



PREPARED FOR



Denman BESS Holdings Pty Ltd as a
Trustee for the Denman BESS Trust

Denman BESS

Environmental Impact Statement

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Denman BESS

Environmental Impact Statement

0717735



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ACRONYMS AND ABBREVIATIONS

Term	Description
ABS	Australian Bureau of Statistics
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHMP	Aboriginal Cultural Heritage Management Plan
AEMO	Australian Energy Market Operator's
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
BC Act	Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
BOS	Biodiversity Offset Scheme
BSAL	Biophysical Strategic Agricultural Land
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CIA Guidelines	Cumulative Impact Assessment Guidelines for State Significant Projects 2021
CNVMP	Construction Noise and Vibration Management Plan
dB(A)	A-weighted Decibels
DPHI	Department of Planning, Housing and Infrastructure
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environmental Protection Agency
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ERM	Environmental Resources Management Australia Pty Ltd
ESCP	Erosion and Sediment Control Plan
FTE	Full Time Equivalent
GW	Gigawatt
GWh	Gigawatt hours
HIPAP No. 4	Hazardous Industry Advisory Paper No. 4, 'Risk Criteria for Land Use Safety Planning'
HIPAP No. 6	Hazardous Industry Planning Advisory Paper No. 6, 'Hazard Analysis'
IBRA	Interim Biogeographic Regionalism for Australia
ICNG	Interim Construction Noise Guidelines
IO	Input-output
ISP	Integrated System Plan
kPa	Kilopascal

Term	Description
kV	Kilovolt
kW/m ²	Kilowatt per square metre
LAIA	Landscape and Agricultural Impact Assessment
LCVIA	Landscape Character and Visual Impact Assessment
LCZ	Landscape Character Zones
LGA	Local Government Area
Li-ion	Lithium-ion
LUCRA	Land Use Conflict Risk Assessment
mG	Milligauss
ML	megalitre
Muswellbrook LEP	Muswellbrook Local Environmental Plan 2009
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market
NIA	Noise Impact Assessment
NML	Noise Management Levels
NPI	Noise Policy for Industry (2017)
NSW	New South Wales
O&M	Operation and Maintenance
OEMP	Operational Environmental Management Plan
OSOM	Oversize Overmass
PAD	Potential Archaeological Deposits
PCT	Plant Community Type
PHA	Preliminary Hazard Analysis
PMF	probably maximum flood
PNTL	Project Noise Trigger Level
PV	photovoltaic
RBL	Rating Background Level
REZ	Renewable Energy Zone
RNP	NSW Road Noise Policy 2011
SEARs	Secretary's Environmental Assessment Requirements
SIA	Social Impact Assessment
SSD	State Significant Development
SSD Guidelines	State Significant Development Guidelines 2024

Term	Description
TEC	Threatened Ecological Communities
TfNSW	Transport for NSW
TIA	Traffic Impact Assessment
VEC	Vulnerable Ecological Community
VIS	Vegetation Integrity Score
vpd	Vehicles Per Day
vph	Vehicles Per Hour
VZ	Vegetation Zone

GLOSSARY

Term	Description
Applicant	Denman BESS Holdings Pty Ltd as a Trustee for the Denman BESS Trust
Development 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
Project	The development to which the Application applies as generally as described in Section 3.0 of the EIS
Project Area	The land to which the Application applies as shown in Figure 3-1 of the EIS
Project Site or Site Boundary	The entire parcel of land on which the Project Area is situated within, i.e. Lot 4 DP 6090
Subject Land	The area of land as defined in the Biodiversity Assessment Method 2020 being subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal.

REAP DECLARATION

EIS declaration	
<i>Project details</i>	
Project name	Denman BESS
Application number	SSD-76189216
Address of the land	1711 Denman Road, Denman, 2328
<i>Applicant details</i>	
Applicant name	Denman BESS Holdings Pty Ltd as Trustee for the Denman BESS Trust
Applicant address	Level 5, 20 Bond Street, Sydney, NSW 2000
<i>Details of person by whom this EIS was prepared</i>	
Name	Catherine Mackay
Address	Level 1, 45 Watt Street, Newcastle NSW 2300
Professional qualifications	Bachelor of Mathematics (Pure and Applied) and Bachelor of Science (Biology)
<i>Declaration by registered environmental assessment practitioner</i>	
Name	Simon Bennett
Registration number	9239
Organisation registered with	Planning Institute Australia
Declaration	• The undersigned declares that this EIS: • Has been prepared in accordance with 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 Development 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.
Signature	

EXECUTIVE SUMMARY

1. INTRODUCTION

Denman BESS Holdings Pty Ltd as Trustee for the Denman BESS Trust (The Applicant) proposes to construct, operate, maintain and decommission the Denman Battery Energy Storage System (BESS) (the 'Project'), situated in Denman in the Upper Hunter Region of NSW.

The BESS facility will have an estimated capacity of up to 2.4 gigawatts (GW) / 4.8 gigawatt hours (GWh) and covers a total area of 38.6 hectares (ha). Connection to the electricity grid is proposed via the existing Transgrid 500 kV (twin circuit) transmission lines.

The Project is declared State Significant Development (SSD) under Clause 2.6(1) of the *State Environmental Planning Policy (Planning Systems) 2024* (Planning Systems SEPP). The Applicant is seeking development consent for the Project under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Environmental Resources Management Australia Pty Ltd (ERM) has prepared this Environmental Impact Statement (EIS) for the Project on behalf of the Applicant.

This EIS covers all aspects of 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 (then) Department of Planning and Environment (DPE; now Department of Planning, Housing and Infrastructure [DPHI]) (SSD-76189216, dated 17 October 2024);
- Advice from State Government agencies;
- Advice from Commonwealth Government agencies;
- Matters raised by Muswellbrook Shire Council;
- Matters raised during the community engagement process; and
- Supplementary SEARs issued by DPHI on 14 April 2025.

The following appendices provide critical information related to the EIS:

- **Appendix A:** Contains a table that outlines where the SEARs have been addressed in both the EIS and the specialist assessment report;
- **Appendix B:** Provides detailed maps and site plans;
- **Appendix C:** Includes a statutory compliance table that shows how relevant statutory requirements have been addressed in the EIS;
- **Appendix D:** Features a community engagement table that details how issues raised by the community during engagement have been addressed in the EIS; and
- **Appendix E:** Provides a summary of all proposed management and mitigation measures for the Project.

The EIS has been prepared in accordance with the State Significant Development Guidelines (DPHI, 2024b). In the absence of an industry specific guideline for BESS, this EIS has been has had regard to the Large-Scale Solar Energy Guideline (DPHI, 2024a) where relevant.

1.1 THE APPLICANT

The Applicant is Denman BESS Holdings Pty Ltd as Trustee for the Denman BESS Trust. The Applicant is a subsidiary of the energy group Metlen Energy & Metals. Metlen Energy & Metals is a global leader in renewable energy, including solar and energy storage. Metlen Energy & Metals is a global industrial and private company active in the entire spectrum of energy, from the development, construction and operation of thermal units to the design and construction of electricity infrastructure projects and electricity supply, providing competitive energy products and services.

Metlen Energy & Metals has successfully delivered similar solar projects across Europe, the Americas, Africa, the Middle East, Asia and Australia. Through its renewables and storage development arm, M Renewables Australia, Metlen Energy & Metals has several BESS projects currently under construction and in operation across NSW, including Corowa, Junee and Wyalong.

As a responsible company with a long-term approach, Metlen Energy & Metals is strategically placed at the forefront of the energy transition as a leading and integrated green utility with an international presence. In Australia, the company aims to own and operate a portfolio of renewable energy production that will generate 450-megawatt peak and cover 900 hectares to support Australia's commitment to a net zero future and greener society.

The Applicant's details are listed below:

- **Applicant:** Denman BESS Holdings Pty Ltd as Trustee for the Denman BESS Trust
- **ABN:** 45 353 763 402; and
- **Address:** Level 5, 461 Bourke Street, Melbourne, Victoria 3000.

1.2 PROJECT OVERVIEW

The Project is located at 1711 Denman Road, Denman, NSW, approximately 7.5 km from the Denman town centre. The Project Area is located within the Muswellbrook Shire Local Government Area (LGA) wholly within a single allotment (Lot 4, DP 6090). The Project Area is located on land predominantly used for small scale cattle farming.

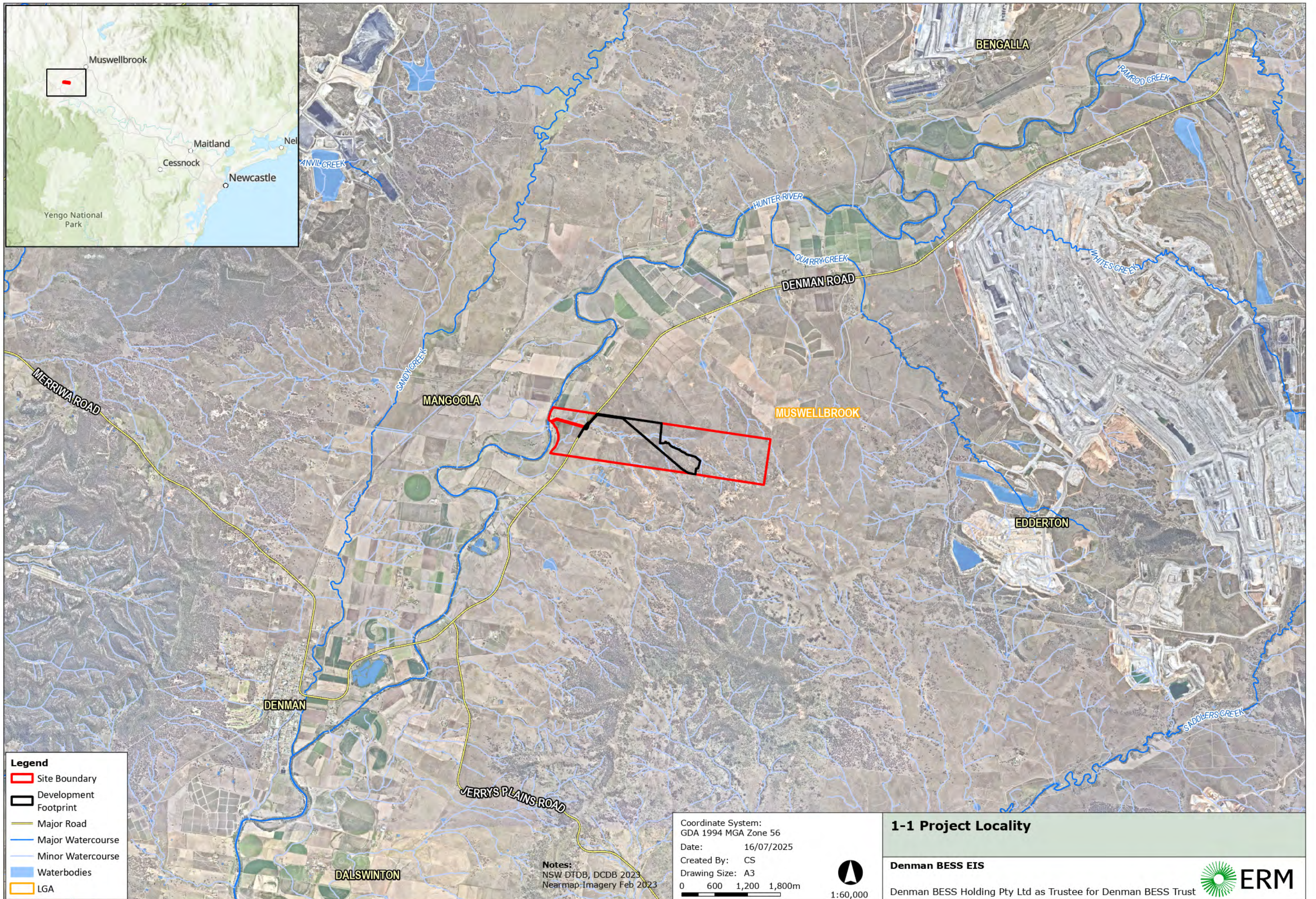
Figure 1-1 shows the Project locality. The Project Layout is provided in **Figure 3-1**.

The Project is entirely located within the Upper Hunter Region of New South Wales (NSW). The region is predominantly used for agriculture and mining.

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

- A BESS with a storage capacity of up to 2.4 GW / 4.8 GWh;
- Electrical reticulation;
- Associated and ancillary infrastructure;
- Connection point to the existing Transgrid 500kV (twin circuit) transmission line; and
- New site access on Denman Road and access road between the BESS and Denman Road.

The Project Area is 38.6 ha. The project layout will be subject to further design development and refinement. The Project Area assessed in the EIS has been sized to allow for some flexibility to micro-site infrastructure and adjust the layout within the approved footprint.



1.3 PROJECT OBJECTIVES

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

- Support the transition in the energy sector away from a centralized system of large fossil fuel electricity generation, towards a decentralized system of widely dispersed, renewable energy production;
- Provide energy storage to support the Upper Hunter Region's industrial transition from coal to a more decentralized renewable energy production system;
- 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 NSW and Federal Government's renewable energy targets;
- Contribute to reducing greenhouse gas emissions to support NSW and Federal Government's net zero emissions by 2050 target;
- Create local employment opportunities and investment for the local economy;
- Minimise adverse impacts to biodiversity and Aboriginal cultural heritage through design development and refinement;
- Ensure quality, safety and environmental standards are maintained through the development of environmental management plans;
- Recycle and reuse materials where practical and economically feasible; and
- Engage early and continuously with the local community, residents and stakeholders in the Project.

1.4 PROJECT BACKGROUND

In 2023, Metlen commenced the Upper Hunter South Solar Farm project which is the subject of a separate planning application SSD-65996959). In mid 2024, Metlen decided to commence planning studies and community engagement for a second project, a standalone BESS (this Project) that could be connected to the existing Transgrid 500kv (twin circuit) transmission line and operated independently of the solar farm project. Collectively, these two projects are called the Denman Renewable Energy Hub.

Community engagement for the Project included the establishment of a project website, advertisements in local newspapers and letters/emails issued to landholders within vicinity to the Project. A public information drop-in session for the Project was held in Denman on 20-21 September 2024.

A Scoping Report (ERM, 2024) was prepared and submitted to the DPHI in September 2024. Project-specific SEARs were issued on 17 October 2024. Field surveys were undertaken during 2024 and 2025 to assess potential impacts on biodiversity, heritage, traffic, visual impacts and agricultural lands. Revisions were made to the Project layout in late 2024 to reduce the Project's impacts on watercourses, biodiversity values and Aboriginal relics.

The Project was declared to be a controlled action under Section 75 of the EPBC Act on 14 April 2025 (EPBC 2024/10085) and will be assessed under the Assessment Bilateral Agreement. Supplementary SEARs have been issued for the Project and are addressed in the BDAR.

Proposed site access onto Denman Road has been shifted approximately 7 m east since the initial design to ensure works are not required on Crown land outside of the Project Area.

1.5 RELATED DEVELOPMENT

The Project is part of the Denman Renewable Energy Hub, which includes the proposed Denman BESS (the subject of this EIS) and the proposed Upper Hunter South Solar Farm (SSD-65996959).

The Upper Hunter South Solar Farm has a generating capacity of 90 MW and a BESS with storage capacity of 30 MW /60 MWh. The Upper Hunter South Solar Farm is subject to a separate development application and will connect to the twin 66 kV Ausgrid distribution lines.

The Denman BESS and Upper Hunter South Solar Farm will share the same site access point from Denman Road. An internal access road is proposed along the western and northern boundaries of the Upper Hunter South Solar Farm Project Area, and its use will be shared by the two projects.

The new site access onto Denman Road and the internal access road between the BESS and Denman Road has been included in the Project Area for both applications to preserve flexibility of the delivery of this infrastructure. The potential impacts associated with the site access and internal access roads has also been included in both applications.

An operations and maintenance facility will be delivered as part of the Upper Hunter Solar Farm project and will be utilised by the Denman BESS. Aside from the shared vehicle access and O&M compound, the two projects will be constructed and operated independently.

1.6 RESTRICTIONS OR COVENANTS

The Project Area is subject to easements for the existing Transgrid 500kV (twin circuit) transmission line.

2. STRATEGIC CONTEXT

2.1 TRANSITION TO RENEWABLE ENERGY

The Australian Energy Market Operator (AEMO) Integrated System Plan (ISP) 2024 highlights the planned retirement of all NSW existing coal fired electricity generation by 2040. Three of these that account for 6 GW of generation are planned to retire before 2030. These include:

- Liddell Power Station (1.26 GW), closed in April 2023;
- Eraring Power Station (2.92 GW) is scheduled to close in August 2027;
- Vales Point B Power Station (1.32 GW) is expected to close in 2033;
- Bayswater Power Station (2.64 GW) is expected to close in 2033¹; and
- Mount Piper (1.4 GW) is expected to operate until at least 2040.

These power stations currently provide around three quarters of NSW's electricity supply. The ISP states that due to the imminent retirement of a significant number of NSW coal-fired power plants, the NEM will require an almost nine-fold increase in renewable energy generation to replace the retiring power stations (AEMO, 2024a).

The AEMO's 2024 Electricity Statement of Opportunities (ESOO) (AEMO, 2024b) notes a substantial pipeline of renewable projects in various stages of development. **Figure 2-1** shows the proposed projects across the NEM by type of generation or storage. Battery storage will be essential to support Australia's transition to renewable energy sources by providing grid stability and dispatchable power.

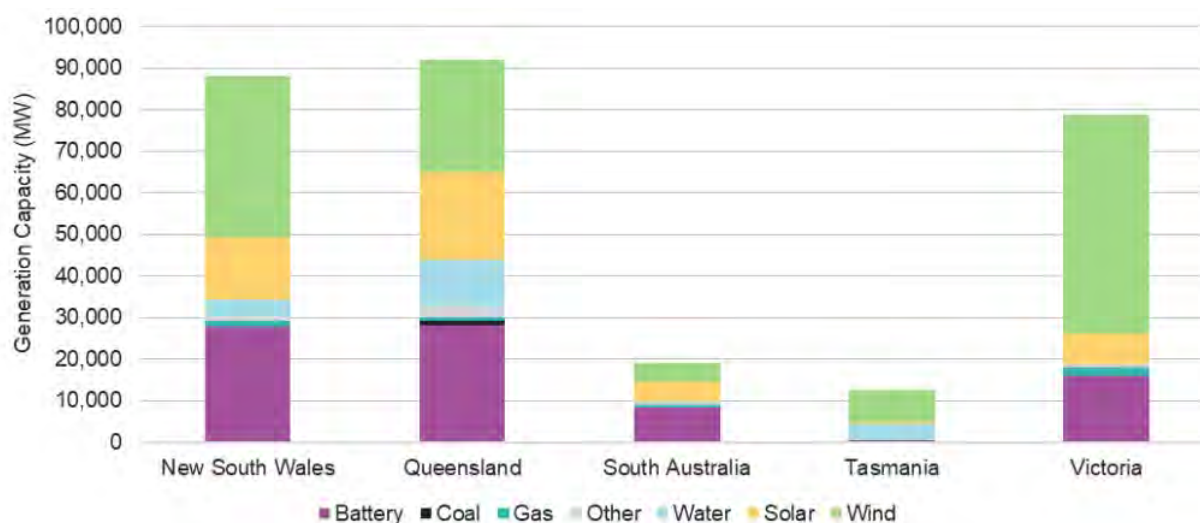


FIGURE 2-1 PROJECTS BY NEM REGION AND TYPE OF GENERATION STORAGE (AEMO, 2024B)

¹ (AEMO, 2024b)

2.2 AUSTRALIAN GOVERNMENT STRATEGIES, POLICIES AND PLANS

The Australian Government has committed to a range of strategies, policies and plans to minimise emissions of greenhouse gases that are implicated in exacerbating climate change. This includes commitments to international agreements and to the development of renewable energy generation and storage. The latter is critical to replace emissions-intensive coal-fired power generation, thereby reducing greenhouse gas emissions.

The Australian Government greenhouse gas emission reduction targets are:

- 43% reduction from 2005 levels by 2030;
- net zero reduction by 2050; and
- 82% renewable energy generation (Australia-wide) by 2030.

These commitments are legislated through the *Climate Change Act 2022* and form part of our Nationally Determined Contributions to the United Nations Framework Convention on Climate Change.

Australia is also one of 195 countries that have signed to the Paris Agreement on Climate Change, the overarching goal of which is to hold “the increase of global average temperatures to well below 2°C above pre-industrial levels” and pursue efforts “to limit the global average temperature increase to 1.5°C above pre-industrial levels”. Reduction of greenhouse gas emissions is critical to meeting this target and increasing renewable energy generation is critical to reducing greenhouse gas emissions.

Australia has also endorsed the 2030 Agenda for Sustainable Development, which is made up of 17 Sustainable Development Goals. While these are non-binding, achieving the goals will be highly influential. Those of relevance to the Project include Goal 7 and Goal 11 which focus on sustainable energy production and improvement of environmental amenity (e.g., air quality) respectively.

The Australian Government commitments are facilitated by a range of initiatives and targets and are administered by several government-owned entities. These include the:

- Clean Energy Finance Corporation – the world’s largest government-owned ‘green bank’, which has invested over \$12 billion in clean energy projects;
- Australian Renewable Energy Agency which has committed more than \$2 billion in funding to over 650 renewable energy projects; and
- Clean Energy Regulator, which manages several programs to accelerate carbon abatement, including the Renewable Energy Target, National Greenhouse and Energy Reporting Scheme, Safeguard Mechanism and Guarantee of Origin Scheme.

The Renewable Energy Target creates a market that incentivizes the generation and use of renewable energy through certificates and has set a target to deliver 33,000 GWh of electricity from renewable sources every year from 2020 to 2030.

2.3 NSW GOVERNMENT COMMITMENTS, STRATEGIES AND POLICIES

2.3.1 CLIMATE CHANGE AND NET ZERO

The *Climate Change (Net Zero Future) Act 2023* legislates the following greenhouse gas emission reduction targets for NSW:

- 50% reduction from 2005 levels by 2030;

- 70% reduction from 2005 levels by 2035; and
- Net zero by 2050.

To achieve these targets, the NSW Government developed the Net Zero Plan Stage 1: 2020–2030 (DPIE, 2020a). The Net Zero Plan Stage 1: 2020–2030 is facilitated by several NSW Government strategies and guidelines that aim to improved energy reliability, security, timely project delivery, increased affordability, and access to cheaper electricity. Overall, these documents aim to facilitate new renewable energy generation, new network infrastructure, and new storage and firming including the establishment of Renewable Energy Zones (REZs) to facilitate the delivery of transmission infrastructure.

2.3.2 HUNTER-CENTRAL COAST RENEWABLE ENERGY ZONE

The NSW Electricity Strategy (DPIE, 2019) and Electricity Infrastructure Roadmap (DPIE, 2020b) establishes the framework to deliver five REZs in strategic areas across NSW. The REZs will play a significant role in delivering renewable energy generation and storage to replace existing fossil fuel power stations as they come to their end of operational life.

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 Project Area is located within the Hunter-Central Coast REZ which was formally declared on 9 December 2022 (NSW Government Gazette, 2022) by the NSW Government. However, the Project does not intend to connect to the REZ transmission infrastructure.

2.4 LAND USE PLANNING

The regional and local land use planning context is summarised in **Table 2-1**.

TABLE 2-1 REGIONAL AND LOCAL LAND USE PLANS

Policy / Plan	Description
Hunter Regional Plan 2041	The Hunter Regional Plan 2041 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 (DPE, 2022a). The Regional Plan aims to grow the region's cities and local centres, support the protection of high value assets, and develop a strong, diverse and competitive economy. One of the key guiding principles for decision making in the region is leadership in reaching net zero emissions, while promoting climate resilience and energy and resource efficiency. Building resilience to global economic cycles and climate change is enforced through diverse infrastructure investment, including renewable energy development.
Muswellbrook Shire Community Strategic Plan 2022-2032	The Muswellbrook Shire Community Strategic Plan 2022-2032 outlines the community's objectives, strategies, and priorities for the Muswellbrook Shire region. The Muswellbrook Shire Community Strategic Plan 2022-2032 objectives are based on regional values of community wellbeing, economic prosperity, social equity and inclusion, environmental sustainability, and culture (MSC, 2022a). The objectives of the Plan include supporting local job growth, diversifying the economy and facilitate the development of growth industries, and supporting federal and state initiatives to reduce the impacts of climate change.

Policy / Plan	Description
Muswellbrook Shire Local Strategic Planning Statement 2020-2040	The Muswellbrook Shire Local Strategic Planning Statement 2020-2040 is a 20-year plan that describes the future desired state for the local area (MSC, 2020). The stated vision is to transition to a more sustainable community and environment, diversify the local economy through focusing on innovative renewable energy generation.
Muswellbrook Local Environmental Plan 2009	The aims of Muswellbrook Local Environmental Plan 2009 (Muswellbrook LEP) include the proper management of the natural and human-made resources of Muswellbrook, and the promotion of ecologically sustainable urban and rural development.

2.5 KEY FEATURES OF THE SITE AND SURROUNDS

The Project is located at 1711 Denman Road, Denman NSW. Denman is located within the Upper Hunter region of NSW which supports significant agricultural and mining activities. The Project is located between Muswellbrook (17 km to the northeast) and Denman (7.5 km to the southwest). Denman Road connects to the Golden Highway, approximately 4 km to the south of the Project Area, which is the major road transport route to Newcastle.

The Project Area is located within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) bioregion and the Hunter IBRA subregion. The Hunter subregion is characterised by rolling hills, wide valleys and large floodplains. The topography of the Project Area is influenced by the nearby Ogilvie Hill and Limb of Addy Hill, which are significant landscape features in the vicinity of the Project Area.

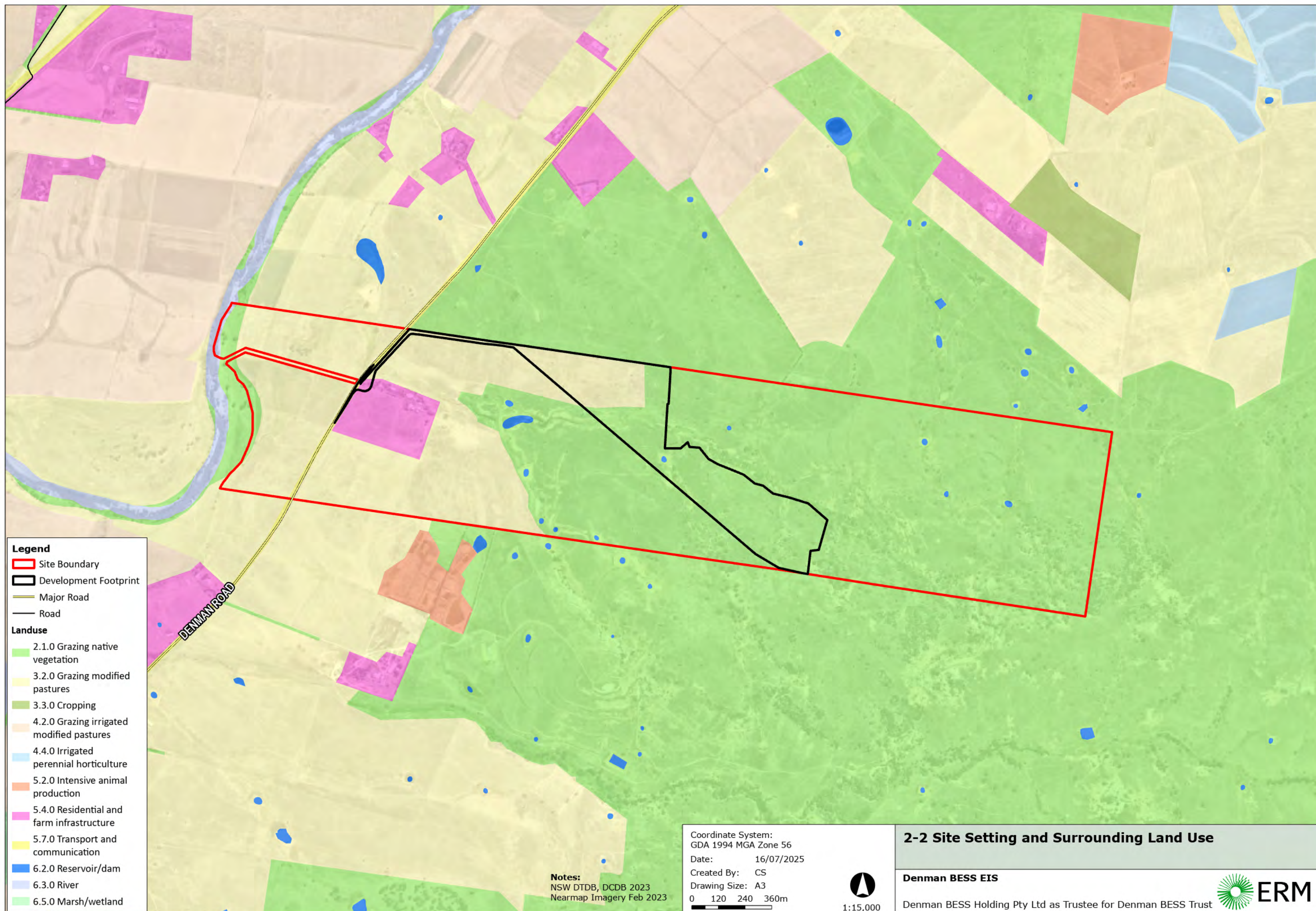
The Project Area is situated within the Hunter River Catchment. The Hunter River adjoins the western boundary of the Project Area. There are minor ephemeral tributaries of the Hunter River that intersect the Project Area. There is one farm dam within the Project Area.

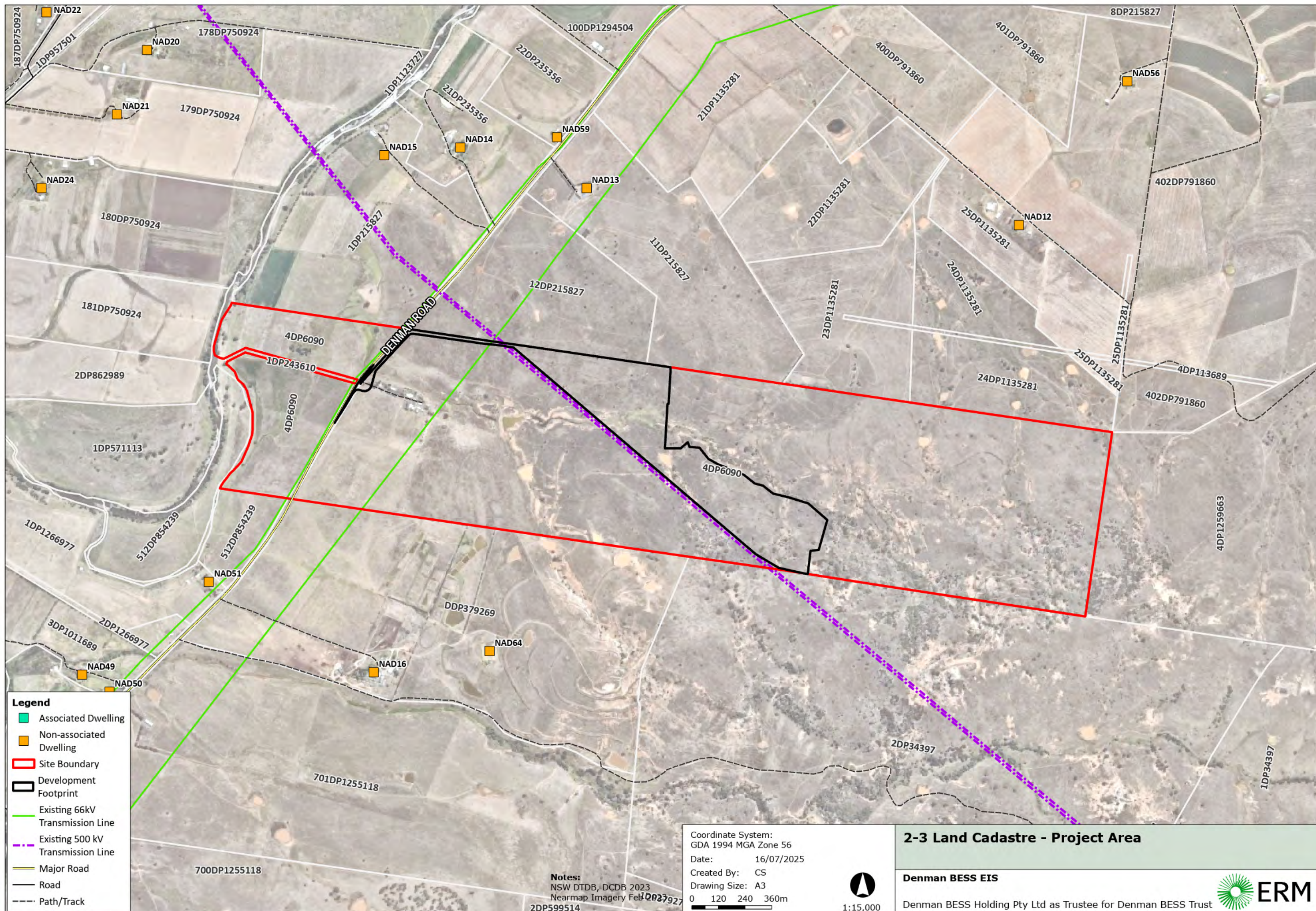
The Project Area is located within the extent of the Wanaruah Local Aboriginal Land Council (LALC). The country of the Wonnarua has been described as encompassing extensive grasslands with few trees and extensive floodplains. The grasslands are thought to have occurred through continual burning by Aboriginal people as part of their management of the land and as a hunting strategy.

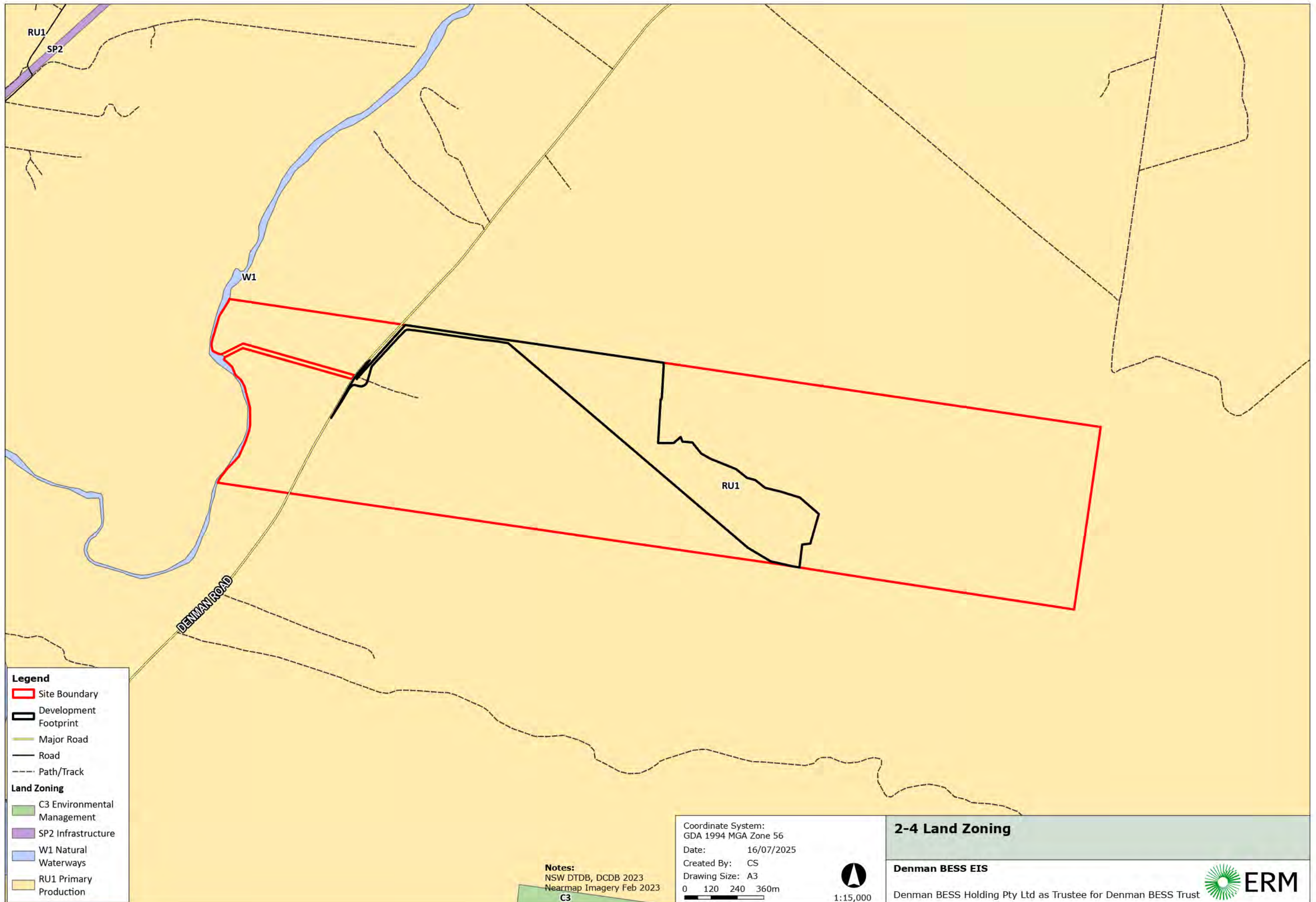
The Project Area has a history of agricultural activities and has been used for small scale livestock grazing. There is an existing residential dwelling located within the Project Area. The dwelling will be vacated and is not intended to be used for residential purposes once construction of the Project commences.

