



APPENDIX L

AGRICULTURAL IMPACT ASSESSMENT

The Plains Wind Farm

Agricultural Impact Assessment

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Executive summary

Project description

The Project involves the construction, operation, maintenance and decommissioning of a wind farm, with up to 188 wind turbine generators, together with associated and ancillary infrastructure (including substations, overhead and underground electrical reticulation) south of Hay NSW.

Existing environment

General

The Project area is located in the Hay Shire Council local government area and in the Riverina Land Services region on the Riverina Plains which has very low topographic relief.

Rainfall in the study area averages approximately 366 millimetres per annum with moderate variability. Summers are relatively hot with an average of 95 days per year over 30°C.

Most of the soils in the Project area are moderate fertility vertosols, with some smaller areas of lighter textured, low fertility soils. Land and soil capability class 5 (moderate - low capability) is the dominant land types with smaller areas of capability class 4 and 6 land.

Land use and agricultural productivity

Historically, the Project area has mainly run Merino sheep for meat and wool production.

The Mungadal Station, which forms 93.7 per cent of the Project area operates two Merino ewe flocks namely a self-replacing Merino ewe flock with the ewes joined to Merino rams and a 'terminal' Merino ewe flock with the ewes joined to Dorset rams. The carrying capacity has been 27,000 to 30,000 ewes on approximately 115,000 hectares. This property also runs agistment cattle and retains wethers during good seasons.

Property 2 which forms 3.7 per cent of the Project area operates a similar livestock program to Mungadal Station, but at a higher average stocking rate. No cropping has been undertaken on either property in recent years.

Properties 2 and 4 together comprise only 2.7 per cent of the project area. Approximately 55% of the land has been set out to irrigated cropping paddocks that has not been regularly used for irrigated cropping in recent years. The remaining is used for grazing.

Impact assessment

Construction and operation of the Project would have similar types of agricultural impacts. However, in most cases the extent and intensity of potential and expected impacts are greater during construction due to higher activity and a larger impact footprint.

Loss of agricultural land use

The loss of agricultural land use will be higher during construction than operation. The potential loss of grazing income is estimated at approximately \$535,000 over a 36-month construction period.

The loss of grazing income during operation is much lower due to the expected continuation of grazing across most of the Project area. The loss of income is estimated at approximately \$115,700 per annum. This is based on the permanent footprint of 1,296 hectares; however, the area impacted is expected to be smaller as much of the 100 metre WTG buffer would continue to be grazed.

The agricultural income loss does not consider the non-agricultural rental income from the Project which would result in an overall net increase in income to the host landowners.

The area of agricultural production lost during construction and operation is a small fraction of the total agricultural land in the Hay LGA. Therefore, the impacts of the Project at a regional scale would be minimal.

Biosecurity

The potential spread of weeds by vehicles, machinery, personnel and movement of soil and water is the highest biosecurity risk. The introduction of plant disease or pest species is also a relevant biosecurity risk. The risks would be managed by implementing mitigation measures and conformation to the biosecurity protocols of the landowners.

Other potential impacts

Other potential impacts include disturbance of livestock by noise and fire risks. However, these impacts are expected to be relatively small and would have a minor effect on productivity. The impacts on agricultural land and production are limited by the lack of any cropping land on the Project area, and its relatively low productivity.

The impact on ground or aerial agricultural operations would be minimal.

Glossary, acronyms and abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
AIA	agricultural impact assessment for the Project – this report
ALC	Agricultural Land Classification System (see Hulme et al, 2002)
BESS	battery energy storage system
BJD	bovine Johne’s disease
BoM	Bureau of Meteorology
BSAL	biophysical strategic agricultural land
Commonwealth	Reference to the Commonwealth of Australia such as Commonwealth land or Commonwealth legislation
construction footprint	The area of construction disturbance, including construction compounds and temporary access tracks.
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment (now DPE)
DSE	dry sheep equivalent. DSE is used as a measurement of the pasture or feed requirements of different types of livestock relative to a wether (a dry sheep) which is rated at 1.0.
EIS	Environmental Impact Statement
ENGIE	International Power Pty Ltd trading as ENGIE ANZ (‘the proponent’)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
FTE	Full time equivalent workers
ha	hectare
km	kilometre
kV	kilovolt
LGA	local government area

LLS	Local Land Services
LSC	Land and Soil Capability Assessment Scheme (see OEH, 2012)
mAHD	metres above the Australian Height Datum
MW	megawatt
NEM	National Electricity Market
NSW	New South Wales
OEH	former (NSW) Office of Environment and Heritage
OJD	Ovine Johne's disease
O&M facility	operations and maintenance facility
permanent footprint	The area of land that will remain disturbed throughout the operational life of the Project.
PEC	Transgrid's Project EnergyConnect.
Primary Production SEPP	State Environmental Planning Policy (Primary Production) 2021
Project (the)	The Project 'The Plains Wind Farm', which is the subject of this Environmental Impact Statement.
Project area	The area that has been assumed for the purpose of this EIS to be directly affected by the construction and operation of the Project. It includes the indicative location of Project infrastructure and the area that would be directly disturbed during construction and any easement required during operation.
Project landowners	The owners of the land on which the Project would be located.
Property 2	The property on which a portion of the Project area in the south east is located.
Property 3	The property on which a portion of the Project area in the north west is located.
Property 4	The property on which a portion of the Project area in the north east is located.
the proponent	ENGIE
SEARs	Planning Secretary's environmental assessment requirements
SEPP	State environmental planning policy

SSAL	State significant agricultural land
stock units	In this assessment, one sheep or goat is equated to one stock unit and cattle are equated to ten stock units each.
TSR	travelling stock reserve
WTG	wind turbine generator

1 Introduction

1.1 Project Overview

1.1.1 Description

The Plains Wind Farm (the Project) involves the construction, operation, maintenance and decommissioning of a wind farm, with up to 188 wind turbine generators (WTGs) and associated and ancillary infrastructure. The Project's nearest WTGs are located approximately 16 km south of Hay NSW (refer Figure 1-1).

The Project consists of the following key components (refer Figure 1-2):

Table 1-1
Project Components

Project Component	Description
Location and Area	The Plains Wind Farm extends across an area of approximately 53,984 hectares and is situated on Mungadal Station and neighbouring properties to the east and west of the Cobb Highway
Wind Turbine Generator parameters	• Maximum blade tip height: up to 270 m • Blade length: up to 90 m • Hub height: up to 180 m
Project Description	Wind Turbine Generators • Up to 188 WTG locations, with a maximum installed capacity of 1,350 MW (based on a 7.2MW turbine generator size currently available) • Maximum tip height of 270 m • Crane hardstand areas, turbine laydown areas, concrete batching plants, internal access tracks, site entrance points off Cobb Highway
Ancillary Infrastructure	• Internal project access roads to connect WTG's and ancillary project infrastructure • Collector groups connected with predominately 33kV underground cabling and occasionally overhead lines • Up to 10 permanent meteorological masts • Accommodation compound on-site as well as accommodation housing for workers in Hay • Main substation, switchyard, operations and maintenance building • 330kV high-voltage overhead lines connecting collector groups of turbines to the main substations, and a switchyard for connection to the project energy connect • Operations and maintenance building • Switchyard to connect into Project EnergyConnect (PEC) • Main substations, facilitating connection to the National Electricity Market (NEM) includes transformers, voltage controls, storage units and potentially power quality control equipment

	- Up to three collector substations, with overhead 330kV lines running back to main substation - Up to eight access points to project site off the Cobb Highway
Construction Program and Staging	<u>Duration:</u> 2-3-year construction <u>Construction workforce:</u> - Peak workforce: 700 jobs - Average workforce: 550 Jobs <u>Operations workforce:</u> - Full time equivalents (FTEs) (on site): 40 - FTEs off site: 6

1.1.2 Site setting and surrounding land use

The Project area is entirely located on land zoned RU1 – Primary Production (DPE, 2023b). The area surrounding the Project area is generally also zoned RU1 – Primary Production. Exceptions are noted below.

- The South West Woodland Nature Reserve is approximately 14 kilometres to the south of the Project area and is zoned E1 – National Parks and Nature Reserves.
- Various urban, village and other zonings in and around Hay and Boorooban. The closest such land zonings are approximately 14 kilometres and 10 kilometres respectively from the nearest WTG. Hay town centre is located approximately 16 kilometres from the nearest proposed WTG.
- Hay Airport and the Sturt Highway which are zoned SP2 – Infrastructure and are approximately 13 kilometres and 11 kilometres respectively from the nearest WTG at their closest point.

1.2 Purpose of this technical report

This technical report is one of several technical reports that form part of the Environmental Impact Statement (EIS) for the Project.

The purpose of this technical report is to identify and assess the potential impacts of the Project in relation to agriculture. It responds directly to the Secretary's Environmental Assessment Requirements (SEARs) (refer to Section 1.3).

This report has the following objectives:

- describe the current socio-economic and environmental situation relevant to agricultural enterprises in the Project area,
- assess the impacts of the Project on agriculture in the Project area and in the surrounding region, and
- formulate mitigation and management measures to minimise the impacts on agriculture in the Project area and in the surrounding region.

