact assessments in **Section 6** have been undertaken based on the Temporary Disturbance Footprint. Permanent Project infrastructure will take up about 14.8 ha of the Project Area. A minimum bushfire APZ of 10 m has been incorporated for PV modules, 17 m APZ for BESS and substation and 12 m APZ for associated infrastructure, as required in **Section 6.11**.

As described in **Section 2.5.3**, several alternative arrangements have also been considered throughout the refinement of the Project design and layout, and Disturbance Footprint. A flexible approach has been adopted to design for elements of the Project to ensure that the final layout can respond to identified social and environmental impacts and constraints.

3.3 Project Elements

Figure 3-1 shows the Project layout for which approval is sought and considers:

- Maximising the yield of solar power generation through suitable positioning of PV modules on-site;
- Minimising environmental impacts and protecting sensitive areas and receivers identified through specialist assessments discussed in **Section 2.5.3** and shown in **Figure 2-6** (including but not limited to biodiversity, noise, visual, heritage, agriculture, etc.); and
- Optimising accessibility of Project elements through identifying topographic constraints and strategically positioning Project elements to minimise earthworks required during construction.

This section describes the Project layout. Minor changes may be made during the detailed design phase and in response to commercial and technical decisions; however, will remain within the impacts identified in **Section 6**.

3.3.1 Solar Arrays

The PV array will be the largest component of the Project and will comprise approximately 430,000 PV modules, each with a nameplate capacity of approximately 665 W, installed on single-axis tracking structures across three solar arrays (east, north and south). Each PV module typically measures 2.4 m by 1.3 m with rows spacing approximately 6.2 m apart.

The tracking system structure axis runs from north to south enabling the PV modules to follow the sun's path from the east in the morning through to the west in the afternoon, maintaining the best possible PV module orientation throughout the day. A backtracking function ensures that the module rows are not shading each other, whereby the system tracks back to a point where shading is avoided to achieve the 'optimal sun angle'. PV modules will comprise of a normal tracking with backtracking but no stowing angle (no night time stowing angle), in this case, the panels move between the operational range (maximum tilt) and move to a horizontal position outside of normal tracking hours.

The operational rotation range of the tracking system is typically +/- 60 degrees from the horizontal position. The maximum height of the PV modules above natural ground is up to 4.2 m.

The PV modules considered for the Project feature solar cells manufactured from silicon typically doped using boron and phosphorous atoms to create heterojunctions of semiconductor materials which generate a voltage upon light absorption. Other PV module technologies utilise cadmium telluride, copper indium selenide and amorphous silicon; however, these technologies represent only a fraction of the utility-scale market, with silicon-based technologies by far the most dominant both globally and in Australia due to their superior balance of cost, efficiency and minimisation of hazardous material usage.

PV modules are mounted on an aluminium supporting frame behind a non-reflective tempered glass layer or, alternatively, may be frameless (dual glass). PV modules use a “high-transmission, low-iron” glass which has lower reflectance and therefore glare, than that of normal glass. A coating applied to the module surface creates a stippled finish to further diffuse any reflected light. The primary role of the glass is to provide mechanical protection and structural rigidity to the sensitive semiconductors and electrical interconnector layers.

The final number of PV modules within the three arrays and tracker design will be dependent on detailed design, equipment availability and commercial considerations. These dimensions may alter based on site constraints such as boundaries, riparian zone, existing vegetation, and access tracks.

A minimum of 10 m bushfire APZ will surround clusters of PV modules.

3.3.2 Battery Energy Storage System

The BESS will be located within the substation and switching station footprint area, occupying an area of up to 3.2 ha. The BESS will utilise lithium-ion batteries to either be $LiFePO_4$ (Lithium Iron Phosphate) (LFP) or Nickel-Manganese-Cobalt (NMC) battery chemistries, with a nameplate capacity of approximately 150 MW/ 300 MWh. The BESS will utilise pre-assembled and pre-tested systems, that may either be segregated into separate PCU and BESS units, or a fully integrated system that includes the battery modules, inverters, thermal management system, circuit breakers, fire protection system as specified by the BESS manufacturer and other controls.

The number and layout of battery modules and cabinets would be confirmed during detailed design. Approximately 40 modular PCUs will be utilised for the BESS, incorporating switchgear, inverters and transformers and associated control and circuit breaker equipment. Each modular PCU unit will typically measure approximately 2.5 metres (m) wide by 3 m high, with a depth of 6 m.

Prior to construction, the total area required for the BESS will be verified against the available space to demonstrate there is adequate area to achieve the required spacing recommended in the PHA (refer **Section 6.10**).

The BESS may include a liquid cooling system to optimally operate the cells within a wide range of ambient temperatures. The BESS will be temperature monitored, and the automated control system will stop/reduce its operation if the temperature exceeds pre-set levels to prevent overheating. The BESS will be certified to UL9540A to prevent fire propagation between units, and ignition from external fire sources.

A minimum of 17 m bushfire APZ will surround the BESS and two 2-sided 4 m high noise walls will be included in the BESS layout as shown in **Figure 6-9.**

3.3.3 Solar PV Power Conversion Units

Approximately 60 modular PCUs will be utilised for the solar farm, incorporating switchgear, inverters and transformers and associated control and circuit breaker equipment. Each modular PCU unit will typically measure approximately 2.5 m wide by 3 m high, with a depth of 6 m or 12 m.

The PCUs will be connected to the solar array blocks to convert the DC electricity generated by the PV modules into AC power for reticulation around the site and connection to the electricity grid.

A two sided 3.5 m high noise wall will be included for 14 inverters as shown in **Figure 6-9**.

3.3.4 Electrical Reticulation and Grid Connection

The Project will connect into the existing 330 kV line which intersects the Solar Array-North with the Solar Array–East and Solar Array–South.

The Solar Farm and BESS will each have a dedicated 33/330kV transformer which will be in the substation adjacent to the switching station. The substation will be connected to the switching station, and the switching station will be connected to the 330 kV line.

The substation will be comprised of two transformers, high voltage switchgear, metering, protection, and communications infrastructure. A security fence will surround the substation. The switchyards and associated equipment would be designed in accordance with AS2067, AS3000 as well as the associated referenced standards.

Gravel will be placed under and around the substation compound to restrict vegetation growth and provide a safe working environment. A minimum of 17 m bushfire APZ will surround the substation.

Internal structures within the fenced substation compounds will generally include:

- Control building/control room, switch room with a height of up to 8 m;
- Two 33/330 kV power transformers with a height of up to 10 m;
- Overhead line gantry structures of up to 20 m height;
- Transformer bunding and environmental controls for oil;
- Integrated earthing systems will also be applied where required for the switching station and the substation as per:
    - ‘AS 1768 Lightning protection’ (Standards Australia, 2021);
    - ‘AS 4853 Electrical hazards on metallic pipelines’ (Standards Australia, 2012); and
    - ‘AS 3835 Earth potential rise – Protection of telecommunications network users, personnel and plant’ (Standards Australia, 2006), safety criteria for telecommunications assets;
- Drainage and civil work including footing support for equipment;
- Cable trenching and cable conduits;
- Up to eight lightning protection masts up to 22 m high. All lightning protection will be in accordance with:
    - ‘AS 1768 Lightning protection’ (Standards Australia, 2021), and
    - ‘IEC 62305:2022 protection against Lightning’ (IEC, IEC 62305:2022 Protection against lightning, 2022);
- Associated high voltage switchgear including busbars, conductors, circuit breakers, and disconnectors, each with a height of up to 10 m; and
- Communications infrastructure.

3.3.5 On-site O&M Facility

A permanent site O&M Facility will be constructed to provide for all operations and maintenance activities associated with the Project. The O&M Facility will be located within the construction compound and laydown area, to the north of the substation and BESS compound.

The O&M Facility and its associated compound will contain at least the following:

- Control room, an office, communications equipment, and staff amenities (toilet, kitchen, first aid, water supply, etc.);
- Static water supply for maintenance, firefighting/bushfire management (may be part of above water supply) and septic system; and
- Storage shed (including workshops area).

Upon commissioning, the Project will be monitored and controlled by a remote Supervisory Control and Data Acquisition (SCADA) located in the control room. Where required, assistance from an offsite SCADA engineering team may be utilised. The SCADA system is designed to maximise power output, allowing for remote control of the PV modules, and monitoring the efficiency of the power plant.

The control room, switch room and storage shed will each contain essential fire safety equipment.

Adequate rubbish waste/facilities providing appropriate waste stream separation using on-site skip bins emptied weekly or as required. Waste will not be retained permanently on-site.

Car parking facilities for up to 20 FTE will be located within the Compound. The parking and vehicle manoeuvring areas will be sealed with crushed road base or asphalt.

The O&M Facility will be constructed of low-combustibility or non-combustible materials in accordance with the 'National Construction Code' (ABCB, 2022).

Over the life of the Project, infrastructure will be maintained and/or upgraded, as required, to ensure health and safety of occupants of buildings.

3.3.6 Other Infrastructure

Additional infrastructure will generally be constructed and utilised within the Project Area, including water management, sediment and erosion control structures, fencing and access tracks.

Other infrastructure may be installed within the Project Area utilising the Due Diligence procedure described in **Section 3.8**.

3.3.7 Internal Access Tracks

Access to the Project Area during construction and operations is proposed via a new access road from the existing road network, namely the Oxley Highway, which borders the northern boundary of the Project Area. An existing access road may be used during emergency situations to ensure through access is available.

The ongoing maintenance of the Project will be accessed through internal access tracks within the Project area, that will be connected to the Oxley Highway. The tracks will provide ongoing access to the PV modules, substation and other Project infrastructure including the existing 330 kV line. Where practicable, the internal access track network will be aligned along the route of existing farm tracks to reduce impacts to biodiversity and to provide upgraded access for ongoing agricultural activities.

The internal access tracks will be up to 6 m trafficable width, with localised widening on curves and where required to support transportation of the over-dimensional component vehicles. The internal access tracks will be constructed using gravel or sealed pavements and generally comply with the specifications and requirements set out in the 'Planning for Bush Fire Protection' (PBP 2019) (NSW RFS, 2019).

3.3.8 Lighting

Lighting will typically be required at the substation, switchyard and O&M Facility. Security lighting will be installed adjacent to security fencing and O&M Facility. All lighting will be designed, managed and operated in accordance with 'AS 4282 Control of Obtrusive Effects of Outdoor Lighting' (Standards Australia, 2019) to reduce light spill.

3.3.9 Landscaping

The landscape strategy for the Project Area will include vegetation planting on the north-western, north-eastern and south-western boundary of the Project Area. The plantings will limit views of the Project Area from Oxley Highway, dwellings to the north-east and south, respectively (as generally shown in **Figure 6-11**).

Conceptually, other landscaping will comprise planting of native trees, shrubs and groundcovers, designed to be low-maintenance and which will further enhance the natural habitat associated with the existing environment.

3.3.10 External Infrastructure

There is no sewer access at the Project Area. Therefore, amenity facilities may be pumped out via tanker and delivered to the closest available sewage treatment facility, or a septic tank will be constructed. Discussions with Tamworth Regional Council will assist in defining the preferred process prior to commencement of construction. Public power and communications infrastructure may be utilised.

3.4 Construction

3.4.1 Duration

The duration of construction from commencement to commissioning of the Project is expected to take up to 18 months with a peak period from month 6 to 12. For the purposes of assessment, it is assumed that construction will commence in Quarter 2, 2024.

The construction duration may be influenced by weather and ground conditions, commercial activities, personnel availability, detailed design and delivery of equipment.

Following set up of temporary construction compound areas, the upgrade of existing access tracks and construction of new access tracks will be the first construction activities, followed by the phasing of the solar array's assembly and installation, then ancillary facilities.

Table 3-2 outlines an indicative timeline for the Project and **Table 3-3** presents the anticipated timing of key Project milestones as well as indicative peak workforce FTEs.

Table 3-2 Indicative Timeline

Stage of Proposal	Estimated Date of Commencement	Estimate Duration
Construction of solar array	Q2 2024	18 months
Construction of ancillary facilities (including BESS, substation, switchyard)	Q2 2024	14 months
Installation of electrical reticulation infrastructure	Q4 2024	9 months
Testing/commissioning completion	Q3 2025	6 months
Decommissioning	Subject to Approval	6 months[4]

[4] Rehabilitation period not included.

Table 3-3 Indicative Construction Schedule

Stage	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
Engineering design																		
Grid connection works																		
PV arrays and associated structures procurement																		
Public Road upgrades																		
Civil works- initial land preparation																		
Site Access internal tracks																		
Temporary Infrastructure																		
Foundation for PV arrays																		
PV arrays assembling and installation																		
Electrical reticulation infrastructure																		
Substation																		
BESS																		
Compounds and associated infrastructure																		
Testing/commissioning completion																		
Decommissioning Temporary Infrastructure																		
Site Rehabilitation																		
Workforce Peak	0	0	56	112	231	307	307	307	307	307	307	307	307	169	135	79	56	11

3.4.2 Workforce and Hours of Operation

A peak construction workforce of approximately 307 Full Time Equivalent (FTE) personnel will be required as generally shown in **Table 3-3**. The average annual employment for the peak 12-month of construction of the Project is estimated to be approximately 260 FTE.

It is estimated that 70% of the workforce will be sourced locally, where available. Additional specialist staff will also be required from outside the local region, as well as contractors, from time to time.

Construction activities will be restricted to standard daytime construction working hours:

- 7:00 am to 6:00 pm (Monday to Friday);
- 8:00 am to 1:00 pm (Saturday); and
- No construction will occur on Sundays or Public Holidays.

Construction outside these hours will be undertaken in accordance with the 'Interim Construction Noise Guideline' (DECC, 2009) as follows:

- For the delivery of materials required by the NSW Police or other authorities for safety reasons; and
- Where it is required in an emergency to avoid the loss of lives, property and/ or prevent environmental harm.

In addition, construction outside recommended standard hours of construction might be undertaken as follows:

- Activities that are inaudible at non-associated dwellings; and
- With agreement by the Department.

No additional accommodation facility is required for the Project. Workforce accommodation will be available within a reasonable distance of the Project.

3.4.3 Pre-Construction Activities

Geotechnical investigations will be undertaken to confirm ground conditions.

A site survey will confirm the Project Area and final infrastructure positioning and placement. Given the Project Area is within solar array mounting structure tolerances, minimal site preparation and civil works are expected to be required prior to construction. Minor earthworks will be required for site preparation and may include clearing, erosion and sediment control, site levelling, access tracks, site drainage works, fencing, foundations and hardstands, office and car parking areas.

Most of the infrastructure will be prefabricated off site and delivered to the Project area, where it will be assembled and installed.

3.4.4 Site Preparation and Construction Activities

The Project will require minor preparatory activities in advance of installing the PV arrays and associated infrastructure. Following set up of the temporary construction compound areas and ancillary facilities, the upgrade of existing internal access tracks and construction of new access tracks will be the first construction activities.

This will be followed by the phased installation of the Project elements in **Section 3.3**.

Construction activities will include (at a minimum):

- Civil works including:
  - Upgrade of existing access tracks and construction of new access tracks;

  - Grading, levelling and earthworks (including the construction of hardstands for key infrastructure items);
  - Grading around lower order streams to facilitate sediment and erosion control and water management structures);
  - Minor earthworks to facilitate installation of security fencing;
- PV Array:
  - Minor trenching works and land forming, including localised cut and fill areas to achieve more consistent gradients beneath the PV modules and facilitate drainage;
  - Driven, pre-drilled or screw piles;
  - Install mounting structures and tracker torque tubes;
  - Secure PV modules to tracker torque tubes;
- Excavation of trenches and the laying of power and instrumentation cables;
- Install PCUs, BESS, maintenance compounds and associated site infrastructure; and
- Test and commission infrastructure.

Some stockpiled soils may be utilised for mitigation measures as noise or visual bunds or for erosion and sedimentation control structures (refer **Section 6.7.8**).

3.4.5 Plant and Equipment

Table 3-4 lists the indicative plant and equipment required to facilitate construction, and vehicles to transport these items to the Project Area. A water cart, forklift, telehandler, excavator, piling rig, grader, trencher, loader, crane, dump trucks, rollers and light vehicles will be on site for all construction activities. Construction machinery will generally remain on site for the duration of the earthworks portion of the construction and will therefore be only required to access the site once for the construction works.

Table 3-4 Indicative Construction Plant

Item	Vehicle
Equipment	
PV modules	B-Double
PCU	Semi-Trailer
Switchboards	Semi-Trailer
Transformer and 200 Tonne Crane	Oversize and overmass vehicles (OSOM) vehicles
Total cables	Semi-Trailer/ B-Double
BESS	Semi-Trailer
Steel posts, tables and brackets	Semi-Trailer/ B-Double
Heavy Machinery	
Scraper	OSOM vehicles
Telehandler	Semi-Trailer
Tractors/bulldozers	Semi-Trailer
Miscellaneous trucks	Rigid truck
Water Tankers	20kL Tanker
Buildings	

Item	Vehicle
Control room	Semi-Trailer
Offices and warehouse	Semi-Trailer
Water tanks	Semi-Trailer
Security Fence	
Posts and wire mesh	Semi-Trailer
Earthworks	Semi-Trailer
Construction Workforce	
Workforce	Shuttle buses, light vehicles (passenger and four-wheel drive)

3.4.6 Temporary Infrastructure

Temporary facilities will be required to facilitate construction of the Project. A temporary construction compound will be established for the duration of the works and will comprise:

- Site offices, car parking and amenities for the construction workforce;
- Temporary laydown area to accommodate storage of construction materials, plant, equipment solar module and other infrastructure elements;
- Laydown areas and temporary waste storage;
- Material stockpile;
- Temporary power supply for construction; and
- Security fencing up to 2.4 m high and CCTV.

Temporary parking will be within the Disturbance Footprint and allow for up to 75 light vehicles and six buses. As part of construction, it is proposed to maximise the local workers content from the region (including the LGAs of Tamworth Regional, Armidale Regional, Uralla Shire and Walcha) and carpooling will also be encouraged.

Temporary facilities will be generally located within the Disturbance Footprint.

3.4.7 Ancillary Activities

Construction materials including gravel, aggregate and sand will be required for the construction of hardstands to support Project infrastructure, including internal access tracks and installation of electrical cabling. Road formation will be constructed using a cut and fill balance with excavated materials used for the final hardstand surfaces of the roads. Use of materials sourced on-site will be confirmed through geotechnical testing prior to works.

Medium and Heavy Rigid Trucks (MRV and HRV respectively) will be used to deliver raw materials and smaller plant elements, Truck and Dog vehicles will be used to transport earthwork material, and OSOM vehicles will be required to deliver larger Project elements to the Project Area (e.g., substation transformer and earthmoving equipment). During peak construction it is anticipated that 62 heavy and 48 light vehicle movements will be generated per day (**Section 6.9**).

Construction equipment will be sourced locally from the Tamworth, Walcha, Uralla or Armidale LGAs, subject to availability and cost considerations. Other general consumables (including but not limited to concrete and aggregates) will typically be sourced from existing operating quarries in the Project locality (less than 100 km from site entry). Quarries and their material resources are shown in **Table 3-5**.

The Applicant has initiated engagement with local suppliers. It is anticipated that the Project will source materials from Boral Quarries and Graymont given their capacity to supply and deliver quarry products to the Project Area.

Table 3-5 Existing Operating Quarries

Facility	Location	Aggregate	Sand	Concrete	Road base
Ward Bros Sand and Gravel Supplies	Killara, Kentucky	✓	✓	-	✓
Hoy's Concrete	Walcha Road, Walcha	-	✓	✓	-
Brooklyn Quarry	Walcha Road, Walcha	✓	-	-	✓
Boral Quarries	Werris Creek Road, Currabubula	✓	✓	✓	✓
Graymont	Garthowen Road, Attunga	✓	✓	✓	✓
BMR Quarry	Ponda Rosa Road, Tamworth	✓	-	-	✓
Scanlon's Concrete and Quarry Products	Crawford Street, Tamworth	-	✓	✓	-
Redimix Concrete Tamworth	Armstrong Street, Tamworth	-	-	✓	-
Boral Concrete Tamworth	Cook Street, Tamworth	-	✓	✓	-
Boral Concrete Armidale	Drew Street, Armidale	-	✓	✓	-
Ducats	Miller St, Armidale	✓	✓	✓	✓
Heritage Concrete PTY Ltd.	Kliendienst Rd, Uralla	✓	✓	-	✓
Heritage Concrete	Kliendienst Road, Uralla	-	-	✓	-
New England & North West Concrete Pumping	Kliendienst Road, Uralla	-	-	✓	-

3.4.8 Services and Utilities

Water Supply

Approximately 110 megalitres (ML) per annum of water will be required during the construction phase for concrete, road works and earthworks, dust suppression and potential watering of revegetated areas (refer **Table 3-6**).

Water required for construction will be supplied from existing or new on-site dams, surface water pumps or groundwater bores (subject to seasonal availability and water licence permissions) or alternatively from an offsite local source from an approved facility.

An extensive analysis was undertaken of water access licence (WAL) holders in the Murray-Darling Basin Fractured Rock Groundwater Sources – New England Fold Belt MDB Groundwater Source, and the Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Source - Mid-Macdonald River Water Source. This analysis identified existing entitlements of 11,996 units in the New England Fold Belt MDB Groundwater Source, and 5,155 units in the Mid-Macdonald River Water Source, with multiple private WALs having individual allocation to supply the Project during construction, operation and decommissioning in entirety.

A search of publicly available information was undertaken on the Lot/DP associated with these WALs to identify landholder contact details. A suitable landholder was identified who holds adequate WAL allocation for the Project construction, operation and decommissioning in the Mid-Macdonald River Water Source.

A memorandum of understanding (MOU) has been signed by this landholder and the Applicant confirming provision of water supply in accordance with the conditions of the WAL and rules under the Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Source.

A small amount of potable (drinking) water (estimated at 0.4 ML per annum in an average year) will be collected in rainwater tanks from temporary site compound buildings or imported during the construction period on an as-needs basis to top up the water tanks.

A non-combustible static water tank of 100,000 L will be included within the APZ for the BESS, substation, and associated infrastructure bushfire protection as defined in **Section 6.11**. An additional water tank/s with storage of approximately 100,000 L may also be included within the Disturbance Footprint for the purposes of construction and maintenance of the Project.

Volumes are approximate for the purposes of assessment only and subject to weather conditions. No unregulated discharge of water from the Project's activities will occur.

No water network upgrade will be required for the Project construction and operation. Water supply agreements would be secured in consultation with Tamworth Regional Council and/or local water suppliers to ensure adequate water supply is secured for construction and operation.

A rainwater capture and reuse system will offset water usage on site during the operation phase for top up of equipment reservoirs, washdown, toilet flushing and bushfire suppression (refer **Table 3-6**).

Table 3-6 Indicative Water Requirements

Water Quality	Construction Water Requirements	Operation Water Requirements
Potable (drinking)	0.4 ML/year (for up to 18 months)	20 KL/ year (drinking water)
Non-potable	110 ML/year (for up to 18 months)	2 ML/ year (solar module cleaning, firefighting, and other maintenance activities)

Power Supply

The power supply for construction will be from local low-voltage distribution supplied via agreements with the local network operator and supported by diesel generators as required. Power sourced from the existing 330 kV line and its associated network will not be available during the construction phase. No additional supply will be required for the Project operations.

Waste Management

Waste storage locations during the construction and operation phase will be provided within assigned areas located within the Project Area. Sufficient space will be allowed for the separation and storage of different waste and sufficient space will also be provided for recycling and reuse of items.

Section 6.13 describes the storage, management and disposal of waste generated during the Project construction, operation and decommissioning. It also describes primary waste streams expected to be generated during all Project phases.

Telecommunications

Communications will be constructed and utilised within the Project Area including but not limited to fibre optics (with cellular and/or landline backup) and radio support (type, channels and call-signs).

3.4.9 Other Minor Works

Other minor works including geotechnical, visual enhancement plantings, fencing, creek crossings, and erosion and sediment controls will be required. These works will occur generally within the Project Area unless otherwise indicated in this EIS.

3.4.10 Transport Route

The Port of Brisbane or the Port of Newcastle (Ports) will be utilised for import and unloading of the major Project components as described in **Section 6.9**.

Other specialist equipment and consumables will be sourced locally from the Tamworth Region (where available and commercially viable).

Heavy vehicles will transport materials and equipment associated with the Project construction. These will consist of vehicles including articulated vehicles (AV), B-Doubles, 'truck and dogs' and concrete trucks.

Due to the size of some of the solar components, there will be a small number of oversize over-mass (OSOM) deliveries. These will be required for delivery of large substation equipment (e.g., transformers, switchrooms), construction equipment (e.g., cranes), and the O&M Facility. To transport these large components to the Project, Restricted Access Vehicles (RAVs) will be utilised.

The proposed transport route to and from the Project (including OSOM deliveries) includes:

- Port of Newcastle: Via Industrial Drive, John Renshaw Drive, Hunter Expressway, then New England Highway through Tamworth to reach Oxley Highway; and
- Port of Brisbane: Via Motorway (M4), Gateway Motorway (M1), M2, Cunningham Highway (M15), New England Highway, then Oxley Highway.

Minor deliveries may be transported from alternative ports. These are minor in quantity and do not require a quantitative analysis.

3.4.11 Site Access

All vehicles will access the Project via B56 Oxley Highway, located north of the Project Area. Other access points (e.g., existing farm accesses) may be used in cases of emergency.

The peak traffic volumes required for the Project's construction is summarised in **Section 6.9.3.1**.

3.4.12 Road Upgrades

Internal Access Tracks

The construction and maintenance of the Project will require construction of up to 35 km of access tracks within the Project area. The roads will provide ongoing access to the solar arrays and other Project infrastructure.

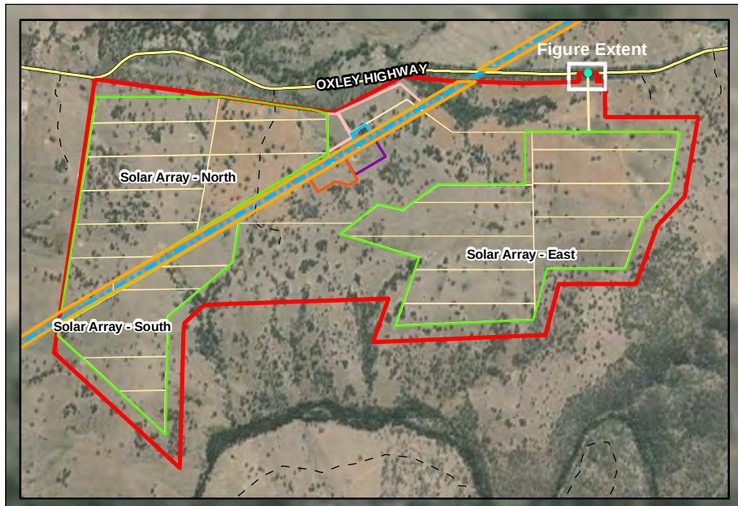
Where possible, the internal road network will be aligned on the APZs and/ or existing farm or other access tracks. The perimeter road and all internal access tracks will be up to 6 m wide. The indicative internal road network is shown in **Figure 3-1**.

The construction of new access tracks will require removal of topsoil to a suitable founding layer (subject to a geotechnical investigation). The running surface will be constructed by placing and compacting a road base layer, gravel or sealed (typically 200 mm).

External Roads

A route survey along the proposed transportation routes from the Port of Newcastle and/ or Port of Brisbane to the Project Area identified no required road upgrades.

Minor road upgrades will be required at the site access point, consisting of a Basic Right Turn (BAR) treatment as conceptually shown in **Figure 3-2**. No additional clearing is required for external road works, and these are considered minimal, on land previously disturbed through the construction of the Oxley Highway, therefore no impacts to biodiversity, historic and Aboriginal sites are expected.



OXLEY HIGHWAY

Legend

Existing Environment

- Main Road
- Local Road
- Track-Vehicular
- Existing 330 kV Transmission Line (Line 85)
- Transmission Line Easement

Project Elements

- Project Area
- External Road Works
- Solar Array
- O&M Facility, Control Room and 33 kV Switchgear
- Construction Compound and Laydown
- BESS
- Substation and Switching Station
- Internal Road
- Site Access

Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019

Conceptual Project Site Access Design

F3-2

Drawing No:	0657132m_EIS_G018_R01.mxd		Bendemeer Solar Farm EIS
Date:	02/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 10 20m

N

ERM

3.4.13 Post Construction Site Rehabilitation

The Project Area will be progressively rehabilitated throughout construction. When construction is completed, temporary plant and equipment will be removed as indicated in **Section 3.6**, and disturbed areas will be revegetated and rehabilitated in consultation with associated host landholders.

Adequate sediment, soil and erosion controls will be implemented during ground disturbing works. Rehabilitation activities will be generally in accordance with the 'Managing Urban Stormwater: Soils and Construction – Volume 1' (Blue Book) (Landcom, 2004).

Post-construction rehabilitation requirements and processes will be detailed in the Environmental Management Strategy (EMS) and undertaken in accordance with relevant conditions of development consent (refer **Section 3.8**).

3.5 Operation

3.5.1 Commissioning

The commissioning of the Project will be based on an agreed schedule which will be staged to allow for partial commissioning of select plant while the Project is under construction. Final commissioning works will involve checks and authorisation on all high voltage equipment prior to connection to the 330 kV line.

Operational infrastructure includes (but is not limited to):

- Solar Arrays;
- BESS;
- PCUs;
- Substation equipment;
- Communications equipment;
- Electrical Reticulation and Grid Connection;
- Internal Access Tracks;
- Gates and fencing;
- O&M Facility; and
- Lighting.

3.5.2 Operational Hours and Workforce

While the Project will be monitored remotely, the PV modules and other equipment will require regular maintenance. Site maintenance will be undertaken by site staff on an ongoing basis with activities scheduled consistently throughout each year. Site maintenance will include at least the PV modules, reticulation network, access roads, substations, transmission line, groundcover management, landscaping, and facilities (e.g., stormwater and wastewater).

Most maintenance will comprise routine maintenance; however, circumstances may arise where additional specialist technical maintenance staff are required (e.g., such as unplanned equipment failure).

Daily maintenance will occur during standard working hours. Outside of emergencies or major asset inspection or maintenance programs, night works or works on Sundays or public holidays will be minimal; however, will be undertaken in accordance with **Section 3.4.2**.

Whilst most activity is anticipated to occur during business-hours Monday to Friday, access to the Project will be required on a 24-hour basis, seven days a week.

During operations, it is expected that a workforce across general site labour, trades, professional, scientific and technical industry sector of approximately 15 FTE will be required. These will be associated with day-to-day maintenance and management of the facility.

3.6 Decommissioning and Rehabilitation

The Applicant has entered long-term lease agreements with Host landholders for the construction and operation of the Project as described at **Section 2.4.1.1**. Following decommissioning, the final land use will revert to preference of the Host landholder, with consideration of the land use objectives of the RU1 zone.

Although Development Consent is sought in perpetuity, Project elements will operate for a minimum of 30 years. At the end of Year 30, one of two options will be undertaken:

- Repower as a solar farm using the existing or “best practice” at the time technology (or replacement) modules and other infrastructure where generally within the predictions and criteria in this EIS; or
- Decommission the Project and remove the modules and associated infrastructure in accordance with a ‘Decommissioning and Rehabilitation Plan’.

If replacement infrastructure is installed, these will remain within the Project Description and predicted impacts for which any development consent is granted (unless a modification is sought and granted).

The Applicant will fund and execute the decommissioning of the Project. When decommissioning occurs:

- Key stakeholders including landholder and relevant regulators will be consulted;
- In general, all above ground structures will be removed and the land rehabilitated to ensure it can be returned to agricultural use;
- Some infrastructure may be retained *in situ* (e.g., internal access tracks) where beneficial and as agreed with the landholder; and
- Some below ground infrastructure may be left *in situ* to avoid further disturbance and minimise clearing of revegetated areas, unless otherwise agreed with the landholder and/or specified in the conditions of development consent.

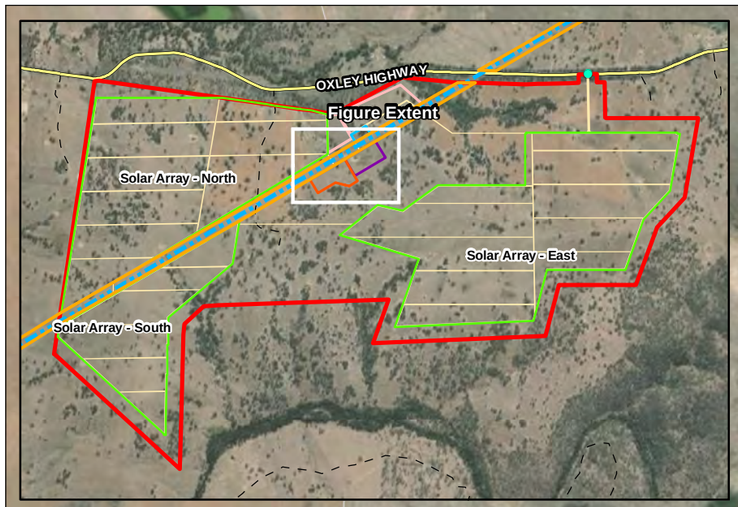
The Applicant aims to recycle all dismantled and decommissioned infrastructure and equipment, removed from the Project Area, where possible. Materials that cannot be recycled will be disposed of at a licensed waste management facility (refer **Section 6.13**).

3.7 Land Subdivisions

TransGrid requires freehold title to the switchyard lot(s) to proceed with the construction of the relevant electrical connections and infrastructure. A new title(s) in a subdivision of Lot 2 of DP1211502 will be required to enable land ownership of the switchyard assets to be transferred to TransGrid. TransGrid will obtain freehold title through either transfer, dedication, or acquisition.

The Project may also require the creation of title(s) to enable land ownership of the substation assets located in Lot 2 of DP1211502.

Figure 3-3 identifies the required subdivision for the substation and switching station. The lot size and configuration are indicative and subject to further detailed design and confirmation with TransGrid and the landholder during the detailed design phase.



Legend

Existing Environment

- Main Road
- Local Road
- Track-Vehicular
- Existing 330 kV Transmission Line (Line 85)
- Transmission Line Easement
- Cadastre (Lot)

Project Elements

- Project Area
- Disturbance Boundary
- Indicative Subdivision Boundary
- Solar Array
- O&M Facility, Control Room and 33 kV Switchgear
- Construction Compound and Laydown
- BESS
- Substation and Switching Station
- Internal Road
- Site Access

Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019

Indicative Subdivision

F3-3

Drawing No:	0657132m_EIS_G035_R0.mxd		Bendemeer Solar Farm EIS
Date:	07/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 25 50m

N

ERM

3.8 Environmental Management

An EMS will be developed to provide the overall framework for environmental management during the construction, operation, decommissioning and rehabilitation of the Project to ensure that appropriate measures and processes are in place to manage identified environmental risks and provide for ongoing continual improvement. The EMS will incorporate mitigation measures that have been identified throughout this EIS and will include relevant management plans consistent with any conditions of development consent.

Any minor works described in the Project description, required outside the Study Area but within the Project Area will be subject to an internal archaeological and ecological (at least) due diligence assessment before proceeding. The activities and relevant mitigation will be described in relevant management plans.

3.9 Contributions and Agreements

3.9.1 Community Benefit Fund

The Applicant intends to establish a CBF to fund a broad range of projects and programs for the benefit of the residents and the broader community.

The Applicant intends to provide $250 per MW per annum of AEMO and Network Operator approved and commissioned capacity, equating to $50,000 per annum for the life of the Project based on a 200 MW AC development. For each MW registered capacity commissioned above 200 MW AC, the Applicant will increase the contribution by $250/MW. Similarly, should the Applicant receive registration approval for a power capacity of less than 200 MW AC, the contribution will be reduced by $250/MW of shortfall capacity.

The CBF will be managed as part of Voluntary Planning Agreement (VPA) with Tamworth Regional Council, and governed by Subdivision 2, of Division 7.1 of Part 7 of the EP&A Act.

The Applicant proposes that a committee, overseen by an Independent Chair, comprised of local community members, a representative from the Tamworth Regional Council, and a representative from Athena be established to review applications/proposals for funding. This committee will vote for allocation of funds from the CBF. The broad intention of the CBF is that funds would be allocated to support local non-profit organisations, community programs/events, local businesses, training, and services/infrastructure.

The VPA will document the obligations of the Applicant to make initial and ongoing contributions to a CBF. The CBF will be administered by the Committee, with provision for annual indexation to consumer price index (CPI), for the operational life of the Project through to decommissioning. The VPA will document the Committee's obligation to hold and pay the funds, to nominate and elect new Committee Members, to review applications/proposals for allocation of funds, to vote for the distribution of funds and to conduct an annual audit of the funds management.

The Applicant has undertaken ongoing consultation with Tamworth Regional Council during 2022 and 2023 regarding the proposed CBF to fulfil the requirements of a VPA, and formally submitted its proposal to Tamworth Regional Council on 13 March 2023. The Applicant received formal correspondence from Tamworth Regional Council on 9 June 2023 which included preliminary feedback and noted that it was Council's preference to defer finalisation of any discussions relating to the VPA until lodgement of the EIS when full details of the development are known.

4. STATUTORY CONTEXT

This section outlines the key statutory requirements for the Project under the EP&A Act and other relevant NSW and Commonwealth legislation. It describes the power to grant approval, permissibility, the any post approvals required under other relevant acts.

4.1 Power to Grant Approval

Approval for the Project is sought under Part 4, Division 4.7 of the EP&A Act, which outlines the approval pathway for development deemed to be SSD. Clause 4.36(2) of the EP&A Act states:

> *(2) A State environmental planning policy may declare any development, or any class or description of development, to be State significant development.*

Relevant SEPPs include *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP) and *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP).

Under the provisions of Clause 2.6(1) of Planning Systems SEPP, a development is classified as SSD if it is specified in Schedule 1 or 2 which states:

> *"(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, Clause 20 of Planning Systems SEPP determines "electricity generating works" to be SSD if it meets the following criteria:

> *"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:*
>
> *has a capital investment value of more than $30 million."*

The Project meets the definition of "electricity generating works" which are defined in Clause 2.35 of T&I SEPP as follows:

> *"electricity generating works means a building or place used for the purpose of—*
>
> *(a) making or generating electricity, or*
>
> *(b) electricity storage."*

The Project involves development for the purpose of electricity generating works using solar power, which will have a Capital Investment Value (CIV) of more than $30 million (see **Appendix F**).

Therefore, the Project is classified as SSD under Part 4 of the EP&A Act.

4.2 Permissibility

4.2.1 SEPP (Transport and Infrastructure) 2021

The permissibility of solar farm developments in NSW is determined by the T&I SEPP.

Clause 2.36 of the T&I SEPP states that "electricity generating works" may be carried out with development consent on land within a prescribed rural, industrial or special use zone. The Project Area is zoned RU1 – Primary Production under the 'Tamworth Regional Local Environmental Plan 2010' (Tamworth LEP).

As RU1 is a prescribed rural zone, the Project is therefore permissible with consent under the provisions of Clause 2.36 of the T&I SEPP.

4.2.2 *Electricity Infrastructure Investment Act 2020*

Clause 23 of the *Electricity Infrastructure Investment Act 2020* identifies Renewable Energy Zones (REZ) in NSW. The Project Area is located within the New England REZ which was formally declared on 17 December 2021 (NSW Government Gazette, 2021) by the NSW Government as shown in **Figure 1-1**.

4.3 Other Approvals

Other approvals that are potentially required under relevant NSW and Commonwealth legislation are discussed in **Appendix D**. It also identifies pre-conditions to exercising the power to grant approval (including mandatory conditions) and identifies in which section of the EIS each is addressed.

Table 4-1 provides a statutory compliance table which identifies key statutory requirements which are required for the Project and indicates how and where each has been addressed.

Table 4-1 Other Approvals Required

Approval Category	Legislation	Discussion	Section Where Addressed
Consistent Approvals Section 4.42 of the EP&A Act outlines that these approvals cannot be refused if necessary for carrying out an approved SSD and are to be consistent with the terms of the SSD approval.	*Roads Act 1993* (Roads Act)	Consent from the appropriate roads' authority under section 138 of the Roads Act will be required as the Project will undertake works on public roads.	**Section 6.9** and **Appendix O**
Native Title	*Native Title Act 1993* (NT Act)	Under section 13 of the NT Act, an individual can apply to the Federal Court for a determination of native title. The Gomeroi Native Title Claim overlaps the Project Area; however, most of the Project Area is freehold land and therefore Native Title is extinguished on this portion. A small portion of the Project Area covers the TfNSW Road Reserve. The Applicant is currently engaging with a Native Title lawyer to ascertain whether Native title is extinguished on the TfNSW Road Reserve.	**Section 6.3.4** and **Appendix H**

Approval Category	Legislation	Discussion	Section Where Addressed
EPBC Act Approval	*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)	Approval from the Minister for the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) is required for any action that will or is likely to have a significant impact on one or more Matters of National Environmental Significance (MNES). The Project was referred under the EPBC Act (EPBC Ref: 2022/09444) and was determined to be a controlled action on 26 March 2023. Supplementary SEARs were issued detailing the requirements of the Commonwealth for the EIS on 11 April 2023. A copy of the supplementary SEARs and where these have been addressed in the EIS is included in **Appendix A**. As such, the Project will be assessed in the manner specified in Schedule 1 to that Agreement including addressing the matters outlined in Schedule 4 of the *Environment Protection and Biodiversity Conservation Regulations 2000* (EPBC Regulations), as shown in **Appendix D**. The controlling provisions that apply to the Project under the EPBC Act were determined to be listed threatened species and communities (sections 18 & 18A).	**Section 6.2** and **Appendix G**
	Amending Agreement No.1 – New South Wales Assessment Bilateral Agreement	The Project will be assessed in accordance with the bilateral assessment agreement *Amending Agreement No. 1* (Commonwealth of Australia & NSW, 2020). Under the *Amending Agreement No.1* (Commonwealth of Australia & NSW, 2020), the NSW determining authority's Assessment Report will be provided to DCCEEW inclusive of a recommendation as to whether the project should be approved and conditions that may be applied to any Federal approval. DCCEEW will subsequently make a determination, inclusive of any conditions.	**Section 6.2** and **Appendix G**
Other Approvals	*Water Management Act 2000* (WM Act)	Water supply will be obtained via water access licences under the WM Act.	**Section 6.8** and **Appendix N**
	Conveyancing Act 1919	The Project will require a lease from the owners of the affected land. Lease of a solar farm site is treated as a lease of premises regardless of whether the lease will be for more or less than 25 years (NSW Land Registry Services, 2022). As solar panels and electricity substation/s are defined as 'premises' it will not constitute a 'current plan' within the meaning of Section 7A *Conveyancing Act 1919* and therefore will not require subdivision consent under Section 23G. Where consent is not required, the 'Subdivision Certificate' or 'Councils Certificate' panel on the Administration	Not Applicable

Approval Category	Legislation	Discussion	Section Where Addressed
		Sheet should be ruled through prior to lodgement of the plan. The Project will however require subdivision as described in **Section 3.7**.	
	Biodiversity Conservation Act 2016	The BDAR has been prepared to accompany the EIS and provides a discussion of the management and protection of listed threatened species of native flora and fauna and Threatened Ecological Communities (TECs). The BDAR assesses biodiversity offsets consistent with the Biodiversity Offset Scheme. Given the Project is SSD, entry into the Biodiversity Offset Scheme is automatically triggered.	**Section 6.2** and **Appendix G**
Approvals not required under SSD Section 4.41 of the EP&A Act states the following approvals; permits, etc are not required for an approved SSD.	*Fisheries Management Act 1994*	The Project will not require a dredging or reclamation work permit under section 201, a marine vegetation regulation of harm permit under section 205, or a passage of fish not to be blocked permit under section 219.	Not Applicable
	Heritage Act 1977	The Project will not require a Part 4 approval to carry out an act, matter or thing referred to in section 57(1), or an excavation permit under section 139.	**Section 6.4** and **Appendix I**
	National Parks and Wildlife Act 1979	The Project will not require an Aboriginal heritage impact permit under section 90.	**Section 6.3** and **Appendix H**
	Rural Fires Act 1997	The Project will not require a bushfire safety authority under section 100B, as the development does not involve subdivision for residential or rural residential development. Under Section 100C, emergency bush fire hazard reduction and management works can be undertaken on any land without consent or approval under the EP&A Act. A Bushfire Risk Assessment has been prepared as part of the EIS.	**Section 6.11** and **Appendix Q**
	Water Management Act 2000	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 is not required for the Project. No new aquifers interference approvals would be required for the Project.	**Section 6.8** and **Appendix N**

4.4 Mandatory Matters for Consideration

The consent authority is required to consider a range of mandatory matters when deciding whether to grant consent for the Project under various legislation.

Appendix D, **Table D-1** describes each mandatory matter and identifies where each is addressed in the EIS. It also identifies pre-conditions to exercising the power to grant approval (including mandatory conditions) and identifies in which section of the EIS each is addressed.

4.5 EIS Requirements

This EIS has been prepared in accordance with Part 8, Division 5 of the EP&A Regulation, which specifies the form and content of an EIS. **Appendix D**, **Table D-2** indicates each requirement and where each is addressed in this EIS.

5. STAKEHOLDER ENGAGEMENT

This section provides a summary of the stakeholder engagement undertaken for the Project. It provides an overview of the engagement process, the findings that have been incorporated into this EIS, and the Applicant's commitment to ongoing engagement.

5.1 Introduction

As part of the development of the Project and preparation of the EIS, engagement has been and will continue to be undertaken with a range of stakeholders including various NSW and Commonwealth Government agencies, the local community, special interest groups, and neighbouring and proximate landholders.

The Applicant is committed to ensuring public concerns and comments are considered, and that attempts are made to avoid, minimise or mitigate potential impacts where possible.

Key documents described in this Section are located on the Project's website (https://bendemeerenergyhub.com.au/).

5.2 Engagement Conducted

The 'Undertaking Engagement Guidelines for State Significant Projects' (Engagement Guidelines) require upfront and ongoing engagement for all State Significant Projects (DPIE, 2022).

To facilitate and plan engagement activities, Athena prepared a 'Stakeholder Engagement Plan' (SEP) for the Project in January 2022. The SEP was prepared in consideration of:

- 'International Association of Public Participation (IAP2)' (IAP2, 2022) engagement spectrum in which engagement activities were designed to 'Inform', 'Consult', 'Involve', 'Collaborate' and 'Empower'.
- SEARs (Appendix A);
- Engagement Guidelines (DPIE, 2022);
- 'Social Impact Assessment Guideline For State Significant Projects' (SIA Guidelines) (DPIE, 2023);
- 'Large-Scale Solar Energy Guidelines' (Solar Guidelines) (DPE, 2022a); and
- 'Aboriginal Cultural Heritage Consultation Requirements for Proponents' (DECCW, 2010b).

The SEP has facilitated engagement with relevant stakeholders which is open and inclusive, easy to access, relevant, timely, and meaningful, as required in the Engagement Guidelines (DPIE, 2022). The SEP also demonstrates the Applicant's commitment to continuously evaluate community engagement and modify when needed, to ensure the Applicant meets stakeholder expectations.

The SEP and all engagement for the Project has been prepared for the Applicant by communication specialists, C7EVEN Communications, based in Tamworth, NSW. All stakeholder engagement has been and will continue to be undertaken in accordance with the SEP.

5.2.1 Engagement Objectives

The objectives of the Project as contained in the SEP were created prior to the SIA Guidelines released in February 2023 and the Engagement Guidelines released in October 2022. However, the SEP has been revised to ensure consistency with the community participation objectives contained in the SIA Guidelines and the implementation detailed in the Engagement Guidelines.

The key objectives of the Project's consultation and engagement process are to:

- Develop and maintain positive working relationships with Project stakeholders and deliver best practice engagement;

- Proactively identify stakeholders that may be affected by the Project and ensure they have access to balanced, objective, timely and up-to-date information about the Project's potential impacts and benefits and the planning and environmental assessment process;
- Collect representative stakeholder inputs and ensure there are highly accessible mechanisms and multiple opportunities for stakeholders to provide input on the Project;
- Identify and consider stakeholder insights and concerns through effective two-way engagement to inform Project planning, design, mitigation, management and monitoring measures;
- Identify long-term community needs and design initiatives that can lead to well-designed support programs for the long-term benefit of the community;
- Develop a sense of local ownership in the Project and a social licence to operate;
- Maintain a positive image for the Applicant and the renewable energy industry;
- Ensure stakeholders are adequately informed and have sufficient understanding of:
  - The justification and need for the Project;
  - The well proven technology proposed as part of the Project;
  - How the Project may affect them and how they can be involved in the approval process;
  - How their views are considered in a meaningful way and used in Project planning, refinement and design, mitigation measures and monitoring and management frameworks;
  - The benefits of the Project, including local investment and employment, reduced greenhouse gas emissions, and replacement of aging coal fired generation in the NSW context;
  - How the Project can contribute to the local community;
  - How the Project complies with relevant regulatory requirements and policies; and
  - How the requirements of the SEARs and technical assessment lead to further information to be taken into consideration to remove, reduce and offset impacts and improve social and environmental outcomes while maintaining a viable Project.

5.2.2 Stakeholder Identification

The SEP was designed to enable community members to be part of the Project planning and development process, and to provide them with the opportunity to engage in a meaningful way at an early stage in the assessment process for the Project. Stakeholder identification was undertaken in the SEP as part of the scoping phase and was updated during the development of the EIS for the Project. This process involved identifying stakeholders with an interest and those directly and indirectly affected by the Project.

Stakeholders were identified through various methods, including:

- The compilation of land ownership information;
- Consideration of the local and wider community, industry and service providers;
- Networking with different individuals and community organisations;
- Media advertisements;
- Newsletter distribution and community information sessions;
- Discussion with regulators; and
- Inclusion of all stakeholders referenced in the SEARs.

Table 5-1 lists key stakeholders relevant to the Project, which have been grouped based on organisation type, individual interest or interaction with the Project.

Table 5-1 Stakeholders Identified

Category	Stakeholder	Description
Community		
Landholders	■ Host Landholder (see **Section 2.4.1.1**)	Landholder hosting infrastructures of the Project. The Project could affect soil, land capability and agricultural production. The Project will implement agrisolar activities, and disturbance to soil will be temporary and minimal. The Project will provide a diversified income stream, which can assist host landholder in making farm more resilient to the impacts of droughts, fires and commodity price fluctuations.
	■ Adjacent Non-associated Landholder (see **Section 2.4.1.3**)	Landholders located on land adjacent to the Project Area, with a potential to be affected by the Project construction and/ or operation. Impacts may include noise, visual, land use and agriculture. Based on technical assessments undertaken for this EIS and the implementation of mitigation measures (**Appendix B**), the Project will not impact any adjacent non-associated landowners located within the Study Area. As necessary, the Applicant will engage with immediate non-associated Project neighbours regarding agreements that may be executed to address 'perceived' impacts of the Project.
	■ Nearby Non-associated Landholder (see **Section 2.4.1.3**) ■ Kentucky South Landholder Group (KSLG)	Nearby landholders with a potential to be affected by the Project construction and/ or operation, particularly along the Project construction access route, or that may have views of the Project. Nearby non-associated landholders will not be affected by the Project.
Nearby Communities	■ Local Communities Bendemeer Woolbrook ■ Regional Centres Tamworth	Nearby communities and community groups may be affected by the Project, particularly during the construction phase of the Project with the influx of workforce and service and infrastructure requirements. Impacts will generally be positive through capital investment, the provision of employment and generation of clean energy.
Community and Business Groups	■ Bendemeer Country Women's Association (CWA) ■ Bendemeer Town Hall Committee ■ Woolbrook Hall and Park Committee ■ Macdonald River Landcare Group ■ Friends of Kentucky Action Group ■ Thunderbolt Energy Hub Community Consultative Committee ■ Red4NE – Responsible Development for New England ■ Bendemeer Rural Fire Service (RFS) ■ Bendemeer Art Show Society ■ Save Our Scenery (SOS) Bendemeer Action Group ■ Kootingal Lions Club ■ Westpac Rescue Helicopter Service ■ Tamworth Business Chamber	

Category	Stakeholder	Description
Aboriginal RAPs	■ Tamworth LALC, Gomeroi Native Title Applicant, Didge Ngunawal Clan, Wurrumay Pty Limited, AT Gomilaroi Cultural Consultancy, Warragil Cultural Services and Steve Talbot and two other stakeholders.	Specific cultural values of importance to Aboriginal parties may be affected by the Project. No cultural values were identified by the RAPs within the Project Area, as such no impacts of the Project is expected.
Other Industry and Stakeholders		
Infrastructure Owners	■ TransGrid ■ Energy Corporation of NSW (EnergyCo)	Infrastructure located within the Project Area could be affected by the Project during construction. Restrictions and covenants have been considered in this EIS and will not be impacted by the Project.
Exploration holders	■ None (as per **Section 2.4**)	
Regulatory		
Local Council(s)	■ Tamworth Regional Council	The Project is aligned with specific regulatory requirements and provides mitigation measures to achieve compliance as required.
Aboriginal Agencies	■ Office of the Registrar - *Aboriginal Land Rights Act 1983,* Heritage NSW, Tamworth Local Aboriginal Land Council (LALC), National Native Title Tribunal, National Native Title Services Corporation Ltd (NTSCORP), and the North West Local Land Services (LLS)	
State Government Agencies	■ DPE – Planning ■ DPE – Water ■ DPI – Agriculture ■ Heritage NSW ■ North West LLS ■ NSW EPA ■ State Member for Tamworth ■ State Member for Northern Tablelands ■ NSW Rural Fire Service (NSW RFS) ■ Fire and Rescue NSW (FRNSW) ■ Biodiversity, Conservation and Science Directorate (BCS) – North West Planning Team ■ Mining, Exploration and Geoscience (MEG) ■ Crown Lands ■ Transport for NSW (TfNSW) ■ Natural Resources Access Regulator (NRAR) ■ Energy Corporation of NSW (EnergyCo)	
Federal Government Agencies	■ Federal Department of Climate Change, Energy, Environment and Water (DCCEEW) ■ Federal Member for New England	

5.2.3 Engagement Tools

Engagement activities were undertaken as part of the EIS and scoping phase to consult and discuss the Project with stakeholders, and to build an understanding of potential concerns, opportunities and mitigation strategies. These also aimed to gather information that could inform the broader

communication strategies required to support future stages of the Project, including during the delivery stage.

The engagement activities used in the engagement process with various stakeholders include:

- Launch of Project's website, email address, hotline and social media;
- Recording of engagements through a Stakeholder Register;
- Distribution of factsheets, newsletters, and briefings;
- Media releases;
- Community pop-up sessions;
- Weekly Community Hub;
- Face-to-face and virtual meetings;
- Community sponsorship events;
- Fieldwork; and
- Community survey.

Appendix E provides a summary of a range of engagement tools deployed to consult with and seek feedback from the various stakeholders of the Project.

5.2.4 Community Engagement

A significant number of individual and group meetings, and public information events have been conducted as part of the engagement process since Project inception. Some of the more significant community consultation events are summarised in **Table 5-2**.

Table 5-2 Summary of Community Consultation

Stakeholder	Date and Tool	Purpose and Outcomes
Landholder	■ March 2022 – June 2023 Phone, email and virtual	■ To introduce the Project, provide updates and identify early feedback and concerns. ■ 3 virtual meetings were held with the host landholder. Ongoing liaison with host landholder also occurred via phone and email, which equates to over 150 individual interactions, as well as 6 non-associated landholders (e.g., owners of 3 dwellings within assessment area as identified in **Section 2.4.1.3)**, with 127 individual interactions via phone and email. ■ Non-associated landholders have been kept updated on progress of the Project and application.
	■ March 2022 – June 2023 Face-to-face	■ To provide updates on the Project progress, the impacts associated with the Project and answer questions. ■ 9 face-to-face meetings with the host landholder. ■ 53 face-to-face meetings with non-associated landowners and 2 group sessions, held at properties neighbouring the Project. ■ The landholders were keen to be kept updated on the progress of the application and have been briefed face-to-face as key environmental studies have been completed. Key areas of interest include ensuring management of impacts such as traffic, visual, noise, and biodiversity. ■ Key information from relevant environmental studies has been provided to community members and landholders via email, newsletters, and in face-to-face meetings. ■ Photomontages have been undertaken and have been provided to residents and landholders once completed.
	■ February 2023 SIA focused engagement	■ To identify the local community values, strengths and vulnerabilities, as well as their perspective on economy, infrastructure, and environment. ■ Host landholder and non-associated landowners were engaged with (**Appendix S**). ■ These engagements indicated the benefits of the Project are well understood (e.g., mixed land use, economic benefits to the region, creation of jobs, decreased costs of energy bills, energy security) and investment in local infrastructure.
Nearby Communities, Community Groups and Business Groups	■ March 2022 – June 2023 Phone and email	■ Direct contact with the Project Team to answer questions from the community, identify early feedback and concerns, and provide updates on the Project. ■ On average, 1 email per week is received on the community email address enquiring about the Project and an average of 2 calls per week have been received on the community hotline. ■ Generally, email and phone enquiries via the community hotline and email have requested general Project information. In this instance the Project fact book has been supplied, as well as information regarding the Project website and monthly newsletter. ■ One landholder was interested in how her property would be impacted from a visual perspective; in this instance a face-to-face meeting was arranged.

Stakeholder	Date and Tool	Purpose and Outcomes
		■ A letter was received from the SOS Bendemeer Action Group requesting information on noise and visual impacts, cumulative assessment and impacts to wildlife. An in-depth response and Project fact book was provided via email and an in-person meeting was offered.
	■ March 2022 – June 2023 Community group meetings	■ A presentation of the Project was given to introduce the Project and identify feedback and concerns. ■ 5 meetings with community groups including the Bendemeer CWA, RFS, Macdonald River Landcare group, Bendemeer Art Society and Kootingal Lions Club. ■ Attendees were keen to learn more about the Project with special interest regarding electricity distribution from the Project, and if there was an ability to graze under solar panels. ■ Community groups requested regular contact from the Project team to be kept informed of Project progress. There was special interest in preservation of Macdonald River, improvements to the Bendemeer community and traffic disruptions during the construction period. ■ Two meetings have resulted in official requests for sponsorship.
	■ July 2022 – June 2023 Community information sessions	■ To provide the community with a greater understanding of the Project, answer questions and identify concerns and feedback. Fact sheets, information brochures and location maps were distributed. ■ 12 community pop-up sessions have been held, including three sessions in the neighbouring village of Woolbrook. An average of 5-10 members of the community attended each session. Numbers fluctuate depending on time and day of week, with the aim to vary the schedule to capture as many community members as possible. ■ Since April 2023, a weekly Community Hub has also been set up, running out of the Bendemeer CWA Hall every Friday between 10am-2pm, where community members have come to ask questions about the Project. Hard copies of factsheets and community newsletters are available at the community hub. ■ Project information stands were also set up at the Grey Fergie Tractor Muster 2022, and the Bendemeer Campdraft and Rodeo 2023, where factsheets and information were distributed to the public. ■ At all community sessions attendees asked questions about the Project, including the Project's economic benefits and noise and visual impacts. An update on SSD review and approvals process and timeline were also provided. Attendees were informed of community newsletters, pop-up sessions and provided with project factsheets and key information.
	■ February 2023 SIA focused engagement	■ Focused engagement was undertaken for the SIA to identify the local community values, strengths and vulnerabilities, as well as their perspective on economy, infrastructure, and environment. ■ Community members, businesses and groups engaged with include neighbours to the Project, Macdonald River Landcare Group, Bendemeer Hotel, Bendemeer Rodeo President, Bendemeer Art Show Society, Bendemeer CWA and Tamworth Business Chamber (**Appendix S**). ■ These engagements indicated that community values most strongly resonated with environment, especially the natural landscape, rolling hills and Macdonald River, farming, and community and family. Benefits identified include increased economic activity in Bendemeer associated with the Project, Community Benefit Fund investment in buildings and social infrastructure (e.g., sewage infrastructure, healthcare services) in the Bendemeer village, and sustainability initiatives surrounding the management of the Macdonald River.

Stakeholder	Date and Tool	Purpose and Outcomes
Aboriginal Stakeholders	■ October – November 2022 Email and media release	■ To identify RAPs who wish to be consulted about the Project and to assist in the preparation of the ACHAR (refer **Appendix H**). ■ An email was sent to Aboriginal agencies (listed in **Table 5-1**) and Tamworth Regional Council, an advertisement was also placed in the *Northern Daily Leader.* ■ Letters were sent to 56 parties identified by Heritage NSW and North West LLS. ■ 9 groups or individuals registered to be consulted as RAPs (Tamworth LALC, Gomeroi Native Title Applicant, Didge Ngunawal Clan, Wurrumay Pty Limited, AT Gomilaroi Cultural Consultancy, Warragil Cultural Services, Steve Talbot and other and two other stakeholders) as described in the ACHAR (refer **Appendix H**).
	■ November – December 2022 Fieldwork	■ To identify any cultural values within the landscape in which the Project is located so that those values can be recognised and incorporated into the Project management recommendations. ■ 2 representatives from Tamworth LALC and 4 representatives from AT Gomilaroi Cultural Consultancy participated in the fieldwork undertaken over four days. ■ No specific cultural values were identified by the RAPs regarding the Project Area; however, the strong cultural values of Aboriginal communities towards landscapes and cultural heritage sites are recognised.
	■ February 2023 SIA focused engagement	■ Engagement with RAPs was also undertaken as part of the SIA to identify community values, strengths and vulnerabilities. ■ Representatives of Tamworth LALC and AT Gomilaroi Cultural Consultant were engaged with as part of the SIA (**Appendix S**). ■ RAPs engaged with were supportive and identified several measures that could benefit from the development of the Project (e.g., training for locals to maintain the MacDonald River, training programs for one or two young Aboriginal people in (or nearby to) Bendemeer to become National Park rangers, improve socio-economic outcomes for local Aboriginal youth/ job procurement, and the facilitation of cultural burning practices, etc).
	■ February 2023 ■ March 2023 Email	■ A letter attached to the draft ACHAR was sent to the 9 registered RAPs to review the draft ACHAR and provide any comments on the cultural values of the sites recorded and the broader Project Area (**Appendix H**). A follow up reminder for feedback was sent to the RAPs on 10 March 2023. ■ The RAPs did not provide comments on the draft ACHAR.
Infrastructure Owners	■ February 2023 Email	■ An email was sent to TransGrid to provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ TransGrid replied to the letter advising that a Connection Processes Agreement (CPA) is required to facilitate a connection to TransGrid's network and will need to include all new connection assets as part of its approval. No concerns or issues were raised by TransGrid.
	■ October 2022 ■ January – June 2023 Email	■ New England Renewable Energy Zone (New England REZ) Expression of Interest (EOI) for the Bendemeer Renewable Energy Hub submitted via email on 21 October 2022. ■ Initial New England REZ introductory session was provided by Energy Co on 8 February 2023 outlining general objectives of the New England REZ, infrastructure requirements, schedule and community engagement. Request was made to Metis for supply of project details, community engagement feedback, and development schedule. Energy Co also offered to review the Project's EIS prior to submission.

Stakeholder	Date and Tool	Purpose and Outcomes
		■ Technical meeting held on 10 March 2023 to provide information requested during initial meeting on 10 February 2023. ■ A meeting was conducted with Energy Co on 14 March 2023 to discuss the engagement activities undertaken by the Project team. Following this, the results of the community survey were shared with Energy Co to assist in understanding community sentiment. ■ The Project EIS Chapters 1 to 4 were provided to Energy Co for review on 17 April 2023. ■ Update to the Project layout was provided to Energy Co on 28 April 2023. ■ No concerns or issues were raised during engagement with Energy Co.

5.2.5 Regulators Engagement

Table 5-3 summarises meetings with relevant regulators and purposes of each meeting. It also indicates where each has been addressed in this EIS.

Table 5-3 Regulatory Engagement Summary

Regulator

Regulator	Date and Tool	Purpose and Outcome
DPE	■ January, 1 March, 31 August, 11 October 2022 and 19 May 2023 Videoconference, phone call, email, briefing	■ To provide an update on the Project status following the receipt of the Project SEARs and update on status of technical assessments. ■ Feedback on original submission of scoping report including required updates due to change in guidelines, and additional information requirements for biodiversity, community engagement and social impacts, sensitive receivers and agency consultation. ■ DPE highlighted key impact assessment matter is biodiversity, and that recent changes to guidelines would likely require an Agricultural Impact Assessment. ■ Potential for additional biodiversity surveys as a result of changes in threatened species status. ■ Provision of updated guideline advice for new Large Scale Solar Energy Guideline and pre-lodgement meeting information requirements. ■ A pre-lodgement meeting was undertaken to provide an update on the potential environmental, social and economic impacts relevant to the Project and how these impacts were avoided, addressed or minimised. The aspects discussed include biodiversity, visual, noise, traffic, hydrology, heritage, and social.
DPE – Water	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ DPE Water responded to the letter, advice will be provided once the EIS is on public exhibition.
DPI – Agriculture	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements.