Existing electrical infrastructure in proximity to the Project includes the Ausgrid twin 66 kV distribution lines that run parallel to the eastern side of Denman Road, and the Transgrid Bayswater – Mt Piper, Bayswater – Wollar transmission line (500 kV twin circuit) which runs in a south-east to north-west direction, parallel to the western boundary of the Project Area. Other infrastructure near the Project includes the Merriwa railway line which runs in a general southwest-northeast alignment, approximately 2 km west of the Project Area.

The properties immediately surrounding the Project are primarily used for grazing purposes and agricultural production. Further to the east, is the Mount Arthur coal mine and several other mines. A coal exploration licence (EL5965) is held by Hunter Valley Energy Coal Pty Ltd and partially overlaps the Project Area.







2.6 NEARBY MAJOR PROJECTS

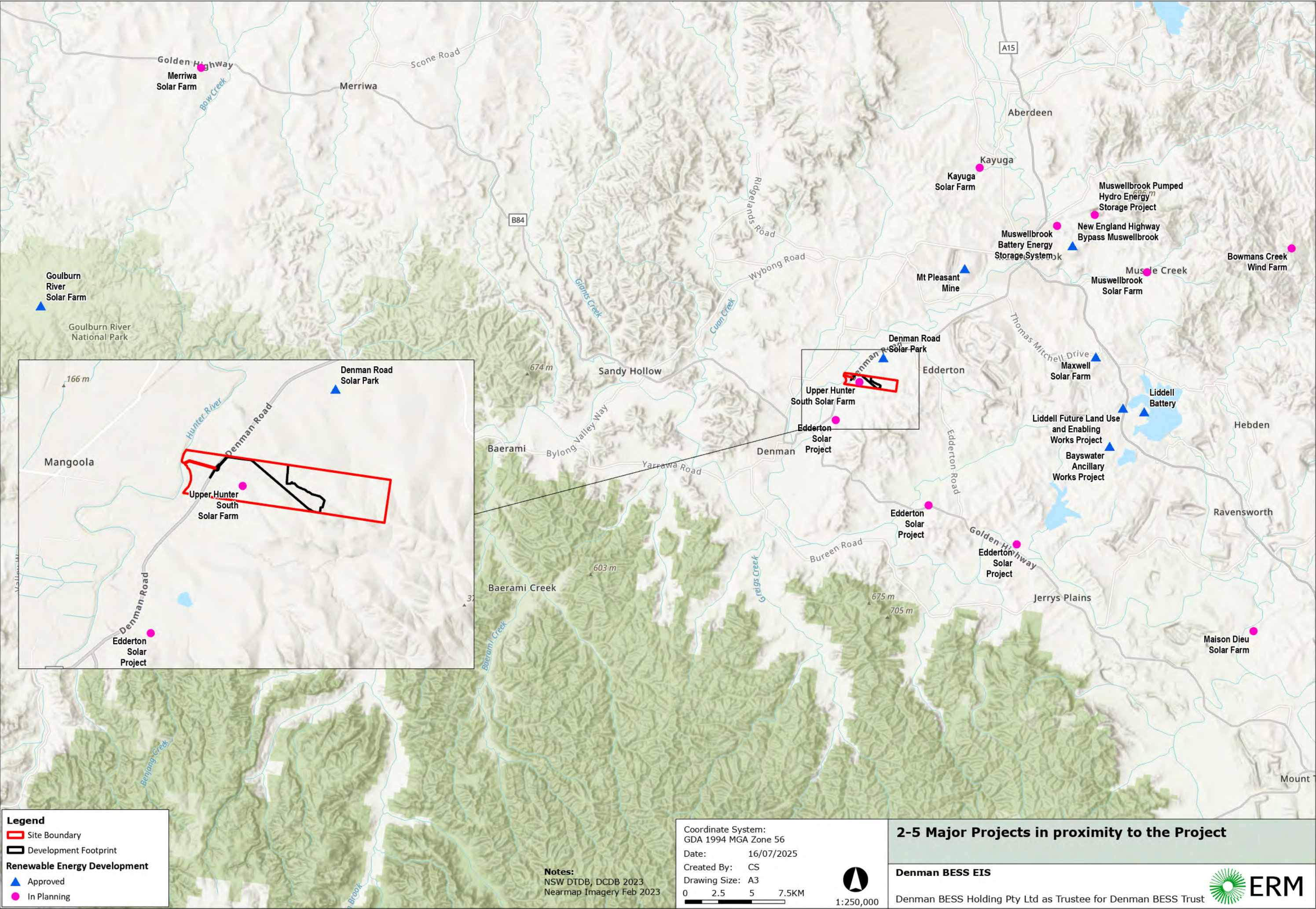
The Project is located within the Hunter-Central Coast REZ, which was proposed to facilitate the coordinated development of renewable energy generation projects, energy storage and transmission and is planned to have a significant number of renewable energy developments. In addition, there are mines still operating in the area and major transport infrastructure upgrades proposed. These major projects could potentially overlap with the construction timing proposed for the Project.

Potential cumulative impacts are investigated further in **Section 6.14**, in accordance with the 'Cumulative Impact Assessment Guidelines for State Significant Projects' (CIA Guidelines) (DPE, 2022b). Projects that have been considered within this EIS are summarized in **Table 2-2**.

TABLE 2-2 NEARBY MAJOR PROJECTS

Project	Application Number	Developer	Scale	Proximity
Upper Hunter Solar Farm and BESS	SSD-65996959	Upper Hunter SF Pty Ltd	90 MW	Adjacent
Denman Solar Park	DA 49/2020	Denman Road Solar Park Pty Ltd and Pukara Estate Pty Ltd	22 MW	1.2 km
Edderton Solar Project	SSD-69965958	EDF Renewables	350 MW	1.3 km
Mt Pleasant Mine	DA92/97	Mach Energy	N/A	6.2 km
Maxwell Solar Farm	SSD-9820	Maxwell Solar Pty Ltd	25 MW	14.4 km
Liddell Future Land Use and Enabling Works Project	SSD-24937520	AGL Macquarie	N/A	14.7 km
New England Highway Bypass Muswellbrook	REF 21.299	Transport for NSW	N/A	14.8 km
Muswellbrook Pumped Hydro Energy Storage Project	SSD-65797725	Muswellbrook Pumped Hydro Pty Ltd	500 MW	16.5 km
Kayuga Solar Farm	SSD-69489708	Dawn Renewables Pty Ltd	80-100 MW	16.9 km
Muswellbrook Battery Energy Storage System	SSD-29704663	Muswellbrook Pumped Hydro Trust	500 MW	18.2 km
Muswellbrook Solar Farm	SSD-46543209	ESCO Solar Farm 9 Pty & Idemitsu Australia Limited	135 MW	18.4 km

Project	Application Number	Developer	Scale	Proximity
Liddell Battery and Bayswater Ancillary Works	SSD-8889679	AGL Macquarie Pty Ltd	500 MW	21.5 km
Bowmans Creek Wind Farm	SSD-10315	Epuron Projects Pty Ltd	336 MW	27 km
Maison Dieu Solar Farm	SSD-48160216	Terrain Solar Pty Ltd	60 MW	33 km
Goulburn River Solar Farm	SSD-33964533	Lightsource Development Services Australia Pty Ltd	550 MW	58.5 km



2.7 KEY POTENTIAL RISKS

The key potential risks that could impact the Project are summarised in **Table 2-3**. Social, economic and environmental risks and hazards for the Project are addressed in further detail in **Section 6**.

TABLE 2-3 PROJECT KEY RISKS OR HAZARDS

Key Risks or Hazards	Description
<i>Biodiversity</i>	Battery energy storage systems typically require access to relatively flat or gently sloping land in areas within proximity to electricity transmission networks. Land suitable for battery energy storage is typically clear of large stands of trees, and often has been used for livestock grazing, which can have historically impacted the biodiversity value of the land. Notwithstanding, there is still potential for parts of the Project Area to have biodiversity value which requires assessment.
<i>Agriculture, Soils and Land Uses</i>	Battery energy storage systems are typically sited on rural land and development of this land can impact high capability agricultural land. Other potential risks include compatibility of battery storage operations with surrounding agricultural uses and impacts to soils from erosion
<i>Noise</i>	There are 16 noise sensitive receivers within 2 km of the Project. Battery energy storage systems and ancillary infrastructure emit noise, which can be audible for sensitive receptors in proximity to the Project and impact upon amenity.
<i>Landscape and Visual</i>	The placement of battery energy storage systems can alter the landscape character of the area. Sensitive receivers, either private residents or public view points, may experience reduced visual amenity particularly to the west of the Project Area.
<i>Traffic and Transport</i>	Battery energy storage systems require the delivery of construction components, equipment, plant and machinery. Some of the equipment is large and heavy and requires delivery by heavy vehicles and over-size over-mass (OSOM) vehicles on local and state roads. In some instance, upgrade to the road network may be needed to facilitate the movement of these components.
<i>Aboriginal Heritage</i>	Battery energy storage systems are typically located in rural settings and require a large land area. There is potential for Aboriginal artefacts and potential archaeological deposits to be discovered in this setting. Disturbance to landscape from construction and operational activities could lead to the harm of items of Aboriginal cultural value and requires assessment.
<i>Hazards and Risks</i>	Potential hazards associated with BESS projects include lithium-ion battery faults leading to thermal runaway, battery, electrical equipment failure fires, electrical surges and/or explosions in transformers. The storage of dangerous goods and the fire safety and protection require technical assessment in accordance with HIPAP 4 and 6 to ensure the risks are adequately identified and can be managed.
<i>Water</i>	Battery energy storage developments can alter natural watercourses through change of natural site topography, increased water run off from the battery modules can lead to erosion and sedimentation impacts during the construction phase.
<i>Social and Economic</i>	While battery energy storage projects will create jobs in the local area, they can also lead to social impacts such as increased demand for housing and competition with other projects for the available local workforce which can drive up costs and wages.

2.8 CONTRIBUTIONS AND AGREEMENTS

2.8.1 VOLUNTARY PLANNING AGREEMENT

The Large-Scale Solar Energy Guideline establishes standard rates for community benefits for renewable energy and BESS projects. Consistent with the Guideline, the Applicant proposes to enter into a Voluntary Planning Agreement with Muswellbrook Shire Council and to provide contributions equivalent to \$150 per MW per annum for the life of the Project which can be used to deliver community benefits.

2.8.2 LANDOWNER AGREEMENTS

The Applicant has an option to purchase the property on which the Project is located. No landowner agreements are proposed.

2.9 PROJECT ALTERNATIVES

2.9.1 NOT CARRYING OUT THE DEVELOPMENT

Not carrying out the development would maintain the status quo and the site would continue to be used for agricultural purposes such as livestock grazing. Not proceeding with the Project would forgo the benefits outlined in **Section 2.2** and **Section 7**, particularly those relating to federal, state and regional policies, and strategies to decarbonise the NEM. Should the Project not proceed, the contribution to the reduction in greenhouse gas 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, and contributions to local community facilities and infrastructure through the Voluntary Planning Agreement with Muswellbrook Shire Council.

2.9.2 KEY ALTERNATIVES

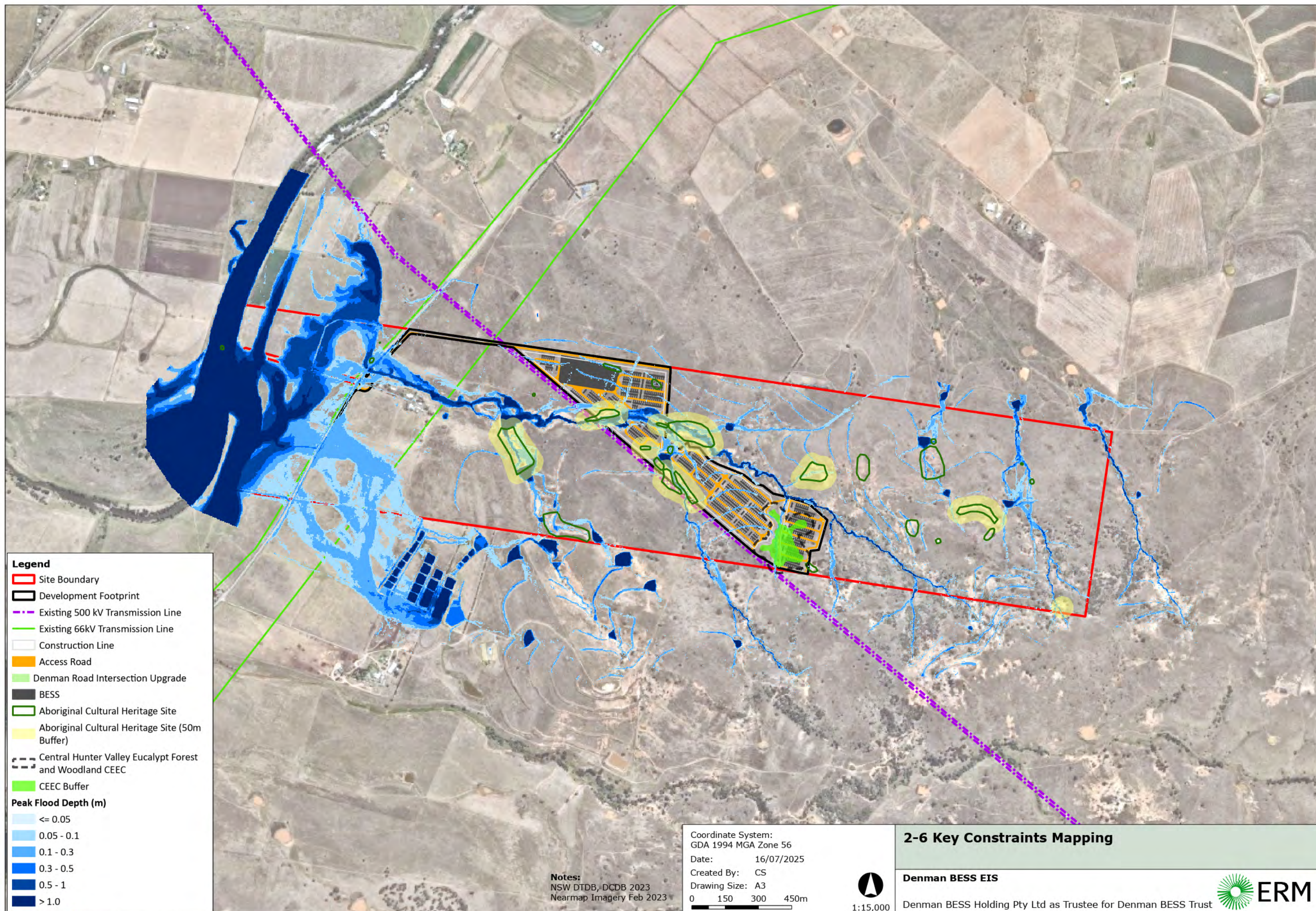
2.9.2.1 DESIGN REFINEMENTS

The Project layout has been refined further to address impacts to flooding, biodiversity, and Aboriginal cultural heritage. Where possible, the disturbance footprint has been located to less constrained areas of the site as presented in **Figure 2-6** and described below:

- **Flooding:** A drainage channel runs east to west through the centre of the Project Area. Preliminary flooding investigations undertaken in October 2024 identified the drainage channel as a floodway that is mapped within the 1% Annual Exceedance Probability (AEP). The drainage channel is subject to greater flood depths and is rated as unsafe for vehicles and people (refer **Section 6.8**). The potential risks and hazards associated with the floodway has led to significant amendments to the Project layout and the provision of buffers to waterfront land to reduce and avoid flooding impacts;
- **Aboriginal cultural heritage:** There was one Aboriginal cultural heritage site identified by the Aboriginal Heritage Information Management System Database within the Project Area during the scoping phase. A further 11 sites were identified during the initial survey undertaken during October 2023 as part of the preparation for the ACHAR. Of these sites, it was determined that six sites were potentially subject to harm as a result of the initial layout of the Project. Substantial amendments to the Project development footprint in December 2024 have reduced direct impact to four sites. The development footprint of the BESS avoids Potential Archaeological Deposit (PAD) site extents, however the development

footprint encroaches the 50 m buffer of three PAD sites (DBESS02, DBESS03 and DBESS10). Mitigation measures will be applied to these PAD sites to minimise impact as a result of the Project;

- **Biodiversity:** surveys undertaken during the scoping phase revealed the presence of two endangered flora species (*Cymbidium canaliculatum* and Red River Gum (*Eucalyptus camaldulensis*)) and the endangered Hunter Valley Delma Legless Lizard (*Delma vescolineata*). The Project layout has since been revised to minimise impacts to these species;
- **Battery technology:** different battery products and suppliers have been considered to reduce the potential noise impacts during operations on the two sensitive receivers immediately adjoining the southern boundary of the Project Area. Inverters and silencers have been assumed in the noise modelling to reduce potential impacts. The layout, design, and battery technology to be selected for the Project will be refined further during detailed design following the determination of the application; and
- **Traffic:** The site access onto Denman Road has been amended in June 2025 to avoid overlapping Crown land on the western side of Denman Road. The intersection has been shifted approximately 7 m east, and no works are proposed within the Crown land.



3. PROJECT DESCRIPTION

3.1 OVERVIEW

The Project will involve the construction, operation and decommissioning (where applicable) of a large, BESS with a capacity of up to 2.4 GW / 4.8 GW hours (MWh), and associated infrastructure.

The Estimated Development Cost of the Project is provided in **Appendix F**.

The Project description is summarised in **Table 3-1** and layout in **Figure 3-1**. Further detail on the Project description is provided in the following sections.

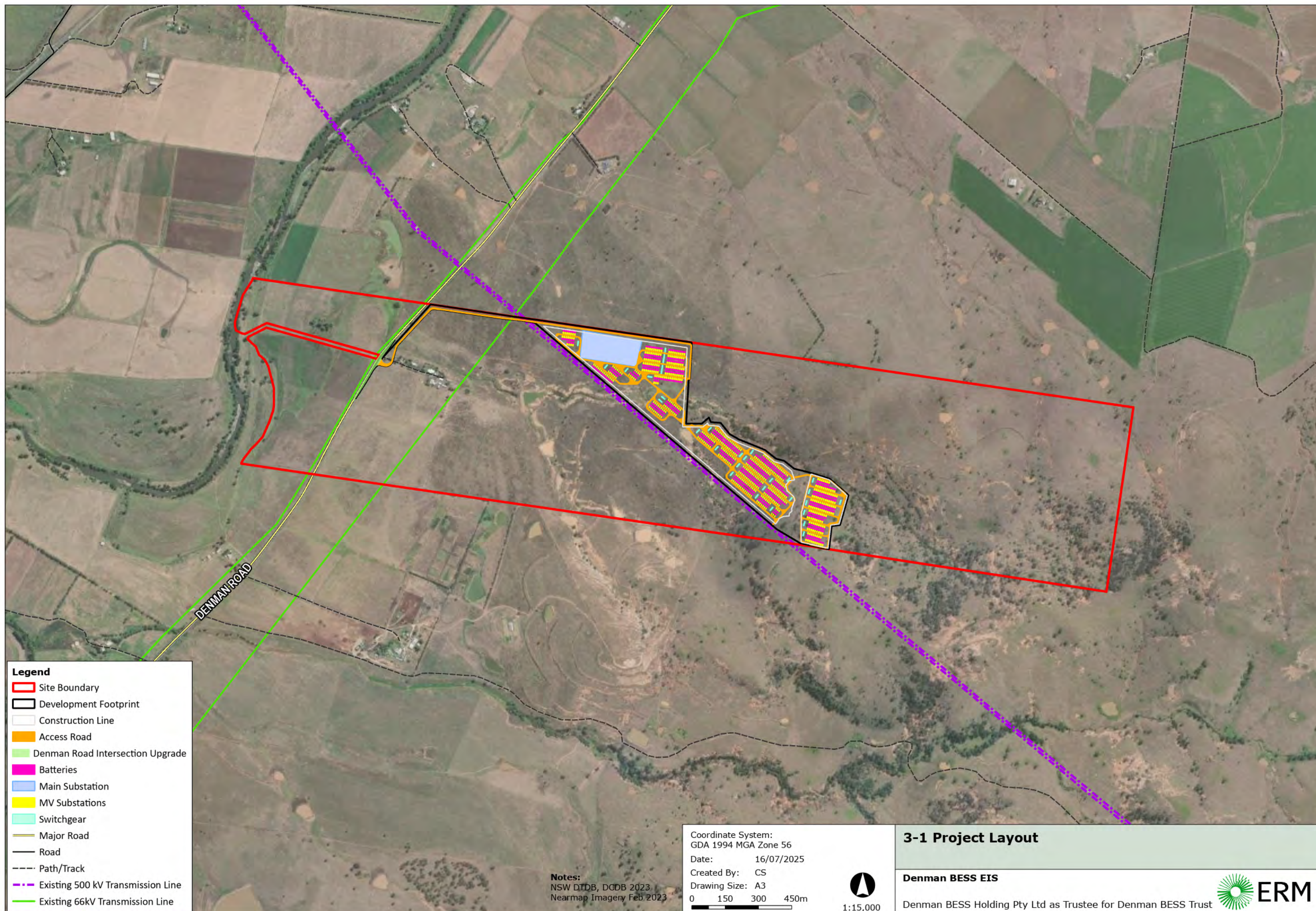
TABLE 3-1 PROJECT SUMMARY

Project Terminology	Summary
<i>Project Details</i>	
Project Area	38.6 ha (including site access and internal roads)
<i>Project Elements</i>	
BESS	- Approximately 1166 battery modules - Capacity of approximately 2.4 GW / 4.8 GWh
Electrical Reticulation Infrastructure	- The 33 kV internal electrical reticulation network will generally follow rows of battery modules and will run parallel to the internal access tracks. - The BESS area will connect into the main high voltage substation directly via 33 kV underground cables - Direct grid connection to existing Transgrid 500kV (twin circuit) transmission line via a T-connection
On-site Supporting Infrastructure	- Fencing and lighting - Landscaping works - Access tracks, drainage and vehicle access point
Subdivision	Torrens subdivision to create a separate allotment for the high voltage substation, if required by the relevant utility authority
<i>Construction</i>	
Construction Duration	The Project construction will comprise of four stages, with each stage consisting of approximately 6-9 months
Construction Hours	As per standard daytime construction working hours (or as defined in Section 3.4.2)
Construction Workforce	75 full time equivalent (FTE) employees during construction 180 FTE during peak construction
Services and Utilities	Adjustment, protection or relocation of existing utilities as required
Transport Route	- Main equipment and OSOM deliveries via Port of Newcastle - Associated external road upgrades (also used for operational maintenance or decommissioning activities)
<i>Operations</i>	
Duration	Minimum of 30 years
Hours of Operation	24 hours a day, seven days a week
Operational Workforce	Approximately 10 FTE.

3.2 PROJECT AREA

The Project Area covers 38.6 ha within Lot 4 DP 6090 including the site access footprint and represents the maximum impacts associated with the construction and operation of the Project (**Figure 3-1**).

The Project Area consists of the area of land that will remain disturbed throughout the operational life of the Project. This will include infrastructure areas such as the switchyard, substation and associated infrastructure.



3.3 PROJECT ELEMENTS

3.3.1 BESS

The large-scale BESS will be situated within the Project Area, on the eastern side of Denman Road and generally follows the alignment of the Transgrid 500 kV (twin circuit) transmission line. The BESS will be constructed within a fenced compound that will also include the substation, switching station, laydown and construction compound footprint area, occupying an area of up to 38.6 ha.

The BESS will use lithium-ion technology with a nameplate capacity of approximately 2.4 GW / 4.8 GWh. The BESS will use pre-assembled and pre-tested systems, that may either be segregated into separate Power Conditioning Units and BESS units, or a fully integrated system that includes battery modules, inverters, thermal management system, circuit breakers, fire protection system as specified by the BESS manufacturer and other controls. The BESS will be comprised of up to 1,166 battery modules.

The battery technology provider will be confirmed during the detailed design phase. The selected battery will have undergone the required hazard assessment to ensure the product meets Australian Standards and legislated safety requirements.

3.3.2 ELECTRICAL RETICULATION AND GRID CONNECTION

3.3.2.1 SUBSTATIONS AND ELECTRICAL RETICULATION

The Project comprises approximately 583 medium voltage substations each connected to two battery modules. The medium voltage substations of the BESS will be connected via a 33 kV internal electrical reticulation to the main high voltage substation. The main high voltage substation will be connected via overhead transmission line to the Transgrid 500 kV (twin circuit) transmission line which runs in a south-east to north-west direction, parallel to the western boundary of the Project Area.

Each substation will have a dedicated 4,600 kVA power conversion unit and inverter. The substations would also comprise internal electrical reticulation, voltage controls, associated high voltage switchgear, storage units, potentially power quality control equipment, and control and protection equipment as well as a communication tower, and drainage and oil containment system. A security fence will surround the substations.

The internal electrical reticulation network, which connects the BESS to the substation, will comprise of underground 33 kV cables. Where possible, trenching will be undertaken to allow the cabling to run parallel to the access track in underground trenches. Where deviation from the access track is required due to geotechnical or other constraints, or to reduce overall cable length, these deviations will be positioned to minimise impact to ecological and heritage areas of high significance.

Where ground conditions are not suitable for open cut trench installation, overhead single circuit electricity lines will be installed using concrete poles. The aboveground conductors may have orange balls for visual identification.

Access to the transmission line for grid connection during the construction phase will be via existing property accesses and farm tracks, as well as constructed internal access tracks.

3.3.3 INTERNAL ACCESS TRACKS

Vehicles will access the Project via Denman Road. The ongoing maintenance of the Project will be accessed through the construction of new private internal access tracks. The internal access tracks will be connected to existing public roads.

The tracks will provide ongoing access to the BESS, substation and associated infrastructure. Where practicable, the internal access tracks network will be aligned along the route of existing farm tracks to reduce impacts to biodiversity. The indicative internal road network is shown in **Figure 3-1**.

The internal access tracks will generally be up to 4 m in 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 with dirt, sand, gravel or sealed pavement with the final design based on material in proximity to site.

An internal access road is proposed between Denman Road and BESS, and its use will be shared by both the Denman BESS and the Upper Hunter South Solar Farm.

3.3.4 ROAD UPGRADES

A short Channelised Right Turn and short Auxiliary Left Turn treatments are proposed at the site access on Denman Road. The road will be widened to 7 m across the Denman Road carriageway within vicinity of the site access. The turn treatments will extend 85 m to the north and 115 m to the south of the site access point to accommodate heavy vehicle access to the site.

The site access intersection will require the relocation of a power pole and the fencing as shown in site access design **Appendix N**. The site access will be designed for heavy vehicle movements and the largest oversize/overmass vehicles expected to access the site.

The site access intersection has been included in both this application and the application for the Upper Hunter South Solar Farm to preserve flexibility of the delivery of this infrastructure.

3.3.5 TEMPORARY CONSTRUCTION COMPOUND

Temporary facilities will be required to facilitate construction of the Project. Temporary construction compounds and temporary laydown areas will be established for the duration of the construction works.

The construction compound will comprise of:

- Storage areas to accommodate storage of construction materials, plant, battery modules and other infrastructure elements;
- Material stockpile;
- Temporary power supply for construction; and
- Security fencing and CCTV.

Upon completion of construction works, all temporary facilities will be removed, and the land rehabilitated in line with **Section 3.6**.

3.3.6 LIGHTING

Lighting will include security lighting for the substation. The light sources are limited to low-level lighting for security, night-time maintenance and emergency purposes.

3.3.7 LANDSCAPING

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.

3.4 CONSTRUCTION

3.4.1 DURATION

The duration of construction from commencement to commissioning of the Project is expected to be undertaken in four stages, with each stage consisting of 6-9 months.

3.4.2 WORKFORCE AND HOURS OF OPERATION

The Project is anticipated to have a peak construction workforce of approximately 75 FTE personnel.

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:

- Delivery of materials required by the NSW Police or other authorities for safety reasons;
- Where it is required in an emergency to avoid the loss of lives, property and / or prevent environmental harm;
- Activities that are inaudible at non-associated dwellings; or
- Activities that have been agreed with DPHI.

3.4.3 SITE PREPARATION AND CONSTRUCTION ACTIVITIES

Site preparation works may include clearing, erosion and sediment control, site levelling, construction of access roads, site drainage works, fencing, foundations, trenching and construction of 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. Set up of the temporary construction compound areas and ancillary facilities, the upgrade of existing internal access tracks and construction of new access roads will be the first construction activities. This will be followed by the phased installation of the Project elements as described in **Section 3.3**.

Materials including gravel, aggregate and sand will be required to facilitate the construction of Project infrastructure. It is anticipated that the 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.

Should volumes of fill required exceed those available on-site, materials will be transported to the Project Area using medium and heavy rigid vehicles. This material will be stockpiled within the laydown areas. Construction materials and equipment will be sourced from the Upper Hunter region subject to availability and cost considerations.

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

When construction is completed, temporary plant and equipment will be removed, and disturbed areas will be revegetated. Post-construction rehabilitation requirements and processes will be detailed in the Environmental Management Strategy and undertaken in accordance with relevant conditions of development consent.

3.4.4 SERVICES AND UTILITIES

3.4.4.1 WATER SUPPLY

Construction of the Project will require approximately 20.6 megalitres (ML) of water for use during road works and for dust suppression and potential watering of revegetated areas.

Existing farm dams and ground water bores may be used to meet water demands. All water take will be within harvestable water rights. Potable water and water for site amenities will be supplied by rainwater tanks within the infrastructure areas. If additional water is needed, the Applicant would purchase and import water to the site.

3.4.4.2 POWER SUPPLY

The power supply for construction will be from the existing transmission network in the area and supported by diesel generators as required. No additional supply will be required for the Project operations.

3.4.4.3 WASTE MANAGEMENT

Waste storage will be provided within the Project Area for both the construction and operation phases. Sufficient space will be allowed for the separation and storage of different waste and for the recycling and reuse of items.

3.4.4.4 TELECOMMUNICATIONS

Communications networks will be constructed, where necessary, and used within the Project Area. These networks may include fibre optics (with cellular and/or landline backup) and radio support (type, channels and call-signs). Telecommunications ensure the secure control of the BESS and substations, which includes emergency shutdowns and management of any maintenance requirements.

3.4.4.5 PLANT AND EQUIPMENT

Plant and equipment required for construction will generally include 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 construction and will therefore be only required to access and egress the site once for the construction works.

Construction equipment will be sourced locally from the Upper Hunter region, subject to availability and cost considerations.

3.4.5 TRANSPORT ROUTE

The Port of Newcastle in NSW will be used for the delivery of all major Project components. Other specialist equipment will be sourced from various areas whilst consumables will be sourced locally from the Upper Hunter region (where available and commercially viable).

The proposed transport route for deliveries of heavy vehicles and High Risk OSOM vehicles travelling from the Port of Newcastle to the Project will travel along Selwyn Street, George Street, Industrial Drive, Pacific Highway, New England Highway, John Renshaw Drive, Hunter Expressway, Golden Highway, Denman Road and the site access driveway. The Project will generate up to three High Risk OSOM vehicle movements during construction and up to three OSOM vehicle movements during decommissioning. This is largely the same route as the route proposed by EnergyCo for the CentralWest REZ.

3.5 OPERATION

3.5.1 COMMISSIONING

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

3.5.2 OPERATIONAL HOURS AND WORKFORCE

While the Project will be monitored remotely, plant and equipment will require regular maintenance. An operations workforce of up to 10 FTE is anticipated to be required for this purpose. Site maintenance will be undertaken by staff on an ongoing basis with activities scheduled consistently throughout each year. Site maintenance could include landscaping, cleaning, maintaining access roads and APZs, repair and maintenance of the Project's components (e.g., fencing, lighting, reticulation network, substations, transmission line).

Most of the maintenance will be undertaken during routine maintenance. Circumstances may arise where additional specialist technical maintenance staff are required (e.g., such as unplanned equipment failure). Over the life of the Project, infrastructure will be maintained and/or upgraded, as required, to ensure health and safety of occupants of buildings. Daily maintenance will occur during standard working hours. 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.

3.6 DECOMMISSIONING AND REHABILITATION

The Project elements will operate for a minimum of 30 years. At the end of the Project's life one of the following options will be undertaken:

- Replacement of BESS and other infrastructure where generally in accordance with this EIS; or
- Decommission the Project and remove the BESS and associated infrastructure in accordance with a 'Decommissioning and Rehabilitation Plan'.

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**).

A Decommissioning and Rehabilitation Plan will be prepared for the Project no less than five years prior to decommissioning and / or in accordance with any project approval requirements. It is anticipated that the decommissioning and rehabilitation phase would take up to six months to complete, with the Project Area being returned, as far as practicable, to its condition prior to the commencement of construction.

4. STATUTORY CONTEXT

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. The Project is defined as ‘electricity generating works’ (Clause 2.35 of Transport and Infrastructure SEPP). Electricity generating works with an estimated development cost exceeding \$30m are State Significant Development pursuant to Schedule 1, Clause 20 of Planning Systems SEPP.

4.2 PERMISSIBILITY

4.2.1 SEPP (TRANSPORT AND INFRASTRUCTURE) 2021

Clause 2.36(1)(b) of the Transport and Infrastructure SEPP states that “electricity generating works” may be carried out with development consent on land within a prescribed non-residential use zone. The Project area is zoned RU1 Primary Production under Muswellbrook LEP 2009. The RU1 zone is a prescribed non-residential zone. The Project is permissible with development consent pursuant to Clause 2.36(1) of the Transport and Infrastructure SEPP.

4.3 OTHER APPROVALS

Other approvals that are potentially required under relevant NSW and Commonwealth legislation are discussed in **Table 4-1**. 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 OTHER APPROVALS REQUIRED

Statutory requirement	Description	Where addressed
<i>Consistent approvals that cannot be refused if necessary for carrying out an approved SSD and are to be consistent with the terms of the SSD approval.</i>		
<i>Roads Act 1993</i> (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 0 and Appendix N
<i>EPBC Act approval and whether the bilateral agreement applies.</i>		
<i>EPBC Act 1999</i>	The Project was referred under the EPBC Act prior to Project approval. The action has been declared to be a controlled action and will be assessed in accordance with the bilateral assessment agreement Amending Agreement No. 1 (Commonwealth of Australia & NSW, 2020).	Section 6.1
<i>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.</i>		
<i>Fisheries Management Act 1994</i>	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

Statutory requirement	Description	Where addressed
<i>Heritage Act 1994</i>	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 6.2 and Appendix H
<i>National Parks and Wildlife Act 1979</i>	As the Project is assessed as being State Significant Development (SSD), an Aboriginal Heritage Impact Permit (AHIP) is not required under Part 4.7 clause 4.41 (1)(d) of the EP&A Act. Instead, Aboriginal cultural heritage will be managed by an Aboriginal Cultural Heritage Management Plan (ACHMP).	Section 6.2
<i>Rural Fires Act 1997</i>	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.	Section 6.10 and Appendix P
<i>Water Management Act 2000</i>	A water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the <i>Water Management Act 2000</i> pursuant to Section 4.41 of the EP&A Act.	Not Applicable

4.4 PRE-CONDITIONS TO EXERCISING THE POWER TO GRANT APPROVAL

The pre-conditions to exercising the power to grant approval for the project are described in **Table 4-2**.