Figure 1-1: Project locality

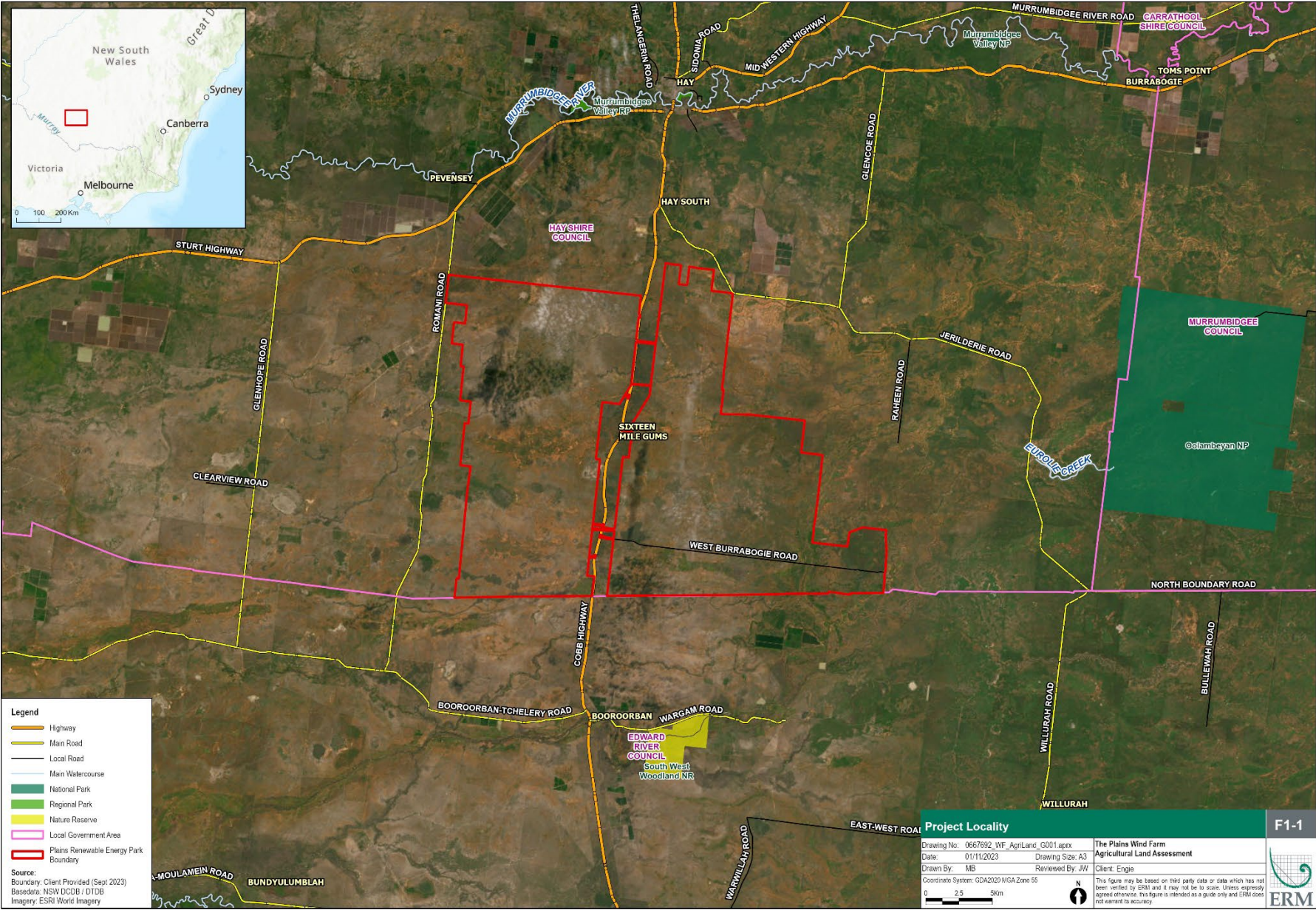
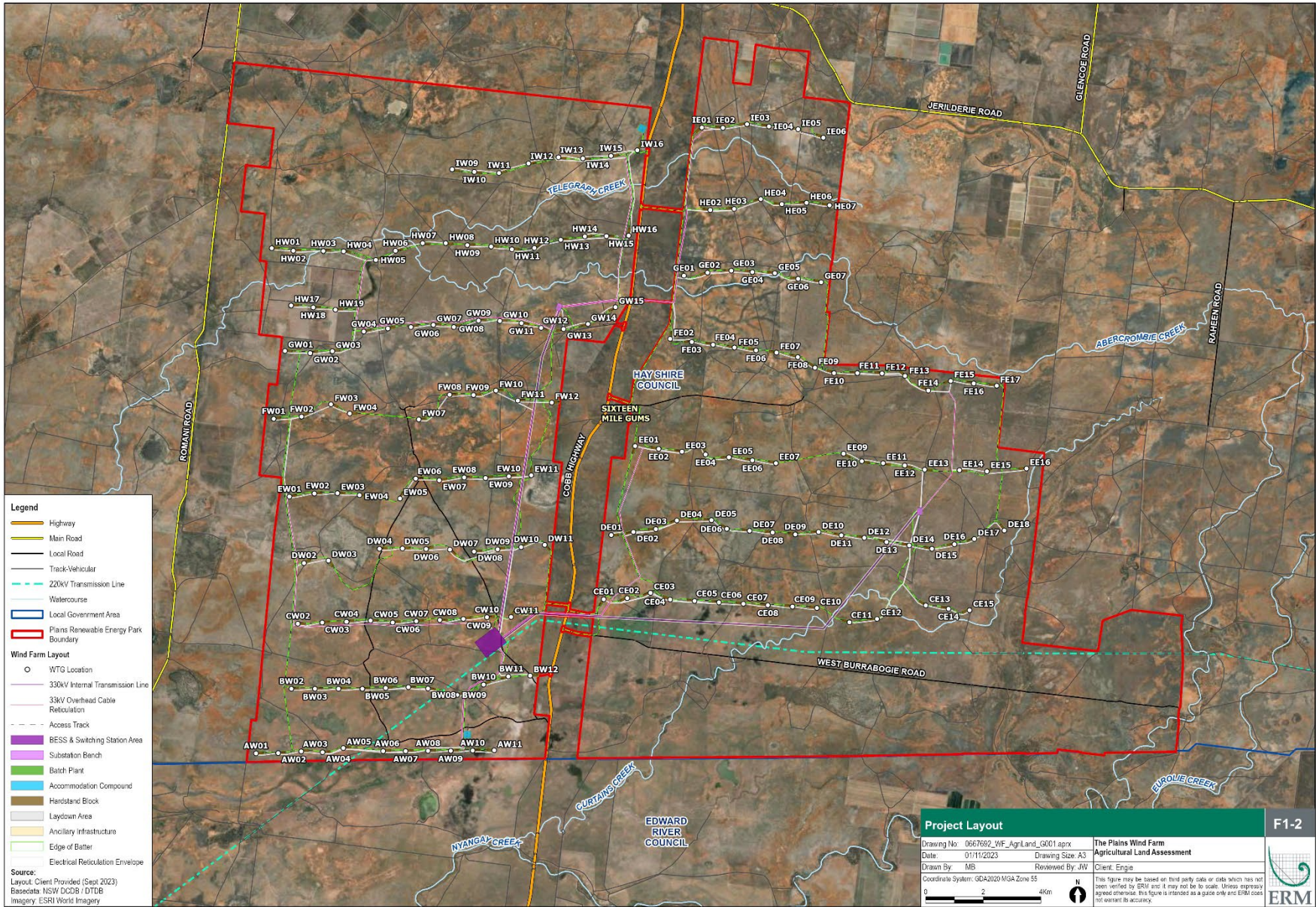


Figure 1-2: Project layout overview



1.3 Secretary's Environmental Assessment Requirements

The NSW Department of Planning and Environment (DPE; now Department of Planning, Housing and Infrastructure, DPHI) has provided the SEARs for the EIS. The requirements specific to this assessment and where these aspects are addressed in this technical report are outlined in Table 1-2.

Table 1-2
Secretary's Environmental Assessment Requirements

Reference	Requirement	Where addressed in this document
The Plains Wind Farm		
Key Issue - Land:	An assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including: ○ (amongst others) consideration of agricultural land, biosecurity, travelling stock routes... ○ a cumulative impact assessment of nearby developments.	Chapter 7
	An assessment of the compatibility of the development with existing land uses, during construction, operation and after decommissioning, including: ○ (amongst others) assessment of impact on agricultural resources and agricultural production on the site and region.	Chapters 5 and 6

The agricultural impact assessment (AIA) addresses assessment requirements from the 'land' key issue in relation to agricultural impacts.

The AIA assesses the impacts of the Project on access; agricultural operations; livestock and machinery movements; crop production activities; irrigation and biosecurity risks. The impact on agricultural productivity is quantified and mitigation strategies to minimise resource loss, biosecurity risks and other impacts are addressed.

1.4 Structure of this report

The structure and content of this report is as follows.

- *Chapter 1 – Introduction:* Outlines the background and need for the Project, and the purpose of this report.
- *Chapter 2 – Legislation and policy context:* Provides an outline of the key legislative requirements and policy guidelines relating to the Project.
- *Chapter 3 – Methodology:* Provides an outline of the methodology used for the preparation of this AIA.
- *Chapter 4 – Existing environment:* Describes the existing agricultural environment.

- *Chapter 5 – Construction impacts:* Describes the potential construction impacts associated with the Project.
- *Chapter 6 – Operational impacts:* Describes the potential operational impacts associated with the Project.
- *Chapter 7 – Cumulative impacts:* Outlines the potential cumulative impacts with respect to other known developments within the vicinity of the Project.
- *Chapter 8 – Management of impacts:* Outlines the proposed mitigation measures for the Project.
- *Chapter 9 – Conclusion:* Provides a conclusion on the potential impacts of the Project on agriculture.
- *Chapter 10 – References:* Identifies the reports and documents used to generate this report.

Attachments to this report are as follows.

- *Attachment 1 NSW DPI Livestock Budgets.*
- *Attachment 2 Other regional weeds lists.*

2 Legislation and policy context

2.1 Legislation

The Project is subject to environmental assessment under Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Other legislation specific to the agricultural impact assessment includes the *Biosecurity Act 2015* and State Environmental Planning Policy (Primary Production) 2021 (Primary Production SEPP). A summary of the relevance of each legislation is provided in the following sections.

2.1.1 Biosecurity Act 2015

The NSW *Biosecurity Act 2015* (the Act) came into effect on 1 July 2017 and complements the *Biosecurity Act 2015* of the Commonwealth. The primary objective of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks. The Act is tenure neutral, that is, it applies to all lands in NSW, both public and private tenure.

The Act defines key concepts such as biosecurity matter, carrier, biosecurity impact, biosecurity risks and pests, and specifies a wide range of prohibited matter including pests and diseases of plants and animals.

Under the Act, the responsibility for biosecurity risk is shared between the NSW Government, industry and the community. Specifically, the Act establishes a general biosecurity duty, as follows:

‘Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.’

The NSW Department of Primary Industries (DPI) holds the primary responsibility for management of biosecurity under the Act, ensuring the legislative and policy settings support best practice management of biosecurity risks. In addition, DPI works with other jurisdictions to prevent, prepare for, respond to and recover from biosecurity incursions and incidents. DPI works with a range of partners in the management of biosecurity. Significant partners include Local Land Services (LLS), local government and industry groups (DPI, 2013a).

The Project is located mostly in the Riverina LLS region with the southern end situated adjacent to the Murray LLS region. Regional biosecurity strategies developed by DPI and LLS covering the Project footprint include:

- *NSW Invasive Species Plan 2018-2021* (DPI, 2018),
- *Riverina Regional Strategic Weed Management Plan 2023-2027* (Riverina LLS, 2022), and
- *Riverina Regional Strategic Pest Animal Management Plan 2018-2023* (Riverina LLS, 2018).

The above listed strategies are considered in sections 5.1 and 6.2 of this report.

2.1.2 Primary Production SEPP

The relevant part of the Primary Production SEPP is ‘Chapter 2 – Primary production and rural development’. This chapter includes the following relevant aims:

- (a) to facilitate the orderly economic use and development of lands for primary production,*
- (b) to reduce land use conflict and sterilisation of rural land by balancing primary production, residential development and the protection of native vegetation, biodiversity and water resources,*

(c) to identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations,

...

(e) to encourage sustainable agriculture, including sustainable aquaculture.

Part 2.2 deals with State significant agricultural land within which clause 10 states that *‘the objects of this Part are as follows—*

(a) to identify State significant agricultural land and to provide for the carrying out of development on that land,

(b) to provide for the protection of agricultural land—

(i) that is of State or regional agricultural significance, and

(ii) that may be subject to demand for uses that are not compatible with agriculture, and

(iii) if the protection will result in a public benefit.’

Clause 1 of section 2.8 states that land is State significant agricultural land if it is listed in Schedule 1 of the Primary Production SEPP. Schedule 1 does not list any State significant agricultural land at present. However, a draft map of State significant agricultural land (SSAL) has been released (DPI, 2021a).

Non-agricultural developments would not be precluded on SSAL. Rather, DPI (2021d) indicates that the process of mapping SSAL is to identify *“the most capable, fertile and productive agricultural lands in the state which support a variety of successful agricultural industries”*. Further it is stated that *“knowing where SSAL is situated and understanding its location, value and contribution will assist in making decisions about current and future allocation of land”*.

It is understood that the NSW Government has not yet announced how SSAL mapping would support land use planning (DPI, 2021a; DPI, 2021e).

2.2 Guidelines

Policies and guidelines relevant to the AIA include:

- *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE, 2021),
- *Riverina Murray Regional Plan 2041* (DPE, 2023a),
- *The Land and Soil Capability Assessment Scheme* (OEH, 2012),
- *Infrastructure Proposals on Rural Land* (DPI, 2013b), and
- *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OEH, 2013).

Some guidelines provide specific guidance in relation to the assessment of agricultural impacts (for example, use of the weed and pest animal management plans in the biosecurity assessment). Where appropriate, these guidelines have been referenced in the relevant sections of this technical report.

3 Methodology

The methodology for this agricultural impact assessment has been designed to meet the requirements of the SEARs (refer to Section 1.3).

3.1 Overview of approach

The key aspects of the methodology were as follows.

- Landowner consultations and property inspections occurred on 13 and 14 April 2023 to obtain information on the agricultural enterprises conducted on the Project area and the landowners' perceived impacts of the Project on these enterprises.
- Other consultation to identify the main biosecurity risks associated with the Project and recommended mitigation measures was undertaken by telephone with various biosecurity officers from the Hay Shire Council, Edward River Council, Riverina LLS and Murray LLS.
- The existing environment was described primarily using a desktop study based on data from various sources referenced in Chapter 4.
- The assessment of the impacts on agriculture was based on the desktop study, consultations with landowners and other stakeholders, property inspections and professional knowledge.
- The identification of mitigation and management measures was based on information from the existing environment and impact assessments, consultations with landowners and other stakeholders, property inspections, professional knowledge, and various information sources as referenced in Chapter 4.

3.2 Relevant areas

The area of impacts on agriculture are mostly limited to the Project area. However, some impacts, such as noise disturbance on livestock and restrictions on aerial agriculture, may occur beyond the Project area.

The permanent footprint includes project infrastructure elements which would have an ongoing impact on agricultural activities after the construction period has ended. However, agricultural production would not be directly impacted in all areas of the permanent footprint. For example, grazing enterprises would be largely unaffected by the transmission line easements.