Regulator	Date and Tool	Purpose and Outcome
		■ DPI Agriculture responded to the letter advising that an Agricultural Assessment is required as required in the Project SEARs and the Large-Scale Solar Energy Guidelines. Impacts of the Project should be fully assessed to allow for mitigating measures to be implemented through consent conditions.
Heritage NSW and North West LLS	■ 15 October 2021 Email	■ To help identify RAPs who wish to be consulted and assist in the preparation of the ACHAR. Other aboriginal agencies also contacted include Office of the Registrar Tamworth LALC, National Native Title Tribunal, NTSCORP, Tamworth Regional Council, and the North West LLS. ■ A list of 56 RAPs was provided by Heritage NSW and North West LLS.
	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ Heritage NSW replied to the letter, no additional information or consultation was required at this stage of the Project.
NSW EPA	■ 08 March 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ NSW EPA replied to the letter, advising EPA will no longer respond to routine referrals of certain types of planning matters including solar farms.
Tamworth Regional Council	■ 19 May 2022 Face to face	■ Project team engaged with Tamworth Regional Council including the Mayor and General Manager to share Project updates, discuss decommissioning, landowner support and community funding. ■ Council indicated interest in regular Project updates.
	■ 15 September 2022 Face to face	■ Project team engaged with Tamworth Regional Council including the Mayor and Director of Liveable Communities to share Project updates, discuss benefits of renewables and jobs associated with the Project. The need for social licence and challenges around housing were also discussed. ■ Tamworth Regional Council were interested in how Project could assist with vocational training and opportunities.
	■ 9 December 2022 Phone call	■ To introduce the Project and describe traffic volumes. During discussion it was noted that the road network seemed to have a lot of capacity, and as such no traffic impacts on the road network are anticipated because of the Project. No changes to the New England Highway or Oxley Highway intersection are being proposed, as the TIA indicated the current design was adequate to support the Project vehicles accessing the Project. ■ Tamworth Regional Council noted there were currently works going on at the intersection and further engagement in this regard should be undertaken with TfNSW. Council did not raise any concern or issue during engagement.
	■ 9 December 2022 Face to Face	■ Project team engaged with Tamworth Regional Council including the Mayor, General Manager and Director of Liveable Communities to share Project updates, particularly around milestones, Project design and community engagement activities. ■ Key area of interest was the VPA and Community Enhancement fund. Council requested Project team to draft initial Terms of Reference. ■ A site visit for Council was also discussed, and Council indicated interest once the EIS was on public exhibition.

Regulator	Date and Tool	Purpose and Outcome
	■ 9 February 2023 Email	■ Official email to General Manager of Tamworth Regional Council to request participation in SIA survey. ■ Council committed to participating in the SIA survey.
	■ 10 February 2023 Face-to-face and Email	■ Project team engaged with Tamworth Regional Council Mayor, Director of Liveable Communities, Senior Strategic Planner and Development Manager to share Project update and discuss details of Voluntary Planning Agreement (VPA) terms of reference and community benefit fund. ■ Council advised that they were working with other surrounding councils to attempt to standardise components of VPA's and committed to provide further guidance. ■ The Project team committed to providing council a draft VPA offer. ■ TRC committed to a site visit, post-submission of the EIS. ■ A letter was sent to Council to provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ No comments were provided by Tamworth Regional Council
	■ 13 March 2023, 30 March 2023, 19 April 2023, 27 April 2023, 4 May 2023 ■ Emails	■ VPA offer and Terms of Reference was delivered to council via email. ■ Feedback and subsequent face to face meeting was requested on several occasions. ■ Tamworth Regional Council advised VPA offer will be assessed once formal assessment has been submitted.
NSW RFS	■ 21 June 2022 ■ 10 February 2023 Email	■ NSW RFS Community Risk Officer was engaged during preparation of the Bushfire Assessment Report to discuss specific operational and planning expectations of the Project, with PBP 2019 confirmed as the lead document for compliance purposes. ■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ No comments were provided by NSW RFS.
FRSNW	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ No comments were provided by NSW RFS.
BCS North West Planning Team	■ 10 June 2022 Virtual meeting	■ To provide an update on progress made to date, including a presentation on design changes to avoid a significant portion of the CEEC located within the Project Area (**Section 2.5.3**). ■ BCS noted that the approach proposed was in accordance with the Biodiversity Offset Scheme regarding the hierarchy of avoid, minimise and mitigate impacts, prior to offset.
	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements.

Regulator	Date and Tool	Purpose and Outcome
		■ No comments were provided by BCS North West Planning Team.
MEG	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ No comments were provided by MEG.
Crown Lands	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ The Crown Lands responded to the letter and noted that the site entrance now avoids impacts to the Travelling Stock Reserve (TSR) adjacent the Oxley Highway. Assistance was offered regarding viability and pathways for potential authorisation on new site access over a track-in-use through Crown reserves.
	■ 6 June 2023 Email	■ To provide a detailed site access location and seek advice on the requirements and pathway for Crownlands Landowners Consent for the Project. ■ Site access from Oxley Highway has been relocated 2 km further east of the previous site access location, which now avoids impacts to the TSR over a track-in-use through Crown reserves. The new proposed site access is now directly into the Oxley Highway road reserve, and as such Crownlands Landowners Consent is not required for the Project.
TfNSW	■ 14 November 2022, 23 January 2023 and Email and phone call	■ To introduce the Project and describe traffic volumes. During discussion it was noted turn treatments at New England Highway and Oxley Highway intersection and requested whether road upgrades were occurring. ■ TfNSW advised that that further traffic assessment associated with the Project will occur at the EIS stage in accordance with the SEARs. TfNSW will provide a comprehensive review of the design and provide the best direction forward.
	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ TfNSW responded to the letter with no further comments provided prior to EIS submission.
NRAR	■ 10 February 2023 Email	■ To provide an update on the Project following the receipt of the Project SEARs, seek feedback, identify concerns, and offer online or phone meeting. A Project Layout updated figure was included in the email indicating Project key elements. ■ No comments were provided by NRAR.
DCCEEW	■ 18 November 2022 Virtual meeting, email	■ Referral pre-lodgement meeting to share key plans and vegetation mapping of the Project in relation to potential impacts to listed endangered species and ecological communities. Update on Project layout was provided to highlight how the Project refinement has avoided areas of the highest biodiversity value PCT.
	■ 17 March 2023 Phone call	■ To clarify the connection of the Project with the Bendemeer Wind Farm. It was noted that the Project is a separate development application; however, the Bendemeer Wind Farm may utilise shared infrastructure of the Project. ■ DCCEEW was appreciative of the context and understood the connection.

Regulator	Date and Tool	Purpose and Outcome
NSW Member for Tamworth. Minister for Lands and Water (2020-2023), Minister for Hospitality and Racing (2020-2023), Shadow minister for Gaming and Racing, Shadow Minister for the Arts and Heritage	■ 12 April 2022 In person ■ 9 November 2022, 21 November 2022, 22 February 2023, 28 February 2023, 1 March 2023, 1 June 2023 Email ■ 15 May 2023 In person	■ Project team have engaged with NSW Member for Tamworth, Minister for Lands and Water, Minister for Hospitality and Racing, on several occasions to provide a Project overview and discuss key Project details. ■ Key areas of interest have included decommissioning, number of landowners and neighbours involved, size of the land, number of solar panels, Community Enhancement Fund, and economic benefits included employment and the use of local contractors. ■ The Project team have also kept the Member and his office informed on engagement activities completed to date and stakeholder feedback. Project timelines and layout were also discussed. ■ The Member's office requested further updates on the project, with open communication to continue.
NSW Member for Northern Tablelands	■ 22 February 2023 Email ■ 10 March 2023 Phone call ■ 10 May 2023 Email ■ 17 May 2023 In person	■ Project team engaged with NSW Member for Northern Tablelands to provide an overview of Project. ■ Arranged meeting, however stakeholder had a last-minute delay and so Project team met with Senior Advisor. ■ The Project team ran through latest Project updates, informed on engagement activities completed to date and stakeholder feedback. Project timelines and layout was also discussed in the meeting. ■ The Advisor reiterated that a key focus for the State Member was the importance of taking the community on the journey. ■ Would like to keep communication open between Member's office and Project team.
Federal Member for New England	■ 27 June 2022, 17 November 2022 In person ■ 11 January 2023 Email	■ Project team engaged with Federal member for New England to provide a Project introduction. The Federal member indicated no personal position on the Project but reiterated the need for social license. As a local resident of the Bendemeer region, he also asked to be kept regularly updated. ■ Project team met with Federal Member for New England again in November 2022 to provide an update on key Project milestones, including solar EIS submission. ■ The discussion included visual impacts for immediate Project neighbours and neighbour agreements. ■ The MP indicated it was positive to hear that neighbour agreement discussions were underway. ■ An updated project layout map and project factsheet was emailed to MP in January 2023.

5.3 Stakeholder Views

Table 5-4 provides a summary of the community views on the Project. A detailed engagement table for the Project that identifies the key issues and where each is addressed in this EIS is provided in **Appendix E**. Justification and evaluation of the Project is discussed in detail in **Section 7**.

Table 5-4 Stakeholders Issues Summary

Stakeholder Category	Level of Interest/ Geographic Extent[5]	Stakeholder Views on the Project					
		Strategic Context	Design and Alternatives	Statutory Issues	Engagement	Impacts of the Project	Issue beyond scope
Community							
Landholder	High/ Local	Agricultural land	■ Vegetation screen will be adopted to avoid visual (including glint and glare) impacts on sensitive receivers. ■ Solar arrays were designed to allow grazing to continue beneath solar arrays alongside Project operations, to minimise loss of grazing land, risk of erosion and potential run-off into waterways.	-	Ongoing as the Project develops.	■ Visual amenity impact and assessment process. ■ Glint and glare impacts. ■ Land and soil risk of biosecurity, erosion and sediment run-off. ■ Economic impacts on property values, employment opportunities, procurement/ local business and community participation. ■ Agricultural impact on grazing activities. ■ Workforce accommodation.	-
Nearby Communities (including Community Groups and business groups)	Medium/ Regional	Macdonald River and waterways, local roads, local infrastructure	■ Vegetation screen will be adopted to minimise glint and glare impacts on sensitive receivers. ■ Changes to physical layout to avoid areas containing CEEC and minimize impacts to biodiversity and noise. ■ Solar arrays were designed to allow grazing to continue beneath solar arrays	-	Throughout the EIS.	■ Water quality impacts, mitigation and management measures, and measures to monitor impacts. ■ Glint and glare impacts. ■ Economics impacts, CBF, employment opportunities, procurement/ local business and community participation. ■ Local infrastructure impacts. ■ Agricultural land impacts.	-

[5] As specified in the EIS Guidelines – Local: < 5 km from the Project Area, regional: 5-100 km and state: > 100 km.

Stakeholder Category	Level of Interest/ Geographic Extent[5]	Stakeholder Views on the Project					
		Strategic Context	Design and Alternatives	Statutory Issues	Engagement	Impacts of the Project	Issue beyond scope
			alongside Project operations, to minimise loss of grazing land, risk of erosion and potential run-off into waterways.			■ Traffic impact on local road. ■ Bushfire hazards. ■ Cumulative impacts. ■ Construction Noise impacts, monitoring and management measures. ■ Decommissioning process.	
Aboriginal Stakeholders	Medium/ Local	Macdonald River, waterways, Aboriginal sites and artefacts.	■ Solar arrays were designed to allow grazing to continue beneath solar arrays alongside Project operations, to minimise loss of grazing land, risk of erosion and potential run-off into waterways.	-	As per State guidelines.	■ Water quality impacts, mitigation and management measures, and measures to monitor impacts.	-
Regulatory							
Local Council	Medium-High/ Local, Regional	CBF, VPA, and Option to Lease Agreement, local roads, Macdonald River and waterways.	■ Changes to physical layout to avoid areas containing CEEC and PADs, to minimise impacts to biodiversity, heritage and noise.	Potential for EPBC Act referral	Ongoing as the Project develops.	■ CBF and VPA. ■ Decommissioning process. ■ Traffic and road impacts. ■ Biodiversity impact. ■ Heritage and cultural significance impact ■ Landholder support. ■ Continual Project updates. ■ Benefits of renewables. ■ Employment and vocational opportunities.	-
State Government Agencies	Medium/ Regional	Cumulative impact	■ Suitable APZs were established around Project infrastructure.	-	Ongoing engagement or as per guidelines.	■ Bushfire risk and site access. ■ Landholders and neighbours involved in the solar Project. ■ Decommission of Project's infrastructure. ■ Community support or opposition.	-

Stakeholder Category	Level of Interest/ Geographic Extent[5]	Stakeholder Views on the Project					
		Strategic Context	Design and Alternatives	Statutory Issues	Engagement	Impacts of the Project	Issue beyond scope
Federal Government Agencies	Medium/ State	Cumulative impact, and Option to Lease Agreement	-	-	Ongoing engagement or as per guidelines.	■ How many landholders and neighbours involved in the solar Project. ■ Decommission of Project's infrastructure. ■ Community support or opposition. ■ Cumulative impacts of renewables in New England REZ.	Cumulative impacts of the overall New England REZ

5.4 Response to Engagement Requirements

The Engagement Guidelines require upfront and ongoing engagement for all SSD projects.

Table 5-5 provides a response to the Engagement Guidelines, how the Project was consistent with the community participation objectives and the engagement requirements during EIS phase.

Table 5-5 Engagement Guidelines and Where Addressed

Requirement	Where Addressed
Consistent with the community participation objectives:	
■ Identify the people or groups who are interested in or are likely to be affected by the Project	Section 5.2.2
■ Use appropriate engagement techniques when engaging with specific groups	Section 5.2.3
■ Ensure the community are provided with safe, respectful and inclusive opportunities to express their views	
■ Involve the community, councils and government agencies early in the development of the proposal, to enable their views to be considered in project planning and design	Sections 5.2 and 5.3
■ Be innovative in their engagement approach and tailor engagement activities	Section 5.2.3
■ Provide clear and concise information about what is proposed and the likely impacts for the relevant people or group they are engaging with	
■ Clearly outline how and when the community can be involved in the process	
■ Make it easy for the community to access information and provide feedback	
■ Seek to understand issues of concern for all affected people and groups and respond appropriately to those concerns	Section 5.2.3 and 5.3 Appendix E
■ Provide feedback about how community and stakeholder views were used to shape the project or considered in making decisions	
■ Be able to demonstrate how the demography of the area affected has been considered in how and what engagement activities have been undertaken	Section 5.3
Preparing the EIS the Applicant must:	
■ Implement any engagement activities required by the SEARs (including engagement with relevant government agencies, council and the community)	Section 5 Appendix E
■ Inform the community about the opportunities to engage	Section 5.2.3
■ Explain how community feedback will be considered and documented	Section 5.3 Appendix E
■ Provide relevant information in plain English so that potential impacts and implications can be readily understood	Section 6
■ Be clear about the level of influence engagement will have by identifying what elements can be changed as a result of feedback	Sections 2.5.3 and 6
■ Give the community the opportunity to voice their concerns or share local knowledge so that this information can be considered early on in the planning, design and assessment	Section 5.2.3
■ Consider the issues raised by the community, council and relevant government agencies when making Project refinements and accurately reflect how these issues have been addressed in EIS documentation	Sections 2.5.3 and 6
■ Keep the community, council and relevant government agencies informed with up-to date information on the Project	Section 5.2.3

Requirement	Where Addressed
The community is able to:	
■ Seek clarification about the Project and its impacts	Section 5.2.3
■ Provide timely feedback to the Applicant about aspects of the Project which they support, do not support or wish to be adjusted	Section 5.2.3
■ Provide clear reasons for any concerns to enable the Applicant to consider possible alternative approaches to address the issues	Section 5.3 Appendix E

5.5 Future Engagement

Ongoing engagement with stakeholders will be undertaken during the EIS exhibition and assessment phase to ensure up to date information is provided and two-way communication continues. This engagement will include (but not be limited to):

- Committee to establish the CBF;
- Enter into a VPA;
- Ongoing meetings with relevant regulators in accordance with planning and design, especially required intersection upgrade, and construction programming;
- Ongoing consultation with other regulatory agencies during preparation of the response to submissions report;
- Create up to date Project Fact Books, based on key areas of community concern, and distribute in-person and online;
- Ongoing consultation with community and regulatory stakeholders via various methods;
- Ongoing monitoring of community hotline, email and post box for complaints and other feedback from the community;
- Maintaining the Project website with regular updates during development and construction period of the Project; and
- Ongoing media relations to ensure community awareness around the Project.

The SEP will also be regularly monitored, reviewed and adapted over the course of the Project to ensure it remains effective and encourages community participation. The SEP includes a regularly reviewed action plan which describes the activities, target audience and timing of actions to ensure smooth delivery of engagement which will be reviewed and adapted post-submission of the EIS.

Should the Project be approved, a Construction Environmental Management Plan (CEMP) will be prepared prior to the commencement of construction for the Project that will include a process for receiving and responding to community complaints.

6. IMPACT ASSESSMENT AND MITIGATION

This section provides information on the range of technical and/or environmental disciplines that would be influenced to varying degrees by the Project. These environmental disciplines are assessed in consideration of the Project SEARs, supplementary SEARs, relevant standards and/or performance measures and stakeholder engagement as described in **Section 5.**

6.1 Categorisation of Impacts

Preliminary investigation undertaken during the preparation of the scoping report (NGH, 2022) helped to identify the potential environmental and social impacts associated with the Project and the required level of assessment (detailed or standard), which are addressed in this EIS.

Where an issue has been established as standard, this has been on the basis that it is well understood, industry-wide and non-site specific, has been found to not apply to solar farms, or an industry standard approach is available which adequately addresses the issue.

This section considers all regulatory requirements as listed in **Appendix A**.

Table 6-1 lists potential environmental, social and economic risks relevant to the Project.

Table 6-1 Project Risk Assessment

Level of Assessment	Aspect
Detailed	Biodiversity
	Aboriginal Cultural Heritage
	Historic Heritage
	Noise
	Landscape and Visual
	Soils and Agriculture
	Water Resources, Hydrology and Flooding
	Traffic
	Preliminary Hazard Analysis
	Bushfire
	Economic
Standard	Air Quality
	Waste Management

6.2 Biodiversity

6.2.1 Introduction

A Biodiversity Development Assessment Report (BDAR) was prepared for the Project and is provided in **Appendix G**. The BDAR assessed the potential impacts associated with the Project to biodiversity values and identifies mitigation and risk management measures to be implemented during construction and operation of the Project to minimise these impacts.

The BDAR addresses the project-specific SEARs issued in March 2022 as well as Supplementary SEARs provided by DCCEEW.

The BDAR is supported by a Land Category Assessment Report, which was submitted to DPE as part of the Scoping Report phase of the Project.

The BDAR was prepared in accordance with the following:

- *Biodiversity Conservation Act 2016* (NSW) (BC Act);
- *Biodiversity Conservation Regulation 2017* (NSW);
- Biodiversity Assessment Method (BAM) (DPIE, 2020b) applies to the Project under the transitional provisions in section 6.31 of the *Biodiversity Conservation Regulation 2017*;
- 'Developments adjacent to National Parks and Wildlife Service Lands' (DPIE, 2020e); and
- EPBC Act.

The biodiversity features and values associated with the Project have been assessed through desktop and field methods at various scales. The following terminology was adopted in the BDAR:

- The Subject Land is the area within which the Project will occur, including the Disturbance Footprint (refer **Section 3.2.1**). The Subject Land boundary coincides with the Project Area and is approximately 606.4 ha; and
- The Assessment Area includes the Subject Land with a 1,500 m buffer for subsequent landscape assessment, which has been applied in accordance with Section 3.1 of the BAM.

The scope of the BDAR included:

- Desktop assessment of key maps, tools and field surveys using information sources as detailed in Section 1.3 of the BDAR in **Appendix G**;
- Field surveys carried out throughout 2021, 2022 and 2023 and involved the methods as summarised below, a full description of the survey methodology is provided in the BDAR:
  - Rapid data points for PCTs/ Threatened Ecological Communities (TECs) and vegetation zone mapping;
  - Vegetation integrity plots (BAM plots); and
  - Targeted threatened flora surveys.

6.2.2 Background

Landscape Features

The landscape context for the Project was assessed within the Subject Land and Assessment Area in accordance with Section 3.1 of the BAM and is detailed in **Table 6-2**.

Table 6-2 Landscape Context for the Study Area

Landscape feature	Description
Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and sub-region	The Subject Land falls within the NSW New England Tablelands IBRA bioregion and within the Eastern Nandewars IBRA subregion, which was used in the BAM Calculator (BAM-C) to determine offset requirements for the proposal. The Eastern Nandewars IBRA subregion is characterised by hills and broad valleys and rugged granite outcrops with tors. Soils are typically siliceous sands amongst rock outcrops that are of relatively low fertility and poor structure, prone to erosion. Vegetation is typically characterised by open forest and woodlands of silver-top stringybark, Blakely's red gum, Youman's stringybark, yellow box, apple box, rough-barked apple with black cypress pine, ribbon gum and some snow gum. Western slopes comprise of tumbledown gum, western New England blackbutt, Caley's ironbark, white cypress pine and black cypress pine, rough-barked apple and silver-leaved ironbark (DPE, 2021).
Rivers and streams	The Subject Land is located south of Perrys Creek and north of the Macdonald River. Several ephemeral tributaries associated with both watercourses are located within the Subject Land. Nine man-made dams exist within the Subject Land. The Subject Land is within the Namoi River catchment.
Connectivity features	Local mapped fauna corridor represents potential corridors able to provide context of connectivity between key habitats over private and public land. The Subject Land is predominantly in a fragmented condition, with non-native vegetation cleared of canopy and grazing areas providing little connectivity for native species at a local and regional level. Mapped corridors within the Subject Land, comprise a north-south stepping stone corridor that connects to the Macdonald River in the south.
Areas of geological significance	There are no Karsts, caves, crevices, cliffs or other geological features of significance within the Subject Land.
Areas of outstanding biodiversity value	There are no areas of outstanding biodiversity value as assessed under the BC Act present within the Subject Land or Assessment Area.
NSW Landscape Regions (Mitchell Landscapes)	The Subject Land supports 2 NSW landscapes: ■ Moonbi – Walcha Granites ■ Peel Channels and Floodplain
Additional landscape features identified in SEARs	No additional landscape features were identified in the SEARs.
Soil Hazard Features	There are no known significant soil hazard features within the Subject Land. A search of the NSW EPA Contaminated Sites Register, identified three sites within the Tamworth Regional council LGA with current or former Declarations of Significantly Contaminated Land, all located in the suburb of Tamworth north or Tamworth South over 50 km from the Subject Land.
Native Vegetation	Approximately 70.4% (426.7 ha) of the Subject Land has been cleared of native vegetation. As such, approximately 29.6% (179.7 ha) of the Subject Land consists of native vegetation with a cover class of >10-30%.

Plant community types

Field surveys were undertaken throughout 2021, 2022 and 2023 to identify and delineate non-native and native vegetation. Surveys validated native vegetation as a PCT and determined their condition. Identification of PCTs within the Subject Land was confirmed with reference to the community profile descriptors identified within the DPE mapping and the NSW BioNet Vegetation Classification.

Survey effort to ground-truth vegetation extent included:

- Winter 2021: 16 rapid vegetation assessments points;
- Spring 2021: 18 vegetation integrity plots, 16 rapid vegetation assessments points, scattered tree assessments;

- Spring 2022: 2 vegetation integrity plots; and
- Summer 2023: 11 vegetation integrity plots and 1 rapid vegetation assessment.

Native vegetation across the Subject Land is comprised of two PCTs, 538 and 510, and further delineated into three (3) vegetation zones due to condition, as identified in **Table 6-3** and **Figure 6-1**.

Thirty-one vegetation integrity plots were undertaken across the Subject Land to support the refined PCT and vegetation zone mapping, carried out in accordance with the BAM. This data was used to validate the assignment of PCTs to vegetation zones and to provide a more accurate dataset on the vegetation integrity score of the vegetation zones within the Disturbance Footprint.

Table 6-3 PCTs identified within the Subject Land

PCT ID	PCT name	Vegetation zone ID	Condition	Subject Land (ha)
538	Rough-barked Apple – Blakely's Red Gum open forest of the Nandewar Bioregion and western New England Tableland Bioregion	1	Moderate	105.8
510	Blakely's Red Gum – Yellow Box grassy woodland of the New England Tablelands Bioregion	2	Moderate	59.29
		3	Low	14.64
Total Area				**179.7**

Threatened Ecological Communities

The following TECs have been considered for assessment within the BDAR:

- White-Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC (EPBC Act and BC Act listed TECs) - This TEC has been ground-truthed to occur within the Subject Land;
- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland (EPBC Act listed); and
- New England Peppermint (*Eucalyptus nova-anglica*) grassy woodlands (EPBC Act listed).

Field surveys and ground-truthed vegetation mapping confirmed the presence of White-Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC covering 179.7 ha of the Subject Land, which consists of the PCT 510 and PCT 538, both assigned a moderate condition in the vegetation zone map. The Disturbance Footprint overlaps 60.3 ha of this TEC (approximately 58% of the TEC mapped within the Subject Land; only 9.9% of the Subject Land's total area).

The presence of the TEC across the Subject Land is discontinuous. The western and eastern boundaries of the Subject Land consist of the Box-Gum Grassy Woodland among areas of non-native vegetation. The central section of the Subject Land consists of the Box-Gum Grassy Woodland as well as areas of PCT 510 and 538.

Details of TECs, associated PCTs of both BC Act and EPBC Act TECs and areas (ha) within the Subject Land are outlined in **Table 6-4**. TECs within the Subject Land is shown in **Figure 6-2**.

Table 6-4 TECs within the Subject Land

TEC name	Profile ID (from TBDC)	BC Act status[6]	EPBC Act status[6]	Area within Subject Land (ha)
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	PCT 510 Moderate PCT 538 Moderate PCT 510 Low	CE	-	179.7
	PCT 510 Moderate PCT 538 Moderate	-	CE	111.1

Based on the referral decision from DCCEEW (EPBC Ref: 2022/0944), an additional two TECs which may be impacted by the proposed action have been considered in the BDAR (**Appendix G**). These TECs (with their EPBC Act listing) were assessed for potential significant impacts:

- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland (Critically Endangered); and
- New England Peppermint (*Eucalyptus nova-anglica*) grassy woodlands (Critically Endangered).

The Subject Land has been assessed against the key diagnostics characteristics for these TECs to assess potential presence. The BDAR concluded these TECs are not present within the Subject Land.

Threatened Species

Based on the PCTs present within the Disturbance Footprint requiring assessment, the BAM-C identified a total of 33 potential species credit species for assessment.

Under the BAM, species credit species generate additional credits unless:

- They are excluded because required habitat constraints are present; or
- Habitat quality is sufficiently degraded such that they could not occur; or
- Survey effort has demonstrated that they are not present.

Based on criteria 1 and 2 above, a total of 23 species were not confirmed as candidate species and were not assessed further.

Additionally, the BDAR has considered the referral decision from DCCEEW (EPBC Ref: 2022/0944) which includes five flora species and one fauna species that may be impacted by the proposed action. These species (with their EPBC Act listing) were assessed for potential significant impacts.

Through analysis and survey efforts, three fauna species considered species credit species have been determined to be assumed present for the Project as summarised in **Table 6-5** and **Figure 6-3**. No threatened fauna species considered species credit species were determined to be present.

[6]BC Act and EPBC Act conservation status – V = Vulnerable; E = Endangered; CE = Critically Endangered

Table 6-5 Threatened Fauna Species Habitat within the Disturbance Footprint

Species name	Habitat constraints/ microhabitats present on the Subject Land/ vegetation zone	Suitable Habitat in Disturbance Footprint (ha)
Squirrel Glider *Petaurus norfolcensis*	Associated PCTs (538) containing Box Gum Woodland in moderate condition with a shrubby understorey. Vegetation zones 1 within the Subject Land	179.7
Eastern Pygmy-Possum *Cercartetus nanus*	Associated PCTs (510 & 538) and vegetation zones (1, 2 & 3) within the Subject Land	179.7
Tusked Frog (Endangered population) *Adelotus brevis*	Mapped dams within the Subject Land, with a 500 m buffer into known PCTs (510) and vegetation zones (2 & 3), measured from the top bank.	31.7

6.2.3 Avoidance and Minimisation Through Design

Various alternatives were considered for the Project as discussed in **Section 2.4**. Avoidance of impacts to native vegetation was a key consideration in the refinement process of the Project, resulting in the avoidance of significant biodiversity values. A key design principle adopted for the Project design was to maximise the placement of infrastructure in cleared areas.

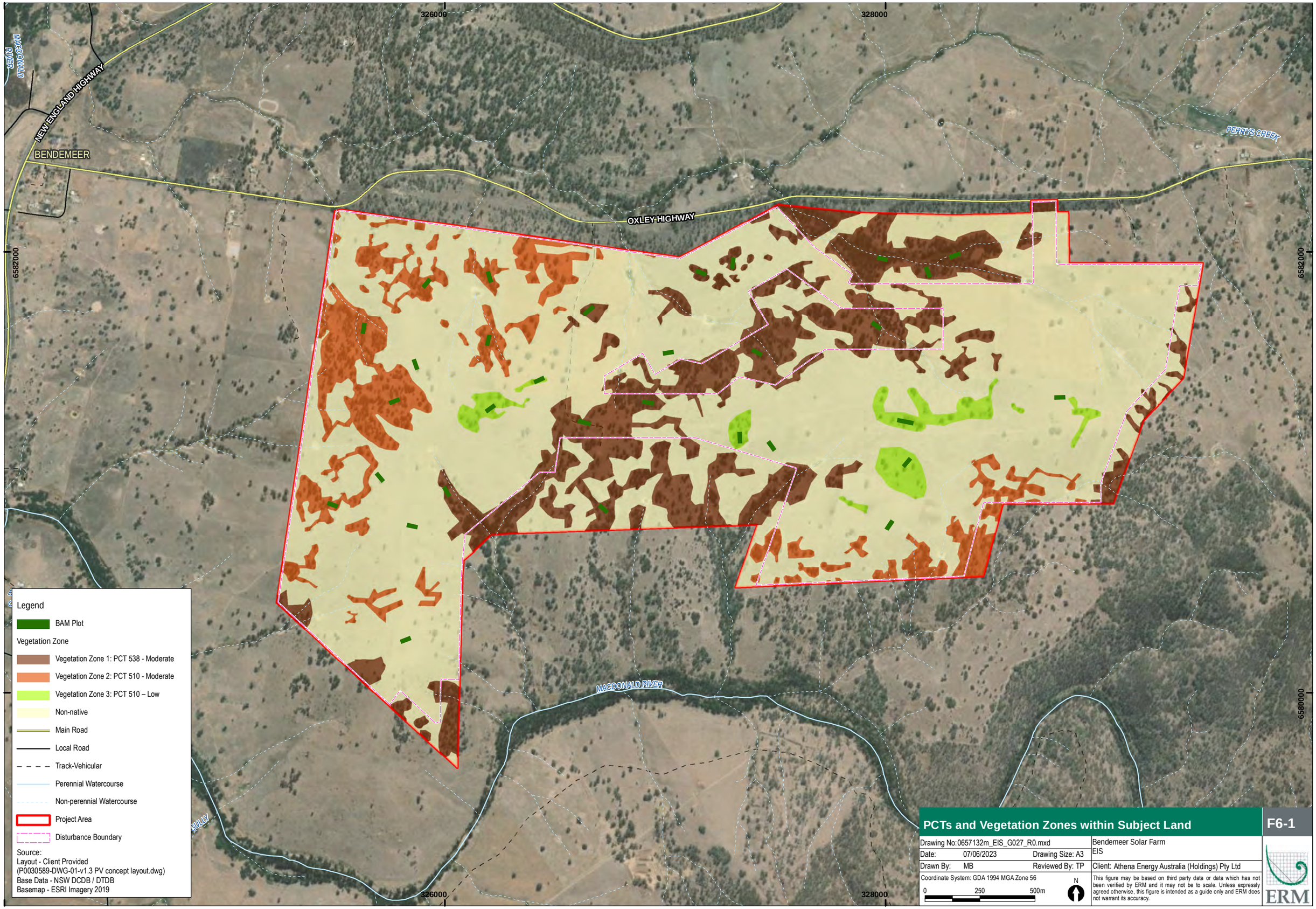
As ecological surveys and vegetation community mapping was completed across the Subject Land, areas of constraint have been identified and mapped. The Disturbance Footprint originally consisted of an area of 680 ha (refer **Figure 2-5**), which had the potential to result in over 97.4 ha of impact to EPBC Act listed Box Gum Grassy Woodland TEC, 154.4 ha of BC Act listed Box Gum Grassy Woodland TEC and 155.8 ha of impact to Koala and Grey-headed Flying-fox habitat.

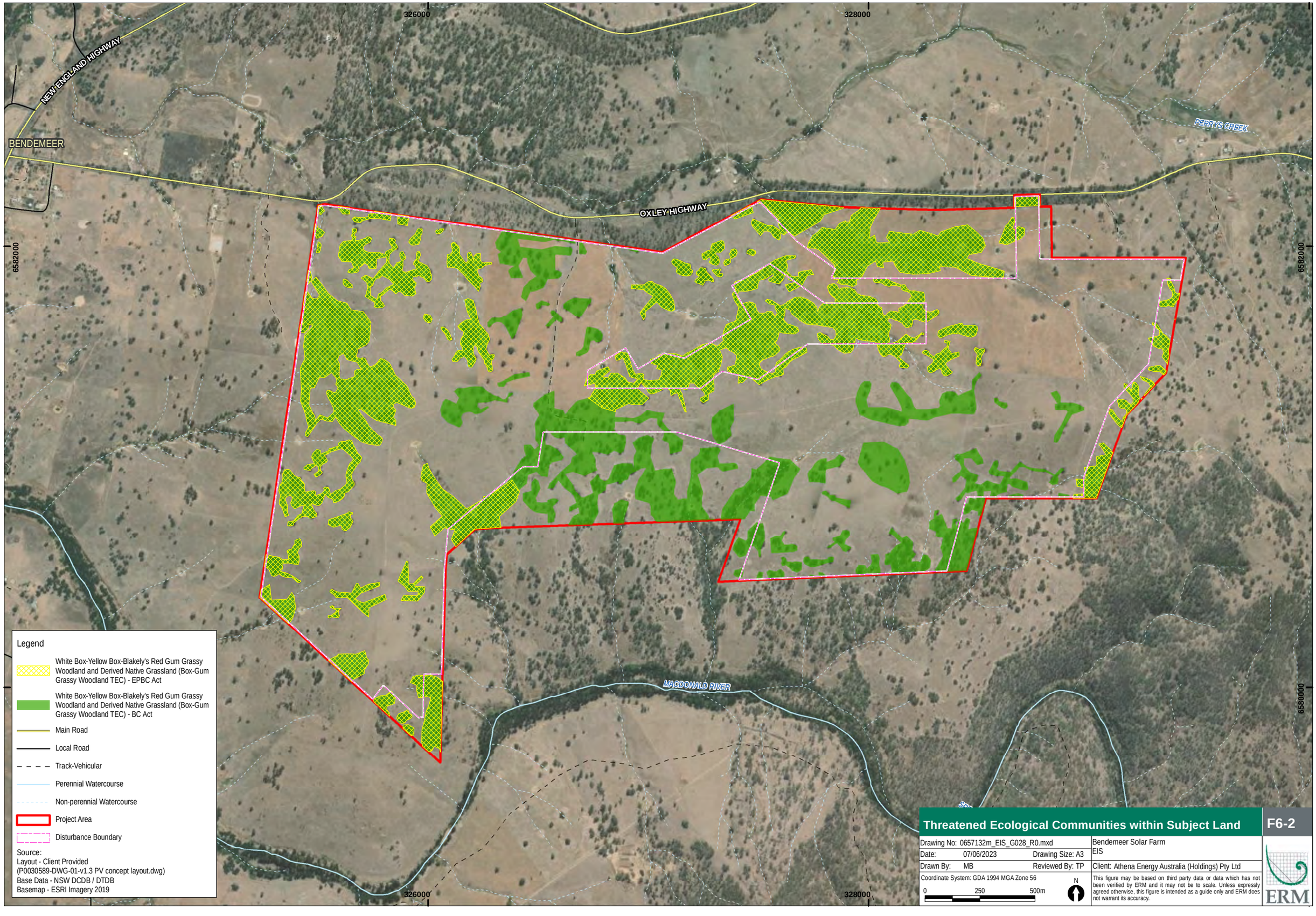
As ecological surveys and vegetation community mapping was completed across the Subject Land, areas of constraint have been identified and mapped. The Project layout and Disturbance Footprint have been refined to respond to these constraints. They have identified a large section within the initial Disturbance Footprint containing Box-Gum Grassy Woodland TEC.

The solar array layout has since been refined to a total area of 350.8 ha and the total Disturbance Footprint to 476.6 ha, and the BESS and substation is located to the south of the existing 330 kV transmission line, to avoid areas of higher quality vegetation. These amendments to the layout have resulted in a 62.2 ha reduction of the area of impact to EPBC Act listed species and 41 ha in reduction of areas of impact to EPBC Act listed TECs. The layout of the solar arrays into three broad areas has also allowed for the retention of an ecological corridor through the centre of the Subject Land, with a vegetated link between the Macdonald River in the south and retained vegetation around the Oxley Highway.

Section 2.5.3 summarises the evolution of the Project layout and the amendment responses to key environmental and other land use limitations identified.

Impacts will be further avoided and minimised through implementation of several measures as described in **Section 6.2.6**. These measures are designed to protect retained vegetation and habitat during construction and to restore and manage native vegetation and habitat within the proposed riparian corridors.


326000
328000
6582000
6580000
MACDONALD RIVER
NEW ENGLAND HIGHWAY
BENDEMEER
OXLEY HIGHWAY
PERRYS CREEK
MACDONALD RIVER
Legend
BAM Plot
Vegetation Zone
Vegetation Zone 1: PCT 538 - Moderate
Vegetation Zone 2: PCT 510 - Moderate
Vegetation Zone 3: PCT 510 – Low
Non-native
Main Road
Local Road
Track-Vehicular
Perennial Watercourse
Non-perennial Watercourse
Project Area
Disturbance Boundary
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
PCTs and Vegetation Zones within Subject Land
F6-1
Drawing No: 0657132m_EIS_G027_R0.mxd
Date: 07/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


326000
328000
6582000
6580000
NEW ENGLAND HIGHWAY
BENDEMEER
OXLEY HIGHWAY
PERRYS CREEK
MACDONALD RIVER
Legend
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Grassy Woodland TEC) - EPBC Act
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Grassy Woodland TEC) - BC Act
Main Road
Local Road
Track-Vehicular
Perennial Watercourse
Non-perennial Watercourse
Project Area
Disturbance Boundary
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Threatened Ecological Communities within Subject Land
F6-2
Drawing No: 0657132m_EIS_G028_R0.mxd
Bendemeer Solar Farm
EIS
Date: 07/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

326000
328000
6582000
6580000
NEW ENGLAND HIGHWAY
MACDONALD RIVER
BENDEMEER
OXLEY HIGHWAY
PERRYS CREEK
BENDEMEER CREEK
MACDONALD RIVER

Legend

- Tusked Frog Habitat
- Squirrel Glider and Eastern Pygmy-Possum Habitat
- Main Road
- Local Road
- Track-Vehicular
- Perennial Watercourse
- Non-perennial Watercourse
- Project Area
- Disturbance Boundary

Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019

Threatened Fauna Species

F6-3

Drawing No: 0657132m_EIS_G029_R0.mxd			Bendemeer Solar Farm EIS
Date: 07/06/2023	Drawing Size: A3		Client: Athena Energy Australia (Holdings) Pty Ltd
Drawn By: MB	Reviewed By: TP		

Coordinate System: GDA 1994 MGA Zone 56

0 250 500m

N

ERM

6.2.4 Assessment of Potential Impacts

Direct impacts

The impact to each vegetation zone and each candidate species credit species are summarised in **Table 6-6** and **Table 6-7**, respectively. The direct impacts of the Project involve all three vegetation zones, resulting in the total clearing of vegetation within the Disturbance Footprint.

Table 6-6 Impacts to Vegetation Integrity

Vegetation Zone	PCT/ Condition	Area (ha)	Current VI score	Future VI score	Project phase/ timing of impact	Change in VI score
1	PCT 538/ Moderate	33.0	47.6	0	Construction	-47.6
2	PCT 510/ Moderate	56.2	55.8	0	Construction	-55.8
3	PCT 510/ Low	14.6	30.3	0	Construction	-30.3

Table 6-7 Impacts to Threatened Species and Threatened Species Habitat

Candidate Species Credit Species	Area (ha)	BC Act status[7]	EPBC Act status[8]	SAII entity	Phase of impact
Squirrel Glider *Petaurus norfolcensis*	33.0	V	-	No	Construction
Eastern Pygmy-Possum *Cercartetus nanus*	33.0	V	-	No	Construction
Tusked Frog *Adelotus brevis*	28.8	E	-	Yes	Construction

Indirect impacts

Without any measures to avoid, minimise or mitigate impacts, the Project could result in the following indirect impacts on biodiversity:

- Inadvertent impacts on adjacent habitat or vegetation;
- Reduced viability of adjacent habitat due to edge effects, noise, dust or light spill;
- Transportation of weeds and pathogens from the subject site to adjacent vegetation;
- Microclimate impacts under the solar arrays;
- Increased risk of starvation, exposure and loss of shade or shelter; and
- Reduced utilisation of Subject Land as fauna movement corridors.

Mitigation measures are proposed, as described in **Section 6.2.6**, to minimise the potential for indirect impacts to occur.

Impacts to Matters of National Environmental Significance

Matters of MNES relevant to the request from DCCEEW, from the referral decision notice (EPBC Ref: 2022/09444) are summarised in **Table 6-8**.

[7]BC Act conservation status – V = Vulnerable; E = Endangered; CE = Critically Endangered
[8]EPBC Act conservation status – V = Vulnerable; E = Endangered; CE = Critically Endangered

Table 6-8 MNES relevant to the Project

MNES		Result
Threatened Ecological Communities (TEC)	■ White Box-Yellow Box-Blakeley's Red Gum Grassy Woodland and Derived Native Grassland.	Confirmed to occur across the Subject Land within restricted areas of PCT538 (Veg zone 1) and PCT 510 (Veg zone 2). This TEC was assessed in line with the bilateral process after being referred to DCCEEW upon an assessment of "may result in a significant impact" to 59.8 ha of this TEC.
	Requested for additional significance: ■ Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland; and ■ New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands.	Both TECs have been concluded to not occur within the Subject Land. Therefore, a significance of assessment for these species is not required, and no impacts to this TEC will occur because of the Project.
Threatened species	■ Koala (*Phascolarctos cinereus*); and ■ Grey-headed Flying-fox (*Pteropus poliocephalus*)	Considered known or likely as part of the referral process, both species were referred with a significance assessment of "may result in a significant impact" to these species habitat. As part of the bilateral agreement, both species have been assessed through the relevant BDAR process and are accounted for in regard to presence, impacts, management and mitigation within the BDAR. Upon further assessment of the survey methodologies, these species are unlikely to utilise critical habitat to the extent where a significant impact is likely to occur.
	Five threatened flora species requested for additional assessment to determine significance: ■ Bluegrass (Dichanthium setosum); ■ Austral Toadflax (Thesium australe); ■ Granite Boronia (Boronia granitica); ■ McKie's Stringybark (Eucalyptus mckieana); and ■ Velvet Wattle (Acacia pubifolia). One threatened fauna species requested for additional assessment to determine significance: ■ Western saw-shelled turtle (*Myuchelys belli*).	All these species have been assessed through the relevant BDAR process and are accounted for in regard to presence, impacts, management and mitigation within the BDAR. All six species were removed for further assessment under the BAM identified throughout the candidate species assessment process.

Serious and Irreversible Impact

All threatened entities impacted by the proposal have been considered if they form or have potential to be Serious and Irreversible Impact (SAII) entities. Two (2) TECs listed as potential SAII entities would be impacted by the Project:

- White-Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC; and
- Tusked Frog (Endangered population) *Adelotus brevis*.

Regarding White-Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC, the additional impact assessment for SAII determined that:

- Abiotic factors critical to the long-term survival of this TEC are unlikely to be affected by the Project. Groundwater and surface water expression is unlikely to be altered in such a way by the Project that remaining TECs would be adversely affected;
- The TEC is subject to offsets under the BOS and accounted for in **Section 6.2.5**; and
- The Subject Land already experiences altered fire/flooding regimes due to the nature of the land use (agriculture) and the Project is unlikely to result in a change to these aspects that would adversely affect the TEC. Further to this, while the TEC will be cleared, areas of remaining TEC will be retained and improved to increase condition and function aligned with the relevant Vegetation Information System (VIS) of the patch.

Regarding Tusked Frog (Endangered population), the additional impact assessment for SAII determined that:

- There is a lack of records of the Tusked Frog from within the Nandewar and NET Bioregion and surrounds, with only one from 1992 in the extreme south of the NET Bioregion. The closest confirmed record of the Tusked Frog is from approximately 38 km east of the Subject Land, north of Walcha, and is dated from 1972. The closest recent record (within 20 years) is located further southeast, approximately 77 km from the Subject Land, and is associated with Mummel Gulf National Park. Evidence indicates numbers may have been reduced to a critical level, if not extinction. Additionally, no individuals were observed within the field surveys undertaken. Further survey works are intended to be undertaken, which may identify that the Project Area does not contain Tusked Frog;
- Six of 14 farm dams within the Subject Area have been avoided during the Project's design. 8 farm dams are currently within the Disturbance Footprint and are likely to be affected by infrastructure placement. Some of these dams may be avoided where infrastructure can be readily moved within the current Disturbance Footprint (e.g., internal roads). Overall, the quality of this potential breeding habitat is considered low, due to destruction and disturbance of habitat by current grazing stock;
- Non-breeding habitat has been mapped as vegetation zone 2 (PCT 510 moderate) within 500 m of the mapped farm dams. This accounts for 28.8 ha of habitat in this vegetation zone that generally has a higher proportion of dominant native vegetation cover, as well as increased leaf litter due to a more intact canopy cover. This species is unlikely to utilise the low condition PCT 510 due its potential to exhibit more threatening processes to this species such as higher predation rates due to less ground cover, higher likelihood of impacts from trampling and habitat degradation from grazing; and
- Impacts to this species may include reduced breeding and non-breeding habitat through impact to up to eight farm dams and 28.8 ha of habitat. If this species were present on the Subject Land, six farm dams capable of holding water will not be impacted, along with large areas of vegetation zone 2 close to these dams. Impacts will be direct and during construction only. Indirect impacts, such as water regime changes (expressed as groundwater and surface water) are unlikely to occur.

6.2.5 Offset Requirement

For residual impacts that cannot be avoided or fully mitigated, offsets will be required to ensure no net loss of biodiversity. A biodiversity offset strategy will be implemented for the Project to ensure the residual impacts on biodiversity of the Project are appropriately offset.

The BDAR have determined that there are no vegetation zones, TECs or ECs that have been assessed as not requiring offsets or that do not require an offset as per BAM Subsection 9.2.1(3.).

A summary of the credit requirements for the Project is provided in **Table 6-9**. A credit report is provided in Appendix D of the BDAR (refer **Appendix G**).

During the detailed design phase of the Project, some refinements to the BAM Calculator may be required to confirm the final biodiversity credit requirements.

Table 6-9 Impacts that Require an Offset – Ecosystem Credits

PCT (Condition)/ Species	Impact area (ha)	Biodiversity risk weighting	Ecosystem credits
PCT 538 (Moderate)	33.0	2.5	981
PCT 510 (Moderate)	56.2	2.5	1,965
PCT 510 (Low)	14.6	2.5	276
Total PCT Credits			**3,222**

Table 6-10 Impacts that Require an Offset – Species Credits

PCT (Condition)/ Species	Impact area (ha)	Biodiversity risk weighting	Number of species credits required
Squirrel Glider	33.0	33.0	784
Eastern Pygmy-Possum	33.0	33.0	784
Tusked Frog (endangered population)	28.8	33.0	1,208
Total Species Credits			**2,776**

6.2.6 Mitigation Measures

In addition to the biodiversity offset, to further minimise residual impacts to biodiversity values in the Subject Land, the mitigation measures detailed in **Table 6-11** will be implemented for the Project.

Table 6-11 Biodiversity Mitigation Measures

Mitigation measure	Proposed techniques	Phase
Implementation of a suite of mitigation measures	■ Delineation of clearing areas, erosion sedimentation and pollution control, timing of vegetation clearance, pre-clearance surveys, clearance supervision, weed management, and a Biodiversity Management Plan (BMP) will be implemented.	Pre- and post-construction and during operation phase
Delineation of clearing areas	■ The limit of clearing with temporary fencing will be demarcated, and ancillary facilities, such as site compounds and construction zones located outside these zones; ■ 'Environmental Sensitive No-Go Zones' will be signed prior to the commencement of clearing; ■ Areas of retained vegetation will be clearly delineated to avoid vehicles or machinery access and construction materials stockpiled or stored; ■ Temporary fencing and signage will be maintained throughout construction; and ■ Site inductions will be given by the civil contractor to all personnel and visitors to ensure all site workers and visitors are aware of any No-Go Zones.	Pre-construction and construction

Mitigation measure	Proposed techniques	Phase
Staged habitat removal	■ Habitat removal will be conducted in at least two stages. – Stage 1: Following pre-clearing surveys, non-habitat trees and surrounding understorey vegetation will be felled or cleared first to give any fauna an opportunity to relocate; – Stage 2: Habitat trees will be felled or cleared under the supervision of the qualified ecologist and/or a licensed wildlife carer at least 24 hours after clearing of non-habitat vegetation; ■ Clearing will be timed where practical to minimise impacts on fauna (e.g., avoid known breeding/nesting seasons, where possible); ■ Vets and wildlife carers will be contacted prior to commencing works to ensure willingness to assist if required; ■ Habitat trees will be felled using the "slow drop" technique and relocated for re-use, where possible, or will be used as coarse woody debris, if damage occurs; and ■ Accurate records will be maintained.	Pre-construction and construction
Pre-clearance surveys	Pre-clearing surveys will be undertaken by a suitably qualified ecologist prior to clearing, which will include: ■ Limits of clearing will be confirmed to have been clearly demarcated with temporary fencing and signed; ■ Key habitat features such as hollow-bearing trees and fallen logs for Stage 2 clearing will be identified and marked; ■ Trees will be checked for the presence of active bird nests; ■ Subject to landowner agreement, and where feasible, hollow-bearing trees will be identified and nominated of or salvaged and relocated to the adjacent retained vegetation for fauna habitat; and ■ Following the completion of a pre-clearing survey, detailing the location and type of each habitat feature, and a record of all fauna species encountered will be provided in a report.	Pre-construction and construction
Fauna rescue	A qualified ecologist and/or a licensed wildlife carer will be present during clearing of habitat trees. If fauna is encountered during clearing activities or construction, a stop-work procedure will be implemented, and the following steps will be taken: ■ Cease work in the vicinity of the fauna and immediately notify the Construction Contractor's Environmental Site Representative; ■ Allow the animal to relocate by itself where possible. This may include herding the animal away from busy roads and towards retained habitat in the east or south of the Subject Land; ■ If fauna is injured or suspected to be injured, contact a qualified ecologist and/or a licensed wildlife carer (e.g., WIRES); ■ If licensed wildlife carer is unable to assist, injured fauna will be transferred to a local vet for treatment; and ■ Non-injured fauna will be captured and relocated to appropriate pre-determined nearby habitat.	Pre-construction and construction
Habitat salvage	■ Timber that would be suitable to create habitat within retained vegetation should be salvaged during clearing under the direction of the qualified ecologist; and ■ Salvaged features will be stockpiled away from areas impacted by earthworks to ensure the features do not become mixed with soil.	Pre-construction and construction
Habitat compensation	■ Hollow replacement will be included in the management action for the retained vegetation in the Biodiversity Management Plan (BMP); ■ Installation of nest boxes should be tailored for fauna species in the locality and be installed by a suitably qualified person. It may include a combination of options as specified in the BDAR; and ■ A nest box strategy/ plan should be developed as part of the BMP, with objective of replacing hollows at a minimum ratio of 1:1.	Construction and operations

Mitigation measure	Proposed techniques	Phase
Weed management	■ Weed control activities will be undertaken in accordance with the North West Regional Strategic Weed Management Plan 2017 – 2022 and management of Weeds of National Significance.	Construction and operations
Vegetation Management Plan	■ A Vegetation Management Plan (VMP) will be included as a sub-plan within the BMP. It will provide guidelines for the revegetation, regeneration and management of vegetation within the Subject Land and wider Assessment Area and will also detail requirements for fauna habitat restoration and weed management practices. Detail on measures to be included in the vegetation management plan is provided in the BDAR.	Construction and operations
Pathogen management	A pathogen management protocol will be implemented and detailed in the BMP, with the following measures to be undertaken: ■ Ensure the risk of spreading pathogens and the mitigation measures required on site are regularly communicated to staff and contractors; ■ Works should be scheduled to move from uninfected areas to infected areas; ■ Ensure vehicles and footwear are free of soil before entering or exiting the site; ■ Wash down facilities for vehicles and footwear; ■ Exclusion zones to be set up with fencing and signage to restrict access into contaminated areas; and ■ Restrict vehicles to designated tracks, trails and parking areas.	Construction and operations
Pest management	■ Feral Pest Control programs will be developed and implemented as required and in accordance with relevant legislation/ standard operating procedures and will be detailed in the BMP.	Construction and operations
Erosion and sediment	■ An erosion and sediment control protocol will be implemented throughout the construction phase and will ensure appropriate sediment control measures prior to any works are installed.	Construction

6.3 Aboriginal Cultural Heritage

6.3.1 Introduction

An ACHAR has been prepared to assess the potential impacts of the Project on Aboriginal cultural heritage and identify mitigation and risk management measures to be implemented during construction and operation.

The ACHAR was prepared to address the requirements of the SEARs (**Appendix A**), in consideration of relevant stakeholder engagement (**Section 5)**, targeted engagement (**Section 6.3.3.2**), relevant legislation, and in accordance with the following government policies:

- 'Code of Practice for the Investigation of Aboriginal Objects in NSW' (DECCW, 2010c);
- 'Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW' (OEH, 2011);
- 'The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance' (Burra Charter) (Australia ICOMOS, 2013); and
- 'Aboriginal Cultural Heritage Consultation Requirements for Applicants 2010' (ACHCRs) (DECCW, 2010b).

The ACHAR is provided in **Appendix H**.

The scope of the ACHAR included:

- Consultation with Aboriginal communities in relation to the Project;
- Review of the landscape and natural resources of the Project Area to establish background parameters;
- Research of Aboriginal cultural heritage literature and archaeological records on a regional and local context, including review of the Aboriginal Heritage Information Management System (AHIMS) database and other relevant database;
- Archaeological surveys within the Project Area. The aims of the field survey were to:
  - Identify the presence or absence of Aboriginal cultural material within the Project Area;
  - Assess the likely extent and nature of any such cultural material;
  - Assess the archaeological significance of any cultural material;
  - Provide an opportunity for Registered Aboriginal Parties (RAPs) to assess the cultural significance of any material; and
  - Assess the management requirements for any cultural material.

6.3.2 Aboriginal Community Consultation

A key objective of the ACHAR was to identify any cultural values within the landscape in which the project is located so that those values can be recognised and incorporated into mitigation and management measures. Aboriginal community consultation was undertaken in accordance with ACHCRs (DECCW, 2010b). A log and copies of correspondence with Aboriginal community stakeholders is presented in Appendix 1 of the ACHAR (**Appendix H**). The ACHCRs include four main engagement stages:

- Stage 1: Identify RAPs who wish to be consulted about the Project;
- Stage 2 & 3: Provide information about the Project to the RAPs and acquire information regarding Aboriginal cultural values associated with the Project through RAP consultation and field work; and
- Stage 4: Produce a draft ACHAR to be issued to all RAPs for their consideration.

Consultation undertaken for each stage above is summarised in **Table 6-12**.

Table 6-12 Aboriginal Community Consultation Process

ACHCR Stage	Actions	Outcome
1	An advertisement was placed in the 'Northern Daily Leader' on 19 October 2021 to request expressions of interest. A letter seeking information from various agencies was sent on 15 October 2021. Letters were sent to individuals and groups whose contact details had been provided by the government agencies.	The following individuals/ groups registered to be consulted, and constitute the RAPs for the Project: ■ Tamworth LALC ■ Gomeroi Native Title Applicant ■ Didge Ngunawal Clan ■ Wurrumay Pty Limited ■ AT Gomilaroi Cultural Consultancy ■ Warragil Cultural Services ■ Steve Talbot ■ Stakeholder 1 ■ Stakeholder 2
2 & 3	Detailed project information was provided in the assessment methodology issued to all RAPs for their consideration on 7 December 2021, with a closing period of 4 January 2022. The document provided the archaeological context of the Project Area, a description of the proposed survey, and asked whether there were any cultural values that should be considered in the assessment. On 14 November 2022, a project update letter was sent to all RAPs advising who would be engaged to complete the ACHAR.	One response was received from Didge Ngunawal Clan on 7 December 2021 advising that they had reviewed and supported the methodology.
4	The draft ACHAR was sent to RAPs on 20 February 2023 with a closing period of 20 March 2023. A follow up reminder for feedback was sent to all RAPs on 10 March 2023. The letter attached to the draft ACHAR invited RAPs to review the ACHAR and provide any comments on the cultural values of the sites recorded and the broader Project Area.	No comments have been received from the RAPs on the draft ACHAR to date.

6.3.3 Background

Landscape and Natural Resources

Topography, geology, hydrology, vegetation and land use are critical considerations in understanding Aboriginal cultural heritage of an area. These are described in detail in **Appendix H**. Broadly speaking, the ACHAR concluded that the topography and hydrology of the Project Area do not include positive attributes that would have encouraged Aboriginal use. The current main land use of the Project Area is associated with agricultural production, with activities such as vegetation clearing and sub-soil disturbance, potentially impacting Aboriginal sites in the past. These activities may have led to the removal of site types (e.g., culturally modified trees) or disturbance of site types (e.g., artefact scatters through ploughing and/or stock trampling).

The Project Area would have once supported an open woodland which would have provided some resources for Aboriginal subsistence. Resources likely to have encouraged Aboriginal use of an area are typically near permanent water sources, such as the Macdonald River. However, these resources are typically contained below the ridgeline that the Project is located and therefore the site may have been subject to transient use.

Aboriginal Archaeological Context

The Project Area falls within the limits of the lands occupied by the Gamilaraay (Kamilaroi) language group on the border of the Aboriginal language group *Nganyaywana,* also known as the Anaiwan (Tindale, 1974).

The Gamilaraay tribal group had two sub-divisions, the Corbon Gamilaroi, meaning "*the people of the greater country of the Gamilaroi*" including the Liverpool Plains and beyond; and the Gammon Gamilaroi meaning "*the people of the lesser country of the Gamilaroi*" which included the more southern area from Murrurundi in a narrow finger south into the Hunter Valley (Milliss, 1980). The Aboriginal people living around the Tamworth area were part of the Corbon Gamilaroi (Tindale, 1974). While the Anaiwan were recorded at "New England tableland from Guyra and Ben Lomond south to Uralla and Moombie Range; northwest to Tingha; at Bendemeer and Armidale" (Tindale, 1974).

A significant amount of archaeological work has been undertaken in the New England Tablelands, most recently for nearby renewable energy developments. These assessments provide an indication of the potential types and quantity of Aboriginal sites associated with certain landforms in the region. These include carved trees, ceremonial bora grounds and art sites, seed grinding and axe grinding grooves in rock slabs, cooking areas and stone artefact scatters, which represent open camp sites.

Previous studies have identified that Aboriginal occupation of the region was patterned, not random. Activities in the landscape were focused on places where people lived and worked (e.g., quarries, camp sites and ceremonial sites), with a preference for areas with clustered resources, such as near watercourse or lagoons, and along tracks and pathways which were followed for ritual and secular purposes. Transitory areas feature fewer archaeological evidence traces, sometimes only marked by isolated or low-density stone artefact scatters. Stone quarry and grinding groove sites are site types that represent more utilitarian, even industrial practices.

Further information and discussion on historical Aboriginal archaeology of the region is provided in **Appendix H**.

Previously Recorded Sites

Table 6-13 summarises the results of desktop searches undertaken to identify previously recorded Aboriginal heritage within and adjacent the Project Area.

Table 6-13 Aboriginal Heritage Desktop Search Results

Name of Database Searched	Date of Search	Type of Search	Findings
Commonwealth Heritage Listings	11 November 2022	Tamworth LGA	No places listed on either the National or Commonwealth heritage lists are located within the Project Area
National Native Title Claims Search	11 November 2022	NSW	The entirety of the Project Area is currently subject to a registered Native Title Claim by the Gomeroi People (Tribunal File No. NC2011/006, Federal Court No. NSD2308/2011). This claim is extinguished on all freehold land associated with the Project.
AHIMS	11 November 2022	20 x 20 km centred on the Project Area	22 sites returned within the search area. None are located within the Project Area.
Local Environmental Plan (LEP)	11 November 2022	Tamworth LEP of 2010	None of the Aboriginal places noted occur near the Project Area.

The search of the AHIMS database revealed 22 Aboriginal sites recorded within 20 km radius search area around the Project Area. No Aboriginal sites have been recorded in or near the Project Area. The closest site (20-6-0031), an artefact scatter, is located approximately 2 km to the south-west.

Table 6-14 summarises the AHIMS search result and **Figure 6-4** depicts the location of the AHIMS sites recorded within 20 km of the Project Area.

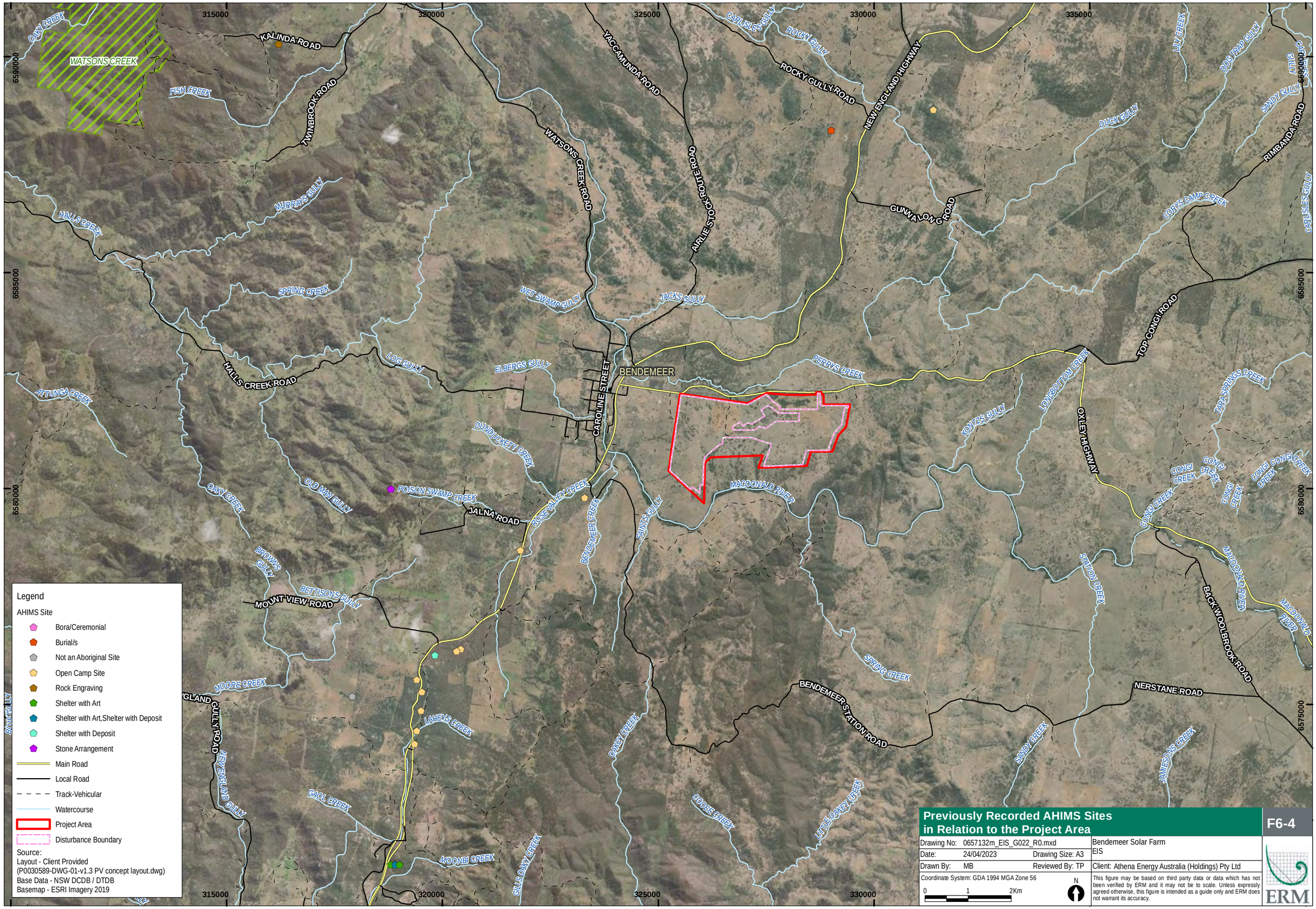
Table 6-14 AHIMS Search Result

Site Type	Number	Frequency (%)
Artefact scatter	11	50.00
Bora/ceremonial	2	9.09
Shelter with art	2	9.09
Shelter with deposit	2	9.09
Shelter with art, shelter with deposit	1	4.55
Stone arrangement	1	4.55
Burial/s	1	4.55
Not an Aboriginal site	1	4.55
Rock engraving	1	4.55
Total	**22**	**100**

The AHIMS data revealed artefact sites as the dominant site category in the search area. Artefact sites are a relatively stable indicator of past Aboriginal occupation. Shelters are another site type recorded in the region, and much like artefact sites, they are a stable indicator of past Aboriginal occupation. The distribution of sites near the Project Area conforms to expected patterns, including:

- Aboriginal sites appear to be most prominent on crest landforms, where there is the presence of outcropping bedrock, particularly silcrete bedrock;
- Aboriginal sites are also identified on flat landforms in relation to watercourses, which have a higher potential to record archaeological sites; and
- Shelters are predominantly recorded in clusters in the surrounding escarpment, largely in proximity to tributaries of the Macdonald River, the closest major waterway.