TABLE 4-2 PRE-CONDITIONS

Statutory requirement	Pre-condition	Where addressed
State Environmental Planning Policy (Resilience and Hazards) 2021	Under section 4.6 of the SEPP, a consent authority is required to consider whether a proposed development site is contaminated and whether it is suitable for the intended use.	Appendix C

4.5 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 as described in **Table 4-3**.

TABLE 4-3 MANDATORY CONSIDERATIONS

Statutory requirement	Description	Where addressed
Consideration under the Act and Regulation		
Section 1.3	Relevant objects of the Act - to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources. - to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment. - to promote the orderly and economic use and development of land. - to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	Whole EIS
Section 4.15	Consider the provisions of any environmental planning instruments, any draft planning agreements and the regulations that apply to the land. Consider the likely impacts of the development including the environmental, social, and economic impacts, the suitability of the site for the development, any submissions made, and the public interest.	Whole EIS
Mandatory relevant considerations under EPI		
Resilience and Hazards SEPP – section 4.6	Consider whether the land is contaminated, and if it is, whether the land will be suitable for the proposed use either in its contaminated state or following its remediation.	Appendix C
Resilience and Hazards SEPP – section 3.7	Departmental guidelines: - Applying SEPP 33. - HIPAP No. 6 – Hazard Analysis. - HIPAP No. 4 – Risk Criteria for Land Use Planning.	Section 6.9
Muswellbrook LEP 2009	Clause 2.3 – Objectives and land use zones for RU1 zone	Section 2.4
Considerations under other legislation		
<i>Biodiversity Conservation Act 2016</i> – section 7.14	The likely impact of the proposed development on biodiversity values as assessed in the biodiversity development assessment report. The Minister for Planning may (but is not required to) further consider under that Act the likely impact of the proposed development on biodiversity values.	Section 6.1 and Appendix G
Development control plans		
Muswellbrook DCP	Pursuant to section 2.10 of Planning Systems SEPP, DCPs do not apply to SSDs	N/A

5. STAKEHOLDER ENGAGEMENT

The Applicant recognises that individual communities are both diverse and unique. Across its renewable energy portfolio, it works closely with local communities to deliver projects that leave a positive, long-term impact in the regions in which it operates.

Stakeholder engagement is an integral part of any major development. As part of the Denman BESS Project development and in preparing the EIS, engagement has been and will continue to be undertaken with a range of stakeholders, including various local and NSW Government agencies, the local community, special interest groups and neighbouring and proximate landowners.

Engagement provides a unique opportunity for projects to benefit from local insights, better anticipate unforeseen issues and build lasting partnerships that are key to forging a social license to operate for the 20-plus year project lifespan.

The Project website can be found here: [Denman Renewable Energy Hub](#).

5.1 STAKEHOLDER ENGAGEMENT PRINCIPLES

ERM developed a Community and Stakeholder Engagement Strategy (CSES) in March 2024 to support the Denman BESS development. The CSES provides the blueprint for robust engagement consistent with the following principles:

- **Respectful** – seek to understand and act on community concerns;
- **Honest** – be open about what aspects of the project can be influenced;
- **Accessible** – provide clear, concise information in formats and channels that best meet a community's needs;
- **Proportionate** – tailor engagement to reflect the level of impact across the stakeholder environment;
- **Evidence-based** – base engagement activities and tools on an understanding of community demographics, history, and social and economic influences;
- **Timely and high-profile** – engage early, across the entire project lifecycle, and widely promote access to project information, feedback channels and engagement activities; and
- **Accurate reporting** – build robust systems to record feedback, track response timeframes and record how feedback has been incorporated into the project.

These principles align with the social justice-focused principles outlined in Muswellbrook Shire Council's Community Engagement Strategy 2022 (MSC, 2022b), which prioritises equity, access, participation and rights as the cornerstone for effective engagement.

5.2 STAKEHOLDER ENGAGEMENT STRATEGY

The Community and Stakeholder Engagement Strategy (CSES) was prepared to guide consultation with stakeholders during the scoping report, EIS, response to submissions and further amendments. The CSES complies with NSW Government consultative requirements under relevant planning instruments and guidelines, including:

- *Undertaking Engagement Guidelines for State Significant Projects* (DPHI, 2024c);
- *State Significant Development Guidelines* (DPE, 2022c);
- *Community Participation Plan* (DPHI, 2024d); and
- *Social Impact Assessment Guideline for State Significant Projects* (DPHI, 2023).

International Association of Public Participation (IAP2) Quality Assurance Standard has also been considered, being the engagement industry best practice guideline.

5.3 STAKEHOLDER IDENTIFICATION

The Applicant has identified relevant stakeholders who are affected by or have an interest in or influence on the Project. Identification was undertaken during the scoping phase of the Project to enable community members to be part of the planning and development process and ensure meaningful engagement during the early stages of 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, and engaging with local businesses
- Community information sessions.

Table 5-1 lists the stakeholder groups who have been or will be engaged throughout the Project lifecycle. Stakeholders have been grouped based on organisation type, individual interest or interaction with the Project.

This list will be updated in response to stakeholder feedback as the Project progresses.

TABLE 5-1 IDENTIFIED STAKEHOLDERS

Stakeholder group	Identified stakeholders
Government	• NSW Member for Upper Hunter, Dave Layzell MP. • Federal Member for Hunter Dan Repacholi MP. • Muswellbrook Shire Council staff and elected councillors. • Transport for NSW (TfNSW). • DPHI. • EnergyCo NSW. • NSW Local Land Services. • NSW Environmental Protection Authority (EPA). • Regional Development Australia. • Department of Climate Change, Energy, the Environment and Water. • Australian Energy Infrastructure Commissioner. • Emergency service organisations, including the NSW Rural Fire Service. • Hunter Joint Organisation.
Aboriginal communities	• Wanaruah Local Aboriginal Land Council. • Native Title Services. • The Registrar of Aboriginal Owners.
Neighbours	• Neighbouring dwellings and businesses within 5 km of the site. • Camel Farm Tours. • Blakefield Stock and Feed. • Fernrigg Farm. • Hunter Valley Pecans. • Pukara Estate. • Small Forest Winery.
Surrounding communities	• Community members outside of the 5 km radius of the site.

Stakeholder group	Identified stakeholders
Local community organisations and businesses	• Business Hunter. • Denman Chamber of Commerce. • Muswellbrook Chamber of Commerce and Industry. • Denman and District Development Association. • Upper Hunter Economic Diversification Working Party. • Nearby coal mines, e.g. BHP Mt Arthur open-cut coal mine and Drayton Mine. • Local contractors/suppliers. • NSW Farmers Hunter branch. • Service industries likely to benefit during construction – food and beverage, supermarkets. • Estate agents. • Prospective renewables developers to the south and north of the Project site.
Utilities	• Transgrid. • Hunter Water. • Ausgrid.
Local schools, religious organisations, clubs	• Osborn's Transport. • Denman Public School. • Martindale Public School. • Muswellbrook High School. • Sandy Hollow Public School. • St Josephs Primary School Denman.
Environment groups	• Climate Change Council. • Hunter Region Landcare Network. • Upper Hunter Landcare. • Hunter Valley Protection Alliance Hunter Local Land Services. • Lock the Gate Alliance.
Local and social media	• Muswellbrook Chronicle. • Hunter Valley News. • Hunter River Times. • ABC Upper Hunter. • Power FM Muswellbrook. • NBN TV. • Facebook groups: ◦ Denman Community (private group), 9,000 members; and ◦ Denman & District Community Group (private group), 2,600 members

5.4 ENGAGEMENT CONDUCTED

The Applicant has developed communication materials and implemented an engagement program to ensure transparent and meaningful engagement with stakeholders. This approach has built an understanding of potential concerns, opportunities and mitigation strategies throughout the scoping and EIS phases. The engagement conducted has also collated information that will support communication during future stages of the Project, including construction and delivery.

Table 5-2 summarises the engagement undertaken in accordance with *Undertaking Engagement Guidelines for State Significant Projects* (DPHI, 2024c).

TABLE 5-2 SUMMARY OF ENGAGEMENT ACTIVITIES

Activity	Description
Letters to introduce the Project	17 letters sent to 25 individual residents and businesses located within 5km of the Project area. - Introductory letter sent to NSW Member for Upper Hunter, Dave Layzell MP. - Introductory letter sent to Federal Member for Hunter, Dan Reepacholi MP.
Established communications channels and tools	- Created a Project website, email address, factsheet and FAQ to promote community awareness, provide Project updates and respond to Project enquiries. - Implemented use of Consultation Manager as a stakeholder and feedback database to record engagements and Project sentiment.
Meetings	Two meetings held with government MPs: - Meeting with NSW Member for Upper Hunter, Dave Layzell MP on 15 September 2024. - Meeting with Federal Member for Hunter, Dan Reepacholi MP on 22 August 2024.
Phone calls	5 calls to local business owners (2 positive, 1 neutral, 2 negative). 3 calls to local residents (2 neutral, 1 negative). 2 calls to local government/other agencies (2 neutral).
Emails	33 emails with government agencies (33 neutral): 9 emails to and from Federal agencies. 24 emails to and from State agencies. 2 emails with local business owners (2 neutral).
Community engagement sessions	- Two sessions held on 20 and 21 September 2024 in Denman Memorial Hall with 30 attendees. - Majority neutral sentiment.

Figure 5-1 below shows that almost two-thirds of the engagement interactions were undertaken with local residents and business owners within 5 km of the Project site. **Figure 5-2** demonstrates most interactions residents or business owners occurred face-to-face.

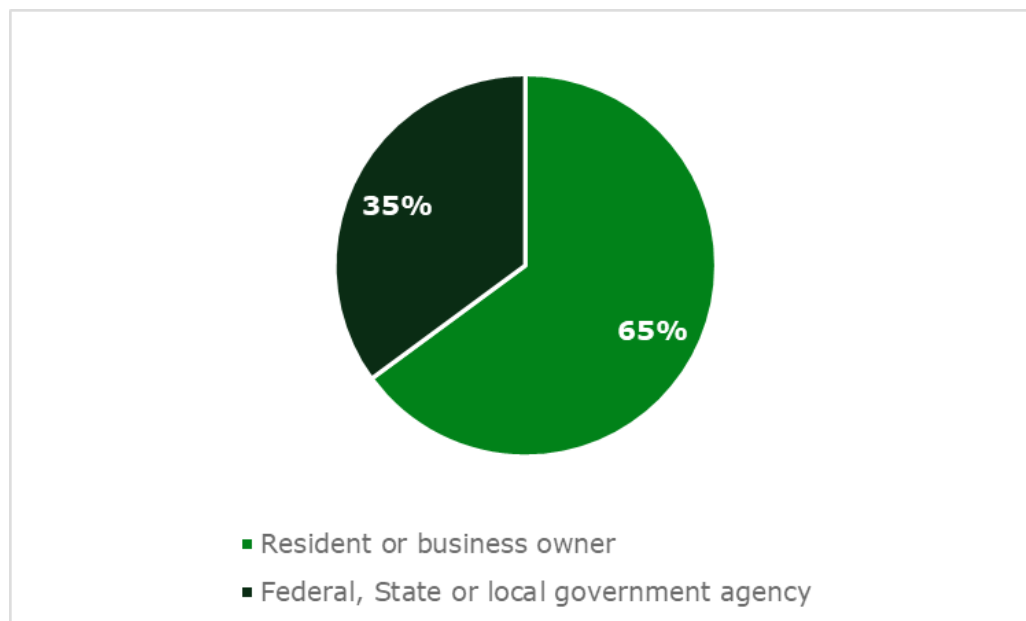


FIGURE 5-1 ENGAGEMENT INTERACTIONS BY STAKEHOLDER GROUP

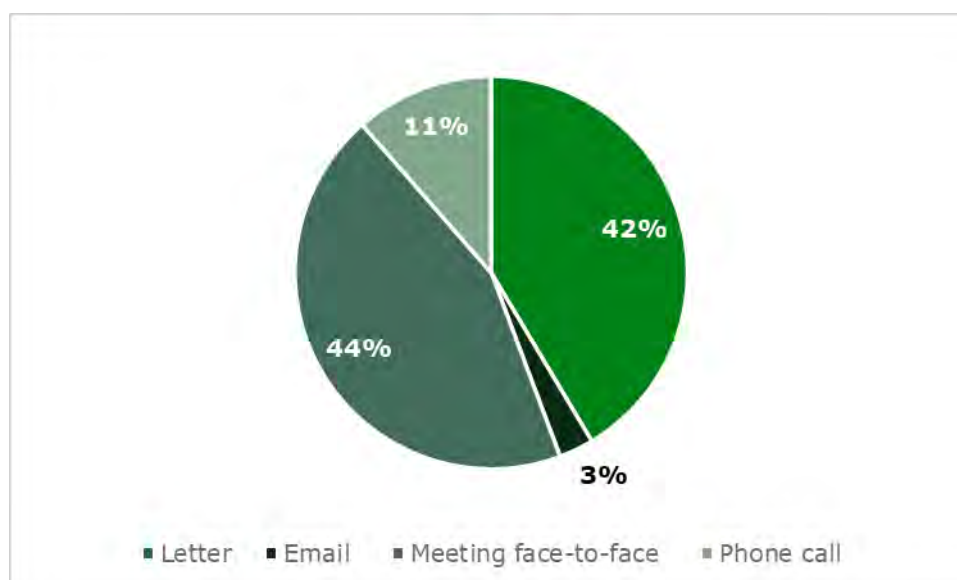


FIGURE 5-2 TYPES OF INTERACTIONS WITH RESIDENTS OR BUSINESS OWNERS

Appendix D provides details of the engagement activities and tools implemented to consult with and seek feedback from the local community and stakeholders.

5.5 COMMUNITY AND STAKEHOLDER VIEWS

The Applicant has sought and received feedback from the community throughout the EIS phase. Most community members were positive or neutral about the project, with only four of 114 interactions classified as negative.

A community-drop in session was held on 20 and 21 September 2024 in Denman NSW. Only a small number of people made direct contact with the drop-in stall, with most people receiving a FAQ and factsheet.

Notification of the Project and the preparation of the EIS was sent to 16 agencies, relevant stakeholders, and relevant neighbours to the Project.

Table 5-3 and **Table 5-4** provides a summary of the community views on the Project and how the issues raised have been addressed in this EIS.

TABLE 5-3 COMMUNITY VIEWS SUMMARY

Theme / Topic	Comment / Concern	Where addressed
Overall perception	The Project would bring a 'good balance' of business and investment to the area	Section 6.11
Project design	Seeking clarity on the exact parcel of land for the development. No objection to the site	Sections 3.2 and 3.3
Agricultural impacts	Project compatibility with local land use	Section 6.4
Project benefits	Support for the economic benefits the Project will bring to Denman Support for the Project's contribution to Australia's renewable energy targets	Section 7
Property values	Potential negative impacts to property values	Section 6.12

Theme / Topic	Comment / Concern	Where addressed
Visual impact	Visual impact 'will reduce quality of life'	Section 6.5
Aboriginal Cultural Heritage	Comment that Aboriginal artefacts may make the site unsuitable	Section 6.2

TABLE 5-4 COUNCIL AND GOVERNMENT AGENCY ENGAGEMENT

Stakeholder Group	Organizations	Matters Raised	Satisfied by
NSW Government Agencies	NSW Fire & Rescue	No consultation required at this time.	No action required
	TfNSW	Consultation with TfNSW has been undertaken to inform the Traffic Impact Assessment. The agency was satisfied with the development and had no further comments.	Appendix N
	Department of Planning and Environment - Crown Lands	NSW Crown Lands provided advice to DPHI on the draft SEARs on 8 October 2024. The agency was satisfied with the development and had no further comments.	Appendix N
	Department of Primary Industries - Agriculture	No consultation required at this time.	No action required
	Department of Planning and Environment - Heritage Council of NSW	No consultation required at this time.	No action required
	Department of Planning and Environment - Mining, Exploration & Geoscience	No consultation required at this time.	No action required
	NSW Rural Fire Service	No consultation required at this time.	No action required
	NSW Government - Subsidence Advisory	No consultation required at this time.	No action required
	DCCEEW - BCS	BCS submitted an RFI for the Land Category Assessment and was satisfied with the amended report. No further comments received.	Appendix G
	NSW Department of Primary Industries and Regional Development (DPIRD)	DPIRD provided advice on the draft SEARs on 8 October 2024. The Land and Agricultural Impact Assessment and the Land Use Conflict Risk Assessment addressed the advice. No further comments received.	Appendix L
	DPI Fisheries	DPI Fisheries provided advice on the draft SEARs on 8 October 2024, confirming that no further consultation was required as the Project was a significant distance from the key fish habitat of the Hunter River.	Appendix G

Stakeholder Group	Organizations	Matters Raised	Satisfied by
	The Department of Primary Industries and Regional Development - NSW Resources	NSW Resources provided advice on the draft SEARs on 25 September 2024 and noted that the Project Area overlaps with Exploration Licence 5695. ERM engaged with the title holder EL 5695, no issues were raised. No further comments received.	No action required
Local Government	Muswellbrook Shire Council	Consultation with the Muswellbrook Shire Council has been undertaken during the preparation of this EIS. The Muswellbrook Shire Council was generally supportive of the Project, with interest in community benefits and voluntary planning agreements, road safety along Denman Road, and potential cumulative impacts on short term and long term accommodation.	Section 2.8, Section 6.7, and Section 6.14.1.11
Other	Siding Spring Observatory	No consultation required at this time.	No action required
	ARTC	The level crossing on Selwyn Street near the Port of Newcastle was discussed. ARTC noted that the crossing may not require management, however the timing of the level crossing may need to be checked to ensure that it is adequate for the length of the load. The agency was satisfied with the development and had no further comments.	Appendix N
	Hunter Valley Energy Coal	Hunter Valley Energy Coal was notified of the preparation of the EIS and the amended layout in relation to the Exploration Licence 5695. The licence holder was satisfied with the development and had no further comments.	No action required

5.6 FUTURE ENGAGEMENT

The Applicant recognises the importance of consistent, targeted and meaningful engagement. It will continue create opportunities for stakeholders and the local community to provide input and feedback throughout the planning approval process, construction and operations.

Ongoing engagement will be undertaken to ensure up-to-date information is provided and two-way communication continues. This engagement will include (but is not limited to):

- Ongoing consultation with the community;
- Ongoing consultation with key stakeholders, including neighbours, Aboriginal communities, local businesses and environmental groups;
- Ongoing meetings with relevant regulators regarding planning and design;
- Ongoing government briefings at local, State and Federal levels;
- Ongoing consultation with other regulatory stakeholders;
- Maintaining Project website with regular Project updates;
- Ongoing monitoring of the Project phone number and Project email to receive community feedback and answer Project enquiries;
- Updates to Project collateral including fact sheets, FAQs and timelines;
- Project letters providing updates to key stakeholders;
- Ongoing media relations to drive community awareness of the Project; and
- Ongoing tracking and recording of stakeholder engagement activities.

Engagement approaches will be regularly monitored, reviewed and updated throughout the life cycle of the Project to ensure it remains effective and current.

6. ASSESSMENT OF IMPACTS

6.1 BIODIVERSITY

A Biodiversity Development Assessment Report (BDAR) has been prepared to assess the impact of the Project on biodiversity values in accordance with the *Biodiversity Conservation Act 2016* (BC Act). The BDAR is summarised below and appended in full, **Appendix G**.

The BDAR has assessed impacts to biodiversity values in accordance with the Biodiversity Assessment Method 2020 (BAM) and includes assessment of key maps, databases, and field data collected over 12 surveys between June 2023 and February 2025.

The scope of the BDAR includes:

- Identifying the extent of native vegetation, threatened ecological communities and vegetation integrity within the Subject Land and assessing the habitat suitability for threatened species;
- Assessing how the Project has avoided and minimised direct and indirect impacts to biodiversity values and Matters of National Environmental Significance (MNES) and identifying further measures that can be implemented to avoid and minimise impacts; and
- Calculating the ecosystem credit and species credit requirements to offset direct impacts of the Project by retiring biodiversity credits through the NSW Biodiversity Offset Scheme (BOS).

The Project was declared to be a controlled action under Section 75 of the EPBC Act on 14 April 2025 (EPBC 2024/10085) and will be assessed under the Assessment Bilateral Agreement. Supplementary SEARs have been issued for the Project and are addressed in the BDAR.

6.1.1 EXISTING ENVIRONMENT

The Project Area is located entirely within the Sydney Basin Bioregion and Hunter IBRA subregion. The Project Area is in Central Hunter Foothills and bound by Upper Hunter Channels and Floodplain to the west.

The Project Area is largely comprised of modified pastures which continue to be used for livestock grazing. A history of intensive agricultural activities is evident across the Project Area and is representative of the overall land use within the greater landscape, with agriculture and mining being the dominant industries within the region.

The Hunter River is located approximately 800 metres west of the project boundary. An unnamed tributary of the Hunter River intersects the Subject Land and is released into an onsite dam. There are approximately 10 dams scattered across the Subject Land that are interconnected with constructed water retention banks present across the site.

Native vegetation presence is fragmented by a historical land clearing event and past/present land uses. The majority of the Subject Land comprises either non-native vegetation in the form of modified or heavily grassed pastures, or native pasture derived from a cleared native vegetation type.

There are no karsts, caves, crevices, cliffs or other geological features of significance within the Subject Land. While there are areas of imbedded rock present throughout the area, these do not constitute key habitat features associated with target threatened species.

Aquatic habitats present within the Project Area include unnamed first and second Strahler stream order tributaries that occur as ephemeral gullies and have been observed to only hold water immediately after rainfall events, providing little habitat potential.

Farm dams and other artificial aquatic systems present have been subject to habitat quality assessments throughout the survey duration. No mapped wetlands occur within the Subject Land, nor are there any aquatic endangered ecological communities that would be affected by the Subject Land.

A Land Categorisation Assessment has been endorsed and establishes the extent of Category 1 and Category 2 lands within the Project Area. Approximately 20 ha of land, inclusive of the shared access road and Denman Road intersection, has been designated as Category 1 – Exempt Land which is taken to not comprise native vegetation, and as such, is excluded from the assessment of direct impacts. The Land Category Assessment is shown in **Figure 6-1**.

A desktop assessment was undertaken to determine the extent of vegetation cover in the Assessment Area (i.e. the Subject Land with a 1,500m buffer applied). Native vegetation occurs in three structural forms within the Project Area, being open woodland, isolated trees and native grasslands. The extent of native vegetation within the Assessment Area is approximately 16% and is shown in **Figure 6-2**.

One Plant Community Type (PCT) has been identified within the Project Area, being PCT 3485 Central Hunter Slaty Gum Grassy Forest, which is described in BioNet as a tall to very tall sclerophyll open forest with a sparse shrub layer and a patchy, grassy ground cover occurring on Permian sediments on gentle slopes and rises in a restricted region between Warkworth and Wybong in the central Hunter Valley. PCT 3485 covers an area of 18.2 ha of the Project Area and is shown in **Figure 6-3**.

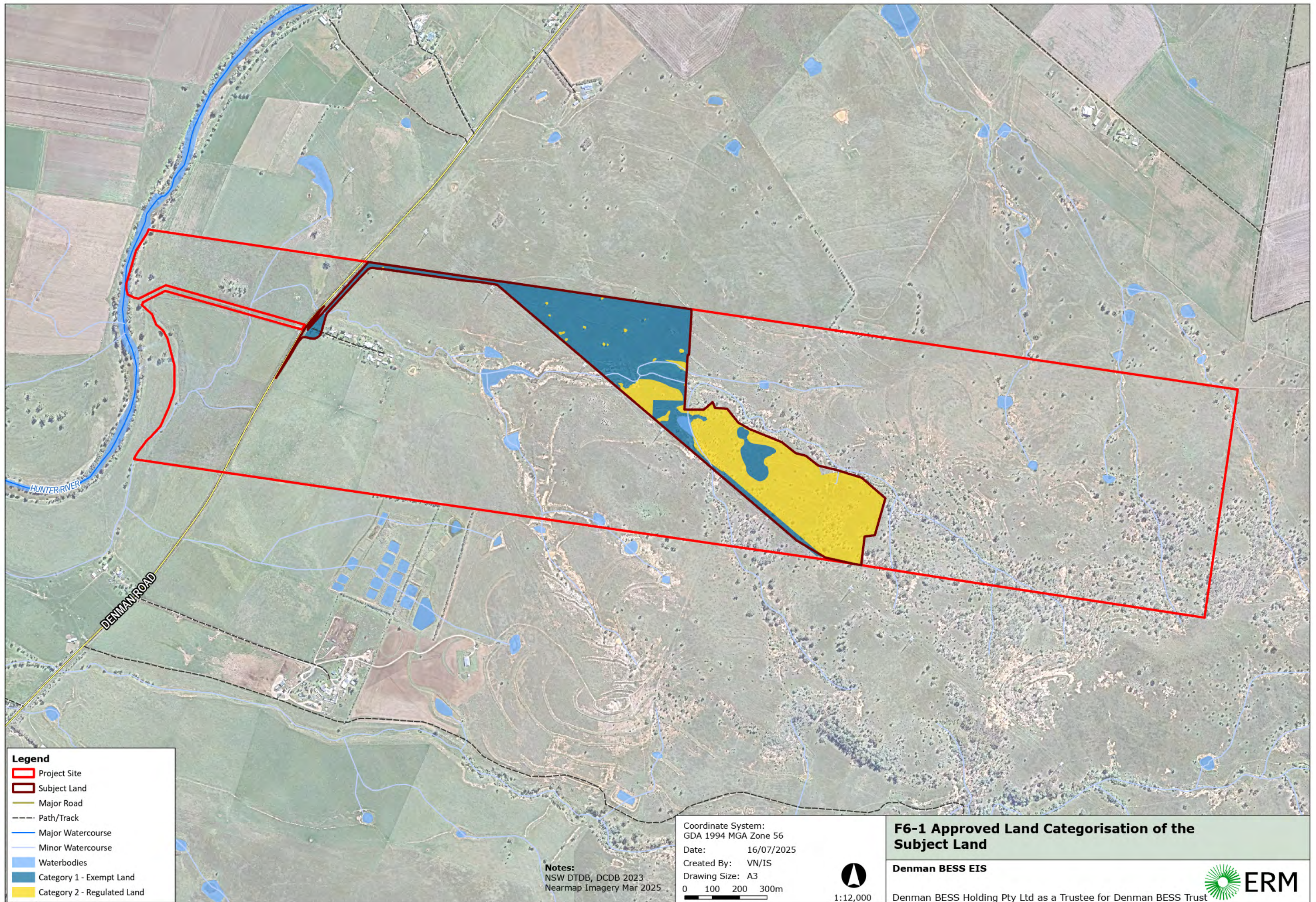
Two BC Act listed TECs were identified as potentially occurring within the Subject Land by PCT association. One additional BC Act listed TEC, Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion, has also been considered following analysis of field survey data. Four EPBC Act TECs were identified as having the potential to occur within the Subject Land through the PMST. One of these TECs, Central Hunter Valley Eucalypt Forest and Woodland, was also identified through PCT association.

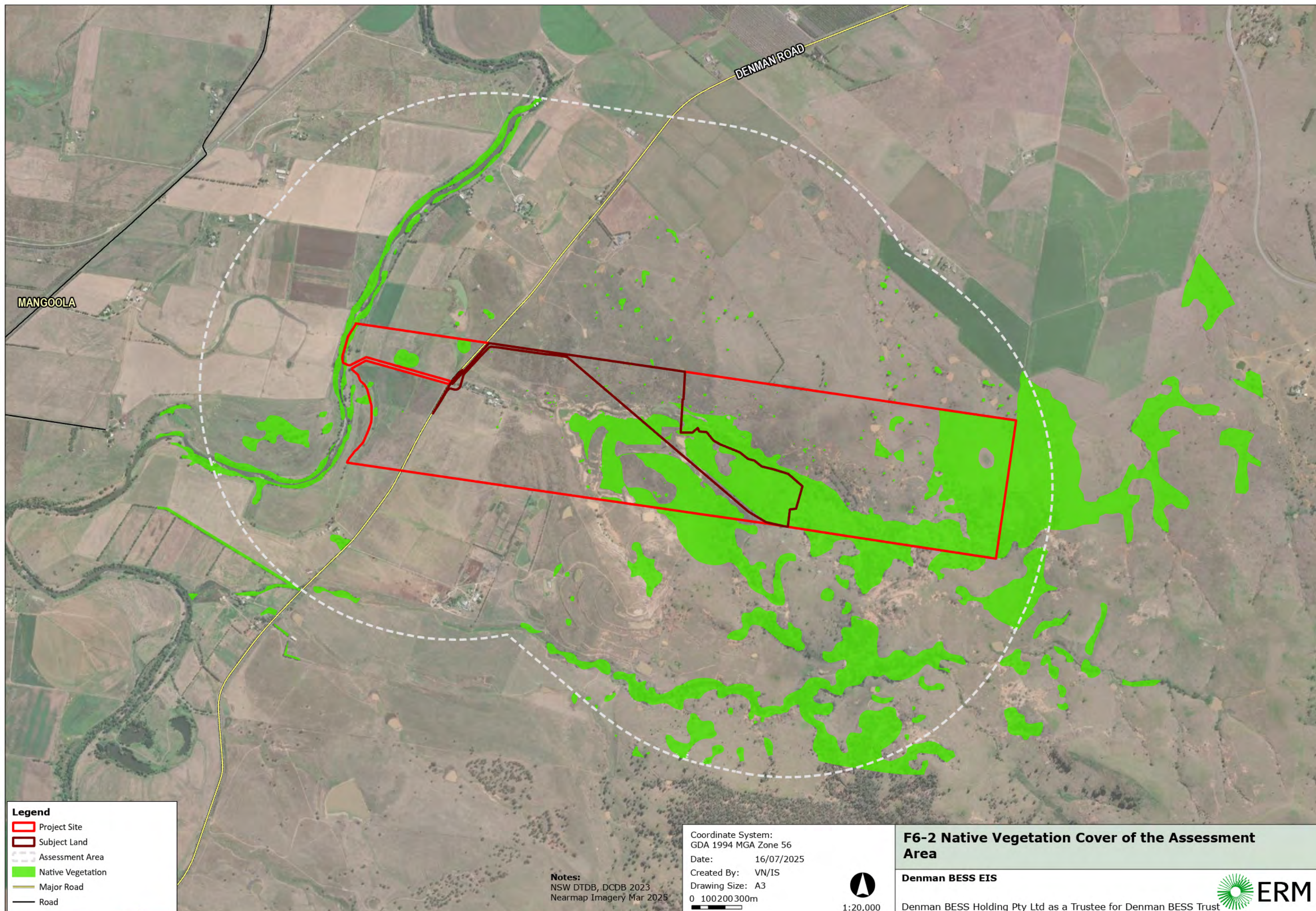
Based on the analysis, the following have been identified as candidate TECs within the Project Area:

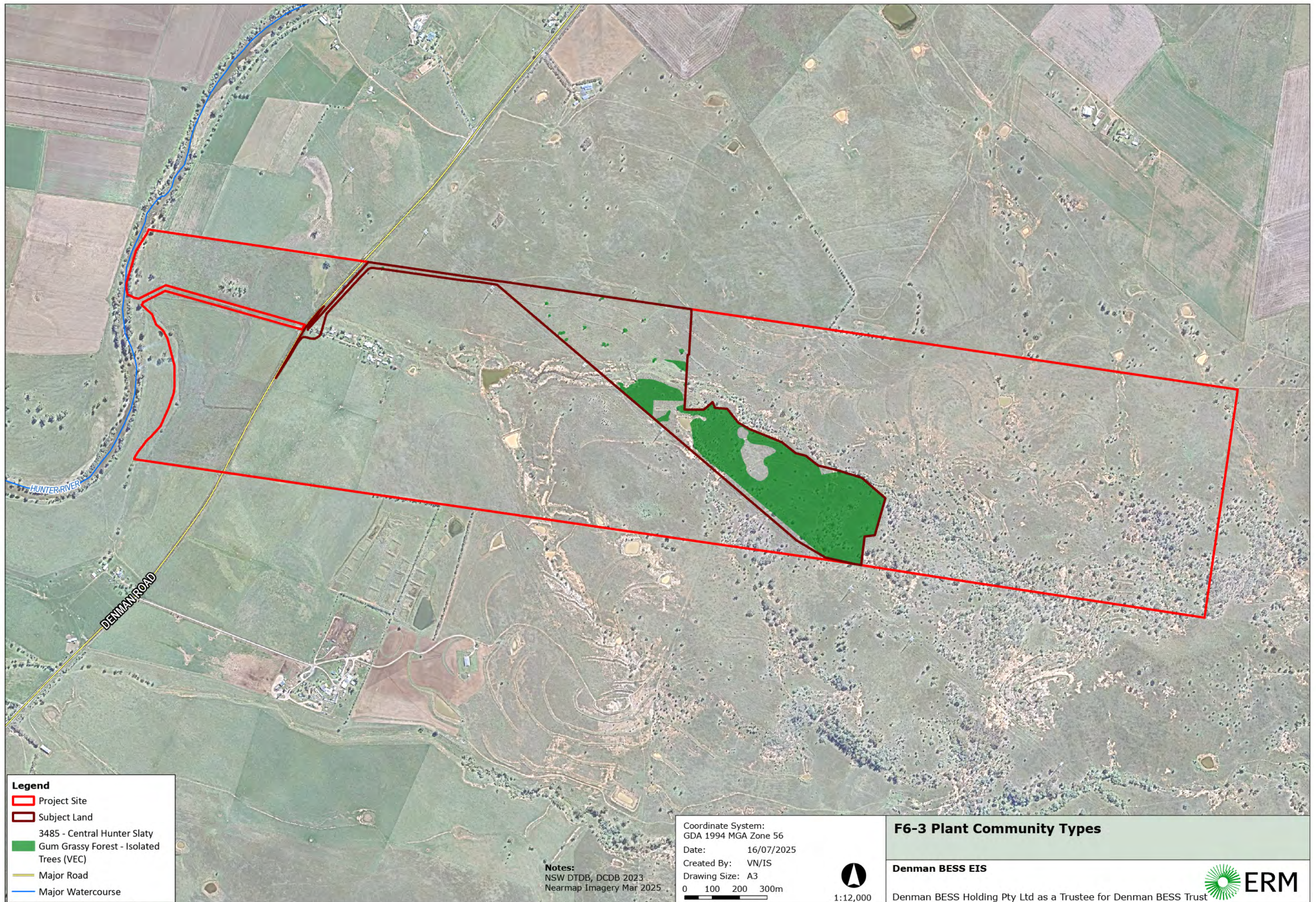
- Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion vulnerable ecological community (VEC) (BC Act only); and
- Central Hunter Valley Eucalypt Forest and Woodland critically endangered ecological community (CEEC) (EPBC Act only).

Three listed threatened species and communities which are considered Matters of National Environmental Significance (MNES) have been identified within the Project Area:

- Central Hunter Valley Eucalypt Forest and Woodland (Critically Endangered);
- Spotted-tailed Quoll (SE mainland population) (*Dasyurus maculatus maculatus*) (Endangered); and
- Hunter Valley Delma (*Delma vesolineata*) (Endangered).







Legend

- Project Site
- Subject Land
- 3485 - Central Hunter Slaty
- Gum Grassy Forest - Isolated Trees (VEC)
- Major Road
- Major Watercourse

Notes:
NSW DTDB, DCDB 2023
Nearmap Imagery Mar 2025

Coordinate System:
GDA 1994 MGA Zone 56
Date: 16/07/2025
Created By: VN/IS
Drawing Size: A3
0 100 200 300m



F6-3 Plant Community Types

Denman BESS EIS

Denman BESS Holding Pty Ltd as a Trustee for Denman BESS Trust



Five vegetation zones have been established and are listed in **Table 6-1**, along with the vegetation integrity score (VIS) and description of the TEC.