3.3 Agricultural impact assessment

3.3.1 Landowner consultation and property inspections

An inspection of the Project area occurred on 13 April 2023. Consultations with three Project landowners were completed on 13 and 14 April 2023. The inspection and consultations were undertaken by Peter Tremain of Tremain Ivey Advisory.

Consultation with landowners obtained information on the size and land types of each property, the size and nature of agricultural enterprises conducted, and the landowner's perceived impacts of the Project on the agricultural property and enterprises.

Other neighbouring properties were viewed to some extent from public roadways and adjacent private property.

Further information on the inspected properties and other properties (such as information on vegetation cover, soil type, land capability, land use, type and locations of horticultural crops, extent

of cleared areas and type of cropping) was gained through examination of satellite imagery, reference material and public GIS datasets.

3.3.2 Stakeholder consultation

Discussions to identify the main biosecurity risks associated with the Project and recommended mitigation measures were undertaken by telephone with biosecurity officers from Hay Shire Council, Edward River Council, Riverina LLS and Murray LLS.

3.3.3 Agricultural impact assessment

The description of the existing environment was primarily a desktop study based on data from various sources referenced in Chapter 4. However, this information was also evaluated with reference to the information gathered during the property inspections and landowner consultations described above. The assessment of the existing environment concentrated on:

- geographical factors (such as climate, topography and soils) that have the greatest influence on agriculture in the study area, and
- measures which best appraise the nature and productivity of agricultural enterprises in the study area (such as land and soil capability, land use and value of production).

The assessment of the impacts on agriculture was based on information from the existing environment assessment, consultations with landowners and other stakeholders, property inspections and professional knowledge.

Mitigation measures are defined as actions, processes or structures which minimise or eliminate the impacts of the Project. The identification of mitigation and management measures was based on information from the existing environment and impact assessments, consultations with landowners and other stakeholders, property inspections, professional knowledge, and various information sources as referenced in Chapter 4.

3.4 Consideration of biosecurity issues

Relevant information on biosecurity issues for the Project were identified from the following sources:

1. landowner consultation (refer to Section 3.3.1)
2. observations during the property inspections (refer to Section 3.3.1)
3. consultation with various LLS and local government biosecurity officers (refer to Section 3.3.2)
4. reference to the *NSW Biosecurity Act 2015*
5. reference to the relevant regional strategic weed management plans
6. review of other documents set out in Section 5.1.

The methodology for the biosecurity assessment was similar to the agricultural impact assessment set out in Section 3.3.3. Existing biosecurity issues and potential biosecurity risks were primarily based on a desktop study including pest, disease and weed distribution data, and various legislation, regional plans and surveys referenced in Section 5.1. However, information gathered from property inspections and landowner consultation was also considered. The biosecurity assessment concentrated on the main risks associated with the Project.

The identification of mitigation and management measures was based on information from the existing environment and impact assessments of this report, consultations with landowners and other stakeholders and property inspections.

4 Existing environment

4.1 General description

4.1.1 Location

The Project area is located in the Hay Shire Council LGA and the Riverina LLS region. The southern boundary of the Project area borders the Edward River Council LGA and the Murray LLS. The Project area extends from approximately 16 kilometres south of Hay to approximately 9 kilometres north of Booroorban at the respective closest points. It occupies both sides of the Cobb Highway and is approximately 34 kilometres from east to west, and approximately 25 kilometres from north to south at its largest extents.

4.1.2 Topography

The Project area is a landscape of relatively flat alluvial riverine plains crossed by five intermittent watercourses, namely:

- Abercrombie Creek towards the north of the Project area,
- Telegraph Creek also towards the north of the Project area,
- Curtains Creek in the south east,
- Nyangay Creek in the extreme south east corner, and
- a drainage line near The Forest Creek, adjacent to the southern boundary.

The elevation across the Project area is approximately 80 to 95 metres above Australian Height Datum (mAHD), generally with a slight fall from east to west and from north to south. There are some sandhill areas with slightly higher elevation than surrounding land.

4.1.3 Climate

Climate, especially rainfall and temperature, has a large impact on the productivity of dryland agricultural properties such as those found on the Project area. The Hay (Miller Street) and Hay Airport Bureau of Meteorology (BoM) recording stations are the closest to the Project area with an extensive dataset. The Miller Street and Airport stations are approximately 11.8 and 10.3 kilometres north of the Project area at the closest point respectively, and at an elevation of 92 to 93 mAHD.

Miller Street (station 075031) has approximately 135 years of rainfall records and up to 134 years of temperature records until 2015, when it closed. Hay Airport station (075019) opened in 2007 and remains operational. The combined climate records of both stations are summarised in Table 4-1.

The mean maximum monthly temperatures reach a peak of approximately 33°C in January and February. The mean maximum monthly temperature varies from 15.7°C to 17.6°C in the winter months.

The average number of days over 30°C is 94.9 per annum while the average over 40°C is 8.2 days per annum.

The mean minimum temperatures fall to a low of 3.5°C in July and between 4°C and 5°C in the other winter months. A minimum temperature under 2°C is generally regarded as the approximate temperature at which frost will occur. An average of 27.8 such days per annum have been recorded. The highest mean minimum temperatures occur in January and February at approximately 16°C to 17°C.

The average rainfall at Hay has been 366 millimetres over 70 rain days per annum. In the driest 10 per cent of years, the average falls to 217 millimetres per annum. The average in the wettest 10 per cent of years is 533 millimetres per annum. The rainfall has moderate variability according to rainfall records (BoM, 2021). Variability is generally much greater in summer and early autumn than at other times of the year.

Rainfall is relatively evenly spread throughout the year with a slight dominance in winter and spring.

Table 4-1
Summary of climate records

Statistic Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<u>Maximum temperature (°C)</u>													
Mean	33.2	32.6	29.3	24.1	19.3	15.8	15.2	17.3	20.8	24.6	28.5	31.3	24.3
Number of days >= 30°C	22.6	19.9	13.7	3.3	0.0	0.0	0.0	0.0	1.0	5.3	11.4	17.6	94.9
Number of days >= 40°C	3.8	1.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	1.4	8.2
<u>Minimum temperature (°C)</u>													
Mean	16.7	16.5	13.8	9.9	6.7	4.5	3.5	4.5	6.6	9.5	12.6	15.0	10.0
Number of days <= 2°C	0.0	0.0	0.0	0.1	2.4	6.8	9.3	6.6	2.3	0.3	0.0	0.0	27.8
<u>Rainfall (millimetres)</u>													
Mean	27.4	28.3	29.3	28.1	34.4	34.9	30.3	31.8	31.2	35.1	27.3	26.8	365.9
10th percentile	0.9	0.5	0.5	2.0	6.3	8.1	7.1	7.8	6.2	5.9	4.6	3.3	216.5
Median	15.1	16.1	18.7	21.1	27.7	29.7	27.9	27.4	26.6	24.6	20.2	16.1	358.1
90th percentile	67.8	74.9	73.0	61.1	67.5	66.0	56.1	59.5	61.6	80.5	60.0	69.1	532.8
<u>Other Rainfall Records</u>													
Variability (%)	444%	462%	388%	279%	221%	195%	176%	188%	208%	303%	275%	408%	88%
Number of days of rain	3.8	3.4	4.0	4.5	6.4	8.3	8.9	8.6	6.7	6.3	4.9	4.3	70.3

4.1.4 Soils

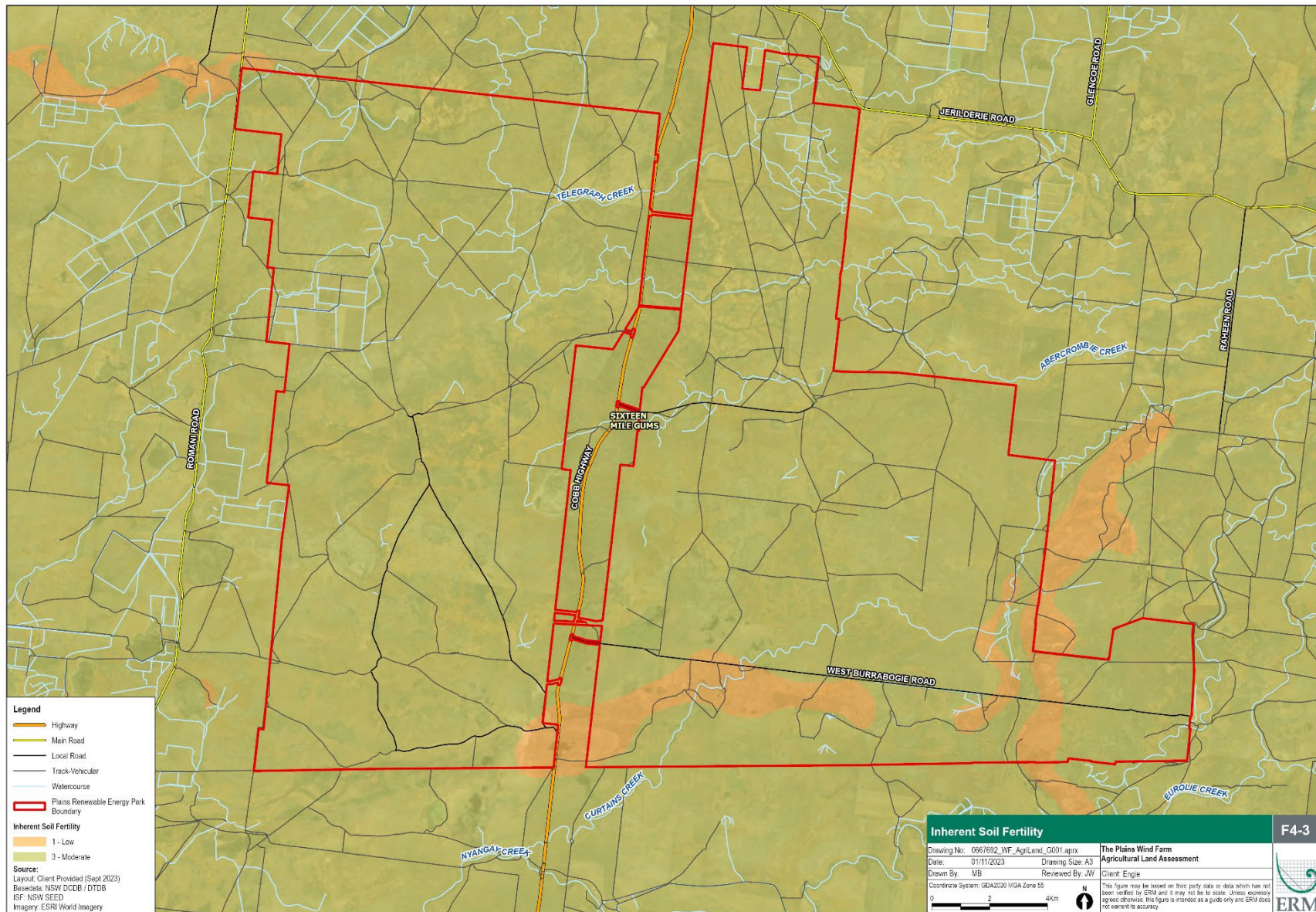
Most of the soils in the Project area are moderate fertility vertosols (CSIRO, 2016; OEH, 2017), as shown in Figure 4-1. All the construction and operation areas are located on these moderate fertility vertosols. Vertosols have clay texture throughout the profile, display strong cracking when dry, and shrink and swell considerably during wetting and drying phases (Agriculture Victoria, 2021).

There are also lighter textured, low fertility rudosols and chromosols in several parts of the project area, including along Curtains Creek in the south east of the Project area and in a band across the southern part of the Project area (CSIRO, 2016). None of the construction and operation areas are located on these soils.

Rudosols have a sandy, weakly developed profile. They are typically acid throughout the profile and plant nutrient availability is quite variable. They may have good infiltration but usually low water holding capacity.

Chromosols have a distinct texture contrast between the loamy A horizons and the clayey B horizons, but the latter is neither strongly acidic nor sodic (Agriculture Victoria, 2021).

Figure 4-1: Inherent soil fertility



4.1.5 Livestock water and irrigation

Water for livestock is mainly supplied by a piped water system supplied from private bores or pumped from the Murrumbidgee River. The water is pumped into tanks and distributed to livestock via pipes and troughs. Some areas in the south and east of the Project area are watered by the Romani Joint Water Supply, which pumps water out of the Murrumbidgee River near Hay for irrigation, stock and domestic purposes.