Appendix H provides a predictive model of the site location, identifying site types in the region, those that are likely to be present in the Project Area, and the site types that are likely associated with these. This was used to inform the survey.



Legend

AHIMS Site

- Bora/Ceremonial
- Burial/s
- Not an Aboriginal Site
- Open Camp Site
- Rock Engraving
- Shelter with Art
- Shelter with Art,Shelter with Deposit
- Shelter with Deposit
- Stone Arrangement
- Main Road
- Local Road
- Track-Vehicular
- Watercourse
- Project Area
- Disturbance Boundary

Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019

Previously Recorded AHIMS Sites in Relation to the Project Area

F6-4

Drawing No:	0657132m_EIS_G022_R0.mxd		Bendemeer Solar Farm EIS
Date:	24/04/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 1 2Km

N

ERM

6.3.4 Aboriginal Sites Recorded

The methodology employed for the ACHAR field surveys is provided in **Appendix H**. Low ground surface visibility (GSV) was a constraint of the surveys, which was compensated for by increased survey coverage which resulted in the entire Project Area being surveyed.

Archaeologists were accompanied by RAPs on each day including, one representative from Tamworth LALC, AT Gomilaroi Cultural Consultancy. The Gomeroi Native Title Applicant was invited to be involved in the field surveys but was unable to supply a site officer at the time.

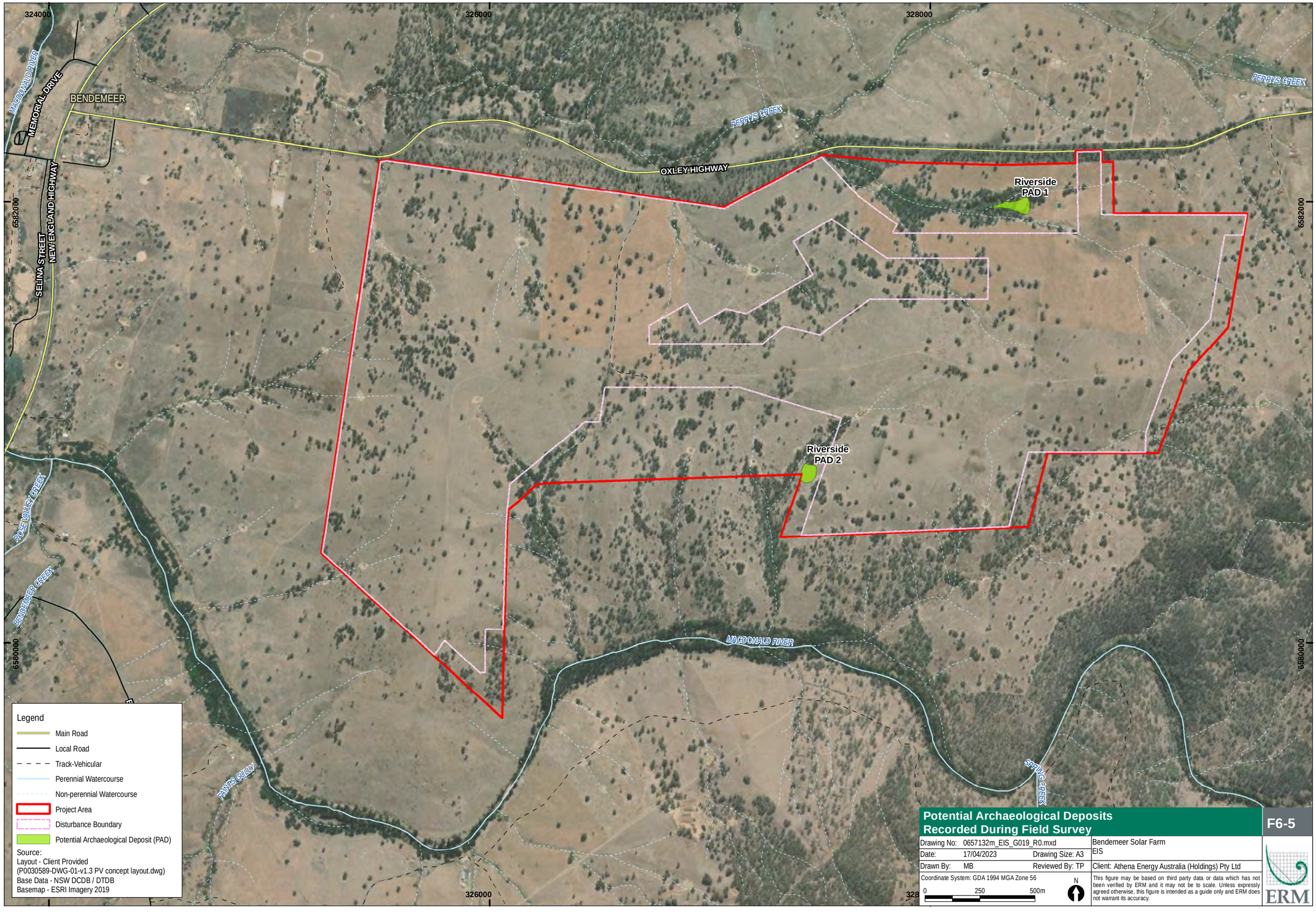
No Aboriginal sites were identified in the Disturbance Footprint during the field survey. Two PADs were identified outside of the Disturbance Footprint area. These are shown in **Figure 6-5** and summarised in **Table 6-15.** Further detail on these PADs is provided in section 6.4 of the ACHAR (**Appendix H**).

Table 6-15 Summary of Aboriginal Sites Recorded

Site Name	*Site type*	*Description of Site*	*Photograph of PAD view*
Riverside PAD1	PAD	The Riverside-PAD1 extent measures 170 m east-west by 70 m north-south. It extends along a flat elevated area adjacent the confluence of heavily incised gullies that drain into Perrys Creek 1 km northwest. The area is covered in dense vegetation obscuring the ground surface. Soils consist of a light brown sand. The area around the gullies has been visibly disturbed by erosion. No artefacts were observed.	
Riverside PAD2	PAD	The Riverside-PAD2 extent measures 85 m north-south by 70 m east-west. It extends along a flat elevated area adjacent an unnamed drainage with large granite outcropping. The area is covered in dense vegetation obscuring the ground surface. Soils consist of a light brown sand. No artefacts were observed.	

As no locations were identified that suggested subsurface archaeological deposits of conservation value are present within the Disturbance Footprint and the PADs recorded are being avoided, as shown in **Figure 6-5**, the ACHAR considered that test excavation was not warranted.

The site access road work area located along the northern corridor of the Oxley Highway across the Project site access (refer **Figure 3-2**) was not subject to survey. This land has been disturbed through the construction of the Oxley Highway, and a review of high-resolution aerial imagery and site photos shows there are no mature trees in this area. Further, the southern corridor of the Oxley Highway located within the Project Area was subject to survey and contains the same landform. As such, the areas for site access road works were assessed as not containing any Aboriginal cultural heritage.


324000
326000
328000
6582000
6580000
MACDONALD RIVER
MEMORIAL DRIVE
BENDEMEER
SELINA STREET
NEW ENGLAND HIGHWAY
OXLEY HIGHWAY
PERRYS CREEK
PERRYS CREEK
Riverside
PAD 1
Riverside
PAD 2
ROSE VALLEY CREEK
BENDEMEER CREEK
MACDONALD RIVER
PAINTS GULLY
SPRING CREEK
Legend
Main Road
Local Road
Track-Vehicular
Perennial Watercourse
Non-perennial Watercourse
Project Area
Disturbance Boundary
Potential Archaeological Deposit (PAD)
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Potential Archaeological Deposits
Recorded During Field Survey
F6-5
Drawing No: 0657132m_EIS_G019_R0.mxd
Bendemeer Solar Farm
EIS
Date: 17/04/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0 250 500m
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

6.3.5 Significance Assessment

The ACHAR provides an assessment of significance for the cultural heritage sites located within the Project Area. The assessment of significance is a key step in the process of impact assessment for a proposed activity as the significance or value of an object, site or place will be reflected in resultant recommendations for conservation, management or mitigation.

The 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (DECCW, 2010a) requires significance assessment according to criteria established in the Australia Burra Charter (Australia ICOMOS, 2013). The Burra Charter and its accompanying guidelines are considered best practice standard for cultural heritage management, specifically conservation, in Australia. Guidelines to the Burra Charter set out four criteria for the assessment of cultural significance, being – Social or cultural value; Archaeological/ Scientific value; Aesthetic value; and Historic value.

Social or Cultural Value

The RAPs who accompanied the survey noted the cultural significance of Aboriginal sites as being reminders of the traditional use of the area by Aboriginal people and as a tangible link to their ancestors. These included sites such as the outcropping rock across the Project Area and the broader New England Tableland which represents the physical state of Warabah (longneck turtle).

No comments were received from the RAPs on the cultural significance of the PADs or broader Project Area. As such, the PADs recorded within the Project Area have been provisionally assessed as having high social and cultural values.

Archaeological/ Scientific Value

Riverside-PAD1 and PAD2 were assessed as having low-moderate scientific/archaeological significance as the sites were considered possible to contain a low density of subsurface deposits and therefore have potential to address general research questions about occupation in the area.

Aesthetic Value

Riverside-PAD1 and PAD2 are not associated with any artefactual material and are located on landforms that do not have significant aesthetic value given the integrity of the sensory landscape has been altered in historic and modern times.

Historic Value

The Project Area and identified PADs do not have any association with important persons, places, or events.

Significance Assessment Summary

The significance assessment of Aboriginal cultural heritage sites recorded during the assessment is summarised in **Table 6-16**. The significance assessment for the identified Aboriginal archaeological PADs is provided in full in Chapter 7 of the ACHAR (refer **Appendix H**).

Table 6-16 Significance Assessment Summary

Site Name	Social or Cultural Value	Archaeological/ Scientific Value	Aesthetic Value	Historic Value
Riverside-PAD1	High	Low-moderate	Low	None
Riverside-PAD2	High	Low-moderate	Low	None

6.3.6 Likely Impacts to Aboriginal Heritage

The potential impacts to Aboriginal cultural heritage associated with the Project are shown in **Table 6-17.** The outcome is due to PAD sites being located outside of the Disturbance Footprint and the management measures proposed are deemed sufficient to avoid impacts.

Table 6-17 Impact Assessment Summary

Site Name	Type of Harm (Direct/Indirect/ None)	Degree of Harm (Total/Partial/ None)	Consequence of Harm (Total/Partial/No Loss of Value)
Riverside-PAD1	None	None	No Loss of Value
Riverside-PAD2	None	None	No Loss of Value

6.3.7 Mitigation and Management

Impacts to Aboriginal cultural heritage (as described in **Section 6.3.6**) will be avoided through implementation of specific mitigation and management measures.

An Aboriginal Cultural Heritage Management Plan (ACHMP) will be prepared prior to the commencement of construction. The ACHMP will detail measures to protect Aboriginal heritage sites outside the area of disturbance, and an unexpected finds procedure and other contingency and reporting procedures. Any new Aboriginal site identified outside the approved impact footprint will be managed in accordance with the following procedures to be outlined in the ACHMP:

- The site will be assessed by a qualified archaeologist and a RAP;
- The site will be considered for fencing depending on its proximity to the impact footprint; and
- If found to be of cultural significance, the site location will be registered with AHIMS, and a site card submitted.

General Management Principles

The following management options are general principles, in terms of best practice and desired outcomes, rather than mitigation measures against individual site disturbance:

- Avoid impact by altering the Project, or in this case, by avoiding impact to a recorded Aboriginal site. If this can be done, then a suitable curtilage around the site must be provided to ensure its protection both during the short-term construction phase of development and in the long-term use of the area. If plans are altered, care must be taken to ensure that impacts do not occur to areas not previously assessed; and
- If impact is unavoidable, then approval to disturb sites under the authority of an ACHMP must be sought from DPE. Normally the management recommendations contained in the ACHAR become policies of the ACHMP. As the Aboriginal community have been provided the opportunity to view the draft ACHAR, the ACHAR must make it clear that a future ACHMP will manage Aboriginal cultural heritage within the Project Area so that the Aboriginal community can assess the management recommendations with this knowledge. The ACHMP policies will often stipulate that the Aboriginal community should be involved in any salvage activities and will dictate what the fate of any salvaged Aboriginal objects will be.

Management and Mitigation of Recorded Aboriginal Sites

Table 6-18 summarises the management and mitigation for the Project for all sites recorded during the survey.

Table 6-18 Summary of Management and Mitigation Recommendations

Site Name	*Type of Harm*	*Recommendation*
Riverside-PAD1	None	Fencing will be placed to the eastern boundary of the PAD with a 10 m buffer from the PAD1 extent. As the remainder of the PAD1 is bounded by two drainage lines where no impacts are prosed, no fencing is required in these areas. Erosion control measures will be implemented near the PAD, if required, to ensure no indirect impact during Project construction. The location of the PAD will be marked on all relevant plans for construction workers
Riverside-PAD2	None	The eastern and southern boundary of PAD2 should be fenced with a 10 m buffer. Erosion control measures will be implemented near the PAD, if required, to ensure no indirect impact during Project construction. The location of the PAD will be marked on all relevant plans for construction workers

6.4 Historic Heritage

6.4.1 Introduction

A Statement of Heritage Impact (SOHI) was completed for the Project and is provided in **Appendix I**.

The SOHI was prepared to address the requirements of the SEARs (**Appendix A**) and considered relevant stakeholder engagement described in **Section 5**. The SOHI was undertaken in line with the following government policies and standards:

- 'NSW Heritage Manual' (Heritage Office , 1996);
- 'Historical Archaeology Code of Practice' (Heritage Council, 2006);
- 'Assessing Heritage Significance' (NSW Heritage Office, 2001);
- 'The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance' (Burra Charter) (Australia ICOMOS, 2013); and
- 'Assessing Significance for Historical Archaeological Sites and 'Relics'' (Department of Planning, Heritage Branch, 2009)

The SOHI included a desktop research and field investigation of the Project Area to identify and assess:

- Any previously recorded heritage items or areas listed within or in proximity to the Project Area;
- Historical heritage items not listed located within or in proximity to the Project Area;
- Potential heritage significance of the historic heritage items identified within the Project Area in accordance with the seven criteria established in the NSW Heritage Office's publication 'Assessing Heritage Significance' (NSW Heritage Office, 2001);
- Potential impacts of the Project to any listed or unlisted items of heritage significance located within or in proximity to the Project Area; and
- Appropriate measures to avoid, manage and/or mitigate any identified impacts of the Project.

6.4.2 Background

Historical Archaeological Context

The first European exploration of the Tamworth LGA and surrounds was undertaken in early 1818 by John Oxley and his party. Around the same time, stockmen and drovers who passed through the Moonbi Ranges, located approximately 13 km southwest of the Project Area, crossed what is now known as the Macdonald River valley and would stop and water their horses before crossing the Macdonald River near Bendemeer. A village started being developed around this crossing.

In 1834, The 'Mcdonalds River' pastoral run was taken up in the Bendemeer area by a stockman named Henry McDonald on behalf of Richard Wiseman. Wiseman held the run until 1836. In 1839, Thomas Augustus Perry J.P. took up squatter rights for the 'MacDonald's River Run' and established 'Bendemeer Station'; however, he was not authorised to occupy the pastoral holding until the *Squatting of Crown Lands Act of 1847* gave Perry tenure. By 1848, Perry had 16,000 acres, 3,000 sheep and 200 head of cattle at Bendemeer Station (Trove, 1953a). Bendemeer Station was described as a "green oasis from afar" by The Armidale Express and New England General Advertiser in 1953 (Trove, 1953b).

By 1851, the postal service extended to Walcha and a local office was established at the site of the current village of Bendemeer, which was known as Macdonald River. The town was renamed Bendemeer in 1853. The name Bendemeer is thought to be derived from a poem by Sir Thomas Moore, Lalla Rookh in which the following line appears, "There's a bower of roses by Bendemeer's stream". Sir Thomas Moore was a family friend of Thomas Perry.

By 1866 the population of Bendemeer was 150 and by 1872 the number of buildings in the township included 26 houses, 5 hotels, a public school, one church, three inns, a post office and a general store (Trove, 1872).

The Great Northern Road which extended from Tamworth to Armidale via Bendemeer was, in 1933, proclaimed the New England Highway. Subsequent upgrades to the New England Highway resulted in a bypass of Bendemeer, which was completed in 2001. The bypass has resulted in businesses in Bendemeer struggling economically.

Previously Recorded Sites

A desktop search was conducted to identify previously recorded items of historic heritage within or near the Project Area. The results of this search are summarised in **Table 6-19**.

Table 6-19 Historic Heritage: Desktop Database Search Results

Name of Database Searched	Date of Search	Type of Search	Comment
National and Commonwealth Heritage Listings	26 November 2022	Tamworth LGA	Search returned no National and Commonwealth Heritage Listings within 5 km of the Project Area
State Heritage Listings	26 November 2022	NSW	Search returned no State Heritage Listings within 5 km of the Project Area
LEP	26 November 2022	Tamworth Regional LEP 2010	Search returned no LEP listed sites within the Project Area; however, 16 items are listed within 5 km of the Project Area.

Table 6-20 summarises 16 sites listed in the Tamworth LEP and the location of these sites in relation to the Project Area is shown in **Figure 6-6**. As indicated none of these items are within the Project Area.

The closest listed site is ‘Bendemeer Station’ located 760 m to the west of the Project Area, the site has been listed for its “historical importance as it is representative of the pastoral stations which were numerous in the area. It depicts the course of the cultural history in the area with the expansion of pastoral development. It is associated with a locally significant family and is important to the community for historical reasons. It has the potential to reveal further information about headstations in the area and the technical aspects associated with these stations. However, the fact that the original homestead no longer exists reduces the significance of the site” (Ferry, 2001).

Table 6-20 LEP listed sites within 5 km of the Project Area

Site ID	Site Name	Distance to Project Area
I079	General Store and Stable	1.8 km
I080	St Stephens Anglican Church	1.8 km
I081	Bendemeer Cemetery	1.4 km
I082	Residence	1.6 km
I083	Residence	1.6 km
I084	Bendemeer Hall	1.8 km
I085	Former Bendemeer Post Office	1.6 km
I086	Bendemeer Hotel	1.6 km
I087	Former Bendemeer Butchery and Residence	1.8 km
I088	Church	1.8 km

Site ID	Site Name	Distance to Project Area
I089	Bendemeer I	1.8 km
I090	Blair Graves	1.8 km
I091	Bendemeer Police Station	1.8 km
I092	Bendemeer Public School	2 km
I093	Timber Bridge over Macdonald River	1.6 km
I096	Bendemeer Station	760 m

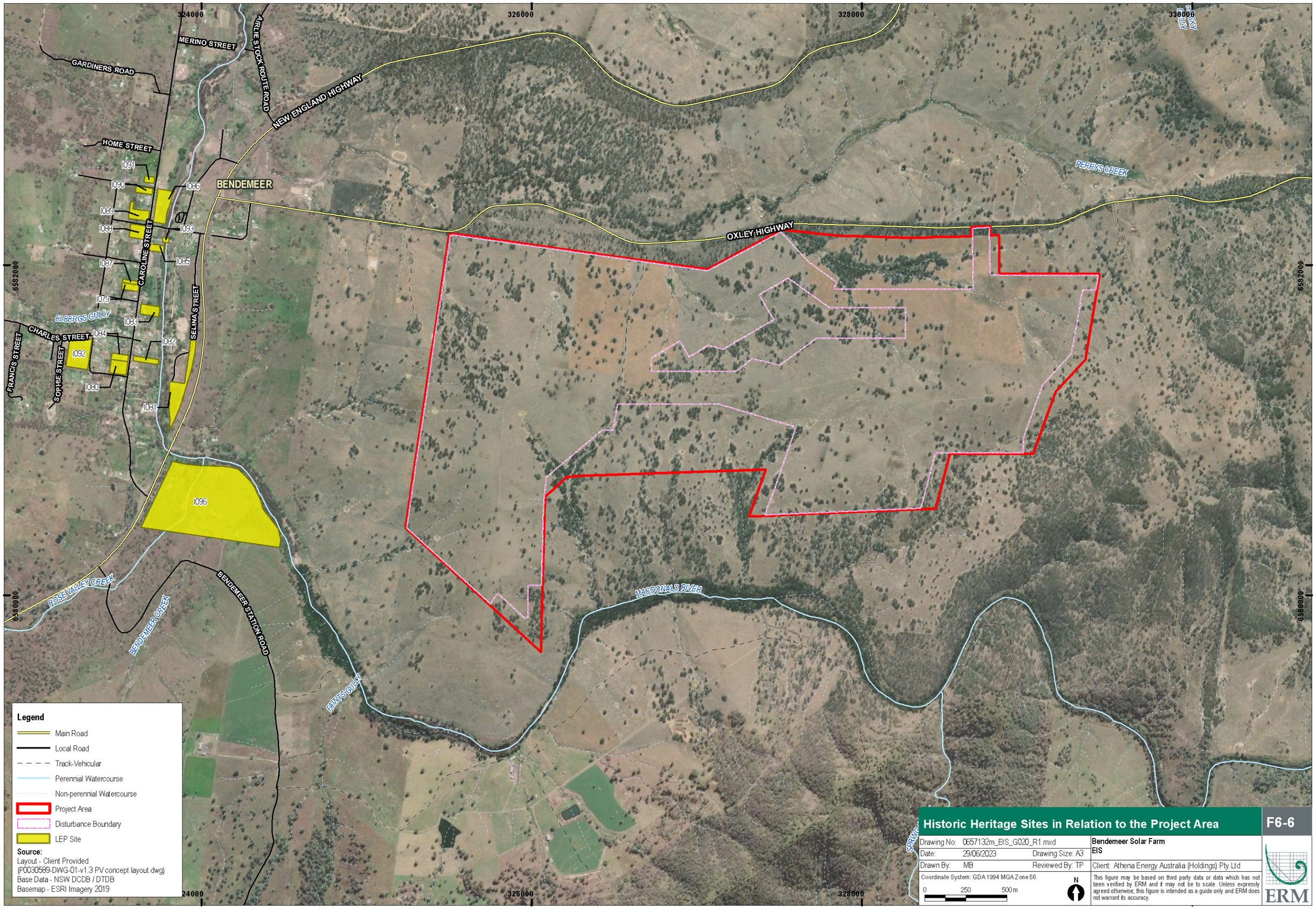
6.4.3 Historic Heritage Sites Recorded

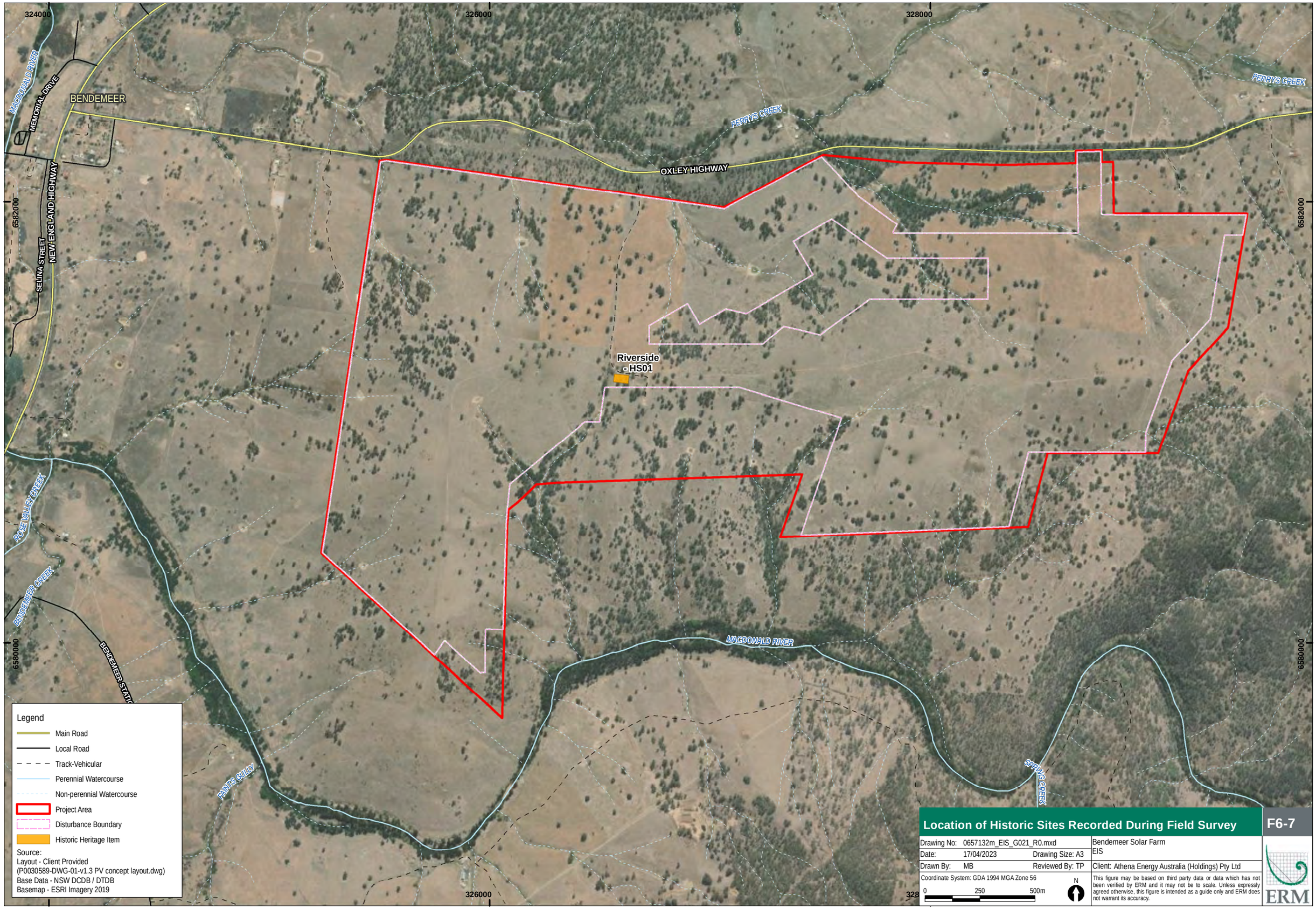
During the archaeological field survey for the SOHI, one historic site was identified within the Project Area (Riverside-HS01), as shown in **Figure 6-7** and the features of these site are detailed in **Table 6-21**. No other potential for historical archaeological deposits were identified. Overall, the SOHI identified limited potential for significant historic heritage to be present within the Project Area.

Table 6-21 Summary of Historic Heritage Sites Recorded

Site Name	*Site type*	*Description of Site*	*Photograph of Site*
Riverside-HS01	Shearing shed and stock yard	Riverside-HS01 is a shearing shed and stock yard and is typical of infrastructure found of agricultural properties in NSW, therefore it is not an item of local or state significance. Further, the woolshed is in disrepair and is no longer able to be used and the stockyards have been altered with modern materials, constructed of corrugated metal sheets applied to the outside walls and has a wooden staircase. The interior of the shed contains mostly modern farming equipment. The stockyard is a combination of timber and modern metal fencing. Parts with timber fencing are typical rail and post style. The shed and associated stockyard do not appear to be of significant age.	

The site access road work area located along the northern verge of Oxley Highway across from the Project site access (refer **Figure 3-2**) was not subject to a formal historic heritage survey. However, the archaeologists did assess the southern verge of the road and made no historical heritage observations. By default, no historical heritage values are present on the northern verge of the proposed site access. The site access road works areas are not considered to have historic archaeological potential given its current land use.


324000
326000
328000
330000
6382000
6380000
MERINO STREET
GARDINERS ROAD
ARLIE STOCK ROUTE ROAD
NEW ENGLAND HIGHWAY
HOME STREET
BENDEMEER
OXLEY HIGHWAY
PERRYS CREEK
CAROLINE STREET
SELINA STREET
ELBERGS GULLY
CHARLES STREET
FRANCIS STREET
SOPHIE STREET
1091
1090
1086
1089
1088
1093
1087
1085
1079
1083
1084
1092
1082
1080
1081
1096
ROSE VALLEY CREEK
BENDEMEER CREEK
BENDEMEER STATION ROAD
PAINTS GULLY
MACDONALD RIVER
Legend
Main Road
Local Road
Track-Vehicular
Perennial Watercourse
Non-perennial Watercourse
Project Area
Disturbance Boundary
LEP Site
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Historic Heritage Sites in Relation to the Project Area
F6-6
Drawing No: 0657132m_EIS_G020_R1.mxd
Date: 29/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Coordinate System: GDA 1994 MGA Zone 56
0 250 500 m
N
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM


324000
326000
328000
6582000
6580000
MACDONALD RIVER
MEMORIAL DRIVE
BENDEMEER
NEW ENGLAND HIGHWAY
SELINA STREET
PERRYS CREEK
OXLEY HIGHWAY
Riverside
- HS01
ROSE VALLEY CREEK
BENDEMEER CREEK
BENDEMEER STATION
PAINTS GULLY
SPRING CREEK
Legend
Main Road
Local Road
Track-Vehicular
Perennial Watercourse
Non-perennial Watercourse
Project Area
Disturbance Boundary
Historic Heritage Item
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Location of Historic Sites Recorded During Field Survey
F6-7
Drawing No: 0657132m_EIS_G021_R0.mxd
Bendemeer Solar Farm
EIS
Date: 17/04/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

Assessment of Significance

The assessment evaluated the heritage significance of Riverside-HS01 in accordance with the criterion established in the 'Assessing Heritage Significance' and considering the Burra Charter, which recognises four categories of heritage value: historic, aesthetic, scientific, and social significance. **Table 6-22** details the assessed significance of Riverside-HS01.

Table 6-22 Historic Heritage Assessment of Significance

Criterion	Description and Assessment	Significance
a	The item has not influenced the course or pattern of NSW or local history.	Does not satisfy the criterion
b	There are no known associations of the item with a significant event, person, or group of persons.	Does not satisfy the criterion
c	The item is not aesthetically pleasing and does not contribute to the cultural landscape of that area.	Does not satisfy the criterion
d	There are no known associations of the item with an identifiable group or a community's sense of place.	Does not satisfy the criterion
e	The item has little potential for further scientific and/or archaeological information. It does not have the qualities of an important benchmark or reference site or type.	Does not satisfy the criterion
f	The item is not a rare item type for the region or NSW.	Does not satisfy the criterion
g	The item is not an exemplary example of this item type as it contains modern materials and therefore does not represent well the characteristics of the item type.	Does not satisfy the criterion

Riverside-HS01 was identified as being in poor condition and containing modern elements, which has been assessed as having no historic heritage significance. It is noted that this result reflects the current thresholds and principles of the assessment criteria that rightly emphasise items with collective, aesthetic, technological and/or natural significance.

Likely Impacts to Historic Heritage

The anticipated impacts to historic heritage from the Project are detailed in **Table 6-23**.

Table 6-23 Historic Heritage Impact Assessment

Site Name	Assessment	Will the site be impacted?
Riverside-HS01	The site is located within the Disturbance Footprint (**Figure 6-7**) and has potential to be impacted by the Project; however, as it has been assessed as having no heritage significance, this site does not require any mitigation and/or management measures.	Yes
'Bendemeer Station'	The site is the closest locally listed item, located 760 m west of the Project Area (**Figure 6-6**). Given the separation from the Project Area by the Macdonald River, dense vegetation and moderately undulating slopes, it is unlikely that the Project will directly or indirectly impact the site, particularly given its significance is not related to aesthetic values. Therefore, no management measures are required.	No

6.4.4 Mitigation Measures

Based on the findings of the SOHI, no further mitigation or management measures are required with regards to historic heritage items Riverside-HS01 and 'Bendemeer Station'. Given there are no items with local, state or national significance within the Project Area a Historic Heritage Management Plan (HHMP) is not considered necessary.

The Applicant will develop and implement an unanticipated finds protocol should previously unrecorded or unanticipated historical archaeological artefacts or sites of potential heritage significance are identified. The unanticipated finds protocol will be used during the construction and operation of the Project. This protocol stipulates the processes to follow should likely historic objects become uncovered through the activities of the Project.

6.5 Noise

6.5.1 Introduction

A Noise Impact Assessment (NIA) was prepared to assess potential noise impacts associated with the construction and operation of the Project, and to recommend feasible and reasonable noise mitigation and management measures. These recommendations are designed to ensure that the construction and operation of the Project are carried out within the noise limits established in the NIA.

The NIA is provided in **Appendix J**.

The NIA address the project-specific SEARs (**Appendix A**) and considers all relevant stakeholder engagement described in **Section 5**.

The NIA was prepared in accordance with the following guidelines and regulation:

- 'Interim Construction Noise Guideline 2009' (NSW ICNG, 2009) (ICNG);
- 'Noise Policy for Industry 2017' (NSW NPI, 2017) (NPI);
- 'Road Noise Policy 2011' (NSW RNP, 2011) (RNP); and
- 'AS 2436:2010 Guide to noise and vibration control on construction, demolition and maintenance sites' (Standards Australia, 2010).

The ICNG presents an accepted method to assess construction noise impacts for a range of receiver types. It provides a set of recommended standard hours of construction, specifically:

- Monday to Friday: 7 am to 6 pm;
- Saturday: 8 am to 1 pm; and
- No work on Sundays or public holidays.

The ICNG encourages works to occur within the recommended standard hours of construction unless justification is provided, as detailed in **Section 3.4.2**. It focuses on minimising construction noise impacts, rather than only on achieving numeric noise levels, and recognises that some noise from construction sites is inevitable.

The NPI provides a framework and methodology for deriving limit conditions for project consent and environment protection licence conditions. The NPI is designed for large and complex industrial sources and outlines processes designed to strike a feasible and reasonable balance between the operations of industrial activities and the protection of the community from noise levels that are intrusive or unpleasant.

The RNP outlines the range of measures needed to minimise road traffic noise and its impacts. It is intended for use by acoustics specialists as well as:

- Road project Applicants;
- Determining authorities and regulators involved in the approval and construction of road projects and land use developments that generate additional traffic on existing roads; and
- City and transport planners and policymakers dealing with issues such as route corridors, heavy vehicle transport and building codes.

The RNP aims to identify the strategies that address the issue of road traffic noise from existing roads, new road projects, road redevelopment projects and new traffic-generating developments. In this case, the RNP is considered the suitable document to qualitatively assess potential noise emissions and impacts associated with construction and operational road traffic.

The scope of the NIA included:

- Evaluation of the existing noise environment and identification of noise-sensitive receivers;
- Establishment of project-specific noise criterion at the receiver locations for compliance with relevant noise guidelines;
- Determining the extent of construction noise impacts (if any) associated with the construction of the proposed solar farm;
- Determining the extent of operational noise impacts (if any) associated with the operation of the proposed solar farm;
- Determining the extent of traffic noise impacts (if any) associated with the construction and operation of the proposed solar farm; and
- Recommendation of mitigation measures to be implemented on site to ensure compliance with the noise limits.

6.5.2 Background

The noise environment of the Project area is best described as rural. Broadly this means an area with an acoustical environment that is dominated by natural sounds such as foliage noise, birdsong and insect noise and is generally characterised by low background noise levels.

The background noise levels at the nearest noise-sensitive receivers to the Project are expected to be similar to the minimum assumed Rating Background Levels (RBLs) specified in Table 2.1 of the NPI – 35 dB(A) during the day period, 30 dB(A) during the evening period and 30 dB(A) during the night period. The use of minimum assumed RBLs is common practice in rural environments where there are no prominent noise sources associated with roads, rail and industrial plant influencing the noise environment at the receivers. It also allows for the strictest NPI PTNLs to be developed. The RBLs applicable to the receivers are further discussed in **Section 6.5.3**.

Potential noise-sensitive receivers within 1.5 km of the Project boundary have been identified and are presented in **Figure 6-8**.

6.5.3 Project-Specific Noise Management Levels

The project-specific construction Noise Management Levels (NMLs), for works within the recommended standard hours for construction, are presented in **Table 6-24** below. These NMLs have been established with due regard to the requirements of the ICNG for all identified residential dwelling and other non-residential potential noise-sensitive receivers, as described in **Appendix J**.

Table 6-24 Construction Noise Management Levels

Receiver Type and Time of Day	Daytime Rating Background Level (RBL)), dB(A)	Noise Affected Management Level, Leq(15 min), dB(A)	Highly Noise Affected Management Level, Leq(15 min), dB(A)
Residence – Recommended Standard Hours1	35	45	75

Project-specific noise criterion need to consider intrusive noise levels, amenity noise levels, and sleep disturbance noise levels. The method for establishing these is detailed in **Appendix J**. Collectively these set the Project Noise Trigger Levels (PNTLs), which are presented in **Table 6-25**.

Table 6-25 PNTLs as per the NSW NPI

Receiver	Period[9]	Project Intrusiveness Noise Level $L_{Aeq,15min}$ dB(A)	NPFI Amenity Noise Level $L_{Aeq, period}$ dB(A)	Project Amenity Noise Level[10] $L_{Aeq,15min}$ dB(A)	Project Noise Trigger Level $L_{Aeq,15min}$ dB(A)	Sleep Disturbance L_{Amax}
Residential	Day	40	50	48	40	-
	Evening	35	45	43	35	-
	Night	35	40	38	35	52

The NSW RNP provides guidance, criteria, and procedures for assessing noise impacts from existing, new, and redeveloped roads and traffic generating developments. The assessment of road traffic noise impacts on residences near public roads is assessed under the RNP.

The RNP criteria applicable to the nearest residences on Oxley Highway affected by additional road traffic due to the Project is presented in **Table 6-26**.

Table 6-26 Residential Road Traffic Noise Criteria as per the RNP

Road Category	Type of Project/Land Use	Assessment Criteria – dB (A)	
		Day 7am to 10pm	Night 10pm to 7am
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)

Additionally, for land use developments generating additional traffic, the RNP states that “For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding ‘no build option’”.

6.5.4 Noise Impact Assessment

Construction Noise Impacts

Conservative calculation of construction noise was undertaken, applying the geometrical dispersion of noise with an assumed flat topography, no acoustic shielding and no ground absorption effects. The

[9] Day-time period is from 0700 to 1800 (Monday to Saturday) and 0800 to 1800 (Sundays and Public Holidays; Evening period is from 1800 to 2200 and Night-time period is from 2200 to 0700 (Monday to Saturday) and 2200 to 0800h (Sundays and Public Holidays).

[10] These levels have been converted to LAeq, 15 minute using the following: LAeq, 15 minute = LAeq, period + 3 dB (NSW Noise Policy for Industry Section 2.2). To account for the existing industrial noise sources, -5 dB was applied to the Project Amenity Noise Level (NSW Noise Policy for Industry Section 2.4).

construction noise predictions take into consideration the sound power level of construction equipment (detailed in **Appendix J**) operating continuously for a 15-minute period. The construction noise levels at any receiver depend on the type and duration of construction activity being undertaken and are expected to be highly variable over the total construction program. Under a worst-case noise scenario, the construction noise sources are assumed to be at the boundary of the site fronting any potential noise sensitive receiver. Three, worst-case construction scenarios were assessed:

- **CON 1** – Site preparation and establishment – A Drum Roller and a Padfoot Roller at the Site boundary fronting a noise-sensitive receiver and operating continuously for 15 minutes;
- **CON 2** – Delivery of infrastructure – Two Cranes at the BESS area fronting a noise-sensitive receiver and operating continuously for 15 minutes; and
- **CON 3** – General construction of infrastructure – Two small Pile Driving Rigs at the Project Area boundary fronting a noise-sensitive receiver and operating continuously for 15 minutes.

Predicted worst-case and unmitigated $L_{eq\ 15minutes}$ noise levels for all construction equipment and construction scenarios at the nearest receivers (non-associated dwellings within 1.5 km of the site boundary where construction noise impacts may be present) demonstrated:

- The ICNG Noise Affected Management Level is exceeded at 12 noise-sensitive receivers for construction scenario CON 1 and 32 noise-sensitive receivers for construction scenario CON 3;
- The ICNG Noise Affected Management Level is complied with at all noise-sensitive receivers for construction scenario CON 2; and
- No exceedance of the ICNG Highly Affected Management Level at any of the noise-sensitive receivers is expected for all construction scenarios.

Table 6-27 shows predictions for receivers within 1.5 km of the Project Area (direct-line at its closest) with potential exceedances of the ICNG Noise Affected Management Levels bolded, for the construction scenarios described above.

Table 6-27 Predicted Construction Noise Levels at Nearest Receivers

Receiver ID	Distance to Project boundary (m) [11]	Construction Scenario [12]		
		CON1	CON2	CON3
29	115	**63**	38	**68**
130	180	**59**	37	**64**
1216	205	**58**	47	**63**
1244	335	**54**	38	**59**
133	390	**52**	37	**57**
113	410	**52**	39	**57**
1219	445	**51**	37	**56**
27	460	**51**	39	**56**
17	520	**50**	36	**55**
119	570	**49**	38	**54**
15	680	**47**	36	**52**
123	755	**46**	39	**51**

[11] Distance is measured in direct-line from Sensitive Receiver to Project Area boundary at its closest.
12 Noise Affected Management Level exceedances are shown in bold font.
The Noise Affected Management Level is LAeq(15 min) 45 dB(A), and the Highly Noise Affected Management Level is LAeq(15 min) 75 dB(A).

Receiver ID	Distance to Project boundary (m) [11]	Construction Scenario [12]		
		CON1	CON2	CON3
120	880	45	37	**50**
60	940	45	35	**50**
370	1165	43	36	**48**
369	1185	43	36	**48**
388	1225	42	35	**47**
379	1245	42	36	**47**
383	1260	42	36	**47**
450	1285	42	36	**47**
380	1295	42	36	**47**
818	1310	42	36	**47**
385	1340	41	36	**46**
451	1370	41	35	**46**
387	1375	41	35	**46**
374	1415	41	35	**46**
377	1415	41	35	**46**
395	1420	41	34	**46**
375	1420	41	35	**46**
394	1450	41	34	**46**
826	1465	41	35	**46**
400	1480	41	34	**46**

It should be noted that the predicted noise levels and duration of exceedances are variable due to the intermittent operation of construction equipment and the changing separation distances between mobile construction noise sources and Sensitive Receivers.

Operational Noise Impacts

Operational noise levels were predicted using the CONCAWE algorithm (Manning, 1981), as implemented within SoundPLAN 8.2. They were assessed for day, evening and night periods, at the nearest Sensitive Receivers over a 15-minute period for different meteorological conditions as required by the NPI. Operational noise sources of the Project and the assumptions considered in the modelling are presented in **Appendix J**.

The predicted operational noise levels have been compared to the PTNLs. Predicted operational noise levels at the potential noise-sensitive receivers within 1.5 km of the Project Area for different meteorological conditions are shown in **Table 6-28** and are graphically shown in the noise contours in **Figure 6-8.**

The noise modelling results are summarised as follows:

- No operational exceedances at non-associated receivers are predicted;
- All the identified noise-sensitive receivers are expected to achieve compliance with the NPI PTNLs except for receiver ID 29; and
- Receiver ID 29 which is 115 m from the Project boundary experiences a NPI PTNL exceedance under noise-enhancing meteorological conditions. Under standard meteorological conditions, compliance with the NPI PTNL is expected.

It should be noted that receiver 29 is an associated dwelling. This is a dwelling owned by the landowner that has signed an agreement with Athena to host the solar farm.

Investigation of noise mitigation measures to enable NPI PTNL compliance has been undertaken as discussed in **Section 6.5.3**.

Table 6-28 PNTLs as per the NSW NPI

Receiver ID	PNTL $L_{Aeq,15\ min}$, dB(A)			Predicted Operational Noise Level $L_{Aeq,15\ min}$, dB(A)[13]		
	Day	Evening	Night	Standard Meteorological Conditions[14]	Noise Enhancing Meteorological Conditions (Daytime and Evening)[15]	Noise Enhancing Meteorological Conditions (Night-time Temperature Inversions)[16]
29	40	35	35	33	**37**	**37**
130	40	35	35	30	34	34
1216	40	35	35	31	35	35
1244	40	35	35	30	35	35
133	40	35	35	29	33	33
113	40	35	35	31	34	34
1219	40	35	35	29	33	33
27	40	35	35	31	35	35
17	40	35	35	28	32	32
119	40	35	35	30	34	34
15	40	35	35	25	28	28
123	40	35	35	29	33	33
120	40	35	35	27	31	31
60	40	35	35	26	30	30
370	40	35	35	27	31	31
369	40	35	35	27	30	30
388	40	35	35	25	29	29

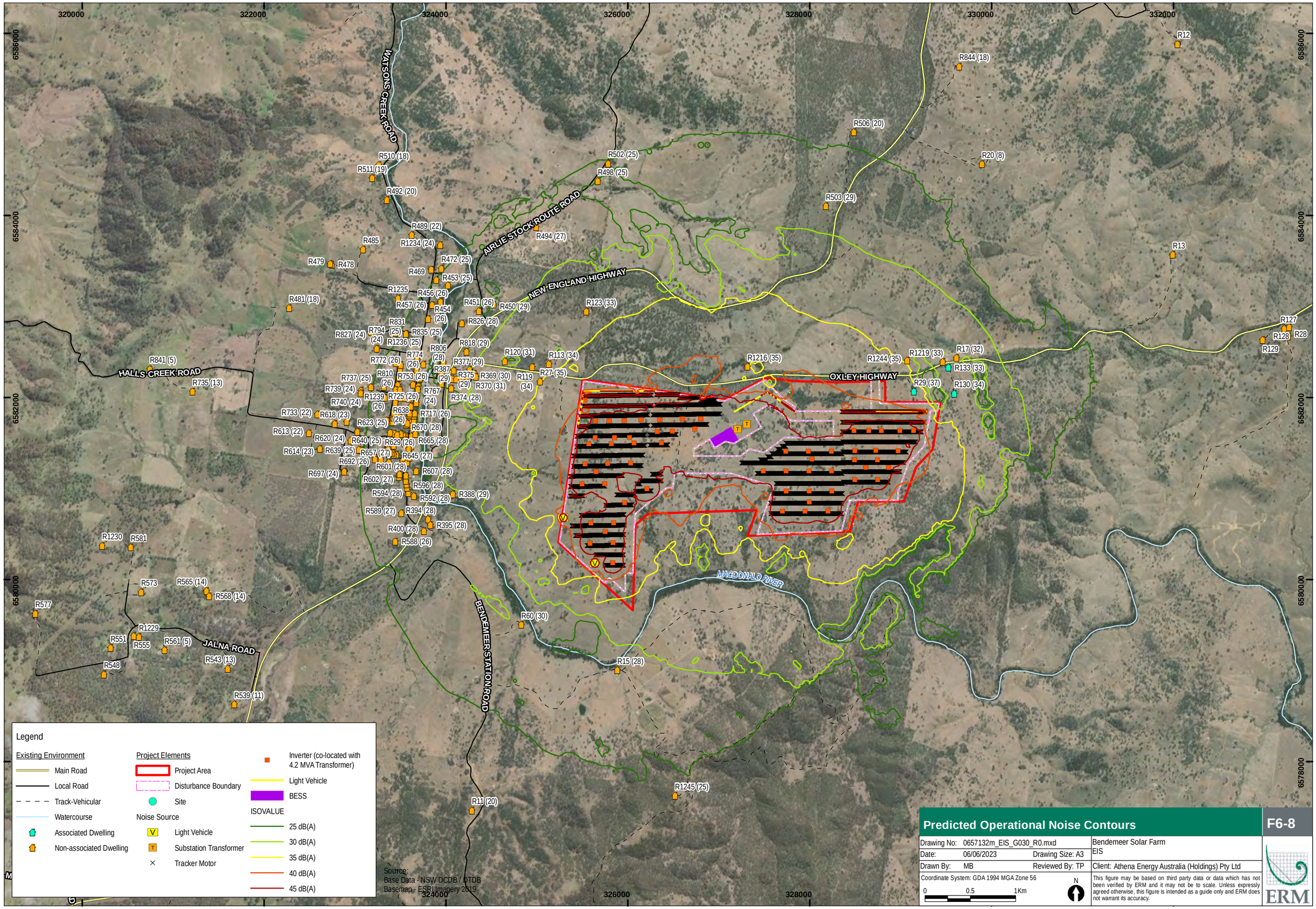
[13] PTNL exceedances are shown in bold and bold font.

[14] Day/evening/night: stability categories A–D with wind speed up to 0.5 m/s at 10 m Above Ground Level (AGL).

[15] Daytime/evening: stability categories A–D with light winds (up to 3 m/s at 10 m AGL).

16 Night-time: stability categories A–D with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

Receiver ID	PNTL $L_{Aeq,15\ min}$, dB(A)			Predicted Operational Noise Level $L_{Aeq,15\ min}$, dB(A)[13]		
	Day	Evening	Night	Standard Meteorological Conditions[14]	Noise Enhancing Meteorological Conditions (Daytime and Evening)[15]	Noise Enhancing Meteorological Conditions (Night-time Temperature Inversions)[16]
379	40	35	35	26	30	30
383	40	35	35	26	30	30
450	40	35	35	25	29	29
380	40	35	35	26	30	30
818	40	35	35	25	29	29
385	40	35	35	26	29	29
451	40	35	35	23	26	26
387	40	35	35	25	29	29
374	40	35	35	24	28	28
377	40	35	35	25	29	29
395	40	35	35	24	28	28
375	40	35	35	25	29	29
394	40	35	35	24	28	28
826	40	35	35	24	28	28
400	40	35	35	24	28	28



Legend

Existing Environment
- Main Road
- Local Road
- Track-Vehicular
- Watercourse
- Associated Dwelling
- Non-associated Dwelling

Project Elements
- Project Area
- Disturbance Boundary
- Site

Noise Source
- Light Vehicle
- Substation Transformer
- Tracker Motor
- Inverter (co-located with 4.2 MVA Transformer)
- Light Vehicle
- BESS

ISOVALUE
- 25 dB(A)
- 30 dB(A)
- 35 dB(A)
- 40 dB(A)
- 45 dB(A)

Source:
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019

Predicted Operational Noise Contours

F6-8

Drawing No:	0657132m_EIS_G030_R0.mxd		Bendemeer Solar Farm EIS
Date:	06/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 0.5 1Km

N

ERM

6.5.5 Traffic Noise Impact

Traffic Modelling Parameters were obtained from the Transport for NSW Traffic Volume Viewer, and the Project Traffic Impact Assessment (TIA) (**Appendix O**).

The NIA utilised the 2011 Annual Average Daily Traffic (AADT) data for Oxley Highway (NSW RMS station ID 92702 -1.66 km east of Back Woolbrook Road). No recent AADT data is available in the vicinity of the Project Area. The posted traffic speed of 100 km/h on Oxley Highway was considered representative of the average vehicular speed.

The Oxley Highway RMS station did not have light and heavy vehicle specification, the NIA adopted a 79% light Vehicles and 21% Heavy Vehicles to Oxley Highway.

Construction Traffic

Based on the predicted construction road traffic volumes (described in **Appendix O**) on New England Highway, the following traffic volumes were used for the assessment:

- 15-hour Day period (7am to 10pm) – 29 Light Vehicles and 40 Heavy Vehicles; and
- 9-hour Night period (10pm to 7am) – 19 Light Vehicles and 22 Heavy Vehicles (It is assumed that the entire traffic movement during the Night period will occur during the morning peak period from 6am to 7am).

Among all the noise-sensitive receivers, receiver ID 119 has the highest potential to be affected by construction traffic noise. The receiver is the closest to Oxley Highway, located 25 m north to the edge of the road **Figure 2-4**.

The predicted construction traffic noise levels at receiver ID 119 are shown in **Table 6-29**. The traffic noise predictions are based on a peak construction period and a worst-case assumption that all Project-related traffic movement occurs east of the Project site along Oxley Highway.

Table 6-29 Predicted Construction Traffic Noise Levels at Sensitive Receiver 119

Period	Existing Traffic			Existing + Project Traffic			RNP Criteria (dB(A))	Noise Level Increase (dB)
	Traffic Volume (vehicles/period)		Predicted Traffic Noise Level (dB(A))	Traffic Volume (vehicles/period)		Predicted Traffic Noise Level (dB(A))		
	Light Vehicle	Heavy Vehicle		Light Vehicle	Heavy Vehicle			
Day (7 am to 10 pm)	466	69	53.4	495	109	54.6	$L_{Aeq,15hr}$ 60	1.2
Night (10 pm to 7 am)	36	7	$L_{Aeq,9hr}$ 46.8	55	29	$L_{Aeq,9hr}$ 51.4	$L_{Aeq,9hr}$ 55	4.6

The predicted road traffic noise levels at receiver ID 119 comply with the RNP criteria and thus compliance with the RNP criteria at all Sensitive Receivers is expected.

No construction traffic noise impact is expected at any noise-sensitive receiver.

Notwithstanding RNP criteria compliance, a night-time noise level increase of 4.6 dB has been identified at receiver ID 119 for the purpose of designing noise mitigation and management measures for the Project's CNMP. It should be noted that the night-time (9-hour duration) noise level increase is due to the morning peak period from 6am to 7am and any noise level increase will occur entirely during this period.

All of the above traffic noise predictions are based on a peak construction period and a worst-case assumption that all Project-related traffic movement occurs east of the Project site along Oxley Highway.

Operation Traffic

Based on the Project's TIA, the traffic generated during operations of the Project is associated with the 15 operational FTE, which would generate up to 30 vehicle movements per day.

This would result in a negligible change to the traffic environment, as discussed in **Section 6.9** (in full in **Appendix O**).

As such traffic noise impacts at Sensitive Receivers during the operational stage of the Project are expected to be negligible.

6.5.6 Cumulative Noise Impacts

The nearest noise-generating relevant future developments to the Project Area are the Bendemeer Wind Farm and Thunderbolt Wind Farm located adjacent, and 16 km north-east of the Project Area, respectively, as shown in **Section 6.16**.

The key noise sources from wind farms covered by the NPI are ancillary infrastructure such as substations and associated BESSs. Wind turbine noise from wind farms is not assessed by the NPI. The cumulative noise assessment considered the below:

- Bendemeer Wind Farm: stand-alone substations are unlikely to contribute to the noise levels generated by the Project at the nearest noise-sensitive receivers. This is due to Bendemeer Wind Farm planned substation infrastructure being located further South from the noise-sensitive receivers most affected by the Project (Sensitive Receiver ID 29). Additionally, all infrastructure associated with the Bendemeer Wind Farm will be assessed cumulatively with noise levels generated by the Project against the NPI in the EIS phase for the Bendemeer Wind Farm; and
- Given the significant separation between the Project and the Thunderbolt Wind Farm (located approximately 16 km north east of the Project), as well as the remaining major developments, the cumulative noise impact at the nearest noise-sensitive receivers to the Project is expected to be negligible.

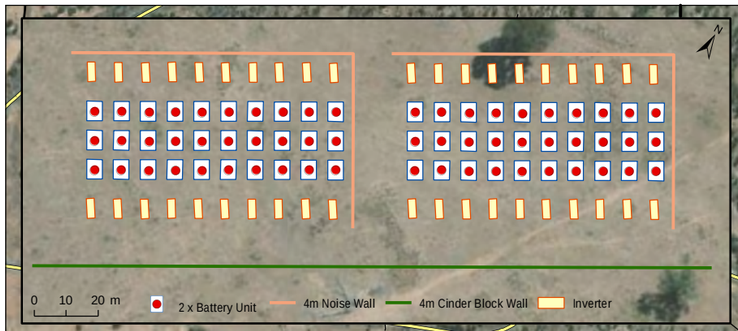
6.5.7 Mitigation and Management

The mitigation measures shown in **Table 6-30** will be incorporated and implemented through all phases of the Project to enable compliance to relevant noise criteria.

Table 6-30 Noise Mitigation Measures

Phase	Mitigation Measure
Construction	
Scheduling	■ Noise generating work and activities will be (as proposed) limited (where possible) to the ICNG recommended standard hours; and ■ Where an equipment item operates close to the Project boundary and these works are anticipated to generate high levels of noise (> 45 dB) at a non-associated Sensitive Receiver, potential respite periods, e.g., three hours of work, followed by one hour of respite will be applied.
Equipment management	■ Appropriate plant, equipment and/or machinery for each task will be selected and efficient work practices to minimise the total construction period and the number of noise sources on the site will be adopted; ■ Unnecessary noise due to idling engines will be avoided. High engine speeds will be avoided when equipment can be powered down and lower engine speeds are feasible;

Phase	Mitigation Measure
	■ All plant, equipment and/or machinery used on the site will be in suitable condition, with particular emphasis on exhaust silencers, covers on engines and inspection of squeaking or rattling components. Excessive noise-generating machines will be repaired or removed from the site; and ■ Reversal alarms will be broadband "squash duck" motion alarms, where feasible.
Protocols	■ If any validated noise complaints are received, operator attended noise validation and compliance measurements will be undertaken to measure and compare the site noise level contributions to the NMLs presented in the NIA. All site noise levels will be measured and quantified in the absence of any influential noise sources not associated with the Project. If the measured site noise levels are above the NMLs presented in the NIA, further mitigation and/or management measures will be considered; and ■ Unattended noise monitoring systems will be established at selected worst-affected Sensitive Receivers depending on the different activities and stages of construction when such details are finalised. The results shall be used to improve the noise mitigation and management measures for the Project so that best practice noise control is continually implemented.
Management Plan	■ As per standard practice for any construction activities in NSW, a CNMP containing noise mitigation and management measures will be created for the construction phase of this Project; ■ The strategies to manage noise provided in Appendix C of the ICNG will be adopted in the CNMP; and ■ A Draft CNMP has been prepared for the Project is included in Appendix B of the NIA (**Appendix J**).
Operation	
Noise wall measurements	Construction of noise wall with the following measurements: ■ A 2-sided 3.5 m high noise wall for 14 inverters located within the Project Area as shown in **Figure 6-9;** and ■ Two 2-sided 4 m high noise walls in the BESS layout as shown in **Figure 6-9.**
Noise wall characteristics	Noise wall material will be selected to meet the following requirements: ■ A non-porous construction with no gaps and a surface density of at least 20 kg/m^2; **or** a construction that has a sound insulation rating value of Rw + Ctr of at least 25 dB as determined by a NATA accredited laboratory; ■ Air-flow requirements for the inverter units will be considered and advice will be sought from the equipment manufacturers on the necessary gap between the inverter and the noise wall; and ■ Bunding may replace the recommended noise walls if the effective height of the bund matches the height of the noise walls, sufficient area in the disturbance footprint is available and equipment air flow requirements are met.
Traffic	
Traffic	Construction and operational traffic noise management will be included in the CNMP, covering: ■ Site awareness training and environmental inductions for construction and operation staff; and ■ Driving practices to minimise traffic noise impacts on the Sensitive Receivers.
Design	
Other mitigation strategies	Opportunities for other mitigation strategies through technology selection, localised equipment noise control, or other options with equivalent or improved noise impact mitigation performance will be considered in the detailed design phase.



328000

330000

6582000

OXLEY HIGHWAY

MACDONALD RIVER

326000

328000

Legend

Existing Environment

- Main Road
- Local Road
- Track-Vehicular
- Watercourse

Project Elements

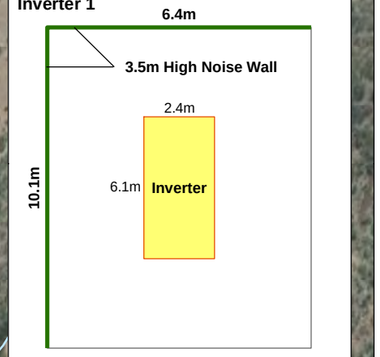
- Project Area
- Disturbance Boundary
- Site Access

Noise Source

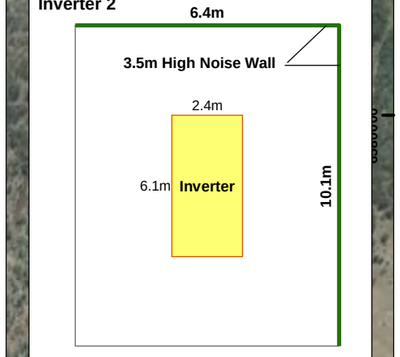
- Substation Transformer
- Tracker Motor
- Inverter (co-located with 4.2 MVA Transformer)
- BESS

Source:
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019

Noise Mitigation Measures
Inverter 1



Noise Mitigation Measures
Inverter 2



Noise Mitigation Measures

F6-9

Drawing No:	0657132m_EIS_G031_R0.mxd		Bendemeer Solar Farm
Date:	06/06/2023	Drawing Size: A3	EIS
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 250 500m

N

ERM

6.6 Visual

6.6.1 Introduction

A Landscape and Visual Impact Assessment (LVIA) was prepared for the Project to identify and assess the visibility and potential visual impacts associated with the Project relating to landscape character, landscape values, landscape amenity and scenic vistas. The LVIA provided recommendations to assist in the mitigation of potential impacts resulting from the Project. The LVIA is provided in **Appendix K**.

The LVIA was prepared in accordance with the Solar Guidelines (DPE, 2022a) and the 'Technical Supplement – Landscape and Visual Impact Assessment' (Landscape and Visual Technical Supplement) (DPE, 2022b) and has considered engagement undertaken for the Project with stakeholders as discussed in **Section 5**.

The scope of works undertaken in the LVIA included:

- An assessment of how the Project will affect the elements that make up the aesthetic and perceptual aspects of the landscape and its distinctive character. The landscape character assessment involves:
  - A baseline analysis to establish the existing landscape character of the area and its sensitivity;
  - Identification of the landscape character zones (LCZs) within 5 km of the Project Area, based on common distinguishing visual characteristics; and
  - Landscape character impact assessment to determine the impact of the Project on each LCZ by evaluating the sensitivity of the landscape and the magnitude of the Project's effects in that area;
- An assessment of the likely impacts of the Project on viewpoints within the private and public domain. The visual impact assessment involves:
  - A preliminary assessment to identify viewpoints that will require a detailed assessment. In accordance with the Landscape and Visual Technical Supplement, viewpoints identified include from public roads and rail lines within 2.5 km from the Project Area and other public and private viewpoints within 4 km from the Project Area; and
  - A detailed viewpoint assessment to undertake a comprehensive assessment of the visual impacts on viewpoints identified in the preliminary assessment;
- Establishment of the level of visual impacts, in accordance with the visual performance objective of each assessable viewpoint;
- Glint and glare assessment to demonstrate the Project does not pose a significant risk to motorists or pilots and that nuisance from glare is minimised for residential locations; and
- Justification for the final proposed layout and identification of mitigation and management measures based on the visual impact identified.

6.6.2 Background

Community Engagement

Stakeholder engagement has been undertaken for the Project throughout the EIS development. The key concern of importance to the LVIA raised during engagement was visual impact of the Project, including glint and glare.

Baseline Analysis

For the purposes of the LVIA and in accordance with the Landscape and Visual Technical Supplement, the Study Area was defined as the area within 5 km of the Project Area. Fieldwork was undertaken for the Project in July 2022, and February 2023 to assess and identify the existing landscape character of the Study Area.

Table 6-31 summarises the baseline investigation results identified within the Study Area. The key landscape features are shown in **Figure 2-3**.