TABLE 6-1 VEGETATION ZONES

VZ	PCT	Condition	Threatened ecological community	VIS	Area (ha)
1	3485	Open woodland (TEC)	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC (BC Act only) Central Hunter Valley Eucalypt Forest and Woodland CEEC (EPBC Act only)	57.9	2.10
2	3485	Open woodland (moderate)	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC	49.5	9.30
3	3485	Open Woodland (low)	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC	48.2	4.00
4	3485	Grassland	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC	31.1	2.20
5	3485	Riparian	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC	37.9	0.58
Total					18.18

Targeted flora and fauna surveys have identified three candidate species as occurring within the Project Area. These species are:

- Pine Donkey Orchid (*Diuris tricolor*) in the Muswellbrook Shire LGA, with colonies observed in secondary grasslands with sandy soils and scattered individuals found elsewhere on clay soils;
- Hunter Valley Delma (*Delma vescolineata*) observed in secondary grasslands with cracking clay soils; and
- Southern Myotis (*Myotis macropus*) recorded on four bat detectors near farm dams.

Species polygons were established for threatened species classed as 'species credit species' where occurring or assumed to occur. A species polygon was developed for each with species extent reflective of the VZ condition state or extent of occurrence as outlined in **Table 6-2**.

TABLE 6-2 SPECIES CREDIT SPECIES POLYGON EXTENT

Species credit species	VZ	Area (ha)
Striped Legless Lizard – <i>Delma impar</i> ²	4	0.85
Pine Donkey Orchid - <i>Diuris tricolor</i> (Endangered Population – Muswellbrook LGA)	2	9.00
	3	4.00
Southern Myotis – <i>Myotis macropus</i>	2	0.98
	3	2.00
	4	2.20
	5	0.39

² Striped Legless Lizard *Delma impar* selected in the BAM-C as Hunter Valley Delma *Delma vescolineata* is not yet included in the database for the BAM-C.

6.1.2 IMPACT ASSESSMENT

6.1.2.1 AVOID AND MINIMISE

During the preparation of the BDAR, 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. With regard to biodiversity, the development footprint has been refined to reduce direct impacts to endangered flora species *Cymbidium canaliculatum* and Red River Gum (*Eucalyptus camaldulensis*) and the Hunter Valley Delma Legless Lizard (*Delma vescolineata*);

Where the potential for impacts could not be avoided, design principles were sought to minimise environmental impacts and/ or mitigation measures were proposed to manage the extent and severity of any residual impacts. Impacts to woody vegetation and TECs have been avoided or minimised through the design process. By refining the development footprint and relocating infrastructure, the Project has minimised direct disturbance to known TECs and has minimised fragmentation of significant vegetation corridors. Buffers to riparian zones and sensitive habitat areas have contributed to maintaining ecological connectivity and reducing edge effects, supporting long-term habitat viability for native flora and fauna species.

6.1.2.2 DIRECT IMPACTS

The construction and operational phase of the development will result in direct impacts to biodiversity values which cannot be avoided. Direct impacts include habitat clearance, noise and disturbance associated with clearing and construction, and presence of infrastructure which may create barriers to movement.

The direct impact on native vegetation and habitat is summarised in **Table 6-3**. The direct impact on species credit species is summarised in **Table 6-4**.

TABLE 6-3 SUMMARY OF IMPACTS THAT REQUIRE OFFSETS – ECOSYSTEM CREDITS

VZ	PCT	Condition	TEC	Extent (ha)	Ecosystem credits (#)
1	3485 -Central Hunter Slaty Gum Grassy Forest	Open woodland (TEC)	Yes ³	2.1	76
2	3485 - Central Hunter Slaty Gum Grassy Forest	Open woodland (moderate)	Yes ⁴	9.3	230
3	3485 - Central Hunter Slaty Gum Grassy Forest	Open woodland (low)	Yes ⁴	4	96
4	3485 - Central Hunter Slaty Gum Grassy Forest	Grassland	Yes ⁴	2.2	34
4	3485 - Central Hunter Slaty Gum Grassy Forest	Riparian	Yes ⁴	0.58	11

³ Central Hunter Valley Eucalypt forest and woodland CEEC (EPBC Act only)

⁴ Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC (BCT Act only)

TABLE 6-4 SUMMARY OF IMPACTS THAT REQUIRE OFFSETS – SPECIES CREDITS

Common Name	Scientific name	Habitat Area (ha)	Count	Species credits (#)
Striped Legless Lizard ⁵	<i>Delma impar</i>	0.85	N/A	10
Pine Donkey Orchid (Muswellbrook LGA Endangered population)	<i>Diuris tricolor</i>	13	N/A	239
Southern Myotis	<i>Myotis macropus</i>	5.57	N/A	113

6.1.2.3 INDIRECT IMPACTS

The BAM identifies 16 potential indirect impacts that, as a minimum, must be considered as a part of a BDAR. Residual indirect impacts of the Project on native vegetation, threatened entities and their habitat beyond the Development Footprint have been considered in accordance with the BAM and are summarised in **Table 6-5**.

The proposed mitigation measures in **Section 6.1.3** are considered reliable and capable of remedying the effects of these impacts without causing harm to the adjoining environment. As such, no residual indirect impacts are expected.

⁵ Note: This species is the Hunter Valley Delma (*Delma vescolineata*)

TABLE 6-5 SUMMARY OF RESIDUAL INDIRECT IMPACTS

Indirect impact	Impact entities	Project phase / timing of impact	Likelihood and consequences
Impacts of the proposal on TECs/PCT and/or threatened species and their habitat beyond the construction area, including but not limited to:			
(a) Inadvertent impacts on adjacent habitat or vegetation	TECs, PCT and threatened species habitat	Construction	There are potential impacts to retained and adjacent vegetation resulting from incidental trampling by site vehicles, and overstepping clearing and disturbance boundaries. These risks will be mitigated through environmental management measures and controls via the preparation and implementation of a CEMP and CTMP. There is unlikely to be residual inadvertent impacts to adjacent vegetation. Clear boundaries are to be created using fencing, tape, etc. to ensure that no retained vegetation adjacent to the project boundary is incidentally impacted.
(b) Reduced viability of adjacent habitat due to edge effects	TECs, PCT and threatened species habitat	Operation	Impacts to viability of adjacent habitat due to edge effects is considered low due to current land use and condition (livestock grazing and weed incursions) of the Subject Land. However, to minimise edge effects as a result of the Project, mitigation measures will be incorporated into the CEMP and the SWMP to manage impacts to soil quality, hydrology regimes and habitat degradation. Clear boundaries are to be created using fencing, tape, etc. to ensure that no retained vegetation adjacent to the project boundary is impacted by edge effects. There is unlikely to be residual inadvertent impacts to adjacent vegetation.
(c) Reduced viability of adjacent habitat due to noise, dust or light spill	TECs, PCT and threatened species habitat	Construction	There are potential impacts to the viability of adjacent habitat as a result of artificial light, runoff, noise and dust incursions during construction of the Project. The CTMP will work to mitigate these impacts occurring from vehicular movement, while the CEMP will work to mitigate these impacts occurring from construction. The CEMP and CTMP will specify how artificial lighting is to be directed away from the neighbouring vegetation and potentially use barriers to further minimise noise and dust disturbance. Due to the limited construction hours, noise and light and will be minimal dark when species are most vulnerable to these disturbances. Minimal residual indirect impacts to the viability of adjacent habitat due to noise, dust or light spill may occur.

Indirect impact	Impact entities	Project phase / timing of impact	Likelihood and consequences
(d) Transportation of weeds and pathogens from the subject site to adjacent vegetation	TECs, PCTs and threatened species habitat	Construction, operation and rehabilitation	There is a potential risk of transportation of introduced weeds and pathogens during construction and operation to adjacent vegetation. This risk is already present as a result of the current land use however, risk is increased with increased vehicular movements. This risk will be mitigated within the CTMP, CEMP and Pest Management Control Programs to be implemented. There is unlikely to be residual inadvertent impacts to adjacent vegetation.
(e) Increased risk of starvation, exposure and loss of shade or shelter	Threatened fauna species	Construction and operation	Clearing of native vegetation for the construction of the Project will result in reduction of resources available for threatened fauna species that may result in starvation, exposure and loss of shade or shelter. The extent of clearing of native vegetation has been minimised where possible and the extent of clearing is not considered critical to the survival of any threatened species. Ongoing monitoring through the biodiversity management plan (BMP) and CEMP will identify any increase in risk to threatened species and will manage this accordingly. There is unlikely to be residual inadvertent impacts to threatened fauna species.
(f) Loss of breeding habitat due to vegetation clearance	Threatened fauna species	Construction	Project will result in reduction of breeding habitat available for a range of threatened fauna species. Habitat features known to be of importance for breeding, such as hollow bearing trees, have been avoided where possible. Ongoing monitoring through the BMP and CEMP will identify any increase in risk to threatened species and will manage this accordingly. There is unlikely to be residual inadvertent impacts to threatened fauna species.
(g) Trampling of threatened flora species	Threatened flora species	Construction, operation and rehabilitation	<i>Diuris tricolor</i> occurs within the Project Area with potential to be trampled. These risks will be mitigated through measures and controls via the preparation and implementation of the CEMP. No-go zones are to be established to ensure no incidental trampling occurs. There is unlikely to be residual inadvertent impacts to threatened flora.
(h) Inhibition of nitrogen fixation and increased soil salinity	TECs, PCTs and threatened species habitat and threatened flora species	N/A	The Project is not expected to result in the inhibition of nitrogen or increased soil salinity.

Indirect impact	Impact entities	Project phase / timing of impact	Likelihood and consequences
(i) Fertiliser drift	TECs, PCTs and threatened species habitat and threatened flora species	N/A	The Project is not expected to result in any fertiliser drift.
(j) Rubbish dumping due to improper management of waste	TECs, PCTs and threatened species habitat.	N/A	The Project is not expected to result in rubbish dumping.
(k) Wood collection	TECs, PCTs and threatened species habitat	N/A	The Project is not expected to result in increased wood collection.
(l) Removal and disturbance of rocks, including bush rocks	TECs, PCTs and threatened species habitat	N/A	The Project is not expected to result in any indirect impacts resulting in Removal and disturbance of rocks, including bush rocks.
(m) Increase in predators	Threatened fauna species	Operation	The Project will involve the construction and upgrading of access tracks throughout the Subject Land, resulting in the potential to increase predator activity. Species such as the Spotted-tailed Quoll and Squirrel Glider are vulnerable to predation by species such as the European Fox. The Project will involve the implementation of a Biodiversity Management Plan that will aim to eliminate or reduce the risk of increase in predator activity. There is unlikely to be residual inadvertent impacts to threatened fauna species.
(n) Increase in pest animal populations	Threatened flora species and their habitat, TECs and PCTs	Operation	The Project will involve the construction and upgrading of access tracks throughout the Subject Land, resulting in the potential to increase pest animal activity. Species such as the European Rabbit can be destructive to native vegetation. The Project will involve the implementation of a Biodiversity Management Plan that will aim to eliminate or reduce the risk of increase in pest animal populations. There is unlikely to be residual inadvertent impacts to threatened fauna species.
(o) Change in fire regimes	TECs, PCTs, threatened species and their habitat	N/A	The Project is not expected to result in any change in fire regimes.

Indirect impact	Impact entities	Project phase / timing of impact	Likelihood and consequences
(p) Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds	Threatened fauna species	N/A	The Project is not expected to result in any disturbance to specialist breeding habitat

6.1.2.4 PRESCRIBED IMPACTS

Prescribed impacts are identified in Clause 6.1 of the BC Regulation. Prescribed impacts are additional to the clearing of native vegetation and associated habitat and include:

- Development of the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs, rock outcrops and other geological features of significance; human-made structures; and non-native vegetation;
- Development of areas connecting threatened species habitat, such as biodiversity corridors;
- Impacts on water quality, waterbodies and hydrological processes that sustain threatened species and TECs; and
- Vehicle strikes on threatened species or on animals that are part of a TEC.

An assessment of prescribed impacts from the Project is provided in **Table 6-6**.

TABLE 6-6 ASSESSMENT OF PRESCRIBED IMPACTS

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
Karst, caves, crevices, cliffs, rocks or other geological features of significance	☐ Yes ☒ No	Areas of rocky outcrops are not present within the Subject Land, however, there are areas of imbedded rock where cracking clay soil is present. No karst, caves, crevices, cliffs or other geological features of significance are present.	There are no significant geological features, such as caves, cliffs, or large rocky outcrops. While there are areas of imbedded rock present throughout the area, these do not constitute key habitat features associated with target threatened species. Therefore, no further assessment is necessary.
Human-made structures	☒ Yes ☐ No	Human-made structures subject to impacts as a result of the Project include fences and gates.	Raptors and other avian species are known to frequently use human-made structures for foraging, perching and nesting. While current human-made structures may be removed during construction of the Project, it is noted that additional fencing and infrastructure will be installed with the Project and therefore there is no expected limitation to the availability of this feature and no further assessment is required.
Non-native vegetation	☒ Yes ☐ No	Areas comprised of non-native vegetation or lacking vegetation entirely occur throughout the Subject Land. These areas are subject to high levels of disturbance, largely due to continued grazing.	Areas of Category 1 – Exempt Land comprise habitat occupied by the Hunter Valley Delma <i>Delma vescolineata</i> . This requires assessment.
Habitat connectivity	☒ Yes ☐ No	Habitat connectivity linking the Subject Land to bushland remnants via vegetation corridors occurs predominant to the south of the Project Area.	Impacts to habitat corridors may occur along riparian zones. This requires assessment.

Feature	Present	Description of feature characteristics and location	Threatened entities that use, are likely to use, or are part of the habitat feature.
		Little habitat connectivity occurs centrally within the Subject Land.	
Waterbodies, water quality and hydrological processes	☒ Yes ☐ No	There is an artificial waterbody (farm dam) and drainage embankments that occur throughout the Subject Land that may be subject to alteration of water quality or hydrological processes.	A farm dam occurs within the Subject Land, however, will be avoided and not removed. This may provide habitat for threatened frog species. An assessment of impacts on these is provided.
Wind turbine strikes	☐ Yes ☒ No	Not applicable	Not applicable
Vehicle strikes	☒ Yes ☐ No	The Project will include the construction of internal access tracks and use of existing roads and tracks within the Subject Land.	Ground-dwelling species such as the Spot-tailed Quoll are most at risk of vehicle strike resulting from the Project. Mitigation measures will be implemented to reduce the risk of vehicle strike.

6.1.2.5 IMPACTS ON MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The Supplementary SEARs require the EIS to identify each EPBC Act listed threatened species and community likely to be impacted by the Project.

The threatened species and ecological communities that require assessment are:

- Central Hunter Valley Eucalyptus Forest and Woodland CEEC;
- Spotted-tail Quoll (*Dasyurus maculatus maculatus*, SE mainland population);
- Hunter Valley Delma (*Delma vescolineata*);
- Austral Toadflax (*Thesium australe*); and
- Pink-tailed Worm-Lizard (*Aprasia parapulchella*).

The habitat descriptions for each of the assessed MNES are provided in Section 8.7.1.1 of the BDAR (**Appendix G**).

The assessment for the above mentioned MNES in the BDAR in accordance with the supplementary SEARs determined no significant residual impact have been identified, meaning that no additional offsets are required to redress impacts on these MNES. The assessment of each MNES species is summarised below.

Central Hunter Valley Eucalyptus Forest and Woodland CEEC

It was determined that one patch of PCT 3485 of greater than 0.5 ha within the Assessment Area forms part of the Central Hunter Valley Eucalyptus Forest and Woodland Commonwealth listed community.

The development will result in the permanent removal of approximately 2.07 hectares of vegetation mapped as Central Hunter Valley Eucalypt Forest and Woodland (refer to **Table 6-3**). This includes loss of canopy, midstorey and ground layer vegetation, as well as associated habitat features such as logs, tree hollows, and native understorey.

There is a predicted loss of 0.04% to 0.12% of the CEEC across its range and this impact will be offset in accordance with the BAM.

Avoid and minimise measures have been considered and general mitigation measures are proposed to reduce impacts (refer to **Section 6.1.3**).

On balance it is considered that the Project is likely to have a neutral impact. This is premised on the outcomes of avoid, minimise and mitigate actions proposed in addition to offsetting through the BOS plus retention/management of woodlands.

It is concluded that a low likelihood of significant residual impact is predicted to occur. No additional offsets are required.

Spotted Tail Quoll

The Spotted Tail Quoll (*Dasyurus maculatus*) is listed as Endangered under the EPBC Act. This species is known to inhabit a variety of environments including forests, woodlands, coastal heathlands and rainforests.

Most areas designated for development in the Project are already cleared and do not support woodland habitat. The Spotted Tail Quoll has been recorded within the Project Area and historical records confirm the species' presence, including sightings on adjacent properties and PCT 3485 - woodland provides suitable habitat.

The Project would result in the loss of an estimated 2.10 ha of PCT 3485 - woodland (habitat). However, the Project has been designed to avoid areas of CEEC where possible to minimise the loss of this vegetation. The Project avoids adversely impacting the integrity and/or connectivity of larger vegetation patches that may be important to an individual of this species and preserves riparian corridors to significantly reduce potential impacts (refer to **Table 6-3**).

As a result, the Project is unlikely to lead to a decline in population size, a reduction in area of occupancy, or fragmentation of important populations occurring on-site. The Project is not likely to have a significant impact on this MNES. No additional offsets are required.

Hunter Valley Delma

The Hunter Valley Delma (*Delma vescolineata*) is endemic to the Hunter region of New South Wales. It is listed as Endangered under the EPBC Act, known almost entirely from a 25km wide corridor between Maitland and Muswellbrook, NSW. The Hunter Valley Delma occurs within selected grassland areas of the Project Area, with a preference for grasslands formed on more clayey soils with seasonal cracking.

The habitat present within the Project Area has historically been subject to disturbance and is largely fragmented. The proposed disturbance is unlikely to exceed 109.45 ha of potential habitat in this landscape. This potential habitat within the Project Area is unlikely to be impacted to the point where the species will experience decline.

The clearing of native vegetation for the development will result in the irreversible loss of 0.85 hectares of potential habitat for the Hunter Valley Delma. This net decrease of available foraging, sheltering, and breeding habitat may compound effects on the species that is already constrained by fragmentation and land-use change within the broader landscape.

The Project may have an adverse significant impact on this MNES. Residual impacts have been identified and will be offset through the BOS using like for like species credits (refer to **Table 6-4**). Avoid and minimise measures have been considered and general mitigation measures are proposed to reduce impacts (refer to **Section 6.1.3**).

Austral Toadflax

Austral Toadflax (*Thesium australe*) is a hemiparasitic herb dependent on the presence of a small number of native grasses for survival. Its patchy distribution, small and declining populations, and specific ecological dependencies make it vulnerable to local extinction. To date, this species has not been confirmed to occur on site during survey and no habitat of importance to the species has been identified within the Project Area. Therefore, the Project is unlikely to have an adverse significant impact on this MNES. No significant residual impact is predicted.

Pink-tailed Worm-Lizard

The Pink-tailed Worm-lizard (*Aprasia parapulchella*) occurs primarily in scattered populations across the Central Southern Tablelands and the South Western Slopes. The species inhabits rocky hilltops and slopes with sparse native grassland or open woodland vegetation. *Aprasia parapulchella* depends on well-embedded, weathered surface rocks, typically of volcanic or metamorphic origin (e.g. rhyolite, granite, shale), that provide critical shelter and thermoregulatory sites.

Within the Project Area, widespread evidence of soil compaction, decline in native grass cover, and exotic species dominance, particularly in zones near watering points and slope bases are inconsistent with the habitat requirements of Pink-tailed Worm-lizard. The Project is not likely to have a significant impact on this MNES. No additional offsets are required.

6.1.3 MITIGATION AND MANAGEMENT

Mitigation measures for prescribed impacts, and residual and indirect impacts are listed below in **Table 6-7**.

TABLE 6-7 BIODIVERSITY MITIGATION AND MANAGEMENT MEASURES

ID	Mitigation and Management Measures
B1	Residual impacts on habitat will be offset by retiring biodiversity credits through the NSW BOS.
B2	During the construction period, potential habitat areas for <i>Diuris tricolor</i> shall be delineated with fencing and no-go zones to prevent inadvertent trampling.
B3	Clear boundaries are to be created using fencing, tape, etc. to ensure that no retained vegetation adjacent to the project boundary is impacted by edge effects.
B4	During the clearing activities and the construction of the Project, plant and machinery will be cleaned of any foreign soil and propagative material prior to being transported to the construction areas to prevent the spread of weeds.
B5	Weed management procedures will be implemented to prevent the spread of weeds both inside and outside the site. Ongoing weed monitoring is to be implemented, and potential weed infestations appropriately managed to minimise the spread of weeds.

ID	Mitigation and Management Measures
B6	Speed limits should be applied and enforced throughout the Project Area to minimise the potential for impacts to threatened species that may result from interactions with Project vehicles and activities.
B7	Hours of construction would be restricted to standard construction working hours. Construction and environmental management controls will be implemented to reduce overall noise, dust, and light spill.
B8	Erosion and sediment control will be implemented and maintained during the project construction and operation phases.

6.2 ABORIGINAL HERITAGE

An Aboriginal Cultural Heritage Assessment Report (ACHAR) has been prepared to assess the potential impacts the construction and operation of the Project may have on Aboriginal cultural heritage and to identify mitigation and risk management measures to avoid or minimise these impacts, (**Appendix H**).

The scope of the ACHAR included:

- Review of the landscape and natural resources of the Project Area to establish background parameters;
- Consultation with Aboriginal communities in relation to the Project;
- Research of Aboriginal cultural heritage literature and archaeological records on a regional and local context, including review of the Aboriginal Heritage Information Management System database and other relevant databases;
- Three field survey programs within the Project Area across 11 September 2024 and 4 December 2024. The aims of the field surveys were to:
 - Cover a representative sample of the Project Area that will potentially be impacted by the Project;
 - Record all Aboriginal objects, sites, or places identified during surveys;
 - Identify areas of Potential Archaeological Deposits (PADs) that may be present; and
 - Collect information to ascertain whether further archaeological investigation is required.

6.2.1 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 appropriate mitigation and management measures can be proposed.

Aboriginal community consultation was undertaken in accordance with the Consultation Requirements (DECCW, 2010a). A log and copies of correspondence with Aboriginal community stakeholders is presented in Appendix A of the ACHAR (**Appendix H**).

In particular, the consultation included:

- 20 individuals / groups registered to be consulted, and constitute the RAPs for the Project;
- RAPs were invited to participate in the site surveys undertaken in September 2024 and December 2024; and

- The RAPs were provided with the initial draft and revised final version of the ACHAR to provide comments and any recommended management and mitigation measures.

Consultation undertaken for each engagement stage is further detailed in Section 4 of the ACHAR (**Appendix H**).

6.2.2 EXISTING ENVIRONMENT

Prior to colonial settlement, the Central Lowlands of the Hunter Valley were inhabited by the Wonnarua people. The country of the Wonnarua has been described as encompassing extensive grasslands with few trees and extensive floodplains. The grasslands are thought to have occurred through continual burning by Aboriginal people, as part of their responsibility to look after the land and as a hunting strategy; fire stick farming was a major economic activity of the Wonnarua people. It is unclear how many Aboriginal people lived in the Hunter Valley prior to the arrival of colonists, however, the population declined dramatically following settlement.

The Project Area is located within the Sydney Basin Bioregion Interim Biogeographic Regionalisation for Australia (IBRA) 5.1). The Sydney Basin Bioregion consists of a geological basin filled with near horizontal sandstones and shales of Permian to Triassic age that overlie older basement rocks of the Lachlan Fold Belt. Erosion by coastal streams has created a landscape of deep cliff gorges and remnant plateaus across which an east-west rainfall gradient and differences in soil control the vegetation of eucalypt forests, woodlands, and heaths.

The Project Area is located within the Hunter subregion of the Sydney Basin bioregion and is associated with several key landscape features including the Hunter River, Macquarie-Tuggerah Lakes, and the ridgelines associated with the Hunter Range, Liverpool Range, and Great Dividing Range. The Project Area is encompassed within two Mitchell Landscapes; the western area is within the Upper Hunter Channels and Floodplain (Uhc) and the eastern area is within the Central Hunter Foothills (Chf). The Project Area includes a variety of landforms including gullies / drainage lines, as well as low lying alluvial flats and steep slopes. The eastern portion of the Project Area comprises substantial ridgeline features.

The Hunter subregion, encompassing the Project Area, is largely defined by the river basins of the Hunter River and the Macquarie-Tuggerah Lakes, which are in part defined by the ridge lines associated with the Hunter Range, Liverpool Range, and Great Dividing Range. The Project Area is adjacent to the Hunter River which would have been heavily frequented by Aboriginal people as an attractive locale for camping and as a source of fresh water.

Geologically, the Hunter Subregion is underlain by the Hunter Coalfield which extends for approximately 50 km north-west from Cessnock to Muswellbrook and a further 120 km north to Murrurundi. The Project Area comprises four soil landscape units; the Hunter, Dartbrook, Liddell, and Bayswater. The soil landscapes across the Project Area have the potential to support the development of archaeological deposits. The deposits may, however, have been subject to significant displacement associated with sheet wash and erosion.

6.2.3 IMPACT ASSESSMENT

The archaeological potential of an area is determined by its landform, surrounding environment, and level of historical disturbance. Certain landforms are conducive to both Aboriginal occupation and the survivability of subsurface deposits.

The location of these landforms in proximity to natural resources (e.g. water, food) increases the likelihood that these landforms would have been used by Aboriginal people in the past.

The Project Area has been delineated into areas moderate and high Aboriginal heritage sensitivity. Areas of high sensitivity include areas within 100 m of drainage lines and high points, areas of moderate sensitivity include areas beyond 100 m of drainage lines.

An assessment of the Aboriginal cultural heritage significance of the Project Area has been completed in accordance with the requirements of the ACHAR Guide.

- The Project Area is considered to demonstrate moderate social and cultural significance as a tangible connection between the current landscape and past Aboriginal occupation of the area. It is also significant as a component of the landscape associated with the Wanaruah's cultural story of the Hungry Lizard;
- The Project Area is considered to demonstrate low historic significance as there is no historic evidence in the ethnographic literature or within the Aboriginal community for specific use or memories within the Project Area;
- The vegetated areas along drainage lines and high points largely maintain a connection to the pre-Contact landscape through the presence of a variety of native trees and plant species, however, these areas also contain significant amounts of regrowth and weeds and as such have low to moderate aesthetic value; and
- Portions of the modified agricultural landscape within the Project Area maintain a connection to the pre-Contact landscape through the presence of a variety of native trees and plant species. However, these areas also contain significant amounts of regrowth and weeds and therefore have low to moderate aesthetic value.

A search of the AHIMS database of the Project Area (with a 2 km buffer) and two separate field surveys were conducted to inform the ACHAR.

The key findings are shown in **Figure 6-4** and summarised below:

- Four previously registered Aboriginal sites are within the Project Area, all consisting of Artefacts;
- 12 new Aboriginal sites were identified within the Project Area as part of the development of this ACHAR (comprising Artefacts and Potential Archaeological Deposits (PADs));
- Based on the current development footprint, harm to 11 sites has been identified (either site extents or their buffer, if applied);
- Of these 11 sites, six will be directly impacted by the development footprint:
 - AHIMS # 37-2-6033: Artefact;
 - AHIMS # 37-2-6579: Artefact;
 - AHIMS # 37-2-6608: Artefact;
 - DBESS 01: Artefact (multiple);
 - DBESS 12: Artefact (isolated); and
 - DBESS 13: Artefact (multiple).
- Five other sites have the potential to be impacted as the development footprint extends into the site buffer;
 - DBESS 02: Artefact (multiple), PAD;

- DBESS 03: Artefact (multiple), PAD;
- DBESS 04: Artefact (multiple), PAD;
- DBESS 05: Artefact (multiple), PAD; and
- DBESS 10: Artefact (multiple), PAD.
- The development footprint will not impact the PAD site extents, and therefore test excavations are not required.

Potential impacts to Aboriginal cultural heritage will be managed as follows:

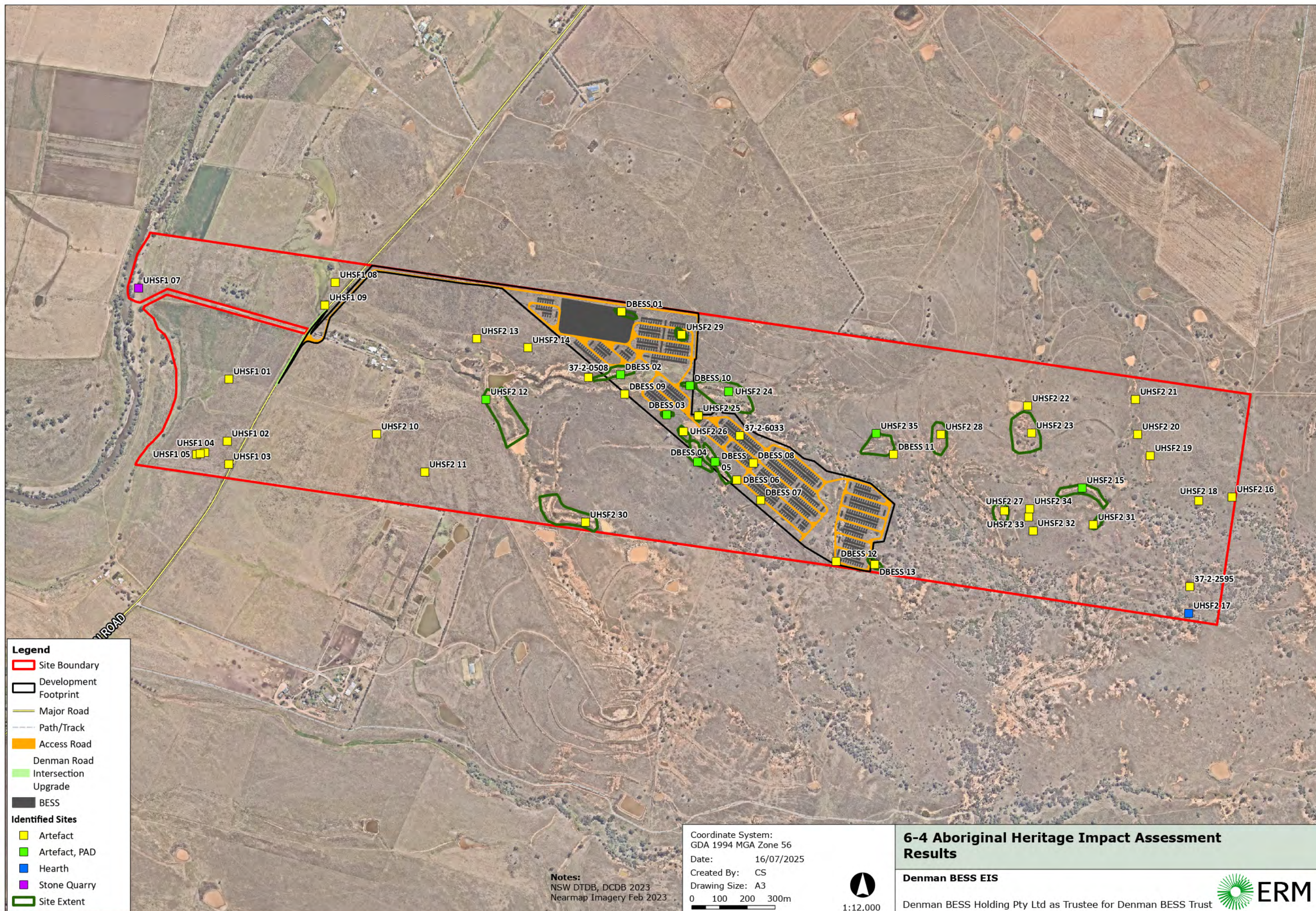
- Where possible, a buffer of at least 50 m will be provided to recorded PADs to limit impacts to identified Aboriginal sites as well as identified associated cultural values. This would affect the following sites:
 - DBESS 02: Artefact (multiple), PAD;
 - DBESS 03: Artefact (multiple), PAD;
 - DBESS 04: Artefact (multiple), PAD;
 - DBESS 05: Artefact (multiple), PAD; and
 - DBESS 10: Artefact (multiple), PAD.
- An ACHMP must be developed to record and describe the processes and procedures required to be implemented regarding Aboriginal cultural heritage prior and during the construction and operational phases of the Project in consultation with the RAPs.

6.2.4 MITIGATION AND MANAGEMENT

The impacts to Aboriginal sites will be avoided through implementation of specific mitigation and management measures as detailed in **Table 6-8**.

TABLE 6-8 ABORIGINAL HERITAGE MITIGATION AND MANAGEMENT MEASURES

ID	Mitigation and Management Measures
AH1	During detailed design, a buffer of at least 50 m should be provided to recorded PADs numbered DBESS 02, DBESS 03, DBESS 04, DBESS 06, DBESS 10).
AH2	An ACHMP will be developed to record and describe the processes and procedures required to be implemented regarding Aboriginal cultural heritage prior to and during the construction and operational phases of the Project. The ACHMP will be developed in partnership with the Traditional Owners.
AH3	Where harm to sites is unavoidable through detailed design, archaeological test excavation and/or archaeological salvage excavation should be undertaken for the areas of PADs which will be subject to harm as a result of clearing the disturbance footprint.



6.3 HISTORIC HERITAGE

An Historic Heritage Due Diligence report has been prepared to inform this EIS (**Appendix I**). The historic heritage assessment included desktop investigations and field surveys undertaken by ERM personnel on 11 September 2024 and 4 December 2024 (refer Section 1.4 of **Appendix I**). The Historic Heritage Due Diligence also addresses the requirements of the SEARs (**Appendix A**), in consideration of relevant stakeholder engagement as described in **Section 5**, and consideration of the Burra Charter, 'NSW Heritage Manual' (Heritage Office, 1996), and relevant Practice Notes.

6.3.1 EXISTING ENVIRONMENT

The Project Area has remained largely undisturbed from substantial impacts and has been characterized by agricultural activities since the nineteenth century. There are no places within the Project Area listed under the World Heritage List Commonwealth Heritage List, National Heritage List, State Heritage Register or the Muswellbrook LEP.

6.3.2 IMPACT ASSESSMENT

Archaeological field surveys were undertaken in September and December 2024 and did not identify any potential historic sites within the Project Area or within its immediate vicinity. There are no direct or indirect impacts to built heritage items or significant view lines as a result of the project. However, should any archaeological remains be present, these are unlikely to provide a substantive contribution to research questions relevant to the early history of the site or local area, that is not available from other sources. As such, the proposed works will result in little to no archaeological impact.

6.3.3 MITIGATION AND MANAGEMENT

There are no historic built heritage sites or archaeological constraints within or in the vicinity of the Project Area. Notwithstanding, an Unexpected Finds Protocol will be developed and applied to any historic heritage finds as described in **Table 6-9**.