There is about 590 hectares of land developed for irrigation in the north western part of the Project area, and a further 290 hectares of developed irrigation land is located in the north east of the Project area. Some of these areas have not been used for irrigation in recent years.

4.1.6 Land use

A map of land use across the Project area as derived from DPIE (2020) has been included as Figure 4-2. Relevant areas of land use are summarised in Table 4-2.

The majority of land use of the Project area is classified as 'grazing of native pastures'. The main exceptions include:

- some 'river' land along Curtains Creek and Abercrombie Creek,
- 'marsh or wetlands' in intermittent lakes and water courses,
- irrigated cropping in the north west and north east of the Project area, and
- and the Cobb Highway (transport).

The classification is consistent with actual historical land use (Section 4.6.1).

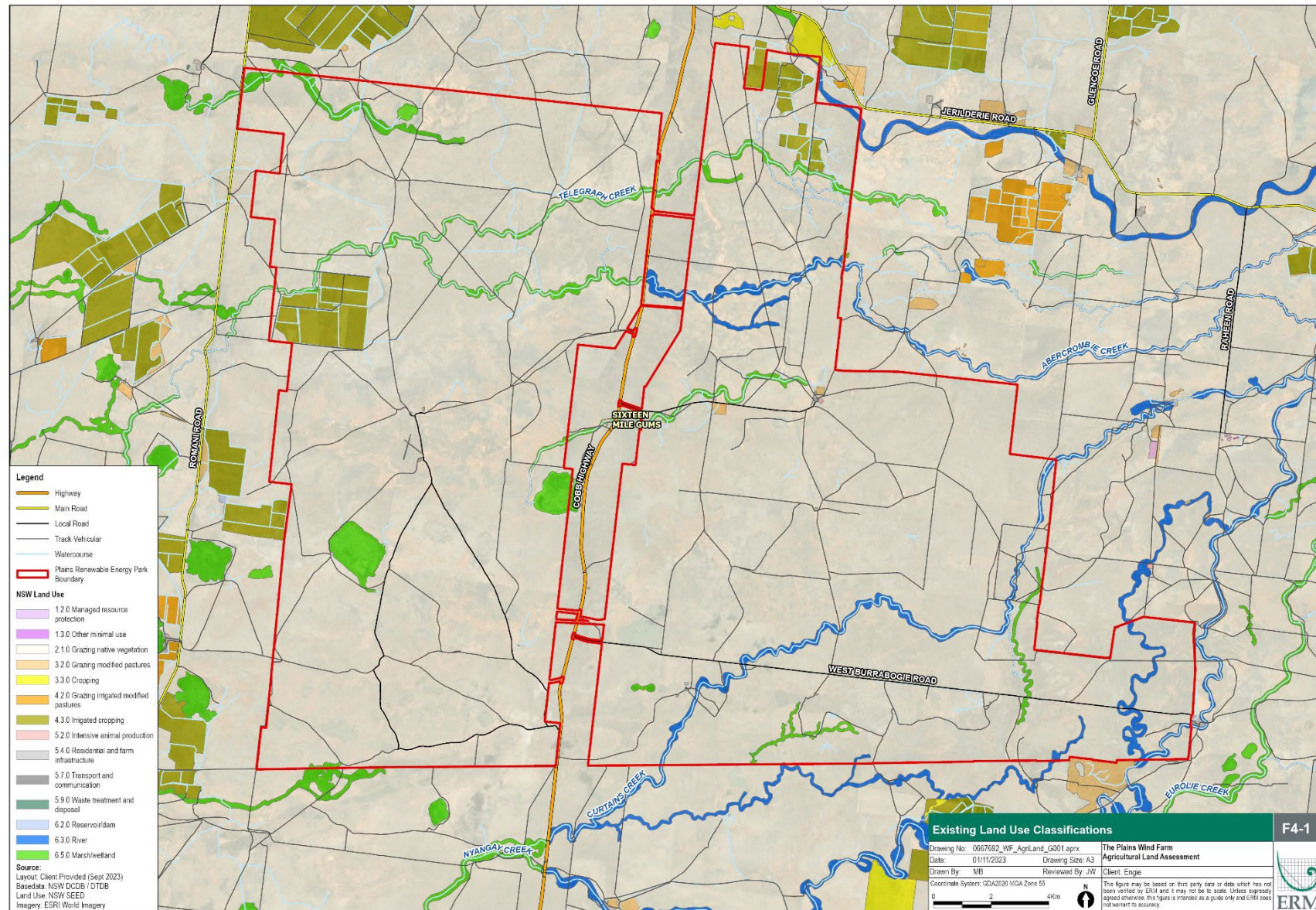
Table 4-2
Summary of land use

Land Use (DPIE, 2020)	Construction Footprint (ha)	Proportion	Permanent Footprint (ha)	Proportion
<u>Agricultural land uses</u>				
2.1.0 Grazing native vegetation	1,939.4	97.1%	1,261.0	97.3%
4.3.0 Irrigated cropping	30.6	1.5%	19.1	1.5%
Sub-total - Agriculture	1,969.9	98.6%	1,280.1	98.7%
5.7.0 Transport and communication	1.8	0.1%	1.65	0.1%
6.3.0 River	14.5	0.7%	7.38	0.6%
6.5.0 Marsh/wetland	10.8	0.5%	7.26	0.6%
Total	1,996.9	100.0%	1296.4	100.0%

Note on Figure 4-2:

Individual amounts are approximate and may not sum to the amount of the totals due to rounding.

Figure 4-2: Land use



4.2 Biosecurity issues

In contrast to much of NSW, the Project area has the potential to effectively manage biosecurity risks due to its separation from major populations and intensive agricultural industries, and the semi-arid climate which is challenging for exotic animals and plants to survive (DPE, 2017).

4.2.1 Weeds

The most common weed recorded near the Project area by authorised officers during property inspections under the *Biosecurity Act 2015* (DPI, 2021b) was African boxthorn (*Lycium ferocissimum*), which comprised over 60 per cent of reports. Khaki weed (*Alternanthera pungens*) accounted for a further 28 per cent of reports. Other less common weeds reported are set out in Table 4-3.

Table 4-3
Weeds reported near the Project area

<u>Commonly reported weeds (more than two reports)</u>	
Bathurst burr (<i>Xanthium spinosum</i>)	Silverleaf nightshade (<i>Solanum elaeagnifolium</i>)
Spiny burrgrass (<i>Cenchrus longispinus</i>)	Spiny burrgrass (<i>Cenchrus spinifex</i>)
<u>Uncommon weeds (one or two reports)</u>	
Asparagus fern (<i>Asparagus virgatus</i>)	Devil's claw - purple-flowered (<i>Proboscidea louisianica</i>)
Golden dodder (<i>Cuscuta campestris</i>)	Devil's claw - yellow-flowered (<i>Ibicella lutea</i>)
Galvanised burr (<i>Sclerolaena birchii</i>)	Horehound (<i>Marrubium vulgare</i>)
Noogoora burr (<i>Xanthium occidentale</i>)	Rhus tree (<i>Toxicodendron succedaneum</i>)
St. John's wort (<i>Hypericum perforatum</i>)	

The Riverina Regional Strategic Weed Management Plan (Riverina LLS, 2022) identifies State and regional priority weeds, some of which may be present in the vicinity of the Project area.

Other "weeds of concern" are listed in the Riverina Regional Strategic Weed Management Plan (Riverina LLS, 2022). These were identified by the Riverina Regional Weed Committee in consultation with the community. They are described as "*species for which a consistent and/or collaborative approach to management will provide the best outcome across the region*". They "*may be a focus for local management plans and coordinated campaigns by the community and other stakeholders in the region*". These weeds are listed in Attachment 2.

Problematic weeds present in the district with the potential to become more widespread that were mentioned by landowners during consultations included Bathurst burr, horehound, devil's claw, African boxthorn, spiny burrgrass, and galvanised burr.

4.2.2 Pest animals

Foxes, feral cats and kangaroos have a widespread distribution in the proximity of the Project area. Wild rabbits are generally in low abundance but can occur in higher densities in sandy country, such as found in the southern part of the Project area (Riverina LLS 2018; DPI 2021c).

Feral pigs are in relatively low numbers in and around the Project area. Feral goats, wild dogs and deer are generally not found near the Project area (Riverina LLS, 2018).

Plague locusts and mice can also cause problems in favourable seasons. Some species (such as goats and pigs) pose important biosecurity, economic and social threats as they can harbour and transmit both endemic and exotic diseases.

4.2.3 Animal and plant diseases

Footrot

Footrot is a contagious bacterial disease of sheep and goats, caused by the organism *Dichelobacter nodosus* (*D. nodosus*) in association with several other bacteria. The bacterium *D. nodosus* may persist for many years in the feet of infected sheep and may pass from infected sheep into the soil. Footrot is introduced into a clean flock by the inclusion of infected sheep, or by exposure to contaminated land under favourable conditions.

The occurrence of sheep footrot in the vicinity of the Project area has been low in recent years. DPI reported a total of 15 flocks infected with virulent footrot as of December 2021 across the Riverina LLS region. The total number of all flocks across the Riverina LLS region was 2,991. Therefore, the infection rate was around 0.5 per cent. However, the infection rate in the drier parts of the Riverina LLS region where the Project area is located is likely to be much lower. As an indicator of this, the Western LLS region, which is similar to the Project area, recorded no infected flocks in December 2021.

Across NSW there was 73 new cases of virulent footrot in 2021, an increase on the previous three years, which averaged 14 cases per annum. The increase was attributed to wetter, more favourable conditions for spread in 2021 (DPI, 2022).

The landowners interviewed generally did not view footrot as a major problem due to its relative rarity and the unlikelihood of it being introduced by Project activities.

Ovine Johne's disease

Ovine Johne's disease (OJD) is an incurable infectious disease caused by the bacterium *Mycobacterium paratuberculosis*.

Little recent data is available on the prevalence of OJD in NSW. However, the Project area was in a low prevalence area in 2010 which had less than 0.8 per cent of flocks estimated to be infected (DPI, 2011). Landowners confirmed that OJD is not a major concern as it is currently well managed and present little risk to their commercial sheep flocks.

4.3 Land and soil capability

There are several measures of land capability relevant to agriculture. This report describes the land and soil capability (LSC) based on the Land and Soil Capability Assessment Scheme (OEH, 2012). However, other measures are also examined in the following sections.

4.3.1 Background

The LSC assessment scheme was published in 2012 by the former Office of Environment & Heritage (OEH, 2012), representing a revision of an earlier scheme that was first published by the former Soil

Conservation Service of NSW in 1986 (Emery, 1986). The LSC system builds on the earlier scheme, but with more emphasis on a broader range of soil and landscape properties.

LSC is based on an assessment of the biophysical characteristics of the land, the extent to which this would limit a particular type of land use, and the current technology that is available for the management of the land. It indicates the broad agricultural land uses most physically suited to an area. That is, it determines the best match between the physical requirements of the use and the physical qualities of the land, and the potential hazards and limitations associated with specific uses over a site. The LSC system can provide guidance on the inputs and management requirements associated with different intensities of agricultural land use (Woodward, 1988).

The LSC assessment is based on the premise that using land beyond its capability may have serious consequences for the land and soil resources of the State as well as broader environmental impacts on water, air and biodiversity (Woodward, 1988).

The LSC assessment scheme comprises eight land capability classes (1 to 8) with values representing a decreasing capability of the land to sustain intensive agricultural land use. Class 1 represents land capable of sustaining most intensive land uses including those that are often associated with regular soil cultivation, whereas class 8 represents land that can only sustain very low intensity land uses.

The current LSC scheme was initially developed for the NSW property vegetation planning program under the former *Native Vegetation Act 2003* and further updated for the NSW Natural Resources Monitoring, Evaluation and Reporting program.

The LSC assessment scheme uses the biophysical features of the land and soil including landform position, slope gradient, drainage, climate, soil type and soil characteristics to derive detailed rating tables for a range of land and soil hazards. These hazards include water erosion, wind erosion, soil structure decline, soil acidification, salinity, waterlogging, shallow soils and mass movement. Each hazard is given a rating between 1 (best, highest capability land) and 8 (worst, lowest capability land). The final LSC class of the land is based on the most limiting hazard.

The LSC class gives an indication of the land management practices that can be applied to a parcel of land without causing degradation to the land and soil at the site and to the off-site environment. As land capability decreases, the management of hazards requires an increase in knowledge, expertise and investment. In lands with lower capability, the hazards cannot be managed effectively for some land uses.