Table 6-31 Baseline Investigations Summary

Visual Baseline	Investigation Summary
Physical Influences	The Project Area is located north of the Moonbi Range. The land is studded with rugged granitic outcrops and broad valleys with hills or peaks. Lower undulations and rolling hills have been cleared and modified to support agricultural activities. South of the Project Area is the Macdonald River, a perennial river within the Namoi catchment. The Macdonald River flows through the towns of Bendemeer and Woolbrook and offers recreational areas and activities.
Ecological Characteristics	The Project is located within the New England Tablelands Bioregion, which is characterized by hills and plains composed of both basalt, granite and sedimentary geology. Vegetation is diverse with a high degree of endemism which includes open forests and woodlands.
Human Activity	The nearest settlement to the Project is the township of Bendemeer, which offers recreational activities such as picnics, swimming, fossicking, trout fishing and camping. The land within the Study Area has been predominantly cleared of remnant vegetation to support agricultural activities, characterised as modified pastures.
Key Landscape features and Aesthetics	Ridgelines are a prominent feature of the New England Tablelands landscape, which are associated with the Great Dividing Range, Thunderbolts Ridge, Flaggy Range, Nandewar Range and Moonbi Range. Mount Pleasant is the closest to the Project, located approximately 1.4 km to the north-east and Pig Mountain is situated approximately 2.6 km to the south-east of the Project. The Moonbi Lookout is a popular lookout and recreational area, about 11 km south-west of the Project. Other significant landscape features within 5 km of the Project Area include the Bendemeer Hotel, Bendemeer Camping Grounds and Bendemeer Showgrounds. The closest State Forest or National Park is the Watsons Creek Nature Reserve, Located approximately 14.6 km to the north-west of the Project Area. No heritage items were identified within the Project Area under the National and Commonwealth Heritage Listings and State Heritage Listings. Sixteen historic heritage items listed under the Tamworth Regional LEP were identified within the Study Area (refer **Figure 6-6**). A full list of the searched items within 5 km of the Project Area and field survey undertaken for the Project is summarised in **Section 6.4**.
Landscape Condition	Topography of the Project Area is gently undulated, ranging from 860 m to 970 m Australian Height Datum (AHD). Several lower order ephemeral streams and gullies flow from the north of the Project Area into Perrys Creek. Several man-made dams occur within the Project Area used to provide water for agricultural activities. Several rural residential dwellings are scattered around the Project, clustered primarily along Oxley Highway. No dwellings are located within the Project Area.
Land Use	The Project is predominantly located on land dedicated to grazing modified pastures and land use adjacent to the Project Area is comprised of grazing modified pastures, grazing native vegetation and dryland cropping where the initial vegetation has been replaced or actively modified to enhance growth of foraging species for stock (NSW Land Use, 2017). The New England Highway and Oxley Highway are the major corridors that connects Bendemeer to Walcha, other minor roads provide access from these major roads to rural properties. Land use surrounding the Project is further discussed in **Section 2.4**.

Visual Baseline	Investigation Summary
Large Scale Energy Development in the area	Thunderbolt Wind Farm is located approximately 16 km north-east of the Project. Based on horizontal scale of the Project combined with the undulating topography and intervening vegetation associated with the landscape within the 4 km of the Project Area, it is unlikely that both these projects will be visible simultaneously within 4 km of the Project Area. The proposed Bendemeer Wind Farm would be located adjacent to the Project. There would be potential cumulative visual impact of both projects due to the elevated positioning of the turbines associated with the Bendemeer Wind Farm.

Landscape Character Assessment

Table 6-32 summarises the landscape character assessment for each identified LCZ within the Study Area.

For each LCZ a quantitative frame of reference was applied to establish the scenic quality rating, which ranged from low to moderate. The overall sensitivity and magnitude of change resulting from the Project on each LCZ was then assessed, which informed the overall landscape character impact ratings.

Table 6-32 Landscape Character Assessment Summary

LCZ	Ratings			
	Scenic Quality	**Sensitivity**	**Magnitude**	**Landscape Character Impact**
LCZ01 – Densely Vegetated Ridges	**Moderate**: Landform within this LCZ is characterised by rocky outcrops and broad valleys. Vegetation is predominantly open woodlands found typically on the higher slopes. Seasonal creeks and gullies drain the elevated areas. Human intervention in the form of transport networks and infrastructure easements are visible in this LCZ.	**High**: Intact landscape with minor evidence of human intervention.	**Very Low**: Due to the horizontal scale of the Project, views are very low from LCZ01. Resulting change is considered minimal.	**Low**
LCZ02 – Alluvial Plains	**Moderate:** Landform within this LCZ is characteristic of river plains with gently undulating land sloping towards the river. It comprises of riparian corridors and fertile soils present in the environment of the Macdonald River and a number of smaller creeks and channels that drain the region. Recreational activities are prominent within the general extents of the LCZ.	**Moderate:** Vegetation along Macdonald River is mostly modified by adjoining land use, with some areas are defined by dense tracts of riparian vegetation.	**Low:** Given the Project is in an elevation above this LCZ and existing vegetation, views of the Project are very limited. Resulting change is not expected.	**Low**
LCZ03 – Partially Vegetated Hills	**Low**: Landform is dominated by undulating hills and low valleys. It is defined by the remnant patchy woodlands on undulating hillsides. Vegetation has been predominantly or partially cleared. Waterbodies within this LCZ are absent other than man-made farm dams.	**Low:** Land has been cleared to support pastoral activities, with the capability to absorb the change as a result of the Project.	**Low:** The landscape elements and its quality will remain unchanged. Resulting change is unlikely.	**Low**
LCZ04 – New England Highway Pastures	**Low**: Landform within this LCZ is characteristic of gently undulating grazing pastures. Vegetation is predominantly cleared. Waterbodies are generally in the form of man-made farm dams. Landscape within this LCZ is highly modified through human intervention in the form of transport corridors and infrastructure easements. Ridges associated with New England Tablelands form a backdrop in the views from this LCZ.	**Low:** Land predominantly cleared to support pastoral activity and livestock grazing. Traversed by New England Highway.	**Very Low:** Project elements are keeping in with highly modified character and existing built form of this LCZ. Resulting change is considered minor.	**Very Low**
LCZ05 – Oxley Highway Pastures	**Low**: Landform within this LCZ is characteristic of gently undulating grazing pastures. Vegetation is predominantly cleared. Waterbodies are generally in the form of man-made farm dams. Landscape within this LCZ is highly modified through human intervention in the form of transport corridors and infrastructure easements. Occasional patches of dense to patchy woodlands reminiscent of the New England Tableland character are visible near undulations	**Low:** Land adjacent Oxley Highway predominantly cleared to support pastoral activity.	**Low:** The Project is located within this LCZ. Existing vegetation along the Oxley Highway will likely fragment views towards the Project.	**Low**

LCZ	Ratings			
	Scenic Quality	**Sensitivity**	**Magnitude**	**Landscape Character Impact**
LCZ06 – Towns & Settlements	**Moderate**: Landform is typically broad shallow valleys with gentle undulating topography. It comprises of small rural settlements along Macdonald River such as Bendemeer, which has an historic agricultural association with the region. Vegetation is usually a mix of remnant native vegetation and introduced exotic trees, contrasting with the nearby open pasture and forested ridgelines. The Landscape within this LCZ is highly modified through human intervention.	**Moderate:** The surrounding landscape has been heavily modified evidenced through widespread clearance of vegetation for transport corridors, dwellings and domestic scale electricity infrastructure.	**Very Low:** Views towards the Project will generally be filtered by intervening topography and existing vegetation.	**Low**

6.6.3 Preliminary Assessment

Viewpoint Analysis

Residential viewpoints (non-associated dwellings) within 4 km of the Project Area and viewpoints from public roads and rail lines (public viewpoints) within 2.5 km of the Project Area were identified as shown in **Figure 6-10**.

The Preliminary Assessment Tool – Vertical Field of View was then used to identify non-associated dwellings and public viewpoints that require detailed assessment in the EIS and eliminate the need to assess the viewpoints that are likely to experience very low impacts.

This preliminary assessment considered the Disturbance Footprint as the worst-case horizontal field of view that the Project is likely to occupy when viewed from each viewpoint (not considering topography or vegetation). The preliminary assessment is influenced by distance from the Project to the viewpoint, height elevation changes, and width of the Project.

Viewshed Mapping

A viewshed map and a reverse viewshed map were prepared to help identify all areas within 4 km of the Project Area that have views of the Project, these have considered a bare ground scenario without intervening elements such as vegetation. Further assessment and ground-truthing during field work ascertained potential visibility by taking into account structures and vegetation.

The viewshed mapping was undertaken to eliminate viewpoint locations that will not have a line of sight to the Project. Based on topography alone the viewshed map analysis concluded:

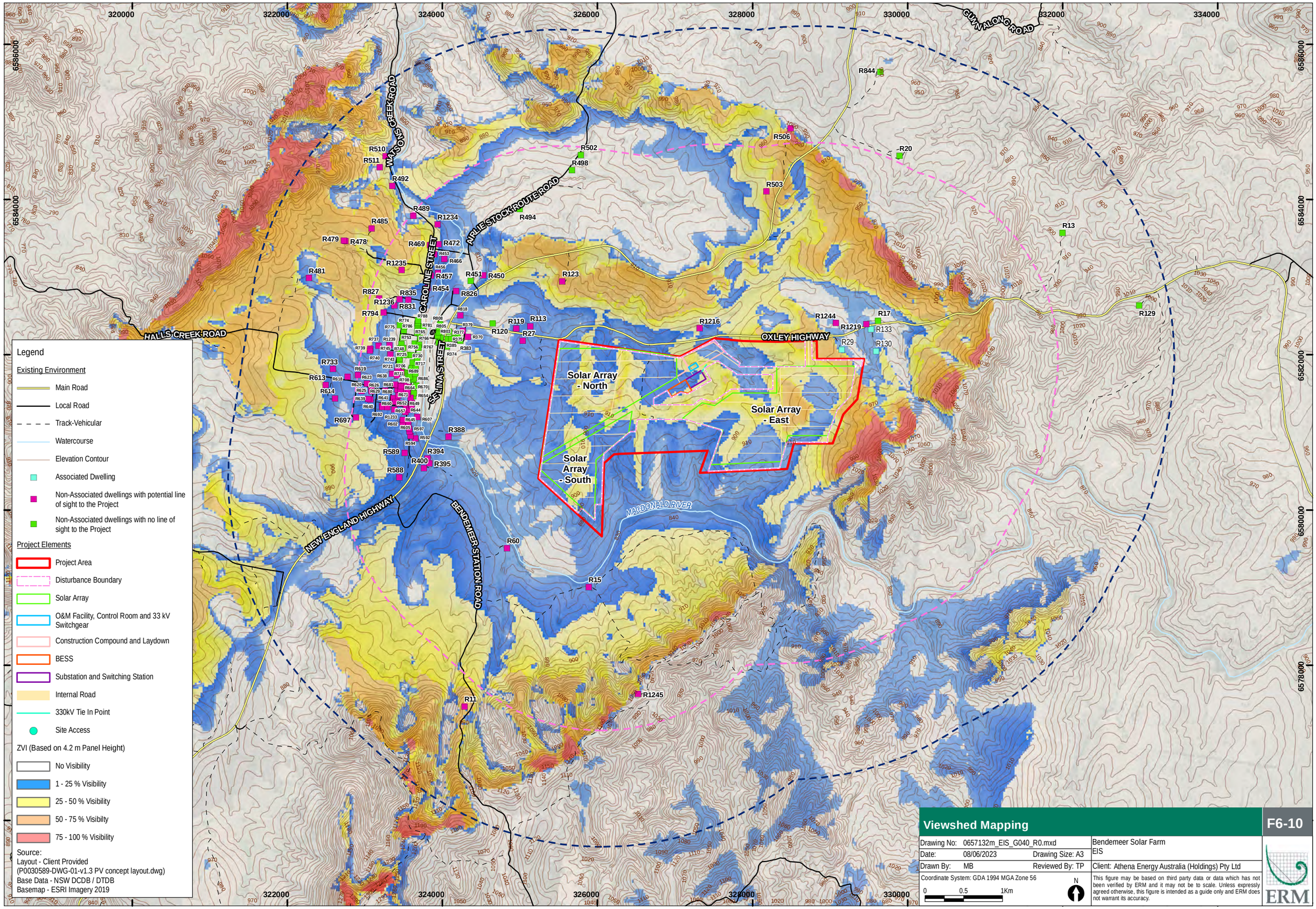
- Areas to the west (including the village of Bendemeer) may have views towards a small portion of the Project due to the undulating terrain and the low horizontal scape of the Project;
- Non-associated dwellings to the north-east, east and south-east of the Project beyond approximately 1.5 km will not have any views of the Project; and
- Views towards a greater portion of the Project are possible from a small number of isolated and elevated portions surrounding the Project Area.

The reverse viewshed map analysis was undertaken to highlight parts of the Project that can be seen from the greatest number of viewpoints, which can assist the Project refinement process and reduce any significant impacts. Based on topography alone the reverse viewshed map analysis concluded:

- Up to 91 non-associated dwellings identified within 4 km of the Project Area may theoretically have views to the western and south-western portions of the Disturbance Footprint (approximately between 45 and 91 dwellings); and
- Approximately 45 non-associated dwellings (of the 91 non-associated dwellings) may theoretically have views to the western portion of the Disturbance Footprint (up to 50%) due to relatively low horizontal scale and undulating topography.

Figure 6-10 illustrates the dwellings with no line of sight to the Project and dwellings with theoretical view to the Project (worst case scenario, which represents a bare ground scenario with no screening, structures or vegetation). The visibility of the Project based on a 4.2 m solar array height is also illustrated in **Figure 6-10**. For the purposes of the LVIA, the solar array height of 4.2 m has been selected in consideration of different manufacturers and solutions in the market as it represents the worst-case for visual impact.

Based on topography alone, **Figure 6-10** suggests that, theoretically views to approximately less than 25% of the Project would be available. A field study was conducted by Moir LA confirming that potential views from Bendemeer would be obscured by intervening vegetation and built form (refer Section 9.10 of **Appendix K**).



Viewshed Mapping

F6-10

Drawing No:	0657132m_EIS_G040_R0.mxd		Bendemeer Solar Farm EIS
Date:	08/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 0.5 1Km

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

6.6.4 Detailed Viewpoint Assessment

The Preliminary Assessment Tool results identified the following for detailed assessment:

- A total of 91 non-associated dwellings within 4 km of the Project Area required detailed assessment; and
- A total of 9 public viewpoints were assessed within 2.5 km of the Project Area, of these 5 public viewpoints required detailed assessment.

Viewpoints identified for detailed assessment from the application of Preliminary Assessment Tool, as discussed **Section 6.6.3**, were grouped in 10 clusters. Representative viewpoints were then selected in lieu of dwellings when viewpoints were clustered close together in.

A total of 12 representative dwellings with the most potential for impact (based on proximity, height and presence of intervening vegetation, ZVI Visibility) were selected for further detailed analysis. An additional 14 non-associated dwellings within 4 km of the Project Area were selected for detailed assessment either based on their proximity or their elevated position in relation to the Project Area.

The detailed viewpoint assessment considers the likely visual impact that the Project would have on the existing landscape character and visual amenity. The visual impact of the viewpoint was assessed based on the topographic and aerial information and field work and photographic evidence to ensure accuracy.

Table 6-33 summarises the results of the 26 non-associated dwellings wireframe analysis, based on their land use, effect and impact and summarises the results for public viewpoints.

The detailed assessment identified that 25 non-associated dwellings would have a ‘low’ visual impact rating (refer **Table 6-33**) and 1 non-associated dwelling (ID R123) would have a ‘moderate’ rating, which is based on topography alone and does not take into account intervening vegetation or mitigation measures. Site investigation of this dwelling identified intervening vegetation between the Project and the receiver. Therefore, a photomontage has been prepared from R123 to verify the visual impact at this location. Assessment of the photomontage using the visual magnitude grid tool identified a ‘low’ impact due to the intervening vegetation that would filter views to most of the Project (refer **Table 6-34**).

The detailed assessments for each of the 26 non-associated dwellings is provided in Appendix B of the LVIA (**Appendix K**). The preliminary assessment for public viewpoints is provided in Appendix A of the LVIA (**Appendix K**).

Table 6-33 Wireframe Analysis Summary - Non-associated Dwellings Prior to Mitigation

Dwelling ID	*Land Zone*	*Receiver Sensitivity*	*LCZ*	*Scenic Quality*	*Overall Visual Sensitivity*	*Magnitude Rating*	*Visual Impact Rating*	*Mitigation Required*
123	RU4	Moderate	LCZ04	Low	Moderate	Moderate	Moderate	**Yes**
450	RU4	Moderate	LCZ04	Low	Moderate	Very Low	Low	No
15	RU1	Moderate	LCZ02	Moderate	Moderate	Very Low	Low	No
60	RU1	Moderate	LCZ02	Moderate	Moderate	Very Low	Low	No
388	RU4	Moderate	LCZ02	Moderate	Moderate	Very Low	Low	No
506	RU1	Moderate	LCZ03	Low	Moderate	Very Low	Low	No
826	RU4	Moderate	LCZ02	Moderate	Moderate	Very Low	Low	No
1216	RU1	Moderate	LCZ05	Low	Moderate	Low	Low	No
489	RU4	Moderate	LCZ02	Moderate	Moderate	Very Low	Low	No

Dwelling ID	*Land Zone*	*Receiver Sensitivity*	*LCZ*	*Scenic Quality*	*Overall Visual Sensitivity*	*Magnitude Rating*	*Visual Impact Rating*	*Mitigation Required*
510	RU4	Moderate	LCZ04	Low	Moderate	Very Low	Low	No
539	RU1	Moderate	LCZ04	Low	Moderate	Very Low	Low	No
568	RU1	Moderate	LCZ04	Low	Moderate	Very Low	Low	No
671	RU5	High	LCZ06	Moderate	High	Very Low	Low	No
737	RU5	High	LCZ06	Moderate	High	Very Low	Low	No
835	RU4	Moderate	LCZ06	Moderate	Moderate	Very Low	Low	No
1219	RU1	Moderate	LCZ05	Low	Moderate	Very Low	Low	No
453	RU4	Moderate	LCZ06	Moderate	Moderate	Very Low	Low	No
394	RU4	High	LCZ02	Moderate	High	Very Low	Low	No
651	RU5	High	LCZ06	Moderate	High	Very Low	Low	No
626	RU5	High	LCZ06	Moderate	High	Very Low	Low	No
27	RU4	Moderate	LCZ05	Low	Moderate	Low	Low	No
113	RU4	Moderate	LCZ05	Low	Moderate	Low	Low	No
1244	RU1	Moderate	LCZ05	Low	Moderate	Very Low	Low	No
17	RU1	Moderate	LCZ05	Low	Moderate	Very Low	Low	No
11	RU1	Moderate	LCZ01	Moderate	Moderate	Very Low	Low	No
1245	RU1	Moderate	LCZ01	Moderate	Moderate	Low	Low	No

Table 6-34 summarises the four non-associated dwellings (IDs 27, 113, 123 and 1216) and two public viewpoints (VP02 and VP07) identified in the LVIA to verify the Visual Impact from the Project using photomontages (refer **Photo 6-1** to **Photo 6-5**). The photomontages for these viewpoints are provided in Appendix C of the LVIA (**Appendix K**).

The photomontages indicate that all public viewpoints have a ‘very low’ visual impact rating and non-associated dwellings have a ‘low’ visual impact rating. As such, they do not require additional mitigation measures. However, additional measures have still been recommended aiming to further limit visual impact from the Project (refer **Section 6.6.7**).

Table 6-34 Visual Magnitude Summary

Viewpoint Type and ID	*Potential Visual Impact* [17]
Non-associated ID 27	■ Occupied Cells[18]: 11. ■ Visual Impact Rating: Low.

Photo 6-1 Photomontage Dwelling ID 27 – Viewpoint from House Yard

[17] The inset image provides an accurate representation of the view when the document is viewed at 100% zoom on a screen or held at arm's length when printed at A3 size.

[18] Occupied cell. A cell is deemed to be unoccupied if the Project does not cover more than approximately 25% of a cell (Technical Supplement, DPE 2022)

Viewpoint Type and ID	*Potential Visual Impact* [17]
Non-associated *ID 113*	■ Occupied Cells: 6. ■ Visual Impact Rating: Low.

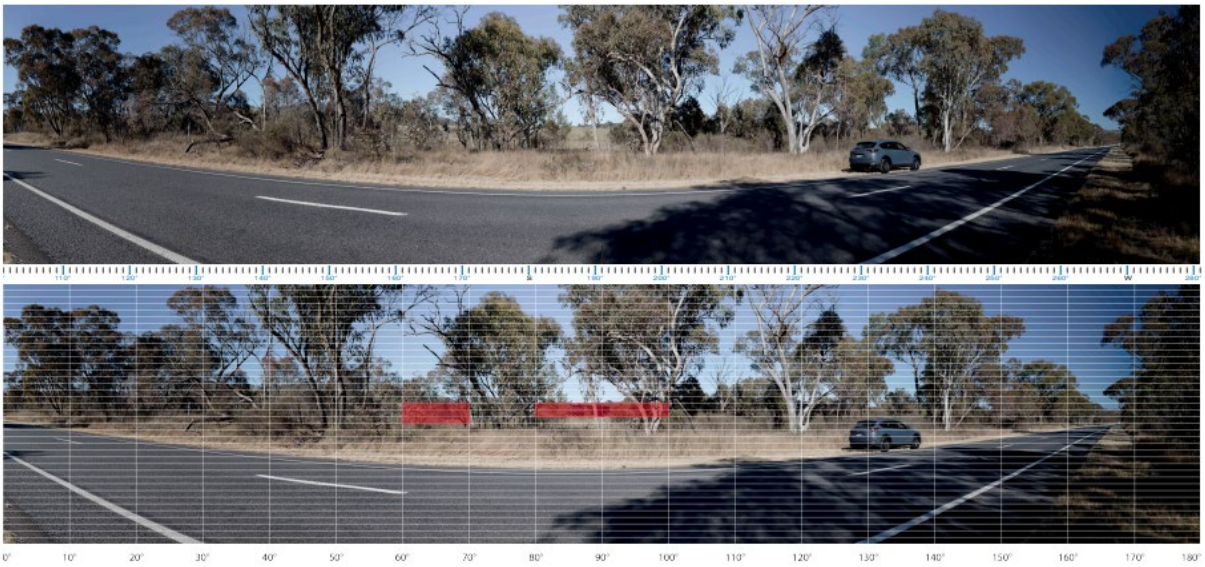
Photo 6-2 Photomontage Dwelling ID 113 – Viewpoint from Driveway

Viewpoint Type and ID	*Potential Visual Impact* [17]
Non-associated ID 123	■ Occupied Cells: 5. ■ Visual Impact Rating: Low.

Open landscape with trees and fence, with grid lines and red shading to indicate Project Area

Photo 6-3 Photomontage Dwelling ID 123 – Viewpoint from House Yard

Non-associated ID 1216	■ Occupied Cells:1. ■ Visual Impact Rating: Low.
Public Viewpoint VP02	■ Occupied Cells: 7. ■ Visual Impact Rating: Very Low.



Viewpoint Type and ID	*Potential Visual Impact* [17]

Photo 6-4 Photomontage VP01 – Viewpoint from Oxley Highway

Public Viewpoint VP07	■ Occupied Cells: 1. ■ Visual Impact Rating: Very Low.

Viewpoint Type and ID	*Potential Visual Impact* [17]

Photo 6-5 Photomontage VP02 – Viewpoint from Southern end of Caroline Street

The LVIA has undertaken a ZVI assessment to determine the visual impact assessment of the Project on the 16 historic heritage items (identified in **Section 6.4**), provided in Section 9.11 of **Appendix K**. The ZVI assessment indicates that 9 historic heritage items would have no visibility toward the Project and 7 historic heritage items would have up to 25% visibility toward the Project.

A detailed assessment for these 7 historic heritage items found that 6 historic heritage items have a 'Low' potential visual impact due to existing screening factors such as intervening vegetation and structures and 1 historic heritage item has a 'Very Low' potential visual impact due to existing screening factors such as intervening vegetation and structures. As such, no further assessment is required for those found to have 'Low' or 'Very Low' potential Visual Impact.

6.6.5 Night lighting

Existing sources of light including homesteads and motor vehicles are currently present in the night-time landscape of the Study Area. Night lighting around the Project infrastructure will be installed to comply with Australian/New Zealand Standard AS/NZS 4282:2019 – Control of Obtrusive Effects of Outdoor Lighting.

The National Light Pollution Guidelines for Wildlife (DEE, 2020) will also be considered during the detailed design phase for night lighting considerations. It is likely there will be limited or no visual impacts resulting from night lighting of Project infrastructure.

6.6.6 Glint and Glare

A glint and glare assessment was undertaken for the Project utilising a Solar Glare Hazard Analysis Tool (SGHAT). The SGHAT was used to evaluate glare resulting from the Project's solar array for each receiver (includes dwellings, roads and rail and aviation), based on proximity, orientation and specifications of the PV modules.

Glint and glare impacts were calculated based on the following factors:

- Position of the sun over time with respect to the location of the Project;

- Assessment is based on a worst-case scenario assuming clear weather all year round (e.g., no cloud coverage);
- Tracking axis tilt, tracking axis orientation and properties of the PV modules; and
- Potential to screen the impact by surrounding topography.

Modelling has been conducted in consideration of three scenarios of tracking system and stowing angle of the PV panels.

The nature of glare that can be expected at each potential receiver was classified into three categories and colours:

- Green Glare: Low potential for temporary after-image;
- Yellow Glare: Potential for temporary after-image; and
- Red Glare: Retinal burn, not expected for PV.

The modelling assumptions considered in this assessment are discussed in full in Section 11 of the LVIA (**Appendix K**).

Non-associated Dwellings

A total of 39 representative non-associated dwellings were assessed within 3 km of the Project Area that have a potential line of sight.

Modelling was assessed for dwellings at a height of 1.5 m AGL and was based on a worst-case scenario and not considering weather conditions and intervening elements (e.g., vegetation and built structures).

Glare modelling of two scenarios resulted in minimal glare at non-associated dwellings surrounding the Project. Scenario 3 was deemed to have no glare impacts. The Applicant is committed to Scenario 3 as a mitigation measure for the Project.

Scenario 3 consists of a normal tracking with backtracking but no stowing angle - scenario was modelled with a normal tracking angle of ±60° and includes backtracking but no night-time stowing angle. In this case, the panels move between the operational range (maximum tilt) and move to a horizontal position outside of normal tracking hours. This scenario allows operation of the panels under normal tracking at all times. Backtracking operations will be restricted during the hours of 11:45 am to 12:15 pm between approximately from mid-June and late-June.

The glare assessment based on Scenario 3 is provided in Appendix D of the LVIA (**Appendix K**).

Road and Rail

New England Highway and Oxley Highway were identified as road receivers within 1 km of the Project's solar array.

Modelling for road receivers was calculated on a maximum height of 2.4 m AGL, which is representative of the eye level for truck drivers (Austroads, 2021), and was based on a worst-case scenario, not considering weather conditions and intervening elements (e.g., vegetation and built structures).

Two scenarios, including Scenario 3 were deemed to have no glare impacts at road receivers. The Applicant is committed to Scenario 3 as a mitigation measure for the Project.

The glare assessment result based on Scenario 3 for road receivers is provided in Appendix D of the LVIA (**Appendix K**).

Aviation

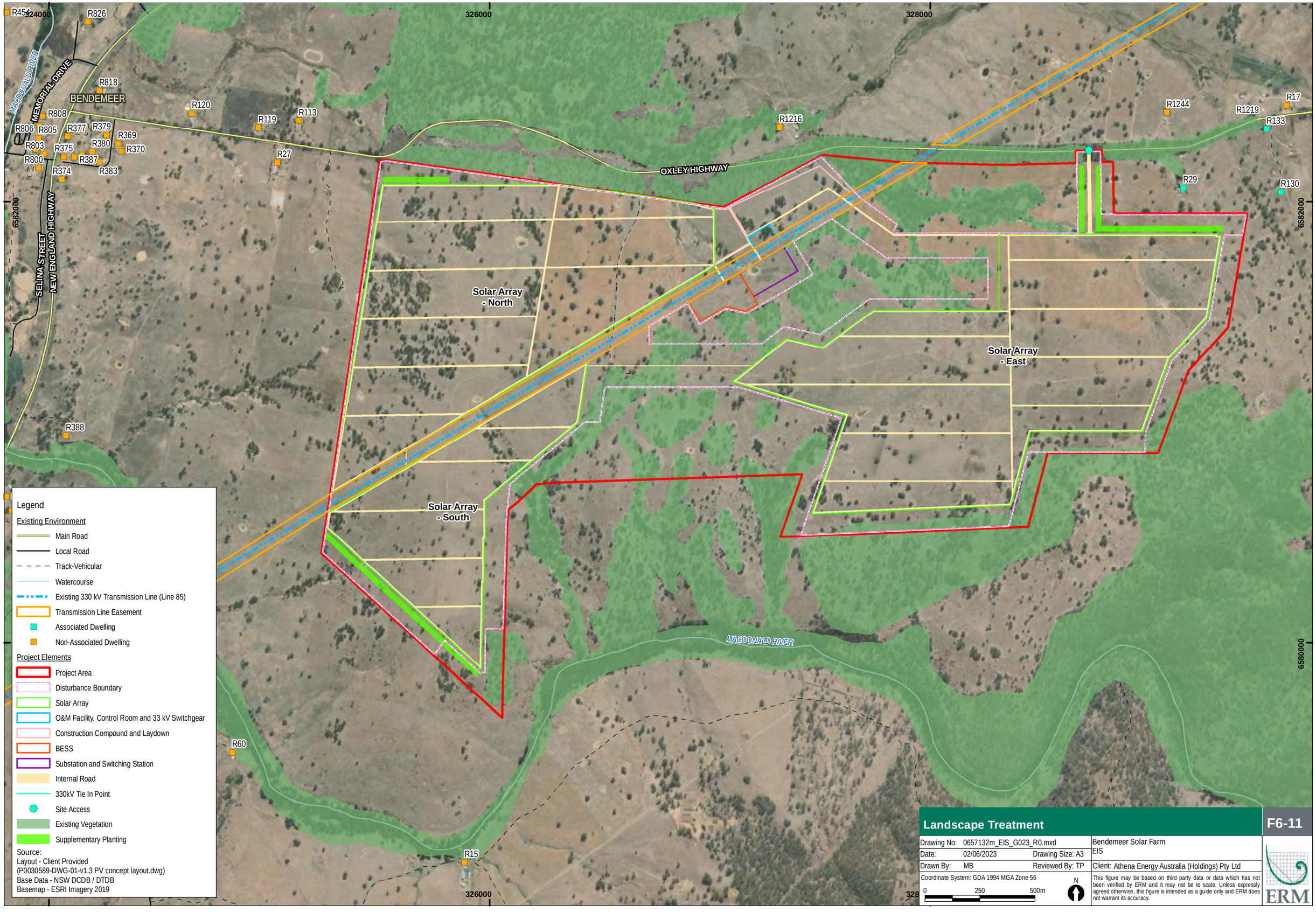
No landing strips have been identified within 5 km of the Project's solar array therefore no further assessment is required.

6.6.7 Mitigation and Management

Specific mitigation measures have been recommended with an aim to further limit visual impact and avoid potential glare from the Project. Additionally, as part of the detailed design, the Applicant will continue to investigate options to further minimise visual and glare impacts of the Project.

The mitigation measures summarised below will reduce and mitigate visual and glare impact of the Project whilst enhancing the visual character of the surrounding environment, these are discussed in detail in Appendix E of the LVIA (refer **Appendix K**):

- A few isolated dense patches of remnant vegetation within the Project Area, which have largely been avoided by the Project, and along the Oxley Highway will be retained, which would limit views towards the Project from dwellings to the north;
- Supplementary planting, illustrated in **Figure 6-11**:
  - On the north-western boundary of the Project Area would limit views of the Project from Oxley Highway;
  - On the north-eastern boundary of the Project Area would limit views from dwellings to the north-east; and
  - On the south-western boundary of the Project Area would limit views from dwellings to the south.
- Project detailed design will consider night lighting practices and design in accordance with specific guidelines. Night lighting considerations will include:
  - Lighting required will be in accordance with Australian/ New Zealand Standard AS/NZS 4282:2019 - Control of Obtrusive Effects of Outdoor Lighting;
  - Control the level and duration of lighting as required;
  - Switch lighting off when not required;
  - Lighting will only be used for areas that require lighting (e.g., paths, building entry points);
  - Use of sensors to activate lighting and timers to switch off lighting will be considered;
  - Use energy efficient bulbs;
  - Direct light downwards to reduce potential light pollution and ensure lights are not directed at reflective surfaces; and
  - Use non-reflective dark coloured surfaces to reduce reflection of lighting and use light shield fittings to avoid light spill.
- Backtracking operations will be restricted during the hours of 11:45 am – 12:15 pm between approximately from mid-June to late-June.


324000
326000
328000
6582000
6580000
R451
R826
R818
BENDEMEER
MEMORIAL DRIVE
MACDONALD RIVER
R808
R806
R805
R377
R379
R369
R803
R375
R380
R370
R800
R374
R387
R383
R120
R119
R113
R27
R1216
R1244
R1219
R17
R133
R29
R130
OXLEY HIGHWAY
SELINA STREET
NEW ENGLAND HIGHWAY
Solar Array - North
Solar Array - East
Solar Array - South
R388
R60
R15
MACDONALD RIVER
Legend
Existing Environment
Main Road
Local Road
Track-Vehicular
Watercourse
Existing 330 kV Transmission Line (Line 85)
Transmission Line Easement
Associated Dwelling
Non-Associated Dwelling
Project Elements
Project Area
Disturbance Boundary
Solar Array
O&M Facility, Control Room and 33 kV Switchgear
Construction Compound and Laydown
BESS
Substation and Switching Station
Internal Road
330kV Tie In Point
Site Access
Existing Vegetation
Supplementary Planting
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Landscape Treatment
F6-11
Drawing No: 0657132m_EIS_G023_R0.mxd
Date: 02/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

6.7 Soils and Agriculture

6.7.1 Introduction

A Soil and Agricultural Impact Statement (SAIS) was prepared to identify and evaluate the impacts associated with the construction and operation of the Project on land capability, soil erosion, sedimentation, agricultural resources and agricultural production. The SAIS is provided in **Appendix L**.

SEARs have been issued for the Applicant to address (refer **Appendix A**). This **Section 6.7**, and the more detailed assessment included in **Appendix L**, address the following SEARs under the 'key issues' Land:

- A soil survey to determine the soil characteristics and consider the potential for erosion to occur;
- Assessment of the impact on agricultural resources and agricultural productivity; and
- Completion of a Land Use Conflict Risk Assessment in accordance with the NSW Department of Primary Industry's Land Use Conflict Risk Assessment (LUCRA) Guide.

In addition to addressing the SEARs, the SAIS considered relevant stakeholder engagement outcomes (e.g., where any potential land value related impacts of the Project were identified on neighbouring properties and any mitigation measures). These are discussed in **Section 5**.

The assessment requirements pathway is shown in Figure 3 of **Appendix L**. Table 1 of **Appendix L** details the requirements of a 'Level 2 – Reduced' Agricultural Impact Assessment.

The SAIS has considered the following guidelines, policy and literature:

- Solar Guidelines (DPE, 2022a);
- 'Land and Soil Capability Assessment Scheme' (LSC Scheme) (Office of Environment and Heritage, 2012);
- 'Land Use Conflict Risk Assessment Guide' (LUCRA Guide) (DPI, 2011);
- 'Managing Urban Stormwater: Soils and Construction' (Landcom, 2004); and
- 'Strategic Regional Land Use Policy' (DPE, 2023b).

6.7.2 Background

The SAIS requires an understanding of land zoning, climate and rainfall, regional landform, regional agricultural land use, agricultural enterprises, and agricultural infrastructure to accurately assess potential impacts.

The lots associated with the Project are zoned RU1 (Primary Production). While electricity generating works are not permitted within these zones under the Tamworth LEP, the provisions of the T&I SEPP take precedence over the LEP.

The Project is in the New England region which experiences a cool temperate climate (OEH, 2014). Climate averages for Bendemeer comprise average maximum temperatures ranging from 28 °C in January to -1 °C in July, and annual rainfall typically between 400 and 800 mm.

The New England and North West Region covers about 98,600 square kilometres (km^2), with landscapes ranging from volcanic rainforest tablelands and cliffs in the east to highly productive broad floodplains on the west flowing rivers. The Project Area is part of the New England fold belt and is composed of sedimentary rock of Carboniferous Permian age that are extensively faulted.

The region plays a significant role in Australia's international export of agricultural products including sporting equine, cattle, poultry, sheep, wool, and pig industries. The most common land use by area is grazing which occupies about 70% of agricultural land, with the remaining productive land mostly used for broadacre cropping. Not surprisingly, agribusiness and service industries dominate employment in the region.

6.7.3 Site specific Agricultural Attributes

The Project Area is situated on a ridge with the top of the ridge running east to west through the associated Lots. The lowest elevation is about 860 m (AHD) in the south-west corner and rises to about 970 m (AHD) in the south-east corner. The change in elevation occurs across about 4 km (**Figure 6-10**). The northern portion of the Project Area slopes down to the Oxley Highway and comprises areas that have been sown with exotic pasture species and has been heavily grazed. The southern half of the Project Area slopes down steeply to the Macdonald River, is generally less heavily grazed and has granite boulders scattered throughout. Watercourses within the Project Area are ephemeral and comprise only 1st and 2nd order streams (refer **Section 6.8**; **Figure 6-14**).

The Project Area is subject to grazing of sheep and cattle as the primary land-use. Livestock are grazed on rotation for breeding and fattening and are watered through surface dams or groundwater water pumped in. General agricultural improvements such as stock fences, shedding, dams and access tracks are widespread throughout the locality, which reflects the historical and current development of the local lands for livestock grazing. No sensitive agricultural activities such as intensive plant or livestock agriculture are being undertaken within the Project Area or its immediate surrounds.

Agricultural productivity is subject to long term climate and rainfall variables, as well as changes in economic, social and policy frameworks, often at a scale well beyond the Project Area. There is no set agricultural productivity value for land under agricultural use. The SAIS has estimated the agricultural productivity reduction of the Project, as stated in **Appendix L,** and summarised in **Section 6.7.6**.

6.7.4 Soil Survey and Site Verification

Existing Soils Information

The following section presents the NSW state government regional mapping data for soil types, inherent soil fertility and LSC relevant to the Project Area (DPIE, 2022).

A search of the NSW regional soil mapping, which has been prepared commensurate with the Australian Soil Classification (ASC), shows the dominant soil type within the Project Area is Tenosol. Tenosol soils have poor physical and/or chemical properties, including weak soils profile, and no significant pedologic development at depth. These properties mean that tenosols generally have very low agricultural potential due to very low chemical fertility, poor structure and low water-holding capacity. As such, sparse grazing is typically the most suitable agricultural land use on these soils.

Inherent soil fertility is a general indication of the soil capacity to retain and release nutrients and water for vegetation to use. It describes soil fertility in NSW according to a class system from 1 to 5, low to high respectively. A search of the inherent soil fertility mapping for NSW indicates the Project Area is dominated by soils with low fertility (1), which present poor chemical and/ or physical properties, supporting limited plant growth. This is consistent with the qualities of tenosols, which are dominant across the Project Area.

The LSC scheme evaluates the physical capacity of the land to maintain a range of land uses and management practices in the long term without leading to degradation of land, soil, water resources and air quality. A search of LSC mapping for NSW shows the Project Area contains the following LSC classes:

- Class 5 (moderate-low capability land) land has high limitations for high-impact land uses; and
- Class 4 (moderate capability land) land has moderate to high limitations for high-impact land uses which restrict land management options for regular high-impact land uses.

The ‘Strategic Regional Land Use Policy’ (DPI, 2011) identifies strategic agricultural land across NSW, including biophysical strategic agricultural land (BSAL) and critical industry clusters (CIC). No areas containing BSAL or CICs were identified within the Project Area. The closest BSAL is associated with Cockburn River, located 15 km south of the Project Area.

Soil and Land Use Survey

A soil and land use survey were undertaken in October 2022 to inform the soil assessment, land and soil capability verification and subsequent management and mitigation measures, particularly those required to avoid or minimise soil erosion during construction, operation and decommissioning of the Project. This satisfies the soil field assessment, sampling and testing requirements relating to soil and land resources in the Solar Guidelines (DPE, 2022a). The fieldwork plan is detailed in the SAIS in **Appendix L**. Briefly, this included:

- Soil survey and mapping undertaken to represent 1 site every 25 ha within the Project Area (1:25,000 survey intensity) and at each site landform pattern and element, soil profile, and taxonomic parameters were collected to allow soil classification in accordance with ASC criteria;
- Collection of data on biophysical features from field sample collection, and comparison to regional mapping to verify LSC; and
- Recording of erosion and evidence of erosive soils including tunnelling, rill, gully and sheet erosion, and recording of areas of potential acid sulphate soils, or salinity.

Soil Survey Outcomes

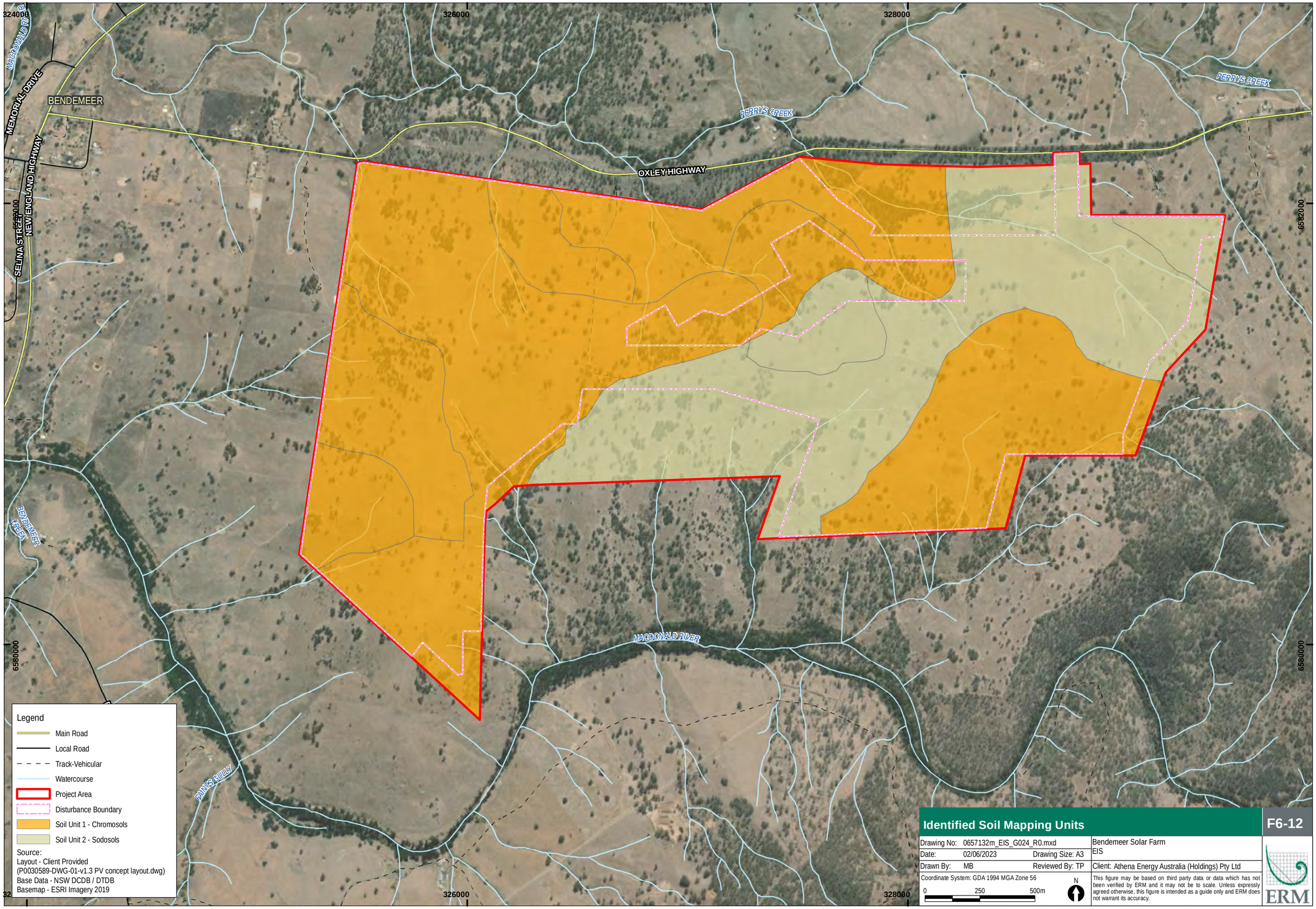
The Project Area was determined to be a stable, free draining landform with 90% - 100% surface cover that has been highly disturbed in the past by land clearing for agriculture. The site is now dominated by sustainable pasture with isolated areas of native trees on some hill crests, lower slopes and drainage lines.

Soil Mapping Units

The soil survey and soil sample analysis found the Project Area contains two dominant soil mapping units, specifically:

- Unit 1 – Chromosols covering about 405.2 ha of the Project Area. These soils have a clear or abrupt textural B horizon in which the upper portion of the horizon (0.2 m) is not strongly acid or sodic. Chromosols are the most encountered soils under agricultural use in Australia; and
- Unit 2 – Sodosols covering 201.2 ha of the Project Area. These soils have a strong texture contrast between A horizons and sodic B horizons which are not strongly acid. The majority of the upper 0.2 m of the B2 horizon (or the entire B2 horizon if it is less than 0.2 m thick) is sodic.

The soil units identified within the Project Area are shown in **Figure 6-12**. Soil profile descriptions are included in Appendix 2 of the SAIS (**Appendix L**).



Identified Soil Mapping Units

F6-12

Drawing No:	0657132m_EIS_G024_R0.mxd		Bendemeer Solar Farm EIS
Date:	02/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56			This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

0 250 500m

N

ERM

Soil Erodibility

Soil aggregate stability refers to the stability of soil structural units (aggregates) when immersed in water. Instability may be indicated by slaking or clay dispersion. A soil with low aggregate stability is likely to be less resilient to mechanical impacts, more likely to be compacted and poorly structured.

The Emerson Aggregate Test (EAT) classifies the behaviour of soil aggregates on their coherence in water when immersed. The EAT classes and the risk relative to erosion potential are provided in The SAIS (**Appendix L**).

Site observations (e.g., of gully erosion) and the EAT indicate that there is moderate to high erosion and sedimentation potential associated with both soil units identified in the Project Area. High levels of sodicity were also observed, primarily in the clay subsoils associated with Soil Unit 2, representing a high risk of dispersion if these soils are disturbed.

Acid Sulphate Soils

Acid sulfate soils (ASS) have been classified into 5 different classes based on the likelihood of the ASS being present in certain areas and at certain depths (DPE, 2018). A review of the NSW ASS mapping identified no areas within the Project Area containing ASS classes (DPE, 2018). Assessment of land elevation and distance from the coast, in conjunction with existing ASS mapping for NSW, identified the potential for ASS within the Project Area is very low. Further, there was no evidence of ASS indicators such as soil gleying, odour, marine sediments and organic materials recorded as part of the soils survey.

Salinity

A review of the regional mapping for salinity risk shows electrical conductivity (EC) between 0.050 to 0.200 decisiemens per metre (dS/m) within the Project Area, which indicates very low salinity risk (eSPADE, 2022).

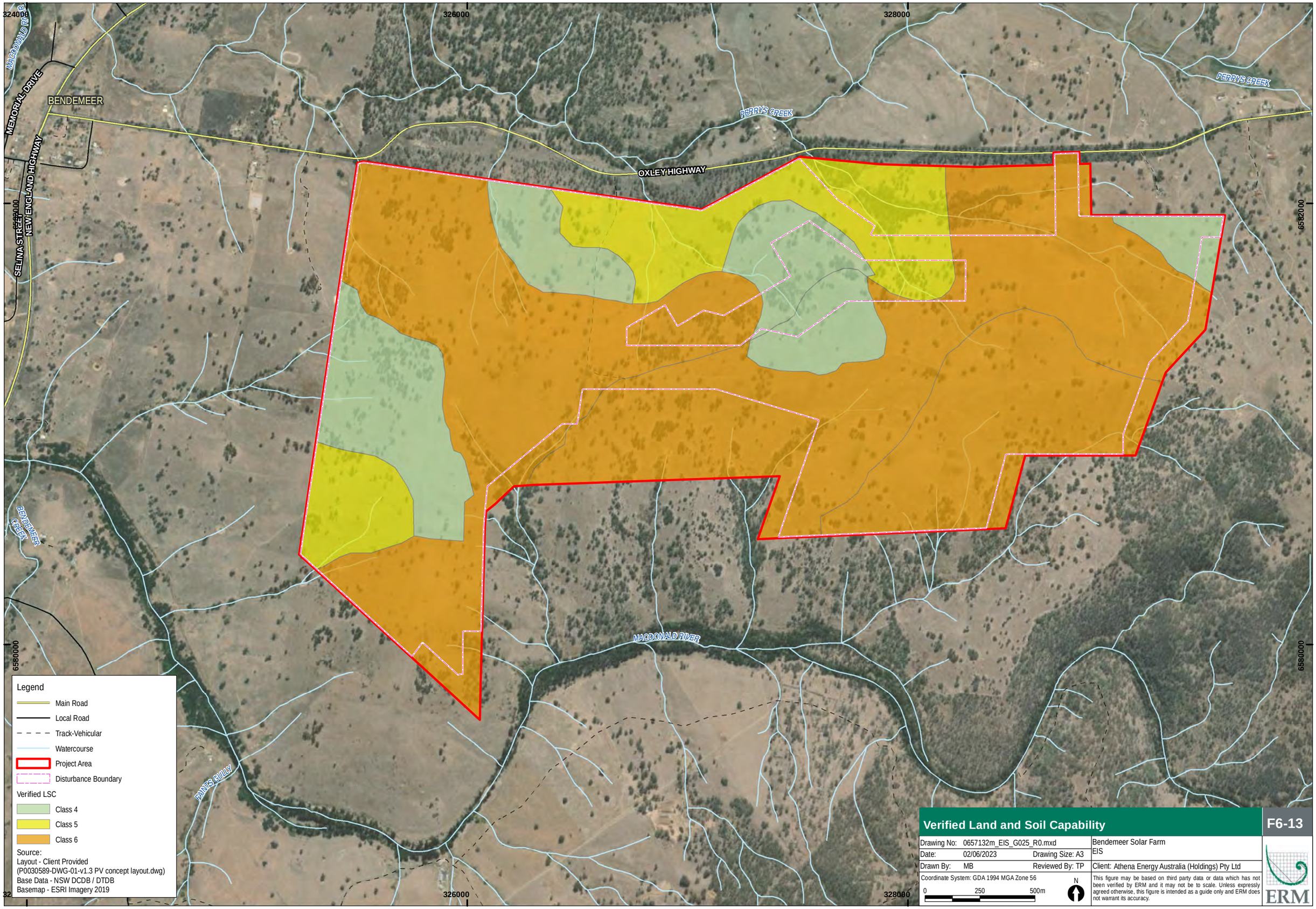
No evidence of areas to be affected by salt scalds or saline seepages were identified during fieldworks. Additionally, the laboratory data indicated all samples tested were non-saline with EC ranging from 0.007 to 0.056 dS/m, and all EC of a saturated soil extract (Ece) were inferior of 0.7 dS/m. Therefore, the risk of salinity within the Project Area is considered negligible.

LSC Site Verification

Soils samples collected at the 25 sites across the Project Area were also used to verify LSC within the Project Area. Results verified that the following three LSC classes occur within the Project Area:

- LSC class 4: moderate capability land, occurs across about 112.5 ha. The key limitations of this class include water-logging and wind erosion;
- LSC class 5: moderate to low capability land, occurs across about 81.9 ha. The key limitations of this class include soil acidity and wind erosion; and
- LSC class 6: low capability land, occurs across about 412.0 ha. The key limitations of this class within the Project Area include water-logging, and soil depth.

The spatial extent of each verified LSC mapping is shown in **Figure 6-13**.


324000
326000
328000
6582000
6580000
MACDONALD RIVER
MEMORIAL DRIVE
BENDEMEER
NEW ENGLAND HIGHWAY
SELINA STREET
OXLEY HIGHWAY
PERRYS CREEK
PERRYS CREEK
BENDEMEER CREEK
MACDONALD RIVER
FAINTS GULLY
Legend
Main Road
Local Road
Track-Vehicular
Watercourse
Project Area
Disturbance Boundary
Verified LSC
Class 4
Class 5
Class 6
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Verified Land and Soil Capability
F6-13
Drawing No: 0657132m_EIS_G025_R0.mxd
Bendemeer Solar Farm
EIS
Date: 02/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Client: Athena Energy Australia (Holdings) Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

6.7.5 Land Use Conflict Risk Assessment

A LUCRA based on the 'Land Use Conflict Risk Assessment Guide' (DPI, 2011) is required as part of a 'Level 2 – Reduced Agricultural Impact Assessment' in accordance with the Solar Guidelines (DPE, 2022a). LUCRA is a system used to identify and assess the potential for land use conflict to occur between neighbouring land uses. The aims of the LUCRA are to:

- Accurately identify and address potential land use conflicts issues and risks of occurrence before a new land use proceeds or a dispute arises;
- Objectively assess the effect of a proposed land use on neighbouring land uses;
- Increase understanding of potential land use conflict to inform and complement development control and buffer requirements; and
- Highlight or recommend strategies to help minimise the potential for land use conflicts to occur and contribute to the negotiation, proposal, implementation and evaluation of separation strategies.

Land use conflicts occur when one land user is perceived to infringe upon the rights or impact the values or amenity of another. In rural areas land use conflicts commonly occur between agricultural and residential uses. However, land use conflicts can also occur between different agricultural enterprises and other primary industries.

The complete LUCRA can be found in Appendix 1 of the SAIS (**Appendix L**). The LUCRA compares the Project against adjoining/surrounding land uses and activities for incompatibility and conflict issues based on the risks and impacts identified in the Section 5 of the SAIS, and the mitigation measures and controls presented in Section 6 of the SAIS. Each potential conflict between the operation of the Project and adjacent land was assessed and given a risk ranking based on probability and consequence as outlined in Appendix 1 of the SAIS.

The implementation of mitigation measures outlined in this EIS and associated technical assessments reduce the level of risk for the majority of considered potential risks with complaints or conflict being managed within normal operations. The summary of mitigation and management measures is provided in **Appendix B**. Considering these mitigations measures, no high-risk potential conflicts were identified in the LUCRA; however, the potential conflicts outlined in **Table 6-35** remain a moderate risk.

Table 6-35 summarises the potential conflicts with moderate risks. The Applicant will continue to engage with stakeholders to identify and address concerns if they arise.

Table 6-35 LUCRA Moderate Risk Items and Mitigation Measures

Potential Conflict	Mitigation Measures
Impact on visual amenity	■ Mitigation measures specified in the LVIA (refer **Section 6.6.7**) will be implemented to minimise the risk of altered amenity for surrounding residents and public within the locality. ■ Compliance with mitigation measures specified within the LVIA is anticipated to further limit visual impact from the Project.
Increased traffic and impact on fauna and machinery	■ Appropriate mitigation measures will be included in the TMP to minimise impacts to the traffic environment (refer **Section 6.9.8)**.
Impact on waterways during construction	■ Soil erosion and sedimentation controls measures will be implemented to ensure the risk of conflict related to watercourse health and quality is reduced. ■ A Conceptual Soil and Water Management Plan is provided in **Appendix M**.
Introduction and/or spread of weeds, diseases and pests	■ The potential for pest species to impact agriculture has been considered in the BDAR. Appropriate mitigation measures will be adopted to minimise the risk for weeds and pests to spread throughout the site and onto neighbouring land (refer **Section 6.2.6**).

Potential Conflict	Mitigation Measures
Fire risks and impacts on fauna, land and infrastructure	■ Consideration of potential bushfire impacts to and from the Project and the use of bushfire prone land has been undertaken as part of the PHA and Bushfire Assessment Report (BFAR). Appropriate mitigation measures will be adopted to minimise the risk of fire incidents including their risk to people and potential to damage surrounding land (refer **Section 6.10.5** and **Section 6.11.4**).
Properties devaluation	■ The key factors that may influence land value are amenities impact of the Project to the locality. The Project has been refined and where impacts could not be avoided, management and mitigation measures will be adopted to further reduce potential impacts that may cause devaluation of properties. This includes the introduction of vegetation screening and noise barriers to reduce potential views and noise disturbance of the Project (refer **Section 6.6.7** and **Section 6.5.7**, respectively). Therefore, the residual impacts of the Project during operational phase, after implementation of management and mitigation measures are predicted to be minimal.
Biodiversity impacts	■ The BDAR has evaluated the potential impacts on biodiversity, which has informed the Project layout refinement. Appropriate mitigation measures will be adopted to minimise the risk for impacts on biodiversity within the site and locality (refer **Section 6.2.6**).
Cumulative impacts	■ A cumulative impact assessment has been undertaken for the Project (where required), summarised in **Section 6.16**. Mitigation measures will be adopted for the Project during construction and operation to avoid cumulative impacts of the Project.
Poor rehabilitation	■ A Decommissioning and Rehabilitation Plan will be prepared to ensure the land can be successfully returned to pre-disturbance land and soil capability, and returned to a final land use commitments following decommissioning.

6.7.6 Impacts on Agricultural Land

The Applicant is committed to maintaining as much of the Project Area as possible for agricultural purposes for the duration of the construction and operational phases of the Project, which is known as agrisolar.

The impacts solar farming activities can have on land resources and agricultural productivity range from short term temporary impacts to long term and permanent impacts. **Table 6-36** summarises the potential impacts to soils and agriculture associated with the Project.

Table 6-36 Soils and Agriculture Impacts

Risk Category	Impact Assessment
Agricultural land use and productivity	■ The impact of the Project on productivity of agricultural land was estimated to be $53,214 per year of the Project during operation (Section 5.2 of **Appendix L**), based on: – Temporary decrease of land used for agriculture (associated with infrastructure areas such as the BESS, switchyard, laydown areas, O&M Building etc.) of about 14.8 ha (of the 606.4 ha of the Project Area) for the duration of the Project. This would result in a reduction of $5,916 per year (merino estimated gross margin of $ 399.75 per ha per year) (DPI, 2022); and – An estimated overall stocking reduction of 20% for the remaining Project Area subject to agriculture, resulting in reduction of $47,298 per year. ■ No change to current agricultural land use and productivity on agricultural lands immediately surrounding and in the broader locality as a result of the Project; ■ The Project will have a negligible impact on local, regional and state agricultural services; and ■ Positive impact associated with upgrades to access roads throughout the Project, which will benefit post-Project agricultural land uses.
Soils	■ Minor and temporary soil disturbance associated with construction and maintenance of solar arrays and electrical cabling trenches;

Risk Category	Impact Assessment
	■ Higher impact, temporary disturbance of soils associated with earthworks for the construction of the BESS, substation switching station, facilities and access tracks; ■ Impacts on soil biological balance and nutrient availability are linked to the status of vegetation beneath the solar arrays. Given grass cover will be maintained between and under the solar arrays to provide groundcover, there will be negligible soil composition and productivity impacts as a result of the Project; and ■ Overall, the impacts to the soils of the Project Area are expected to be minimal and temporary. There will be no direct or indirect impacts to the soil resources of the Project locality outside the Project Area.
LSC	■ Minor, temporary impacts on LSC only, no permanent impacts on LSC classes are anticipated as a result of the Project.
Erosion and sediment	■ Erosion risks are primarily associated with the anticipated impacts to sodic subsoils in the vicinity of the proposed BESS and switchyard/ switching station; and ■ EAT classes throughout the entire Project Area indicate the widespread presence of potentially dispersive soils with the potential for increased dispersion upon disturbance. Erosion and sedimentation mitigation and management measures (outlined in **Section 6.7.8**) will be implemented to reduce impacts to surface soils and waterways.
Water	■ Low risk of surface or groundwater impacts, given excavation during construction will be less than 1.2 m; and ■ The hydrologic and hydraulic assessment determined the Project will not create any significant adverse impacts to flood behaviour on the Project Area, downstream properties and floodplain (discussed in **Section 6.8**).
Pest species	■ Pest and/or weed species could potentially be introduced into the Project Area from imported materials, machinery, or naturally spread through removal or damage of current vegetation.
Biosecurity	■ Appropriate measures outlined in **Section 6.2.6** and **Section 6.7.8** will be implemented at local and regional levels to protect the economy, environment and community from pests, diseases and weeds. Therefore, the Project will not have any potential impact on the biosecurity of agricultural resources and enterprises within the region.
Air quality and dust	■ Low risk of impacts associated with dust emissions generated by traffic on unsealed roads, vegetation removal and land disturbance during construction and operation (refer **Section 6.12**).
Traffic	■ Current road network has adequate capacity for construction traffic and free flow conditions would continue (refer **Section 6.9**). Further, no increases in levels of noise and dust that could impact agriculture will result from increased traffic. Therefore, traffic impacts of the Project are not likely to have consequences on agricultural enterprises within the Project locality.
Noise	■ With the implementation of mitigation measures recommended in the NIA, noise impacts will be minimised (refer **Section 6.5, Appendix J**). As a result, the NIA does not predict greater than 90dBA where cattle will be located on a non-associated property adjacent to the Project Area. As such, livestock and other agricultural resources are unlikely to be impacted by noise from the Project.

6.7.7 Cumulative Agricultural Impacts

The cumulative impact on agriculture for the region is considered to be low, as the changes to agricultural land use and agricultural productivity are anticipated to be minor for each SSD, particularly renewable projects. This is assuming other renewable projects in the region will also implement agrisolar and other developments such as mining, industrial development, urban development and re-zoning of large lots into smaller rural residential has minimal land disturbance.

However, cumulative impacts are likely to increase where projects in the New England REZ do not implement agrisolar, these impacts may include changes to land used for agriculture, localised productivity, secondary productivity and some agricultural support services.

Nevertheless, the agricultural industries within the region have an established nature and scale, meaning that significant impacts to critical mass thresholds and regional agricultural infrastructure are unlikely to occur in the foreseeable future.

6.7.8 Mitigation and Management

Table 6-37 summarises the mitigation measures to be implemented for the Project to ensure negligible impact on agricultural resources and enterprise.

A Conceptual Soil and Water Management Plan (SWMP) was prepared to outline the fundamental principles to be followed in the planning and implementation of erosion and sediment control measures for the Project. The SWMP is provided in **Appendix M**.

Table 6-37 Mitigation and Management Measures

Risk Category	Impact Assessment
Agricultural land use and productivity	■ Following construction, agrisolar practices will be implemented across as much of the Project Area as feasible and practicable, minimising the area of land removed from agricultural services; and ■ On Project decommissioning, the entire Project Area will be re-established and returned to an equivalent of its current agricultural productivity, unless otherwise agreed with the landowner and/or regulatory authorities.
Soil and erosion management	■ An erosion and sediment control plan (ESCP) will be prepared and implemented that considers the specific soil dispersion risks during all phases of the Project; ■ Construction will occur in stages, such that the construction zones at any one time will only be a proportion of the overall Project Area. Construction areas will then be progressively revegetated; ■ Where practicable and feasible within engineering constraints construction of the Project should use existing landforms, and minimise contouring; ■ At locations where earthworks are necessary (e.g., construction of substation pads, site facilities, etc) localised erosion and sediment controls will be placed in accordance with the Landcom (2004) guidelines; ■ Where practicable and feasible drainageways will be preserved and stabilised and any surface disturbance will be prioritised during construction to minimise its extent and duration; ■ Gypsum may be applied if sodic subsoils of soil Unit 2 Sodosols are inadvertently exposed during construction and/or decommissioning, which will provide the soil with a stronger aggregate and hold structure when wet; ■ Areas disturbed during construction that are not in active use for over 3 months, will be sown with grass and pasture species with starter fertiliser to provide stabilising ground cover and a healthy topsoil to provide long term protection against erosion (refer **Appendix M**); ■ During operations erosion and sediment control measures will be implemented where soil disturbance occurs to minimise the potential for sediment export. Measures may include sediment fencing, localised sediment traps, and progressive stabilisation with vegetation; ■ Measures to manage any bare areas and erosion that develop beneath the solar arrays over time will be included in a land management plan or similar for implementation during ongoing operation of the proposal; ■ A Decommissioning and Rehabilitation Plan will be prepared within 1 year of the planned closure of the Project, which will detail all infrastructure unwanted for post Project land use that may require temporary erosion and sediment control measures; and ■ Further soil and erosion control measures are described in the Conceptual Soil and Water Management Plan (SWMP) in **Appendix M**.
Soil stripping for rehabilitation	■ Soil will be stripped to maximum excavation depths, or to a depth where parent material is encountered; ■ Where practicable, soil will be stripped when slightly moist, and stripping of excessively dry or wet soils will be avoided; ■ Topsoil and subsoils will be stockpiled separately;

Risk Category	Impact Assessment
	■ Soil stockpiles surfaces will be left in as coarsely structured condition as possible, to promote infiltration and minimise erosion until vegetation is established; ■ Stockpile will be maintained to a height of 3 m; ■ Some stockpiled soils may be utilised as noise or visual bunds or for erosion and sedimentation control structures; and ■ On reuse, topsoil will be spread to a depth that reflects pre-disturbance soil horizons, topsoil will also be treated with fertiliser and seeded in one consecutive operation (as required).
Soil Biology	To mitigate the long-term impacts of the Projects on soil biological balance and nutrient availability the following measures will be implemented: ■ Routine vegetation monitoring and maintenance; ■ Erosion and sediment controls to preserve topsoil material; ■ Routine monitoring and management of visible surface erosion, such as rilling caused by concentrated flows from infrastructure; ■ Promotion of grass cover in spacing between solar arrays; and ■ Weed management strategies to promote continued presence of pasture species and seedbank within topsoil.
Water	■ The ESCP will include erosion hazards to reduce impacts to waterways; and ■ Further management practices that may be relevant to control water impacts and water quality risks of the Project are described in the Conceptual Soil and Water Management Plan (SWMP) in **Appendix M**.
Pest species	Weed and pest management will occur in accordance with control measures specified in **Appendix L**, measures include: ■ Weeds will be assessed and managed continuously through herbicide application and/ or “scalping” of weed species prior to topsoil spreading; and ■ Pests and feral animals may include goats, foxes, cats, rabbits, pigs, and dogs and will be controlled in accordance with Livestock Health and Pest Authority procedures.
Biosecurity	■ On a local level, appropriate weed management will reduce biosecurity risks; and ■ On a regional level, any import of equipment or machinery from overseas will follow the standard procurement safeguards and quarantine procedures as per Australian requirements.
Air quality and dust	■ The Project will implement dust suppression measures to reduce dust emission, as described in **Section 6.12**.
Noise	■ Noise will be effectively managed and minimised through the adoption of standard management practices as described in **Section 6.5.7**.
Monitoring Program	■ Monitoring programs will be outlined in the Soil and Water Management Plan to assess predicted verses actual impacts as the Project progresses to implement controls where required; ■ All operations associated with the Project will be undertaken in accordance with approved environmental management plans and strategies. The management plans will include environmental monitoring programs, where required. Key management plans, or chapters housed within approved environmental management plans will include land management practices, that will assist in managing impacts on agricultural land; and ■ These management plans, which will include mitigation measures to control impacts to soils and agriculture, will be reviewed and revised where necessary to incorporate the requirements associated with the Project prior to commencement.