TABLE 6-9 HISTORIC HERITAGE MITIGATION AND MANAGEMENT MEASURES

ID	Mitigation and Management Measures
HH1	An Unexpected Finds Protocol for historic heritage will be developed and implemented as follows: - where a potential historic heritage item is found during works, all works within the vicinity of the item, or with the potential to impact the item should cease and a temporary exclusion zone established; - an appropriately qualified heritage consultant should examine the item to assess its significance and further archaeological potential; - where a relic is found, the NSW Heritage Council should be notified (in accordance with Section 146 of the <i>Heritage Act 1977</i>) and approval will likely be required prior to the continuation of works. Other archaeological deposits should be recorded and assessed for significance and potential salvage by an appropriately qualified heritage consultant; and - Depending on the nature of the discovery, additional assessment and approval under the <i>Heritage Act 1977</i> may be required prior to the recommencement of excavation in the affected area.
HH2	In the event that relics are unexpectedly exposed, works should cease immediately. The management of relics should be in accordance with NSW Heritage guidelines and policies, as outlined in the Unexpected Finds Protocol;

6.4 SOILS AND AGRICULTURE

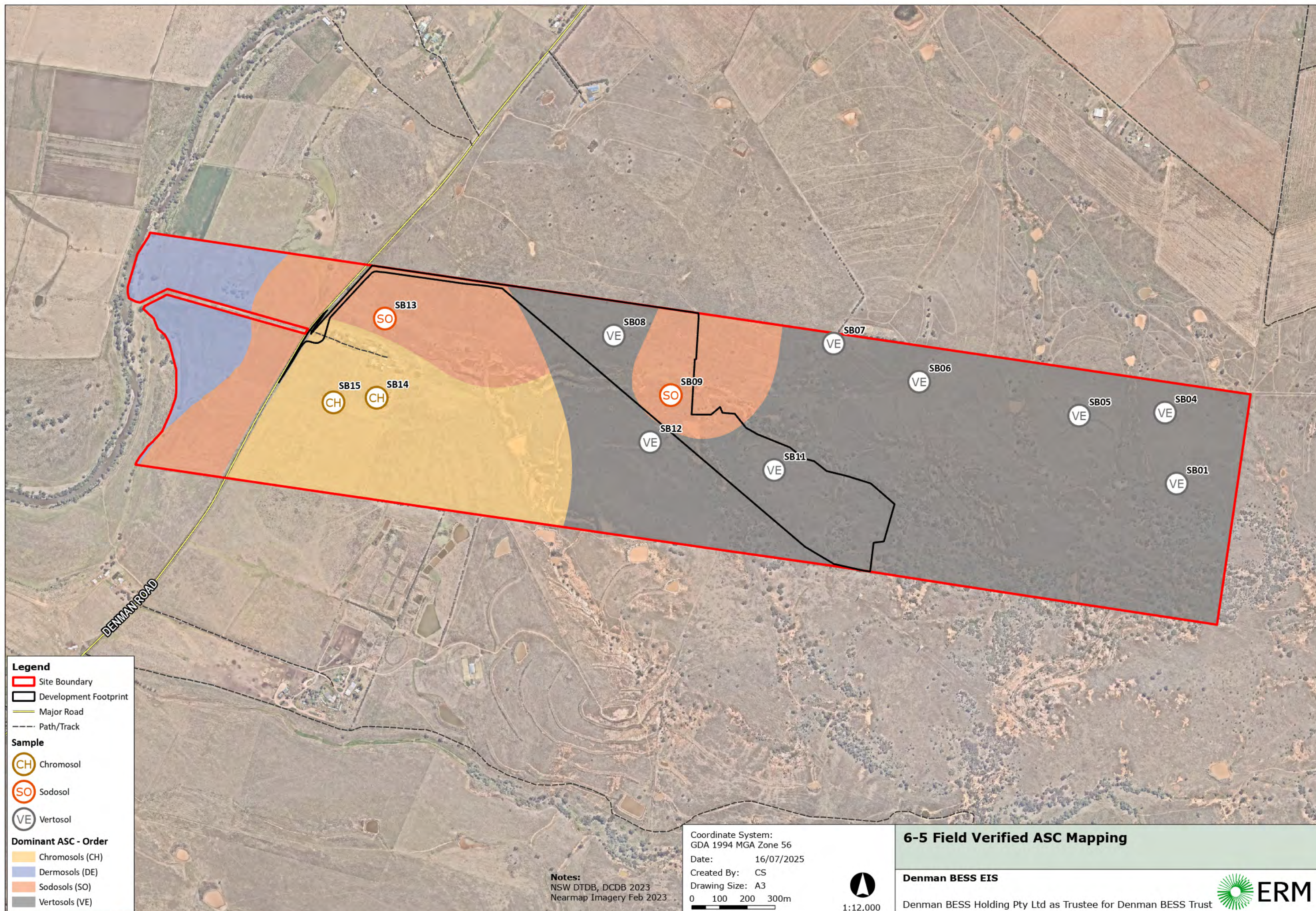
A Land and Agricultural Impact Assessment (LAIA) (**Appendix L**) has been prepared for the Project in line with relevant guidelines, policy and literature, and addresses the project-specific SEARs. The LAIA has considered the following guidelines, policy and literature. A 'Level 2 – Reduced' agricultural impact assessment is required for the Project Area (refer Appendix A of the *Large-Scale Solar Energy Guideline*).

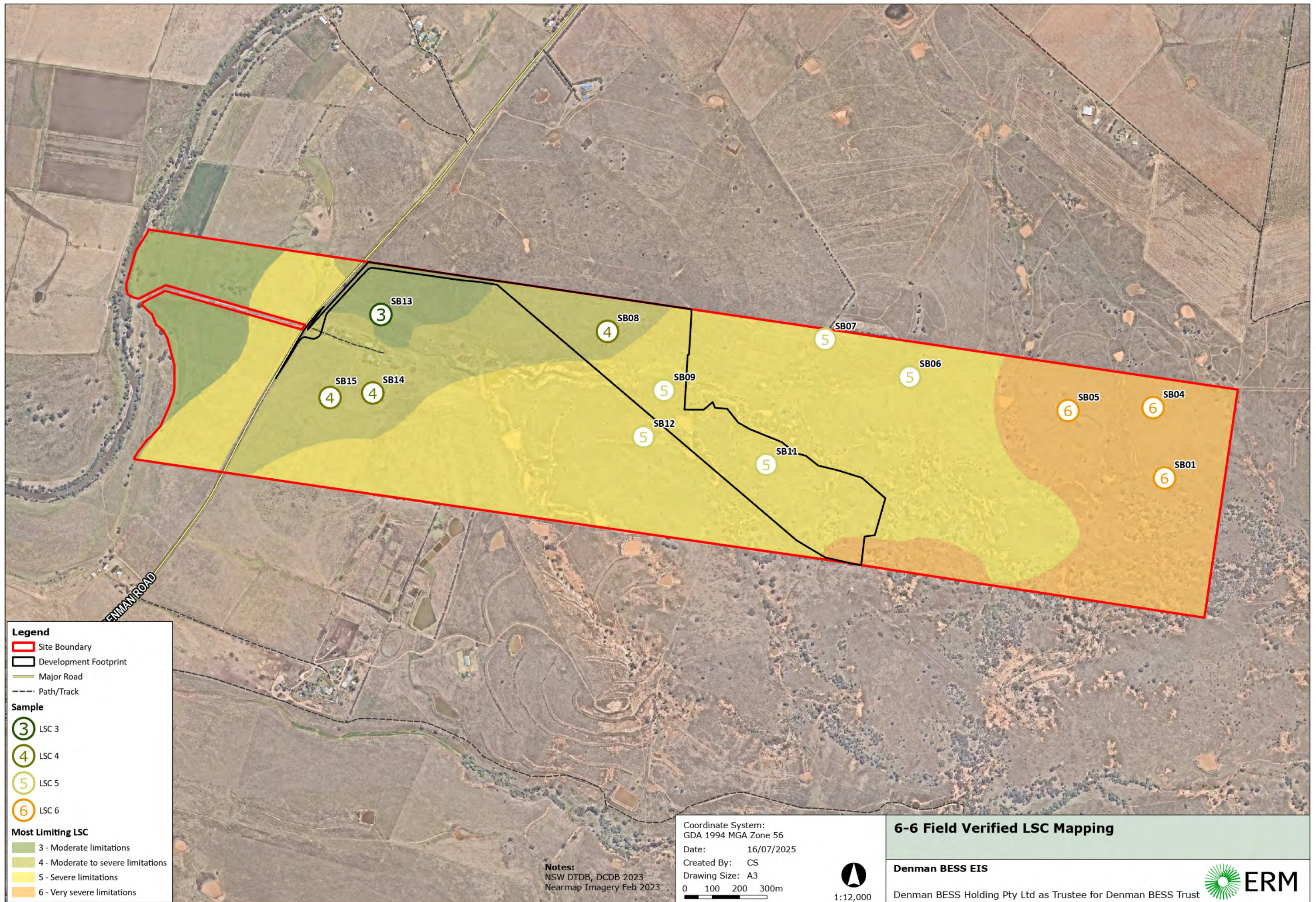
6.4.1 EXISTING ENVIRONMENT

The Project Area is characterised by undulating hills with the elevation ranging from approximately 119 to 254 m Australian Height Datum (AHD). The Project Area is currently used for small scale cattle grazing. There are general agricultural improvements on the site, including a set of cattle yards, various troughs, unsealed access tracks, erosion banks and waters pumps and dams. No sensitive agricultural activities such as intensive cropping or intensive grazing are being undertaken on the Project Area or its surrounds.

Field surveys were undertaken including soil samples at 13 sites within the Project Area, of which nine were within the proposed development footprint. The soil type mapping and soil verification have confirmed the following characteristics:

- The dominant soil type within the Project Area is Sodosols (**Figure 6-5**);
- The Project Area contains Class 4, 5 and 6 land, which indicates that the Project Area is moderate to low capability land. The spatial extent of each verified LSC class is shown in **Figure 6-6**;
- There is no BSAL mapped within the proposed Development Footprint, however there is BSAL mapped land to the west near the Hunter River. No BSAL is anticipated to be impacted as a result of the Project;
- No potential acid sulfate soils are expected to occur across the Project Area (NSW DPE, 2024). The probability of encountering acid sulphate soils within the locality is considered low;
- The inherent fertility of soils across the Project area was moderately low;
- The erosion risk within the Project Area is low and does not present limitations to the activities proposed for the site (i.e. agriculture and construction); and
- There are signs of sheet gully erosion throughout the centre of the Project Area, associated with the drainage line/floodway suggesting that there is potential for erosion to occur.





6.4.2 IMPACT ASSESSMENT

6.4.2.1 IMPACTS ON AGRICULTURAL LAND

The LAIA considered the potential impacts of the Project on agricultural land and soil. The key findings of the LAIA are as follows:

- The Project will remove 38.6 ha of land currently used for small scale cattle grazing as a hobby farm. At the end of the Project, following decommissioning, the land could be returned back to the current level of agricultural productivity;
- The Project is not likely to impact agricultural activities occurring on the surrounding properties;
- The Project will require land clearing to construct access tracks, infrastructure and facilities, underground trenching for cabling and BESS construction pads. The removal of topsoil and soil displacement from these activities will be limited to the Development Footprint;
- Changes to water flow paths may result from the installation of infrastructure. Progressive rehabilitation of cleared areas during construction phase will be carried out to maintain soil stability and reduce the likelihood of erosion;
- Water required during the construction and operation of the Project will be sourced from the existing farm dams, where available, or from off site;
- Removal of ground cover can lead to higher levels of erosion hazard. Potential erosion and sediment impacts can be effectively managed through the implementation of an Erosion and Sediment Control Plan (ESCP);
- Construction activities, intensified vehicle movements and imported materials within the Project Area will increase the risk of pest species (fauna and weeds) being introduced to the region. Biosecurity measures will be implanted in the Construction Environmental Management Plan (CEMP) and the Operational Environmental Management Plan (OEMP); and
- Air emissions from the Project are considered unlikely to be significant and will be limited to vehicle emissions or dust emissions from bare earth. Dust suppression methods will be implemented in the CEMP and OEMP.

6.4.2.2 IMPACTS ON AGRICULTURAL PRODUCTIVITY

Within the Muswellbrook Shire LGA, 130,500 ha are used for livestock production, of which 87,000 ha is grazing native vegetation. The livestock commodity value in the region is estimated to be worth \$20.95M.

The primary impact to agriculture productivity is the removal of land used for cattle grazing. The Project Area native grazing pasture equates to less than 1% of the total land use for livestock production within the Muswellbrook Shire LGA. The annual productivity of the Project Area is estimated to range from \$5,384 - \$8,964, which will be lost as a result of the Project. This is considered negligible compared to the overall agricultural activity of the Hunter Region.

Secondary impacts associated with the loss of land to agriculture such as employment within the agricultural industry and other employment such as agriculture supporting industries is considered unlikely to have a material impact to local providers due to the scale of operation currently occurring on the Project Area.

Following decommissioning, the Project Area will be rehabilitated to the same standard as prior to the construction of the BESS. All infrastructure from the Project will be removed up to the top 0.5m of soil.

6.4.2.3 LAND USE CONFLICT RISK ASSESSMENT

Land use conflicts occur when one land user is perceived to infringe on the rights of or impact the values or amenity of another. A Land Use Conflict Risk Assessment (LUCRA) has been prepared (**Appendix L**) and assesses the Project surrounding land uses and activities for incompatibility and conflicting issues.

The LUCRA identified two items that could represent a potential moderate impact to surrounding agricultural land including:

- **Water Quality:** run off from surface disturbance activities resulting in changes to local water quality, quantity and surface water flows; and
- **Bushfire:** potential risk of fire from mechanical failure, resulting in bushfire risk, loss of livestock and loss of life.

The LUCRA concluded that with 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.

6.4.3 MITIGATION AND MANAGEMENT

Table 6-10 summarises the mitigation measures to be implemented for the Project to ensure negligible impact on agricultural resources and enterprise.

TABLE 6-10 SOIL AND AGRICULTURE MITIGATION AND MANAGEMENT MEASURES

ID	Mitigation and Management Measures
SA1	• The Applicant will develop a CEMP, OEMP and an ESCP that addresses specific erosion risks. • Soil that will be disturbed will be stripped and re-used in rehabilitation measures on site to mitigate long term risks on-site.
SA2	• Biosecurity protocols will be implemented in the CEMP and OEMP. • Weeds will be managed in accordance with the Biosecurity Act 2015 and the relevant regional strategic weed management plans and in consultation with landowners.
SA3	• At the end of the Project operations, the ground condition will be returned to the condition that existed prior to the Project construction, in accordance with the Decommissioning and Rehabilitation Strategy that will be developed for the Project; • Underground infrastructure (such as cables and footings) will be removed where practical to a depth of 0.5 m below ground surface, but may otherwise remain; and • Any contamination or waste would be removed or managed in consultation with the landowners and according to regulations and weed infestations will be controlled during the decommissioning process, as possible. • A Decommissioning and Rehabilitation Plan will be prepared within 5 years prior to the completion of Project operations.

6.5 LANDSCAPE AND VISUAL

The Landscape Character and Visual Impact Assessment (LCVIA) was undertaken by Moir Landscape Architecture Pty Ltd (Moir Studio) to assess the potential visual impacts the Project may have on the character, values, and amenity of the surrounding landscape. The LCVIA also provides recommendations to mitigate the potential impacts resulting from the Project. The LCVIA is provided in **Appendix K**.

The LCVIA was prepared in accordance with the Large-Scale Solar Energy Guideline and 'Technical Supplement - Landscape and Visual Impact Assessment' (Landscape and Visual Technical Supplement) (NSW DPE, 2022b) and addresses SEARs requirements relating to potential visual impact.

6.5.1 EXISTING ENVIRONMENT

A baseline analysis and landscape character assessment was undertaken to assess and identify the existing character of the Study Area, which was defined as all land within 5 km of the Development Footprint (as per the Landscape and Visual Technical Supplement). Fieldwork was conducted in October 2024.

A total of four LCZs were identified in the Study Area, each of which were assigned a scenic quality rating based on the Scenic Quality Frame of Reference and the visual reference for scenic quality values. 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. A summary of the landscape character is provided in **Table 6-11**.

The Project is located in LCZ01 (Agricultural Pastures) classified land, which is the dominant LCZ in the Study Area. LCZ02 (vegetated Watercourses) is characterised by the Hunter River, and LCZ04 (Mining Landscapes) is associated with the Mount Arthur Coal Mine. LCZ03 (Vegetated Slopes) is associated with undulating to steep terrain with dense vegetation with minimal human interference, located south of the Project Area.

TABLE 6-11 LANDSCAPE CHARACTER SUMMARY

LCZ	Ratings			
	Scenic Quality	Sensitivity	Magnitude	Landscape Character Impact
LCZ01	Low	Very low	Low	Low
LCZ02	Low	Low	Low	Low
LCZ03	Low	Moderate	Low	Low
LCZ04	Very low	Very low	Very low	Very low

6.5.2 IMPACT ASSESSMENT

In accordance with the Landscape and Visual Technical Supplement, the visual impact assessment was broken down into three assessment stages: Simple Assessment, Intermediate Assessment and Detailed Assessment. A description of each assessment methodology is provided in the LCVIA (**Appendix K**).

6.5.2.1 SIMPLE ASSESSMENT

Simple Assessment Tools were applied to identify public and private viewpoints that require further assessment, and eliminate those that are likely to experience very low to low visual impacts. This assessment is based on vertical and horizontal field of view that a development is likely to occupy when viewed from each viewpoint, and is influenced by distance, height elevation changes, and width of a project. Viewshed mapping was undertaken based on a maximum panel height of 2.5 m.

The assessment identified seven public receptors within 2.5 km of the Project and 36 non-associated dwellings within 4 km of the Project. Land to the west of the Project was identified as having the highest theoretical visibility of the Project, with limited opportunity to view the Project from the east. There were 17 non-associated dwellings determined to have no visibility of the Project, with the remaining 19 having potential line of sight to the Project. No lots with dwelling entitlements were identified within 4 km of the Project.

Reverse viewshed mapping, which only considers the 19 non-associated dwellings with visibility of the Project, determined that a majority of the Project Area has low visibility from surrounding dwellings, and no further assessment is required.

Of the four identified public receptors identified, two were assessed as low visual impact and two were assessed as very low visual impact, therefore no further assessment is required.

Figure 6-7 illustrates the location and visual impact of the assessed public and private receptors.

6.5.2.2 INTERMEDIATE ASSESSMENT

No viewpoints require an Intermediate Assessment as all viewpoints were determined as Low to Very Low visual impact rating.

6.5.2.3 DETAILED ASSESSMENT

No viewpoints require a Detailed Assessment as all seven private viewpoints were determined as Low to Very Low visual impact rating.

6.5.2.4 ASSOCIATED INFRASTRUCTURE

In addition to the proposed BESS modules, the associated infrastructure has the potential to contrast with the existing visual landscape. Due to the relatively low scale and siting of the Project, access roads, transmission lines and other ancillary infrastructure are unlikely to alter the existing visual landscape outside of the immediate vicinity.

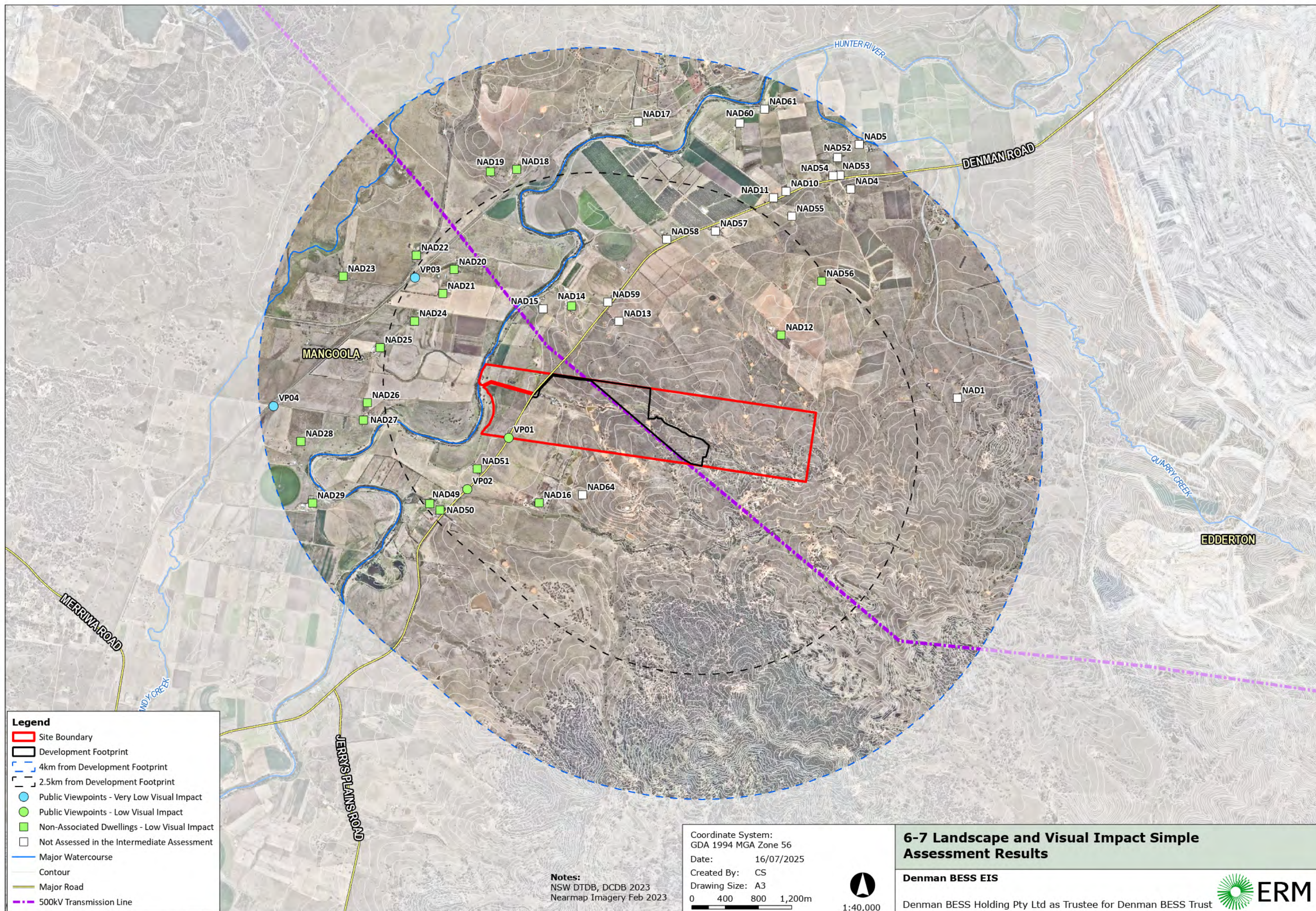
Due to the undulating topography and existing intervening elements such as vegetation and surrounding ancillary buildings, views of associated infrastructure from private viewpoints are limited. Infrastructure may be visible from public viewpoints such as Denman Road; however, the overall visual impact is considered low due to the area's low visual sensitivity and low scenic quality.

6.5.3 MITIGATION AND MANAGEMENT

Note, mitigation is required for receptors with a moderate visual impact or higher only. The proposed mitigation measures are presented in **Table 6-12**.

TABLE 6-12 VISUAL MITIGATION AND MANAGEMENT

ID	Mitigation Measures
LV1	Retain and protect the existing vegetation present around the Project Area to maintain the existing level of screening and to reduce the overall visual impact
LV2	Incorporate setbacks to infrastructure to allow for on-site screening where required in the form of perimeter planting
LV3	Consideration of the height of ancillary structures to ensure the Project does not contrast significantly with the surrounding landscape
LV4	Consider the colours of the ancillary structures to ensure minimal contrast and to help blend into the surrounding landscape to the extent practicable.
LV5	Adoption of lighting practices in consideration of the 'Dark Sky Planning Guideline' (DPE, 2023c) and 'The National Light Pollution Guidelines for Wildlife' (DCCEE, 2023) including: - Control the level of lighting by only using lighting for areas that require lighting (e.g., paths and building entry points), and reducing the duration of lighting (e.g., switch off lighting when not required and use of sensors); and - Light design considerations such as lowest intensity, energy efficient bulbs and warm colours, light directed downwards, close as possible to the ground and not directed at reflective surfaces, use of non-reflective dark coloured surfaces, and use of light shield fittings.



Legend

- Site Boundary
- Development Footprint
- 4km from Development Footprint
- 2.5km from Development Footprint
- Public Viewpoints - Very Low Visual Impact
- Public Viewpoints - Low Visual Impact
- Non-Associated Dwellings - Low Visual Impact
- Not Assessed in the Intermediate Assessment
- Major Watercourse
- Contour
- Major Road
- 500kV Transmission Line

Notes:
NSW DTDB, DCDB 2023
Nearmap Imagery Feb 2023

Coordinate System:
GDA 1994 MGA Zone 56
Date: 16/07/2025
Created By: CS
Drawing Size: A3
0 400 800 1,200m
1:40,000

6-7 Landscape and Visual Impact Simple Assessment Results

Denman BESS EIS

Denman BESS Holding Pty Ltd as Trustee for Denman BESS Trust

ERM

6.6 NOISE

A Noise Impact Assessment (NIA) has been prepared to assess the potential noise impacts associated with the construction and operation of the Project (**Appendix J**). The NIA responds to the relevant SEARs (**Appendix A**) and considers all relevant stakeholder engagement described in **Section 5**. The NIA was prepared in accordance with the following policies and guidelines:

- *NSW Interim Construction Noise Guideline (ICNG)* (DECC, 2009);
- *Noise Policy for Industry (NPI)* (NSW EPA, 2017); and
- *NSW Road Noise Policy (RNP)* (NSW DECCW, 2011).

The NIA is supported by a noise model which was developed to predict noise levels generated during the construction and operation of the Project and the potential impacts at the identified sensitive receivers. A detailed methodology can be found in Section 5.1 and Section 6.1 of **Appendix J**.

6.6.1 EXISTING ENVIRONMENT

The noise environment in the vicinity of the Project and at noise sensitive receivers is best described as rural residential. Rural residential is described in the NPI (EPA, 2017) as an area with an acoustical environment that is dominated by natural sounds (such as foliage noise, birdsong and insect noise) having little or no road traffic noise and is generally characterised by low background noise levels. Settlement patterns (rural residential) would be typically sparse.

Potential noise-sensitive receivers within 2 km of the Project boundary have been identified and assessed within the NIA. There are 16 sensitive noise receivers with the closest being about 741 m from the Project boundary.

The background noise levels at the noise sensitive receivers within 2 km of the Project are expected to be similar to the minimum assumed rating background levels (RBLs) specified in Table 2.1 of the NPI. The RBLs are:

- 35 dB(A) during the day-time period defined as 7am to 6pm (Monday to Friday) and 8am to 6pm (Sundays and Public Holidays);
- 30 dB(A) during the evening period defined as 6pm to 10pm; and
- 30 dB(A) during the night-time period defined as 10pm to 7pm (Monday to Saturday) and 10pm to 8am (Sundays and public holidays).

For this assessment, noise monitoring was not conducted and instead the minimum assumed RBLs were adopted.

6.6.2 IMPACT ASSESSMENT

6.6.2.1 CONSTRUCTION NOISE AND VIBRATION

Construction works are expected to occur only during the recommended standard day-time hours recommended in the ICNG (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturday; no work on Sundays or public holidays).

The project-specific construction Noise Management Levels (NMLs) are presented in **Table 6-13** below.

TABLE 6-13 CONSTRUCTION NOISE MANAGEMENT LEVELS

Time of Day	Daytime Rating Background Level, dB(A)	Noise Affected Management Level, $L_{eq(15\ min)}$, dB(A)	Highly Noise Affected Management Level, $L_{eq(15\ min)}$, dB(A)
Residential - Recommended Standard Hours	35	45	75

The main contributors of construction noise would be the padfoot roller, the drum roller, the cranes and the small pile driving rigs. The potential noise impacts from this equipment were assessed in the following worst-case construction noise scenarios:

- **CON 1** - Site preparation and establishment - A drum roller and a padfoot roller at the Site boundary fronting a sensitive receiver and operating continuously for 15 minutes;
- **CON 2** - Delivery of infrastructure – Two cranes at the Site boundary fronting a sensitive receiver and operating continuously for 15 minutes; and
- **CON 3** - General construction of infrastructure – Two small pile driving rigs at the Site boundary fronting a sensitive receiver and operating continuously for 15 minutes.

Under a worst-case noise scenario, the construction noise sources are assumed to be at the boundary of the site fronting the nearest sensitive receivers, representing the shortest separation distance between noise source and receiver.

The predicted noise levels are summarised as follows:

- The ICNG 'noise affected' management level (45 dB(A) $L_{eq(15\ min)}$) represents the point above which there may be some community reaction to noise. The 'noise affected' management level is exceeded at:
 - 3 Sensitive Receivers for construction scenario CON 1;
 - 4 Sensitive Receivers for construction scenario CON 2; and
 - 7 Sensitive Receivers for construction scenario CON 3;
- The ICNG 'highly noise affected' management level (75 dB(A) $L_{eq(15\ min)}$) represents the point above which there may be a strong community reaction to noise. No exceedance of the 'highly affected' management level at any of the sensitive receivers is expected for all construction scenarios; and
- The main noise contributors are the drum roller, the padfoot roller, the cranes and the small pile driving rigs, as defined in the worst-case construction noise scenarios.

Table 6-14 presents the predicted noise construction levels for each worst-case construction scenario at the noise sensitive receivers within 2 km of the Project. The predicted construction noise levels of each individual construction noise source are presented in full in Table 5-2 of the NIA.

TABLE 6-14 PREDICTED CONSTRUCTION NOISE LEVELS

Sensitive Receiver ID	Noise affected NML (dB) $L_{Aeq}(15 \text{ min})$	Highly noise affected NML (dB) $L_{Aeq}(15 \text{ min})$	Scenario (dB) $L_{Aeq}(15 \text{ min})$			Compliance with noise affected NML CON1/CON2/CON3 (dB) $L_{Aeq}(15 \text{ min})$
			CON 1	CON 2	CON 3	
NAD13	45	75	47	48	52	No (+2) / No (+3) / No (+7)
NAD15	45	75	46	47	51	No (+1) / No (+2) / No (+6)
NAD14	45	75	46	47	51	No (+1) / No (+2) / No (+6)
NAD64	45	75	45	46	50	Yes / No (+1) / No (+5)
NAD59	45	75	44	45	49	Yes / Yes / No (+4)
NAD51	45	75	43	44	48	Yes / Yes / No (+3)
NAD16	45	75	42	43	47	Yes / Yes / No (+2)
NAD12	45	75	40	41	45	Yes / Yes / Yes
NAD21	45	75	40	41	45	Yes / Yes / Yes
NAD24	45	75	39	40	44	Yes / Yes / Yes
NAD20	45	75	39	40	44	Yes / Yes / Yes
NAD50	45	75	39	40	44	Yes / Yes / Yes
NAD49	45	75	39	40	44	Yes / Yes / Yes
NAD58	45	75	39	40	44	Yes / Yes / Yes
NAD25	45	75	38	39	43	Yes / Yes / Yes
NAD26	45	75	38	39	43	Yes / Yes / Yes

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

The highest construction noise impact will only be experienced for a short duration when activities are closest to the receivers. Although construction noise may be audible, the noise impact to residents and other noise sensitive receivers surrounding the site can be managed.

In terms of vibration impacts, the safe working distances for typical vibration causing plant in construction range from 7 to 100 m to trigger a human response (TfNSW, 2016). There are no vibration sensitive receivers within this range and therefore vibration impacts are not expected from the project.

A construction noise and vibration management plan (CNVMP) will be prepared and will include noise mitigation and management measures. A draft CNVMP containing noise mitigation measures has been included in Appendix B of **Appendix J**.

6.6.2.2 OPERATIONAL NOISE

The NIA considers the lowest of the intrusive or amenity residential receiver criterion so that the most stringent threshold is set concerning existing industrial noise in the area (refer Section 4.2 of **Appendix J**).

Point Noise Trigger Levels (PNTLs) have been established with regard to the requirements of the NPI for all identified residential and other sensitive (industrial) receivers. PNTLs for all associated assessment periods are provided as noise emitting sources, and will always be operational to some degree.

The predicted operational noise levels indicate that the PNTLs are likely to be exceeded at one sensitive receiver location only (NAD64) under noise enhancing meteorological conditions as defined by the NPI, by 2 dB in both evening and night-time assessment periods. Compliance with the day-time PNTLs are predicted to be achieved at all noise sensitive receivers.

The Project has considered the application of all source and pathway feasible and reasonable noise mitigation measures to reduce noise impacts at NAD64, as follows:

- Quieter equipment including inverters fitted with silencer kits have been selected to minimise the sound emission at source;
- Appropriate fan duty loads for the battery units have been implemented for the day, evening and night-time assessment periods; and
- The use of noise barriers to mitigate noise along the sound transmission path has been investigated, however, modelling results indicate that noise barriers will only provide minimal noise reduction at receiver locations where PTNL exceedances are predicted. The marginal noise benefit of applying noise barriers for the Project is not economically viable. Following consultation and discussion with the Applicant, no sound transmission pathway noise mitigation measures in the form of noise barriers are recommended.

The PNTLs for the Project are dictated by the project intrusiveness noise levels for all assessment periods. By meeting the PNTLs at the remaining identified sensitive receivers, the noise levels at all other receivers located further away from the Project are expected to comply with the noise criteria of the NPI.

The potential for sleep disturbance from maximum noise level events from the development during the night-time period needs to be considered. Sleep disturbance relates to both awakenings and disturbance to sleep stages.

A detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater; and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

The night-time noise levels subject to a detailed maximum noise level event assessment are therefore $L_{Aeq,15min}$ 40 dB(A) and/or L_{AFmax} 52 dB(A).

PNTLs have been determined in **Table 6-15** and are the more stringent level between the Project intrusiveness noise level and the Project amenity noise criteria for all assessment periods.

TABLE 6-15 NSW NPI CRITERIA FOR RESIDENTIAL RECIEVERS

Time of Day	Project Intrusiveness Noise Level $L_{Aeq,15min}$ dB(A)	NPI Amenity Noise Level $L_{Aeq,period}$ dB(A)	Project Amenity Noise Level $L_{Aeq,15min}$ dB(A)	Project Noise Trigger Level $L_{Aeq,15min}$ dB(A)	Sleep Disturbance $L_{Aeq,15min} / L_{Amax}$ dB(A)
Day	40	50	48	40	-
Evening	35	45	43	35	-
Night	35	40	38	35	40 / 52

Notes:

^a Day-time period is from 7am to 6pm (Monday to Saturday) and 8am to 6pm (Sundays and Public Holidays; Evening period is from 6pm to 10pm and Night-time period is from 10pm to 7am (Monday to Saturday) and 10pm to 8am (Sundays and Public Holidays).

^b Based on RBL as noted in Table 4-2 of Appendix J.

^c These levels have been converted to $L_{Aeq, 15 \text{ minute}}$ using the following: $L_{Aeq, 15 \text{ minute}} = L_{Aeq, period} + 3 \text{ dB}$ (Reference: Section 2.2 of the NPI).

^d To account for the existing industrial noise sources, '-5 dB' was applied to the Project Amenity Noise Level (Reference: Section 2.4 of the NPI).

Predicted operational noise levels at the nearest sensitive receivers within 2 km of the Project boundary for the day, evening and night-time noise enhancing meteorological conditions are displayed in **Table 6-16**. Operational noise contours are displayed in **Figure 6-8** and **Figure 6-9**. With the exception of NAD64, the predicted noise levels indicate compliance with the relevant PNTLs across day, evening and night-time. No additional noise mitigation or management measures are required.