The LSC assessment scheme is most suitable for broad-scale assessment of land capability, particularly for assessment of lower intensity, dryland agricultural land use. It is less applicable for high intensity land use, or for irrigation (Woodward, 1988).

4.3.2 LSC classes

Class 1 land is described as *“extremely high capability land: Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices”*.

Class 2 land is described as *“very high capability land: Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation”*.

Class 3 land is described as *“high capability land: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily*

available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation".

Class 4 land is described as “moderate capability land: Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology”.

Class 5 land is described as “moderate–low capability land: Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation”.

Class 6 land is described as “low capability land: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation”.

Class 7 land is described as “very low capability land: Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation”.

Class 8 land is described as “extremely low capability land: Limitations are so severe that the land is incapable of sustaining land use apart from nature conservation. There should be no disturbance of native vegetation”.

4.3.3 LSC in the Project area

A map of LSC across the Project area is included as Figure 4-3. The area of each LSC class is summarised in Table 4-4. Published LSC mapping (NSW Government, 2023) indicates that there are no class 1 to 3 lands within the Project area.

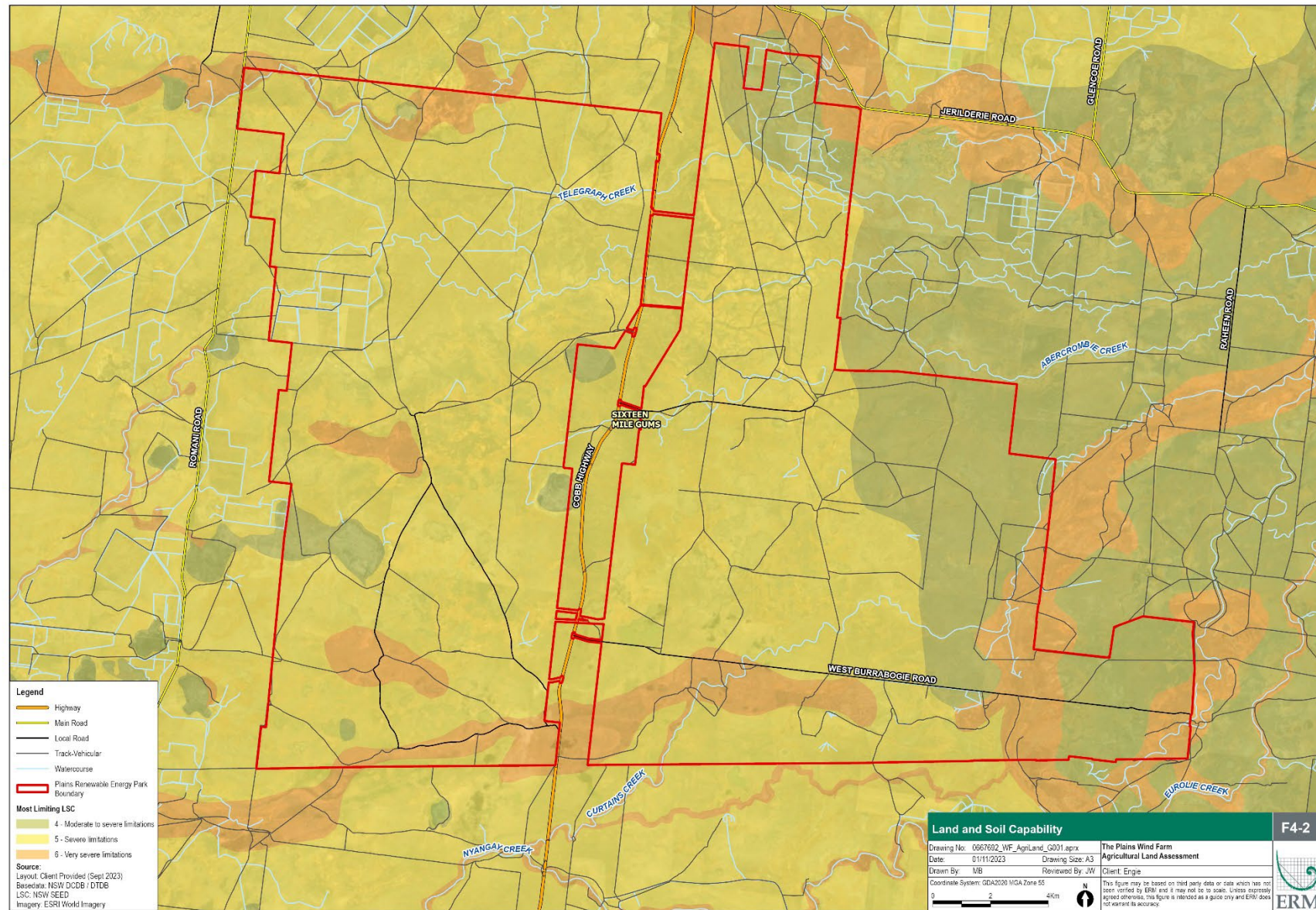
The Project area consists mainly of moderate -low capability (severe limitations) class 5 land, with a smaller area of moderate–low capability land (moderate to severe limitations) class 4, mainly in the east of the Project area. There is also some low capability (very severe limitations) class 6 land scattered across the Project area.

Table 4-4
Summary of land and soil capability

LSC class	Construction Footprint (ha)	Proportion	Permanent Footprint (ha)	Proportion
4 - Moderate capability	238.4	11.9%	149.7	11.6%
5 - Moderate–low capability	1,689.1	84.6%	1107.2	85.4%
6 - Low capability	69.5	3.5%	39.4	3.0%
Total	1,996.9	100.0%	1,296.3	100.0%

The moderate–low capability land class 5 land comprises about 85 per cent of both the construction footprint and the permanent footprint. Only about 3 per cent of these footprints are located on lower capability class 6 land.

Figure 4-3: Land and Soil Capability



4.4 Other measures of land capability

4.4.1 Agricultural land classification

The Agricultural Land Classification (ALC) system is similar to the LSC assessment scheme. The current ALC system (Hulme, et al., 2002) was developed by the former NSW Agriculture (now DPI).

Under the ALC system, land is classified by evaluating biophysical, social and economic factors that may constrain the use of land for agriculture. In general terms, the fewer the constraints on the land, the greater its value for agriculture. Each type of agricultural enterprise has a particular set of constraints affecting production.

The ALC system is not considered in this assessment due to its similarity to the LSC assessment scheme, and its limitations. Squires (2017) states that the ALC system has limitations with *“poor quality control of product, limited availability and suitability for digital conversion (available as paper maps only in some areas), does not identify specific industry needs and excludes non-soil based agricultural needs”*.

4.4.2 Biophysical strategic agricultural land

Biophysical strategic agricultural land (BSAL) has high quality soil and water resources capable of sustaining elevated levels of productivity. The protocol for determining BSAL is set out by the former Office of Environment and Heritage (OEH, 2013). BSAL has the best quality intrinsic landforms, soil and water resources which are naturally capable of sustaining high levels of productivity and require minimal management to maintain the high quality (DPE, 2013).

Mapping of BSAL was undertaken by the then NSW Department of Planning and Environment. This mapping indicates that there is no BSAL in or near the Project area.

4.4.3 State significant agricultural land

A draft map of State significant agricultural land (SSAL) has been recently released (DPI, 2021a). The distribution of draft SSAL across the Project area is similar to BSAL, as the assessment of both is based on similar parameters. However, there is more land classified as draft SSAL than BSAL, including two areas in the north west and north east of the Project area. These areas of draft SSAL correspond to the areas developed for irrigation (refer to Section 4.1.5), and total approximately 870 hectares, or about 1.5 per cent of the investigation area.

Only four WTGs and an associated access track, electrical reticulation and hardstand blocks would be located on the draft SSAL in the north west of the Project area. No WTGs would be located on the draft SSAL in the north east of the Project area, however a small distance of access track and electrical reticulation would cross the draft SSAL.

4.5 Regional agricultural productivity

4.5.1 Employment and businesses

Agriculture forestry and fishing is the largest industry (by number of employees) in the Hay and the Edward River LGAs. In 2021, employment in ‘agriculture, forestry and fishing’ was 23.8 per cent of all employed persons in the Hay LGA and 16.5 per cent in the Edward River LGA. Total employment in ‘agriculture, forestry and fishing’ is estimated at approximately 936 persons across the two LGAs (ABS, 2023).

On 30 June 2021, there were 152 ‘agriculture, forestry and fishing’ businesses in the Hay LGA and 334 in the Edward River LGA (ABS, 2023). This is approximately 41 per cent and 35 per cent of all businesses in the LGAs, respectively.

4.5.2 Agricultural land use

The total area of agricultural holdings across the Hay LGA in 2020-21 (ABS, 2022a)¹ was 1,092,559 hectares. The number of businesses was 85, which gives an average size of 12,854 hectares per business. The average size was much smaller in the neighbouring Edward River LGA (2,361 hectares).

The Project area is in a district with relatively large properties. Mungadal covers approximately 115,000 hectares, while Property 2 is approximately 11,300 hectares (refer Section 4.6).

The same ABS statistics show the following broad land uses on agricultural holdings in the Hay and Edward River LGAs. Nearly 92 per cent of the agricultural holdings in the Hay is used for grazing. Most of the remainder is used for relatively small areas of broadacre cropping and non-agricultural uses.

Table 4-5
Land use on farms 2020-21

Land use	Hay		Edward River	
	Area (ha)	Proportion	Area (ha)	Proportion
Wheat for grain	1,062	0.1%	60,160	7.0%
Other broadacre crops	8,565	0.8%	80,262	9.3%
Unused cropping land (eg fallow)	10,022	0.9%	48,739	5.7%
Hay and Silage	548	0.1%	17,185	2.0%
Grapes	-	0.0%	33	0.0%
Fruit and nuts	2	0.0%	361	0.0%
Other horticulture	43	0.0%	404	0.0%
Grazing improved pastures	59,672	5.5%	154,201	17.9%
Grazing other land	940,796	86.1%	460,104	53.5%
Other agriculture	82	0.0%	261	0.0%
Total agricultural area	821,710	93.4%	1,020,792	95.6%
Forestry	4,908	0.0%	375	0.6%
Other	32,726	6.5%	71,392	3.8%
Total area of holdings	859,344	100.0%	1,092,559	100.0%

There are substantial differences in agricultural land use between the two LGAs. Hay LGA has less cropping and more grazing land, but a much lower proportion of improved pastures. Land use in the Project area is more similar to that in the Hay LGA than in the Edward River LGA.

¹ Detailed agricultural statistics are only produced by the ABS to an LGA level every five years. The most recent LGA data are from 2020-21.

4.5.3 Livestock carried

Table 4-6 sets out total livestock numbers across the Hay and Edward River LGAs in 2020-21.

The number of grazing 'stock units' is calculated as one unit for sheep, lambs, goats and 'other', and 10 units each for meat cattle and dairy cattle. Pigs are disregarded for this calculation as they are generally intensively raised rather than grazed on pasture.

The 'stock units per hectare' amount is calculated as the total grazing 'stock units' divided by the pasture area (Table 4-5) and indicates the average stocking rate of pastures in the region.

The average stocking rate of 0.57 units per hectare across the Hay LGA in 2020-21 is relatively low, and reflects the semi-arid conditions and the high proportion of native pastures rather than improved pastures (Table 4-5). Stocking rates are much higher in the Edward River LGAs. Stocking rates in the Project area are more comparable to that in the Hay LGA than in the Edward River LGA.

The average stocking rate across all of NSW in 2016 was 1.53 stock units per grazing hectare (ABS, 2022a). This includes large areas of semi-arid rangeland in the west of the State.

Table 4-6
Total livestock numbers

	Hay	Edward River	Total
Sheep and lambs	383,620	567,453	951,072
Meat cattle	19,315	33,838	53,153
Dairy cattle	-	10,005	10,005
Pigs	-	36,598	36,598
Goats & other livestock	3,575	1,732	5,307
Total number	406,510	649,624	1,056,135
Total - Stock Units	580,346	1,007,610	1,587,955
per hectare	0.57	1.52	0.95

Source: ABS, 2022a

4.5.4 Value of agricultural production - ABS

The total gross value of agricultural production across the Hay and Edward River LGAs in 2020-21 (ABS, 2022b) is shown in Table 4-7 at \$75 million and \$326 million, respectively.