6.8 Water Resources, Hydrology and Flooding

6.8.1 Introduction

An assessment of the available water resources, including both groundwater and surface water, as well as the risk of flooding within the Project Area was conducted to inform potential impacts to water resources from the Project.

A conceptual SWMP has been developed to inform the necessary measures to mitigate the risk to water resources from erosion and sedimentation (**Appendix M**). A detailed flooding and hydrology assessment was conducted by Northrop Consulting Engineers, with a summary of the report included in following sections and the full report included in **Appendix N**. The FIA was conducted to model various magnitude flood events that may impact the Project Area. A two-dimensional TUFLOW model was used to model the existing case and operational phase impacts from the Project for the 5%, 1%, 0.5%, 0.2% AEPs and PMF events. The 1% AEP (or 1 in 100 AEP) event is generally a critical event used to assess flood risk, and to reduce flood exposure and damage (DPI, 2005).

The modelling incorporated direct rainfall, burst and pre-burst rainfall, rainfall losses, critical storm durations, and various hydraulic parameters. This included terrain, landform modifications, boundary conditions, hydraulic structures, surface roughness, and building and PV panel representations.

These assessments were conducted to satisfy the requirements set out by the SEARs (refer **Appendix A**), and in consideration of the following guidelines:

- 'Guidelines for Controlled Activities on Waterfront Land' (DPI, 2018);
- 'Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings' (DPI, 2003);
- 'Policy & Guidelines for Fish Habitat Conservation & Management' (DPI, 2013);
- 'NSW Floodplain Development Manual 2005' (DPI, 2005);
- 'Managing Urban Stormwater: Soils & Construction' (the 'Blue Book') (Landcom, 2004);
- 'Best Practice Erosion and Sediment Control' (BPESC) (IECA, 2008);
- 'Australian Rainfall and Runoff: A guide to flood estimation' (ARR) (Ball J, et al., 2019);
- 'Bendemeer Flood Study' (Tamworth Regional Council, 2012) and
- 'Bendemeer Floodplain Risk Management Study and Draft Plan' (Tamworth Regional Council, 2015).

The scope of work that was conducted to complete each assessment is presented in **Table 6-38**.

Table 6-38 Scope of Works

Assessment	Scope
Water Resources	■ Desktop review of the water resources within the Project Area; ■ Identification of water supply options for the Project; and ■ Identification of potential impacts from the Project to the identified water resources.
Conceptual Soil and Water Management Plan	■ Review of relevant guidance; ■ Identification of relevant management and mitigation measures for erosion and sedimentation control; and ■ Description of best practice control measures that can be employed and referenced during the development of a Soil and Water Control Plan following detailed design.
Hydrology and Flooding	■ Desktop review of Project Area terrain data, aerial imagery, design plans and pervious flood investigations; and ■ Hydraulic modelling of 5%, 1%, 0.5%, 0.2% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF) events for the current Project area and for the proposed Project layout.

6.8.2 Existing Environment

Surface Water and Water Courses

The Project is located within the Namoi River catchment. The Namoi River catchment is a major sub-catchment of the Murray-Darling Basin. The Namoi River catchment covers an area of about 42,000 square kilometres and is over 350 km long, with Bendemeer at the eastern boundary and Walgett on the western boundary. Climate averages for Bendemeer include average maximum temperatures ranging from 28 °C in January to -1 °C in July, and annual rainfall typically between 400 and 800 mm.

The Strahler stream order classification is used within NSW to describe the hierarchy of streams within a catchment. Stream order is used when provisioning the conservation measures, access licencing requirements and other regulatory considerations. Within the Project Area, there are numerous first order and second order unnamed, ephemeral waterways. Ephemeral waterways to the North of the Project Area flow to Perrys Creek. While ephemeral waterways in the south of the Project Area flow to the Macdonald River. Perrys Creek is an ephemeral 3rd order stream that flows generally east-west meeting the Macdonald River near Bendemeer. The Macdonald River is a perennial 7th order stream that rises on the western slopes of the Moonbi Range and flows generally north-west about 169 km to its confluence with the Namoi River at Warrabah National Park.

Under the *Fisheries Management Act 1994*, waterways that are 3rd order or above may be considered for key fish habitat. As such, both the MacDonald River and Perrys Creek are considered key fish habitat. There are no known threatened freshwater fish species mapped for either watercourse.

These waterways would meet the definition of 'waterfront land' under the WM Act; however, the Project does not involve any works within 40 m of the high bank of these waterways (or any lake, river or wetlands - collectively waterfront land). There are no wetlands of international importance or nationally important wetlands located within the Project Area. There are no large waterbodies within the Project Area, although there are nine man-made dams. The watercourses present within the Project Area and the surroundings are presented in **Figure 6-14**.

The Project Area is part of the Mid-Macdonald River Water Source, managed under the Namoi and Peel Unregulated Rivers Water Sources 2012. Within the Namoi Catchment, the Peel and Namoi Rivers are regulated. However, the Macdonald River, located to the south of the Project Area, is unregulated. Under the Namoi and Peel Unregulated Rivers Water Sources 2012, all water extraction, except for some basic landholder rights extraction, must be authorised by a water access license (WAL).

Groundwater Resources

The Project Area is part of the NSW Murray Darling Basin Fractured Rock Groundwater Source 2020 Plan and is specifically part of the New England Fold Belt Murray Darling Basin Groundwater Source. Small upper aquifers exist in locations in the south and north of the Project Area. Surface dependent groundwater aquifers are mainly associated with perennial 3rd order streams and above.

There are two groundwater bores within the Project Area or a 500 m buffer. These groundwater bores are both listed as functioning, with further detail provided below:

- GW965744 is located within the Project Area and was drilled to a total depth of 95.1 m. This bore is listed for Water Supply use; and
- GW904282 is located outside of and to the east of the Project Area and was drilled to a total depth of 49 m. This bore is listed for stock and domestic uses.

Note that the water bearing zone for these wells have not been recorded. GW965744 was drilled in 2002 and GW904282 was drilled in 2019. Groundwater use for the Project would require a WAL to be approved under the WM Act.

Groundwater Dependent Ecosystems

An assessment of the number and type of Groundwater Dependent Ecosystems (GDEs) within and adjacent the Project Area was conducted through a review of the GDE Atlas (BoM, 2022). A summary of GDEs within or surrounding the Project Area are presented in **Table 6-39** below.

Table 6-39 GDE Mapping Across Project Area

GDE Type	Description
Aquatic	■ There are no aquatic GDEs mapped within the Project Area. High potential aquatic GDEs are mapped along the MacDonald River, to the south of the Project.
Terrestrial	■ Low potential terrestrial GDEs are predominantly mapped across the Project Area. ■ Small scatterings of high potential terrestrial GDEs are present within the project Area. ■ High potential terrestrial GDEs are mapped along MacDonald River.
Subterranean	■ The Project Area is not in an area where subterranean GDEs have been assessed or mapped.

Impacts to GDEs are not anticipated, as the maximum construction depth is not anticipated to intersect groundwater.

Water Quality Objectives

The NSW Water Quality Objectives (WQOs) are the agreed environmental values and long-term goals to achieve healthy waterways in surface water catchments across the State. The WQOs include a range of water quality indicators to help assess the current conditions of waterways and their ability to support its respective uses and values.

The Namoi catchment contains the towns of Tamworth, Gunnedah, Narrabri, Barraba, Boggabri, Manilla, Quirindi, Walgett, Wee Waa and Werris Creek, as well as numerous villages. The key users of water within the region include local councils and water utilities, dryland agriculture, irrigated agriculture (cotton), livestock grazing and forestry. Under the Murray-Darling Basin Plan 2012, there is a requirement to develop water quality management plans for each water resource plan area within the Murray-Darling Basin with the purpose of providing a framework to protect, enhance and restore water quality that is suitable for a range of outcomes. The *Water Quality Management Plan for the Namoi Water Resource Plan Area SW14* (DPIE, 2019) identifies relevant water quality objectives for the Namoi catchment watercourses and the water quality targets required to achieve these objectives.

The corresponding WQO for the Namoi Catchment are detailed in **Table 6-40**.

Table 6-40 Namoi Catchment Water Quality Objectives

Catchment Area	*Applicable Water Quality Objectives*	
Namoi	■ Indigenous People	Maintain water quality to protect First Nations people's water dependent values and uses.
	■ Environment	Maintain water quality to protect and restore water dependent ecosystems.
	■ Drinking water – disinfection	Maintain the quality of raw surface water for treatment for human consumption.
	■ Irrigation water supply	Maintain the quality of surface water for irrigation use.
	■ Primary Contact Recreation	Maintain the quality of surface water for recreational use.
	■ Water Supply	Maintain good levels of water quality.

Namoi Surface Water Resource Plan Area Water Quality Objectives (WQO) have been developed to provide guideline levels to assist water quality planning and management. Considering the Project Area is situated within proximity of a 7th order tributary, meeting the WQO is vital for protecting the

local ecosystem, environmental values, and uses people have for the water downstream of the Project.

Waterway health is assessed against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (formerly ANZECC, 2000). The Guideline establishes values for various water quality measures which support the WQOs.

Water Supply Options

Water volumes that will be required during construction and operation have been estimated based on an understanding of the construction requirements and schedule, as well as the operational water requirements. The anticipated water usage for the Project is provided in **Table 3-6**.

The Project has four viable options available to obtain an adequate source water supply, being:

- Council water supply (or treated wastewater), in agreement with the relevant Council(s);
- Extraction of water collected from existing or new dams using landowner basic rights or an existing landowner bore, in agreement to use their allocation;
- Use of existing surface water or groundwater supply works and WAL and onsite storage using dams or tanks; and
- Extraction from one or more new groundwater bores, which will require WAL(s) in consultation with WaterNSW.

The Project may also store water for use during construction in the numerous dams that are within the Project Area. Water within those dams could be supplemented with water imported from offsite. Should additional groundwater bores or water from other sources covered under the relevant water sharing plan be required, the Applicant would seek to obtain a WAL, and other relevant approvals, subject to availability. As the Project is designated SSD, Clause 4.41 of the EP&A Act negates the requirements for relevant approvals otherwise obtained through the WM Act, including a water use approval under Section 89, a water management work approval under Section 90, or an activity approval under section 91 of the WM Act.

Existing licensed water extraction from surface water sources within the area is primarily for domestic stock purposes. The total number of WALs for water sources relevant to the project and the total allocations available (WaterNSW, 2023) are summarised in **Table 6-41** below.

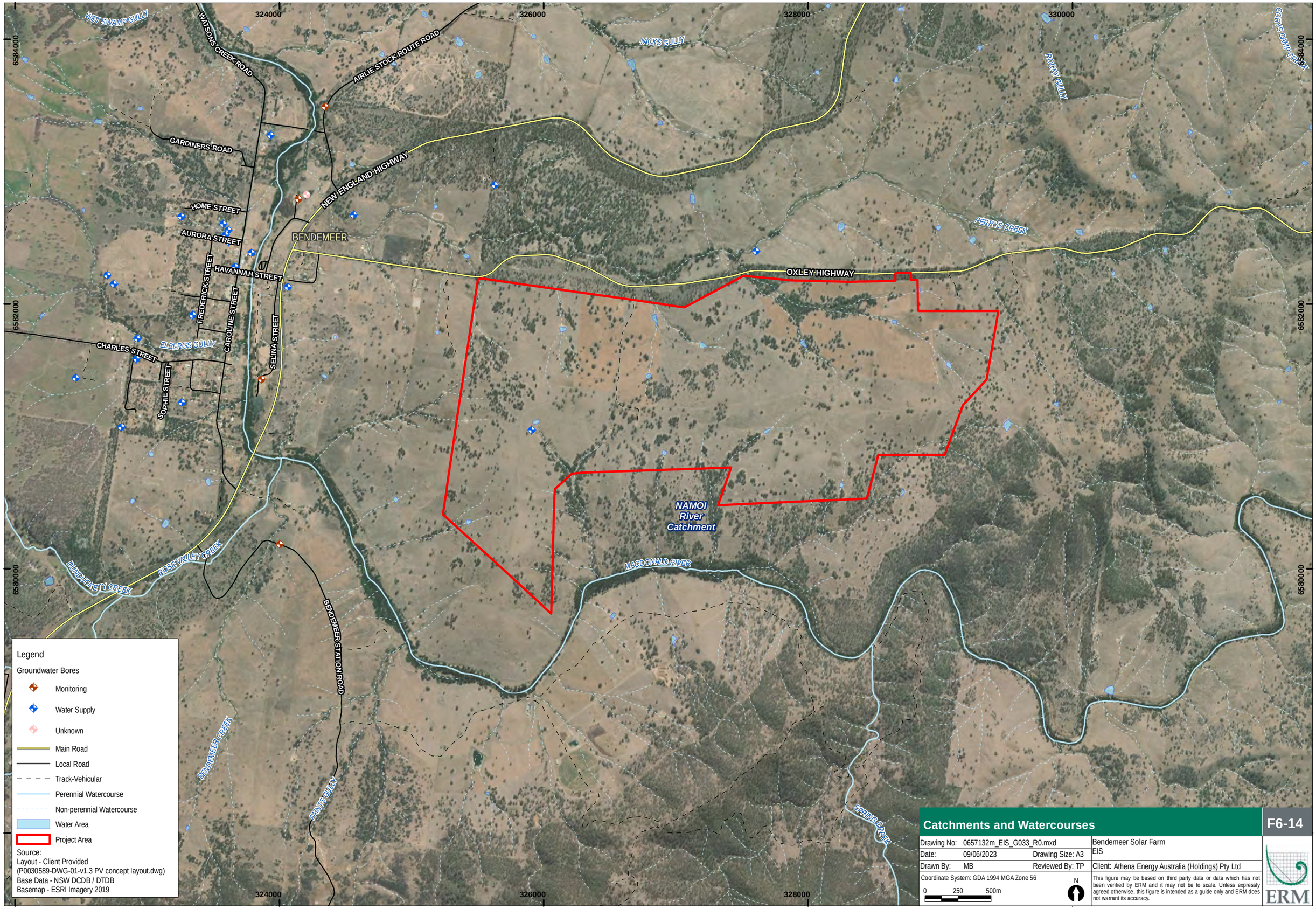
Table 6-41 Catchment Water Licenses and Allocations

Water Sharing Plan Management Area	Total Number of Share Components	No. of WALs
Mid-Macdonald River Water Source	5,156	39
New England Fold Belt Murray Darling Basin Groundwater Source	11,996	156

An extensive analysis was undertaken of water access licence (WAL) holders in the Murray-Darling Basin Fractured Rock Groundwater Sources – New England Fold Belt MDB Groundwater Source, and the Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Source - Mid-Macdonald River Water Source. This analysis identified multiple private WALs having individual allocation to supply the Project during construction, operation and decommissioning in entirety.

A search of publicly available information was undertaken on the Lot/DP associated with these WALs to identify landholder contact details. A suitable landholder was identified who holds adequate WAL allocation for the Project construction, operation and decommissioning in the Mid-Macdonald River Water Source.

The Applicant is currently in negotiations with the identified landholder for use of an existing surface water licence, water supply works permit for a river pump and the potential for a temporary transfer from the registered stock and domestic bore identified within the Project Area.



Catchments and Watercourses

F6-14

Drawing No:	0657132m_EIS_G033_R0.mxd		Bendemeer Solar Farm EIS
Date:	09/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

ERM

6.8.3 Assessment of Impacts

Construction Period

During construction, it is anticipated that water will be required for the following activities:

- Construction of roads, hardstands and miscellaneous construction work;
- Dust suppression; and
- Potential watering of revegetated areas.

The water demand for the construction requirements has been estimated based on these activities and the likely construction schedule (refer **Section 3**). Potential impacts to water resources and water courses from construction are outlined in **Table 6-42**. Impacts to groundwater are not expected as construction activities are not anticipated to be to a depth that will intersect groundwater aquifers.

Table 6-42 Potential Construction Impacts to Waterways

Activity	Potential Impacts
Watercourse Crossings	■ Erosion of drainage lines and subsequent sediment runoff; ■ Removal of vegetation and the subsequent increased erosion potential; ■ Vehicle movements across unaltered watercourses during the construction phase leaving wheel tracks and causing damage to creek beds; ■ Potential for unstable steep banks collapsing under the weight of vehicles or machinery; and ■ Bank erosion at creek crossings from culvert installations.
Water Supply	■ Over-extractions of surface water or groundwater resulting in reduced environmental flows, reduced water availability for existing licensed users and impacts on water dependent ecosystems.
General Construction Activities (e.g., Machinery Operations)	■ Erosion from stockpiles and subsequent sediment run-off; ■ Hydrocarbon spills from machinery (e.g., burst hoses, mechanical failures, leaking machinery); and ■ Contamination of soils from poor refuelling practices.
Ancillary Infrastructure (e.g., substation, operations and maintenance facility)	■ Erosion of disturbed areas and subsequent sediment run-off; and ■ Erosion of soil stockpiles and subsequent sediment run-off.
Stockpile Management	■ Erosion from soil stockpiles and subsequent sediment run-off.

Operation

Water demand during the operation of the Project is expected to be minimal, with the largest requirement likely to be used for solar module cleaning. Water will also be made available for other general maintenance activities and emergency water supply (in the event of a fire).

Potential impacts to water sources during operation are expected to be negligible, as summarised in **Table 6-43**.

Table 6-43 Potential Operational Impacts to Waterways

Activity	Potential Impacts
General Operational Activities (e.g., Machinery Operations)	■ Erosion from stockpiles and subsequent sediment run-off; ■ Hydrocarbon spills from machinery (e.g., burst hoses, mechanical failures, leaking machinery); and ■ Soil erosion following heavy rainfall and subsequent sediment run-off.
Watercourse Crossings	■ Bank erosion at culvert crossings; and

Activity	Potential Impacts
	■ Vehicle movements across unaltered watercourses leaving wheel tracks and causing damage to creek beds.
Driving on Unsealed Access Roads	■ Erosion of roads and roadside drainage; and ■ Mud tracking at the confluence of internal access roads and public roads.

Flooding and Hydrology

Modelled flood behaviour determined that there may be minor increases (generally less than 100 mm) in flood depth and velocity within watercourse corridors in the Project Area; however, these are not considered to create any significant impact on flood behaviour. The 5% and 1% AEP modelled scenarios (both pre- and post-development) are presented in **Figure 6-15** to **Figure 6-18**.

Peak flow increases outside of the Project Area of up to 22% were observed at two locations due to surface roughness changes from the disturbed areas and concentrated flows from PV panels. Graphical presentations of the pre- and post-development changes are presented in **Appendix N**. Other findings regarding flood depth increases in the 5%, 1%, 0.5% and 0.2% AEP from the Project include:

- Minor increases in flood depth that are contained within watercourse channels and creeks. These flood depth increases are not expected to create a significant adverse impact to the Project;
- Increase in water depth of up to 50 mm for the 1% AEP was observed in two off-site locations on the Oxley Highway. However, these impacts are not considered to adversely traffic within the area as the locations are already non-trafficable due to high flood hazard conditions;
- Water depth increases in the 0.5% AEP and 0.2% AEP is less due to the higher flows in the existing case;
- Flood velocity within the Project Area will increase during the operational period following development of the site. However, the increase in velocity is considered minor and is not expected to create any significant impact on flood behaviour or alter flood hazard conditions;
- Modelled flood velocities increases were typically less than 10% and were typically contained within creek and watercourse channels;
- The 5% and 1% AEP flood velocities recorded within the creek and watercourse channels were slightly higher than the erosive threshold for grass (2.5 m/s). Increase flood velocities in the 0.5% and 0.1% events were typically smaller due to greater magnitude of the event; and
- The increase in velocity is minor (10%) and while it may erode the channels and watercourses that will contain the flood impacts, it is considered that the erosion caused following development of the Project Area is not significantly different or increased to the existing scenario.

Therefore, from the modelling conducted it is not considered that the Project will have an adverse impact on flood behaviour.

Climate Change Modelled Events

The 0.5% and 0.2% AEP flood events were modelled as proxy climate change scenarios. This modelling suggested that the flood depth and velocity will increase in both the Project Area and study catchment area as a result of the climate change scenarios. However, the modelling also indicated that the increase would be minor and is considered insignificant in comparison to the other modelled scenarios.

6.8.4 Project Mitigation and Management

Water Resources

The following measures will be implemented to minimise impacts to water resources due to the project, most of which relate to erosion and sedimentation:

- Should additional groundwater bores or water from other sources covered under the relevant water sharing plan be required, the Applicant will seek to obtain a WAL, and other relevant approvals, subject to availability;
- Prepare a SWMP prior to the commencement of construction. The SWMP will be prepared by a suitably qualified person and be accompanied by progressive ESCP to address specific high-risk areas identified during detailed design. The SWMP will be prepared in accordance with the Managing Urban Stormwater guidelines, particularly Volumes 2A and 2C;
- Stage construction activities to minimise the duration and extent of land disturbance;
- Investigate site features and access constraints, and design the Project to minimise disturbance areas;
- Divert upslope (clean) stormwater around the disturbed site and capture sediment-laden run-off from within the disturbed site for diversion to sediment control devices;
- Strip and stockpile topsoil for use in subsequent rehabilitation, and rehabilitate the Project Area promptly and progressively as works progress; and
- Inspect and maintain erosion and sediment control devices for the duration of the Project.

Further management measures that will be employed to minimise the Project impacts are included in **Table 6-44**.

Table 6-44 Erosion and Sedimentation Management and Mitigation

Aspect	Mitigation Measures
Stormwater Management	■ Diversion of clean stormwater run-on away from areas that will be disturbed by construction activities using earth banks or catch drains; ■ Installation of temporary or permanent diversion banks sized by a suitably qualified professional; ■ Collect dirty water in earth banks or catch drains for diversion to sediment control structures; ■ Installation of check dams using rock aggregate, sandbags or geotextile “sausages” may be installed within drains and diversion channels to help reduce flow velocity and consequent erosion, especially on steep sections; and ■ Maintain slope lengths no greater than 80 m in disturbed areas and preferably <50 m on exposed road surfaces and steep slopes.
Erosion Control	■ Stabilise the access point by sealing with concrete, asphalt or loose rock fill; ■ Limit unnecessary vehicle movements across the Project Area; ■ Limit the stripping of topsoil to within two weeks of commencing construction activities; ■ Stockpiles will be located 40 m from any natural waterways, and are to have a 5 m buffer from areas that are likely to receive concentrated water flows; ■ Cover or stabilise stockpiles not in use; ■ Prevent the generation of dust by keeping unsealed access tracks moist during dry or windy conditions; and ■ A suitably qualified person will design all areas of concentrated flow (e.g., diversion banks and waterways) to remain stable during the design storm event.

Aspect	Mitigation Measures
Sediment Control	■ Sediment traps will be used to treat sediment laden run-off that is generated from disturbed areas and maintain the sediment as close as possible to its source; ■ Sediment traps such as sediment fencing, earth or mulch bunds, geotextiles, rock or a combination of these may be employed to manage stormwater run-off across the site; and ■ Sediment basins may be required for larger capture areas of the Project Area to capture dirty water run-off.
Site Rehabilitation	■ Rehabilitation of disturbed areas will occur progressively during the construction period to allow for the stabilisation of individual site areas and to prevent erosion and sedimentation issues; ■ Site stabilisation could be managed through vegetative cover, mulch, rock armouring, paving, concrete, geofabrics and synthetic soil binders; and ■ Site stabilisation will be determined on a site by basis and will be included within the Progressive ESCPs.
Trenching	■ When designing sediment control measures, avoid trenching immediately prior to forecasted rainfall and avoid trenching in areas of concentrated, permanent water flows; ■ Fill trenches as soon as possible after opening, aim for three days from opening to closing trench; ■ Separate topsoil from subsoil materials when excavating and manage the reuse of topsoil during rehabilitation to avoid risk of erosion and sedimentation; ■ Progressively backfill trenches and rehabilitate as soon as possible following excavation; ■ Appropriate sedimentation measures should be used for perpendicular or parallel (across grade) contours to adequately manage stormwater impacts. These measures include, but are not limited to, the use of sandbag plugs or bulkheads for perpendicular trenching or the compaction of excavated soils to create earthbanks uphill from the excavation for parallel excavations; and ■ Minimisation of the disturbance area.
Dewatering	■ Dewatering will be conducted if water collects in trenches, sediment traps or low-lying depressions following rain events; and ■ Water collected from the dewatering could be re-used for dust suppression or watering of rehabilitated areas so long as no run-off can directly discharge to a waterway.
Unsealed Internal Access Roads	■ Maintain good stormwater drainage on unsealed roads across the Project Area; ■ Use of table or metre drains along the road alignment to enable adequate drainage. These drains need to be properly installed and stabilised; ■ Minimise cut and fill by constructing the road at-grade wherever possible; ■ Employ outfall drainage or crowned road surfaces (depending on road placement) to enable roads to shed water; ■ Avoid the formation of windrows along road shoulders when grading; ■ Cross-banks (or rollover banks) or cross-drains should be considered in suitable locations to shed water from the road surface, discharging water in well vegetated, stable areas; and ■ Use of rolled erosion control products to stabilise road batters.
High Risk Areas	■ Areas deemed high risk for potential erosion and sediment control risk such as areas of steep slopes, flow paths of high velocity or in proximity to named waterways, will be identified during detailed design; and ■ Additional management of these areas will be required to manage greater rainfall events.

Conceptual SWMP

A conceptual SWMP was developed (refer **Appendix M**) to outline the fundamental principles to manage the potential erosion and sedimentation impacts from the Project. As part of the Project's detailed design, the Applicant will continue to investigate options to further avoid and minimise impacts from erosion and sedimentation. The conceptual SWMP was developed in accordance with the following guidelines:

- 'Managing Urban Stormwater: Soils and Construction, Volume 2A, Installation of Services' (Volume 2A) (DECC, 2008a); and
- 'Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads' (Volume 2C) (DECC, 2008b).

Site Monitoring and Maintenance

An inspection, maintenance and cleaning program will be required to maintain the effectiveness of the outlined mitigation and management measures. The recommended inspection schedules will be developed as part of the detailed SWMP during the detailed design phase and will include:

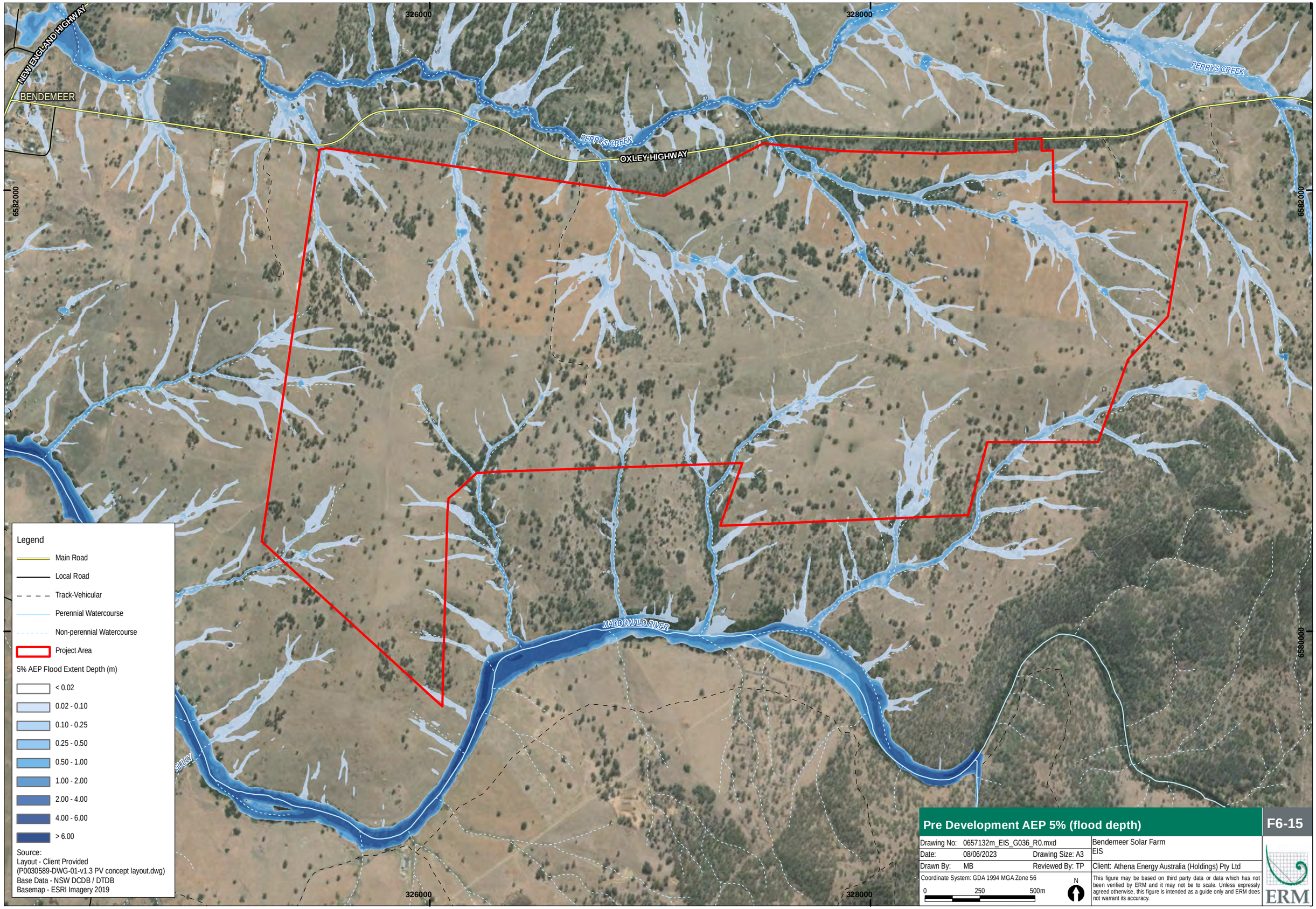
- Inspections during and following storms to check the operation of the installed controls;
- Redesign of inadequate devices; and
- Visual monitoring of potential dust during construction activities to mitigate any air quality impacts.

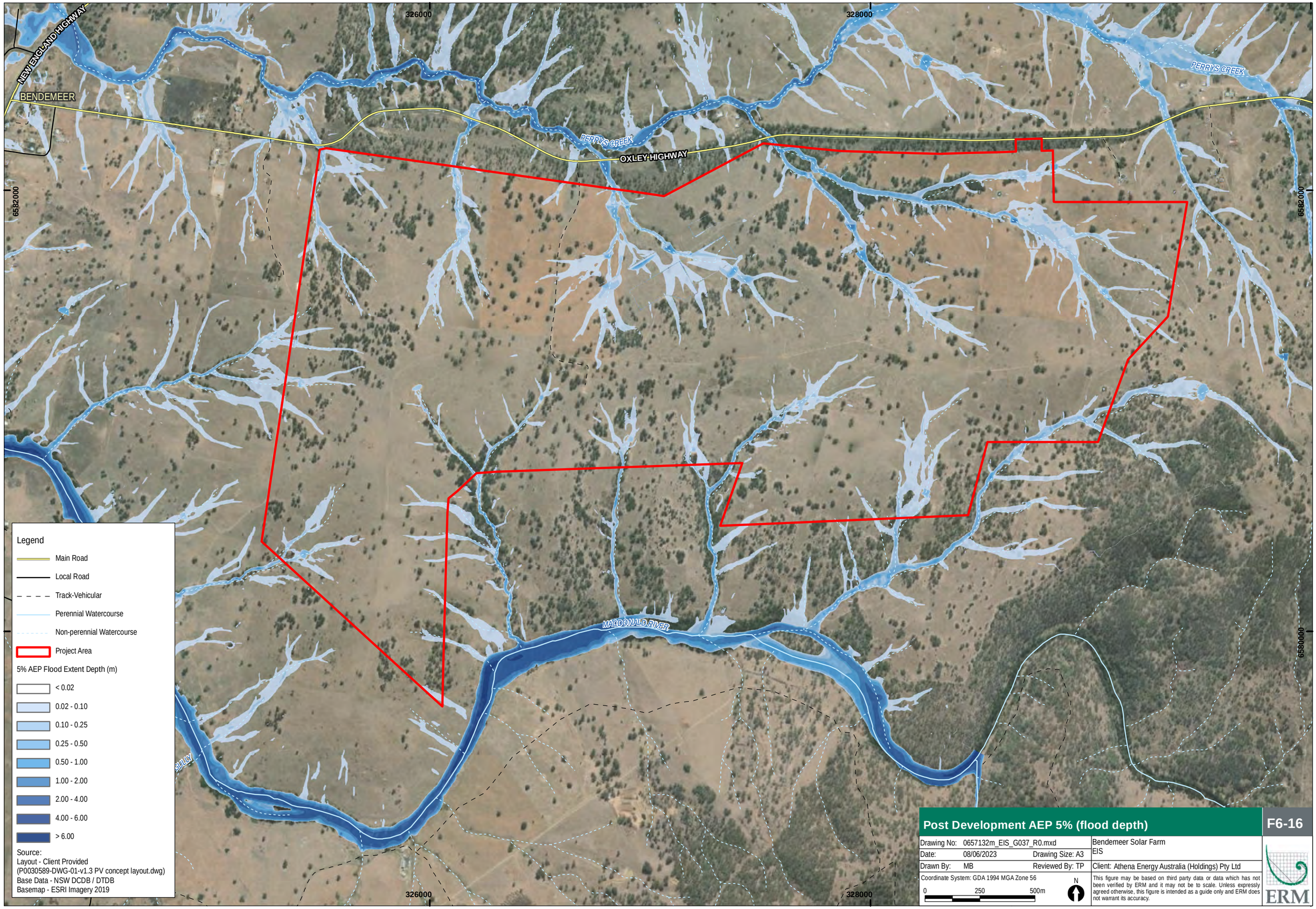
Flooding Mitigation and Management

As considered in **Section 6.8.4.1**, run-off can be managed through the relevant outlined erosion and sedimentation controls.

The following mitigation and management measures will be undertaken to further manage potential flooding impacts as a result of the Project construction:

- Maintain 100 mm of grass cover across the solar array area to mitigate potential impacts from erosion due to increased run-off from the solar panels during rain events;
- Design buildings within the Project Area so that the finished floor level is above the 1% AEP flood level and extra 500 mm freeboard. The freeboard design for other non-habitable budlings should be greater than 300 mm;
- Emergency flood management measures will be in place during operation. These measures will include:
  - Early evacuation during significant rainfall events;
  - Storage of potable water and non-perishable food items on-site is recommended should refuge be required as an option of last resort (modelling indicates isolation on-site would be no more than six hours); and
  - Personnel at the Project Area should stay away from any floodwaters if on-site during a significant rainfall event.


NEW ENGLAND HIGHWAY
BENDEMEER
326000
328000
6582000
PERRYS CREEK
OXLEY HIGHWAY
PERRYS CREEK
MACDONALD RIVER
SULLY
6580000
326000
328000
Legend
Main Road
Local Road
Track-Vehicular
Perennial Watercourse
Non-perennial Watercourse
Project Area
5% AEP Flood Extent Depth (m)
< 0.02
0.02 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 2.00
2.00 - 4.00
4.00 - 6.00
> 6.00
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Pre Development AEP 5% (flood depth)
F6-15
Drawing No: 0657132m_EIS_G036_R0.mxd
Date: 08/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM



Post Development AEP 5% (flood depth)

F6-16

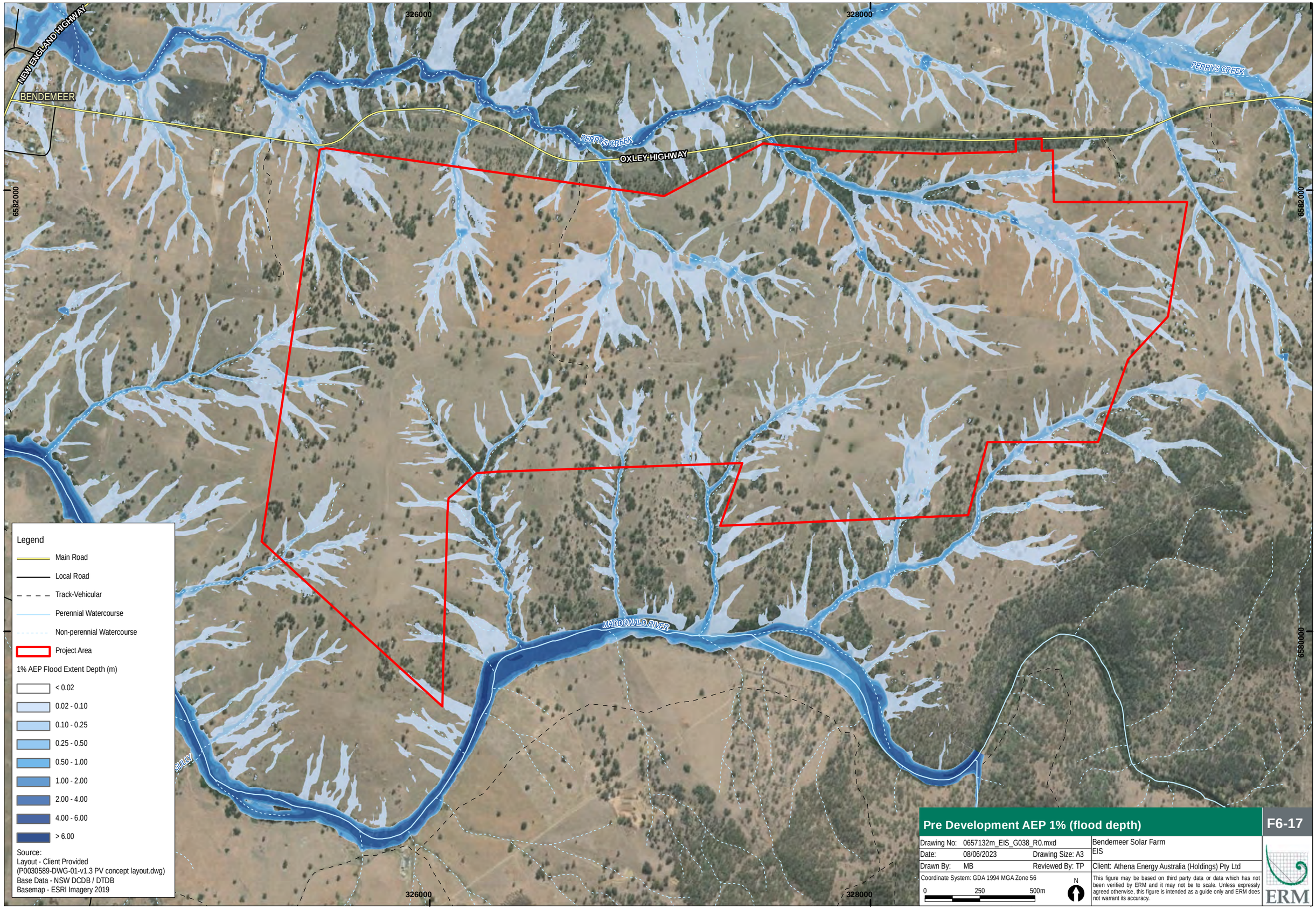
Drawing No:	0657132m_EIS_G037_R0.mxd		Bendemeer Solar Farm EIS
Date:	08/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 250 500m

N

ERM



Pre Development AEP 1% (flood depth)

F6-17

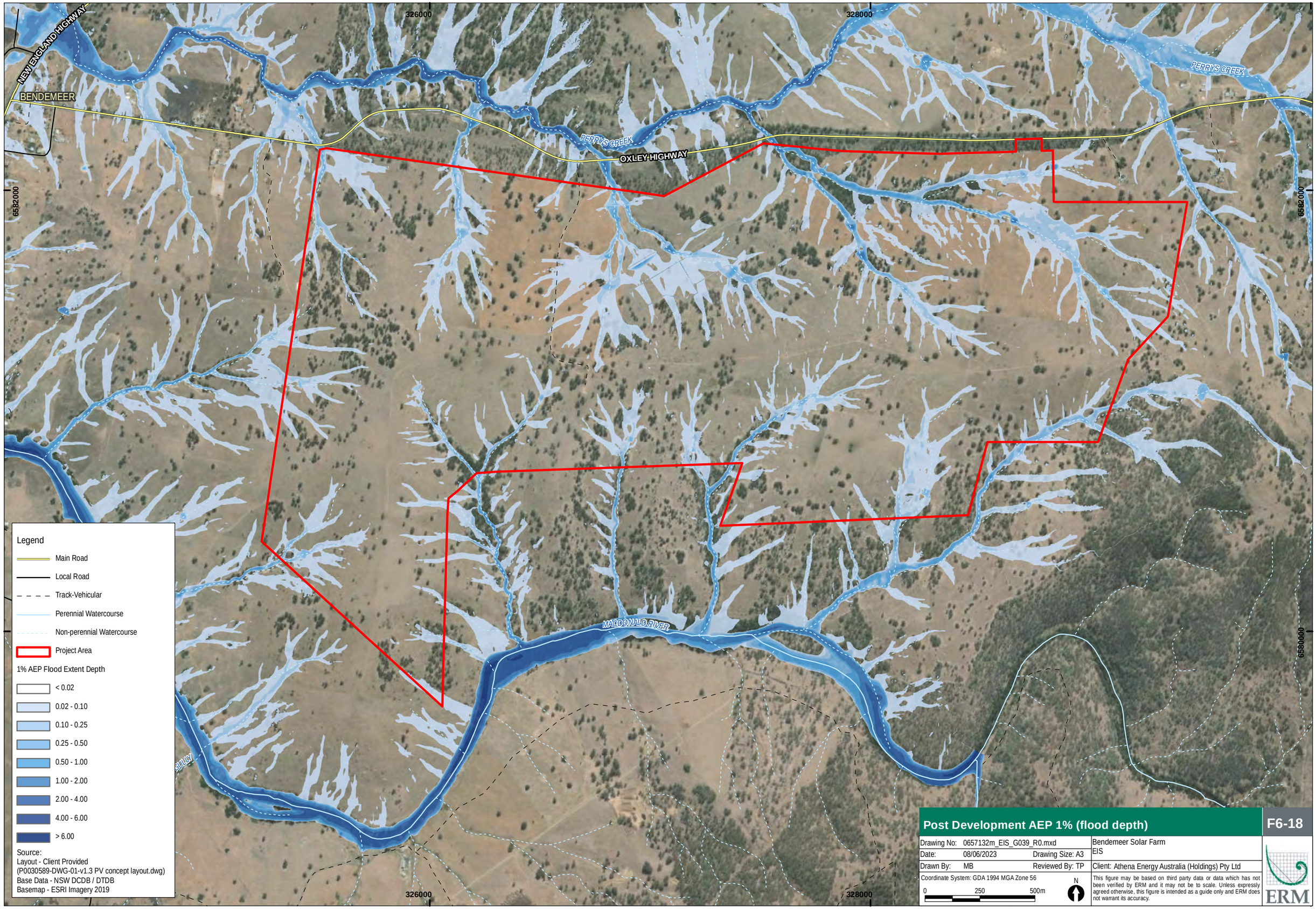
Drawing No:	0657132m_EIS_G038_R0.mxd		Bendemeer Solar Farm EIS
Date:	08/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 250 500m

N

ERM


NEW ENGLAND HIGHWAY
BENDEMEER
326000
328000
6582000
PERRYS CREEK
OXLEY HIGHWAY
PERRYS CREEK
MACDONALD RIVER
SULLY
6580000
326000
328000
Legend
Main Road
Local Road
Track-Vehicular
Perennial Watercourse
Non-perennial Watercourse
Project Area
1% AEP Flood Extent Depth
< 0.02
0.02 - 0.10
0.10 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 2.00
2.00 - 4.00
4.00 - 6.00
> 6.00
Source:
Layout - Client Provided
(P0030589-DWG-01-v1.3 PV concept layout.dwg)
Base Data - NSW DCDB / DTDB
Basemap - ESRI Imagery 2019
Post Development AEP 1% (flood depth)
F6-18
Drawing No: 0657132m_EIS_G039_R0.mxd
Date: 08/06/2023
Drawing Size: A3
Drawn By: MB
Reviewed By: TP
Coordinate System: GDA 1994 MGA Zone 56
0
250
500m
N
Bendemeer Solar Farm
EIS
Client: Athena Energy Australia (Holdings) Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

6.9 Traffic

6.9.1 Introduction

A Traffic Impact Assessment (TIA) was undertaken for the Project to evaluate the potential construction, operational, and decommissioning traffic impacts, and the access arrangements of the Project. It also assesses the potential traffic and transport impacts of the Project and provides appropriate management measures to ensure that any potential impacts can be minimised or avoided. The TIA is provided in **Appendix O**.

The TIA addresses the requirements of the SEARs (refer **Appendix A**) and considers all stakeholder engagement as described in **Section 1**.

The TIA was prepared in accordance with the following guidelines:

- 'Guide to Traffic Generating Developments' (RTA, 2002);
- 'Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections' (Austroads, 2021); and
- 'Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings' (Austroads, 2019).

The TIA incorporated the following scope of works:

- Review of existing traffic and road safety data, including road accident history (crash data) and historical traffic count data;
- Site inspection of the road network and proposed vehicular access routes to the Project, which focused on the intersection design, sight distances, and suitability of the proposed routes;
- Assessment of traffic impacts during all phases of the Project, regarding vehicle types, transport routes, traffic volumes, and site access arrangements;
- Road impacts assessment from heavy vehicle and oversize and overmass vehicles (OSOM);
- A swept path analysis of the largest Restricted Access Vehicle (RAV) to access the site, to identify any constraints, including detailing required road upgrade works; and
- Consultation with key stakeholders.

6.9.2 Background

Local Road Network

The existing road network serving the Project comprises of state roads, which are the major arterial links throughout NSW and within major urban areas. **Figure 6-19** shows the state road network of relevance to the Project include:

- **Oxley Highway**: runs east-west from Port Macquarie linking the Pacific Highway to the New England Highway near Bendemeer, and the Newell Highway near Coonabarabran. It terminates at its connection with the Mitchell Highway at Nevertire. Between the New England Highway and Walcha, the carriageway width is 9 m, with one lane of traffic in each direction and speed limit of 100 km/h; and
- **New England Highway**: runs in a north-west south-east direction, from Newcastle to Muswellbrook and to its end at the Queensland border. From north of Tamworth the carriageway width is 13 m, with one lane of traffic in each direction and sealed shoulders on both sides. It has a speed limit of 100km/h and reduced to 50km/h within populated areas (e.g., Moonbi).

The New England Highway/ Oxley Highway intersection at Bendemeer has a wide geometry and complies with BAL and Channelised Right Turn (CHR) standards.

No incidents were recorded between 2017 and 2021 on the Oxley Highway adjacent the Project Area and New England Highway and within 1 km of the intersection of New England Highway and Oxley Highway. Therefore, the road network currently operates in a safe manner.

Traffic Volumes

A turning movement count survey was undertaken on 16 February 2023 at the intersection of New England Highway and Oxley Highway during peak hours (from 6:00 am to 9:30 am and from 3:00 pm to 7:00 pm). The survey helped to determine the existing traffic conditions at this intersection.

The survey results indicate the intersection currently carries a moderate level of traffic, with most vehicle movements on the New England Highway. The total movements are in the order of 299 vehicle movements in the morning peak hour recorded between 8:15 am and 9:15 am, and 353 vehicle movements in the evening peak hour between 4:45 pm and 5:45 pm. Note that for the purposes of this assessment a vehicle movement is classified as a vehicle travelling in one direction only.

Traffic volume data for the road network was collected from the TfNSW Traffic Volume Viewer. A summary of the traffic volumes is provided in **Table 6-45**, where growth rates have been applied to calculate the current estimated traffic volumes.

Table 6-45 Turning Movement Count Peak Hour Survey Results

Road	Survey Location	Survey Year	Recorded Volume	Current Estimated Traffic Volume
New England Highway	140 m south of Caroline Street, Bendemeer	2021	3,803 vpd 78% light 22% heavy	3,860 vpd
		2019	4,301 vpd 78% light 22% heavy	4,497 vpd
Oxley Highway	1.66 km east of Back Woolbrook Road, Woolbrook	2011	622 vpd 83% light 17% heavy	680 vpd

The traffic volume data was provided for the years 2019 and 2021, which indicates reduced traffic movement during 2021, likely due to COVID-19 pandemic impacts.

The data indicates that New England Highway carries 22% heavy vehicles and approximately 4,301 vehicle movements per day (vpd). While the Oxley Highway currently carries a low to moderate level of traffic which is well within the existing road capacity, with most traffic movements between 8:00 am and 5:00 pm.

Overall, the survey data shows that both intersection and midblock locations for New England Highway and Oxley Highway, and the surrounding road network experiences a low to moderate level of traffic and can accommodate an increase in traffic movement.

Access and Transport Services

The available restricted vehicle access and transport services within the vicinity of the Project Area include:

- Restricted Vehicle Access: New England Highway and Oxley Highway are rated to accommodate B-double vehicles;
- Bus services: The nearest bus stop is on Havannah Street (route No. 444), 1.8 km west of the Project Area, which provides access from Bendemeer to Tamworth; and
- School buses: Operate alongside the Oxley Highway.

6.9.3 Traffic Generation and Distribution

Construction

Vehicles will access the Project Area via Oxley Highway with Project elements delivered from either Port of Newcastle or Port of Brisbane.

Table 6-46 summarises predicted construction vehicles accessing the Project Area, and the expected distribution.

Table 6-46 Vehicle Type and Distribution

Vehicle type		Traffic Distribution
Light Vehicles		From Tamworth or Armidale, with 95% of workforce travelling from west and 5% travelling from east. Vehicles coming from New England Highway, 70% will travel from the south (Tamworth, Kootingal, Moonbi, Nemingha), and 25% from the north (Uralla, Armidale).
Shuttle buses and utilities	Transport construction workforce to and from the Project Area.	
Heavy Vehicles		
Medium Rigid Trucks (MRV) and Heavy Rigid Trucks (HRV)	Deliver raw materials and smaller Project elements, as concrete and fencing supplies	
Truck and Dog vehicles	Transport earthwork material and water trucks to and from the Project Area	
Articulated Vehicles (AV) and B-Doubles	Transport the majority of the Project large elements	Project elements will travel from Port of Newcastle or Port of Brisbane via New England Highway and Oxley Highway from the west.
OSOM Vehicles		
Restricted Access Vehicles/ OSOM vehicles	Transport the largest Project elements, including substation, transformer and earth moving equipment	

Overall, it is expected that approximately 41 vehicle movements per hour during the morning and evening peak hours will be generated during the peak construction period of the Project, which will reduce to 22 vehicle movements over the typical construction periods.

Table 6-47 provides the summary of the estimated vehicle movements per hour (vph) and vpd during the peak of construction.

Table 6-47 Traffic Generation During Construction

Vehicle Type	Average Vehicle Movements		Peak Vehicle Movements	
	Daily (vpd)	**Peak Hour (vph)**	**Daily (vpd)**	**Peak Hour (vph)**
Light Vehicle	20	8	28	11
Shuttle Bus	14	6	20	8
MRV/HRV	16	4	44	18
AV/ B-Double	12	4	18	4
Total	**62**	**22**	**110**	**41**

The peak traffic movement will occur in the morning when light vehicle transporting workforce arrives onsite (between 6:00 am and 7:00 am) and leaves (staggered finish times, resulting in peak distributed in the evening). Heavy vehicle movements will be scattered throughout the day, with even inbound and outbound movements.

Operation

During operation, the Project will generate a minimal level of traffic associated with technical servicing and maintenance personnel. The Project will generate approximately 30 vpd, which would result in a negligible change to the traffic environment.

Decommissioning

Traffic generation during decommissioning is anticipated to be similar to the traffic generated during the average construction period.

6.9.4 Traffic Assessment

A traffic modelling exercise has been undertaken for the intersection of New England Highway and Oxley Highway using the SIDRA intersection modelling software during morning and evening peak hours of construction. The analysis assisted in defining its Level of Service (LoS), which is the road network capacity to accommodate the traffic expected to be generated during peak construction period. The LoS ranges from 'A' to 'F', being 'A' free flow conditions, and 'F' forced flow with stop start operation, long queues and delays.

The SIDRA analysis for the morning and evening peak hour (available In full in Appendix B of the TIA) indicates:

- The intersection is expected to operate with minimal queue lengths on all legs of the intersection;
- The overall average delay at the intersection is 2.3 seconds in the morning and 2.0 seconds in the evening peak hour; and
- The intersection is expected to operate in free flow conditions, having LoS rating *A*.

Therefore, the road network can readily accommodate the traffic generated by the Project during the construction and operational periods.

6.9.5 Route Assessment

The indicative heavy and OSOM vehicle access route from port to the Project is shown in **Figure 6-19** and as follows:

- Port of Newcastle: Via Industrial Drive, John Renshaw Drive, Hunter Expressway, then New England Highway through Tamworth to reach Oxley Highway; and
- Port of Brisbane: Via Motorway (M4), Gateway Motorway (M1), M2, Cunningham Highway (M15), New England Highway, then Oxley Highway.

These access routes utilise roads that are designated for B-Double vehicles as outlined within the TfNSW Restricted Access Vehicle Map, and the Queensland Department of Transport and Main Roads (TMR) Heavy Vehicle Route Map. Accordingly, these routes can accommodate the heavy vehicle movements expected to be generated during construction of the Project.

The volume of OSOM vehicles anticipated to access the Project Area include:

- Two OSOM vehicles to transport the main transformer which would result in a movement in one direction only for both phases of construction and decommissioning;
- Four OSOM vehicles to transport the modular buildings resulting in a movement in one direction only for both construction and decommissioning;
- Two cranes would access the site which are classified as OSOM vehicles and would generate a movement when accessing and egressing the site during both construction and decommissioning; and
- Three OSOM movements associated with the transportation of the dozer/scrapers which would occur when vehicles access the site and depart the site during construction.

The Project is expected to generate 16 OSOM vehicle movements during construction and 10 OSOM vehicle movements during decommissioning, which are expected to utilised the routes displayed in **Figure 6-19**.

Further, the OSOM vehicles are anticipated to be able to travel to the intersection of New England Highway and Oxley Highway given the routes have been utilised by several other renewable projects in the wider area. The route assessments for the below wind farms assessed similar OSOM vehicle configurations to the expected transformer of the Project and are considered to provide confidence that the access route is able to accommodate the OSOM vehicles generated by the Project. It is also noted that the routes utilise roads that are approved within the NSW Oversize Overmass Load Carrying Vehicles Network Map. These include:

- Port of Newcastle: The Winterbourne Wind Farm provides a route assessment for the wind turbine blade transport vehicle from the Port of Newcastle to Walcha which would utilise the same route and travel past the site. The assessment for the components (excluding the blade transport vehicle) identified that no road upgrades were required; and
- Port of Brisbane: The access route has been utilised by Glenn Innes Wind Farm and White Rock Wind Farm between Port of Brisbane and Glen Innes and as such, it is considered that this section of the route would be suitable to accommodate the Project OSOM vehicles without the need for road upgrades. A Route Assessment has been prepared between Guyra and Port of Newcastle for Doughboy Wind Farm which indicates the route is able to accommodate the OSOM vehicles identified without road upgrades (excludes blade transport vehicles). The route between Glen Innes and Guyra travels along New England Highway and a desktop review of the route indicates there are no intersections or bends that warrant further assessment.

A swept path assessment for an example OSOM vehicle has been provided in Appendix C of the TIA. This example OSOM vehicle would be similar to the vehicle transporting the transformer, which is the largest component of the Project. The assessment indicates the OSOM vehicle can travel from the intersection of New England Highway and Oxley Highway to the Project Area without any road upgrades.

OSOM vehicles are subject to specific road permits that will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are known.

The Applicant is open to exploring opportunities to use the Tamworth Intermodal Freight Facility (TIFF) to bring containerised equipment and supplies to Tamworth via the rail network. This would obviously minimise heavy vehicle movements on the proposed transport route to Tamworth. This option will be explored further with Tamworth Regional Council and the developers Qube Logistics.

6.9.6 Traffic Impacts

Turning Treatments

An assessment of the turning treatments was undertaken considering peak hours of construction traffic, which is expected to occur between 6.00 am and 7:00 am when the workforce accesses the Project Area. The following intersections that will provide access to the Project were assessed:

- New England Highway and Oxley Highway would require a Basic Left Turn (BAR) and CHR treatments. However, considering a BAR and CHR are existing at the intersection, no upgrades will be required; and
- Oxley Highway and Project site access: would require a BAL and BAR treatments. A BAR treatment is proposed at the site access. However, a BAL treatment is not considered necessary based on the following:
  - There would only be three left turn movements and only 14 westbound movements resulting in a low probability of vehicle conflict;

- Left turn movements are considered to be conservative. It is not considered likely that construction deliveries will access the site from a westbound direction and the construction workforce is expected to access the site from an eastbound direction, with all major plant and materials movements expected to access the project from the New England Highway and Oxley Highway intersection; and
- The site access location ensures there is excellent sight distance for vehicles to see a vehicle turning into the site.

A swept path assessment of B-Double vehicles was undertaken at the intersection between Project site access and Oxley Highway. The swept path assessment has considered the proposed BAR treatments, which proves to have a suitable design able to accommodate the vehicles expected (refer Appendix E of **Appendix O**).

Therefore, the site access is expected to operate in a safe manner with the provision of a BAR and no BAL treatment. **Figure 3-2** provides the site access design able to accommodate the turning treatment required for this intersection, which is compliant with the 'Austroads Guide to Traffic Management Part 6' (Austroads, 2019).

Sight Distance

The sight distances on Oxley Highway have been estimated based on the road speed limit of 100 km/h. The assessment indicates that the sight distances at the intersection exceeds the minimum requirement of 285 m, as stipulated in 'Austroads Guide to Road Design Part 4A' (Austroads, 2021). Therefore, vehicles are expected to be able to safely enter the state road network (Oxley Highway) from the site access.

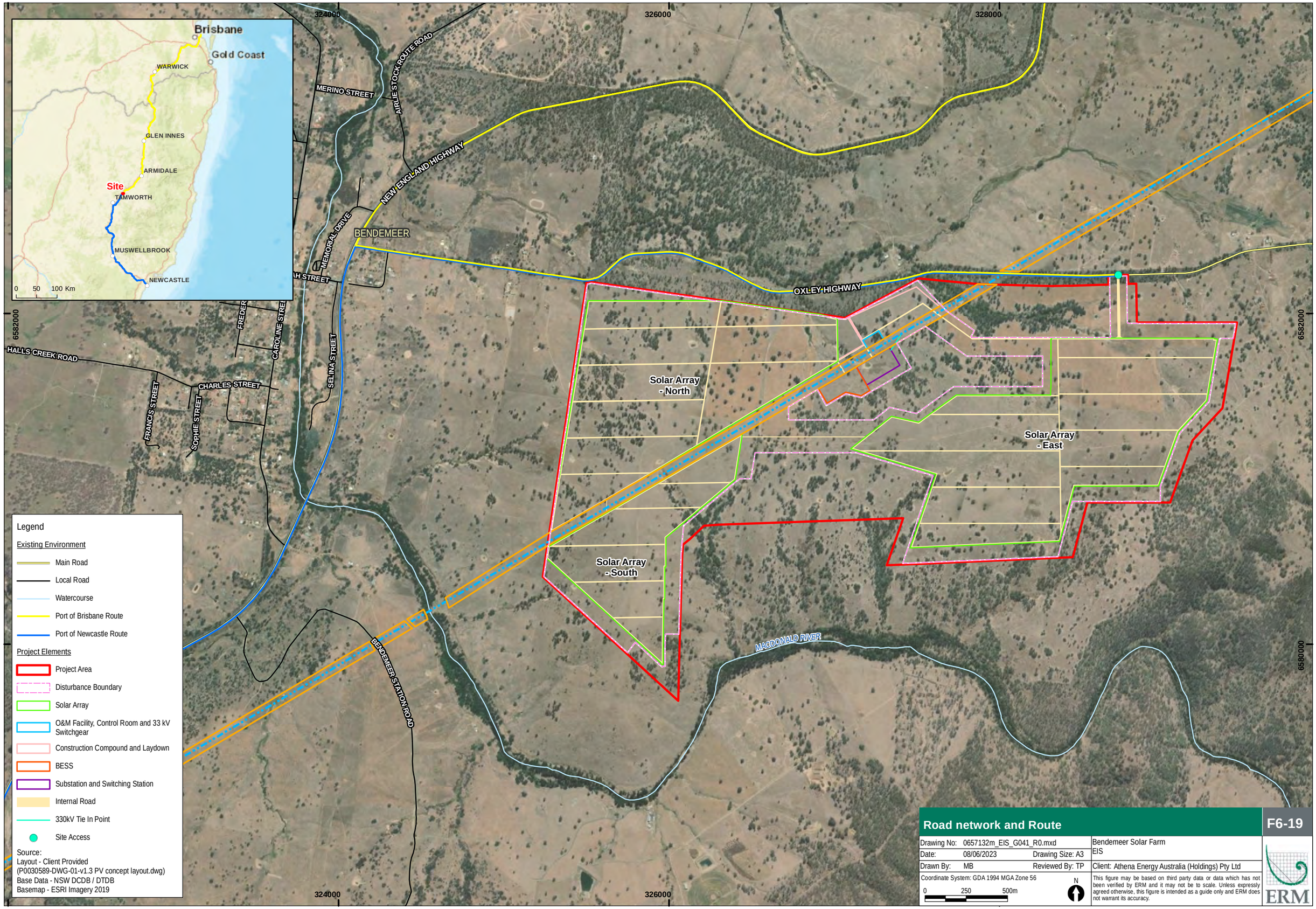
Appendix F of **Appendix O** provides the detailed sight distance assessment for Oxley Highway.

6.9.7 Cumulative Traffic Impacts

Development of SSD projects within 100 km of the Project Area (shown in **Section 6.16.1**) has the potential to generate cumulative traffic impacts together with the Project. The major potential for cumulative impacts of SSDs and the Project in relation to traffic are associated with the construction phase, which have the potential to overlap with the Project's construction period (refer **Section 3.4.1**).

The cumulative assessment considered the cumulative additional traffic of the other SSDs, particularly from staff vehicles during peak periods, and whether they could increase congestion on the road network that would result in the unacceptable delays or queue lengths, and whether there was potential conflict for OSOM vehicles. Based on the assessment, the surrounding SSDs have the potential to generate several staff vehicle movements during peak construction, which are located in Tamworth, Uralla, and Armidale.

The TIA indicates that the surrounding road network is expected to continue to operate with a good LoS with ample spare capacity. Therefore, the cumulative traffic generated by the Project together with other SSDs is expected to have a minimal cumulative impact on the road network, including through Tamworth, Uralla, and Armidale. Additionally, the peak traffic generated by these projects during construction occurs before 7:00 am and after 6:00 pm which is outside of the peak times of the road network, as discussed in **Section 6.9.2.2**.



Road network and Route

F6-19

Drawing No:	0657132m_EIS_G041_R0.mxd		Bendemeer Solar Farm EIS
Date:	08/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 250 500m

N

ERM

6.9.8 Mitigation and Management

A Traffic Management Plan (TMP) will be prepared prior to construction and implemented in accordance with 'Australian Standard AS1742.3' (Australian Standard, 2019) and the *Work Health and Safety Regulation 2017*. The TMP will provide additional information regarding the traffic volumes and distribution of construction vehicles that is not available at this time, including road transport volumes, distribution and vehicle types, and origin, destination, and routes for all vehicle types. It will also consider the actual status of other SSD projects at the time in its recommendations and commitments.

Measures that will be adopted within the TMP to minimise the impact of construction traffic along the road network including:

- Consultation with neighbours of the Project and notify timing of major deliveries which have a potential to require additional traffic control and disrupt access;
- Avoidance of peak school bus times by heavy vehicles to restrict interaction between these vehicles;
- Loading, unloading and storage to occur within the Project Area;
- Project site access in a forward direction by all vehicles;
- Only the designated transport routes to be utilised;
- Construction vehicles accessing the site will abide finalised schedules as approved by the relevant authorities;
- All permits for working within the road reserve must be received from the relevant authority prior to works commencing;
- Include a map of the primary haulage routes highlighting critical locations;
- An induction process for vehicle operators and regular toolbox meetings;
- A complaint resolution and disciplinary procedure;
- Driving in local climatic conditions that may impact road safety of employees throughout all Project phases, including rain, fog, frost, icy conditions, bright sunlight and within/near a bushfire; and
- OSOM vehicles are subject to separate permit applications and regulations, which will be applied for by the contractor once the dimensions of the load and the specific delivery vehicle are established. OSOM will be timed so they do not coincide with other OSOM vehicles within the surrounding area to limit the impact to the road network, which can be undertaken as part of the permit application.