TABLE 6-16 PREDICTED OPERATIONAL NOISE LEVELS

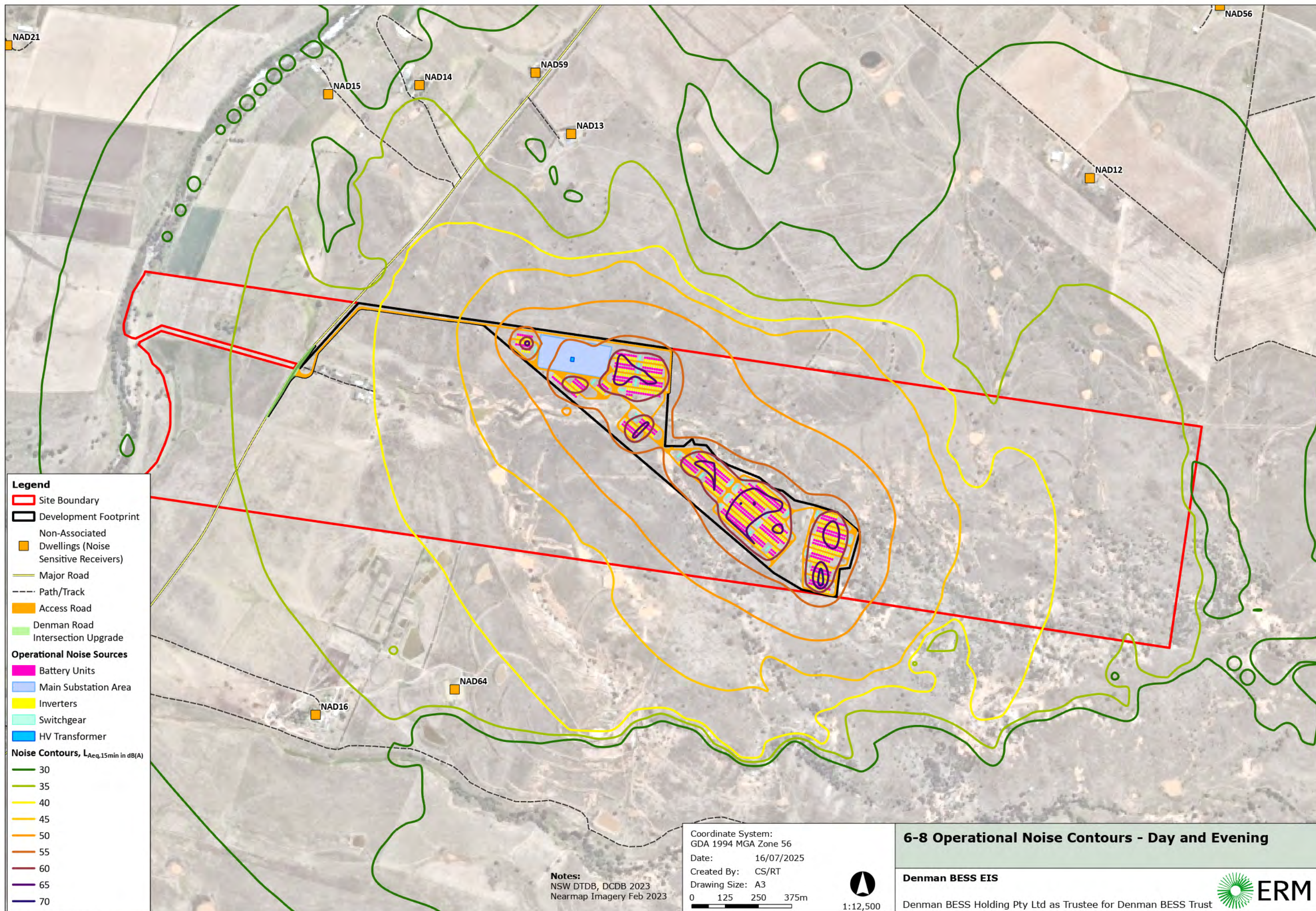
Sensitive Receiver ID	Distance to Project Boundary, in metres	Assessment Criteria, PNTLs in $L_{Aeq,15 \text{ min}}$, dB(A) Day / Evening / Night-time	Predicted Operational Noise Level for Noise Enhancing Meteorological Conditions* in, $L_{Aeq,15 \text{ min}}$, dB(A)		
			Day	Evening	Night-time
NAD13	741	40 / 35 / 35	32	32	32
NAD15	790	40 / 35 / 35	32	32	32
NAD14	840	40 / 35 / 35	35	35	35
NAD64	847	40 / 35 / 35	37	37	37
NAD59	949	40 / 35 / 35	30	30	30
NAD51	1095	40 / 35 / 35	31	31	31
NAD16	1267	40 / 35 / 35	34	34	34
NAD12	1569	40 / 35 / 35	34	34	34
NAD21	1624	40 / 35 / 35	28	28	28
NAD24	1684	40 / 35 / 35	27	27	27

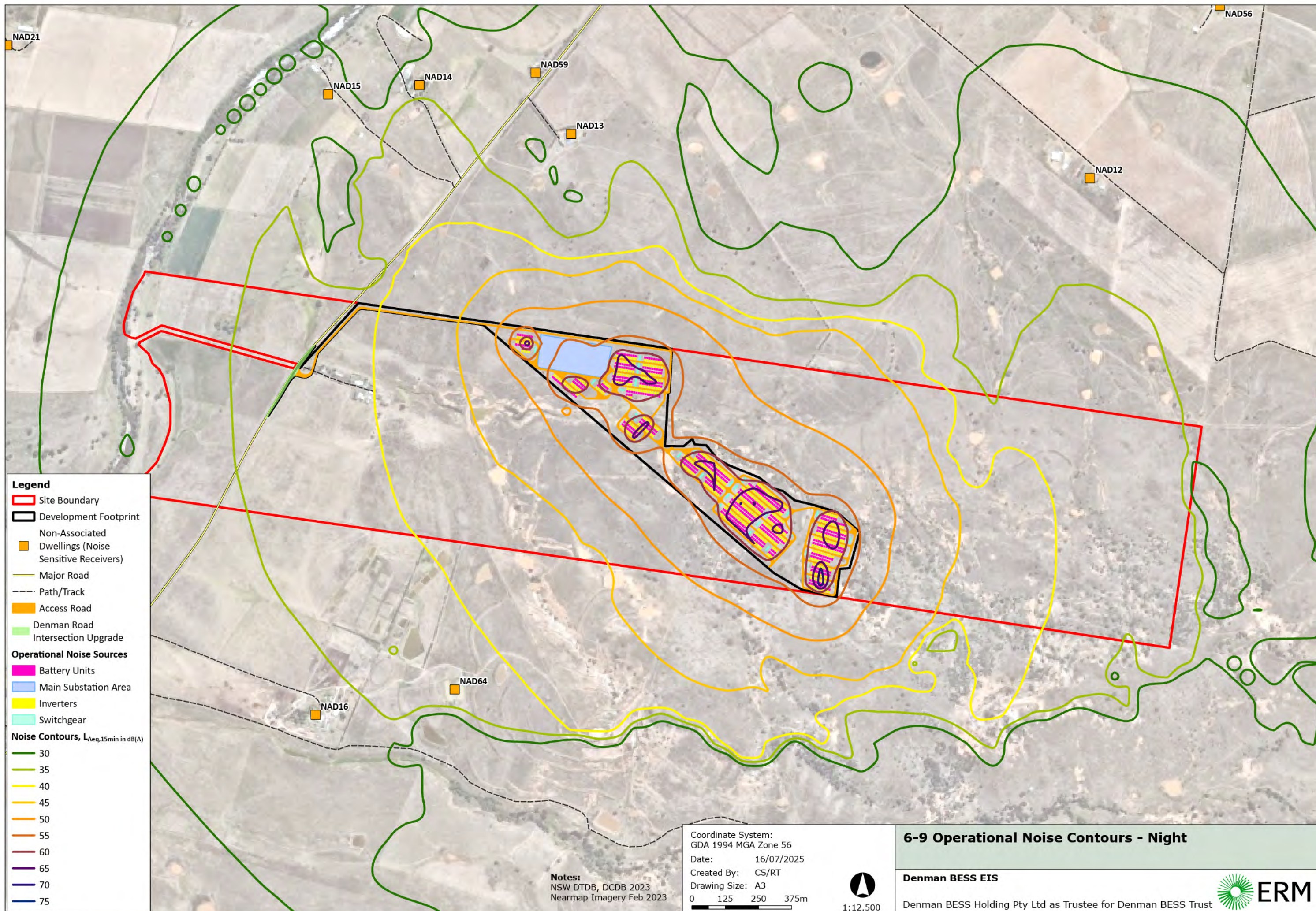
Sensitive Receiver ID	Distance to Project Boundary, in metres	Assessment Criteria, PNTLs in $L_{Aeq,15 \text{ min}}$, dB(A) Day / Evening / Night-time	Predicted Operational Noise Level for Noise Enhancing Meteorological Conditions* in, $L_{Aeq,15 \text{ min}}$, dB(A)		
			Day	Evening	Night-time
NAD20	1723	40 / 35 / 35	27	27	27
NAD50	1759	40 / 35 / 35	28	28	28
NAD49	1784	40 / 35 / 35	27	27	27
NAD58	1797	40 / 35 / 35	28	28	28
NAD25	1926	40 / 35 / 35	25	25	25
NAD57	2041	40 / 35 / 35	27	27	27
NAD56	2379	40 / 35 / 35	28	28	28

Note:

* Day/Evening: stability categories A–D with light winds up to 3 m/s at 10 m AGL.

** Night: 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.





6.6.2.3 TRAFFIC NOISE

The RNP criteria applicable to the nearest residences affected by additional road traffic due to the Project are presented in **Table 6-17**. It should be noted that the RNP criteria is applicable to a permanent road traffic scenario. Use of the RNP criteria for assessment of construction traffic noise, which is temporary, is considered conservative.

TABLE 6-17 RNP RESIDENTIAL ROAD TRAFFIC NOISE CRITERIA

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

Note: The assessment criteria for external noise levels apply at 1 metre from the façade of any affected residential receiver.

Noise sensitive receiver NAD59 located north of the site (approximately 40 m west of Denman Road) was selected to be the assessment location. Among all the noise sensitive receivers, NAD59 is the most sensitive and has the highest potential to be affected by construction traffic noise.

The predicted construction road traffic noise levels at NAD59 complies with the daytime RNP criteria during a worst-case peak construction traffic during both hours of arrival and departure of the workers during peak construction. The peak construction period is expected to last 6-9 months.

6.6.3 MITIGATION AND MANAGEMENT

Identified construction noise and construction traffic noise impacts will be managed through the mitigation measures that are proposed in **Table 6-18**. It is noted that no operational mitigation measures are required since the predicted operational noise levels indicate compliance.

TABLE 6-18 NOISE MITIGATION AND MANAGEMENT MEASURES

ID	Mitigation Measure
N1	Noise generating work and activities should be (as proposed) limited (where possible) to the ICNG recommended standard hours (i.e., 7am to 6pm Monday to Friday and 8am to 1pm Saturdays and no work on Sundays or public holidays).
N2	Where an equipment item operates close to the Project Boundary and these works are anticipated to generate high levels of noise, (e.g. > 45 dB(A) at a sensitive receiver) potential respite periods should be applied (e.g., three hours of work, followed by one hour of respite).
N3	Appropriate plant, equipment and/or machinery for each task should be selected and efficient work practices to minimise the total construction period and the number of noise sources on the site should be adopted.

<i>ID</i>	<i>Mitigation Measure</i>
N4	Unnecessary noise due to idling engines should be avoided. High engine speeds should be avoided when equipment can be powered down and lower engine speeds are feasible.
N5	All plant, equipment and/or machinery used on the site should be in suitable condition, with particular emphasis on exhaust silencers, covers on engines and inspection of squeaking or rattling components. Excessive noise-generating machines should be repaired or removed from the site.
N6	Reversal alarms shall be replaced with broadband “squash duck” motion alarms, where feasible.
N7	If any validated noise complaints are received, operator attended noise validation and compliance measurements should be undertaken to measure and compare the site noise level contributions to the NMLs presented in this report. All site noise levels should 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 this report, further mitigation and/or management measures should be considered.
N8	Unattended noise monitoring systems shall 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.
N9	A CNMP containing noise mitigation and management measures shall be created for the construction phase of this Project.
N10	Consult regularly with the community information about potential noisy activities reasonably ahead of time, including about the duration of the activities, before and after works begin.
N11	Develop a complaints handling procedure for the construction period that sets out measures to respond to and record complaints.
N12	Scheduling of work activities to reduce impacts to affected residents where possible.

6.7 TRANSPORT

A Traffic Impact Assessment (TIA) was undertaken to evaluate the potential construction, operational, and decommissioning traffic and transport impacts, and the access arrangements for the Project (Amber Organisation, 2024; **Appendix N**). The TIA also provides appropriate management measures to ensure that any potential impacts can be avoided or minimised.

The TIA addresses the requirements of the SEARs and has been undertaken in accordance with the Roads and Traffic Authority (RTA) Guide to Traffic Generating Developments and relevant Austroads Guidelines. The TIA was also prepared in consultation with Transport for NSW and Muswellbrook Shire Council and has considered relevant outcomes of stakeholder engagement as described in **Section 5**.

6.7.1 EXISTING ENVIRONMENT

6.7.1.1 EXISTING ROAD NETWORK

The Project is connected to the nearby towns of Denman and Muswellbrook via the surrounding State Road Network, with Denman Road running through the site. Denman Road has a posted speed limit of 100 km/hr and runs in a general northeast-southwest alignment between Sydney Street in Muswellbrook and its intersection with Golden Highway approximately 4 km southwest of the Project Area (**Figure 6-10**).

Review of the TfNSW Centre for Road Safety Crash and Casualty Statistics database for Denman Road between Thomas Mitchell Drive, Muswellbrook and the Golden Highway revealed four incidents with no discernable crash trends between 2018 to 2022. The road network was determined to currently operate in a relatively safe manner, based on the nature of the rural high-speed road environment and associated traffic volumes.

6.7.1.2 TRAFFIC VOLUMES

A tube count survey was undertaken on Denman Road near the proposed site access location to determine the existing road environment. The tube count was undertaken from Monday 5 February to Sunday 11 February 2024. The traffic volume data suggests that Denman Road currently carries a moderate level of daily traffic, split evenly between northbound and southbound vehicles, and accommodates approximately 13% heavy vehicle traffic.

Overall, the survey results indicate that Denman Road can accommodate an increase in vehicle traffic. A summary of the traffic volumes is provided in **Table 6-19**.

TABLE 6-19 DENMAN ROAD TRAFFIC VOLUMES

Survey Location	Weekday Traffic (vpd)	Weekday AM Peak - 8:00 (vph)	Weekday PM Peak - 16:00 (vph)	85th Percentile Speed	Heavy Vehicle Percentage
Northbound	1,327	126	87	101.9 km/hr	13%
Southbound	1,316	70	130	107.5 km/hr	
Both Directions	2,643	196	218	104.7 km/hr	

6.7.1.3 ACCESS AND TRANSPORT SERVICES

The available restricted vehicle access and transport services within the vicinity of the Project Area include:

- **Restricted Vehicle Access:** The Project Area has access to the Class 1 Oversize Overmass (OSOM) Vehicle, B-Double and Special Purpose Vehicle (SPV) Level 4 approved road network via Denman Road;
- **Bus services:** Bus route 415 operated by Osborn's Transport travels along Denman Road between Muswellbrook and Denman during its daily loop service. The service passes the Project Area at approximately 12:15pm in the southwest direction and 12:35pm in the northeast direction; and
- **School buses:** the 'Denman, Muswellbrook, Scone' school bus route operated by Osborn's Transport passes the Project Area at approximately 8:20am in the southwest direction and 8:45am in the northeast direction. During the afternoon, the school bus passes at approximately 2:45pm in the southwest direction and 3:10pm in the northeast direction.

6.7.2 IMPACT ASSESSMENT

6.7.2.1 TRAFFIC GENERATION

Traffic is proposed to access the Project Area via Denman Road, and the Project components are expected to be delivered from the Port of Newcastle. It is anticipated that during peak construction, the Project could generate up to 112 heavy and 200 light vehicle movements per day.

It is noted that a vehicle movement is classified as a vehicle travelling in one direction (e.g., a vehicle would generate one movement towards the Project Area and one movement away from the Project Area when it departs).

During the peak construction period, the Project is expected to generate approximately 128 vehicle movements during the morning and evening peak hours, which would reduce to 64 vehicle movements over the typical construction periods. Heavy vehicle movements will be scattered throughout the day, with even inbound and outbound movements.

Table 6-20 presents the predicted traffic generation during the construction period.

TABLE 6-20 TRAFFIC GENERATION DURING CONSTRUCTION

Vehicle Type	Vehicle Size	Average Vehicle Movements		Peak Vehicle Movements	
		Vehicle Trips per Day (vpd)	Peak Hour Trips (vph)	Vehicle Trips per Day (vpd)	Peak Hour Trips (vph)
Light Vehicle (car / 4WD)		100	50	200	100
Heavy Vehicles	Rigid Trucks / Truck and Dog	40	10	70	20
	Semitrailer / B-Doubles	20	4	40	7
	Non High Risk OSOM	0	0	2	1
	Heavy Vehicle Subtotal	60	14	112	28
Total		160	64	312	128

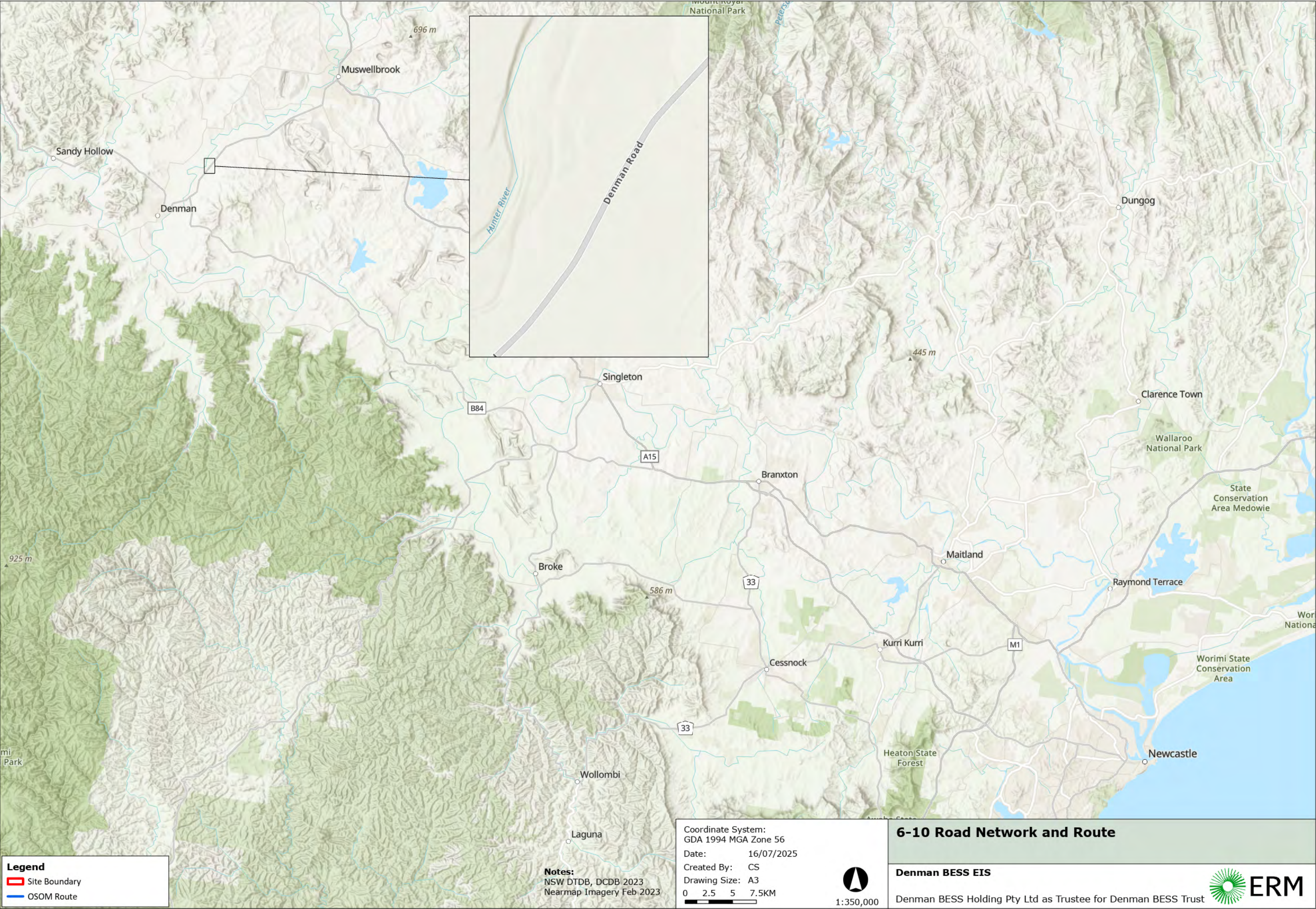
Vehicle movements during operation of the Project would primarily be associated with maintenance and operational services. During operations, there would be a periodic increase in traffic of up to 20 vehicle trips per day associated with the 10 maintenance personnel. This is expected to have negligible impact to the local traffic environment. There would also be the occasional light commercial vehicles delivering parts to the Project Area but only as required for maintenance.

Traffic generation during decommissioning would be similar to traffic generation during the average construction period. A comprehensive Traffic Management Plan would be prepared prior to the decommissioning phase in conjunction with the relevant road authorities. This would aim to ensure adequate road safety and road network operations are maintained.

6.7.2.2 ROUTE ASSESSMENT

The Port of Newcastle has been identified as the location where the majority of the BESS infrastructure will be imported as shown in **Figure 6-10**. Heavy vehicles and OSOM vehicles will use the same route, which is approximately 136 km on length, and utilizes roads that are currently designated for B-Double vehicles.

The route assessment in Appendix A of the TIA (**Appendix N**) confirmed that the proposed OSOM vehicles will be able to access the site with suitable traffic management measures, without the need for any civil works or signage relocation.



6.7.3 SITE ACCESS ONTO DENMAN ROAD

The vehicles will access the site driveway via Denman Road. This access route uses roads that are designated for B-Double vehicles as outlined within the National Heavy Vehicle Regulator Restricted Access Vehicle Map. Accordingly, these routes can accommodate the heavy vehicle movements expected to be generated during construction of the Project.

An assessment of the turn treatments and sight distance has been undertaken for the site access location on Denman Road to ensure vehicles can safely enter and exit the Project Area. Based on the expected traffic volumes at the intersection and in consideration of the cumulative traffic from nearby SSD projects, the intersection would require a Basic Right Turn and Basic Left Turn at a minimum. Notwithstanding, a short Channelised Right Turn and a short Auxiliary Left Turn treatments are proposed to accommodate potential cumulative impacts with nearby projects. The proposed site access design is shown in **Figure 6-11** and the turn treatment design is shown in Appendix E of the TIA (**Appendix N**).

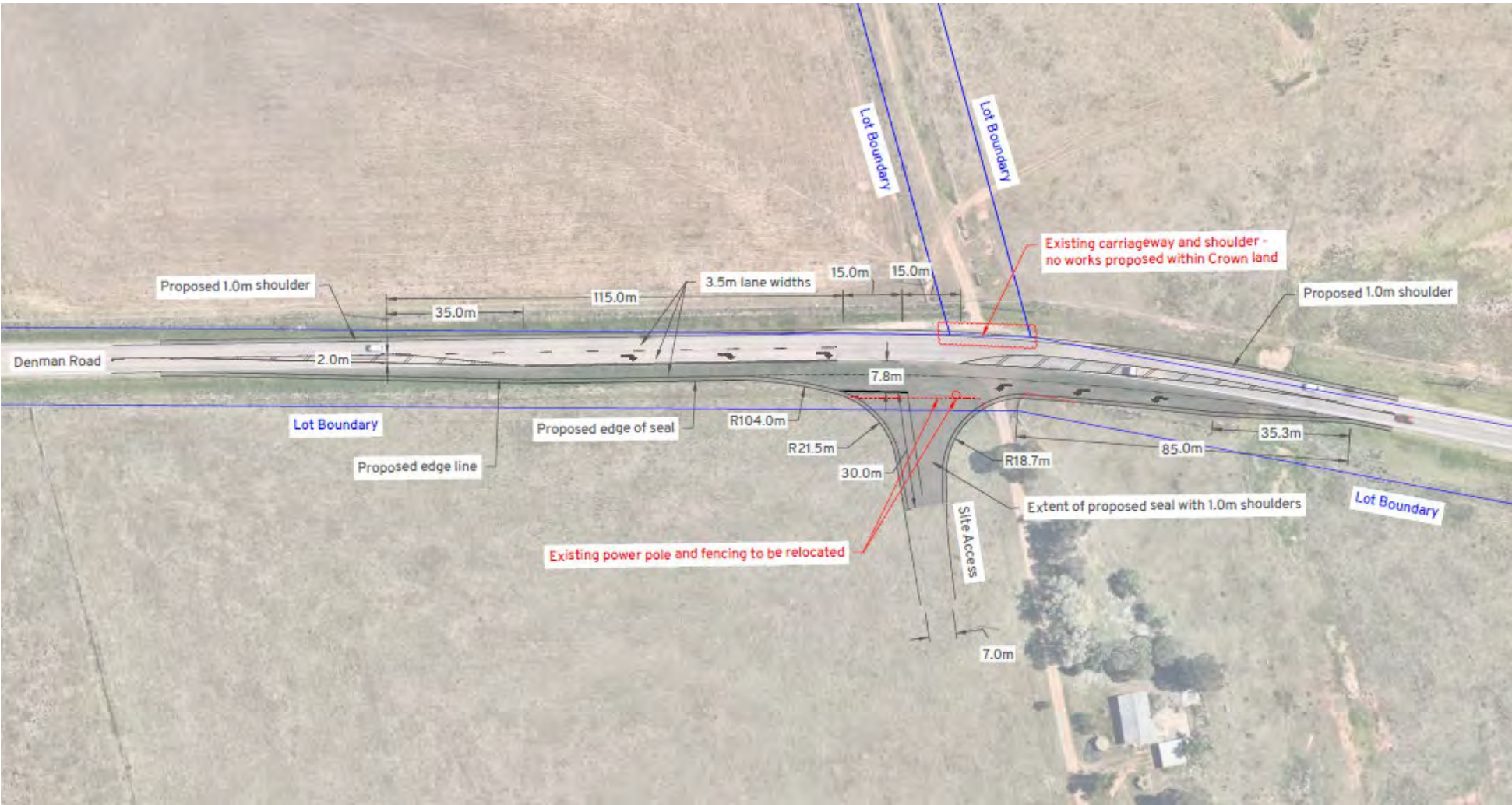


FIGURE 6-11 PROPOSED SITE ACCESS DESIGN

6.7.4 MITIGATION AND MANAGEMENT

The proposed mitigation measures to minimise traffic impacts are included in **Table 6-21**.

TABLE 6-21 TRAFFIC AND TRANSPORT MITIGATION AND MANAGEMENT

ID	Mitigation Measures
TT1	A Traffic Management Plan will be prepared prior to the commencement of construction in consultation with TfNSW and Muswellbrook Shire Council.
TT2	During construction the sections of the road network used by the Project will be monitored and maintained to ensure continued safe use by all road users, and any faults attributed to construction of the BESS would be rectified.
TT3	Neighbours of the Project will be consulted and notified regarding the timing of major deliveries which may require additional traffic control and disrupt access
TT4	Heavy vehicles should avoid travel along Denman Road during peak bus operating time to limit the interaction of larger vehicles and vulnerable road users
TT5	OSOM vehicle trips should 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
TT6	A complaints and safety incident monitoring register will be implemented prior to construction to assist in managing the traffic impacts.
TT7	Specific warning signs will be placed on approaches to and from the transport routes on Council roads, as required, which will advise of the changed traffic operations and heavy vehicle movements.
TT8	Onsite mitigation measures will be implemented, which may include speed restrictions, dust suppression measures, internal access tracks maintenance program, loading, unloading and storage will occur within the Project Area only, and the provision of car parking.
TT9	A Drivers Code of Conduct will be established.
TT10	At the end of construction, a post-condition survey will be undertaken to ensure the road network is left in a condition equivalent to that at the start of construction.
TT11	Road upgrades will be provided as part of the Project which are to be constructed prior to construction commencing. The road upgrade proposed includes Channelised Right Turn and Auxiliary Left Turn treatments at the site access location on Denman Road.

6.8 WATER, HYDROLOGY AND FLOODING

A detailed flooding and hydrology assessment was conducted by Engeny Pty Ltd, with the full report included in **Appendix M**. An assessment considers flooding risks and impact within the Project Area, groundwater and surface water impacts, and impacts to water resources. These assessments were conducted to satisfy the requirements set out by the SEARs (refer to **Appendix A**), and in consideration of relevant policies, plans and guidelines.

6.8.1 FLOODING

6.8.1.1 EXISTING ENVIRONMENT

Initial review of historic flood studies indicated that part of the land to the western side of Denman Road is located within the 20% AEP, 1% AEP and Probable Maximum Flood (PMF) extent of Hunter River. It should be noted that there is no infrastructure proposed to be located within the Hunter River flood extent and that all infrastructure is proposed to be constructed to the east of Denman Road.

Baseline flood modelling indicates that the Project Area is not significantly impacted by overland flow from the local catchment area, and due to the relatively steep terrain within the upper reaches of the Project Area, flows are contained to several minor drainage lines and avoids most of the proposed Project infrastructure.

6.8.1.2 IMPACT ASSESSMENT

A flood model was developed for the Project (refer Appendix A of **Appendix M**). Simulation of design flood events for the 5%, 1%, 0.5%, 0.2% AEP and PMF events were undertaken to determine flood behaviour through the Project Area.

The results from the baseline flood modelling for the Project Area indicated:

- Flooding from the Hunter River does not generally break out above the modelled Hunter River initial water level of 118 m AHD and the Hunter River does not directly flood over Denman Road;
- Overland flow of greater than 50 mm within the site is predominantly contained to the local drainage lines or farm drains for events ranging from the 5% to the 0.2% AEP;
- Peak flood depths range up to 2 m in the local farm dams, 800 mm in the incised channels and are typically less than 250 mm along the farm drains;
- Peak flow velocities are more than 3.5 m/s in the more incised and steep channels;
- Outside of the incised channels, flow is mostly contained to farm drains;
- The presence of multiple farm dams results in multiple areas of ponded water, with peak flood depths ranging from 2 m to 5 m;
- Denman Road is flooded by local catchment overland flows during the baseline 5% AEP event. Model results indicate that the peak flood depth at the road crest is currently up to 200 mm, with a depth velocity product of less than 0.3 m²/s in the 5% AEP;
- The hydrolines in the majority of the Project Area are rated safe for vehicles and people (H1), while the major drainage channels are rated as generally unsafe for vehicles and people (H4, H5 and H6); and

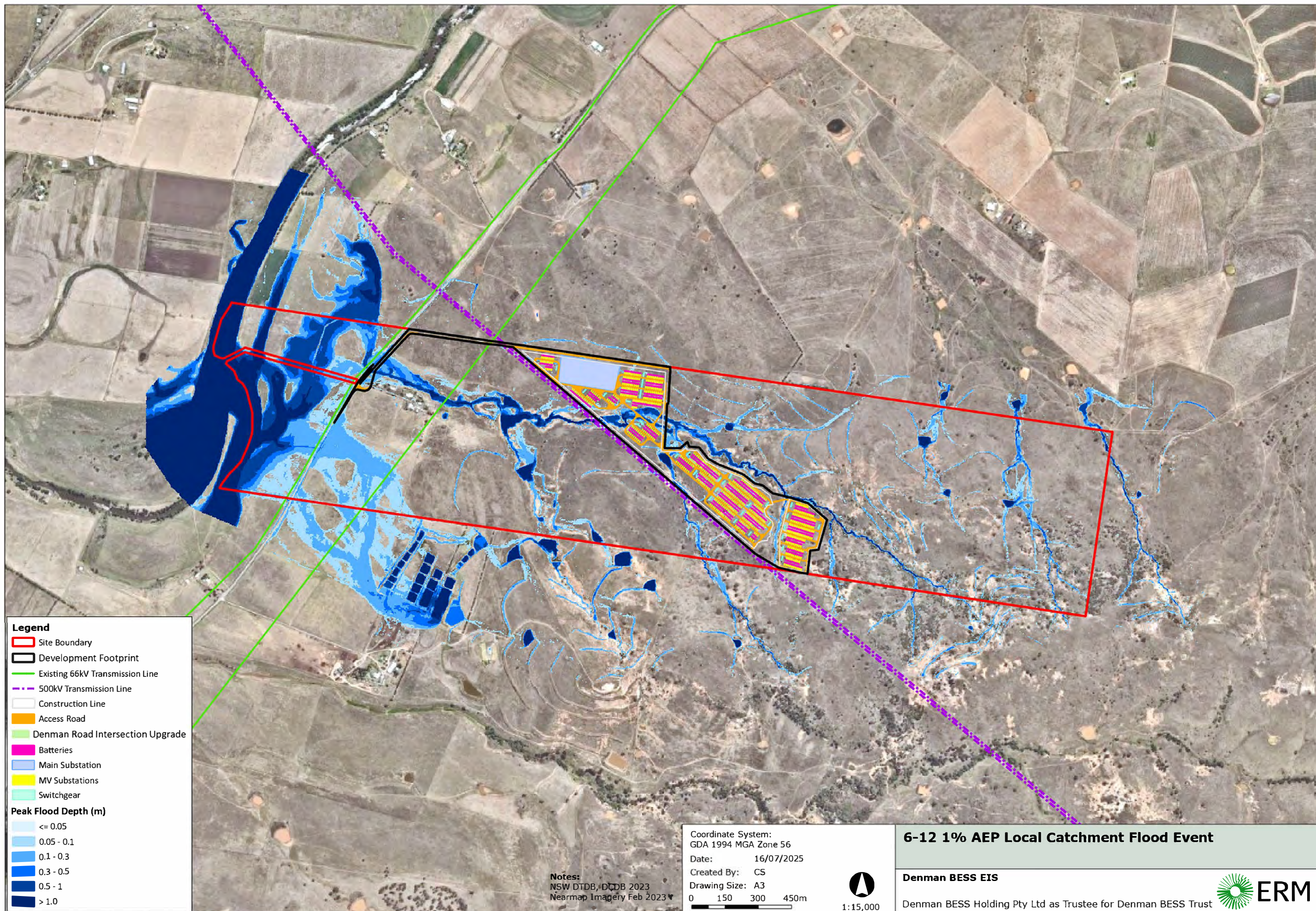
- The flood hazard for Denman Road is predominantly classified as generally safe for vehicles, people and buildings (H1) with some smaller areas beside the main overland flow path classified as unsafe for smaller vehicles (H2) to unsafe for vehicles and people (H5) for the 5% and 1% AEP events. For the 0.5% and 0.2% AEP events, Denman Road is predominantly classified as H1 with some areas on the road in the main overland flow path classified as H2 to H5. For the PMF result, the area in the main overland flow path that has a H5 classification expands, covering a length of around 250 m.

A developed-case (i.e., with the Project area developed) flood model was prepared to assess how, if at all, the 5%, 1%, 0.5%, 0.2% AEP and PMF events may change due to the Project (refer Appendix B of **Appendix M**). The developed-case flood modelling indicates the development of the Project may result in:

- An increase in peak flood depths greater than 100 mm (compared to existing depths) around some of the ancillary infrastructure, typically due to the blockage of overland flow paths by raising the infrastructure, or increases in runoff, is predicted for all AEP events. These flows will be conveyed within the formal drainage system around the infrastructure;
- Increases in modelled peak flood depths greater than 300 mm are observed in the PMF event. This impact occurs due to the presence of the BESS raised platforms constricting the available waterway area in the PMF event;
- Decreases in modelled peak flood depths of up to 0.1 m around proposed local access/site roads. Minor isolated changes within the bed levels crossings may also occur, however, these are considered to have a negligible impact;
- Negligible impacts on peak flood depths at Denman Road;
- Negligible impacts on flood velocity within the Project Area and Denman Road; and
- Negligible changes in flood hazards within the Project Area and with no predicted changes to flood hazards outside of the Project Boundary.

The flood assessment indicates that the Project has minimal potential to impact surrounding properties in the 5%, 1%, 0.5%, 0.2% AEP and PMF events. The only external impacts are potential minor increases to flood depths (by 0.01 m in the 5% AEP) across Denman Road. Denman Road is typically used by vehicle traffic and not pedestrians and a 0.01 m increase is therefore considered minor.

Figure 6-11 and **Figure 6-12** and show the developed-case 1% AEP flood depth and flood hazard results, which demonstrates there are negligible to minor changes in flood levels and velocities as a result of the Project.