Agricultural production in the Hay LGA is mainly in several main products with barley, 'other broadacre crops, wool, 'sheep and lambs' and 'cattle and calves' each being between \$2 million and \$25 million in gross value. Wheat, vegetables and hay were also substantial products. Edward River LGA has a more diversified agricultural industry which also produced a substantial value of rice, 'fruit and nuts', 'nurseries, cut flowers & cultivated turf', milk and pigs.

The total gross value of agricultural production in 2020-21 across the Hay LGA was equivalent to \$73 per hectare over the total agricultural area of holdings (1,092,559 hectares, refer to Table 4-5). The average gross value was substantially higher in the Edward River LGA (\$397 per hectare).

There were also large differences between the average gross value in the Hay LGA of broadacre cropping production (\$2,082 per hectare), horticulture production (approximately \$25,006 per

hectare) and broadacre grazing production¹ (\$45 per hectare). The value of broadacre grazing production in the Edward River LGA was higher at \$177 per hectare. The Edward River value reflects the higher rainfall in parts of the LGA and the greater grazing of sown pastures.

The average gross value of sheep and wool products was equivalent to \$86 per head in both the Hay and Edward River LGAs.

The value of agricultural production is greatly influenced by seasonal and market conditions and can fluctuate widely from year to year.

Table 4-7
Total gross value of agricultural production

	Hay	Edward River	Total
<u>Broadacre crops</u>			
Wheat	\$913,954	\$50,854,598	\$51,768,552
Barley	\$2,326,462	\$27,123,440	\$29,449,902
Rice	\$0	\$23,233,513	\$23,233,513
Other broadacre	\$24,598,663	\$31,552,112	\$56,150,775
Hay	\$671,957	\$17,900,691	\$18,572,648
Total - Broadacre Crops	\$28,511,036	\$150,664,354	\$179,175,390
<u>Horticulture</u>			
Grapes	\$0	\$374,012	\$374,012
Fruit and nuts	\$39,806	\$7,878,667	\$7,918,472
Vegetables	\$1,079,480	\$35,965,216	\$37,044,696
Nurseries, cut flowers & cultivated turf	\$0	\$13,980,690	\$13,980,690
Total - Horticultural crops	\$1,119,286	\$58,198,585	\$59,317,871
<u>Livestock products</u>			
Wool	\$13,067,769	\$19,329,906	\$32,397,674
Sheep and lambs	\$20,019,266	\$29,330,830	\$49,350,097
Cattle and calves	\$11,960,258	\$27,152,271	\$39,112,528
Milk	\$0	\$24,494,827	\$24,494,827
Pigs	\$0	\$16,959,387	\$16,959,387
Poultry and eggs	\$0	\$140,925	\$140,925
Goats and other livestock	\$50,263	\$24,346	\$74,609
Total - Livestock products	\$45,097,556	\$117,432,492	\$162,530,048
Total – Agriculture	\$74,727,878	\$326,295,431	\$401,023,309

4.5.5 Value of agricultural production – other measures

Farm surveys data from the Australian Bureau of Agricultural and Resource Economics (ABARES) indicates that the average sheep and wool income of NSW Pastoral Zone (Far West) properties between 2012 and 2021 was \$127 per ewe and \$85 per sheep. The latter amount is similar to the

¹ Excluding the gross value of milk and pigs.

average gross value of sheep and wool product in the Hay and Edward River LGAs during 2020-21 (Section 4.5.4).

NSW DPI 2022 farm enterprise budgets (Attachment 1) include a gross income for a 20 micron Merino ewe breeding flock with Merino rams of \$181 per adult sheep and \$102 per sheep shorn (including ewes, rams, ewe hoggets and lambs). The budget for a 20 micron Merino ewe breeding flock with terminal rams has gross income of \$210 per adult sheep and \$130 per head of average flock size (including ewes, rams, ewe hoggets and lambs). These amounts are significantly higher than set out in the ABS and ABARES data.

The enterprise budget for 20 micron Merino wethers reveals a gross income of \$80 per head, which is relatively consistent with the ABS and ABARES data.

NSW DPI farm enterprise budgets (Attachment 1) indicate the following annual gross incomes per dry sheep equivalent (DSE):

- 20 micron Merino ewe breeding flock with Merino rams \$79.39 per DSE
- 20 micron Merino ewe breeding flock with terminal rams \$93.14 per DSE
- 20 micron Merino wethers \$67.79 per DSE
- Grow out steers \$154.14 per DSE

The gross income obtained from agistment cattle is lower than growing out steers, and is typically around \$50 per DSE per annum.

The ABS and ABARES income data is difficult to convert to a per DSE basis, as detailed stock types and DSE values are not reported.

4.6 Agricultural productivity of the Project area

4.6.1 Past and current enterprises

Historically and currently, the Project area has mainly run Merino sheep for meat and wool production.

Mungadal Station

Mungadal Station forms most of the Project area (refer to Figure 1-2) operates two Merino ewe flocks as follows:

- a self-replacing Merino ewe flock with the ewes joined to Merino rams, and
- a 'terminal' Merino ewe flock with the ewes joined to Dorset rams.

Approximately 45 per cent of ewes are joined to Dorset rams, with the remainder joined to Merino rams.

The property also runs agistment cattle and Merino wethers during good seasons. This occurs approximately 50 per cent of the time, on average. Generally, between 800 and 2,000 agistment cattle have been run in the past. Wethers are usually sold as weaners, but some can be retained or transferred in from associated properties on a seasonal basis.

The past carrying capacity has been 27,000 to 30,000 ewes on approximately 115,000 hectares, although less sheep are carried during poor seasons, and currently approximately 24,000 ewes are being carried with 13,000 joined to Merino rams. More agistment cattle and Merino wethers have been run recently to compensate for the reduced ewe numbers.

The current enterprises have been in place for many years. However, Mungadal Station has operated a Merino stud, and undertaken both irrigated and dryland cropping in the past. No stud sheep or cropping enterprises have been conducted in recent years.

There is approximately 50 hectares developed for irrigation in the north-east part of Mungadal, within the investigation area. However, this area has not been used for irrigation in recent years. Other parts of Mungadal that have been used for past irrigation are outside the investigation area.

Mungadal Station encompasses approximately 50,414 hectares (93.4 per cent) of the total investigation area (approximately 53,984 hectares). The design indicates that this area will host 177 WTGs.

Property 2

Property 2 in the south east of the Project area (refer to Figure 1-2) comprises about 800 hectares of the investigation area.

The property also operates two Merino ewe flocks as follows:

- a self-replacing Merino ewe flock with the ewes joined to Merino rams, and
- a 'terminal' Merino ewe flock with the ewes joined to White Suffolk 'terminal' sires.

Approximately 60 per cent of ewes are joined to White Suffolk rams, with the remainder joined to Merino rams. Approximately 5,000 ewes are run on about 11,300 hectares, and currently about 900 Merino ewes have been retained as replacement for the ewe flock. In the past, sheep numbers have generally been slightly higher with 900 to 1,000 Merino ewe lambs retained for breeding.

Wether lambs are usually sold early as weaners. However, wethers have been retained for longer during good seasons. A wether flock of 300 head has been retained this year.

The property originally operated a Merino breeding flock. This changed in the late 1990s as the business began purchasing all its Merino ewe replacements and joined all ewes to 'terminal' sires. In recent years, the sheep flock has partially reverted to the current Merino breeding enterprise combined with a 'terminal' flock.

Heifers and steers have also been purchased for finishing when there is spare dry feed. Currently there are 224 heifers on the property. This number is slightly higher than usual. Some agistment cattle have also been taken on in the past. No cropping has been undertaken.

The investigation area on Property 2 encompasses approximately 800 hectares, which is 1.5 per cent of the total investigation area. The design indicates that this area will host two WTGs.

Property 3

Property 3 in the north west of the Project area (refer to Figure 1-2) comprises about 820 hectares or 1.5 per cent of the investigation area.

This part of the investigation area includes approximately 590 hectares of land set out to irrigated cropping paddocks. The area has not been regularly used for irrigated cropping in recent years. The remaining area is rangeland grazing.

The design indicates that this area will host three WTGs.

Property 4

Property 4 in the north east of the Project area (refer to Figure 1-2) comprises about 650 hectares or 1.2 per cent of the investigation area.

This part of the investigation area has approximately 240 hectares of land set out to irrigated cropping paddocks. The area has not been regularly used for irrigated cropping in recent years. The remaining area (410 hectares) is used for grazing.

The design indicates that this area will host three WTGs.

Property 5

Property 5 in the south of the Project area (refer to Figure 1-2) comprises about 1,300 hectares or 2.4 per cent of the investigation area.

This part of the investigation area used for rangeland grazing. The design indicates that this area will host three WTGs.

4.6.2 Average stocking rate

The average stocking rates of Mungadal, which comprises over 93 per cent of the investigation area and hosts over 94 per cent of the planned WTGs, are estimated in Table 4-8.

the expected number of ewes run on Mungadal is based on the long-term average of 27,000 to 30,000 head rather than the current number of 24,000 ewes. Past seasonal stocking has been a combination of agistment cattle and wethers, but this is simplified in the estimate by using an average of 2,000 agistment steers per year.

The DSE rating of the enterprises are derived from the NSW DPI budgets in Attachment 1.

The average stocking rate of Mungadal is estimated at 0.74 DSE per hectare.

Table 4-8
Average stocking rate

	DSE rating	Mungadal	
		Number	DSE
<u>Merino ewes</u>			
Self-replacing flock	2.32	16,000	37,120
Terminal flock	2.30	13,000	29,900
Sub total		29,000	67,020
<u>Seasonal cattle</u>			
Average number	8.90	2,000	17,800
Total			84,820
<u>Divided by</u>			
Grazing area (ha)			115,000
Average stocking rate (DSE per ha)			0.74

4.6.3 Average gross grazing income

The average gross grazing income is estimated at \$80 per DSE, based on the income data in Sections 4.5.4 and 4.5.5. The average gross grazing income on Mungadal is estimated in Table 4-9 at \$59.00 per hectare per year, based on the amounts.

Table 4-9
Average gross income per hectare

	Mungadal
Average stocking rate (DSE per ha)	0.74
Estimated annual gross income (\$ per DSE)	\$80.00
Estimated gross income (\$ per ha per year)	\$59.00

4.6.4 Average gross cropping income

The gross income of the cropping land in the north west and north east of the Project area is estimated at \$2,082 per hectare, which is the average gross value of broadacre cropping production in the Hay LGA (Section 4.5.4).

The cropping area comprises only 1.5 percent of the investigation area, and therefore has a relatively low influence on the overall impact of the Project on agriculture.

4.6.5 Average overall gross income

The weighted overall average gross income across the total investigation area is estimated at \$89.60 per hectare per year, based on the estimated average grazing and cropping gross incomes and the investigation areas set out in Section 4.6.1.

5 Construction impacts

5.1 Loss of land use

5.1.1 General comments

The main impact of construction on agriculture would be the temporary or permanent removal of areas from production to accommodate the construction of the Project.

The current land use within the construction footprint is mostly grazing of native pastures (Table 4-2). The impact on agricultural land use would be limited by the relatively small area affected and the relatively low productivity of the native pastures on the Project area.

5.1.2 Area affected

The construction footprint would include areas required for permanent works such as crane hardstand areas, turbine laydown areas, access tracks, substations, underground electrical reticulation, meteorological masts, collector substations, and overhead and underground transmission lines. There would also areas required for temporary construction works, such as offices, car park, amenities, accommodation camp, concrete batching plants and on-site quarries.

The main substation, switchyard, operations and maintenance building and BESS, which are shared with The Plains Solar Farm (separate SSD application), are addressed in the AIA for that project.

The construction footprint covers an area of 1,997 hectares.

5.1.3 Impact on income

Construction is estimated to take about 3 years to complete. The potential loss of gross income during construction is assessed in Table 5-1.

Table 5-1
Potential loss of gross income during construction

<u>Project area productivity</u>	
Construction footprint (hectares)	1,997
Gross income (\$ per ha per year)	\$89.60
Period (months)	36
Annual loss of income	\$178,931
Total loss of income (36 months)	\$536,794

There may be some opportunity for the potential loss of income to be mitigated to a lower amount than that assessed in Table 5-1 by running sheep that are displaced from the construction footprint on other parts of the properties unaffected by construction activities. However, the properties are not generally understocked and do not have substantial spare grazing capacity except in good seasons.