Further, a Decommissioning TMP (or similar) will be prepared prior to the decommissioning phase in conjunction with the relevant authorities. This would aim to ensure adequate road safety and road network operations are maintained.

6.10 Preliminary Hazard Analysis

6.10.1 Introduction

A Preliminary Hazard Analysis (PHA) was prepared for the Project and is provided in **Appendix P**.

The PHA summarises the potential hazards and risks associated with the Project and determined the risk acceptability from a land use perspective. It also details management measures which, when implemented, will reduce these hazards and risks to acceptable levels.

The PHA addresses the relevant requirements of the SEARs (**Appendix A**) and considers all relevant stakeholder engagement as described in **Section 5**.

The PHA was prepared in accordance with the following guidelines and regulation:

- 'Hazardous Industry Planning Advisory Paper No. 6 – Hazard Analysis' (DPIE, 2011a) (HIPAP 6);
- 'Hazard Industry Planning Advisory Paper No 4 – Risk Criteria for land Use Safety Planning' (DPIE, 2011b) (HIPAP 4);
- 'Hazardous and Offensive Development Application Guidelines: Applying SEPP 33' (Applying SEPP 33) (DoP, 2011a)
- 'Assessment Guideline – Multi-level Risk Assessment' (DoP, 2011b);
- 'AS/NZS 5139:2019 Electrical Installations – Safety of Battery Systems for use with Power Conversion Equipment' (Standards Australia, 2019);
- 'International Commission on Non-Ionizing Radiation Projection (ICNIRP) Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields' (ICNIRP, 2010); and
- *Work Health and Safety Regulation 2017* (WHS Regulation).

The indicative design and layout of the Project's BESS and other elements relevant to the PHA is further discussed in **Section 6.10.2** and shown in **Figure 3-1**.

The PHA follows the requirements of the HIPAP No. 6, which includes:

- Determine the level of analysis and risk assessment criteria through the Multi-level Risk Assessment;
- Conduct a detailed hazard identification for the facilities and operations;
- Conduct a detailed consequence analysis for the identified events with offsite impact (note where an incident was identified to not have an offsite impact, and a simple solution was evident and recommended, no further analysis was performed);
- Conduct a frequency analysis of the identified incidents with offsite impact (note if no incident was identified to have potential offsite impact, a frequency analysis was required); and
- Assess the estimated risks from identified incidents with offsite impact consequence and frequency analysis to determine acceptability (note if no incident was identified to have offsite impact and no frequency analysis was carried out, no risk assessment and reduction were conducted).

The Multi-level Risk Assessment considered the location and description of the Project (**Section 3)**, the quantity and type of Dangerous Goods (DGs) to be stored and used on site, and information relating to the Projects technical and safety management controls. The Multi-level Risk Assessment for the Project determined that a Level 2 PHA (partially quantitative) was required.

The approach of the Level 2 PHA included hazard analysis, consequence analysis, frequency analysis, and risk assessment and reduction. These are discussed in further detail in **Appendix P**.

6.10.2 Hazard Identification

A hazard identification table was prepared in accordance with HIPAP 6 and provides a summary of the potential hazards, consequences, and safeguards at the site. The recommended approach for eliminating hazards from further assessment as detailed in HIPAP 4 was followed. This included assessment of:

- Fire impacts – application of the HIPAP 4 maximum permissible heat radiation (4.7 kW/m^2) at the site boundary;
- Explosion – application of the HIPAP 4 criterion for the maximum permissible explosion over pressure (7 kPa) at the site boundary (this is conservative as the HIPAP 4 criterion relates to residential areas);
- Toxicity – potential toxic by-products of combustion of project elements (as per the Emergency Response Planning Guidelines);
- Property damage and accidental propagation – application of the HIPAP 4 criterion for the maximum permissible heat radiation /explosion overpressure (23 kW/m^2/14 kPa) at the site boundary; and
- Societal risk – consideration of societal risk in accordance with HIPAP 4.

Based on the hazard identification presented in Appendix A of the PHA (**Appendix P**), the following hazardous scenarios were developed:

- Lithium-ion (Li-ion) battery fault, thermal runway fire;
- Victorian Big Battery fire review;
- Li-ion battery fire and toxic gas dispersion;
- Electrical equipment failure and fire;
- Transformer internal arcing, oil spill, ignition and bund fire;
- Transformer electrical surge protector failure and explosion; and
- Electromagnetic field impacts.

A review of the expected types and quantities of hazardous materials to be stored or handled on site, identified that none of the relevant screening thresholds of Applying SEPP 33 as per *State Environmental Planning Policy (Resilience* and *Hazards) 2021* (Resilience and Hazards SEPP) will be exceeded. This included consideration of batteries, transformer oils, and diesel fuel stored and used on site which is described in Section 3 of **Appendix P**.

6.10.3 Assessment of Potential Hazards and Risks

Li-ion Battery Fault, Thermal Runway Fire

Despite recent improvements in Li-ion battery technology there are still several degradation mechanisms present which can result in thermal runaway. These primarily arise through high discharge, overcharging, or water ingress resulting in the formation of bi-products. To counteract these risks, Li-ion batteries are equipped with several standard safety features. As such, the potential for thermal runaway to occur during normal operation is very low. Similarly, the risk of physical damage to a battery initiating an incident is low as Li-ion batteries are contained within modules which are located within a fenced area.

The chemistry of the proposed battery to be installed for the Project is lithium-ion to either be LFP or NMC, assessed below.

LFP Battery Chemistry

LFP batteries are considered one of the safest battery chemistries within the industry. Compared to other Li-ion batteries, lithium-ion phosphate batteries have a very low thermal rise at peak, resulting in a gradual temperature rise that typically does not result in fire. Testing of physical damage (e.g., puncture of a membrane) on lithium-ion phosphate batteries has demonstrated that the battery chemistry is protected against shock, and typically do not result in fire. In the event a lithium-ion phosphate battery did ignite, the combustion releases carbon dioxide which, in a confined space such as the modules the batteries are housed in, reduces oxygen levels and thus inhibits the propagation of the fire. The modules also have fire suppression systems installed further minimising the risk of fire propagating.

NMC Battery Chemistry

NMC batteries are also considered for the Project due to their high energy density when compared to LFP batteries. NMC are more sensitive to temperature changes and release oxygen from the cathode to participate in the electrochemical reaction when discharging. If oxygen is released from the battery, it may contribute to the combustion reaction. As a result, NMC batteries present a slightly higher risk of thermal runaway and fire than LFP batteries. While higher risk than the LFP chemistry, NMC batteries still perform well compared to other chemistries used in the industry.

BESS units are temperature controlled using liquid cooling and/or HVAC units. If a battery is faulted and released oxygen during discharge, it would not be expected that the oxygen levels within the BESS unit would accumulate to a point where it posed a substantial risk of accelerating combustion. Additionally, the temperature of the batteries themselves are monitored by the battery management system which alerts personnel to any overheating and can shut off the unit prior to any ignition occurring. Furthermore, the primary combustion by-product of both NMC and LFP batteries is carbon dioxide which reduces the oxygen concentration within a confined space, thereby reducing the combustion rate. Finally, the containers are fitted with a fire suppression system which will activate to suppress and control a fire preventing escalation to other battery units.

Li-ion Battery Product Assessment

One of the preliminary battery products considered for the purposes of the PHA for the Project is the SolBank modular Energy Storage System (ESS). A UL9540A report has been completed for the SolBank modular ESS (refer Appendix B of **Appendix P**).

Based on data shown from UL9540A reports for similar systems, the results demonstrate that when thermal runaway is triggered in one cell in a BESS container, the heat generated would neither be transferred to all cells within one battery module, nor from the test module to adjacent ones. However, although Li-ion technology typically does not result in fire, there are circumstances where modules can catch fire. These include leaking coolant or electrical faults. Should this occur, the fire would likely be contained within the module, particularly with the in-built fire suppression systems, including smoke and thermal sensors, combustible gas detector, pressure relief system, and aerosol E-Stop buttons.

Li-ion Battery Fire and toxic gas Dispersion

If a BESS were to fail causing a fire, toxic emissions may result including carbon dioxide, carbon monoxide, and fluoride gases. These are applicable to both battery chemistries LFP and NMC proposed for the Project. Based on a review of the Victorian Big Battery fire and other literature, the following conclusions are made:

- Carbon dioxide – the formation of carbon dioxide in a BESS fire is unlikely to generate quantities that would result in downwind impacts that could cause injury or fatality; therefore, no further analysis was required;
- Carbon monoxide – there is the potential for the formation of carbon monoxide from a fire in a BESS unit if there is insufficient oxygen to sustain complete combustion. However, it is noted that the combustible load within the BESS which could result in the formation of carbon monoxide is

relatively low compared to the available oxygen in the surrounding atmosphere. Therefore, it is considered that the formation of carbon monoxide at levels which would result in a substantial downwind impact are not considered credible and subsequent analysis of, this incident is not required; and

- Fluoride gases – The electrolyte used in Li-ion batteries typically is lithium hexafluorophosphate ($LiPF_6$) or other li-salts containing fluorine. The decomposition of $LiPF_6$ in a fire event is promoted by water/humidity. Bi-products of the combustion of $LiPF_6$ include several fluoride gases. Most of these are reactive immediately except hydrogen fluoride, which is readily dissolved in water forming hydrofluoric acid. Although the toxicity risk from fluorides is high, the risk of fire in a BESS is low, and combined with the stable chemistry of the battery the risk associated with fluorides is considered low.

Equipment Failure and Fire

The type of equipment used within the Project is ubiquitous throughout the world and across industry segments and is therefore not a unique fire scenario. Based upon fire development within switch rooms the fire would be relatively slow in growth and would be unlikely to result in substantial impacts in terms of offsite impact or incident propagation. This incident was not carried forward for further analysis.

Transformer Internal Arcing, Oil Spill, Ignition and Bund Fire

Transformers contain oil used to insulate the transformers during operation. If arcing occurs within the transformer (e.g., due to a low oil level), the high energy passing through the coolant vaporises the oil into light hydrocarbons (methane, ethane, acetylene, etc.) resulting in rapid pressurisation within the reservoir.

Notwithstanding the protection systems, if the pressure rise exceeds the structural integrity of the reservoir, and the installed pressure relief devices, the reservoir can rupture allowing the release of oil into the bund. The rupture also allows oxygen to enter the reservoir. The temperature of the gases is above the auto ignition point, but this does not occur until oxygen is present. When oxygen enters the reservoir, the gases auto ignite which generates sufficient heat to ignite the oil in the bund.

However, transformers are ubiquitous units with a low potential for failure and the separation distance to the site boundary and other adjacent units would be unlikely to result in incident propagation and offsite impacts. This incident was not carried forward for further analysis.

Transformer Electrical Surge Protection Failure and Explosion

Transformers generate large amounts of heat because of the high electrical currents that pass through them; hence, oil is used as an insulating material within the transformers to protect the mechanical components. However, if an energy surge to the transformer occurs, and the electrical surge protection measures fail, the mineral oil may decompose and vaporise, resulting in gas bubbles of hydrogen and methane. The formation of gases will increase the pressure within the transformer which can result in the transformer structure rupturing which allows the ingress of oxygen. As oxygen enters, the concentration of flammable gases reaches limits above their autoignition temperatures which can ignite resulting in increased formation of hot gaseous products resulting in an explosion. The explosion may generate significant overpressure, sparks and fire and would result in a whole transformer fire.

To protect against overheating and explosions, transformers generally have surge protection devices which shunt electrical surges safely to ground. However, this surge detection and protection devices are not universally installed nor do they protect against all events. Therefore, there is the potential for an explosion to occur which may result in offsite impacts; however, as previously noted, these units are ubiquitous and have a low potential for failure. Therefore, this incident was not considered further.

Electromagnetic Field Impacts

Electric and Magnetic Fields (EMFs) are associated with a wide range of sources. Naturally occurring EMFs, occurring during lightning storms, are generated from Earth's magnetic field. Man-made EMFs are present wherever there is electricity; hence, EMFs are present in almost all built environments where electricity is used.

BESSs, PCUs, substations, and other Project elements create EMFs from operational electrical equipment, such as transmission lines, transformers and the electrical components found within BESS units (e.g., inverters), substations and others. These have the potential to produced Extremely low frequency (ELF) EMFs in the range of 30 to 300 Hz.

There are currently no existing standards in Australia for governing the exposure limits to ELF EMFs; however, the ICNIRP has provided some guidelines around limits for prolonged exposure of 2,000 milligauss (mG) in a 24 hour period.

There are no dwellings immediately adjacent to the area where the Project elements will be developed , which therefore provides substantial distance for attenuation of EMFs. Based upon the typical levels which may be generated by transmission equipment the cumulative effect would not exceed the 2,000 mG limit for prolonged exposure. In addition, the closest residence is over 1 km away from the EMF generating sources at the BESS; hence, the potential for the EMF to exceed the accepted levels is considered negligible.

6.10.4 Hazard and risk minimisation

The BESS proposed for the Project has reviewed and considered separation distance to account for fire safety. The installation layout will follow those proposed in the chosen BESS compliance standards, such as the UL 9540 A report, NFPA 855, NFPA 69, and others. Lessons learnt from the Victorian Big Battery fire independent investigation report will also be incorporated in the BESS design and layout.

An additional review was undertaken to determine if there is sufficient space within the site to maintain the required separation distances to prevent fire propagation between BESS modules. The review concluded that about 6,052 m^2 is required. The site has 32,370 m^2 available. This allows for the minimum module separation distances as specified by UL 9540 A, or 150 mm, which provides an actual separation distance, accounting for the space between the module wall and battery unit, of 470 mm.

The review of the potential incidents indicated that there were no observed offsite impacts; therefore, based on the analysis conducted, it is concluded that the risks at the site boundary are not considered to exceed the acceptable risk criteria. As such, the project would be classified as potentially hazardous and would be permitted within the current land zoning for the site.

6.10.5 Mitigation and Management

The following management measures are recommended to minimise hazards and risks associated with the Project:

- The total required and available area for the BESS will be verified prior to construction to demonstrate that the necessary separation distances will be achieved;
- End-to-end spacing (short-side) of the BESS modules shall be a minimum of 600 mm;
- End-to-end spacing (long-side) of the BESS modules shall be a minimum of 150 mm;
- Spacing between BESS container accumulations (e.g., four modules) shall be a minimum of 2.5 m;
- The BESS containerised units shall be provided with the fire protection system specified by the BESS manufacturer; and
- Prior to commissioning, the UL test data for the selected battery units shall be made available to the DPE, where requested.

Additionally, based on lessons learnt from the Victorian Big Battery incident the following fire safety precautions will be adopted on the design of the Project:

- The vent atop the containers will be made of metal instead of plastic and covered by a metallic mesh shield; and
- Fans will be placed as such that batteries or flammable materials are not located directly beneath ventilation openings.

6.11 Bushfire

6.11.1 Introduction

A Bushfire Assessment Report (BFAR) was prepared by EMBER Bushfire Consulting (EMBER) to identify and evaluate the potential hazards and risks associated with bushfires to and from the Project and the use of bushfire prone land. The BFAR addresses bushfire protection measures and provides management and mitigation measures designed to address identified risks.

The BFAR was prepared in consideration of the 'Planning for Bush Fire Protection' (PBP 2019) (NSW RFS, 2019), it addresses the project-specific SEARs (**Appendix A**) and considers all relevant stakeholder engagement described in **Section 5**.

The BFAR is provided in **Appendix Q**.

6.11.2 Background

An analysis of the fire weather experienced in the region provides insight into potential bushfire behaviour within the Project Area and its surrounds. Over the past decade four fire incidents have impacted the Project Area, the closest of which was in November 2019 (the Moonbi Fire Complex), which narrowly missed the Project Area (refer Figure 4 of **Appendix Q**).

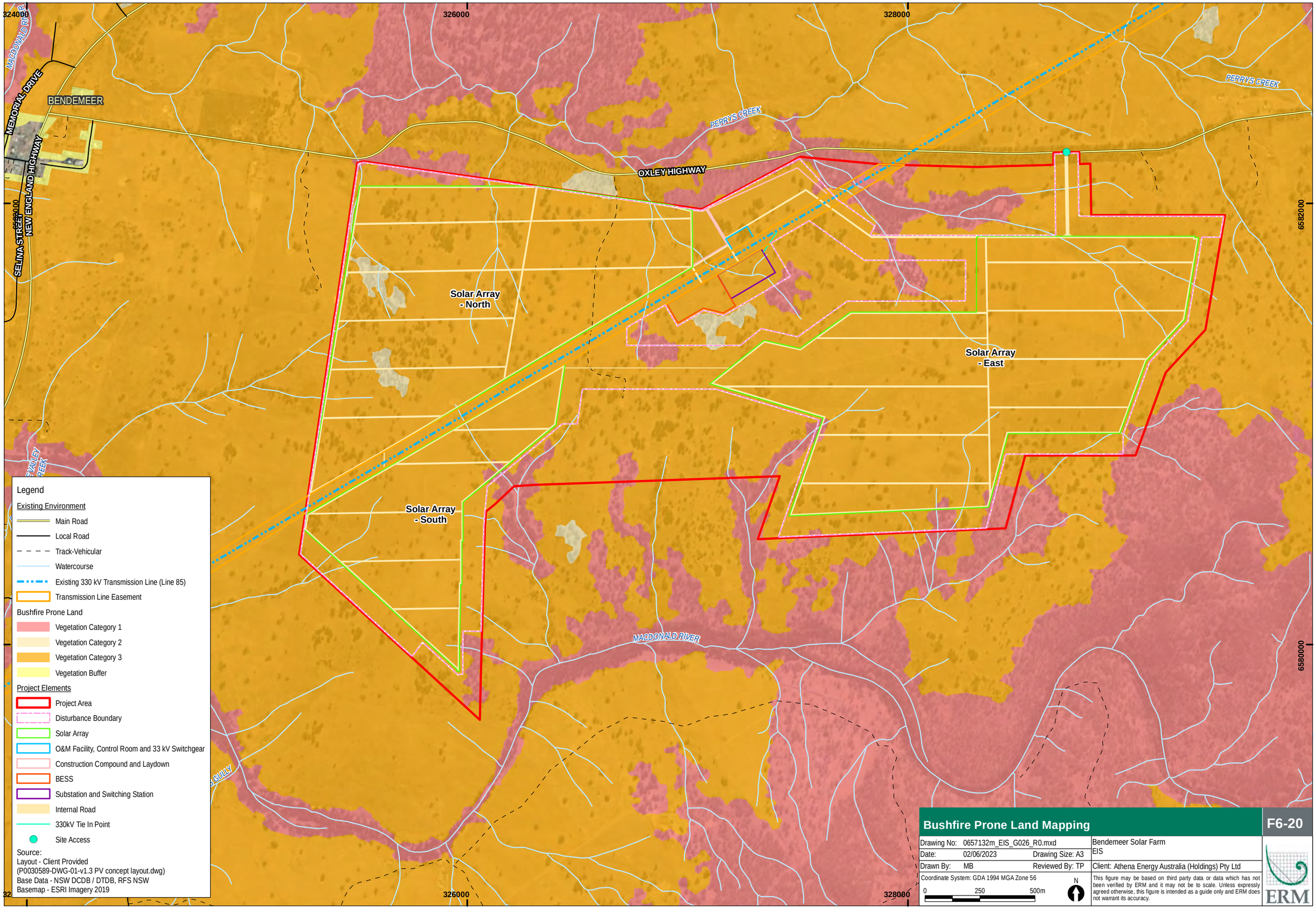
Forest Fire Danger Index (FFDI) values are based upon the LGA and Fire Weather District, as determined by the NSW RFS. The FFDI measures the degree of danger of fire in Australian vegetation and assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing wind. The Project is located at Tamworth Regional LGA, and based on this has an FFDI of 80.

The vegetation formation surrounding the Project Area can determine the potential fire intensity and directly relates to the overall bushfire threat. For instance, a fire will burn with significantly greater intensity in forest vegetation than grassland vegetation. The Project Area has been predominantly cleared of overstorey vegetation for agricultural purposes and is comprised of grassland, grassland with paddock trees, woodland and forest (classified in accordance with Appendix A1.2 of PBP 2019).

Slopes significantly influence bushfire behaviours. Steeper slopes increase the rate of spread of a fire throughout the landscape. A wildfire moves quickly up-slope, doubling in speed every 10 degrees of incline (SA DEW, n.d.). The topography of the Project Area is undulating and rolling, with gentle slopes dropping to the north and south of the Project Area (refer **Figure 6-10**), with slopes at between 5° to 10° degrees downslope.

The Bushfire Prone Land mapping identifies if the Project Area has the potential to be impacted by a bushfire. **Figure 6-20** indicates that the Project Area and its surrounds are bushfire prone land containing areas of vegetation category 1 and 3 and vegetation buffer. These are classified based on vegetation types and potential risk (NSW RFS, 2015). A site survey conducted in June 2022 by EMBER, verified these vegetation categories, and the bushfire prone map was determined to be and accurate representation of the identified hazard.

Resources available for firefighting include various NSW Rural Fire Service (RFS) and Fire and Rescue NSW, located within 48 km of the Project (refer Section 2.9 of the BFAR). The Bendemeer Brigade is the nearest NSW RFS, located approximately 5.7 km (by road) west of the Project Area.



Bushfire Prone Land Mapping

F6-20

Drawing No:	0657132m_EIS_G026_R0.mxd		Bendemeer Solar Farm EIS
Date:	02/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

ERM

6.11.3 Impact Assessment

Woodland fragments are sparse within the Disturbance Footprint. Throughout the Project refinement process the Applicant has adopted a preference for avoidance of woodland areas; however, the risk of grassland fire remains.

APZ and setback dimensions will ensure that the critical components of the Project are not exposed to excessive radiant heat levels and prevent direct flame contact by providing a buffer zone between identified hazard and infrastructures.

A setback is the distance that Project elements (e.g., BESS, PV modules, substation, associated infrastructure) are separated from vegetation that represents a bushfire hazard. APZs are bands of managed vegetation to minimise fuel loads and reduce potential radiant heat levels, flame, localised smoke and ember attack. APZs are based on vegetation type, slope and FFDI (as identified in **Section 6.11.2**).

The PBP 2019 recommends a minimum APZ of 10 m for structures and associated buildings, which is assumed to be sufficient for future compliance purposes.

Given the PBP 2019 does not provide a maximum radiant heat threshold for solar farms or BESS facilities, the BFAR has opted for the maximum radiant heat threshold to be 29 kW/m^2 for the BESS, substation and associated infrastructures.

Table 6-48 provides the APZ distances for elements of the Project to ensure that the critical components of the BESS, substation and associated infrastructure are not exposed to radiant heat levels exceeding 29 kW/m^2.

Table 6-48 APZ and Setback Dimensions

Vegetation	Minimum APZ for PV Modules	Minimum APZ for BESS, Substation and Associated Infrastructure
Grassland	10 m	12 m
Woodland	10 m	17 m
Forest	10 m	31 m

The locations and dimensions of APZs and setbacks needed for the Project to achieve necessary bushfire protection will be confirmed in consultation with NSW RFS, subject to detailed design.

6.11.4 Mitigation and Management

Given the Project Area is mapped as bushfire prone land, a range of bushfire protection measures are required to address this threat to an acceptable level of protection. Protection measures recommended for the Project are summarised in **Table 6-49**. All the bushfire protection measures will be restricted to the Project Area.

Additionally, the Solar Guidelines requires the preparation of a Strategic Bush Fire Study for development proposals in bushfire prone land. A Strategic Bushfire Study Assessment is provided for the Project in **Table A-4** of **Appendix A**, which confirms the PBP strategic issues have been addressed by the Project.

A systematic analysis of the Project during the detailed design and post EIS approvals process would be needed to refine the specifications of these protection measures to ensure an acceptable level of bushfire protection has been met.

Table 6-49 Bushfire Mitigation Measures

Project Element	Mitigation Measures
APZs	■ Appropriate setbacks from adjacent forested areas are to be provided for clusters of PV modules, BESS, substation, and associated infrastructure, as determined in **Table 6-48**. Location and widths will be confirmed with NSW RFS (subject to detail design); ■ The perimeter APZ will incorporate an all-weather, gravel road, with a minimum width of 4 m where practicable; and ■ At the commencement of construction, and during operations, all land associated with the APZ of the Project Area is to be managed as an APZ in accordance with the requirements of Asset Protection Zone Standards – Appendix 4 of PBP (2019).
Performance-based Design	■ A Performance-based Design approach will be employed where site constraints limit the APZ and setback dimensions; ■ It will provide alternative methods to achieve critical radiant heat thresholds on heat sensitive equipment, such as radiant heat barriers/fire walls or the like, to ensure the critical radiant heat thresholds can be achieved; and ■ Performance-based Design is subject to endorsement by the consent authority at the detailed design phase of the Project.
Landscaping	■ Vegetation in areas identified as APZ surrounding PV modules will be managed in perpetuity and in accordance with the requirements of Appendix 4 of PBP 2019; ■ Areas below PV modules will be accessible for grazing to reduce fuel risks; ■ Leading up to and during the declared bush fire season areas below PV modules will be continually monitored for excessive grass growth with fuel reduction activities actioned when necessary; and ■ Where possible, non-combustible mulch (stone or aggregate) will be incorporated in areas identified as APZ (surrounding the BESS, substation, and associated infrastructure) to eliminate the growth of vegetation or storage of combustibles.
Site Access	■ Site access and internal road network will generally comply with the specifications and requirements set out in the PBP 2019.
Water Supplies	■ A non-combustible static water tank of 100,000 L will be included within the APZ for the BESS, substation, and associated infrastructure; and ■ Water supply fittings and specifications will be in accordance with Table 7.4a of the PBP 2019.
Electricity Services	■ Electrical services will be provided in accordance with Table 7.4a of the PBP 2019.
Construction	■ The BESS, substation and associated buildings are recommended to the appropriate Bushfire Attack Level as per AS3959:2018 Construction of buildings in bushfire prone areas.
Bushfire Emergency Management and Operations Plan (BFEMOP)	■ The BFEMOP will identify all relevant risks and mitigation measures associated with the construction and operation of the Project. The BFEMOP will include: – Detailed measures to prevent or mitigate fires igniting; – Work that should not be carried out during total fire bans; – Availability of fire-suppression equipment, access and water; – Storage and maintenance of fuels and other flammable materials; – Notification of the local NSW RFS Fire Control Centre for any works that have the potential to ignite surrounding vegetation, to be carried out during a bushfire fire danger period to ensure weather conditions are appropriate; and – Appropriate bush fire emergency management planning.

6.12 Air Quality

6.12.1 Introduction

This section discusses the potential impacts to air quality relevant to the Project and summarises the mitigation measures proposed to manage these. Due to the lack of significant point and fugitive sources of air emissions from the Project, a quantitative assessment was not necessary.

The following methodology was used to assess potential impacts relating to air quality that may result from the construction, operation and decommissioning of the Project:

- Description of the local climate relevant to the assessment of air quality impacts, including rainfall, wind speed and direction;
- Description of existing air quality based on publicly available monitoring data;
- Identification of sensitive receivers relevant to air quality;
- Qualitative assessment of Project emissions; and
- Recommendation of mitigation and management measures to minimise impacts.

6.12.2 Background

Locality Considerations

The Project Area is in a rural setting in which agricultural primary production is the predominant land use. Agricultural operations are unlikely to have a significant influence on local and regional air quality.

Figure 2-4 identified dwellings within and surrounding the Project Area. Dwellings are generally located along the New England Highway, Oxley Highway and in the township of Bendemeer. Bendemeer village is located 1.8 km to the west of the Project and has a population of 486 (ABS, 2021). Except for Tamworth, which is 46 km to the south-west of the Project, the region has a relatively sparse population density typical of a rural setting.

Local climate

The Project is located within the New England Tablelands (NET) IBRA Bioregion, which is characterised by cool winters, warm summers and uniform rainfall. However, Bendemeer is on the western edge of the NET IBRA Bioregion, adjacent to the Nandewar IBRA Bioregion, therefore its climate shows some characteristics of both regions.

The closet operating weather stations are at Woolbrook (BoM 055136), approximately 19 km to the south-east of the Project (direct-line), and Tamworth (BoM 055325), approximately 33 km south-west of the Project (direct-line).

Figure 6-21 and **Table 6-50** show the mean annual rainfall (mm) for Woolbrook from records obtained between 1958 and 2022. Mean annual rainfall at Woolbrook is 781.2 mm. December has the highest average monthly rainfall total of 101.1 mm and April the lowest at 40.3 mm.

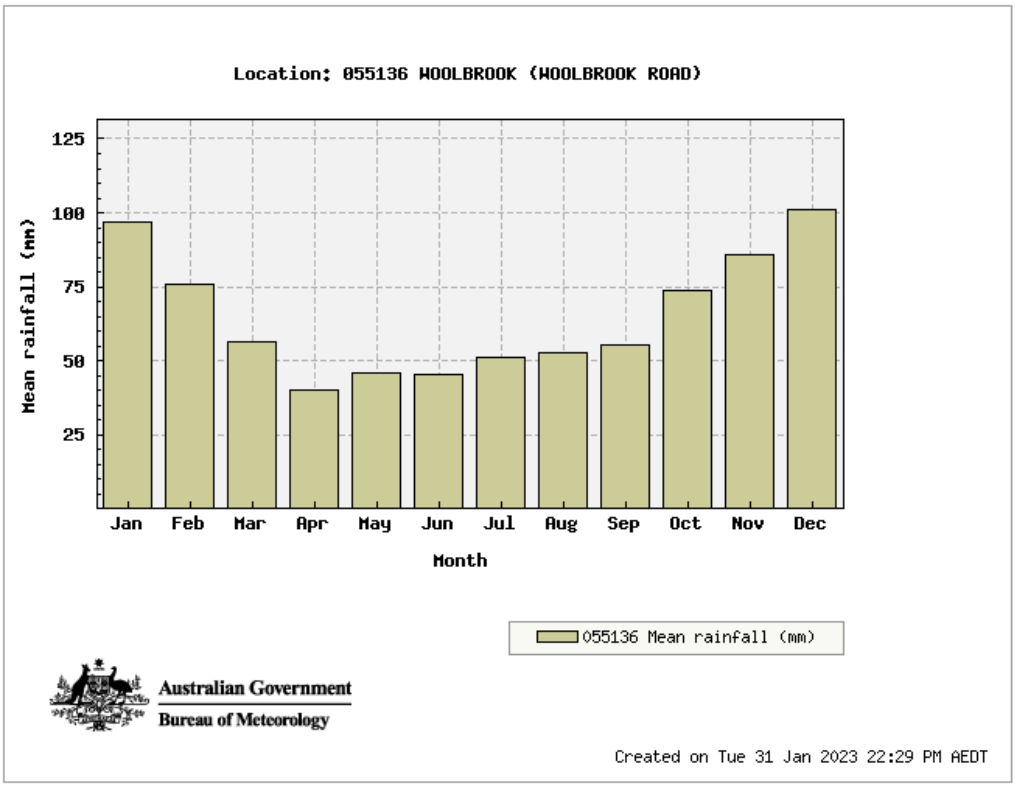


Figure 6-21 Mean Rainfall (mm) Woolbrook Weather Station 1958-2022

Table 6-50 Mean Rainfall (mm) Woolbrook Weather Station 1958-2022

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean rainfall (mm)	97.1	75.7	56.4	***40.3***	45.7	45.5	51.2	52.7	55.4	73.9	85.9	***101.1***	781.2

Figure 6-22 and **Table 6-51** show the mean annual rainfall (mm) for Tamworth from records between 1993 and 2023. Mean annual rainfall at Tamworth is 647.4 mm. November has the highest average monthly rainfall total of 82.7 mm and similarly to Woolbrook April has the lowest at 25.3 mm average monthly rainfall.

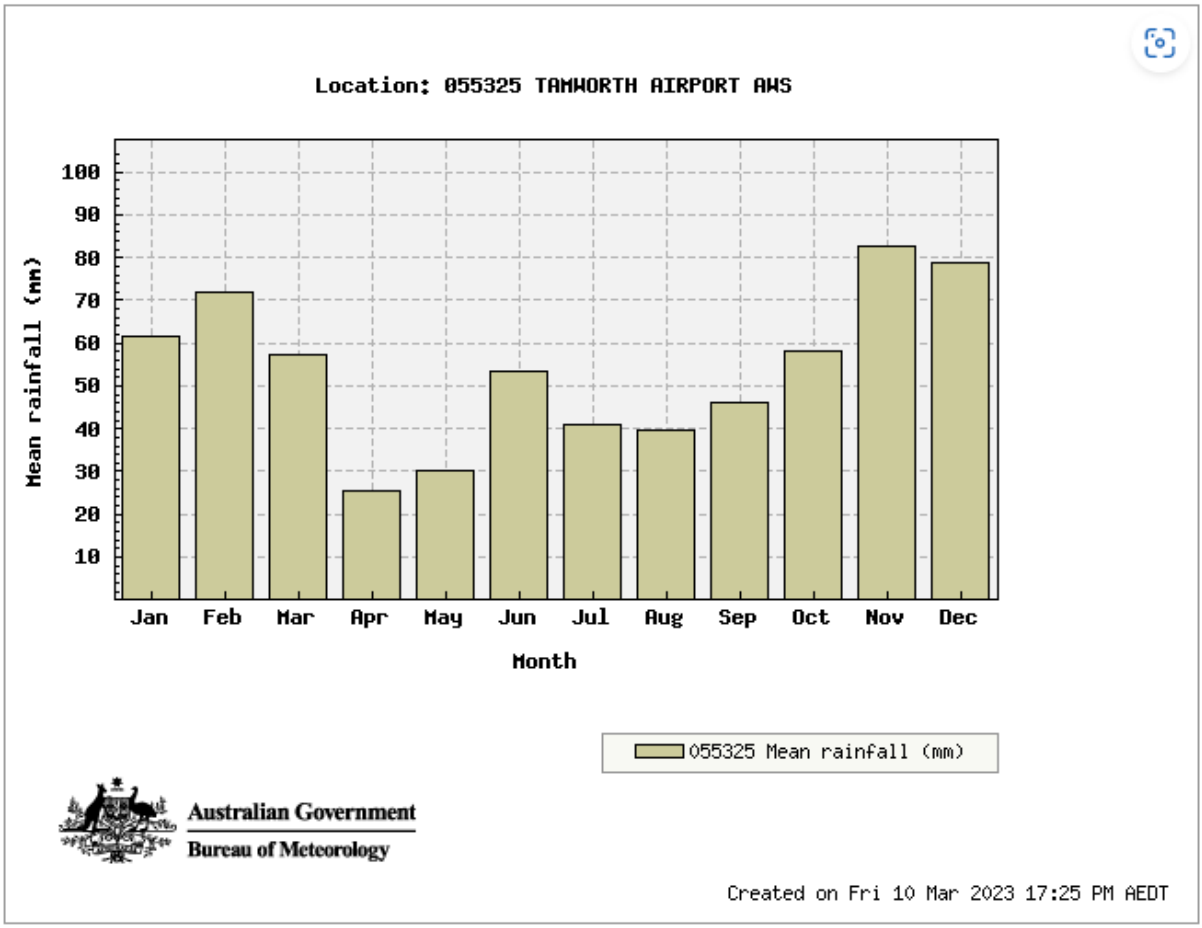


Figure 6-22 Mean Rainfall (mm) Tamworth Weather Station 1992-2023

Table 6-51 Mean Rainfall (mm) Tamworth Weather Station 1993-2023

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean rainfall (mm)	61.6	72.0	57.2	***25.3***	30.4	53.4	40.9	39.5	46.3	58.3	***82.7***	79.0	647.4

During winter, the Bendemeer region primarily encounters cool, dry, west to south-westerly winds supplied from the continental interior or from the southern areas. In summer, winds are predominantly from the east, originating from the Tasman Sea.

Across Australia, wind speed and wind direction measurements are made at various times of the day. Historically, these measurements tended to occur at 9 am and 3 pm. Wind roses summarise the occurrence of winds at a location, showing their strength, direction, and frequency, noting that:

- The percentage of calm conditions is represented by the size of the centre circle – the bigger the circle, the higher the frequency of calm conditions;
- Each branch of the rose represents wind coming from that direction, with the top of the diagram representing winds blowing from the north (e.g., northerly winds); and
- The length of the bar represents the frequency of occurrence of winds from that direction, and the colour and width of the bar sections correspond to wind speed categories.

Figure 6-23 illustrates how to interpret a wind rose and **Figure 6-24** illustrates local wind speed and direction based on 1970 to 2022 records measured at 9 am and 3 pm at the Woolbrook weather station.

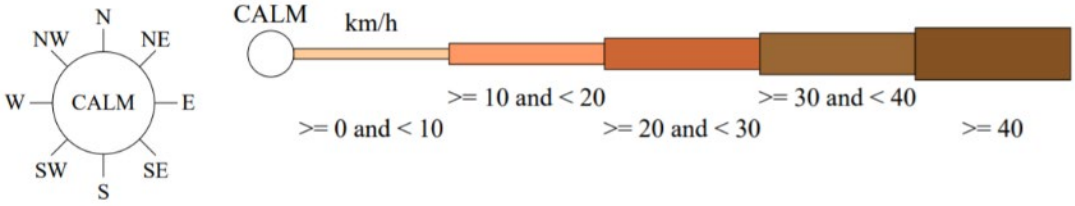


Figure 6-23 Guide to Interpreting the Wind Rose

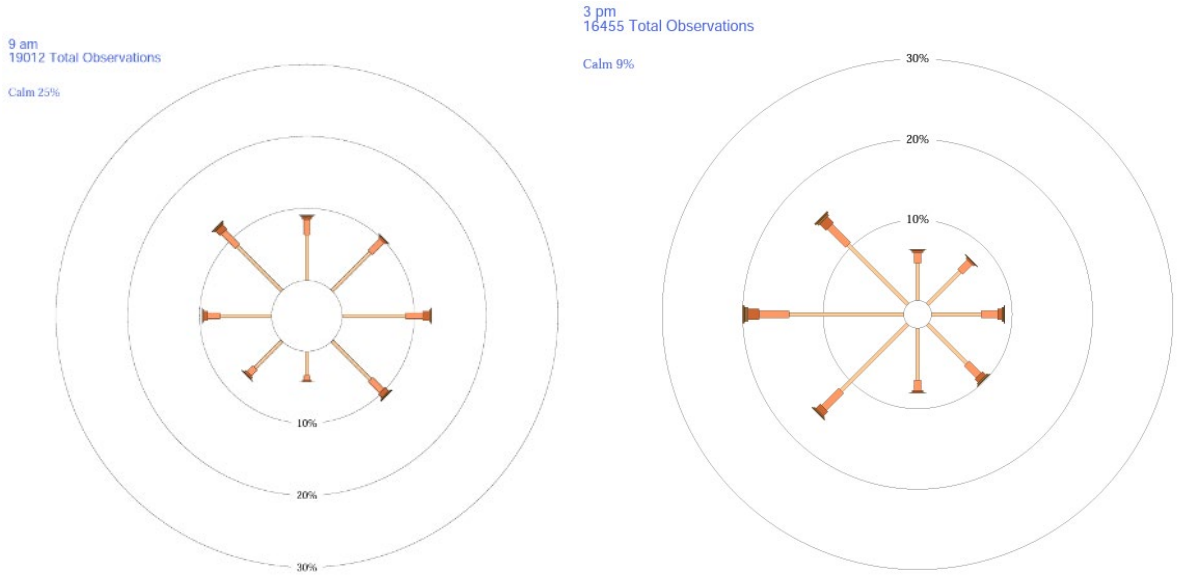


Figure 6-24 Woolbrook Wind Annual Observations 1970-2022

Source: Bureau of Meteorology (BoM, 2023b)

Figure 6-25 illustrates local wind speed and direction from the Tamworth weather station based on records from 1957 to 1992 and measured at 9 am. The dominant wind direction in the Tamworth region is from the south-east during summer, autumn and winter. During spring the wind is similar from both directions south-east and north-west. The average hourly wind speed experiences mild seasonal variation over the course of the year. The windier part of the year is during spring and summer, with average wind speeds of more than 12.3 kilometres per hour (km/h), and the calmer time of the year is during autumn and winter, with an average hourly wind speed of 11.2 km/h (Spark, 2022).

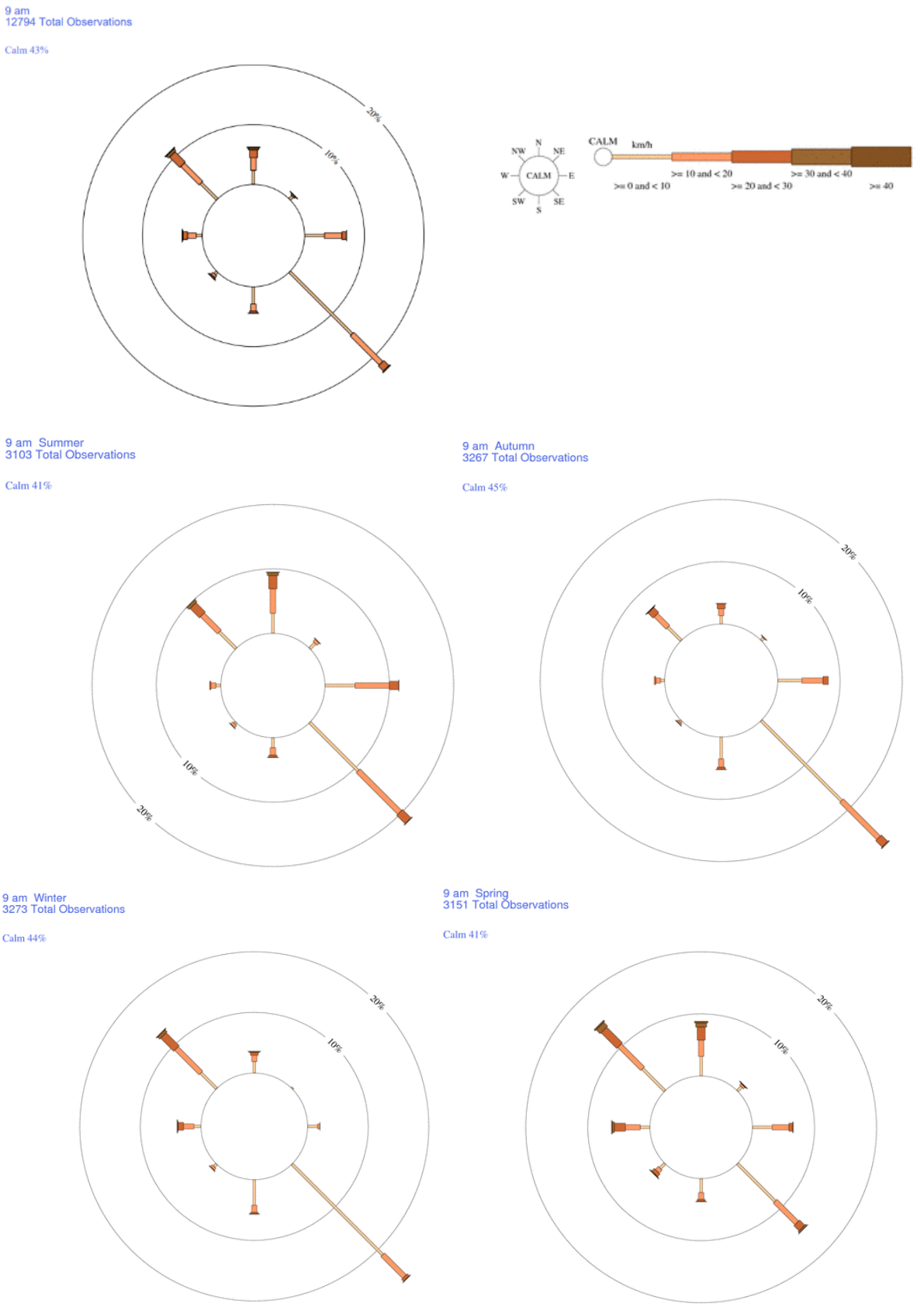


Figure 6-25 Tamworth Annual and Seasonal Wind Roses 1957-1992

Source: Bureau of Meteorology (BoM, 2023b)

Local Air quality

Air quality in Bendemeer is expected to be good due to the regional, rural landscape and limited number of polluting industries. The Project is located on land zone RU1 (Primary Production). Land surrounding the Project is predominantly zoned RU1, immediately west of the Project Area is zoned RU4 (Primary Production Small Lots) and the Bendemeer village zoned RU5 (Village), located 1.2 km to the west of the Project at its closest (direct-line). There are no industries in Bendemeer that are considered to have a significant impact to the air quality within the township.

Existing sources of air emissions in the locality include:

- Vehicle emissions – expected to be low for the site considering the traffic along the Oxley Highway; however, may be moderate closer to Bendemeer village and along the New England Highway; and
- Dust generated during dry periods – generated from traffic, ploughed agricultural land, livestock grazing (particularly mustering), agricultural machinery.

During winter months there may be minor increases in particulate matter due to smoke emissions from residential heating, and periodic bushfires.

Air quality monitoring stations are installed at Tamworth (33 km south-west of the Project, direct-line) and Armidale (58 km north-east of the Project, direct-line). The stations provide hourly pollutant concentration data, 24-hour summaries and air quality category ratings. These monitoring stations provide an indication of regional air quality. Both Tamworth and Armidale typically record “good” daily air quality index (AQI) ratings (DPE, 2023).

6.12.3 Impact Assessment

Air Quality

Emissions to the atmosphere from the Project are expected to predominantly be associated with construction activities which will be temporary and limited to:

- Localised dust emissions generated by land disturbance; and
- Exhaust emissions of civil construction and vehicle, plant, and machinery.

The anticipated construction timeframe for the Project is 18 months, with peak construction activities to occur from month 6 to 12. During the construction phase, dust particles and other air quality emissions could potentially be released from activities including:

- Earthworks including clearing, erosion and sediment control, site levelling, access tracks, site drainage works, fencing and foundations;
- Construction activities associated with earthmoving and construction equipment;
- Vegetation clearing and creation of exposed areas;
- Transport of material and equipment and haulage activities along unsealed roads;
- Processing and handling of material;
- Transfer points; and
- Loading and unloading of material.

Vehicular access within the Project Area will be provided via sealed roads; however, several new internal unsealed access tracks will be required to be constructed. The implementation of the recommended mitigation measures in **Section 6.12.4** will ensure that the Project can be constructed without any significant impact to local and regional air quality.

Greenhouse Gas Emissions

Direct GHG emissions are those emissions that are principally the result of the following types of activities undertaken by an entity, which may include:

- Generation of electricity, heat or steam. These emissions result from combustion of fuels in stationary sources;
- Physical or chemical processing. Most of these emissions result from manufacture or processing of chemicals and materials, e.g., the manufacture of cement, aluminium, etc;
- Transportation of materials, products, waste and employees. These emissions result from the combustion of fuels in entity owned/controlled mobile combustion sources, e.g., trucks, trains, ships, aeroplanes, buses and cars; and
- Fugitive emissions. These emissions result from intentional or unintentional releases, e.g., equipment leaks from joints, seals, packing, and gaskets; methane emissions from coal mines and venting; Hydrofluorocarbon (HFC) emissions during the use of refrigeration and air conditioning equipment; and methane leakages from gas transport.

The use of heavy machinery, equipment and heavy vehicles during construction of the Project will be limited to the construction phase and emissions will be localised, therefore, considered negligible.

During operations, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. However, ongoing maintenance of infrastructure and land will result in minor, localised vehicle and machinery emissions.

The Project will contribute to air quality improvement through the displacement of GHG emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations. The Project would thus abate the production of approximately 420,000 tonnes of CO_2e per annum which is a substantial contribution towards a cleaner atmosphere.

The Project does not include any point or fugitive source of offensive odours and hence will not cause or permit the emission of any offensive odour pursuant to section 129 of the POEO Act.

Decommissioning

Potential impacts to air quality during the decommissioning of the Project would be like those during construction, with the omission of clearing vegetation and earthworks that are required for site preparation.

Additionally, at the time of decommissioning the Applicant will consider best available technologies to avoid and minimise air quality impacts, which may include the potential for decommissioning to be undertaken using future technologies such as electrical vehicles.

Therefore, air quality impacts during decommissioning would be less than expected for construction.

6.12.4 Mitigation and Management

The implementation of mitigation measures will ensure that the Project will not generate significant air quality impacts during construction, operation or decommissioning and ensure that dust will not be dispersed off to surrounding properties and dwellings.

Air quality impacts associated with the Project will be temporary and minor during the construction phase of the Project. Appropriate measures will be included in the EMS and implemented to minimise the potential for offsite dust impacts resulting from construction. As part of the detailed design, the Applicant will continue to investigate options to further avoid and minimise impacts.

Measures to be included in the EMS may include, where appropriate:

- Watering roadways or preparing roadways with coarse gravel or other road coverings where required to minimise wheel-generated offsite dust emissions;

- Covering and/or stabilising material loads which may generate dust, such as aggregates, during transport into and within the construction site where practicable;
- Managing soil stockpiles through stabilisation, light watering or the use of covers;
- Minimising vegetation clearance, including clearing vegetation in stages, and stabilisation of cleared areas where practicable;
- Managing vehicle speed when travelling on unsealed roads;
- Controlling the speed of dumping from tip trucks;
- Minimising vehicle movements, where practicable;
- Cleaning and washing of vehicles, plant and equipment;
- Progressive revegetation and stabilisation of disturbance areas no longer required for construction;
- Regular inspection and maintenance of all vehicles, plant and equipment to ensure operational efficiency; and
- Regular monitoring of environmental conditions during construction, such as wind, that may result in dust generation and implementation of control measures as specified above.

During the operation phase, the Project will generate electricity without directly emitting air pollutants that are known to affect the climate and human health. The Project will contribute to the improvement of air quality through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations. The Project would thus abate the production of approximately 420,000 tonnes of CO_2e per annum which is a substantial contribution towards the reduction of anthropogenic generated GHG emitted to the atmosphere.

6.13 Waste Management

6.13.1 Introduction

This waste assessment has been prepared to characterise and quantify the waste streams likely to be generated from the construction, operation and decommissioning of the Project. It also describes measures to manage these waste streams.

The waste assessment addresses the requirements of the SEARs (refer **Appendix A**), including:

- "The EIS must 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."

The requirements of the following legislation will also be considered during construction and operation of the Project, to ensure the effective management of wastes on-site:

- POEO Act;
- *Protection of the Environment Operations (Waste) Regulation 2014*; and
- *Waste Avoidance and Resource Recovery Act 2001* (NSW) (WARR Act).

The following guidelines and strategies were considered to ensure resources are used effectively and impacts to the environment that may result because of waste generated from the Project are minimised:

- 'NSW EPA Waste Classification Guidelines – Part 1: classifying waste' (NSW EPA, 2014a) and Addendum (NSW EPA, 2016);
- 'NSW EPA Waste Avoidance and Resource Recovery Strategy 2014-2021' (WARR Strategy) (NSW EPA, 2014b);
- 'NSW EPA Better Practice Guidelines for Waste Management and Recycling in Commercial and Industrial Facilities 2012' (NSW EPA, 2012).

Further, this waste assessment considered the relevant outcomes of stakeholder engagement as described in **Section 5**.

The qualitative desktop assessment included the following tasks:

- Review of waste legislation and policy to ensure compliance and manage mitigations towards the development of appropriate management strategies;
- Determination of potential waste streams generated during construction, operation and decommissioning of the Project; and
- Establishment of waste mitigation and management options.

NSW waste management legislation, guidelines and policy have been considered to help identify requirements for waste management for the Project.

Best practice for waste management was considered in this assessment to implement the waste hierarchy principles (refer **Figure 6-26**), in accordance with the WARR Act and the principles of ESD:

- Avoidance of unnecessary resource consumption;
- Resource recovery (including reuse, reprocessing, recycling and energy recovery); and
- Disposal.

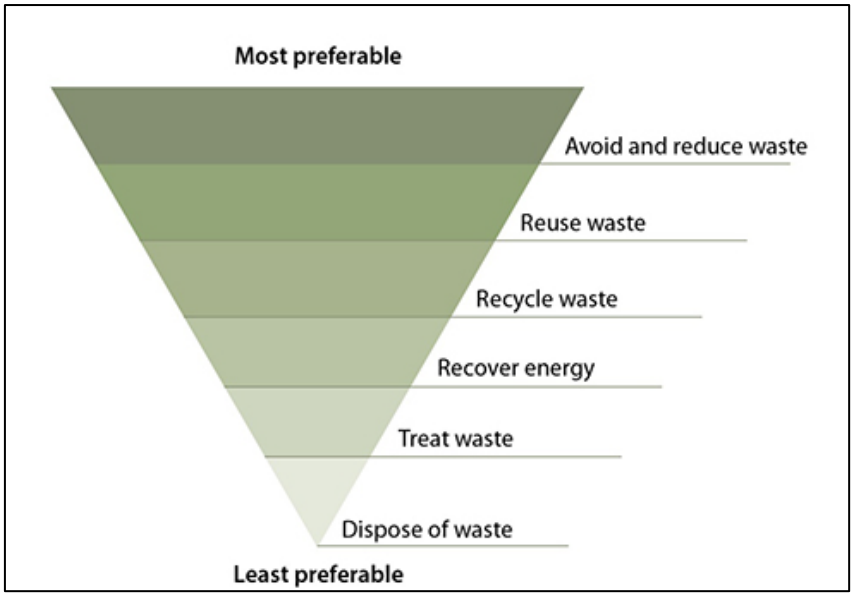


Figure 6-26 Waste Hierarchy

Source: (NSW EPA, 2022)

The Waste Classification Guidelines provide direction on the appropriate classification of waste, specifying requirements and opportunities for management, transportation and disposal of each waste category. The following classification was adopted in this assessment (NSW EPA, 2014a):

- Special waste: asbestos and tyres;
- Liquid waste: fuels, oils and pesticides;
- Hazardous waste: lead-acid, nickel-cadmium and lithium-ion batteries;
- Restricted solid waste: no wastes have been pre-classified by the EPA (at present);
- General solid waste (putrescible): food waste, green waste, sanitary waste and animal waste; and
- General solid waste (non-putrescible): building and demolition waste, synthetic fibre waste and wood waste.

6.13.2 Background

The Project Area is characterised by agricultural and grazing activities. The management of waste generated because of these activities currently lies with the landholder.

Existing waste management facilities in the vicinity of the Project and their distance by road to the Project site access point are listed in **Table 6-52**.

Table 6-52 Existing Waste Management Facilities

Waste Management Facility	Location	Distance to Project (by road)
Bendemeer Transfer Station	Sophie Street, Bendemeer	8 km
Walcha Waste Depot	48 Aerodrome Road, Walcha	42 km
Tamworth Landfill	Forest Road, Tamworth	45 km
Cleanaway Tamworth	Gunnedah Rd, Taminda, NSW, 2340	49 km
Uralla Waste Management Facility and Community Recycling Centre	Tip Road, Uralla	54 km
Duri Landfill	Duri Winton Road, Duri	69 km
Manilla Landfill	Manilla Road, Manilla	72 km
Cleanaway Armidale – Solid Waste Services	Mann Street, Armidale	75 km
Somerton Landfill	Somerton Tip road, Somerton	76 km
Armidale Waste Management Facility	Long Swamp Road, Armidale	79 km
Nundle Landfill	River Road, Nundle	83 km
Tillbuster Waste Transfer Station	New England Highway, Armidale	89 km
Bundarra Waste Management Facility	Bingara Road, Bundarra	98 km
Hillgrove Transfer Station	Hillgrove Common, Hillgrove	108 km
Guyra Recycling & Transfer Station	Everett Street, Guyra	113 km
Wollomombi Waste Transfer Station	Waterfall Way, Wollomombi	117 km
Barraba Landfill	Wittens Lane, Barraba	118 km

6.13.3 Impact Assessment

Waste Streams

Construction Phase

Waste generated during construction phase will include green waste and soil from site establishment and earthworks, packaging materials (e.g., carboard, plastics, wooden pallets), and excess construction materials such as electrical cabling, metals. Some types of waste, such as hazardous chemicals, cannot be safely recycled and direct treatment or disposal is the most appropriate management option.

Under the waste definitions in the POEO Act, most of the waste generated during the construction phase will be classified as general solid waste, either putrescible or non-putrescible. Staff facilities such as transportable amenities would also produce sanitary wastes defined as general solid wastes (putrescible) is accordance with the relevant waste definitions under the POEO Act.

Table 6-53 details the anticipated waste types, volume and classification as a result of site preparation and activities from the entire Project construction phase.

Table 6-53 Indicative Construction Waste Streams

Waste Type	Indicative Quantities	Waste Stream	Source	Classification
Green waste	All material expected to be reused	Reuse	Site establishment and clearing of Disturbance Footprint	General solid waste (non-putrescible)
Spoil	All material expected to be reused	Reuse	Site earthworks	General solid waste (non-putrescible)
Timber (including pallets)	1,300 tonnes (t)	Reuse/ General Waste	Construction and packaging waste, store, workshop	General solid waste (non-putrescible)
Cardboard packaging/ paper waste	130 t	Recyclable	Construction waste, store, workshop, O&M office	General solid waste (non-putrescible)
Polystyrene sheets	Negligible	Recyclable	Construction waste, store, workshop, O&M office	General solid waste (non-putrescible)
Plastic packaging	40 t	Recyclable	Construction and packaging waste, store, workshop, O&M office	General solid waste (non-putrescible)
Aluminium packaging	Negligible	Reuse or Recycling	Construction waste, store and workshop	General solid waste (non-putrescible)
Cable	160 t	Recyclable (nearly all), General solid waste (minimal)	Offcuts and damaged items	General solid waste (non-putrescible)
Metal	300 t	Recyclable	Offcuts and damaged items	General solid waste (non-putrescible)
Concrete	120 t	Recyclable	Construction waste	General solid waste (non-putrescible)
Electronics and electrical infrastructure	32 t	Reuse, Recyclable, General solid waste	Offcuts and damaged items	General solid waste (non-putrescible)
Oil spill clean-up material	500 kg	Hazardous waste	Construction waste, store, and workshop	General solid waste (non-putrescible)
Recyclable domestic waste	24 t	Recyclable	Recyclable domestic waste during construction	General solid waste (non-putrescible)
Domestic wastes	60 m^3	General solid waste	Domestic waste during construction	General solid waste (putrescible)
Septic tank waste	340 kL	Sewage	Ablutions during construction, operations and decommissioning	Liquid waste

Operational Phase

During the Project operations, the waste streams will be limited to minor quantities of putrescible waste associated with site maintenance activities and domestic and sewerage waste from the O&M facility. Materials such as fuels and lubricants, redundant equipment and metals may require replacement over the operational life of the Project. No waste streams would be associated with the generation of electricity.

Table 6-54 details the annual anticipated waste types, volume and classification as a result of the operational phase.

In general, the potential impacts associated with waste generation and management during the operational phase would be like those for construction, albeit at a much smaller scale per annum.

Table 6-54 Indicative Project Operational Waste Streams

Waste Type	Indicative Quantities	Waste Stream	Source	Classification
Green waste	All material expected to be reused	Reuse	Site maintenance	General solid waste (non-putrescible)
Metal	29 t	Recyclable	Offcuts, damaged items during site maintenance	General solid waste (non-putrescible)
Electronics and electrical infrastructure	250 t	Reuse, Recyclable, General solid waste	Repairs, offcuts, damaged items, site maintenance	General solid waste (non-putrescible)
Oil spill clean-up material	1.5 t	Hazardous waste	Store, workshop and site maintenance	General solid waste (non-putrescible)
Dangerous goods	830 t	Reuse, Recyclable, Hazardous waste	Damaged lithium-ion cell and batteries	General solid waste (non-putrescible)
Recyclable domestic waste	40 t	Recyclable	Recyclable domestic waste during operations	General solid waste (non-putrescible)
Domestic wastes	100 m^3	General solid waste	Domestic waste from offices during operations	General solid waste (putrescible)
Septic tank waste	320 kL	Sewage	Ablutions during operations	Liquid waste

Decommissioning Phase

At Project retirement, infrastructure and facilities will be decommissioned with the various structures, plant, equipment and buildings de-energised, disconnected, dismantled, demolished and removed. **Table 6-55** details the anticipated waste types, volume and classification as a result of the Project's one-off decommissioning.

At the end of the infrastructure life, most materials are likely to be recycled or reused in accordance with waste hierarchy principles. Items that cannot be reused or recycled, would be classified and disposed of at suitable facilities following applicable regulations. Batteries would be disposed in accordance with the hazardous waste policies active at the time of decommissioning.

Table 6-55 Indicative Project Decommissioning Waste Streams

Waste Type	Indicative Quantities	Waste Stream	Source	Classification
Green waste	All material expected to be reused	Reuse	Site rehabilitation	General solid waste (non-putrescible)
Solar panels and mounting system	22,000 t	Recyclable (nearly all), General solid waste (minimal)	Decommissioning of solar panels and tracker mounting systems (excluding piles)	General solid waste (non-putrescible)
Cable	3,150 t	Recyclable (nearly all), General solid waste (minimal)	Decommissioning of underground cabling including 1500V DC and 33kV AC cabling	General solid waste (non-putrescible)
Dangerous goods	2,750 t	Reuse, Recyclable, Hazardous waste	Decommissioning of lithium-ion cell and batteries	General solid waste (non-putrescible)
Metal	12,000 t	Reuse, Recyclable	Disassembly of equipment such as the inverters, transformers, tracker piles and similar components	General solid waste (non-putrescible)
Concrete	11,500 t	Recyclable	Infrastructure demolishment	General solid waste (non-putrescible)
Recyclable domestic waste	6 t	Recyclable	Recyclable domestic waste during decommissioning	General solid waste (non-putrescible)
Gravel	69,000 t	Reuse	Road base and hard stand areas	General solid waste (non-putrescible)
Oil	450 t	Hazardous waste	De-tanking of transformer insulating oil	General solid waste (non-putrescible)
Domestic wastes	16 m^3	General solid waste	Domestic waste from offices during decommissioning	General solid waste (putrescible)
Septic tank waste	90 kL	Sewage	Ablutions during decommissioning	Liquid waste

Waste Disposal Options

Table 6-56 provides the waste streams accepted at each waste facility currently operational nearby the Project, two facilities are licensed under the POEO Act. The waste classification and volume accepted at these facilities are further described in **Table 6-56** to **Table 6-59**.

Given the Project Area has no access to a sewer a septic tank may be constructed, or amenity facilities may be pumped out via tanker and delivered to the closest available sewage treatment facility, or as agreed with Tamworth Regional Council and defined prior to commencement of construction.

Table 6-56 Existing Waste Management Facilities and Accepted Waste streams

Waste Management Facility	Waste Streams Accepted
Bendemeer Transfer Station	■ Transfer Station
Walcha Waste Depot	■ General solid waste (non-putrescible), including scrap metal, bulky goods, fridges/freezers/air-conditioning units and offal; ■ General solid waste (putrescible); ■ Special waste (asbestos)
Tamworth Landfill	■ Refer **Table 6-57.**
Cleanaway Tamworth	■ Refer **Table 6-58.**
Uralla Waste Management Facility and Community Recycling Centre	■ General solid waste (non-putrescible), including pallets; ■ General solid waste (putrescible); ■ Liquid waste (oil); ■ Special waste (tyres, asbestos); and ■ Hazardous waste (paint, batteries)
Duri Landfill	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Special waste (tyres, asbestos).
Manilla Landfill	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Special waste (tyres).
Cleanaway Armidale – Solid Waste Services	■ Solid waste
Somerton Landfill	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Special waste (tyres).
Armidale Waste Management Facility	■ Refer **Table 6-59.**
Nundle Landfill	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Special waste (tyres).
Tillbuster Waste Transfer Station	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Hazardous waste (paint, batteries).
Bundarra Waste Management Facility	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Hazardous waste (batteries).
Hillgrove Transfer Station	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Hazardous waste (paint, batteries).

Waste Management Facility	Waste Streams Accepted
Guyra Recycling & Transfer Station	■ Liquid waste (motor oil); ■ Hazardous waste (batteries – lead acid, single use and rechargeable-, Chemical Drums, paints and solvents).
Wollomombi Waste Transfer Station	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Hazardous waste (paint, batteries).
Barraba Landfill	■ General solid waste (non-putrescible), excludes building and demolition waste; ■ General solid waste (putrescible); ■ Liquid waste (motor oil); and ■ Special waste (tyres).