Legend

- Site Boundary
- Development Footprint
- Existing 66kV Transmission Line
- 500kV Transmission Line
- Construction Line
- Access Road
- Denman Road Intersection Upgrade
- Batteries
- Main Substation
- MV Substations
- Switchgear

Peak Flood Depth (m)

- <= 0.05
- 0.05 - 0.1
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 1
- > 1.0

Notes:
NSW DTDB, DCDB 2023
Nearmap Imagery Feb 2023

Coordinate System:
GDA 1994 MGA Zone 56

Date: 16/07/2025

Created By: CS

Drawing Size: A3

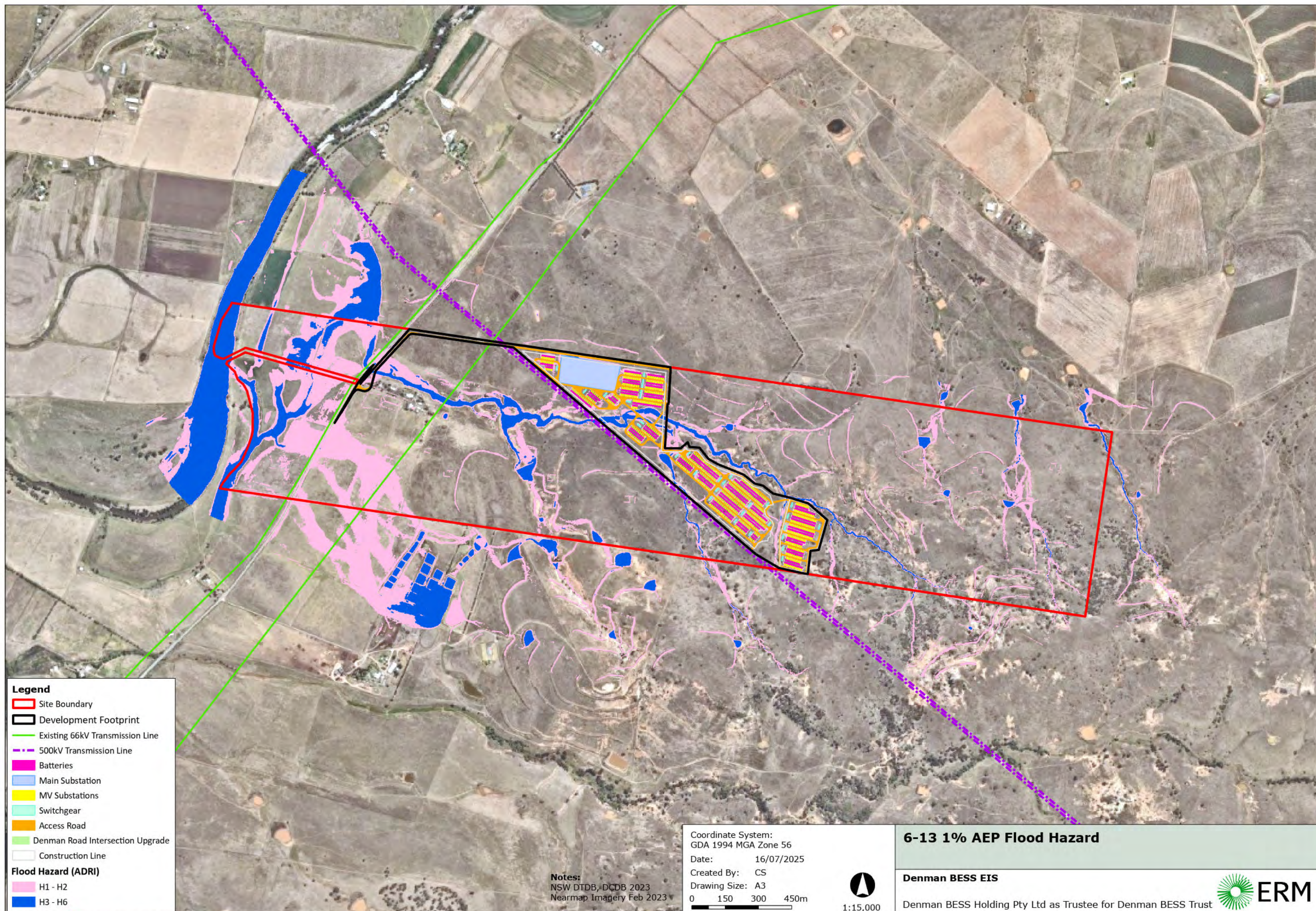
0 150 300 450m



6-12 1% AEP Local Catchment Flood Event

Denman BESS EIS

Denman BESS Holding Pty Ltd as Trustee for Denman BESS Trust



6.8.2 SURFACE WATER

6.8.2.1 EXISTING ENVIRONMENT

Regional Systems

The Project Area is located within the Hunter River catchment in the Upper Hunter region of NSW. The dominant surface water feature within proximity to the Project is the Hunter River, which flows directly adjacent to the western extent of the Project Area in a south-east direction. There are well defined local drainage lines within and surrounding the Project Area, and approximately 10 existing manmade farm dams.

Local Systems

The Project Area contains surface level elevations ranging from approximately 120 m AHD to 250 m AHD. There are two mapped ephemeral drainage lines within the Project Area, the smaller of which has 1st and 2nd order (Strahler classification) drainage lines that intersect the Project Area to the north. The larger drainage line has several 1st and 2nd order drainage lines that converge to a 3rd order drainage line, at the centre of the Project Area before draining to the west and into the Hunter River.

Waterfront Land

Waterfront land is defined as any river, lake or estuary, and the land within 40 m of the riverbanks, lake shore, or estuary mean high-water mark (NSW DPIE NRAR, 2020). It was assessed that all watercourses in the Project Area, including 1st and 2nd order hydrolines, have partially or fully defined bed and banks, indicating waterfront land.

Water Quality and Flow Regimes

The Project Area exists within the Hunter River Basin, and consists of areas with the following classifications:

- Uncontrolled streams - applies to uncontrolled waterways that are not in the other categories. The flow patterns of these streams are largely natural; and
- Waterways affected by irrigation drainage - applies to natural and semi-natural waterways whose flows are now dominated for substantial periods by irrigation drainage. Flow and water quality are therefore largely unnatural.

Water Quality Objectives and River Flow Objectives relevant for the region and the Project Area, in relation to maintaining or improving waterbody conditions, are provided in Section 2.4 of **Appendix M**.

The surface water impact assessment indicates the Project Area and downstream watercourses are assumed to be 'slightly to moderately disturbed systems' which, in accordance with the Australian and New Zealand Guidelines, are ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity.

Further, findings of the State of the Catchments 2010 Hunter-Central Rivers Region Report (DECCW, 2010b) indicate that the Hunter Catchment relevant to the Project Area generally exceeds guideline values for total phosphorus and turbidity and that waterway health as characterised by data recorded for aquatic biota is poor.

6.8.2.2 IMPACT ASSESSMENT

The Project will not involve modification or realignment of any existing drainage lines traversing the Project Area, resulting in no predicted impacts to waterfront land, flow paths or stream ordering. Additionally, impacts to water quality and watercourse-stability will be negligible.

Project construction would require up to 8 ha of land disturbance for the installation of BESS infrastructure and the establishment of site facilities and access tracks which may result in some disturbance of minor flow/drainage paths. Construction activities involving ground disturbance, earthworks and transporting and stockpiling soil introduce pathways for soils erosion and, in turn, potential movement of sedimentation into downstream water systems.

Impacts associated with the mobilisation of soil from the site include:

- Degradation of the quality of downstream domestic and stock drinking water;
- Increased turbidity and reduced visual clarity of downstream watercourses, impacting aquatic ecosystem health (changes to natural reflectance of water, smothering aquatic life and clogging fish gills);
- Increased sedimentation in downstream watercourses and waterbodies, changing the geomorphology and disturbing natural flow regimes; and
- Increased levels of dissolved metals and nutrients become mobilised with the soil, entering watercourses and waterbodies. This can be a threat if high concentrations of undesirable metals and nutrients reach water supplies for aquatic life or domestic, irrigation and livestock users.

Some of the project infrastructure is located within the waterfront land of the 1st, 2nd, and 3rd order ephemeral drainage lines within the Project Area, however construction of Project infrastructure will avoid bank areas of defined drainage lined to mitigate impacts to water quality and stability of the drainage lines.

Water for the Project will be sourced from the existing farm dams to meet water demands. These dams also provide a form of on-site stormwater detention and reduce the potential impacts overland flow regimes in larger flow events is reduced. Additionally, where possible, existing access tracks will be used during construction and operation of the Project, limiting the crossings of flow/drainage paths.

A CEMP and ESCP will be developed to manage and mitigate any potential impacts on waterfront lands.

6.8.3 WATER BALANCE

6.8.3.1 EXISTING ENVIRONMENT

The Project Area is located within the Hunter Unregulated and Alluvial Water Sources 2022 water sharing plan area. The Hunter River is located within the WSP for the Hunter Regulated River Water Sources 2016 WSP.

A search of Water NSW's real time data website (WaterNSW, 2024) identified one registered bore (ID GW078914) within the greater Site boundary to the west of Denman Road and not within the development footprint of the Project, and is listed for stock water use. The bore has a total depth of 10.00 m, and no standing water level is available. The Project will not impact groundwater sources given no infrastructure is proposed on the western side of Denman Road.

There is one work approval for an irrigation pump within the greater Site boundary. It is understood that there is no water access licence associated with this pump. Further to this, harvestable rights dams exist within the Site and support the existing land use activities.

The landholdings within the Project area do not hold any current water access licences. However, harvestable rights dams exist within the Project Area and support the existing land use activities (maximum capacity 21 ML / year).

A summary of water supply work and use approval applicable to the Project Area is included in **Table 6-22** below.

TABLE 6-22 WATER SUPPLY WORK AND USE APPROVAL APPLICABLE TO THE PROJECT AREA

Kind of Approval	Purpose / Work Type	Approval Number	Water Source
Water Supply Works and Water Use	Irrigation Diversion Works (Pumps)	20CA201855	Hunter Regulated River Water Source
Basic Rights	Excavation Works (Bore)	20WA207567	Hunter Regulated River Alluvial Water Source
Basic Rights	Excavation Works (Well)	20WA207722	Hunter Regulated River Alluvial Water Source

6.8.3.2 PROJECT WATER DEMAND

Water will be required during the construction phase for dust suppression, concrete works, road construction and compaction, vehicle equipment washdown and potable water for site amenities.

Water demand will vary depending on the stages of construction, however, it is estimated to be up to a total of 20.6 ML throughout the entire construction period. Post-construction water demands will be negligible, primarily consisting of occasional cleaning and potable water demands. The total site water demands are summarised in **Table 6-23**.

TABLE 6-23 PROJECT WATER DEMANDS SUMMARY

Activity	Project Water Demand (ML)
Construction of hardstands (BESS)	8.0
Road construction / compaction	4.3
Dust suppression	1.7
Vehicle and equipment washdown	4.0
Potable water	2.6
Total construction water demand	20.6

6.8.3.3 PROJECT WATER SUPPLY

Water will be sourced from the existing farm dams to meet water demands of the Project. Take of water will be within harvestable water rights provisions. Potable water and water for site amenities will be supplied by rainwater tanks within the infrastructure areas. If additional water is needed, the Applicant would purchase and import water to the site. Although unlikely, if required, additional water may be obtained through agreements with landholders from farm dam runoff, sediment basin reuse, and water recycling. No groundwater extraction is currently planned.

6.8.3.4 WASTEWATER MANAGEMENT

During construction, wastewater from the site office and temporary construction facilities will be collected and managed through an on-site treatment system. The treated wastewater would be re-purposed on site to fulfill non-potable construction, and operation demands such as dust suppression, earthworks and concrete conditioning. To prevent interaction with natural surface and groundwater systems, the treated wastewater would be contained in tanks on site subject to detailed design.

Waste solids generated by the treatment system will be handled by a licensed contractor, who will transport and dispose of at a nearby Council wastewater treatment plant or other appropriately licensed facility.

6.8.4 MITIGATION AND MANAGEMENT

Management measures that will be employed to minimise the Project impacts to surface water resources are included in **Table 6-24**.

TABLE 6-24 FLOODING AND HYDROLOGY MITIGATION AND MANAGEMENT

ID	Mitigation Measure
WHF1	Implement the following measures during detailed design: • Limit water crossing to existing access tracks where possible; and • Arrange BESS modules such that stream disturbance and modifications (filling / diversions) are limited to minor watercourses.
WHF2	In the event construction of watercourse crossings is required, these will be designed, constructed and maintained to consider DPE Guidelines for instream works on waterfront land (DPE, 2022) and Guidelines for Riparian Corridors on Waterfront Land (DPE, 2022).
WHF3	Implement the following mitigation measures during detailed design stage to minimise impacts to flooding: • Minimise filling of BESS, substations sites and O&M facilities; • Minimise extent of Project infrastructure within the 1% AEP flood extent; and • Design to manage flood impacts and flow conveyance at watercourse crossings (if any).
WHF4	Floodplain management planning to determine site management protocols during flood events that could impact construction or access areas, including: • Suitable early warning and communication protocols; • Triggers for closure, evacuation and recovery; and • Emergency response and support.

ID	Mitigation Measure
WHF5	Increased stormwater runoff during operations (due to clearing of vegetation and filling for infrastructure) will be managed through development of ESCP. The ESCP will consider: • Location of site infrastructure away from existing watercourses or areas subject to high levels of overland flow; • Diversion of upstream flows around site infrastructure as required, to minimise scouring and erosion; and • Inspection and monitoring regimes to maintain stormwater and erosion and sediment control structures.
WHF6	• Development of ESCPs through all project phases, in accordance with Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004), Volume 2A Installation of Services (DECC, 2008), Volume 2C Unsealed roads (DECC, 2008), Volume 2D Main Road Construction (DECC, 2008) and Best Practice Erosion and Sediment Control (IECA, 2008). • The ESCPs will detail area specific erosion and sediment control measures to be implemented and maintained during construction until the design intent is met by the as-built infrastructure and rehabilitated vegetation. As well as ongoing monitoring and maintenance through operation and decommissioning of additional controls if identified as required. • The total area of disturbance at any time should be minimised where possible and ongoing rehabilitation and stabilisation strategies implemented throughout construction.
WHF7	During construction, the following management measures will be considered to minimise the potential for mobilisation of sediment or dust from topsoil stockpile: • Locate stockpiles away from drainage lines, or areas subject to high levels of overland sheet flow and minimise stockpile size; • Develop and implement area specific erosion and sediment control measures including bunding and diversion drains as required; and • Use stockpile stabilisation techniques such as covering or dust suppression.
WHF8	Prior to commencing construction activities, a CEMP will be developed to identify site specific controls and procedures to minimise the potential for hydrocarbons and other contaminants being discharged into the environment. This CEMP should consider: • Storage of hydrocarbons and other liquid chemicals with above ground, bunded area away from watercourses or area subject to high levels of overland sheet flow; • Re-fuelling of construction vehicles and equipment to be limited to designated areas, with adequate spill management controls; • Maintain an emergency spill kit and relevant emergency spill response procedures; • Transport and dispose of any hydrocarbons captured during Project construction and operation of the substations and switchyards at a suitable off-site licenced facility.
WHF9	The CEMP will consider the following management measures to minimise the potential impacts to surface water and groundwater quality within and surrounding the Project area: • Develop and implement a suitable monitoring regime of all stormwater and erosion and sediment control structures, particularly following large flow events.
WHF10	All required water licensing and approvals will be coordinated with associated landholders and/or regulators (e.g. Council, others) if that source is needed to support water supply arrangements for construction and operation.
WHF11	Design and implement a wastewater treatment system that: • Is appropriately sized for the Project infrastructure and operations. • Collects and treats wastewater from site offices and temporary accommodation facilities for re-use on site to fulfill non-potable construction and operation demands. • Be designed and operated in accordance with best practices.

6.9 PRELIMINARY HAZARD ANALYSIS

The hazards and risk associated with the Project have been assessed in a Preliminary Hazard Analysis (PHA) (**Appendix O**). The objective of the PHA was to determine any potential offsite impacts that may result from the operation of the BESS, and the risk acceptability of the BESS from a land use safety planning perspective.

The PHA incorporates the requirements of the HIPAP No. 6, which included:

- Determining the level of analysis and risk assessment criteria through the Multi-level Risk Assessment;
- Undertaking a detailed hazard identification for the Project's operations and storage of materials;
- Conducting a detailed consequence analysis for the identified events with offsite impact (note that where an incident was identified to not have an offsite impact, and a simple solution was evident and recommended, no further analysis was performed);
- Conducting a frequency analysis of the identified incidents with offsite impact (note that if no incident was identified to have potential offsite impact, no further analysis was required); and
- Assessing the estimated risks from identified incidents with offsite impact consequence and frequency analysis to determine acceptability (note that if the criteria were exceeded, a review of the major risk contributors was performed, and the risks reassessed incorporating the recommended risk reduction measures).

The Multi-level Risk Assessment considered the location and description of the Project, 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, discussed in further detail in **Appendix O**.

6.9.1 HAZARD IDENTIFICATION

A hazard identification table has been developed in accordance with HIPAP No. 6 and provides a summary of the potential hazards, consequences, and safeguards for the Project. The hazard identification table is presented in Appendix A of the PHA (**Appendix O**).

The recommended approach for eliminating hazards from further assessment, as detailed in HIPAP 4, was followed in the PHA, which 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/m²/14 kPa) at the site boundary; and
- **Societal risk:** consideration of societal risk in accordance with HIPAP 4.

Based on the hazard identification table the following hazardous scenarios were identified:

- Lithium-ion (Li-ion) battery fault, thermal runaway and fire;
- 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 protection failure and explosion; and
- Electromagnetic field impacts.

A review of the expected types and quantities of DGs to be stored or handled on site, identified that none of the relevant screening thresholds of Applying SEPP 33 as per the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) will be exceeded. This included consideration of the BESS, transformer oils, and diesel fuel stored and used on site which is described in Section 3.4 of Appendix O.

6.9.2 IMPACT ASSESSMENT

The results of the impact assessment in the PHA (**Appendix O**) are summarised below:

- **Li-ion battery fault and runaway fire:** The chemistry of the proposed battery to be installed for the Project is lithium-ion phosphate (LFP), which are one of the safest battery chemistries in the industry. Li-ion batteries are equipped with several standard safety features, and as such, the potential for thermal runaway to occur during normal operation of the BESS is very low;
- **Li-ion battery fire and toxic gas dispersion:** If an LFP BESS were to fail causing a fire, toxic emissions may result including carbon dioxide, carbon monoxide, and fluoride gases. The formation of these gases 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;
- **Equipment fail and fire:** The type of equipment proposed for the Project is not unique and is widely implemented across many industries throughout the world. Therefore, equipment failure does not present a unique fire scenario. Based on 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 arcing, oil spill and bund fire:** The 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 explosion:** 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, these units are ubiquitous and have a low potential for failure. Therefore, this incident was not considered further; and

- **Electromagnetic fields:** There are no dwellings immediately adjacent to the Project Area, 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. The potential for the EMF to exceed the accepted levels is considered negligible.

6.9.3 MITIGATION AND MANAGEMENT

The following mitigation measures identified in **Table 6-25** will be implemented by the Project.

TABLE 6-25 HAZARDS AND RISK MITIGATION AND MANAGEMENT MEASURES

ID	Mitigation Measures
HR1	The BESS will be tested in accordance with UL9540A and will be installed in accordance with manufactured and UL9540A report recommended clearances based on testing.
HR2	The BESS will be tested to demonstrate clearances required to prevent propagation of fires between separated units.
HR3	The BESS will be installed with fire protection systems specified by the manufacturer and UL9540A report.
HR4	Detailed design to validate the system will be installed in the Project Area before construction, while meeting the recommended clearances.
HR5	UL testing information will be made available to the certifying authority.
HR6	The vent covers of the BESS shall be constructed of a non-combustible material.
HR7	The vents shall not be located above battery packs within the BESS container.

6.10 BUSHFIRE

A Bushfire Risk Assessment has been prepared to identify potential hazards and risks associated with the Project and its proximity to bushfire prone land. The need for a Bushfire Risk Assessment was identified within the SEARs, and the *Rural Fires Act 1997* imposes obligations on land occupiers to take all practicable steps to prevent the occurrence and spread of wildfire to adjoining lands from lands under their care and management.

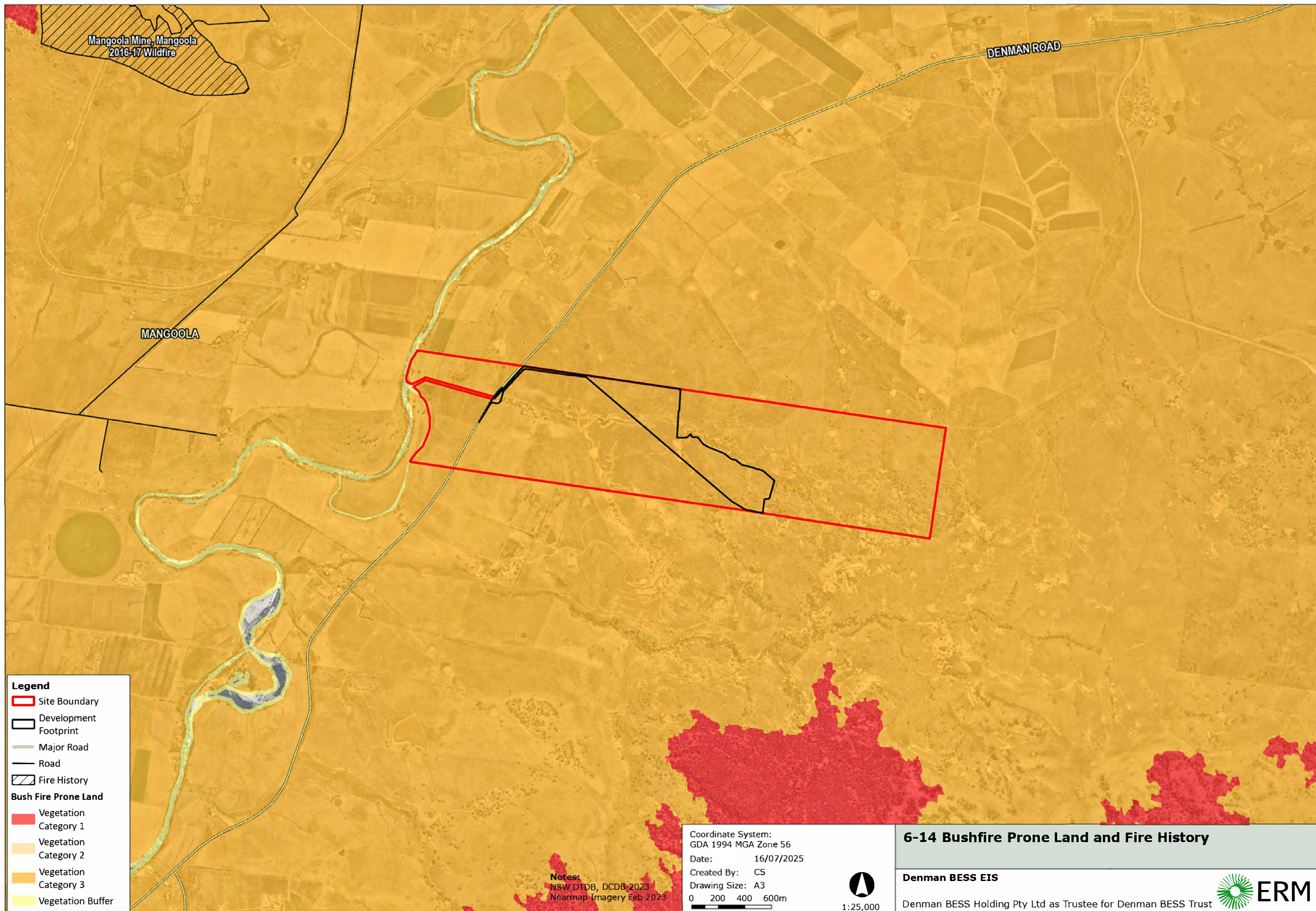
The Bushfire Risk Assessment is provided in **Appendix P**. Electrical hazards including battery fires and transformer fires are addressed separately as part of the Preliminary Hazard Assessment and is provided in **Appendix O**.

6.10.1 EXISTING ENVIRONMENT

The Project Area is within a designated bushfire prone area (refer **Figure 6-13**). The Project Area is currently in Vegetation Category 3 bushfire prone land, presenting a medium bushfire risk. Vegetation Category 1 bushfire prone land surrounds the Project Area with the closest being approximately 2.5 km south of the Project Area, 4.5 km north and 5.5km east and 6 km west. Category 1 presents highest risk for bushfire.

The fire season in Wollemi National Park (15 km from Project) usually extends beyond the declared fire season and occurs between August and April of the following year. Dry lightning storms occur frequently during the bushfire season often starting forest and grass fires. (Wollemi National Park Bushfire Management strategy (NPWS, 2006).

Bushfires have occurred in most years in this district. The closest reported fire was the Mangoola Mine wildfire, which occurred in February 2017, about 4.3 km northwest from the Project Area, and burned a total of 88.81 ha. Ten more wildfires have been reported within 25 km of the Project Area.



6.10.2 IMPACT ASSESSMENT

The Project Area does not have a history of bushfires and has a moderate bushfire danger rating. The risk that a BESS will cause a fire is considered low given appropriate protection measures. Mitigation will be a combination of complementary strategies, all of which are required to provide the best possible protection outcome for the project and the community.

To minimise the risk, the Project will be designed to:

- provide a defendable space around infrastructure; and
- ensure that appropriate access, egress and maneuverability within the BESS is provided for first responders;

In the event that a fire does breach any containment lines and threatens the project assets, it is possible that the BESS infrastructure will sustain direct flame contact and that firefighting will require aerial support. Key assets such as the switching station, substations, and O&M buildings all have adequate defendable space on all sides.

Vegetation fuel within the overhead transmission line easements and within access tracks will be maintained in a low fuel state by mechanical or manual clearing methods.

6.10.3 MITIGATION AND MANAGEMENT

Detailed mitigation strategies are outlined in Section 6 of **Appendix P**. These measures have been developed to meet the provisions of Section 8.3.5 of *Planning for Bushfire Protection 2019* and to ensure that the BESS development does not increase the risk of widespread fire across the landscape. The mitigation measures are summarised in **Table 6-26**.

TABLE 6-26 SUMMARY OF RECOMMENDED MITIGATION STRATEGIES AND ACTIONS

ID	Mitigation and Management Measure
BF1	Asset Protection Zones: • A minimum 10-12m APZ will be established on all sides of the BESS and would be the focus of any firefighting activities. This will include the internal perimeter road and carparking areas. • A minimum 10 m fire break around the perimeter of the facility and around infrastructure is also supported by CFA (CFA, 2023). • No trees and shrubs are to be planted within the APZ • All APZ are to be managed as an inner protection zone (IPA) as outlined within Appendix 4 of PBP 2019, and NSW RFS 'Standards for Asset Protection Zones'. • APZ will not extend beyond the property boundary or rely on actions being undertaken by adjacent landowners.
BF2	BESS Construction: • The APZ and access roads will be constructed prior to the installation of any BESS modules or related infrastructure; • Fire detection and suppression systems should be installed at the earliest stage of construction for BESS infrastructure. • Ensure appropriate bunding in areas where there is potential for flammable fuels and oils to leak and create bushfires or other environmental risks; • Install appropriate signs to assist emergency response crews determine the location of infrastructure; • Ensure that appropriate permits have been issued for work during the Fire Danger Period, and that any conditions on permits are adhered to; • Adhere to restrictions on Total Fire Ban or days of high fire danger; • Carry emergency communications equipment; • Restrict smoking to prescribed areas, and provide suitable ash and butt disposal facilities;

ID	Mitigation and Management Measure
	- All plant, vehicles and earth moving machinery are cleaned of any accumulated flammable material (e.g., vegetation); - On days of Extreme or Catastrophic fire danger, access to the site should be limited to essential works only.
BF3	BESS Operation: - Vegetation fuels throughout the Project Area are to be maintained in a minimal condition by grazing, or with additional slashing or mowing if required. - A Bushfire Emergency Management and Operations Plan will be prepared with consideration of Australian Standard/ISO 31000 Risk management principles and guidelines and Australian Standard 3745: Planning for emergencies in facilities.

6.11 SOCIAL

6.11.1 EXISTING ENVIRONMENT

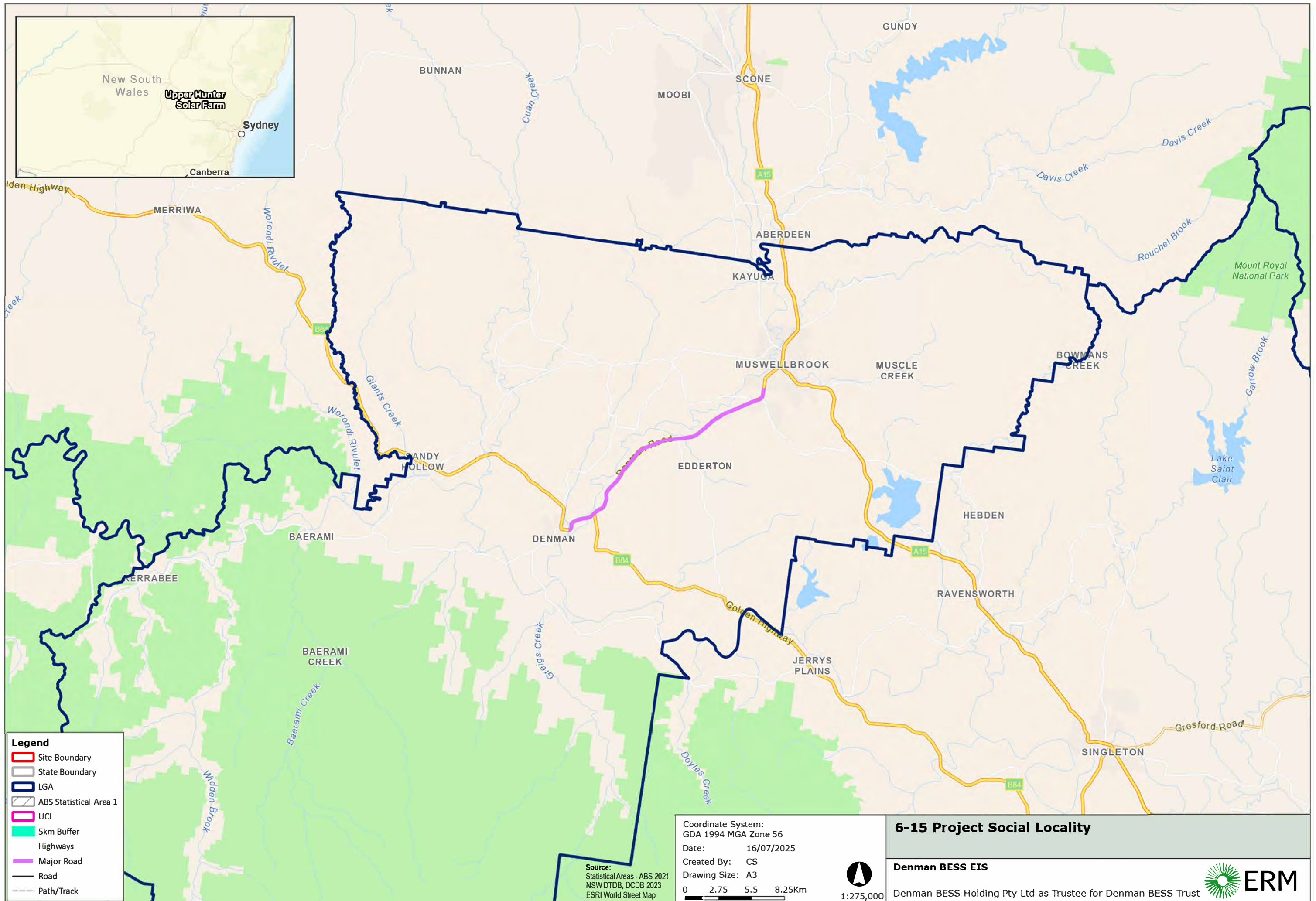
A Social Impact Assessment (SIA) has been prepared in accordance with the provisions of the Guideline (DPE, 2023a) and Technical Supplement (DPE, 2023b). The SIA is provided in full in **Appendix R**.

The purpose of this SIA is to provide the DPHI with an understanding of the Project's potential social impacts, and how these social impacts are identified, assessed, managed, and monitored, consistent with the legislative and regulatory context in the Guideline and Supplement referenced above.

The Project's Social Locality includes the Project Area, the area surrounding the Project Area wherein noise, visual and other amenity 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 (refer **Figure 6-14**).

The Project's Social Locality, as defined for the purposes of the SIA, is comprised of the following three (3) components:

- The **Project Area and immediate surrounding areas**, located within the Australian Bureau of Statistics (ABS) LGA of Muswellbrook Shire Council. The local level ABS Area containing the Project Area is the Statistical Area Level 1 (SA1) No. 10604112713 (containing the Project), SA1 10604112702 (adjacent to Project Area to the south) and 10604112708 (immediately north adjacent of the Project Area);
- The **transportation and haulage routes** to the Project Area, including the existing road network from Golden Highway and Denman Road. All plant is expected to be delivered from Port of Newcastle (refer to **Figure 6-10**); and
- The **surrounding towns and regional centres** of Denman, Muswellbrook, Aberdeen, Singleton, Merriwa, and Scone, which may provide goods and services to support the construction phase of the Project.



6.11.2 IMPACT ASSESSMENT

The key drivers of social change that may affect communities in the Social Locality resulting from the Project relate to:

- Procurement opportunities for Local/Regional Businesses and employment opportunities for the local workforce;
- Disruptions due to construction related activities (noise, dust, transportation of materials and workers, etc.);
- Accommodation arrangements for construction workforce; and
- Amenity (noise, visual) and other land use and landscape changes due to altered landscapes.

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 receptors. A summary of impact issues is included in **Table 6-27**.

TABLE 6-27 POTENTIAL SOCIAL IMPACT

Impact Issue	Sensitive Receivers	Wider Community	Local Workforce	Local Businesses	Regional Visitors	Traditional Owners	Phase of the Project
<i>Stakeholder and Community</i>							
Insufficient or ineffective stakeholder engagement	✓	✓	✓	✓		✓	Construction and Operation
<i>Employment and Procurement</i>							
Increased Direct and Indirect Employment Opportunities			✓	✓			Construction and Operation
Increased Local Procurement Opportunities			✓	✓			Construction and Operation
Potential to Create Skills Shortages			✓	✓			Construction
<i>Local Disruptors</i>							
Construction-Related Disturbances to Social Amenity	✓	✓					Construction
Traffic Congestion, Community Safety Concerns and Deterioration of Road Surface Conditions	✓	✓			✓		Construction
Perceived health impacts	✓	✓				✓	Construction and Operation
Impacts on the environment and biodiversity	✓	✓					Construction
Disruption to farming practices	✓						Construction and Operation
Potential for reduced community cohesion	✓	✓				✓	Construction and Operation

Impact Issue	Sensitive Receivers	Wider Community	Local Workforce	Local Businesses	Regional Visitors	Traditional Owners	Phase of the Project
<i>Accommodation and Worker Influx</i>							
Increased Demand for Long- and Short-Term Accommodation		✓		✓	✓		Construction and Operation
Increased Demand for Services and Recreational Facilities	✓	✓				✓	Construction and Operation
<i>Land Use and Landscape</i>							
Perceived Impacts to Land Values	✓	✓					Construction and Operation
Altered Rural Character	✓	✓			✓	✓	Construction and Operation
Potential impact on tangible and intangible Aboriginal cultural heritage						✓	Construction and Operation

6.11.3 MITIGATION AND MANAGEMENT

With the implementation of appropriate mitigation measures, the identified impacts can all be reduced to low or medium. For benefits, the implementation of mitigation measures will allow for the enhancement of local benefits (including increased local employment and procurement activities) to medium or high.

Section 7 of the SIA provides an overview of the recommended monitoring and management framework for the social impact management measures to be implemented during the construction and operation phases of the Project. The mitigation and management measures are summarised in **Table 6-28**.

TABLE 6-28 SOCIAL MANAGEMENT AND MITIGATION MEASURES

<i>ID</i>	<i>Mitigation and Management Measure</i>
SO1	A Voluntary Planning Agreement will be entered into with Muswellbrook Shire Council to provide contributions of \$150 per MW per annum for the life of the project to fund local infrastructure and community benefits.
SO2	Prepare and implement a Stakeholder Engagement Plan (SEP) during the construction of the Project to facilitate stakeholder appropriate, transparent, and meaningful engagement. The SEP will include the requirement to provide regular Project updates (e.g., electronic and hard-copy communication materials).
SO3	A community enquiry and complaints mechanism will also be developed and implemented throughout the life of the Project to manage concerns that may arise during day-to-day construction and operational activities.
SO4	Develop and implement a Local Employment Plan for the Project including measures to encourage and set targets for local employment for the EPC Contractor.
SO5	Develop a detailed Workforce Accommodation Management Plan (WAMP) for the Project that will: • Monitor the available accommodation options in the Social Locality; • Consult with Council and proponents of nearby SSDs regarding potential sites and options to co-locate a temporary workforce accommodation camp; • Prioritise local accommodation options, where available and practical; • 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; • Require ongoing contact with 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; • Provide and maintain register of local property owners who have expressed interest in offering dwellings for rent, with the intent to provide to the EPC Contractors and subcontractors; • Review workforce predictions during construction to ensure that accommodation requirements are met; and • Identify any overlaps with peak demand periods for accommodation and engage with key stakeholders.
SO6	Develop and implement a Worker Code of Conduct to mitigate the potential for increased anti-social behaviour or crime that may potential arise from an increased number of FIFO/DIDO workers.
SO7	Undertake regular auditing throughout the construction and operation Phases of the Project.

6.12 ECONOMIC

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 (**Appendix Q**). The Economic Assessment addresses the relevant requirements of the SEARs (**Appendix A**) and considers all relevant stakeholder engagement as described in **Section 5**.