The loss of net income (after production expenses are deducted) would also be lower than the loss of gross income assessed in Table 5-1.

The assessed annual loss of gross income is 0.24 per cent of the total gross value of agricultural production across Hay LGA (\$74,727,878 - Table 4-7). The loss is also 0.40 per cent of the total gross value of sheep and cattle production (including wool).

The agricultural income loss during construction does not consider the non-agricultural rental income from the Project which would result in an overall net increase in income to the host landowners.

5.2 Biosecurity

The following sections address the potential biosecurity impacts during construction of the Project.

5.2.1 General biosecurity risks

There is a risk that animal diseases, plant diseases, feral pests and weeds could be introduced or spread during construction of the Project. A biosecurity breach of this nature is likely to increase costs and decrease income of the host properties and could impact other properties in the vicinity of the Project. Depending on the biosecurity matter, impacts on both costs and income could be short to long term (more than five years).

Increased costs could include expenses associated with monitoring pests, weeds or diseases and implementing control measures; while lesser income could arise from reduced livestock, crop or pasture production, plus lower quality of produce.

Potential carriers of weed seeds, plant material and diseases include vehicles (especially tyres), machinery and personnel (clothing and footwear). These can transport biosecurity matter over relatively long distances (Animal Health Australia, 2018).

Biosecurity matter also has the potential to be spread by soil and water movements associated with construction works. These movements would generally occur over relatively short distances given the nature of the works and the characteristics of the Project area.

Compared to much of NSW, the Project area is less susceptible to biosecurity risks due to its separation from major populations and intensive agricultural industries, and the semi-arid climate which is challenging for exotic animals, diseases and plants to survive (DPE, 2017).

5.2.2 Weed biosecurity risks

Weeds which present a high biosecurity risk of the Project generally have the following characteristics:

- Spread readily by activities associated with the Project.
- Adapted to the environmental conditions of the region.
- Would have a substantial economic impact if they were to spread.

Weeds that are present in the region and present a potential biosecurity threat are discussed in Section 4.2.1.

Weeds such as some cactuses, spiny burrgrass, caltrops, horehound, khaki weed, Noogoora burr and Bathurst burr are readily spread by vehicle, machinery and human activity. Some also have a potential high impact on the income and costs of agricultural enterprises. For example, weeds such as blue heliotrope and silver-leaf nightshade are difficult to control, while spiny burrgrass containment presents a challenge in pastures and crops. Noogoora burr and Bathurst burr are important contaminants which decrease wool quality and prices.

There are numerous other weeds which could potentially have a large impact on the agricultural enterprises, however the risk is moderated by:

- most weeds not being readily spread by activities associated with the Project
- limited adaptability of some weeds to the environmental conditions of the region.

The highest risk of weed spread associated with the Project would occur during construction due to earthworks, the frequency of vehicle and personnel movements, and increased weed growth due to disturbance of ground cover and soil.

Mitigation measures to limit and manage the weed biosecurity risk are provided Chapter 8.

5.2.3 Livestock pests and diseases biosecurity risks

Sheep lice, OJD and ovine footrot are the most important livestock pest and disease risks. These sheep diseases are present in the region and can have large productivity impacts on sheep enterprises.

Footrot is the greatest risk despite its low current prevalence (refer to Section 4.2.3), due to the relative ease of its spread and its high potential economic impact. Virulent footrot is a severe, debilitating disease that causes considerable economic loss from reduced wool growth, lower wool quality, poor ewe fertility, slow growth rates, losses from blowfly strike, and reduced value of sale sheep. In infected flocks, there are also substantial costs associated with the control of the disease.

OJD is a wasting disease of sheep that can result in sizeable economic losses on infected farms due to sheep deaths, lost meat production, fewer lambs and less wool. Under the *Biosecurity Act 2015*, sheep footrot and OJD are notifiable diseases.

Sheep lice cause considerable losses in sheep enterprises due to treatment costs, reduced wool growth and lower meat production.

There are many other important diseases of domestic livestock. Some diseases, such as bovine Johne's disease (BJD), leptospirosis, pestivirus and those caused by internal parasites, have the potential to be spread by uncontrolled livestock movements or carried by humans. However, the chance of this arising from activities associated with the Project would be low.

Other diseases, such as anthrax, bovine respiratory disease, cheesy gland, clostridial diseases, ovine brucellosis, pinkeye, three-day sickness, trichomoniasis and vibriosis, are very unlikely to be spread by proposed construction activities.

The risks associated with these diseases are minimal due to the small probability of spread being caused by Project activities and the low prevalence of disease in the area (refer to Section 4.2.3). However, the Cobb Highway, from which access is gained to the project area, is a travelling stock route (see Section 5.9) and therefore is an additional potential source of livestock pests and diseases. Care would be needed to avoid transferring material from the stock route onto the Project area or allowing access to the site by travelling stock.

Exotic diseases are an issue for international travel associated with the Project. Appropriate measures would be implemented if there is any heightened risk of the introduction of an exotic disease via the Project, such as the recent outbreaks of foot and mouth disease and lumpy skin disease in Indonesia.

5.2.4 Vertebrate pest biosecurity risks

The most important vertebrate pests in the vicinity of the Project area are pigs, foxes, rabbits and kangaroos. Other pest species such as deer, goats, horses and wild dogs have a more restricted distribution and lower overall economic impact. Such as goats and pigs have a more restricted distribution, a lower overall economic impact and present lesser risks. These pests have economic impacts on agricultural enterprises arising from lamb predation, fence damage and consumption of pasture and crops.

The Project is unlikely to significantly change the number or movement patterns of vertebrate pests and therefore risks are very low. However, it is possible that disturbance by construction activities may temporarily change the distribution of pests to a small degree. There is also a possibility that the Project area, or specific infrastructure, could provide favourable conditions or harbour for pests such as rabbits.

5.2.5 Plant disease and pest biosecurity risks

Biosecurity risks associated with plant diseases and pests would be low due to the limited cropping, horticultural and irrigation activities near the Project area. Rangeland pastures are not particularly susceptible to most exotic plant diseases and pests, and the semi-arid climate is not conducive to their establishment or spread.

There is a ban on taking grapevines, cuttings, budwood, or soil that has been in contact with grapevine material from a Phylloxera Infested Zone into a Phylloxera Exclusion Zone. The Phylloxera Exclusion Zone covers most of NSW including the Project area. The Project area is also in the Potato Biosecurity Zone which covers all of NSW. The movement of plants belonging to the family Solanaceae and associated matter is banned from entering the zone. However, the risk associated with Phylloxera and potato diseases is very low due to the lack of horticultural crops in the vicinity of the Project.

There are several important crop diseases in the region and pathogens such as rusts can be spread on vehicles, footwear and clothing (Plant Health Australia, 2017). Activity associated with the Project has the potential to result in the spread of crop or pasture diseases or pests, but the risk appears to be low due to the lack of intensive cropping activities on or adjacent to the Project area.

5.3 Restricted movement

It is unlikely that construction activities would substantially restrict movements of landowners, agricultural workers, their livestock or equipment within the Project area. There are contractual agreements in place with the landowners that ensure their agricultural activities are not restricted by the project, and the project is compatible with continued grazing and farming practices.

Proposed overhead transmission line should not generally restrict access for most of the construction period, except for the small areas around the tower construction locations. Stringing operations would more substantially affect access for short periods. However, impacts would be minimised through consultations with landowners.

It is possible that some movements would be affected temporarily due to restricted access to the construction footprint. However, these restrictions would be generally short in duration and in limited locations, and therefore would be unlikely to markedly affect agricultural activities.

5.4 On-ground agricultural operations

Construction activities have the potential to disrupt on-ground husbandry operations such as spraying, cultivation, sowing, slashing and harvesting. However, the prevalence of low input native pastures and the limited cropping area on the project footprint means that such operations would be rare. Therefore, the impact would be low.

Airborne dust from vehicle movements and construction activities can reduce the yield and quality of pastures. Dust can block stomata, hinder transpiration, reduce photosynthesis, foster pathogens and make pasture less palatable to livestock. The impact of dust generated by construction activities is likely to be minor due to the limited earthworks, the impact being restricted to pasture close to access tracks or near construction sites, the low pasture productivity and the extensive nature of the grazing on the project area resulting in a very high proportion of the pastures being unaffected by dust.

5.5 Impacts on aerial agriculture operations

Wind farms have the potential to have substantial impacts on aerial agriculture operations (such as aerial spreading of fertilisers, monitoring and aerial spraying) by aircraft and drones. However, the past and likely future use of aerial agriculture in the Project area is very limited and therefore impacts would be minimal.

The impacts on aerial agriculture operations are addressed in detail in the Aviation Impact Assessment.

5.6 Impacts on livestock enterprises

The main potential impact on livestock enterprises would be disturbance of sheep and cattle caused by noise and vehicle movements. Although livestock habituate to disturbances, the noise and movement of construction vehicles and other construction activities may have an impact on livestock in specific circumstances, especially during sensitive periods such as calving and lambing. There are also concerns that young livestock may be scared away from watering points by construction activities.

Livestock can be panicked, particularly if they are new to the area near the Project (such as relocated, agisted or newly purchased animals) or if they are not accustomed to human contact. In semi-arid areas such as the Project area, paddocks are large and stocking rates are low so livestock can move a considerable distance away from any source of disturbance. Balanced against this is that livestock in semi-arid areas are often unaccustomed to human contact and therefore more susceptible to noise and vehicle disturbance.

Although there is potential for some disturbance, the effect on productivity is expected to be relatively minor, and can be reduced through consultation, cooperation and planning with landowners.

Considerable disruption to livestock enterprises (such as livestock deaths, illness and stress; disease spread; mixing of animals and uncontrolled breeding) is possible if stock water pipelines or fences are damaged and not promptly repaired during construction, or if gates are left open.

Grazing management would also be disrupted if construction activities result in paddocks being temporarily unavailable for grazing, or cause a disruption to the grazing pattern of livestock.

While the construction of infrastructure such as access tracks, WTGs, substations and transmission lines will result in localised impacts on rangeland pasture, no broad-scale modification of pastures (such as cultivation, slashing or herbicide treatment) is proposed.

5.7 Strategic agricultural land

No BSAL is located within the Project area.

There would be approximately 880 hectares of SSAL in the north west and north east of the Project area. These areas of SSAL correspond to the areas developed for irrigation (refer to Section 4.1.5) and comprise only about 1.6 per cent of the total investigation area.

The impact on SSAL would be relatively low for the following reasons:

- Only four WTGs are planned to be built on SSAL.
- The irrigation land has not been regularly cropped in recent years.
- Irrigated or dryland cropping could continue on the affected SSAL, apart from a buffer area around each WTG.

5.8 Fire risk

Fires have the potential to be started by human activities, equipment and vehicles during construction. Particular fire risks may involve hot work or the storage and use of dangerous materials. Fires can cause great damage to livestock, agricultural infrastructure (such as dwellings, stock yards, sheds and fences), pasture, shade and shelter trees, and agricultural equipment.

A bushfire plan would be prepared for the Project and would include mitigation measures applicable to construction activities undertaken during the bushfire danger period. The implementation of this plan is expected to adequately manage the bushfire risk during construction.

Fire risk is addressed in greater detail in other parts of the EIS.

5.9 Travelling stock reserves and livestock routes

The Cobb Highway, which dissects the Project area is a designated livestock highway (LLS, 2021). The NSW Department of Industry (2017) defined livestock highways as a key network of livestock routes connecting key agricultural regions within NSW, and with Queensland and Victoria. The roadside of the highway is generally 1 mile (approximately 1,600 metres) wide and consists of numerous interconnected travelling stock reserves (TSRs).

Overhead transmission lines servicing the Project would cross the Cobb Highway in two places, and there would be up to eight access points to the Project site off the Cobb Highway

Despite the importance of the Cobb Highway as a livestock route, the impact on travelling stock would be minimal due to the relatively short time that it would be affected by construction of the transmission line, and the relatively low usage of roadsides for moving livestock.

There are no other TSRs within the Project area, the nearest (at their closest points) being:

- Nelleonia TSR (168.70 ha) approximately 6.8 kilometres north east of the Project area,
- Aerodrome Yards TSR (24.24 ha) approximately 8.8 kilometres north,
- Abercrombie TSR (16.92 ha) approximately 8.7 kilometres west, and
- a series of TSRs along the Sturt Highway approximately 3.7 kilometres north west.