Table 6-57 Licensed Facility: EPL 5921 Tamworth Landfill

Tamworth Landfill

EPL number	Scheduled Activity	Fee Based Activity	Scale
5921	Composting	Composting	> 5,000-50,000 T annual capacity to receive organics
	Waste disposal (application to land)	Waste disposal by application to land	Any capacity
	Waste processing (non-thermal treatment)	Non-thermal treatment of general waste	Any annual processing capacity
	Waste storage	Waste storage – other types of waste	Any other types of waste stored
		Waste storage – waste tyres	> Any tyres stored

Waste Streams Accepted	Description	Activity	Other Limits
Waste tyres	As defined in Schedule 1 of the POEO Act, as in force from time to time.	Waste storage.	Maximum of 50 tonnes or 5000 waste tyres at any one time.
General solid waste (putrescible), General solid waste (non-putrescible), and Asbestos waste	As defined in Schedule 1 of the POEO Act, as in force from time to time.	Waste disposal (application to land).	N/A
Certain liquid wastes	Liquid waste as defined in Schedule 1 of the POEO Act, as in force from time to time. Limited to septic tank pump-out waste, grease trap pump-out waste, garbage bin wash-out waste or other chemically similar liquid wastes.	Waste processing (non-thermal treatment)	N/A
Certain organics	Organics as defined in Schedule 1 of the POEO Act, as in force from time to time. Limited to garden waste and paunch material generated by livestock processing activities.	Composting	
Waste	Any waste received on-site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time.	-	N/A

Table 6-58 Licensed Facility: EPL 10804 Cleanaway Tamworth Landfill

Cleanaway Tamworth

EPL number	Scheduled Activity	Fee Based Activity	Scale
10804	Waste processing (non-thermal treatment)	Non-thermal treatment of hazardous and other waste	Any annual processing capacity
	Waste storage	Waste storage – hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	Any listed waste type stored

Waste Streams Accepted	Description	Activity	Other Limits
Waste mineral oils unfit for their original intended use, Filter cake, Tyres, Residues from industrial waste, Waste oil/hydrocarbons mixtures/emulsions in water, Grease trap waste, Liquid Food Waste, Containers & drums containing controlled waste residues, and Lead; lead compounds.	-	Waste processing (non-thermal treatment) Waste storage	-
Fly ash, Clinical and related wastes, Photographic chemicals & processing waste, Acidic solutions or acids in solid form, Basic solutions or bases in solid form, Waste ink, dye, pigment, paint, lacquer & varnish, Waste resin, latex, plasticiser, glue & adhesive, and Organic solvents excluding halogenated solvents.	-	Waste processing (non-thermal treatment) Waste storage	-
General or Specific exempted waste	Waste that meets all the conditions of a resource recovery exemption under Clause 51A of the POEO (Waste) Regulation	As specified in each specific resource recovery exemption	N/A
Waste	Any waste received on-site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	N/A

Table 6-59 Licensed Facility: EPL 5860 Armidale Solid Waste Landfill Facility

Armidale Solid Waste Landfill Facility

EPL number	Scheduled Activity	Fee Based Activity	Scale
5860	Composting	Composting	Composting
	Waste processing (non-thermal treatment)	Non-thermal treatment of hazardous and other waste	Any annual processing capacity
	Waste disposal (application to land)	Waste disposal (application to land)	Any capacity
	Waste storage	Waste storage – hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	Any listed waste type stored
		Waste storage – waste tyres	> Any tyres stored

Waste Streams Accepted	Description	Activity	Other Limits
General solid waste (putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	The total quantity of waste disposed of at the premises must not exceed 20,000 tonnes per year
General solid waste (non-putrescible)			
Asbestos waste			
Waste tyres		Waste disposal (application to land) Waste storage	The total quantity of waste disposed of at the premises must not exceed 20,000 tonnes per year. The total quantity of waste tyres stored at the premises must not exceed 50 tonnes or 5,000 waste tyres at any one time.
General solid waste (non-putrescible)	Wastes assessed as General Solid Wastes which are also subject to general or specific immobilisation approvals which have a restriction that they may only be disposed of at waste disposal facilities which have currently operating leachate collection systems.	Waste disposal (application to land)	The total quantity of waste disposed of at the premises must not exceed 20,000 tonnes per year
Garden Waste	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste processing (non-thermal treatment)	NA
Concrete, bricks and roof tiles	-	Waste processing (non-thermal treatment)	NA
Contaminated Soil from Armidale Gas Works	-	Waste storage	The total quantity of contaminated soil stored at the premises must not exceed 1,000m³ at any one time
Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-	NA

6.13.4 Mitigation and Management

A Waste Management Plan (WMP) will be prepared and will describe the measures to be implemented to manage, reuse, recycle and safely dispose of waste. The key objective of the WMP is to ensure that any use of local waste management facilities does not disadvantage local businesses and the local community, by exhausting any available capacity at these facilities.

Table 6-60 summarises specific measures to be included in the WMP of the Project for each phase.

Table 6-60 Mitigation Measures

Measures	Phase[19]		
	C	O	D
Adopt protocols to identify opportunities to follow the waste hierarchy, to encourage the most efficient use of resources, as well as reduce costs and environmental harm in accordance with the principles of ESD.	■	■	■
Adopt purchasing protocols in the selection of all components of the Project, to reduce the likelihood of equipment failure and minimise the potential for waste.	■	■	
Select solar panels manufacturers as recommended by Clean Energy Council, that will meet a range of higher standards in addition to relevant Australian and International Standards.	■		
Engage with Tamworth Regional Council to discuss the options for disposal and reuse of the identified waste streams likely to be generated, to ensure that any use of local waste management facilities does not exhaust available capacity, nor disadvantage the local community.	■		■
Classify wastes in accordance with the NSW EPA Waste Classification Guidelines – Part 1: classifying waste (NSW EPA, 2014a) and Addendum (NSW EPA, 2016).	■	■	■
Provide waste storage locations within assigned area, with sufficient space for separation and storage of different waste.	■	■	■
Store and dispose of waste lawfully at a licensed waste facility, including fuels, oils and hazardous substances used onsite.	■	■	■
Separate recyclable and non-recyclable materials on-site prior to being transported to waste facility.	■	■	■
Investigate opportunities for recycling of wastes prior to sending to landfill.	■	■	■
Waste receptacles will be collected on a regular basis by licensed contractors or Council collection service and transported for offsite disposal at an appropriately licensed landfill or recycling facility.	■	■	■
Provide toilet facilities for onsite workers and how sullage would be disposed of (e.g., pump out to local sewage treatment plant).	■	■	■
Provisions protocol for the packaging, transportation of spent batteries to collection and recycling facilities.	■	■	■

Decommission and rehabilitation of the Project will be undertaken in accordance with Project approval requirements. Indicative management strategies that will be adopted for each waste type are detailed in **Table 6-61**.

Table 6-61 Indicative Waste Generation and Management Strategies

Waste Type	Management Strategies
Green waste	Onsite reuse where possible or reused offsite in accordance with the 'Mulch Resource Recovery Order and Exemption' (NSW EPA, 2016).
Spoil	Onsite reuse; or reused offsite as Virgin Excavated Natural Material or the Excavated Natural Material Resource Recovery Order and Exemption' (NSW EPA, 2014b) (as applicable).
Concrete	Source separated and stored in separate receptacles/ storage areas. Reused onsite where feasible; reused offsite in accordance with the 'Recovered Aggregate Resource Recovery Order and Exemption' (NSW EPA, 2014c); or transported off site for recycling
Timber	Where practicable procurement of surplus pallets will be avoided. Delivery of material on pallets will be limited where practicable; however, if materials have to be delivered on pallets, these will be returned to the supplier at time of delivery (where practicable). Pallets will be reused where possible, through product stewardship arrangements sought by the Applicant prior to construction.

[19] C - construction; O - operation; D – decommissioning.

Waste Type	Management Strategies
	Damaged pallets will be sold for wood chip where practicable (e.g., if untreated and uncontaminated). Wood pallets not suitable for reuse or recycling would be stored in designated waste storage areas for collection by an authorised contractor for offsite drop-off.
Plastic packaging	Source separated and stored in separate receptacles/ storage areas. Offsite transport for recycling.
PET	Source separated and stored in separate receptacles/ storage areas. Offsite transport for recycling.
Cardboard packaging/ paper waste	Source separated and stored in separate receptacles/ storage areas. Offsite transport for recycling.
Glass	Source separated and stored in separate receptacles/ storage areas. Offsite transport for recycling.
Empty chemical drums	Reused onsite, recycled via contractor or returned to supplier.
Paint	Transported from site and disposed of in accordance with the 'Waste Classification Guidelines' (NSW EPA, 2014a).
Oil spill clean-up material	Collected oily rags and spill clean-up material will be collected in regulated waste bins and transported by a licensed regulated waste contractor to a licenced regulated waste receiver for disposal.
Waste oils, lubricants and liquids	Stored separately and transported by a licensed regulated waste contractor to a licensed regulated waste receiver for disposal
Metals (ferrous and non-ferrous)	Scrap metal will be stored in for periodic transportation offsite to applicable recycling facilities.
Solar panels	Damaged and end-of-life solar panels and associated infrastructure will be transported by a licensed regulated waste contractor to a licenced regulated waste receiver for disposal. As technology allows waste management providers that specialise in recycling of solar panels will be investigated.
Electronics and electrical infrastructure	Stored in dedicated areas prior to offsite transport. As far as possible, all materials and components will be reused, sold as scrap, recycled or re-purposed to the maximum amount economically practicable. Where not practicable, transported from site and disposed of in accordance with the 'Waste Classification Guidelines' (NSW EPA, 2014a)
Recyclable domestic waste	Stored in dedicated recyclable bins for periodic transportation offsite to applicable recycling facilities.
Septic tank waste	Collected waste will be transported by a licenced regulated waste contractor to a licenced regulated waste receiver for disposal.
Domestic wastes	Transported from site and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014a).

6.14 Economic

6.14.1 Introduction

An Economic Assessment was undertaken to assess the potential economic impacts of the construction and operation of the Project on the regional and NSW economy. The Economic Assessment is provided in **Appendix R**, it addresses the relevant requirements of the SEARs (**Appendix A**) and considers all relevant stakeholder engagement as described in **Section 5**.

The following methodology was used to assess potential economic impacts that may result from the Project:

- Identification and description of the Study Area;
- Impact on the regional economy from the construction and operation of the Project;
- Input-output (IO) analysis to assess the direct and indirect impacts (gross economic footprint) of the construction and operation of the Project on the regional and NSW economy. There are 2 key steps in IO analysis, which includes:
  - IO table development: to identify the economic structure of the region and multipliers for each existing sector of the economy;
  - Direct impact or stimulus of the Project identification: to estimate the IO multipliers and flow-on effects for the impacts or stimulus of the Project;
- The IO analysis identifies the economic activity of a project on the economy in terms the four main indicators, including:
  - 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 wage costs;
  - Income: the wages paid to employees including imputed wages for self-employed and business owners;
  - Employment: the number of people employed (including self-employed, full-time, and part-time);
- Assessment of agricultural economic activity reduction from the construction and operation footprint;
- A cumulative impact assessment of other relevant future developments on economic activity; and
- Measures to mitigate and/ or manage potential economic impacts.

Full details regarding the methodology for the Economic Assessment are provided in **Appendix R**.

6.14.2 Background

The Study Area (also referred to as ‘regional economy’) assessed in the Economic Assessment (**Appendix R**) is the region within which the Project is located, which has the potential to provide inputs to, and derive economic benefits from the construction and operation of the Project. This region may experience impacts from reduction in agricultural activity and from increased demand for labour and other inputs to production. The Study Area is defined as the combined LGAs of Tamworth Regional, Armidale Regional, Uralla Shire and Walcha.

Table 6-62 provides a summary of the Study Area based on the 2021 ABS Census of Population and Housing and the Australian and New Zealand Industry Classification (ANZSIC).

Table 6-62 Characteristics of the Study Area

Aspects	Study Area Summary
Residents	■ In 2021, the Study Area total population was 101,181, with Tamworth Regional accounting for the majority with 62%, followed by Armidale Regional 29%, then Uralla Shire with 6% and Walcha 3%. ■ The Study Area total labour force was 47,687, Tamworth Regional representing 63% of the total, Armidale Regional 28% followed by Uralla Shire 6% and Walcha 3%. ■ During the same period, 2,187 people were identified as being unemployed, which accounts for approximately 4.6% of the total labour force in the Study Area. The majority of these (1,314 unemployed) are located in the Tamworth Regional, followed by Armidale Regional (715 unemployed), Uralla Shire (115) and Walcha (43).
Population Growth	■ The population of the Study Area has been growing at an average annual rate of 0.8% (from 2006 to 2021), approximately half the rate of NSW, which is 1.6% for the same period. ■ The past population growth rate in the Study Area is largely driven by the population growth rate for Tamworth Regional, with an average annual rate of 1.2%, for the period from 2006 to 2021. Followed by Armidale Regional with 0.4% growth and Uralla Shire with 0.3% growth for the same period. However, the population of Walcha has declined in 0.4% from 2006 to 2021. ■ The population for the Study Area from 2021 to 2041 is predicted to continue to grow, with average an annual rate of 0.5%, which is approximately half that of the NSW growth prediction of 1.0%. ■ The predicted growth from 2021 to 2041 for the LGAs within the Study Area are at slower rates compared to the period of 2006 to 2021. Tamworth Regional prediction average growth rate is 0.7%, followed by Armidale Regional 0.3%, Walcha -0.2%, then Uralla Shire with -1.0%.
Occupation	■ The main occupation in the Study Area were *Professionals*, accounting for 19.5% of the total employed people aged 15 years and over. Followed by *Managers* with 14.7% and *Labourers* 13.6%. ■ In Tamworth Regional the main occupation was *Professionals* accounting for 17.6% of the total employment in the LGA, followed by *Technicians* 14%. ■ In Armidale Regional the main occupation was *Professionals* accounting for 24.2% of the total employment in the LGA, then *Managers* 15.5%. ■ In Uralla Shire the main occupation was *Managers* accounting for 18.6% of the total employment in the LGA, followed by *Professionals* 16.9%. ■ In Walcha the main occupation was *Managers* accounting for 34.1% of the total employment in the LGA, then *Labourers* with 14.7%.
Top Industry Sectors of Employment for Usual Residents	■ *Hospitals (except Psychiatric Hospitals*) was the most significant employment sector for residents of the Study Area reflecting the significance of this sector to both the Tamworth Regional LGA and Armidale Regional LGA. ■ *Beef Cattle Farming (Specialised)* was the second the most significant employment sector for usual residents of the Study Area driven by the significance of this sector to the Armidale Regional LGA, Uralla LGA and Walcha LGA. ■ *Other Social Assistance Services, Higher Education,* and *Secondary Education* were the following most significant employment sectors for residents of the Study Area.
Exporting Industries	Exporting sectors are key drivers of regional economies and reflect a region's endowments and competitive advantages. Using the IO industry sector classifications, the largest four exporting industries in the Study accounts for $2.4 billion in total or 61% of the total exports. These industries are: ■ Manufacturing mainly *Meat and Meat Product Manufacturing*, representing $1.1 billion of Gross Regional Product (GRP) of the Study Area. ■ Education and Training mainly *Technical, Vocational, and Tertiary Education Services*, which accounts for $0.5 billion. ■ Construction mainly *Residential Building Construction*, $0.4 billion. ■ Agriculture, Forestry and Fishing mainly *Sheep, Grains, Beef and Dairy Cattle Sector*, $0.4 billion.

6.14.3 Impact Assessment

Multipliers

Multipliers are used to predict the total impact on all industries in an economy from changes in the demand for the output of any one industry (ABS, 1995).

During construction, the adjusted type 11A ratio multipliers for the construction workforce of the Project range from 1.60 for income up to 1.87 for output for the Study Area. Whilst for NSW the type 11A ratio multipliers for the construction workforce range from 2.88 for income up to 3.40 for value added.

During operation, the Type 11A ratio multipliers for the Project's impact on the Study Area economy range from 1.20 for value-added up to 2.33 for employment. Whilst the NSW Type 11A ratio multipliers for the Project range from 1.56 for value-added up to 4.75 for employment.

Impact on Economy

The Project will provide economic activity to the Study Area and NSW economy during construction and operation of the Project. The expenditure during construction is associated with manufacturing of equipment and expenditure across the following three construction sectors of the IO industry classification:

- *Heavy and Civil Engineering Construction Sector*: includes businesses involved in engineering construction and project management services for a diverse range of activities;
- *Construction Services Sector*: includes businesses involved in earthmoving work; and
- *Non-Residential Building Construction Sector*: includes businesses engaged in the construction of industrial buildings.

Note that a conservative approach was adopted in the Economic Assessment, where all machinery manufacturing is assumed to occur outside the Study Area and NSW.

The average annual employment for the peak 12-month of construction of the Project is 260 FTE. Based on the IO coefficients of the above construction sectors in the regional IO table, $90M of (direct) expenditure would be required across these sectors to generate the level of onsite workforce required for the Project for a year (refer **Section 3.4.2**).

Based on similar projects in the region and indicative feedback provided by the Applicant's engineering, procurement and construction (EPC) contractor for a similar renewable energy project, it is anticipated that approximately 70% of the construction workforce will reside in the region. The assumptions resulting in the 70% employment sourced from the Study Area is provided in Section 4.1.1 of **Appendix R**.

Table 6-63 summarises the estimated direct and indirect economic impacts of the Project's construction and operation on the Study Area and NSW economy. The analysis in the Economic Assessment assumed that approximately 70% of the construction workforce and all the operational employment would reside in the Study Area.

Table 6-63 Annual Economic Impacts of the Project

Impacts	Total Effect		Phase
	Study Area	NSW	
Direct and indirect output	$168M	$290M	Construction
	$32M	$44M	Operation
Direct and indirect value-added	$64M	$126M	Construction
	$21M	$27M	Operation
Direct and indirect household income	$34M	$80M	Construction
	$3M	$7M	Operation
Direct and indirect jobs	469 jobs	880 jobs	Construction
	35 jobs	71 jobs	Operation

The construction and operation impacts are larger for the NSW economy since there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy. For instance, the NSW economy because of its size and diversity is better placed to provide more of the inputs to production than the regional economy.

Impact on Sectors

Table 6-64 summarises the sectors of the Study Area likely to be impacted as a result of the Project.

Table 6-64 Study Area Economy Main Sectors Affected

Sectors Impacted	Phase
Output, value-added, income and employment production induced flow-on effects	
■ *Retail Trade*	Construction
■ *Road Transport*	Construction
■ *Employment, Travel Agency and Other Administrative Services*	Construction
■ *Non-Residential Property Operators and Real Estate Services*	Construction
■ *Cement Lime and Ready-Mixed Concrete Manufacturing*	Construction
■ *Professional, Scientific and Technical Services*	Construction and Operation
■ *Wholesale Trade*	Construction and Operation
■ *Electricity Transmission, Distribution, On Selling and Electricity Market Operation*	Operation
■ *Finance*	Operation
■ *Construction Services*	Operation
■ *Auxiliary Finance and Insurance Services*	Operation
Consumption induced flow-on effects	
■ *Retail and Wholesale Trade*	Construction and Operation
■ *Food and Beverage Services*	Construction and Operation
■ *Health Care Services*	Construction and Operation
■ *Primary and Secondary Education*	Construction and Operation
■ *Residential Care and Social Assistance*	Construction and Operation
■ *Finance*	Operation

Table 6-65 summarises the sectors of the NSW economy likely to be impacted from the development of the Project.

Table 6-65 NSW Economy Main Sectors Affected

Sectors Impacted	Phase
Output, value-added, income and employment production induced flow-on effects	
■ *Finance*	Construction
■ *Auxiliary Finance and Insurance Services*	Construction
■ *Electricity Generation*	Operation
■ *Non-Residential Property Operators and Real Estate*	Operation
Consumption induced flow-on effects	
■ *Road Transport*	Construction
■ *Finance*	Construction and Operation
■ *Professional*	Construction and Operation
■ *Scientific and Technical Services*	Construction and Operation
■ *Insurance and Superannuation*	Construction and Operation
■ *Personal Services*	Construction and Operation
■ *Other Services*	Construction and Operation
■ *Non-Residential Property Operators and Real Estate Services*	Construction and Operation
■ *Automotive Repairs and Maintenance*	Operation

Impact on Agriculture

Construction of the Project will impact approximately 606.4 ha of agricultural land that is currently used for beef cattle and sheep. Whilst during operations is assumed to result in 14.8 ha being unavailable for agriculture and the remaining 591.6 ha having a 20% (as used in the SAIS in **Appendix L**) reduction in the sheep stocking rate.

Assuming gross revenue equivalent to that of the NSW DPI Gross Margin Budget for Merino Ewes (20 micron) – Merino Rams equals to $794 per ha, the foregone agriculture during Project construction would be in the order of $482,000 annually, and of $106,000 annually during operations.

Table 6-66 summarises the estimated direct and indirect economic impacts of foregone agriculture associated with the construction and operation of the Project on the Study Area and NSW economy for one year. It indicates that the agricultural impacts from the operation and construction of the Project on direct and indirect jobs are negligible.

Table 6-66 Annual Economic Impacts of Foregone Agriculture

Impacts	Total Effect		Phase
	Study Area	NSW	
Direct and indirect output	$0.9M	$1.3M	Construction
	$0.2M	$0.3M	Operation
Direct and indirect value-added	$0.4M	$0.6M	Construction
	$0.1M	$0.1M	Operation
Direct and indirect household income	$0.2M	$0.3M	Construction
	$0.0M	$0.1M	Operation
Direct and indirect jobs	3 jobs	4.5 jobs	Construction
	0.6 jobs	1 jobs	Operation

Other Impacts

The construction of the Project will create demand for regional labour resources and regional inputs to production. Considering a direct demand of an average of 260 FTE for the 12-month peak construction of the Project, no or modest observable price effects are anticipated. In the short-term this has a potential on:

- Regional labour resources: demand can lead to increased construction wages, attraction of workers from other relevant sub-sectors and sectors of the economy leading to labour shortages in these other areas of the economy (and associated shortages of goods and services), and rising inflation as firms pass wage costs onto consumers; and
- Regional inputs to production: excess demand for inputs to construction of an individual project such as quarry materials and concrete can result in rising costs for these factor inputs and potentially shortages for other uses.

During operations, the Project will create a very small demand for regional labour resources and regional inputs to production when compared to the construction phase. Consequently, no wage or price increases or production shortages are anticipated.

6.14.4 Cumulative Economic Impacts

The cumulative impacts of the Project together with other relevant future SSDs on the economic activity include:

- Generate large demand for a suitably qualified construction workforce in the region and surrounds, which can help address the jobs growth imbalance between Australia's biggest cities and regions;
- Provide opportunities for the existing and future regional workforces, attracting middle skilled and high skilled workers and families to regional areas, reducing outmigration of the regional workforce to look for employment in cities, and increasing regional labour force participation;
- Potential to increase construction wages, attraction of workers from other relevant sub-sectors and sectors of the economy leading to labour shortages in these other areas of the economy (and associated shortages of goods and services), rising inflation as firms pass wage costs onto consumers; and
- Rise costs for construction inputs, such as quarry materials and concrete, and potentially shortages for other uses.

These potential impacts will be more likely and larger as a result of cumulative SSDs across the region and the State, than from an individual development.

6.14.5 Mitigation and Management

The economic impact mitigation and management measures include:

- Employment of regional residents where they have the required skills, experience and commitment;
- Participating, as appropriate, in business groups, events or programs in the regional community;
- Locally sourcing non-labour inputs to production where local producers can be cost and quality competitive;
- Establishment of a CBF administered by a Bendemeer Community Benefit Fund Committee and forms part of a VPA to fund community projects;
- Lease payments to host landowners that provide an alternative drought proof income with potential flow-on benefits to the regional economy;
- Continued agricultural activities during the operational phase of the Project and reinstatement of full pre-project agricultural production following Project decommissioning; and
- Measures to maximise community involvement and assist respective businesses in becoming 'job ready' will be implemented to assist with job procurement within the Study Area.

The Applicant will work in partnership with the relevant Council in the Study Area, and the local community so that the projected economic benefits of the Project are maximised, and the impacts minimised.

6.15 Social

6.15.1 Introduction

A Social Impact Assessment (SIA) was undertaken for the Project to identify the Project's potential social impacts, and the means by which these social impacts are identified, assessed, managed, and monitored. The SIA is provided in full in **Appendix S**.

The SIA addresses the relevant requirements of the SEARs (**Appendix A**) and considers all relevant stakeholder engagement as described in **Section 5**. It was completed in line with the 'Social Impact Assessment Guideline for State Significant Projects' (SIA Guideline) (DPE, 2023a) and the 'Technical Supplement: Social Impact Assessment Guideline for State Significant Projects' (SIA Technical Supplement) (DPE, 2023b), which aims to enhance the rigour applied to SIAs with a view to minimising impacts and enhancing benefits in line with good international industry practice.

Figure 6-27 outlines the steps taken to complete the SIA, which are described in the following sections.

Figure 6-27 SIA Process

The phases adopted by the SIA are as follows:

- Phase 1: Scoping aimed to capture and characterise the likely social impacts to inform Project planning and ensuring level of assessment is proportionate to the scale and nature of the likely social impacts;
- Phase 2: The social baseline describes the social context in the absence of the Project. It documents the existing social environment, conditions and trends relevant to the impacts identified. The social baseline is the benchmark against which direct, indirect and cumulative impacts are predicted and analysed;
- Phase 3: The impact assessment undertaken in the SIA places people at the centre and considers the impacts from their perspective. The primary and secondary data collected and compiled for the social baseline, including community voices, is then assessed with the rigorous impact significance methodology, as outlined in the SIA Technical Supplement. In this approach, impact significance is understood as the likelihood of an impact occurring combined with the magnitude of impacts, both positive and negative, and prior to the application of any mitigation or management measures;
- Phase 4: Following the assessment of impacts, measures to avoid and/or minimise negative impacts are considered, including those implemented in earlier stages of Project planning and development. Where avoidance or minimisation is not possible, management strategies are identified. Where an impact is predicted to be positive, measures to enhance positive impacts are identified to ensure the maximum benefit to the community across all impact significance ratings; and
- Phase 5: The accuracy of the impact assessment, progress towards implementation of mitigation and management measures, and their effectiveness is understood through implementation of a monitoring and management framework. The framework includes a program for monitoring the predicted social impacts against actual impacts that arise as a result of the Project.

6.15.2 Background

Social Locality

The first step in a SIA is the scoping process, which helps to define the social area of influence, or Social Locality (**Figure 6-28**), as well as the potential interactions between the Project and people surrounding the Project who may experience impacts.

For the purposes of the SIA, the Social Locality includes the Project Area, the area surrounding the Project Area where noise, visual and other impacts may occur, the haulage routes where similar amenity impacts may be experienced, and the communities in larger centres that may provide workers or goods and services to the Project. The Project's Social Locality is comprised of the following three components:

- The Project Area and immediate surrounding areas: located within the Tamworth Regional LGA. State level data for NSW and national level data for Australia are used to provide an understanding of the broader and comparative social context within which the Project sits;
- The transportation and haulage routes: solar farm components are anticipated to be transported from either the Port of Brisbane or Port of Newcastle to the Project Area via the New England Highway (the route is described in **Section 3.4.10**); and
- The surrounding towns and regional centres: Tamworth and Armidale may provide goods and services to support the construction phase of the Project. ABS Urban Centres and Localities (UCLs) provide baseline data for these regional centres.

Social Baseline

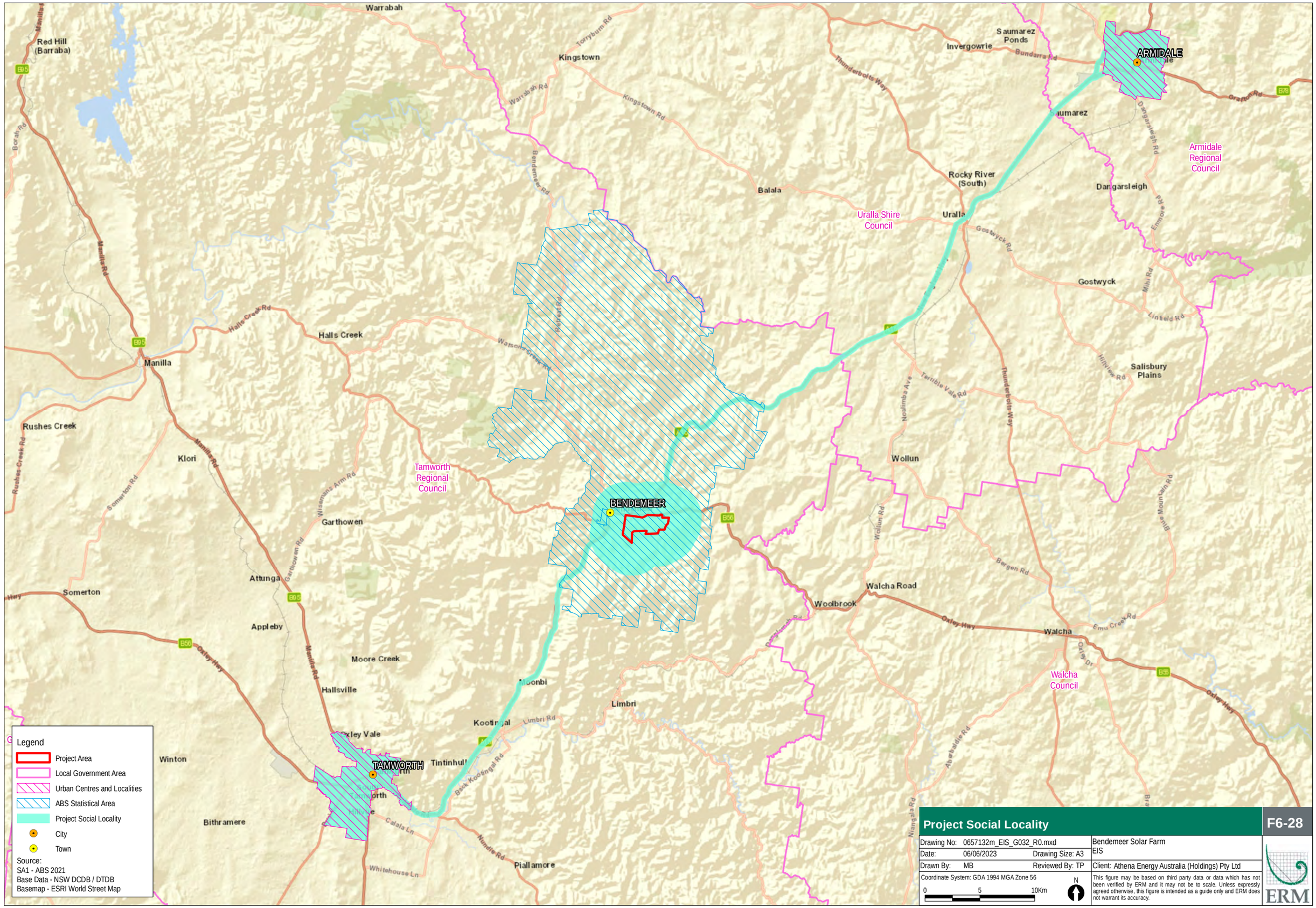
Land Use Context

The Project Area's immediate surroundings comprise sparsely populated rural farm properties. The Project Area contains limited social infrastructure or commerce, with the closest services available in Tamworth, located 46 km (by road) south-west of the Project access.

The Project Area is spread over rural properties zoned 'RU1: Primary Production' under the Tamworth LEP. Immediately west of the Project Area is zoned as 'RU4: Primary Production Small Lots' and the Bendemeer village is zoned 'RU5: Village'. Land use within the vicinity of the Project Area typically comprises mixed farming with livestock and crops and other farming activities.

Population Demographics

The Social Locality is generally characterised by an ageing population, with the younger demographics located in the Town Centres. This Social Locality also has a much higher proportion of residents identified as Indigenous Australian when compared to the state of NSW. Section 5.2 of the SIA (refer **Appendix S**) further summarises the primary ABS datasets used to provide key demographic data across the Project's Social Locality, drawing on select ABS datasets.



Legend

- Project Area
- Local Government Area
- Urban Centres and Localities
- ABS Statistical Area
- Project Social Locality
- City
- Town

Source:
SA1 - ABS 2021
Base Data - NSW DCDB / DTDB
Basemap - ESRI World Street Map

Project Social Locality

F6-28

Drawing No:	0657132m_EIS_G032_R0.mxd		Bendemeer Solar Farm EIS
Date:	06/06/2023	Drawing Size: A3	
Drawn By:	MB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 5 10Km

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

Housing and Accommodation

Rental affordability and availability are the most likely features of the housing market to respond to change in population prompted by large projects and is a key component for economic vitality of communities and the wellbeing of individuals (Lawrie et al., 2011). Generally, housing stress can occur when rent exceeds 30% of a low-income household gross income.

SQM housing vacancy rate data draws on a combination of ABS data and online data from monitoring major property listing sites to provide a time-series analysis on a monthly and postcode scale (SQM Research 2022). A review of rental properties housing vacancy data exhibited that Tamworth's highest vacancy rate was in April 2015 at 3.8%, by May 2018 the rate dropped to 1.1% and by October 2022 the vacancy rate was at 0.8% (SQM Research, 2022). Armidale's highest vacancy rate was in December 2016 at 6.1%, by January 2019 the vacancy had dropped to 1.8%, and as of October 2022, the vacancy rate is 1.5% (SQM Research, 2022). For Bendemeer, July 2018 had the highest vacancy rate of 14.9%, by November 2020 the vacancy rate had dropped to 0.0% (SQM Research, 2022), indicating that no rentals were available.

Regarding rental availability in the Social Locality, at the time of writing Bendemeer has no rental properties available, the closest rental properties to the Project are in Kootingal, which at the time had three rental properties available (Real Estate, 2022).

In addition, the Accommodation and Employment Strategy for the New England Solar Farm (ACEN Australia and Green Light Elecnor Group, 2022) identified the approximate number of long-term rental housing available within Tamworth, Armidale, Uralla and Walcha LGAs. This rental property availability data is presented in **Table 6-67**.

Table 6-67 Long-term Rental Housing Availability

Location	House and Unit Size				Rental Properties (Approx.)
	1 Bed	2 Bed	3 Bed	4+ Bed	
Tamworth	22	72	67	32	193
Armidale	27	37	46	24	134
Uralla	-	3	1	2	6
Walcha	-	-	1	-	1
Total	**49**	**112**	**114**	**58**	**334**

Short-term accommodation such as hotels, motels, cabins and caravan parks are important in regional areas to provide accommodation for visitors and to support regional tourism and economic activity. An overview of the short-term accommodation total rooms is as follows (ACEN Australia and Green Light Elecnor Group, 2022):

- Tamworth Regional:1,093 rooms;
- Armidale Regional: 633 rooms;
- Uralla: 95 rooms; and
- Walcha: 64 rooms.

Social Infrastructure and Community Wellbeing

Social infrastructure comprises schools and other education institutions, medical services, emergency services, recreational facilities and community organisations. Some commercial services are also listed under social infrastructure, such as childcare facilities.

The immediate vicinity of the Project Area is limited to outdoor recreation areas in Bendemeer, such as the Bendemeer Tourist Park and Campground, and in the Watsons Creek National Park and Moore Creek, which includes various trails throughout the National Park and lookout points.

Bendemeer (population of 486) is located 1.8 km west of the Project Area. Bendemeer hosts a public primary school, a childcare centre, a post office, RFS, a tourist centre, two progress associations, and a church. Bendemeer also has a range of temporary accommodation options and a general store.

Tamworth (population of 35,415) is the nearest regional centre servicing the north of the Project Area. The Tamworth Hospital is a public hospital providing a variety of medical services, including a 24-hour emergency facility. Tamworth also has multiple other medical centres with general practitioners. Emergency services based in Tamworth include NSW Police, Ambulance, Fire and Rescue, RFS, and the State Emergency Service (SES). Tamworth has private and public primary and high schools. A variety of religious organisations and churches are present in Tamworth, along with branches of the Returned Services League (RSL), the Lions and Rotary Clubs, and several sporting and recreation clubs including for equestrian activities, sailing, pistol shooting, cricket and writing. The Tamworth Correctional Centre is a state run medium-security prison facility for male offenders in the locality of the Northern. The facility is located approximately 35 km south-west from the site access location.

Armidale (population of 21,312) is located approximately 70 km by road from the Project Area and is a regional centre to the north-east of the Project Area. Armidale is the largest centre in the Armidale Regional LGA hosting the council offices. Medical services available in Armidale include the Armidale Hospital, Armidale Medical Centre, Armidale Community Health Service and aged care services. All major emergency services are present in Armidale, including NSW Police, Ambulance, Fire and Rescue, RFS, and the SES. Armidale has several public and private primary and high schools. A wide variety of community organisations are present in the town including the CWA, progress association and historical society, Lions and Rotary Clubs, an RSL and a Legacy Club, a branch of the Red Cross, and a Men's Shed.

Access and Connectivity

The Project Area is adjacent to the state-maintained highways of Oxley Highway and New England Highway, providing connections to other regions as described in **Section 6.9.2.1**.

The Tamworth Regional Council is approximately five and a half hours from Sydney. Tamworth is ideally located with main roads leading north to the Darling Downs in Queensland, South to Hunter and Central West and west to the Orana, making the route a popular drive and destination for tourists and bringing economic activity into the area. Attractions are associated with the natural environment and cultural activities, such as national parks, retreats, historic buildings and museums and country experiences assist with bringing tourists to visit the region.

Tamworth and Armidale are serviced by the Tamworth Regional Airport and Armidale Regional Airport for aviation services, respectively. In addition, Tamworth and Armidale are also serviced by the Intercity Train, which operates from Central Station to Tamworth Station and Armidale Station once a day.

The Tamworth regional council operates six bus services Monday-Friday between Tamworth and Bendemeer. NSW Transport provides bus services from Tamworth to Dubbo, Port Macquarie and Inverell via a number of regional stations. The Oxley Community Transport Service provides additional transport services in Tamworth for the elderly to and from medical and shopping facilities with the trips generally restricted to Tamworth and Liverpool Plains Shire Areas. There are also taxi and minibus services available in both Tamworth and Armidale LGAs.

Community Values

The Project is located near the Bendemeer village, which is a small rural community around 40 minutes' drive from Tamworth. Bendemeer remains dependent on rural industries, mainly sheep and beef cattle farming, which provides jobs and economic prosperity to the local community.

Community values were obtained during focused stakeholder engagement interviews conducted for the SIA during February 2023. SIA focused engagement interviews were undertaken with a targeted sample group including associated landowners, neighbouring landowners, community groups, RAPs, emergency services and local government.

Bendemeer was described as a tight knit rural community where people are 'always willing to help each other out'. The Macdonald River and the Bendemeer Hotel were frequently described as being the heart of the Bendemeer community. The Rodeo and Camp draft, held in February, is the major annual event in Bendemeer, with the Grey Fergie Muster and Art and Craft show also being major events. The stakeholder engagement conducted for the Project indicates that community values most strongly resonate with the natural environment, farming, and community and family, with the region's natural landscape, rolling hills, and Macdonald River of particular value.

Other

Other social baselines considered in the SIA for the Project's Social Locality include the economic profile of the Tamworth Regional LGA, summarised in **Section 6.14.2**, and the Aboriginal Cultural Heritage, described in **Section 6.3**.

6.15.3 Assessment of Impacts

The key drivers of social change that may affect communities in the Social Locality resulting from the Project relate to:

- Increased economic activity for local businesses and employment opportunities for the local workforce;
- Opportunities for diversification of income streams for host land owners;
- Disruptions due to construction related activities (noise, dust, transportation of materials and workers);
- Accommodation arrangements for construction workforce; and
- Visual amenity and other land use and landscape changes due to altered landscapes.

Technology to support renewable energy projects is continuously evolving and improving. Accordingly, following the 30-year operational timeframe, components of the solar farm may be upgraded to prolong the life of operation, or decommissioned and the land returned to the original land use. Given the timeframe involved, the Decommissioning Phase has not been assessed in this SIA. It is noted that the potential social impacts associated with the decommissioning of the Project will be considered as part of a future Decommissioning and Rehabilitation Plan (or similar).

In assessing the potential impacts, the SIA has considered the:

- Characteristics of the Project, including the timing, duration and intensity of activities (where known);
- Issues raised by stakeholders during the engagement process; and
- Outcomes from technical studies undertaken by the Project (noise, visual, aboriginal cultural heritage etc.).

The impacts have been assessed based on the likelihood of the impact occurring, the magnitude of the impact (degree of change caused by the impact) if it occurs, and the vulnerability of the impacted receivers.

Table 6-68 provides an overview of predicted impacts likely to be experienced by different stakeholder groups and the cumulative impact likely to arise from additional projects in the wider New England Region.

Table 6-68 Impact Issues

Impact Issue	Host Landowners	Project Neighbours	Wider Community	Local Workforce	Local Businesses	Regional Visitors	Traditional Owners	Phase of the Project
Stakeholder and Community								
Adequacy and transparency of stakeholder engagement		✓	✓					Construction
Macdonald River and tributaries environmental impacts	✓	✓	✓					Construction
Establishment of the CBF			✓					Operation
Perceived health impacts	✓	✓						Operation
Employment and Procurement								
Direct and indirect employment opportunities				✓				Construction and Operation
Increased demand for labour contributes to skills shortages					✓			Construction
Local procurement opportunities					✓			Construction and Operation
Local Disruptions								
Road safety impacts	✓	✓	✓	✓		✓		Construction
Construction amenity impacts	✓	✓	✓					Construction
Accommodation and Worker Influx								
Increased demand for accommodation			✓		✓	✓		Construction
Increased demand for local services			✓					Construction
Land Use and Landscape								
Impacts on neighbouring land values		✓						Operation
Visual amenity impacts	✓	✓	✓			✓		Operation
Impacts to tangible and intangible Aboriginal heritage							✓	Operation

Impact Issue	Host Landowners	Project Neighbours	Wider Community	Local Workforce	Local Businesses	Regional Visitors	Traditional Owners	Phase of the Project
Cumulative Impact								
Traffic and road safety impacts			✓					Construction
Socio-economic impacts associated with an additional project in the New England region			✓					Construction and Operation
Amenity impacts			✓					Operation

6.15.4 Cumulative Social Impacts

Solar farms can provide a significant economic boost to local communities, both during the construction and operational phases. The economic benefits provide flow-on social benefits, particularly in the provision of a range of employment opportunities for the region, increased economic tourism, upgrades to local infrastructure and a diversified income stream for rural landholders.

At a broader social level, the development of additional solar farms and BESSs enhance the security and reliability of the electricity system, reduces the community's reliance on energy derived from fossil fuels, supports the community's growing desire for renewable energy sources and reduces greenhouse emissions.

The Project is in a relatively isolated region within the New England REZ, and to the south of the main areas of major projects, as such cumulative impacts are not expected to be a cause of concern for stakeholders within the Social Locality. It is anticipated that the key cumulative impacts are likely to be related to:

- Cumulative impacts to traffic congestion, road vehicle incidents and increased rate of transport infrastructure deterioration;
- Potential cumulative increase in demand for short and long-term accommodation if local recruitment goals are not met;
- Cumulative increased demand for social and emergency services and recreational facilities if local recruitment goals are not met; and
- Cumulative visual amenity across the wider area and change to the rural character of the New England Tablelands.

The potential cumulative impacts associated with the Project will be manageable through the Applicant's commitment to the development and implementation of strategies informed by the EIS, which include a Workforce Accommodation Strategy (WAS), TMP, Local Employment Plan and visual amenity mitigation measures as informed by the LVIA.

6.15.5 Mitigation Measures

A range of social management and mitigation measures to be adopted for the Project (further detailed in Section 6.3 of **Appendix S**) may include:

- Develop and implement a grievance mechanism to ensure that road user concerns/ complaints are identified and acted upon;
- Develop and implement a CEMP informed by the EIS to manage construction environmental impacts, consistent with component studies included in the EIS, which includes (but not limited to) dust, bushfire and biosecurity risk management,
- Update and implement a SEP to engage surrounding landowners and wider community to publicise environmental measures in place to protect aquatic environments, to understand traffic movements and local road use patterns and preferences, and to understand land devaluation concerns;
- Create awareness amongst the community, in partnership with LGAs and other partner organisations to foster a better understanding as to the ways prospective workers may be able to take part in the Project (e.g., using a Project specific website and through existing communication channels within the LGAs);
- Develop and implement a WAS, which will include the following management measures:
  - Explore available accommodation options in Tamworth, Uralla, Walcha and Armidale;
  - Prioritise local accommodation options;

- Investigate local and regional community social media options to disseminate information to local accommodation operators and rental property owners, such as construction timing, workforce estimates and accommodation requirements;
- Consult with Tamworth Regional Council, Uralla Shire Council, Walcha Council and Armidale Regional Council to minimise pressure on local resources;
- Contact the local accommodation operators to provide Project information such as construction timing, workforce estimates and accommodation requirements;
- Provide a register of local accommodation options and contact details to contractors and subcontractors;
- Maintain a register of local property owners who have expressed interest in offering dwellings for rent. Provide this register to contractors and subcontractors;
- Review workforce predictions during construction to ensure that accommodation requirements are met;
- Identify any overlaps with peak demand periods for accommodation and engage with key stakeholders; and
- Consult with local property owners and accommodation providers to manage occupancy and maximise use of local accommodation, without preventing its use for major event and holiday purposes;

- Develop and implement a Local Employment Plan which includes include the following management measures:
  - Host information sessions to engage with the community and local businesses who can provide inputs or services and other prospective contractors/subcontractors, regarding construction timing, workforce estimates and accommodation requirements;
  - Engage local media including radio, newspaper and social media to advertise expressions of interest for employment or provision of services or materials;
  - Engage with the local employment agencies to identify access pathways for local workers. Assess the candidate pool to determine suitable labour, trade or other employment on the Project;
  - Investigate any local and regional community social media channels which can disseminate information to the community and local businesses which can provide inputs or services and prospective subcontractors;
  - Set up a dedicated employment opportunity platform on the Project's website in consultation and coordination with the EPC contractor;
  - Consult with the Tamworth Business Chamber, Walcha Council, Uralla Shire and Armidale Business Chamber and the New England North West Business Enterprise Centre to provide their members with relevant details such as Project construction timing, workforce estimates and accommodation requirements;
  - Implement shuttle bus services where practical to enable local workforce in the respective locations to easily commute to the project site;
  - Encourage businesses with an ABN register their business and submit expressions of interest on the Industry Capability Network (ICN) Gateway);
  - Provide opportunities for local businesses to submit proposals and tenders and prioritise the use of goods and services that can be sourced locally and are competitive for price and quality;
  - Encourage subcontractors to employ local workers wherever practicable and reasonable;
  - Use local presence and content as a criterion when awarding contracts to subcontractors; and

  - Identify positions where training would allow additional local workers, and encourage local workers and businesses to undertake training to provide for specialist works;
- The Project will also implement measures to encourage local content where importance is placed on procurement of local non-labour inputs to production, and where local producers can be cost and quality competitive;
- Establish, implement and publish information of the CBF to the wider community;
- Implementation of the ACHMP informed by the heritage assessments in the EIS;
- Implementation of the TMP informed by the TIA in the EIS; and
- Implementation of the visual amenity mitigation measures as informed by the LVIA in the EIS.

Additionally, the SIA provides a monitoring framework for the social impact management measures during construction and operation phases of the Project. The monitoring framework will be integrated with the broader EMS to be developed for the Project.

The monitoring framework key aims are to verify the predicted impacts and identify any other impacts that may arise, confirm that management measures are being implemented as planned, and assess the effectiveness of the management measures.

The monitoring activities will include:

- Record queries and complaints received from stakeholders, local employment, employee retention rate, number of apprenticeships, number of training programs undertaken, number of trees planted to fulfil required screening planting mitigations;
- Ensure major contractors report on local employment;
- Report on number of and value of contracts with local and regional businesses; and
- Record and publish detailed information on funds available and payments made through the CBF.

6.16 Cumulative Impacts

The ‘Cumulative Impact Assessment Guidelines for State Significant Projects’ (CIA Guidelines) (DPIE, 2021d) requires the consideration of impacts from the Project in combination with other past, present and reasonably foreseeable future state significant developments (SSDs).

The CIA Guidelines state that the assessment should focus on the key matters that are within the immediate geographical area of influence of the Project (e.g., within proximity to the Project Area) and within the relevant strategic context.

This section draws on the relevant aspect-specific assessments undertaken as part of the preparation of this EIS, which have identified and addressed potential cumulative impacts related to that aspect.

The CIA Guidelines state that the CIA is to focus on the key matters that could be materially affected by the cumulative impacts of the Project and other relevant future developments. As such, an assessment of the potential cumulative impacts to aspects including biodiversity, heritage, water, bushfire, air quality and waste has not been undertaken as it is considered that these potential impacts are primarily confined to the Project Area and are negligible in a broader context.

6.16.1 Existing Environment

In accordance with the CIA Guidelines, the Project has considered relevant future developments, and only included the types of development specified in Section 3.4 of the CIA Guidelines.

The Project will contribute to the overall development of the New England REZ. Other proposed, approved, under construction and operational SSDs known at the time of finalisation of this EIS and within and in the vicinity of the New England REZ are shown in **Figure 6-29** and summarised in **Table 6-69**. As shown, the majority of these developments are renewable energy generation.

Table 6-69 Proximate SSDs with Cumulative Potential

Project	Description	LGA	Current Status[20]	Distance (km)[21]	Relevant Future Development	Potential Cumulative Impacts
Solar Farm Development						
Salisbury Solar Farm	Approx. 600 MW solar photovoltaic (PV) energy generation facility, ancillary infrastructure, including a grid connection and battery storage.	Uralla Shire LGA	■ Planning Portal - Prepare EIS ■ Salisbury west construction starts by Q2 2021 and operation by Q3 2022 ■ Salisbury east construction starts by Q2 2022 and operation by Q4 2023 ■ Operational life of 25 years	33	Yes	Traffic Economic Social
New England Solar Farm	Development of 720 MW solar farm with energy storage and ancillary infrastructure.	Uralla Shire LGA	■ Planning Portal - Approved (March 2020) ■ Currently under construction ■ Operational life of 30 years	45	Yes	Traffic Economic
Middlebrook Solar Farm	Up to 500 MW proposed solar farm, battery storage (100 MW) and ancillary infrastructure.	Tamworth LGA	■ Planning Portal - Prepare EIS ■ Construction duration of 12-24 months, with peak construction taking around 12 months, start date unknown ■ Operational life of 30 years	47	Yes	Traffic Economic Social
Tamworth Solar Farm	Development of a 65 MW solar farm with energy storage and ancillary infrastructure.	Tamworth Regional LGA	■ Planning Portal - Approved (November 2020) ■ Construction timeframe 12 months ■ Operational life of 30 years	51	Yes	Traffic Economic Social

[20] *Project status current as of July 2022 based on DPE's Major Projects website.*

[21] *Indicative direct-line distances from the Project boundary.*

Project	Description	LGA	Current Status[20]	Distance (km)[21]	Relevant Future Development	Potential Cumulative Impacts
Oxley Solar Farm	Approx. 225 MW photovoltaic (PV) energy generation facility, BESS, and ancillary infrastructure.	Armidale Regional LGA	■ Planning Portal - More Information Required ■ Construction duration of 12-18 months, anticipated to start in Q3 2023 ■ Operational life of 30 years	64	Yes	Traffic Economic Social
Tilbuster Solar Farm	Development of a 150 MW solar farm, energy storage facility and ancillary infrastructure.	Armidale Regional LGA	■ Planning Portal - Approved (March 2019) ■ Construction duration of 12 months with a peak construction period of 3 to 4 months ■ Operational life of 30 years	68	Yes	Traffic Economic Social
Metz Solar Farm	Development of a 100 MW solar farm and ancillary infrastructure.	Armidale Regional LGA	■ Planning Portal - Approved (July 2017) ■ Currently operational ■ Operational life of 30 years	73		Economic
Orange Grove Solar Farm	Development of a 110 MW solar farm and ancillary infrastructure.	Gunnedah Shire LGA	■ Planning Portal - Approved (March 2019) ■ Construction duration of 9 months, anticipated to start in 2022 ■ Operational life of 30 years	75	Yes	Traffic Economic Social
Gunnedah Solar	Development of a 153 MW solar farm and ancillary infrastructure.	Gunnedah Shire LGA	■ Planning Portal - Approved (March 2019) ■ Currently operational ■ Operational life of 30 years	79		Economic
Wind Farm Development						

Project	Description	LGA	Current Status[20]	Distance (km)[21]	Relevant Future Development	Potential Cumulative Impacts
Bendemeer Wind Farm	Development of a wind farm, with up to 58 WTGs, as part of the Bendemeer Renewable Energy Hub, with ancillary infrastructure.	Tamworth Regional LGA	■ In Planning (Preparing Scoping Report) ■ Construction duration of 24 months, anticipated to start in 2025 ■ Operational life of 30 years	Adjacent	Yes	Landscape and Visual Traffic Economic Social
Thunderbolt Wind Farm	Development of a 192 MW wind farm, with up to 32 WTGs, as part of the Thunderbolt Energy Hub, with ancillary infrastructure.	Tamworth Regional LGA; Uralla Shire LGA	■ Planning Portal- Response to Submissions ■ Construction phase is expected to commence in Q1 2024 (subject to approval) and be completed by the end of Q2 2025 with the peak period of construction expected to occur between Q2 and Q3 2024. ■ Operational life of 25 - 30 years	16	Yes	Landscape and Visual Traffic Economic Social
Winterbourne Wind Farm	Development of a 700 MW wind farm, with up to 126 WTGs, BESS up to 100 MW/ 200 MWh and ancillary infrastructure.	Walcha LGA; Uralla Shire LGA	■ Planning Portal – Response to Submissions ■ Construction duration of 24-30 months, with peak construction of 9 to 10 months, anticipated to start late 2023 ■ Operational life of 30 years	51	Yes	Traffic Economic Social
Hills of Gold Wind Farm	Development of a wind farm with up to 65 WTGs each with a generating capacity of approximately 6 MW, BESS up to 100 MW/400 MWh, and ancillary infrastructure.	Tamworth Regional LGA; Liverpool Plains Shire LGA; Upper Hunter Shire LGA	■ Planning Portal - More Information Required ■ Construction duration of 18-24 months ■ Operational life between 25-35 years	80	Yes	Traffic Economic Social

Project	Description	LGA	Current Status[20]	Distance (km)[21]	Relevant Future Development	Potential Cumulative Impacts
Rangoon Wind Farm	Development of a wind farm with up to 25 WTGs, BESS up to 100 MW/400 MWh, grid connection and ancillary infrastructure.	Armidale Regional LGA	■ Planning Portal - Prepare EIS ■ Construction duration of 18 months, start unknown ■ Operational life of 30 years	93	Yes	Traffic Economic Social
Doughboy Wind Farm	Development of a wind farm with up to 52 WTGs, battery energy storage facility, grid connection and ancillary infrastructure.	Armidale Regional LGA	■ Planning Portal - Prepare EIS ■ Construction duration of 18 months ■ Operational life unknown	99	Yes	Traffic Economic Social
Other Development						
Calala Battery Energy Storage System	Development of a battery energy storage system (300 MW/ 1200 MWh) and underground transmission lines connecting to Tamworth substation plus ancillary works.	Tamworth Regional LGA	■ Planning Portal - Prepare EIS ■ Construction duration of 12 months, with commissioning expected to be completed within 15-18 months. ■ Operational life of 25 years	28	Yes	Traffic Economic Social
Tamworth Battery Energy Storage System	Development of a 200 MW battery energy storage facility with ancillary infrastructure	Tamworth Regional LGA	■ Planning Portal - Prepare EIS ■ Construction duration of 12 months, start date unknown ■ Operational life of 25 years	34	Yes	Traffic Economic Social
Eathorpe Battery	Development of a 100 MW/ 200 MWh battery energy storage facility with ancillary infrastructure	Armidale Regional LGA	■ Planning Portal - Prepare EIS ■ Construction duration of 12-18 months, anticipated to start in 2025 ■ Operational life of 20 years	59	Yes	Traffic Economic Social

Project	Description	LGA	Current Status[20]	Distance (km)[21]	Relevant Future Development	Potential Cumulative Impacts
Armidale Battery Energy Storage System	Development of a 150 MW battery energy storage facility with ancillary infrastructure	Armidale Regional LGA	■ Planning Portal - Prepare EIS ■ Construction duration of 9 months, start date unknown ■ Operational life of 20 years	60	Yes	Traffic Economic Social
Oven Mountain Pumped Hydro Energy Storage Project	Development of a 600 MW pumped hydro energy storage and generation project and ancillary infrastructure	Armidale Regional LGA	■ Planning Portal - Prepare EIS ■ Construction duration of 36-48 months, expected to commence in 2023 ■ Operational life over 50 years	90	Yes	Traffic Economic Social

State Significant Developments in Proximity to the Project

F6-29

Drawing No:	0657132m_EIS_G009_R02.mxd		Bendemeer Solar Farm EIS
Date:	06/07/2023	Drawing Size: A3	
Drawn By:	MB/CB	Reviewed By: TP	Client: Athena Energy Australia (Holdings) Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 10 20Km N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

Legend

Solar Farm Development
- Operational
- Under Construction
- Approved
- In Planning

Wind Farm Development
- In Planning

Proximal Major Development
- In Planning
- Locality
- Highway
- Main Road
- Watercourse
- Project Area
- LGA Boundary
- New England REZ

Source:
Base Data - NSW DCDB / DTDB
Basemap - ESRI World Imagery

240000 280000 320000 360000 400000

6640000 6600000 6560000

HORTON RIVER
Gwydir Shire Council
BINGARA ROAD
BARRABA
MANILLA RIVER
GWYDIR RIVER
Boorolong Wind Farm
GARA RIVER
WOLLOMBI RIVER
CHANDLER RIVER
Tilbuster Solar Farm
Armidale Regional Council
Doughboy Wind Farm
UNE Solar Farm
BUNDARRA ROAD
ARMIDALE
Armidale Battery Energy Storage System
Metz Solar Farm
OAKY RIVER
Eathorpe Battery
HILLGROVE
Narrabri Shire Council
NAMOI RIVER
MANILLA ROAD
Uralla Shire Council
THUNDERBOLTS WAY
ROCKY RIVER
URALLA
Oxley Solar Farm
Stringy Bark Solar Farm
New England Solar Farm
SITZ RIVER
RANGARI ROAD
MACDONALD RIVER
Salisbury Solar Farm
MANILLA
RUSHES CREEK ROAD
Thunderbolt Wind Farm
NEW ENGLAND HIGHWAY
Oven Mountain Pumped Hydro Energy Storage Project
BENDEMEER
Winterbourne Wind Farm
Bendemeer Wind Farm
Tamworth Regional Council
Orange Grove Solar Farm
Gunnedah (Ironbark Energy)
Gunnedah (Canadian Solar)
PEEL RIVER
Tamworth Solar Farm
WALCHA
MOONBI
OXLEY HIGHWAY
Gunnedah Shire Council
COCKBURN RIVER
Taminda Solar Farm
TAMWORTH
APSLEY RIVER
Tamworth Battery Energy Storage System
Walcha Council
TIA RIVER
Calala Battery Energy Storage System
COBBADAH RIVER
WARNES RIVER
WERRIS CREEK ROAD
NUNDLE ROAD
Middlebrook Solar Farm
YARROWITCH RIVER
TOBINS RIVER
Port Macquarie-Hastings Council
Liverpool Plains Shire Council
NUNDLE
BARRY ROAD
BAC RIVER

6.16.2 Strategic Planning Framework

Section 2 of this EIS discusses the strategic context of the Project with reference to relevant strategic planning publications. In consideration of the Project and relevant future developments, most of those detailed in **Table 6-69** align with the relevant objectives of the:

- United Nations Sustainable Development Goals;
- UNFCCC COP26 and COP21;
- Federal Government's Renewable Energy target;
- *Climate Change Act 2022*; and
- NSW Government Commitments.

Most relevant future developments identified are renewable energy developments that will provide affordable, reliable and sustainable energy. These developments will assist Australia and NSW in meeting their respective emissions reduction targets. They will also assist NSW in the development of affordable, reliable and sustainable renewable energy generation, transmission and storage. The New England REZ will connect multiple generators and storage in the same area, to capitalise on economies of scale to deliver cheap, reliable and clean electricity for homes and businesses in NSW.

The Project, as well as the relevant future developments have or are all progressing assessments required under their relevant planning approvals pathways, which will minimise impacts on the environment and their respective social localities. For example, most of the wind and solar farms would have had to undertake a visual impact assessment and implement either design modifications or management measures to avoid or minimise impacts. This process assists in preserving the rural landscape, which is a key objective of relevant local strategic planning statements and community strategic plans.

More broadly these developments will provide social and economic benefits to the region. They will encourage economic development within the region, by supporting both employment and economic growth. While all developments would endeavour to hire locally, it is inevitable that skilled labour from outside of the region would be also required; however, this will also benefit local business and the community through an increased in demand for local services, and diversification of communities.

6.16.3 Cumulative Impact Summary

Potential cumulative impacts associated with the Project have been addressed in relevant technical assessments and the relevant findings summarised in this EIS. A summary of the potential cumulative impact of key environmental aspects is provided in the below sections.

Noise Impacts

The key noise sources from wind farms covered by the NPI are ancillary infrastructure such as substations and associated BESSs. Wind turbine noise from wind farms is not assessed by the NPI.

The stand-alone substations from the Bendemeer Wind Farm are unlikely to contribute to the noise levels generated by the Project at the nearest Sensitive Receivers. This is due to Bendemeer Wind Farm substation infrastructure being located further South from the Sensitive Receivers most affected by the Project (Sensitive Receiver ID 29). Additionally, all ancillary infrastructure that are part of the Bendemeer Wind Farm will be assessed cumulatively with noise levels generated by the Project against the NPI.

All other relevant SSDs listed in **Table 6-69** have a significant separation to the Project and are therefore not considered to contribute to cumulative noise impacts. The Noise Impact Assessment determined that the cumulative noise impact of the Project and these SSDs at the nearest Sensitive Receivers to the Project is expected to be negligible. As such, no cumulative noise impacts are expected.

Landscape and Visual Impacts

Cumulative landscape and visual effects result from additional changes to the landscape or visual amenity caused by the Project in conjunction with other SSDs (associated with or separate to it) or actions that occurred in the past, present or are likely to occur in the foreseeable future. Cumulative visual effects may also affect the way a landscape is experienced and can be positive or negative. Where they comprise benefits, they may be considered to form part of the mitigation measures.

Of the SSDs listed in **Table 6-69**, only the Bendemeer Wind Farm would have the potential to be visible at the same time as the Project. The potential cumulative visual impact of both projects is due to the elevated positioning of the turbines associated with the Project. However, considering the generally low visibility of the Project, it is unlikely the Project will contribute to cumulative impacts from public viewpoints and private dwellings.

Thunderbolt Wind Farm is located approximately 16 km to the north-east of the Project. Due to the distance, horizontal scale of the Project, combined with undulating topography and intervening vegetation, it is unlikely that both projects will have cumulative visual impact.

Agricultural Production and Land Use Impacts

Considering the Project will implement agrisolar and assuming other renewable SSDs in the region will also implement agrisolar. The cumulative impact on agriculture for the region is considered to be low, as the changes to agricultural land use and agricultural productivity are anticipated to be minor for each development.

However, cumulative impacts are likely to increase where SSDs in the New England REZ do not implement agrisolar, these impacts may include changes to land used for agriculture, localised productivity, secondary productivity and some agricultural support services.

Nevertheless, the agricultural industries within the region have an established nature and scale, meaning that significant impacts to critical mass thresholds and regional agricultural infrastructure are unlikely to occur in the foreseeable future.

Traffic and Transport Impacts

The primary traffic impact of the Project is generated during construction which is anticipated to start in Q2 2024 and expected to take up to 18 months. The TIA (refer **Appendix O**) demonstrates that the road network will continue to operate with ample spare capacity even during the peak construction period of the Project.

Proposed SSDs that have the potential to overlap with the Project during construction period are provided below. A description of each SSD is included, which assisted in assessing the cumulative impacts of SSDs that are proposed in the surrounding area:

- Salisbury Solar Farm: The construction period for both projects may partially overlap which is when the projects will generate the peak traffic on the road network. Staff for both projects are anticipated to be in similar locations given the sites proximity to each other. Therefore, the state road network in the vicinity of Armidale, Uralla, Walcha and Tamworth will be utilised by both projects. During operation, the projects are both expected to generate a minimal level of traffic;
- Thunderbolt Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale, Uralla, and Tamworth and will utilise the same transport route to deliver the plant from the Port of Newcastle;
- Oxley Solar Farm: There is potential for construction of both projects to overlap. Construction traffic generated by the projects may interact within the township of Armidale where staff for both projects are proposed to be located. During operation, the projects are both expected to generate a minimal level of traffic;
- Tilbuster Solar Farm: There is potential for construction of both projects to overlap. The traffic generated by the projects may interact within the township of Armidale where staff for both projects are proposed to be located;

- New England Solar Farm: There is potential for construction of both projects to overlap. The traffic generated by the projects may interact within the township of Uralla and Armidale where staff for both projects are proposed to be located;
- Middlebrook Solar Farm: There is potential for construction of both projects to overlap. The traffic generated by the projects may interact within the township of Tamworth where staff for both projects are proposed to be located. Upgrades are proposed to the intersection of Middlebrook Road/ New England Highway to allow vehicles to turn safely from the state road;
- Tamworth Solar Farm: There is potential for construction of both projects to overlap. The traffic generated by the projects may interact within the township of Tamworth where staff for both projects are proposed to be located;
- Hills of Gold Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Tamworth and will utilise the same transport route to deliver the plant for the Port of Newcastle;
- Doughboy Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale and will utilise the same transport route to deliver the plant from the Port of Newcastle;
- Rangoon Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale and will utilise the same transport route to deliver the plant from the Port of Newcastle;
- Winterbourne Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Tamworth and Armidale and will utilise the same transport route to deliver the plant from the Port of Newcastle;
- Tamworth Battery Energy Storage System: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Tamworth and will utilise the same transport route to deliver the plant from the Port of Newcastle;
- Armidale Battery Energy Storage System: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale and will utilise the same transport route to deliver the plant from the Port of Newcastle;
- Oven Mountain Pumped Hydro Energy Storage Project: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale;
- Eathorpe Battery: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Armidale;
- Calala Battery Energy Storage System: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Tamworth and will utilise the same transport route to deliver the plant from the Port of Newcastle; and
- Bendemeer Wind Farm: The construction periods for the projects could potentially overlap. Both projects are anticipated to have staff located in Tamworth and Armidale and will utilise the same transport route to deliver the plant from the Port of Newcastle.