An input-output (IO) analysis was performed to assess the direct and indirect impacts (gross economic footprint) of the construction and operation of the Project on the regional and NSW economy. This modelling provides an upper bound estimate of the gross economic impact or footprint of the Project which is also an upper bound estimate of net economic activity impacts. A detailed methodology for this assessment is included in Section 2 of **Appendix Q**.

6.12.1 EXISTING ENVIRONMENT

The Project is located within the Muswellbrook Shire LGA. The existing economic environment has been assessed through relevant economic indicators of the Study Area based on the 2021 ABS Census (ABS, 2021) and is included in **Table 6-29**.

TABLE 6-29 CHARACTERISTICS OF THE REGIONAL ECONOMY

Aspects	Study Area Summary
Residents	- In 2021, the region had a population of 16,357 and a labour force of 7,751, which was 47% of the population. - During the same time period, there were 397 people unemployed, at an unemployment rate of 5.1%.
Population Growth	- The population of the Study Area has been growing at an average annual rate of 0.4% since 2006, less than half than that of NSW (1.3%). - The predicted growth rate of the region is predicted to continue to grow at an average annual rate of 0.4%.
Occupation	The main occupation in the Study Area were Technicians and Trade Workers (19%), Machinery Operators and Drivers (18%), and Labourers (14%).
Top Industry Sectors of Employment for Usual Residents	- Mining was the most significant employment sector for residents of the Study Area reflecting the significance of this sector to the Muswellbrook Shire LGA. - On Selling Electricity and Electricity Market Operation, Labour Supply Services, Horse Farming and Takeaway Food Services Stores 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 five exporting industries in the Study accounts for \$10,572 million in total or 97% of the total exports by industry in the region. These industries are: - Mining (\$6,471 million); - Electricity, Gas, Water & Waste Services (\$484 million); - Rental, Hiring & Real Estate Services (\$235 million); - Construction (\$155 million); and - Agriculture, Forestry & Fishing (\$133 million).

6.12.2 IMPACT ASSESSMENT

6.12.2.1 IMPACT ON ECONOMY

The Project will provide economic activity to the regional and NSW economy, particularly to the heavy and civil engineering construction, construction services and non-residential building construction sectors.

The construction will comprise of four stages, with each stage consisting of approximately 6-9 months, and will have an average annual employment of 75 FTEs, with a peak construction period of 180 FTEs. It is estimated that \$30M of (direct) expenditure would be required across these sectors to generate the level of onsite workforce of 75 FTEs for a year.

Consumption-induced flow-on effects only occur in a proportional way if workers and their families are in the region or migrate into the region. Where workers commute from outside the region, some of the consumption-induced flow-on effects leak from the region.

Approximately 50% of the construction workforce would be sourced from the region, with the remainder residing outside the region and commuting. It is assumed that approximately 50% of the consumption induced expenditure leaks from the region.

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

- \$43M in annual direct and indirect output;
- \$15M in annual direct and indirect value added;
- \$5M in annual direct and indirect household income; and
- 100 direct and indirect jobs.

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

- \$98M in annual direct and indirect output;
- \$41M in annual direct and indirect value added;
- \$27M in annual direct and indirect household income; and
- 272 direct and indirect jobs.

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

- \$128M in annual direct and indirect regional output;
- \$44M in annual direct and indirect regional value-added;
- \$4M in annual direct and indirect household income; and
- 53 direct and indirect jobs.

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

- \$165M in annual direct and indirect regional output;
- \$64M in annual direct and indirect regional value-added;
- \$17M in annual direct and indirect household income; and
- 174 direct and indirect jobs.

The construction and operation impacts are larger for the NSW economy because there is less leakage of direct and indirect expenditure out of the NSW economy compared to the regional economy.

6.12.2.2 IMPACT ON AGRICULTURE

Construction and operation of the Project will impact up to 38.6 ha of agricultural land. Based on average sheep and cattle grazing gross margin budgets (NSW DPI, 2024), the Project would result in approximately \$9,274 per annum of foregone revenue.

Indirect impacts include economic activity associated with suppliers to agricultural production. These impacts would occur for approximately 18 months.

The annual regional direct and indirect impact of foregone agriculture during Project construction and operation is estimated at up to:

- \$0.04M in annual direct and indirect regional output;
- \$0.02M in annual direct and indirect regional value-added;
- \$0.01M in annual direct and indirect household income; and
- 0.1 direct and indirect jobs.

This represents approximately 0.02% of direct agricultural economic activity in the region. The agricultural impacts from the operation and construction of the Project on direct and indirect jobs are therefore considered negligible.

6.12.2.3 LABOUR MARKET AND HOUSING IMPACTS

During the construction phase, the Project could potentially result in the following economic impacts:

- Create additional demand for regional labour resources and regional inputs to productions during construction of the project;
- Increase demand for construction labour leading to increased wages in the sector and create labour shortages in other sectors of the economy due to competition for workers;
- In the short-term, excess demand for construction materials could inflate prices for materials and lead to supply shortages for other sectors; and
- Regional employment growth, accompanied by in-migration of labour, may also increase demand for short-term and long-term accommodation and can impact housing prices, rents and availability of accommodation.

During the operations phase, the Project will create a very small demand for regional labour resources and regional inputs to production. Decommissioning will provide stimulus to the regional and NSW economy via spending on inputs to refurbishment or decommissioning, and demand for labour and associated wage expenditure. These economic impacts would only be short-term.

6.12.3 MITIGATION AND MANAGEMENT

The Applicant will work in partnership with the local councils and community to help maximise the projected economic regional benefits whilst minimising any impacts. **Table 6-30** details the proposed mitigation and management measures.

TABLE 6-30 ECONOMIC MANAGEMENT AND MITIGATION

ID	Mitigation Measures
EC1	The Applicant will work in partnership with the local councils and the community to help maximise the projected economic regional benefits whilst minimising any impacts. Economic mitigation and management measures could include: • Employment of regional residents where they have the required skills and experience. • 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. • Enter into a Voluntary Planning Agreement with Muswellbrook Shire Council to provide community benefits and support the regional community • Explore continued agricultural activities during the operational phase of the Project and reinstatement of full pre-project agricultural production following project decommissioning.

6.13 WASTE MANAGEMENT

This waste assessment addresses the requirements of the SEARs (refer **Appendix A**) and has been prepared to characterise 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 requirements of the following legislation, guidelines and strategies 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;
- *Waste Avoidance and Resource Recovery Act 2001* (NSW)
- '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' (NSW EPA, 2014b); and
- 'NSW EPA Better Practice Guidelines for Waste Management and Recycling in Commercial and Industrial Facilities 2012' (NSW EPA, 2012).

Best practice for waste management was considered in this assessment with the waste hierarchy principles 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.

6.13.1 EXISTING ENVIRONMENT

Existing waste management facilities in the vicinity of the Project and the waste streams accepted at each facility are shown in **Table 6-31**.

TABLE 6-31 EXISTING WASTE MANAGEMENT FACILITIES

Waste Management Facility	Location	Waste Streams Accepted	Distance to Project
Muswellbrook Waste & Recycling Facility (includes the Community Recycling Centre)	252 Coal Road, Muswellbrook NSW 2333	General solid waste (putrescible) General solid waste (non-putrescible) including construction waste Asbestos	21 km
Denman Waste Transfer Station	Rosemount Road, Denman NSW 2328	General solid waste (household generated putrescible and non-putrescible)	11 km

6.13.2 IMPACT ASSESSMENT

Waste generated during the construction phase will generally include packaging materials (e.g., cardboard, plastics, wooden pallets), and excess construction materials such as electrical cabling, metals.

During operation, the potential impacts associated with waste generation and management would be similar to those for construction, albeit at a much smaller scale per annum. No waste streams would be associated with the generation of electricity.

When the Project reaches decommissioning, 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.

Indicative management strategies will be adopted for each waste type as detailed in **Table 6-32**.

TABLE 6-32 INDICATIVE WASTE GENERATION AND MANAGEMENT STRATEGIES

Waste Type	Management Strategies
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. - 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.

Waste Type	Management Strategies
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.
BESS Modules	Damaged and end-of-life BESS modules and associated infrastructure will be transported by a licensed regulated waste contractor to a licenced regulated waste receiver for disposal.
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).

6.13.3 MITIGATION AND MANAGEMENT

A Waste Management Plan will be prepared in accordance with the waste management principles in the Large-Scale Solar Energy Guideline and in consultation with Muswellbrook Shire Council following approval of the application and prior to construction commencing.

Table 6-33 details the proposed mitigation and management measures.

TABLE 6-33 WASTE MANAGEMENT MITIGATION MEASURES

ID	Measures
WM1	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.
WM2	Adopt purchasing protocols in the selection of all components of the Project, in order to reduce the likelihood of equipment failure and minimise the potential for waste.
WM3	Select BESS manufacturers as recommended by Clean Energy Council, that will meet a range of higher standards in addition to relevant Australian and International Standards.

ID	Measures
WM4	Engage with Muswellbrook Shire Council to discuss the options for disposal and reuse of the identified waste streams likely to be generated, in order to ensure that any use of local waste management facilities does not exhaust available capacity, nor disadvantage the local community.
WM5	Classify wastes in accordance with the NSW EPA Waste Classification Guidelines – Part 1: classifying waste (NSW EPA, 2014a) and Addendum (NSW EPA, 2016).
WM6	Provide waste storage locations within assigned area, with sufficient space for separation and storage of different waste.
WM7	Store and dispose of waste lawfully at a licensed waste facility, including fuels, oils and hazardous substances used onsite.
WM8	Separate recyclable and non-recyclable materials on-site prior to being transported to waste facility.
WM9	Investigate opportunities for recycling of wastes prior to sending to landfill.
WM10	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.
WM11	Provide toilet facilities for onsite workers and how sullage would be disposed of (e.g., pump out to local sewage treatment plant).
WM12	Provisions protocol for the packaging, transportation of spent lithium-ion batteries to collection and recycling facilities.
WM13	Decommission and rehabilitation of the Project will be undertaken in accordance with Project approval requirement

6.14 CUMULATIVE IMPACTS

In accordance with the CIA Guidelines, the Project has considered past, present and reasonably foreseeable future SSD projects, and only included the types of development specified in Section 3.4 of the CIA Guidelines. Relevant projects known at the time of writing this EIS are shown in **Figure 2-5** and summarised in **Table 6-34**.

TABLE 6-34 CUMULATIVE POTENTIAL OF NEARBY MAJOR PROJECTS

Project	Applicant	Scale	Status	Distance (km)	Potential impacts
Upper Hunter South Solar farm (SSD-65996959)	Upper Hunter Solar Farm Pty Ltd	90 MW	Prepare EIS	Adjacent	The construction and operation of the two projects are likely to overlap. Potential cumulative impacts include traffic, visual, noise, social and economic impacts.
Denman Solar Park (DA 49/2020)	Denman Road Solar Park Pty Ltd and Pukara Estate Pty Ltd	22 MW	Approved	1.2 km	It is understood the Denman Solar Park may not proceed to construction. The construction of the two projects is unlikely to overlap and therefore cumulative impacts would be minimal.
Edderton Solar Project (SSD-69965958)	EDF Renewables	350 MW	Prepare EIS	1.3 km	The construction and operation of the two projects are likely to overlap. Potential cumulative impacts include traffic, visual, noise, social and economic impacts.
Mt Pleasant Mine (DA92/97)	Mach Energy	N/A	Approved	6.2 km	Construction of the Project will overlap with the operation of the mine. There is potential for cumulative social and economic impacts.
Maxwell Solar Farm (SSD-9820)	Maxwell Solar Pty Ltd	25 MW	Approved	14.4 km	The construction of the two projects could overlap and there is potential for cumulative traffic, social and economic impacts.
Liddell Future Land Use and Enabling Works Project (SSD-24937520)	AGL Macquarie	N/A	Approved	14.7 km	The construction of the two projects could overlap. There is potential for cumulative social and economic impacts.
New England Highway Bypass Muswellbrook	Transport for NSW	N/A	Early construction	14.8 km	The construction of the two projects could overlap. There is potential for cumulative social and economic impacts.
Muswellbrook Pumped Hydro Energy Storage Project (SSD-65797725)	Muswellbrook Pumped Hydro Pty Ltd	500 MW	Prepare EIS	16.5 km	The construction of the two projects could overlap. There is potential for cumulative traffic, social and economic impacts.

Project	Applicant	Scale	Status	Distance (km)	Potential impacts
Kayuga Solar Farm (SSD-69489708)	Dawn Renewables Pty Ltd	80-100 MW	Prepare EIS	16.9 km	The construction of the two projects could overlap. There is potential for cumulative social and economic impacts.
Muswellbrook Battery Energy Storage System (SSD-29704663)	Muswellbrook Pumped Hydro Trust	500 MW	Approved	18.2 km	The construction of the two projects could overlap. There is potential for cumulative traffic, social and economic impacts.
Muswellbrook Solar Farm (SSD-46543209)	ESCO Solar Farm 9 Pty & Idemitsu Australia Limited	135 MW	Assessment	18.4 km	The construction of the two projects could overlap. There is potential for cumulative traffic, social and economic impacts.
Liddell Battery and Bayswater Ancillary Works (SSD-8889679)	Epuron Projects Pty Ltd	336 MW	Approved	27 km	The construction of the two projects could overlap. There is potential for cumulative traffic, social and economic impacts.
Maison Dieu Solar Farm (SSD-48160216)	Terrain Solar Pty Ltd	60 MW	Response to Submissions	33 km	The construction of the two projects could overlap. There is potential for cumulative traffic, social and economic impacts.
Goulburn River Solar Farm (SSD-33964533)	Lightsource Development Services Australia Pty Ltd	450 MW	Approved	62 km	The construction of the two projects could overlap. However, this project is a considerable distance from the Project Area and is unlikely to lead to any cumulative impacts

6.14.1 CUMULATIVE IMPACT SUMMARY

Cumulative impacts occur when impacts from a project interact or overlap with impacts from other projects and can potentially result in a larger overall effect on the environment. Potential cumulative impacts associated with the Project have been addressed in relevant technical assessments and the relevant findings summarised in this EIS.

6.14.1.1 CUMULATIVE BIODIVERSITY IMPACTS

The Project is located within the Hunter Local Land Service region; an area that comprises the northern part of the Sydney Basin Bioregion and southern part of the North Coast Bioregion. This region extends from Newcastle in the east to Ulan in the west and encompasses the Hunter and Goulburn River catchments and is a reasonable broad reference for evaluating cumulative impacts.

Based on data published on the Statewide Land Cover and Tree Study (SLATS) dashboard, the region is estimated to have lost ~22,500 ha of native vegetation over a 14 year period (2009 – 2022). Annualised, the loss of native vegetation across the region is ~1,650 ha per annum, with the greatest amount of vegetation clearing by local government area being within the Mid Coast LGA, where ~15,000 ha has been cleared.

The Project is located within the Central Hunter Foothills Mitchell Landscape. An estimated 78,000 ha of native vegetation remains within this area, with most of this being woody vegetation. This landscape is sensitive to further loss of native vegetation, with the Project representing approximately 0.02% of the remaining woody vegetation within this region.

Broadly, the cumulative impacts of the Project can be summarised as follows:

- ~10% of the annual vegetation loss for the Muswellbrook Shire LGA;
- ~1% of the annual vegetation loss for the Hunter LLS region; and
- ~0.02% of the native vegetation remaining in the Central Hunter Foothills Mitchell Landscape.

Potential direct, indirect and prescribed biodiversity impacts because of the Project have been assessed and it is acknowledged the Project will contribute to cumulative impacts during construction and operation within the existing environment. Cumulative impacts occur when impacts from a project interact or overlap with impacts from other projects and can potentially result in a larger overall effect on the environment.

The Project is located within the Hunter-Central Coast Renewable Energy Zone (REZ) although it is not proposed to connect to the REZ infrastructure. Nonetheless, a significant number of renewable energy projects have either been approved or are currently under preparation and assessment, and the cumulative impacts of these projects have been considered. In addition, the cumulative impacts of major infrastructure projects within the region have also been considered.

A review of renewable energy projects and major infrastructure projects known at the time of finalisation of this BDAR and within the vicinity of the Project has been undertaken. A large portion of these projects are in the planning phase, and as such the level of direct impacts to native vegetation, TECs, and threatened and migratory listed species is unknown. While it is likely that cumulative impacts will increase the loss of similar native vegetation and threatened species habitat in the region, however, there will not be a cumulative loss in habitat connectivity from the projects and therefore the impacts are not significant.

6.14.1.2 CUMULATIVE ABORIGINAL IMPACTS

As the Project contains Aboriginal Objects, there are cumulative impacts associated with any land uses which would result in impacts to these elements. It is acknowledged that continued development across the Hunter region has the potential to result in a cumulative impact to the cultural values identified of the local area when impacts overlap with impacts from other projects, which can result in a greater overall effect. It is also acknowledged that the Aboriginal cultural heritage values of the Hunter Valley region have already been subject to many decades of cumulative impacts from the agricultural, military, and mining industries.

identifies and describes three renewable energy projects that are within or adjacent to the Project. The Denman Solar Park and Edderton Solar Project are within 2 km of the Project to the north and south, respectively, and the Project Area encompasses the Upper Hunter South Solar Farm.

It is recommended that ongoing consultation with and opportunities for involvement with the cultural heritage management of the Project, through the ACHMP, is provided to the RAPs to ensure cultural continuity during the project.

6.14.1.3 CUMULATIVE NOISE IMPACTS

The NIA indicates the nearest developments with the potential to contribute to the noise levels generated by the Project at the identified sensitive receivers are the Denman Solar Park, Edderton Solar Park and Upper Hunter South Solar Farm. Noise impact assessments for these projects are under preparation and publicly available. It has been assumed for the purpose of cumulative impact assessment that the noise impacts from these developments will comply with the NPI.

The Upper Hunter South Solar Farm development is located within the same parcel of land as the Project and is expected to contribute to cumulative noise impacts at the closest noise sensitive receivers to this Project. The noise assessment indicates that the operational noise of the Upper Hunter Solar Farm would comply with the recommended amenity noise levels at all noise sensitive receivers with the exception of NAD64. A cumulative noise impact assessment was undertaken for NDA64 considering the operational noise from the Project combined with the Upper Hunter Solar farm. The predicted cumulative noise levels were 39 dB(A), 39 dB(A), and 38 dB(A) for the day, evening and night time periods, respectively, and complies with the recommended amenity noise levels for the corresponding periods (i.e. 53 dB(A) for daytime, 48 dB(A) for evening and 43 dB(A) for night time). The predicted cumulative noise levels demonstrates that no exceedances of the recommended amenity noise levels are expected under noise enhancing meteorological conditions at NAD64.

The Denman Solar Park and Edderton Solar Project are located further away from the Project and the sensitive receivers and their contribution to cumulative noise would not be significant.

6.14.1.4 CUMULATIVE VISUAL IMPACTS

The LCVIA provides an assessment of the cumulative visual impacts of the Project along with other SSD projects within the surrounding area. The cumulative viewshed mapping assessment considered potential receptors within the 4 km Study Area and the three large scale renewable energy developments located within 5 km of the Project:

- Upper Hunter South Solar Farm;
- Edderton Solar Park – Mayfield Cluster; and
- Denman Road Solar Farm.

A small section of the Study Area has the potential to view all four nearby energy developments simultaneously, however all receptors in this area were established as low visual impact. Potential cumulative impacts were identified for three public receptors being Denman Road, Mangoola Road and Merriwa Railway Line.

Due to distance from the Project and nearby developments, the cumulative visual impact to Mangoola Road and Merriwa Railway Line are anticipated to be negligible to very low visual impacts. Due to proximity to the developments, there is a high magnitude of change along Denman Road. However, due to the speed of travel and very low visual sensitivity of the road corridor, overall visual impact is low.

Cumulative impacts have been considered as 'not applicable' to private receptors that were identified as 'Very Low' or 'Low' visual impact in the Simple Assessment (refer **Section 6.5.2.1**). Cumulative visual impact to the remaining seven dwellings was generally considered to be negligible / low due to intervening topography and existing screening (primarily vegetation). Cumulative visual impact is detailed further in the LCVIA (**Appendix K**).

6.14.1.5 CUMULATIVE AGRICULTURAL IMPACTS

The LAIA indicated that the projects with potential to experience cumulative agricultural impacts are Upper Hunter South Solar Farm, Denman Solar Park and Edderton Solar Project.

Cumulative impacts related to these developments, as well as others within the REZ, include land use change and loss of agricultural productivity. The relative loss of agricultural productivity against the total regional agricultural productivity, as well as land used for agricultural use, is negligible.

The cumulative impact of the Project and Upper Hunter South Solar Farm is also considered to be negligible. Impacts of the remaining renewable developments are also considered likely to be low, given the small footprint of the proposed developments within the context of the wider regional area.

No cumulative impacts are anticipated to the agricultural industry from the Project.

6.14.1.6 CUMULATIVE HYDROLOGY AND FLOODING IMPACTS

The cumulative impact flood assessment has considered the impacts of permanent infrastructure associated with the Project (including BESS infrastructure and access tracks), and permanent infrastructure associated with the Upper Hunter South Solar Farm.

No cumulative impacts are anticipated to hydrology and flooding regimes of the Hunter River catchments and its tributaries.

6.14.1.7 CUMULATIVE TRAFFIC IMPACTS

The TIA provides an assessment of the cumulative impacts of the Project along with other SSD projects within the surrounding area. The TIA identifies some projects expected to generate additional vehicle movements within the nearby towns such as Denman and Muswellbrook (refer **Appendix N**). However, 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.

The TIA review indicates that the Upper Hunter South Solar Farm, Edderton Solar Project, and Liddell BESS and Bayswater Ancillary Works projects would have the potential to generate additional vehicle movements along Denman Road in the vicinity of the Project Area. The Liddell BESS and Bayswater Ancillary Works may generate approximately one OSOM vehicle per month along Denman Road, which would have a negligible impact on the operation of the road. There is currently no traffic data is currently available for the remaining projects since no EIS has been prepared for these projects.

The TIA concludes that the road network is expected to continue to operate with an acceptable level of service during construction. Therefore, the road network is able to accommodate the traffic generated by the development during the construction period.

It is recommended that any High Risk OSOM movements 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 for the OSOM vehicles.

6.14.1.8 CUMULATIVE BUSHFIRE IMPACTS

It is assumed that each renewable energy project in the region will manage its bushfire risks and incorporate adequate bushfire protection measures such as asset protection zones and water supply for fire-fighting purposes. However, given the number of renewable energy projects expected within the region, there could be cumulative impacts on the operational capacity and resources of fire-fighting services. However, these impacts are not considered significant for the following reasons:

- **Volunteer fire-fighter workload:** Response call outs should not significantly increase because the ignition risk will be very low. There will, however, be an ongoing requirement for briefing on the Emergency Management and Operations Plan;
- **Construction stage transport and road use:** the bushfire mitigation will add a small percentage to the total construction traffic and road use; and
- **Ongoing operations:** there would not be any cumulative operational impacts although it is noted that the proximity of multiple construction and/or operational projects may exceed the current capacity of local firefighting resources.

6.14.1.9 CUMULATIVE ECONOMIC IMPACTS

The cumulative economic impacts of the Project combined with the other major projects in the surrounding region include:

- Large demand for a suitably qualified construction workforce, which can help to address job growth within regional areas;
- Increased opportunities for regional job growth, increase regional labour force participation and providing stimulus to the local economy through increased spending and increased regional population growth;
- Potential to increase the demand and cost for short and long-term accommodation, which may cause inflation as businesses pass these costs onto local consumers; and
- Potential decreased revenue for agricultural businesses and supply chains in rural areas.

6.14.1.10 CUMULATIVE SOCIAL IMPACTS

The cumulative social impacts of the Project combined with the other major projects in the surrounding region include:

- **Construction Workforce:** The total expected construction workforce of the major projects identified in **Table 6-34** is approximately 2,938. If these projects have a similar local employment target as that of the Project (50%), they will require at least 1,469 local (19% of the total Muswellbrook LGA labour force), and 1,469 influx workers. It is unlikely that all cumulative labour demand can be met from existing residents of the Muswellbrook LGA only. Population growth may occur due to workers (and their families) relocating to the regional areas within the Social Locality;
- **Goods and Services:** The Project has the potential to generate competition for local goods and service providers within the Social Locality, particularly those of direct relevance to the resourcing requirements specified to construction. This competition may reduce the ability of Local/Regional Businesses to work on smaller-scale projects within the Social Locality. Additionally, this lessened accessibility to goods and services within the local community may result in these goods and services becoming more expensive; and
- **Recreational Facilities:** The cumulative extent of worker influx may also increase the demand on recreational facilities within the Social Locality, and in doing so, impact recreational experiences due to overcrowding and limitations of accessibility. These experiences may impact on the health and well-being of local residents.

Through the development of monitoring frameworks and complaints procedures it is considered that the Project can effectively mitigate the identified impacts.

6.14.1.11 CUMULATIVE WORKFORCE ACCOMMODATION IMPACTS

Cumulative regional population changes driven by cumulative regional employment growth will increase demand for short-term and long-term accommodation. The impacts can be increases in housing prices and rents, and shortages of short-term accommodation that might otherwise be used for tourism or other purposes.

Based on a review of the anticipated construction timeframes, the following SSD projects have the potential to overlap with the Project, and be seeking employees from within the Social Locality or wider Hunter-Central Coast REZ:

- Upper Hunter South Solar Farm;
- Denman Solar Park;
- Edderton Solar Project;
- Maxwell Solar Farm;
- Muswellbrook Pumped Hydro Energy Storage Project;
- Kayuga Solar Farm;
- Muswellbrook BESS;
- Muswellbrook Solar Farm;
- Liddell Future Land Use and Enabling Works;
- Mount Pleasant Mine; and
- New England Highway Bypass Muswellbrook.

The total expected construction workforce of these projects is approximately 2,938 (refer to **Appendix R**). If these projects have a similar local employment target as that of the Project (50%), they will require at least 1,469 local (19% of the total Muswellbrook LGA labour force), and 1,469 influx workers. The Project is estimated to generate demand for approximately 75 influx workers which represents 4.9% of the total expected cumulative workforce relevant to this assessment. This would increase to 6.4% to 7.3% during peak construction.

It should be noted, however, that dependent upon the final construction timeframes of these projects, there may also be the possibility for workers to transition from one project to the next, meaning that part of the large construction workforce may already be present in the Social Locality or wider region, which will reduce temporary worker in-migration.

The cumulative social impacts of the Project extend to short and long-term accommodation markets across the Social Locality and the Hunter-Central Coast REZ. The ability for the local community to adapt to the increase in demand for short and/or long-term accommodation will be difficult and impact their ability to afford, rent and/or own housing. In addition, vulnerable groups will be most impacted, including those facing financial hardship, housing instability, or with lesser disposable incomes.

Accommodating large construction workforces in regional areas is a multifaceted challenge that simultaneously requires mitigating socio-economic impacts and enhancing socio-economic benefits to various stakeholders. Achieving a socially equitable outcome for all stakeholder groups requires careful planning and communication between local governments, short term accommodation providers and occupants and owners of the existing housing stock.

To address the potential increase in demand for short and long-term accommodation from the Project and other major projects in the vicinity, a Local Employment Plan and Workforce Accommodation Management Plan would be prepared in consultation with Muswellbrook Shire Council, local accommodation providers and other developers in the area.

7. JUSTIFICATION OF THE PROJECT

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 Project layout has considered identified environmental risks and feedback during the stakeholder engagement process.

A range of alternative Project designs were considered to avoid potential environmental impacts, as detailed in **Section 2.9**. Key layout changes made during the EIS preparation include:

- Provision of buffers to waterfront land and relocating the high voltage substation and BESS to avoid increasing flood levels and flood risk, particularly during the 1% and 5% AEP flood events;
- Amending the development footprint to avoid direct impacts at four identified Aboriginal cultural heritage sites; and
- Amending the development footprint to reduced direct impacts to endangered flora species *Cymbidium canaliculatum* and Red River Gum (*Eucalyptus camaldulensis*) and the Hunter Valley Delma Legless Lizard (*Delma vescolineata*).

Where the potential for impacts could not be avoided, design principles were sought to minimise environmental impacts and/ or mitigation measures were proposed 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 E**.

During detailed design and prior to construction, the project layout may be refined to further avoid and/or minimise environmental impacts.

7.2 CONSISTENCY WITH STRATEGIC CONTEXT

As discussed in **Section 2.2** and **2.3**, the Project will support the Australian and State governments strategies, plans and policies to achieve their respective renewable energy and greenhouse gas emission reduction targets. Importantly, the Project will contribute to the continued growth of renewable energy storage capacity in NSW.

The Project is consistent with the strategic context as described in **Section 2** through:

- Providing an additional source of renewable energy storage, supporting Australia's transition away from fossil fuel energy production;
- Improving the reliability of the NEM by providing energy storage and dispatching energy during peak times;
- Contributing the growth of renewable energy storage in NSW;
- Generating employment opportunities and economic stimulus on the regional economy through the facilitation of 100 direct and indirect jobs during construction of the Project;
- Monetary contributions to Muswellbrook Shire Council through a Voluntary Planning Agreement to fund infrastructure and deliver community benefits for the life of the Project; and
- Mitigating and avoiding adverse environmental impacts as a result of the Project and aligning with the principles of ecologically sustainable development.

7.3 COMPLIANCE WITH RELEVANT STATUTORY REQUIREMENTS

The Project is declared SSD under Clause 2.6(1) of the Planning Systems SEPP. Development consent for the Project is sought under Part 4, Division 4.7 of the EP&A Act.

The Project Area is zoned RU1 Primary Production under the Muswellbrook LEP. The Project is for the purposes of electricity generating works and is permissible with development consent in the RU1 zone.

The EIS has been prepared with regard to the Large-Scale Solar Energy Guideline (DPHI, 2024a) and the State Significant Development Guidelines (DPHI, 2024b). The EIS has been prepared in accordance with the Project SEARs (**Appendix A**). The mandatory matters for consideration and statutory requirements are addressed in **Section 4** and **Appendix C**.

The Project complies with the relevant statutory requirements and the potential environmental, social and economic impacts arising from the Project can be effectively managed through the mitigation and management measures included in **Appendix E**.

7.4 COMMUNITY VIEWS

Stakeholder engagement encompassed a range of stakeholders including NSW and Australian Government agencies, the nearby community and community groups, Aboriginal groups, proximate landowners and infrastructure owners, as described in Section 5.

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 drop-in sessions, phone and email interactions, Project's website, letters and factsheets.

During engagement activities, key topics raised included the potential visual amenity impacts, property values and community benefits. Feedback from the community was generally neutral. Overall, the Project is supported by the local community and key stakeholders who recognise the benefits of the Project.

The Applicant will continue to work with the community to address real and perceived impacts as a result of the Project through the ongoing engagement and complaints management detailed in **Section 5.6**.

7.5 SCALE AND NATURE OF IMPACTS

The Project will primarily be developed on land which has been modified following a long history of vegetation clearing and livestock grazing. 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 sites and surrounding receivers. Progressive design iterations for the 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" hierarchy.

7.5.1 ENVIRONMENTAL IMPACTS

This EIS and supporting technical assessments have considered the potential for environmental impacts as a result of the Project. For each assessment, the potential impacts and measures to mitigate and avoid these are detailed in **Section 6**.

Additionally, **Appendix E** details all the measures proposed in this EIS to mitigate, avoid and offset the potential environmental impacts during each stage of the Project.

In particular, the proposed environmental impacts of the Project are considered acceptable for the following reasons:

- The majority of the development footprint is located on land classified as Category 1 – Exempt Land under the LLS Act 2013 to avoid impacts to biodiversity. In addition, the Project footprint has been refined to avoid and minimise impacts to endangered flora species *Cymbidium canaliculatum* and River Red Gum (*Eucalyptus camaldulensis*) and the Hunter Valley Delma Legless Lizard (*Delma vescolineata*);
- The Project footprint has been refined to reduce the number of Aboriginal cultural sites directly impacted by the Project. However, six sites will be directly impacted by the development footprint and it is recommended that these impacts be avoided where possible during the detailed design through micro-siting infrastructure and providing buffers to recorded PADs and Hearths;
- The Project does not result in significant impacts in terms of landscape character, visual amenity, glint and glare or noise and vibration, and these matters can be adequately managed during the construction and operation phases of the Project;
- The potential hazards and risks associated with bushfires, flooding, and hazardous and dangerous goods can be effectively managed in accordance with the relevant guidelines and agency requirements; and
- A new site access is proposed on Denman Road to manage traffic movements for the Project and will be designed to accommodate heavy vehicles and oversize overmass vehicles. The traffic impacts associated with the Project can be effectively managed and did not give rise to adverse impacts on the overall performance and safety of the surrounding road network.

7.5.2 ECONOMIC IMPACTS

The Project will provide economic activity to the regional and NSW economy during the construction, operation and decommissioning phases. The Project will generate 100 direct and indirect jobs and the impacts on the regional economy are estimated at up to \$43M in direct and indirect output, \$15M in direct and indirect value added, \$5M in direct and indirect household income. Further, the construction impacts of the Project on the NSW economy are estimated at up to \$98M in direct and indirect output, \$41M in direct and indirect value added, \$27M in direct and indirect household income, and 272 direct and indirect jobs.

The Project will result in a reduction of the land available for agricultural activity, however these impacts are considered negligible relative to the positive economic activity impacts of the construction of the project, such as creation of local employment, and increased investment and expenditure in local businesses and the regional economy. The Project will create demand for regional labour resources and regional inputs to production and combined with the number of other major projects occurring in the region, could result in increases to regional wages, prices and rents, and increased demand for housing.

7.5.3 SOCIAL IMPACTS

The Applicant proposes to enter into a Voluntary Planning Agreement with Muswellbrook Shire Council and will contribute \$150 per MW per year for the life of the project consistent with the Large-Scale Solar Energy Guideline (DPHI, 2024a). The Voluntary Planning Agreement is subject to on-going discussions with the Muswellbrook Shire Council.

During construction phase, the Applicant will work with contractors, local communities, neighbours and local council, to plan and manage construction to minimise disturbance. The potential social impacts can be appropriately managed with the implementation of the mitigation and management measures, as summarised in **Appendix E**. These measures 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 the Project would result in a net benefit to the region and NSW community.

7.6 COMPLIANCE AND MONITORING

An Environmental Management System will be developed to provide a 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 Environmental Management Strategy will incorporate mitigation measures that have been identified throughout this EIS and associated technical assessments and will include relevant management plans.

Appendix E 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 Environmental Management Strategy 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 they have been avoided, mitigated, managed or offset. Various options have been considered for the Project 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 2.9** 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, the Project is no threat of direct or indirect serious or irreversible damage to the environment.

7.7.2 INTER-GENERATIONAL EQUITY

The Project will contribute to inter-generational equity by maintaining and promoting agricultural diversity that builds resilience into regional and rural community economies' which helps these communities thrive. During the detailed design and operational phases of the Project, the developer may consider the use of agrisolar activities which would provide the potential for climate-change resilience by creating a more favourable growing environment and curbing some of those extreme conditions as a result of drought conditions.

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

Locating a majority of the Project on Category 1 land contributes to the conservation of biodiversity, which 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 panels 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. This is detailed in **Section 6.1**.

7.7.4 SOCIAL AND ECONOMIC BENEFITS

The Project enables the storage of renewable 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 **Section 6** and **Appendix E** of this EIS. 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 75 FTE jobs during construction, 180 FTE during peak construction, 53 direct and indirect 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 VPA with Muswellbrook Shire Council.

7.8 CONCLUSION

The Project involves the construction, operation and where relevant decommissioning of a BESS with a capacity of up to 2.4 GW / 4.8 GWh 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 this EIS and supporting technical assessments will be managed through the mitigation and management measures summarised in **Appendix E**.

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 their 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.

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APPENDIX A SEARS TABLE



APPENDIX B DETAILED MAPS AND PLANS



APPENDIX C STATUTORY COMPLIANCE TABLE



APPENDIX D COMMUNITY ENGAGEMENT TABLE



APPENDIX E MITIGATION MEASURES TABLE



APPENDIX F ESTIMATED DEVELOPMENT COST



APPENDIX G

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT



APPENDIX H

ABORIGINAL CULTURAL HERITAGE
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APPENDIX I

HISTORIC HERITAGE ASSESSMENT
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APPENDIX J NOISE IMPACT ASSESSMENT



APPENDIX K

LANDSCAPE AND VISUAL IMPACT
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APPENDIX L AGRICULTURAL IMPACT ASSESSMENT



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