Based on the assessment, several surrounding SSDs have the potential to generate additional vehicle movements within nearby regional centres such as Tamworth, Uralla, and Armidale. These vehicle movements would be distributed on the surrounding road network and are expected to have a minimal cumulative impact on the operation of the road network.

Key projects that are expected to generate traffic on the surrounding road network include the Salisbury, Oxley and Tilbuster Solar Farms, Thunderbolt, Doughboy, Rangoon, and Winterbourne Wind Farms, and Eathorpe BESS. The TIA reviewed the additional traffic generated by these developments at the New England Highway and Oxley Highway intersection based on the information available. The additional traffic generated by the above projects at the New England Highway and Oxley Highway intersection is further described in Section 3.3 of **Appendix O**.

To determine the ability of the road network to accommodate the traffic expected to be generated during peak construction periods a traffic modelling exercise has been undertaken for the intersection

of New England Highway and Oxley Highway using the SIDRA intersection modelling software. The modelling was based on the morning peak hour of construction (6:00 am to 7:00 am) and evening peak hour of construction (5:00 pm to 6:00 pm).

Below is summary of the SIDRA analysis:

- The intersection is expected to operate with minimal queue lengths on all legs of the intersection;
- The overall average delay at the intersection is 2.0 seconds in both the morning and evening peak hour; and
- The intersection is expected to continue to operate with good level of service (LoS 'A' free flow conditions).

Further, during the middle of the day the traffic movements are expected to be predominantly associated with heavy vehicles with approximately 6 to 8 vehicle movements per hour. This increase in traffic would be within the daily variation of traffic volumes on the New England Highway and can be readily accommodated on the road network.

Therefore, the TIA determined that the road network is expected to continue to operate with a good level of service with ample spare capacity. As such, the combined increase in traffic generated by the Project and these developments is expected to have a minimal cumulative impact on the road network, including through Tamworth, Uralla, and Armidale.

Economic Impacts

Renewable SSDs can provide a significant economic boost to local communities, both during the construction and operational phases. As a result, the main cumulative economic impact of the SSDs identified in **Table 6-69** is to generate large demand for a suitably qualified construction workforce in regional areas. This will assist in addressing the jobs growth imbalance between Australia's biggest cities and regional areas.

Regional jobs will provide opportunities for the existing and future regional workforces, attracting middle skilled and high skilled workers and families to regional areas, reducing outmigration of the regional workforce to look for employment in cities, and increasing regional labour force participation. Regional projects can therefore provide a boom to non-coastal regional economies that have experienced low growth or decline because of globalisation and associated structural adjustment.

Nevertheless, excess demand for construction workers could potentially lead to increased construction wages, attraction of workers from other relevant sub-sectors and sectors of the economy leading to labour shortages in these other areas of the economy (and associated shortages of goods and services), rising inflation as firms pass wage costs onto consumers. The extent of these impacts for regional economies will depend on the balance of labour supply from inside the region, outside the region and drive-in-drive-out (DIDO) or fly-in-fly-out (FIFO), as well as adjustment of the overall labour market to respond to increased demand.

Additionally, in the short run, excess demand for inputs to construction (e.g., quarry materials, concrete) can result in rising costs for these factor inputs and potentially shortages for other uses.

Social Impacts

At a broader social level, the development of additional renewable energy generation developments reduces the community's reliance on energy derived from fossil fuels and supports the community's growing desire for renewable energy sources and a reduction in greenhouse emissions.

It is anticipated that cumulative impacts are likely to be related to increased traffic congestion during construction and a change to the rural character of the New England Tablelands. Many stakeholders discussed the possibility of cumulative socio-economic benefits to the region if the New England REZ results in increased economic tourism from the increasing number of Australians who are interested in renewable technology.

Cumulative impacts identified in the SIA include:

- Traffic congestion, road vehicle incidents and increased rate of transport infrastructure deterioration;
- Socio-economic impacts from an additional project in the region, which may affect access to services, particularly trades and accommodation arising from this Project combined with other proposed SSDs in the region; and
- Visual amenity impacts particularly across the wider area arising from this Project combined with other SSDs in the region.

Service and Infrastructure Impacts

Local population growth associated with the construction and operation of the Project and SSDs can increase the need for funding and presence of local social and health services due to increased pressures and demand from workforces of parallel SSDs.

Potential cumulative benefit of the Project and SSDs is related to significant combined community contribution, such as benefit sharing, VPAs, procurement and local investment. These contributions will help deliver benefits to affected communities in response to impacts assessed and funding for infrastructure investments.

Population growth can also increase demand on rental housing within the local and regional areas. The rental vacancy rate in Tamworth, Armidale and Bendemeer in October 2022 was consistently below the 1.5% benchmark, indicating a tight rental market with an undersupply of rental housing during that time. Whilst the data shows considerable fluctuation in rental vacancy rates across the three communities of the local area, overall rental vacancy rates have steadily declined (SQM Research, 2022). Regarding rental availability, at the time of writing Bendemeer has no rental properties available, the closest rental properties to the Project are in Kootingal, which at the time had three rental properties available (Real Estate, 2022).

Dependant on the construction timeframes for other solar/ wind farm SSDs within the New England Region, there is the potential for their periods of peak construction to overlap with the Project. Like the Project, these other renewable energy SSDs are likely to employ large construction workforces (e.g., 200-350 employees) that may comprise both local and non-local workers. Where non-local workers are employed by these projects, they will need to be accommodated within the surrounding towns and/or in project-specific accommodation camps, dependent upon the accommodation strategies employed by each project. This cumulative worker influx has the potential to place additional temporary pressure on the short and long-term accommodation within Bendemeer, Tamworth, Armidale, and Uralla. The impact of this pressure will have varying degrees of impact upon these towns, including increased demand for community services (e.g., emergency services, recreational facilities, etc.), intensification of accommodation shortages and cost of living pressures, and disruptions to tourist accommodation options that may have subsequent implications for significant festivals and events.

The Project aims to recruit 70% of the construction workforce from the region, as such accommodation impact is unlikely to occur. However, given the number of other renewables projects, there also remains the potential that the localised employment targets set by the Project and/or other projects may not be able to be achieved due to lack of available resources. If these localised employment targets are not achieved, a larger number of non-local workers will need to be employed to meet demand. If this occurs, the social impacts associated with worker influx may be further exacerbated.

The cumulative impacts associated with workforce accommodation influx will be addressed through the implementation of the Project LEP and WAS, and the associated mitigation and management measures.

Additionally, the use of shuttle buses to transport workers to and from the Project would reduce the amount of disruption to traffic along local roads. The Applicant will consider for the Project long-term

bus hire opportunities from metropolitan centres for temporary relocation with drivers directly employed during construction.

Nonetheless, the influx of workforce from outside the region would have a positive effect on accommodation demand, given the workforce may seek to relocate permanently to the area if there is an opportunity for long-term employment. Encouraging a permanent construction workforce on the regional area would benefit long term sustainability of these communities and the services and facilities they provide, as well as supporting long term economic benefits for business operators.

6.16.4 Mitigation and Management Summary

Appendix B provides a consolidated summary of all the Project's environmental management and monitoring measures, identifying all the commitments in the EIS. These measures will also minimise cumulative impacts. No specific mitigation measures to minimise cumulative impacts were identified.

7. PROJECT JUSTIFICATION

This section outlines a broad justification and evaluation of the Project with reference to its environmental, economic, and social impacts, and the principles of ecologically sustainable development. It evaluates how the relevant strategic factors and statutory requirements are satisfied. This section includes a review on how the community views about the Project have been addressed and how the uncertainties associated with the Project could be managed.

7.1 Project Design Evolution

During the preparation of the EIS, the Project has been subject to an ongoing iterative design and siting process with the objective of developing an efficient Project that avoids and minimises environmental and social impacts. The final Project layout for which approval is sought has considered identified environmental risks and comments made in the comprehensive stakeholder engagement process.

A range of alternative Project designs were considered to avoid potential environmental impacts, as detailed in **Section 2.5.3**. A such, the irregular shape of the Project Area and Disturbance Footprint is a result of avoidance of identified impacts, including areas of high biodiversity value containing two PCTs associated with a CEEC Box Gum Woodland, two areas of PAD, and visual and noise impacts on nearby sensitive receivers (refer **Section 6**).

In those instances where the potential for impacts could not be avoided, design principles were sought to minimise environmental impacts and/ or implement mitigation measures to manage the extent and severity of any residual impacts. The proposed mitigation and management measures that will be implemented for each environmental aspect assessed in this EIS are summarised in **Appendix B**.

Refinement of the Project since the scoping phase (refer Scoping Report (NGH, 2022)) is shown in **Figure 2-5** and has included:

- A reduction of the Project Area from over 1,370 ha to 606.4 ha, largely to avoid impacts to biodiversity values, including entities at risk of SAII;
- A reduction in the number of PV modules from 500,000 to 430,000, thereby reducing the solar array area from 1,370 ha to 350.8 ha;
- A reduction in the Disturbance Footprint from 680 ha to 476.6 ha, largely through the design changes mentioned above, but also through optimisation of the project layout;
- Relocation of and reduction in the capacity of the BESS from 200 MW/ 400 MWh to 150 MW/ 300 MWh to avoid noise impacts at non-associated dwellings;
- Relocation of the substation to the south of the existing 330kV transmission line to optimise the project layout and reduce potential for visual impact;
- Relocation of the site access road 2 km further east to avoid impacts to the Crown lands travelling stock route; and
- Consideration of minor operational constraints on PV module tracking algorithms to avoid glint and glare impacts, albeit during rare scenarios.

During detailed design and prior to construction, it is expected that the placement of infrastructure and extent of construction activities will be further refined to provide additional avoidance and minimisation of environmental impacts.

7.2 Consistency with Strategic Context

Section 2.2 and **Section 2.3** presents an overview of the key regulatory commitments and strategic goals, as well as local and regional plans relevant to the Project. The Project is consistent with key regulation as it will:

- Provide an additional renewable energy generation source which will assist Australia in its transition from traditional fossil fuel energy production, which is linked to atmospheric pollution, water pollution, land pollution and human health impacts;
- Reduce net GHG emissions through replacement of traditional emissions-intensive energy sources with renewable energy, which will assist to slow the effects of climate change, benefitting current and future generations in line with the principles of ecologically sustainable development;
- Improve security and reliability of the electricity system in the NEM, by providing additional energy generation of approximately 280 MW, and dispatchable energy storage of 150 MW/ 300 MWh, providing increased reliability of energy supply at peak times;
- Contribute to the continued growth of renewable energy generation and storage capacity in the New England REZ and NSW;
- Generate employment, leading to local economic stimulus, including provision of approximately 307 FTE jobs during construction and 15 FTE jobs during operation;
- Generate economic stimulus to the regional and NSW economy of:
  - During construction: $290 million (M) in annual direct and indirect output, $126M in annual direct and indirect value added, and $80M in annual direct and indirect household income;
  - During operations: $44M in annual direct and indirect NSW economic output, $27M in annual direct and indirect NSW economic value added, and $7M in annual direct and indirect household income;
- Provide ongoing benefit-sharing with the community through the CBF (VPA), proposed to be implemented for the life of the Project to provide continuing value to the Bendemeer and regional community, by supporting local and meaningful community development or neighbourhood-level initiatives that have strong community support;
- Provide a diversified income stream for landholders (hosting Project infrastructure) through payments to host landowners. The income provided can assist rural landholders make farms more resilient to the impacts of droughts, fires and commodity price fluctuations; and
- Ensure mitigation measures will be applied to avoid or minimise impacts.

7.3 Compliance with Relevant Statutory Requirements

As discussed in **Section 2.2** of this EIS, the Project will support the Federal and State governments strategies, plans and polices to achieve their respective renewable energy and greenhouse gas emission reduction targets. Importantly, the Project will contribute to the continued growth of renewable energy generation and storage capacity in the New England REZ.

The Project is also consistent with several regional community goals, including those in the Tamworth Regional Blueprint 100, Tamworth CSP and Tamworth Sustainability Strategy, as described in **Section 2.3**.

The permissibility of the Project has been described in **Section 4.2**, and the compliance of the Project with other approvals, as well as mandatory matters for consideration are outlined in **Sections 4.3** to **4.5**, **Section 6** and **Appendix D**. An assessment of the consistency of the Project with the objects of the EP&A Act pursuant to Section 1.3 is provided in **Appendix D.**

Through the adoption of management and mitigation measures described throughout **Section 6** and compiled in **Appendix B**, and appropriate design and site selection the Project complies with statutory requirements.

7.4 Consistency with Community Views

Stakeholder engagement encompassed a range of stakeholders including NSW and Federal Government agencies, the nearby community and community groups, Aboriginal groups, proximate landholders and infrastructure owners, as described in **Section 5**.

A significant number of engagement activities were conducted throughout the development of the EIS and scoping phase to discuss the Project with the community and to build an understanding of potential concerns, opportunities and mitigation strategies. These included community pop-up sessions, face-to-face and virtual meetings, phone and email interactions, community events, community survey, Project's website, briefing, factsheets, newsletters, media releases, social media and site visits (refer **Section 5**).

Feedback from the community included both positive and negative views on a range of aspects of the Project. Overall, the Project is supported by a significant number of local community members in Bendemeer and surrounds, who have recognised the benefits of the Project as a source of employment opportunities and generation of clean energy. Stakeholders were interested in understanding how local business could be involved with the Project and how the benefits could be shared within the community.

During engagement activities, key issues emerged such as impacts of the Project on visual amenity, including glint and glare, agricultural production and land value, local traffic, workforce accommodation, bushfire risks and community division. The Applicant will continue to work with the community to address such issues (refer **Section 5.5**).

7.5 Scale and Nature of Impacts

The Project will primarily be developed on land which has been previously disturbed and historically cleared for agricultural purposes. The Project layout has been designed to maximise the use of existing disturbed areas and to avoid and/or minimise impacts to identified biodiversity and Aboriginal cultural heritage values and surrounding receivers. Progressive design iterations for the solar arrays, BESS, and associated infrastructure have continued throughout the development of this EIS with key drivers being measures to avoid and minimise environmental and social impacts in line with the Avoid-Minimise-Mitigate-Offset design hierarchy.

7.5.1 Environmental Impacts

This EIS and relevant technical assessments have assessed the potential impacts of the Project to various environmental aspects, these are summarised in **Table 7-1** below:

Table 7-1 Environmental Impacts Summary

Aspects	Environmental Impacts
Biodiversity	The Project layout and Disturbance Footprint have been refined to avoid and minimise impacts to biodiversity, resulting in the avoidance of areas of high biodiversity value to the greatest extent feasible. As identified in the BDAR (**Appendix G**) the Project will result in the residual impact to 33.0 ha of PCT 538 and 70.8 ha of PCT 510, and associated loss of habitat for fauna species, including the Tusked Frog (28.8 ha), Squirrel Glider and Eastern Pygmy-Possum (33.0 ha each). The Project is expected to result in impacts to TEC White Box-Yellow Box-Blakeley's Red Gum Grassy Woodland and Derived Native Grassland which was confirmed to occur across the Subject Land within restricted areas of PCT 538 and PCT 510. The Project "may result in a significant impact" to 60.3 ha of this TEC.

Aspects	Environmental Impacts
	Two fauna species were assessed for significance as part of the EPBC Act referral for the Project, the Koala and Grey-headed Flying-fox, which have been considered to potentially have a significant impact because of the Project. However, upon further assessment, these species are unlikely to utilise critical habitat to the extent where a significant impact is likely to occur. The Project is not expected to result in significant impacts to other identified and additional MNES within the Subject Land. To compensate for unavoidable disturbance of native vegetation and species habitat, offsets are proposed.
Aboriginal Cultural Heritage	Avoidance of Aboriginal cultural heritage values have been considered in the Project refinement process. The survey undertaken as part of the ACHAR (**Appendix H**) resulted in two potential archaeological deposits (PADs) being recorded (Riverside-PAD1 and PAD2) within the Project Area. Both newly recorded sites are located outside the Disturbance Footprint and therefore, will be avoided by the Project. An ACHMP will be prepared prior to the commencement of construction and include an unexpected finds procedure.
Historic Heritage	No historic sites were identified with local, state or national significance within the Project Area. However, 16 heritage items are listed in the Tamworth LEP within 5 km of the Project Area, being the 'Bendemeer Station', which is the closest site to the Project Area, located 760 m to the west. Given the topographic and natural visual barriers present between the Project Area and 'Bendemeer Station', it is considered unlikely that the Project will indirectly impact the significance of the item, particularly given its significance is not due to aesthetic values. An unanticipated finds protocol will be developed for the Project.
Noise	Initial noise modelling undertaken for the Project has informed the Project layout refinement. The NIA identified construction noise exceedances at 32 sensitive receivers within 1,500 m of the Project boundary, under a worst-case construction noise scenario. The exceedance can be managed with reasonable and feasible measures, as identified in the CNMP. Traffic noise levels as a result of the construction works are not expected to adversely affect any receiver. During operations, all identified Sensitive Receivers are expected to achieve compliance with the NPI PTNLs except for Sensitive Receiver 29, which is an associated dwelling. Further, the cumulative noise impact of the Project and nearby SSDs at the nearest Sensitive Receivers to the Project is expected to be negligible. Noise mitigation measures will be implemented to enable NPI PTNL compliance.
Visual	Considering the extent of existing vegetation in the area and the undulating topography, the Project could be constructed with minimal impact on the existing landscape character or upon its defining features. The LVIA concluded that all 26 non-associated dwellings identified during the preliminary assessment as requiring a detailed assessment would have a '**low**' visual impact rating, and all public viewpoints a 'very low' visual impact rating. Therefore, no additional mitigation measures are required. Considering the low visibility of the Project, it would be unlikely to contribute to cumulative impacts from public viewpoints and private dwellings. Through optimisation of the PV tracker range, no glint and glare impacts are likely. Notwithstanding the above, the Applicant is implementing a landscape plan.
Soils and Agriculture	Agricultural activities will be maintained within the Project Area (as much as possible) for the duration of the construction and operational phases of the Project. The SAIS concluded that the impact of the Project on productivity of agricultural land is determined to be minimal, temporary, and limited to the Project Area. The impact of the Project on soil resources is expected to be temporary and only within the Project Area where surface disturbance occurs. While the expected operational life, being a minimum of 30 years makes this a long-term Project, the Project is highly reversible in terms of its current land use, as such the land zoning will not be modified and agricultural activities following decommissioning can continue. Additionally, the cumulative impact on agriculture for the region is considered to be low, as the changes to agricultural land use and agricultural productivity are anticipated to be minor from the Project and each SSD.

Aspects	Environmental Impacts
	The LUCRA did not identify high-risk potential conflicts to occur between neighbouring land uses; however, the following potential conflicts remain a moderate risk and may require further consultation and management: ■ Impact on visual amenity ■ Increased traffic and impact on fauna and machinery ■ Impact on waterways during construction ■ Introduction and/or spread of weeds, diseases and pests ■ Fire risks and impacts on fauna, land and infrastructure ■ Properties devaluation ■ Biodiversity impacts ■ Cumulative impacts ■ Poor rehabilitation By adopting the principles of impact avoidance and minimisation during construction and operation of the Project and implementing effective decommissioning and rehabilitation at the end of the Project life, the Project will have no permanent negative impacts on agricultural resources or enterprises.
Water Resources, Hydrology and Flooding	Key impacts on water resources from the Project are related to the increased risk of erosion and sedimentation as a result of construction activities and the disturbance to the Project Area. In consideration of the measures incorporated in the conceptual SWMP drafted for this EIS, a detailed SWMP will be developed prior to construction to manage the identified erosion and sedimentation impacts from the Project. As part of the SWMP a Progressive Erosion and Sediment Controls Plans (ESCP) will be developed during construction to adequately manage the risks on a site-by-site basis. The staging of works to minimise disturbance areas and progressive rehabilitation during construction will further mitigate these impacts. The flood impact assessment determined that sensitivity to climate change and increase in flood water levels will not be significant following Project development to the existing Project Area layout. Any impacts from flooding can be mitigated through the maintenance of ground cover and the implementation of appropriate erosion and sediment controls.
Traffic	A new site access via Oxley Highway has been designed to allow access to the Project Area. The intersection of Oxley Highway and the site access will be provided with a BAR treatment and with adequate sight distance to allow vehicles to safely enter and exit the road network. The road network can accommodate the traffic, loads and type of vehicle movements generated by the Project during construction and operation, therefore no impact from the Project on the road network is expected. Further, the cumulative impact of the Project and nearby SSDs on road traffic is expected to be minimal. A TMP will be prepared to mitigate the impacts of site traffic generated along the proposed transport route.
Hazards and Risks	The qualitative review of the potential incidents of the Project indicates that offsite impacts would not be expected to occur. Hence it is concluded that the risks at the Project boundary are not considered to exceed the acceptable risk criteria. Final Project layout will adopt the required spacings and offsets, and a Bush Fire Emergency Management and Operations Plan will be prepared for the Project.
Air Quality	The impacts of the Project on air quality are concentrated during the construction phase. The implementation of mitigation measures will ensure that the Project will not generate significant air quality impacts. Overall, the Project will provide benefit impacts as it will improve air quality through the displacement of emissions that would otherwise be generated through the burning of fossil fuels used to generate electricity from traditional coal fired power stations.
Waste	Waste generated during construction, operation and decommissioning of the Project can be minimised in accordance with statutory requirements. A WMP will be prepared for the Project and will describe the measures to be implemented to manage, reuse, recycle and safely dispose of waste.

7.5.2 Economic Impacts

The Project is justified economically due to the economic stimulus and benefits it will provide to the region, which includes the LGAs of Tamworth Regional, Armidale Regional, Uralla Shire and Walcha Shire and, more broadly, NSW.

During construction the Project will generate up to 307 FTE jobs, creating annually $290 M in direct and indirect output, $126 M in direct and indirect value added, $80 M in direct and indirect household income, and 880 direct and indirect jobs throughout the region and NSW. The Project will create demand for regional labour resources and regional inputs to production. No impacts of the Project on wage or price increases or production shortages are anticipated.

During operations, the Project will generate 15 FTE jobs and create annually $44 M in direct and indirect output, $27 M in direct and indirect value added, $7 M in direct and indirect household income, and 71 direct and indirect jobs in the region and NSW.

Demand for regional labour resources and regional inputs to production will be created in smaller rates during operations. Consequently, the Project will not impact wage or price increases or production shortages.

The employment and economic opportunities created by the Project have been supported by the community during engagement and consultation activities (refer **Section 5**).

The potential cumulative impacts of the Project and nearby SSDs on the economy activity are generally positive. These are associated with the demand for construction workforce, as described in **Section 6.16.3**.

7.5.3 Social Impacts

The Project will provide a diversified income stream for rural landholders through lease payments to host landholders. The income provided to landowners hosting Project's infrastructure can help make farms more resilient to the impacts of droughts, fires and commodity price fluctuations.

A CBF is proposed by the Applicant wherein eligible community initiatives could be funded through annual contributions to the fun. The Applicant has proposed that the CBF be managed by a dedicated committee, the Bendemeer Community Benefit Fund Committee and forms part of the VPA with Tamworth Regional Council. Funds will be awarded to local projects and programs that are successful in the applications/proposal process (refer to **Section 3.9**). The Applicant and Tamworth Regional Council are still in negotiations on the VPA.

While the Project has the potential to generate environmental impacts, it is considered that these can be appropriately managed with the implementation of the mitigation and management measures, as summarised in **Appendix B**. These measures will also address the community concerns and associated social impacts identified during the stakeholder engagement process (refer **Section 5**).

Further, during construction, the Applicant will work with contractors, local communities, neighbours and local council, to plan and manage construction to minimise disturbance. Construction management will include:

- Regular and ongoing communication with the community;
- Working during standard construction hours, or as defined in **Section 3.4.2**;
- A rigorous safety culture; and
- Environmental monitoring.

Given the net benefit and commitment from the Applicant to appropriately manage the potential environmental impacts associated with the Project, it is considered the Project would result in a net benefit to the Tamworth locality, New England Region and broader NSW community.

7.6 Compliance and Monitoring

An EMS will be developed to provide the overall framework for environmental management during the construction, operation, decommissioning and rehabilitation of the Project to ensure that appropriate measures and processes are in place to manage identified environmental risks and provide for ongoing continual improvement. The EMS will incorporate mitigation measures that have been identified throughout this EIS and associated technical assessments and will include relevant management plans.

Appendix B provides a summary of the environmental management commitments of the Project which will be implemented to avoid, minimise and where necessary, offset the potential environmental impacts associated with the Project.

Prior to the commencement of construction, detailed design and layout plans will be finalised. Environmental mitigation and management measures outlined in the EMS and the associated environmental management plans will be prepared and submitted as required by the conditions of development consent.

7.7 Ecologically Sustainable Development

7.7.1 The Precautionary Principle

The environmental impacts of the Project have been carefully evaluated in this EIS and where practicable been avoided, mitigated, managed or offset. Various options have been considered for the solar arrays, BESS and associated infrastructure having regard to environmental risks. Ultimately, options with lower environmental impacts and risks have been selected to avoid and minimise potential biodiversity and heritage impacts.

The site suitability and Project alternatives selection process, as detailed in **Section 2.4** of this EIS, have thoroughly considered and sought to minimise the likely impacts to the local environment. Where uncertainty exists, measures have been suggested to address the uncertainty.

Management measures have been proposed for all significant environmental impacts. As such, is no threat of serious or irreversible damage to the environment.

7.7.2 Inter-generational Equity

The 'State of the Climate' (BoM & CSIRO, 2022) draws on the latest monitoring, science and projection information to describe variability and changes in Australia's climate. The following statement on climate change is highlighted in the report:

> *"Observations, reconstructions of past climate and climate modelling continue to provide a consistent picture of ongoing, long-term climate change interacting with underlying natural variability. Associated changes in weather and climate extremes—such as extreme heat, heavy rainfall and coastal inundation, fire weather and drought—have a large impact on the health and wellbeing of our communities and ecosystems."*

At the local context, the 'Tamworth Regional Council Our Environmental Sustainability Strategy & Action Plan 2022 – 2026' (Tamworth Regional Council, 2022) has made the following statement about climate change:

> *"Energy use sourced from fossil fuels is the primary contributor to climate change. The most significant action that Tamworth Regional Council can take is to implement energy efficiency projects to reduce energy consumption and to utilise renewable energy sources.*"

Additionally, the 'Draft Tamworth Regional Council Our Environmental Sustainability Strategy & Action Plan 2022- 2026' (Tamworth Regional Council, 2022c) states:

> *"With an increasing number, frequency and severity of climate related events such as bushfires, floods, severe storms and droughts, building community resilience and taking action to build adaptive capacity and reduce carbon emissions is critical."*

The Project is consistent with the principles of inter-generational equity as it involves a new renewable energy resource which will result in estimated savings of approximately 420,000 t-CO_2e of GHG per annum, which is an action against climate change that will benefit future generations.

Other environmental benefits associated with the Project include reductions in air quality emissions and water use from solar power generation when compared to impacts from Projects which input to traditional coal fired power stations.

Following decommissioning, the Project Area will be rehabilitated and made suitable for continued agricultural activities, or renewable energy generation, both of which would provide benefits for future generations.

7.7.3 Conservation of Biological Diversity and Ecological Integrity

Conservation of biodiversity has been a fundamental consideration throughout Project development. Extensive desktop and field assessment has been undertaken to understand the anticipated biodiversity impacts. The findings of the biodiversity assessment have informed an ongoing iterative design for the layout of the Project and siting of solar arrays and other key infrastructure.

Impacts to biodiversity will be avoided, mitigated and offset where necessary to ensure that there is no net loss in biological diversity and that ecological integrity is maintained (refer **Section 6.2**).

7.7.4 Improved Valuation, Pricing and Incentive Mechanisms

The Project enables the utilisation of a valuable resource, solar energy, which is otherwise lost if the Project does not proceed. The Project further contributes to the transition from fossil fuel generation sources. The Project will reduce air, water and land pollution from coal-fired power stations, which currently bear none of the external costs of such pollution.

The environmental consequences of the Project and mitigation measures with potential for adverse impacts have been considered and identified in this EIS (refer **Section 6**). Implementing the mitigation measures will impose an economic cost on the Applicant, which increases the costs of the Project.

Project benefits are considered to outweigh the costs. The Project will generate up to 307 FTE jobs during construction and 15 FTE jobs during operations and will provide economic benefits to the local community. It will also provide tangible and durable financial benefits to the community through the CBF and VPA.

7.8 Conclusion

The Project involves the construction, operation and decommissioning of a PV solar facility with a capacity of approximately 280 MW, BESS with a capacity of approximately 150 MW/ 300 MWh and associated infrastructure. The Project will contribute significantly to reducing carbon emissions and human induced climate change as part of the necessary and ongoing clean energy transition from fossil fuels.

The Project has been carefully designed and sited to minimise environmental impacts in consultation with the local community and relevant stakeholders. The residual environmental and social impacts identified throughout the EIS and technical assessments will be managed through the mitigation and management measures summarised in **Section 6**.

The Project will not result in significant impacts on the environment, or the local community and these impacts will be significantly outweighed by the strong strategic and economic benefits which the Project will deliver. The Project will:

- Assist the Federal and NSW Governments to fulfil its targets and policies to increase renewable energy supply and reduce carbon emissions;
- Assist in meeting energy demand as part of the market transition from traditional energy sources; and
- Deliver economic benefits to regional and local communities.

The Project represents a positive addition to the local and wider NSW economy and the NEM. Through the implementation of proposed mitigation and management measures, it is considered that this Project is consistent with the objects of the EP&A Act and is in the public interest.

8. ABBREVIATIONS AND TERMINOLOGIES

This section includes terminologies and abbreviations consistently used in this EIS. It describes key terms specific to the Project and EIS; and provides consistent abbreviations for Acts; Guidelines, Manuals and Policies; Management Plans; and general renewables' industry terms.

8.1 Terminologies

Terminology	Description
Applicant	Athena Energy Australia (Holdings) Pty Ltd.
Project Area	Red boundary to which the Application applies as shown in Figure 1-2.
Project	The development to which the Application applies generally as described in Section 1.3 of the EIS.
Application	Application for Development Consent under Part 4, Division 4.7 of EP&A Act and Sections 18 and 18A of EPBC Act.
Disturbance Footprint	The area of land that is directly impacted by the Project including: all temporary and permanent disturbance areas; and all areas where vegetation may be removed during project construction and operations (as utilised in the BDAR).
Temporary Disturbance	The area of land that will be temporarily disturbed during construction of the Project, and later rehabilitated.
Permanent Disturbance	The area of land that will be subject to permanent alteration as a result of construction and operation of the Project's infrastructure until decommissioning.
Study Area	The area which applies to specific technical studies and includes Disturbance Footprint (within which all Project disturbance will occur unless otherwise stipulated in the Project Description).
Assessment Area	Ecology only – as Guidelines require some specific terms. Includes all land within a 1,500 m buffer of the Project Area, as appropriate for non-linear developments under the BAM, for which landscape features such as native vegetation cover, bioregions, waterways and other features are described.
Subject Land	Ecology only – as Guidelines require some specific terms. The Subject land is the area in which Stage 1 of the BAM has been applied to assess the biodiversity values of the land where direct and indirect impacts may occur.
Host Landholder	Landholder where physical project elements are to be located on their land.
Associated	Affected residence where an agreement is in place between an applicant and a landholder/s, as per Large-Scale Solar Energy Guideline (DPE, 2022a).
Non-associated	Affected residence where an agreement is not in place between an applicant and a landholder/s, as per Large-Scale Solar Energy Guideline (DPE, 2022a).
Referencing	*Legislation 20xx* 'Document Title' (xyz, 2022) *"quotation"* 'Guidelines'

8.2 Acts

Abbreviation	Title
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPBC Regulations	*Environment Protection and Biodiversity Conservation Regulations 2000*
BC Act	*Biodiversity Conservation Act 2016*
CLM Act	*Contaminated Land Management Act 1997*
CrLM Act	*Crown Land Management Act 2016*
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
LAJTC Act	*Land Acquisition (Just Terms Compensation) Act 1991*
NP&W Act	*National Parks and Wildlife Act 1974*
NW Act	*Noxious Weeds Act 1993*
POEO Act	*Protection of the Environment Operations Act 1997*
RE Act	*Renewable Energy (Electricity) Act 2000*
NW Act	*Noxious Weeds Act 1993*
LG Act	*Local Government Act 1993*
WM Act	*Water Management Act 2000*
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
Wilderness Act	*Wilderness Act 1987*

8.3 Management Plans

Abbreviation	Title
ACHMP	Aboriginal Cultural Heritage Management Plan
BFMP	Bushfire Management Plan
BMP	Biodiversity Management Plan
CEMP	Construction Environmental Management Plan
EMP	Environmental Management Plan
ESCP	Erosion and Sediment Control Plan
HHMP	Historic Heritage Management Plan
NMP	Noise Management Plan
SWMP	Soil and Water Management Plan
TMP	Traffic Management Plan
WMP	Waste Management Plan
ESCP	Erosion and Sediment Control Plan

8.4 Guidelines, Manuals and Policies

Abbreviation	Title
NPI	*Noise Policy for Industry* (2017)
Noise Bulletin	*Wind Energy: Noise Assessment Bulletin* (2016)
INP	*NSW Environmental Noise Management – Industrial Noise Policy*
CIA Guidelines	Cumulative Impact Assessment (CIA) Guidelines for State Significant Projects
SIA Guideline	Social Impact Assessment Guideline for State Significant Projects (DPE, 2023a)
Visual Bulletin	*Wind Energy: Visual Bulletin 2016*
HIPAP	Hazardous Industry Planning Advisory Paper
HIPAP 4	Hazardous Industry Advisory Paper No. 4, 'Risk Criteria for Land Use Safety Planning'
HIPAP 6	Hazardous Industry Planning Advisory Paper No. 6, 'Hazard Analysis'
Approved Methods	*Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*
AIS	Agricultural Impact Statements – technical notes
AA Guidelines	Archaeological Assessment guidelines
ASHASR	Assessing Significance for Historical Archaeological Sites and Relics
AGRD Part 4A	Austroads Guide to Road Design Part 4A
AGTM Part 12	Austroads Guide to Traffic Management Part 12
AGTM Part 6	Austroads Guide to Traffic Management Part 6
BAM 2020 OM Stage 1	BAM 2020 Operational Manual Stage 1
BAM 2020 OM Stage 3	BAM 2020 Operational Manual Stage 3
BAMC User Guide	BAM CaLCZlator User Guide
BAMOM Stage 2	BAM Operational Manual Stage 2
Bat calls of NSW guide	Bat calls of NSW - region-based guide to the echolocation calls of Microchiropteran bats
BRM in LUP & DG	Biosecurity Risk Management in Land Use Planning and Development Guide
CBS Manual	Community Biodiversity Survey Manual
Draft SSAL	Draft State Significant Agricultural Land mapping
Fisheries NSW P&G	Fisheries NSW policies and guidelines
FDM 2005	Floodplain Development Manual 2005
FRM Guidelines	Floodplain Risk Management Guidelines
DANPWSL Guidelines for consent and planning authorities	Guidelines for consent and planning authorities for Developments adjacent to National Parks and Wildlife Service Land
CAOWL Guidelines	Guidelines for Controlled Activities on Waterfront Land
FMWQ Guidelines	Guidelines for Fresh and Marine Water Quality
RCOWL Guidelines	Guidelines for Riparian Corridors on Waterfront Land
IPORL	Infrastructure Proposals on Rural Land (Primefact)
LUCRA Guide	Land Use Conflict Risk Assessment Guide
Solar Guidelines	Large Scale Solar Energy Guidelines
MLRA	Multi-level Risk Assessment

Abbreviation	Title
NSW AIP	NSW Aquifer Interference Policy (2012)
NSW HM	NSW Heritage Manual
NSW SGFTF	NSW Survey Guide for Threatened Frogs
RM Guide to TGD	Roads and Maritime Guide to Traffic Generating Developments
Hazardous and Offensive Development SEPP	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
Survey Guide for 'Species credit' threatened bats and their habitats	Surveying 'species credit' threatened bats and their habitats – NSW survey guide for the Biodiversity Assessment Method
Survey Guide for Threatened Plants and their Habitats	Surveying Threatened Plants and their Habitats - NSW Survey Guide For The Biodiversity Assessment Method
Landscape and Visual Technical Supplement	Technical Supplement - Landscape and Visual Impact Assessment
SIA Technical Supplement	Technical Supplement: Social Impact Assessment Guideline for State Significant Projects
TfNSW Supp.	TfNSW Supplement
Threatened Biodiversity Survey and Assessment Guidelines	Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (2004)
Threatened Species survey and assessment guidelines	Threatened species survey and assessment guidelines: field survey methods for fauna – amphibians
WQ Guidelines	Water Quality Guidelines

8.5 Abbreviations – General

Abbreviation	Description
AAAA	Aerial Agriculture Association of Australia
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHMP	Aboriginal Cultural Heritage Management Plan
ACMA	Australian Communications and Media Authority
AEMO	Australian Energy Market Operator's
AEP	Annual Exceedance Probability
AGL	Above Ground Level
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AIA	Aviation Impact Assessment
ALA	Aircraft Landing Area
AMSL	Above Mean Sea Level
ANZECC	Australian and New Zealand Environment Conservation Council
APZ	Asset Protection Zone
ARR	Australian Rainfall and Runoff
AS	Australian Standard

Abbreviation	Description
ASA	Air Services Australia
AusWEA	Australian Wind Energy Association
BAM	Biodiversity Assessment Method
BAL	Basic Left Turn
BAR	Basic Right Turn
BCS	Biodiversity, Conservation and Science Directorate (BCS)
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BFEMOP	Bush Fire Emergency Management and Operational Plan
BFMC	Bushfire Management Committee
BGS	Below Ground Surface
BMP	Biodiversity Management Plan
BMS	Battery Management System
BMT	BMT Commercial Australia Pty Ltd
BoM	Bureau of Meteorology
BOS	Biodiversity Offset Strategy
BSAL	Biophysical Strategic Agricultural Land
BUS	Bird Utilisation Survey
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CCC	Community Consultative Committee
CIA	Cumulative Impact Assessment
CLM Act	*Contaminated Land Management Act 1997*
Commissioner	Australian Energy Infrastructure Commissioner
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCCEEW	Department of Climate Change, Energy, the Environment and Water
dB	Decibel
dB(A)	A-weighted Decibels
DCP	Development Control Plan
DNG	Derived Native Grassland
DP	Deposited Plan
EEC	Endangered Ecological Community
This EIS	Environmental Impact Statement (not “the EIS”)
EL	Exploration Licence
ELF	Extremely Low Frequency
EMF	Electromagnetic Field

Abbreviation	Description
EMI	Electromagnetic Interference
EMR	Electromagnetic Radiation
EMS	Environmental Management Strategy
EPC	Engineering, procurement and construction
EPI	Environmental Planning Instrument
EPL	Environmental Protection Licence
ERM	Environmental Resources Management Australia Pty Ltd
ESD	Ecologically Sustainable Development
FM	Frequency Modulation
FRNSW	Fire and Rescue NSW
FTE	Full Time Equivalent
G	Gauss
GHG	Greenhouse Gas
GPS	Global Positioning System
ha	Hectares
HBT	Hollow-bearing tree
HVAC	Heating, Ventilation, and Air Conditioning
HRV	Heavy Rigid Trucks
Hz	Hertz
IBRA	Interim Biogeographic Regionalism for Australia
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEC	International Electrotechnical Commission
IFR	Instrument Flight Rules
IPA	Inner Protection Area
ISO	International Standards Organisation
ISP	Internet Service Providers
KFH	Key Fish Habitat
km	Kilometre
kV	Kilovolt
LCZ	Landscape Character Units
LEP	Local Environmental Plan
LGA	Local Government Area
LSALT	Lowest Safe Altitude
LRET	Large-scale Renewable Energy Target
LSC	Land and Soil Capability
LSPS	Local Strategic Planning Statement

Abbreviation	Description
LVIA	Landscape Visual Impact Assessment
m	Metres
mG	Milligauss
Minister	NSW Minister for Planning and Public Spaces
MNES	Matters of National Environmental Significance
MOC	Minimum Obstacle Clearance
MRV	Medium Rigid Trucks
Mt	Million tonnes
mT	Millitesla
t-CO_2e pa	Tonnes CO_2 equivalent per annum
MVA	Mega Volt Ampere
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market
NEPM	National Environment Protection (Ambient Air Quality) Measure
NHMRC	National Health Medical Research Council
NMP	Noise Management Plan
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NT Act	*Native Title Act 1993*
NT LSS	Northern Tablelands Local Land Services
NVIA	Noise and Vibration Impact Assessment
O&M	Operation and Maintenance
OH&S	Occupational Health and Safety
OLS	Obstacle Limitation Surface
OSOM	Oversize and Overmass
PBP 2019	Planning for Bushfire Protection 2019
PCT	Plant Community Type
PHA	Preliminary Hazard Analysis
Planning Systems SEPP	*State Environmental Planning Policy (Planning Systems) 2021*
POEO Act	*Protection of the Environment Operation Act 1997*
RAP	Registered Aboriginal Party
RAV	Restricted Access Vehicles
RBL	Rating Background Level
RE Act	*Renewable Energy (Electricity) Act 2000*
RECs	Renewable Energy Certificates

Abbreviation	Description
Resilience and Hazards SEPP	*State Environmental Planning Policy (Resilience and Hazards) 2021*
RET	Renewable Energy Target
REZ	Renewable Energy Zone
RFS	NSW Rural Fire Service
RJA	Rex J Andrews Pty Ltd
RRL	Register of Radiocommunications Licences
SAII	Serious and Irreversible Impact
SCADA	Supervisory Control and Data Acquisition
SDG	Sustainable Development Goals
SEARs	Secretary's Environmental Assessment Requirements
SEIFA	Socio-Economic Index for Areas
SEPP	State Environmental Planning Policy
SIA	Social Impact Assessment
SIA Guidelines	Social Impact Assessment Guideline: For State Significant Projects
SSD	State Significant Development
SWMP	Soil and Water Management Plan
T	Tesla
TEC	Threatened Ecological Communities
TfNSW	Transport for NSW
The Blue Book	*Managing Urban Stormwater: Soils and Construction- Volume 1* (Landcom, 2004)
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
T&I SEPP	*State Environmental Planning Policy (Transport and Infrastructure) 2021*
UCL	Urban Centres and Localities
V	Volts
VIZ	Visual Influence Zone
VFR	Visual Flight Rules
VP	Voluntary Planning Agreement
vpd	Vehicles Per Day
V/C	Volume Capacity Ratio
V/m	Volts per metre
WHO	World Health Organisation
WPI	Wind Power Invest
WQO	Water Quality Objective
ZVI	Zone of Visual Influence

REFERENCES

ABCB. (2022). *National Construction Code*. Retrieved from https://ncc.abcb.gov.au/

ABS. (1995). *Information Paper Australian National Accounts Introduction to Input-Output Multipliers. Cat. No. 5246.0.*

ABS. (2021). *2021 Census Community Profiles*. Retrieved from Australian Bureau of Statistics: https://www.abs.gov.au/census/find-census-data/quickstats/2021/SAL10289

ABS. (2022, December 20). *Agricultural Commodities*. Retrieved from https://www.abs.gov.au/statistics/industry/agriculture/agricultural-commodities-australia

AEMO. (2022a). *2022 Integrated Systems Plan For the National Electricity Market.* Australian Energy Market Operator.

AEMO. (2022b). *2022 Electricity Statement of Opportunities: A report for the National Electricity Market.*

AER, A. E. (2021). *State of the energy market 2021.*

Athena. (2022, November 21). *Our Technologies*. Retrieved from Athena Holdings: https://www.athena-holdings.com/our-projects/

Australia ICOMOS. (2013). *The Burra Charter: The Australia ICOMOS Charter for Place of Cultural Signficance 2013.* Burwood: Australia ICOMOS Incorporated.

Australian Standard. (2019). *Australian Standard AS1742.3 - Opens in new window: Manual of uniform traffic control devices, Part 3: Traffic control for works on roads.*

Austroads. (2019). *Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings.*

Austroads. (2021). *Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections .*

Aviation Projects. (2021). *Winterbourne Wind Farm – Aviation Impact Assessment.* ERM Australia Pty Ltd.

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, & Testoni I. (2019). *Australian Rainfall and Runoff: A guide to flood estimation.* Retrieved from http://www.arr-software.org/pdfs/ARR_190514.pdf

BoM & CSIRO. (2022). *State of the Climate 2022.* Retrieved from file:///C:/Users/elohanna.levi/Downloads/22-00220_OA_REPORT_StateoftheClimate2022_WEB_221115%20(2).pdf

BoM. (2022). *Groundwater Dependent Ecosystems Atlas*. Retrieved from http://www.bom.gov.au/water/groundwater/gde/map.shtml

BoM. (2022b). *Climate statistics for Australian locations: Summary statistics WOOLBROOK (WOOLBROOK ROAD)*. Retrieved from Bureau of Meteorology: http://www.bom.gov.au/climate/averages/tables/cw_055136.shtml

BoM. (2023b, 03 07). *Climate statistics for Australian locations: Monthly climate statistics - WOOLBROOK*. Retrieved from http://www.bom.gov.au/climate/averages/tables/cw_055136.shtml

CEC. (2018). *Best Practice Guidelines: For Implementation of Wind Energy Projects in Australia.* Clean Energy Council.

Clayton-Dixon. (2019). Surviving New England. A History of Aboriginal Resistance and Resilience through the first forty years of the Colonial Apocalypse. Anaiwan Language Revival Program, Armidale.

Clean Energy Regulator. (2020). *Large-scale Renewable Energy Target market data*. Retrieved from Clean Energy Regulator: http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/Large-scale-Renewable-Energy-Target-market-data#progress

Clean Energy Regulator. (2022). *Large-scale Renewable Energy Target market data*. Retrieved from Clean Energy Regulator: http://www.cleanenergyregulator.gov.au/RET/About-the-Renewable-Energy-Target/Large-scale-Renewable-Energy-Target-market-data#progress

CSIRO. (2021). *CSIRO report confirms renewables still cheapest new build power in Australia*. Retrieved from https://www.csiro.au/en/news/news-releases/2021/csiro-report-confirms-renewables-still-cheapest-new-build-power-in-australia

DCCEEW. (2022, November 2). *Australian Energy Statistics, Table O Electricity generation by fuel type 2020-21 and 2021*. Retrieved from https://www.energy.gov.au/publications/australian-energy-statistics-table-o-electricity-generation-fuel-type-2020-21-and-2021

DECC. (2008a). Managing Urban Stormwater: Soils and Construction, Volume 2A, Installation of Services.

DECC. (2008b). Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads.

DECC. (2009). *Interim Construction Noise Guideline (ICNG) .*

DECCW. (2010a). *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales.* Sydney South: Department of Environment, Climate Change and Water NSW.

DECCW. (2010b). *Aboriginal cultural heritage consultation requirements for proponents 2010.*

DECCW. (2010c). *Code of Practice for archaeological investigation of Aboriginal Objects in New South Wales.*

DEE. (2020). *The National Light Pollution Guidelines for Wildlife .*

Department of Agriculture, Fisheries and Forestry. (2010). *The Australian Land Use and Management.*

Department of Planning, Heritage Branch. (2009). *Assessing Significance for Historical Archaeological Sites and 'Relics'.*

DoP. (2011a). *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33.* Department of Planning. Retrieved from https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/hazardous-and-offensive-development-application-guidelines-applying-sepp-33-2011-01.pdf?la=en

DoP. (2011b). *Multi-level Risk Assessment: Assessment Guideline.*

DPE. (2016a). *Wind Energy Guideline for State Significant Wind Energy Development.* NSW Department of Planning and Environment.

DPE. (2016b). *Wind Energy: Visual Assessment Bulletin.* NSW Department of Planning and Environment.

DPE. (2018). *Environmental Planning Instrument - Acid Sulfate Soils*. Retrieved from NSW Planning Portal.

DPE. (2018). *NSW Transmission Infrastructure Strategy.* Department of Planning and Environment.

DPE. (2020). *NSW Landuse 2017 v1.2.*

DPE. (2021, May 24). *New England Tableland bioregion.* Retrieved from Department of Planning and Environment Web site: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/bioregions/bioregions-of-nsw/new-england-tableland

DPE. (2022a). *Large-Scale Solar Energy Guidelines.*

DPE. (2022b). *Technical Supplement - Landscape and Visual Impact Assessment Large-Scale Solar Energy Guideline.*

DPE. (2023, April 18). *Air quality monitoring station*. Retrieved from Air quality concentration data - updated hourly: https://www.dpie.nsw.gov.au/air-quality/air-quality-concentration-data-updated-hourly

DPE. (2023a). *Social Impact Assessment Guideline for State Significant Projects.* Department of Planning and Environment.

DPE. (2023b). *Strategic Regional Land Use Policy (SRLUP).* Retrieved from https://datasets.seed.nsw.gov.au/dataset/srlup-salbiophysical

DPE. (2023b). *Technical Supplement: Social Impact Assessment Guideline for State Significant Projects.* Department of Planning and Environment.

DPI. (2003). *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings.* Cronulla: NSW Fisheries.

DPI. (2005). *Floodplain Development Manual: The management of flood liable land.* Retrieved from https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Floodplains/floodplain-development-manual.pdf

DPI. (2011). *Land Use Conflict Risk Assessment Guide.*

DPI. (2013). *Policy and guidelines for Fish Habitat Conservation and Management.*

DPI. (2018). *Guidelines for Controlled Activities Waterfront Land.* Department of Primary Industries.

DPI. (2022). *Farm Enterprise Budget Series - 2022 Sheep enterprise gross margins Farm Enterprise Budget Series - 2022 Sheep enterprise gross margins.*

DPIE. (2011a). *Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis (HIPAP No. 6).* Sydney: Department of Planning, Industry and Environment.

DPIE. (2011b). *Hazardous Industry Planning Advisory Paper No. 4 - Risk Criteria for Land Use Safety Planning (HIPAP No. 4).* Sydney: Department of Planning, Industry and Environment.

DPIE. (2019, December). Water quality management plan for the Namoi water resource plan area SW14.

DPIE. (2019a). *NSW Electricity Strategy.* NSW Department of Planning, Industry and Environment.

DPIE. (2019a). *NSW Electricity Strategy.* NSW Department of Planning, Industry and Environment.

DPIE. (2020a). *Net Zero Plan Stage 1: 2020-2030.* Parramatta: Environment, Energy and Science.

DPIE. (2020b). *Biodiversity Assessment Method.* NSW Department of Planning, Industry and Environment.

DPIE. (2020d). *NSW Electricity Infrastructure Roadmap.* NSW Department of Planning, Industry and Environment.

DPIE. (2020e). *Developments adjacent to National Parks and Wildlife Service lands Guidelines for consent and planning authorities.*

DPIE. (2021a). *NSW Annual Compliance Report 2020: National Environment Protection (Ambient Air Quality) Measure.* NSW Department of Planning, Industry and Environment.

DPIE. (2021a). *State Significant Development Guidelines - Preparing a Scoping Report: Appendix A to the State Significant Development Guidelines.* Department of Planning, Industry and Environment.

DPIE. (2021d). *Cumulative Impact Assessment Guidelines for State Significant Projects.* Sydney, NSW: NSW Department of Planning, Industry and Environment.

DPIE. (2021d). *NSW Annual Compliance Report 2020: National Environment Protection (Ambient Air Quality) Measure.* NSW Department of Planning, Industry and Environment.

DPIE. (2022). *Retrieved of following layers: soil landscapes, soil types, inherent soil fertility, land and soil capability.* Retrieved from espade.environment.nsw.gov.au

DPIE. (2022). *Undertaking Engagement Guidelines for State Significant Projects .*

DPIE. (2023). *Social Impact Assessment Guideline for State Significant Projects.* Department of Planning, Industry and Environment.

EnergyCo. (2023, June 8). *New England Renewable Energy Zone*. Retrieved from https://www.energyco.nsw.gov.au/ne-rez#key-facts

Environment Protection and Heritage Council. (2010). *Draft National Wind Farm Development Guidelines.* Adelaide: Environment Protection and Heritage Council.

EPHC. (2010). *National Wind Farm Development Guidelines - Draft.* Adelaide: Environment Protection and Heritage Council.

Ferry, J. (2001). *Thematic History of Parry Shire. Report to Tamworth.*

Fraser, D. (2004). Nomination Report for the Bendemeer Bridge as an Historic Engineering Marker celebrating its centenary in 2005. Retrieved from https://portal.engineersaustralia.org.au/system/files/engineering-heritage-australia/nomination-title/Bendemeer_Bridge_Nomination.pdf

Heritage Council. (2006). *Historical Archaeology Code of Practice.*

Heritage Office . (1996). *NSW Heritage Manual.*

IAP2. (2022, November 03). *International Association for Public Participation (IAP2)*. Retrieved from IAP2 Spectrum of Public Participation: https://cdn.ymaws.com/www.iap2.org/resource/resmgr/communications/11x17_p2_pillars_brochure_20.pdf

ICNIRP. (2010). *Guidelines for limiting exposure to Time-varying Electric, Magnetic and Electromagnetic Fields.*

IEC, I. E. (2019). *IEC 61400-24:2019 Wind energy generation systems - Part 24: Lightning protection.*

IEC, I. E. (2022). *IEC 62305:2022 Protection against lightning*.

IECA, I. E. (2008). *Best practice erosion & sediment control.*

Landcom. (2004). *Managing Urban Stormwater: Soils and Construction - Volume 1, 4th Edition.* NSW: Landcom.

Landscape Institute and IEMA. (2013). *Guidelines for Landscape and Visual Impact Assessment.* Landscape Institute and Institute of Environmental Management & Assessment.

Lawrie et al. (2011). Boomtowns, Resource Dependence and Socioeconomic Well-being. *Australian Geographer, 42(2)*, 139-164.

Manning, C. J. (1981). *The Propagation of Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities, CONCAWE Report No. 4/81.*

Milliss, R. (1980). *City on the Peel. A.H. & A.W. Reed Pty Limited Sydney.*

NGH. (2022). *Scoping Report: Bendemeer Solar Farm.*

NSW Department of Land and Water Conservation. (2001). *Macquire Groundwater vulnerability map.*

NSW EPA. (2012). *Better Practice Guidelines for Waste Management and Recycling in Commercial and Industrial Facilities.*

NSW EPA. (2014a). *Waste Classification Guidelines.*

NSW EPA. (2014a). *Waste Classification Guidelines – Part 1: Classification of waste.* Sydney: NSW Environment Protection Authority.

NSW EPA. (2014b). *Resource Recovery Exemption under Part 9, Clauses 91 and 92 of the Protection of the Environment Operations (Waste) Regulation 2014.* NSW Environmental Protection Authority.

NSW EPA. (2014b). *Waste Avoidance and Resource Recovery Strategy 2014-2021 .*

NSW EPA. (2014c). *Resource Recovery Exemption under Part 9, Clauses 91 and 92 of the Protection of the Environment Operations (Waste) Regulation 2014.* NSW Environment Protection Authority.

NSW EPA. (2016). *Addendum to the Waste Classification Guidelines (2014) – Part 1: classifying waste .*

NSW EPA. (2016). *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014: The mulch order 2016.* NSW Environment Protection Authority.

NSW EPA. (2022, October 13). *The Waste Hierarchy*. Retrieved from https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/warr-strategy/the-waste-hierarchy

NSW Government Gazette. (2021, December 17). Government Gazette of the State of New South Wales Number 643–Electricity and Water. *RENEWABLE ENERGY ZONE (NEW ENGLAND) ORDER 2021*.

NSW Heritage Office. (2001). *Assessing Heritage Significance.*

NSW ICNG. (2009). *NSW Department of Environment and Climate Change (DECC), Interim Construction Noise Guideline (ICNG).*

NSW Land Registry Services. (2022, September 16). *Registrar General's Guidelines - Solar Farm Leases*. Retrieved from https://rg-guidelines.nswlrs.com.au/deposited_plans/lease_plans/lease_of_premises/solar-farms

NSW National Parks and Wildlife Service. (2003). *The Bioregions of New South Wales – their biodiversity, conservation and history: The New England Tableland Bioregion.*

NSW NPI. (2017). *NSW Environmental Protection Authority, Noise Policy for Industry.*

NSW NPWS, N. N. (1991). *The Bioregions of New South Wales: Chapter 12 The Nandewar Bioregions.*

NSW RFS. (2015). *Guide For Bush Fire Prone Land Mapping.* Retrieved from https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0011/4412/Guideline-for-Councils-to-Bushfire-Prone-Area-Land-Mapping.pdf

NSW RFS. (2019). *Planning for Bush Fire Protection: A Guide For Councils, Planners, Fire Authorities and Developers.* Retrieved from https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0005/130667/Planning-for-Bush-Fire-Protection-2019.pdf

NSW RNP. (2011). *NSW Department of Environment, Climate Change and Water (DECCW), Road Noise Policy (RNP).*

OEH. (2001). *Assessing Heritage Significance'* . NSW Heritage Offfice.
OEH. (2011). *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW Office of Environment and Heritage.* Retrieved from https://www.environment.nsw.gov.au/research-and-publications/publications-search/guide-to-investigating-a
OEH. (2014). *New England North West Climate change snapshot.*
OEH. (2016). *NSW Climate Change Policy Framework.* Sydney, NSW 2000: State of NSW and Office of Environment and Heritage. Retrieved from https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Climate-change/nsw-climate-change-policy-framework-160618.pdf
Office of Environment and Heritage. (2012). *The land and soil capability assessment scheme: second approximation – A general rural land evaluation system for NSW.*
PoA. (2017). *Paris climate agreement: a quick guide*. Retrieved from Parliament of Australia: https://www.pmc.gov.au/domestic-policy/taskforces-past-domestic-policy-initiatives/united-nations-framework-convention-climate-change-unfccc
Real Estate. (2022). Retrieved from https://www.realestate.com.au/rent/in-bendemeer,+nsw+2355/list-1
REINSW. (2021). *Vacancy Rate Survey Results*. Retrieved from https://www.reinsw.com.au/Web/Members/Property_data/Vacancy_Rates_Survey.aspx
RTA. (2002). *Guide to Traffic Generating Development.* Roads and Traffic Authority.
SA DEW. (n.d.). *Fire behaviour*. Retrieved from www.environment.sa.gov.au/topics/fire-management/fire-science/fire-behaviour
Scottish Natural Heritage. (2017). *Visual Representation of Wind Farms: Guidance Version 2.2.* Scottish Natural Heritage.
SGS. (2021a). *Winterbourne Wind Farm Socio Economic Assessment.* SGS Economics & Planning.
SGS. (2021b). *Rental Affordability Index: research*. Retrieved from https://www.sgsep.com.au/projects/rental-affordability-index
Spark, W. (2022, November 9). *Climate and Average Weather Year Round in Tamworth*. Retrieved from https://weatherspark.com/y/144513/Average-Weather-in-Tamworth-Australia-Year-Round#:~:text=The%20wind%20is%20most%20often,of%2037%25%20on%20January%201.
SQM Research. (2022). *Residential Vacancy Rates.*
Standards Australia. (2006). *AS/NZS 3835:2006 Earth potential rise - Protection of telecommunications network users, personnel and plant.*
Standards Australia. (2010). AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites.
Standards Australia. (2012). *AS 4853:2012 Electrical hazards on metallic pipelines .*
Standards Australia. (2019). *AS/NZS 4282:2019 Control of Obtrusive Effects of Outdoor Lighting.*
Standards Australia. (2019). *AS/NZS 5139:2019 Electrical Installations – Safety of Battery Systems for use with Power Conversion Equipment.*
Standards Australia. (2021). *AS 1768:2021 Lightning protection .*
Tamworth Regional Council. (2012). *Bendemeer Flood Study.*
Tamworth Regional Council. (2015). *Bendemeer Floodplain Risk Management Study and Draft Plan.*
Tamworth Regional Council. (2016a). *Tamworth Regional Community Strategic Plan: Keychange 2017- 2027.*
Tamworth Regional Council. (2016b). *Tamworth Tomorrow 2016-2021: Driving the Tamworth Region's Economic Growth.*
Tamworth Regional Council. (2020b). *Tamworth Regional Blueprint 100 Part 2: Local Strategic Planning Statement 2020.*
Tamworth Regional Council. (2022). *Tamworth Regional Council Our Environmental Sustainability Strategy & Action Plan 2022 - 2026.*
Tamworth Regional Council. (2022). *Tamworth Regional Council Our Environmental Sustainability Strategy & Action Plan 2022 – 2026 .*
Tamworth Regional Council. (2022). *Tamworth Tomorrow 2022-2026: Economic Development and Investment Strategy*.

Tamworth Regional Council. (2022b). *Draft Tamworth Regional Council Our Environmental Sustainability Strategy & Action Plan 2022- 2026 – Our Plan for a Sustainable Region.*

Tamworth Regional Council. (2022c). *Draft Tamworth Regional Council Our Environmental Sustainability Strategy & Action Plan 2022- 2026 – Our Plan for a Sustainable Region.*

Tindale. (1974). Tindale N. Aboriginal Tribes of Australia. ANU Press, Canberra.

Trove. (1872, August 31). *Bendemeer. The Armidale Express and New England General.* Retrieved from https://trove.nla.gov.au/newspaper/article/188988026?searchTerm=Bend

Trove. (1953a, February 13). *Bendemeer Station. The Land. .* Retrieved from https://trove.nla.gov.au/newspaper/article/106922953?searchTerm=bend

Trove. (1953b, February 4). *Pasture Improvement on Historic Bendemeer Station. The Armidale Express and New England General Advertiser.* Retrieved from https://trove.nla.gov.au/newspaper/article/196454603?searchTerm=bend

U.S. Energy Information Administration. (2021). *Wind explained: Where wind power is harnessed*. Retrieved from https://www.eia.gov/energyexplained/wind/where-wind-power-is-harnessed.php

UNFCCC. (2021). *Glasgow Climate Pact.* United Nations Framework Convention on Climate Change. Retrieved from https://unfccc.int/sites/default/files/resource/cma3_auv_2_cover%20decision.pdf

Vestas. (2021). *Sustainability Report 2021*. Retrieved from https://www.vestas.com/en/sustainability/reports-and-ratings

Walcha Council. (2013). *2012-2013 Annual Report – Appendix E State of the Environment .* Retrieved from https://www.walcha.nsw.gov.au/f.ashx/Appendix-E-SOE-Report-20122013.pdf

Walcha Council. (2019). *Walcha Local Strategic Planning Statement 2036 .* Walcha Council.

WaterNSW. (2023). *NSW Water Register*. Retrieved from https://waterregister.waternsw.com.au/water-register-frame

APPENDIX A REGULATORY REQUIREMENTS AND WHERE ADDRESSED

APPENDIX B MITIGATION AND MANAGEMENT SUMMARY

APPENDIX C RESIDENTIAL DWELLINGS

APPENDIX D STATUTORY COMPLIANCE

APPENDIX E STAKEHOLDER ENGAGEMENT

APPENDIX F CAPITAL INVESTMENT VALUE

APPENDIX G BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

APPENDIX H ABORIGINAL CULTURAL ASSESSMENT REPORT

APPENDIX I STATEMENT OF HERITAGE IMPACT

APPENDIX J NOISE IMPACT ASSESSMENT

APPENDIX K LANDSCAPE AND VISUAL IMPACT ASSESSMENT

APPENDIX L SOIL AND AGRICULTURAL IMPACT STATEMENT

APPENDIX M CONCEPTUAL SOIL AND WATER MANAGEMENT PLAN

APPENDIX N HYDROLOGY ASSESSMENT

APPENDIX O TRAFFIC IMPACT ASSESSMENT

APPENDIX P PRELIMINARY HAZARD ANALYSIS

APPENDIX Q BUSHFIRE ASSESSMENT

APPENDIX R ECONOMIC ASSESSMENT

APPENDIX S SOCIAL IMPACT ASSESSMENT

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
Chile
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Senegal
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UAE
UK
US
Vietnam

ERM's Sydney Office
Level 14 207 Kent Street
Sydney NSW 2000

T: +61 2 8584 8888
F: +61 2 9299 7502

www.erm.com

The business of sustainability

ERM