6 Operational impacts

6.1 Loss of land use

6.1.1 Impacts

Operation of the Project would result in the long-lasting change in some land use from the existing agriculture to electrical generation infrastructure where permanent infrastructure would be established (eg WTGs, transmission line structures, permanent access tracks, substations, meteorological masts and transmission lines).

Some of the area defined as the permanent footprint would be removed from all agricultural production. However, grazing could continue on other parts of the permanent footprint, such as in the overhead transmission line easement, around WTGs and under the bases of transmission line structures.

Permanent access tracks are likely to affect soil characteristics to the extent that these locations would no longer be productive pasture areas. This would greatly reduce agricultural productivity in these locations, but they comprise only a small percentage of the Project area.

The Project footprint would be rehabilitated back to its current productive capability where required by landowners, at the end of the Project's life.

6.1.2 Area affected

The impact of Project on grazing production would be minimal during operation due to the small area of pasture directly affected relative to total size of agricultural enterprises on the subject properties. Although the permanent footprint totals 1,296 hectares, the area of pasture permanently taken out of production is expected to be smaller as much of the 100 metre WTG buffer would continue to be grazed.

6.1.3 Impact on income

The loss of gross income during operation is assessed in Table 6-1.

Table 6-1
Potential loss of gross grazing income during operation

Area (hectares)	1,296
Gross income (\$ per DSE per year)	\$89.60
Annual loss of income	\$116,122

The assessed annual loss of gross income would be 0.15 per cent of the total gross annual value of agricultural production of the Hay LGA (\$74,727,878 - Table 4-7).

The agricultural income loss during operation does not consider the non-agricultural rental income from the Project which would result in an overall net increase in income to the host landowners.

6.2 Biosecurity

Any activity during operation (such as inspections, maintenance and repairs) that requires access of personnel, vehicles or machinery to the transmission line easement poses a potential biosecurity risk to agricultural operations in the vicinity of the Project.

The biosecurity risks and potential impacts outlined in Section 5.1 in relation to construction are also applicable to the operational phase. The major difference is that vehicle, machinery and personnel activity would be less intense and frequent during operation, and therefore the risk of weed, pest or disease spread would be much lower.

6.3 Restricted movement

It is unlikely that the operation of the Project would significantly restrict the movements of landowners, workers, livestock or equipment.

6.4 Impacts - on-ground agricultural operations

The presence of structures on crop and pasture land could disrupt, to some extent, normal on-ground husbandry operations around the structure. However, the prevalence of low input native pastures and the limited cropping area in the Project area means that impacts would be very low.

6.5 Impacts on aerial agriculture operations

As discussed in Section 5.5, wind farms have the potential to have substantial impacts on aerial agriculture operations.

In addition, transmission line structures and operational transmission lines would restrict drone flight in areas around these structures. Drones are subject to electric and magnetic interference from transmission lines, and it is recommended that they are not flown within approximately 30 to 45 metres of power lines, electrical substations and other electrical equipment (Indiana Electric Cooperatives, 2020). Transgrid guidelines indicate that unmanned aerial vehicles (such as drones) cannot be flown within 60 metres of any transmission line structure, guy wire or conductor (Transgrid, 2022a).

However, as discussed in Section 5.5, the past and likely future use of aerial agriculture in the Project area is very limited and therefore impacts would be minimal.

6.6 Impacts on livestock enterprises

The main potential impact on livestock enterprises would be noise and movement disturbance of sheep and cattle as discussed in Section 5.6. These impacts would be lower during operation due to a lower intensity of personnel and vehicle movements required for operation activities. The potential for damage to fences and other livestock infrastructure and gates being left open, are also lower.

6.7 Strategic agricultural land

No BSAL is located within the Project area.

There would be approximately 880 hectares of SSAL in the north west and north east of the Project area. As for construction, the operational impact on SSAL would be relatively low for the following reasons:

- Only four WTGs are planned to be built on SSAL.
- The irrigation land has not been regularly cropped in recent years.
- Irrigated or dryland cropping could generally continue on the affected SSAL.

6.8 Fire risk

Fires have the potential to be started by human activities, equipment and vehicles during operation. This risk would be lower than during construction but are dependent on seasonal and weather conditions.

Fires also have the potential to arise from the operation of transmission lines and substations. Mechanical failure of a transmission line (for example, a dropped conductor), or failure of a transmission line to operate correctly under fault conditions (for example, faulty earthing at times of lightning strike), can initiate fire under specific conditions (Transgrid, 2013). Other fire risks may involve hot work, storage and use of dangerous materials, high heat, wind impacts and contact with vegetation.

The Project's WTGs, transmission conductors and transmission line structures may result in safety issues during firefighting operations. There is a risk of contact with this infrastructure by firefighting aircraft. The combination of dense smoke and hot gases generated by a large fire directly under or near a high voltage transmission line can create a conductive path that increases the potential for a 'flashover'. Wires on transmission lines also sag lower in times of high temperature and fires, reducing the ground clearance (Powerlink Queensland 2015). Spraying water at fires near transmission lines is also a safety issue.

This may lead to inefficient firefighting activities due to restriction of activities in the vicinity of WTGs and transmission lines, and the creation of a barrier to movement across a fire ground by transmission lines.

Fire risk is discussed in greater detail within the EIS and Bushfire Assessment Report.

6.9 Frost

There is some evidence that WTGs reduce the occurrence of frost on surrounding land (Henschen, et al, 2011). However, this is unlikely to be significant on the Project area due to the relatively low frost incidence (Section 4.1.3), a lack of cropping and the low intensity of pasture production. Crops are generally more susceptible to frosts than pastures.

7 Cumulative impacts

The cumulative impact assessment considers other nearby developments along with the Project and assesses the scale and nature of the cumulative impacts the developments on key matters.

7.1 Developments

Proposed developments which may be relevant to cumulative impacts have been identified as follows.

- | | |
|-------------------------|------------------------------|
| • Project EnergyConnect | • Currawarra Solar Farm |
| • Baldon Wind Farm | • Hay Solar Farm |
| • Bullawah Wind Farm | • Keri Keri Solar Farm |
| • Dinawan Wind Farm | • Lang's Crossing Solar Farm |
| • Keri Keri Wind Farm | • Pottinger Solar Farm |
| • Pottinger Wind Farm | • Southdown Solar Farm |
| • Tchelery Wind Farm | • Tarleigh Park Solar Farm |
| • Wilan Wind Farm | • The Plains Solar Farm |
| • Yanco Delta Wind Farm | |

Brief details and impacts of each of these Projects are set out in Table 7-1 on page 48. This information was obtained from the websites of various proponents, the Australia and New Zealand Infrastructure Pipeline website (infrastructurepipeline.org) and the NSW DPE's Major Projects website (planningportal.nsw.gov.au/major-projects).

7.2 Summary

Cumulative impacts on agriculture in the region arising from the Project being constructed and operated close to other major Projects would be small.

All the projects have relatively little impact on agricultural production, generally allowing agricultural activities to continue across most of the respective project areas. The amount of agricultural land taken out of production is small in relation to the total project area, and very small relative to the total regional agricultural area. Consequently, the effect on regional agricultural production would be minimal and no impact on the number of persons employed in the agricultural sector would be expected.

Other WTGs and transmission lines could potentially result in a cumulative impact on aerial agriculture. However, the limited use of aerial agriculture in the vicinity of the Project would minimise any cumulative impact and the distance between projects would eliminate the possibility of a cumulative impact in most instances.

The regional solar farm projects are likely to have a larger impact on agricultural production than transmission lines or wind farms. The solar farms will remove any current arable land from future crop production, although continued grazing is proposed or considered on all solar farms. The area of the solar farms is very small compared to the total regional agricultural area and the cumulative impact is also very small. The Project would have little or no impact on cropping (Sections 5.4 and 6.4), and there would be no cumulative impact on crop production.

Biosecurity risks are expected to be low once mitigation measures are implemented.

Table 7-1
Summary of cumulative impacts identified

Project	Details	Location	Cumulative Impacts
EnergyConnect (NSW – Eastern Section)	EnergyConnect (NSW – Eastern Section) would include 375 kilometres of new 330 kV double circuit transmission line and associated infrastructure between the Buronga substation and the proposed Dinawan 330 kV substation, a new 330 kV Dinawan substation around 30 kilometres south of Coleambally and about 162 kilometres of new 500 kV double circuit transmission line and associated infrastructure between the proposed Dinawan substation and the existing Wagga 330 kV substation. Construction of the project commenced in 2023 and is expected to be complete by 2025.	This project's 330 kV transmission line easement is adjacent to BESS and switching station, and passes through the southern part of the Project area.	The magnitude of the impacts of this Project on agriculture is limited by: - the relatively low productivity of agriculture in the area - the minor amount of land removed from agriculture - the continuation of agriculture activity despite the construction and operation of the Project - the low biosecurity risks. The impacts of both projects are minor compared to the large scale of regional agricultural activity and the cumulative impact would also be minor. Much of EnergyConnect is distant from the Project and would impact different parts of NSW. Transmission towers can cause cumulative impacts on aerial agriculture operations in association with WTGs. However, use of aerial agriculture in the Project area is very limited and therefore impacts would be minimal.
Baldon Wind Farm	Baldon Wind Farm would be located approximately 15 kilometres north of Moulamein and 55 kilometres east of Balranald. The project is at an early stage of development and the proponent is currently preparing the EIS. Construction is expected to occur between October 2024 and December 2026.	Approximately 65 kilometres west of the Project.	The land is distant from the Project and currently used for sheep grazing. A small area of land is expected to be removed from agricultural production resulting in a relatively small loss of agricultural production. Therefore, the cumulative

Project	Details	Location	Cumulative Impacts
			impact on regional agricultural production would also be small. The use of aerial agriculture in the Project area is limited and therefore cumulative impacts of an additional wind farm would be minimal. In addition, there is sufficient distance between the two projects to eliminate the possibility of a cumulative impact on aerial agriculture.
Bullawah Wind Farm	The proposed Bullawah wind farm will have an installed capacity of up to 1,000 megawatts and a battery facility on site. The project includes 170 WTGs, with a maximum blade-tip height of 300 metres above the ground. It is located approximately 30 kilometres southeast of Hay. A scoping report has been prepared and SEARs have been issued. Construction is expected to occur between 2025 and 2027.	Approximately 10 kilometres north east of the Project	The project area is currently used for low intensity grazing. The impacts of this project on agriculture would be low and the cumulative impact on regional agricultural production would also be small. As for Baldon Wind Farm, there would be no cumulative impact on aerial agriculture.
Dinawan Wind Farm	Dinawan Wind Farm is mainly located west of the road between Coleambally and Jerilderie, around the localities of Gala Vale and Mabins Well. Approximately 250 WTGs are proposed with a generation capacity of approximately 1.5 gigawatts. A scoping report has been prepared and SEARs have been issued. Construction is expected to occur between 2025 and 2027.	Approximately 50 kilometres south east of the Project	The land is relatively distant from the Project and is currently used mainly for sheep and cattle grazing plus with some areas of irrigated canola, cotton and cereal crops. A small area of land is expected to be removed from agricultural production resulting in a relatively small loss of agricultural production. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be small. As for Baldon Wind Farm, there would be no cumulative impact on aerial agriculture.

Project	Details	Location	Cumulative Impacts
Keri Keri Wind Farm	The project features up to 158 WTGs. A scoping report has been prepared and SEARs have been issued. Construction is expected to begin in late 2024.	Approximately 70 kilometres west of the Project	The project area is distant and currently used for low intensity grazing. Grazing would continue on most of the site during the operation phase. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be small. As for Baldon Wind Farm, there would be no cumulative impact on aerial agriculture.
Pottinger Wind Farm	Pottinger Wind Farm would consist of around 108 WTGs with a generation capacity of approximately 750 megawatts. It is located approximately 60 kilometres south of Hay and 15 kilometres north east of the locality of Boorooban. Construction is expected to occur in 2026.	Approximately 10 kilometres south east of the Project.	The project study area is currently used mainly for grazing plus with some areas of dryland and irrigated crops. However, no WTGs are planned for the cropping areas. A small area of land is expected to be removed from agricultural production resulting in a relatively small loss of agricultural production. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be small. As for Baldon Wind Farm, there would be no cumulative impact on aerial agriculture.
Tchelery Wind Farm	Tchelery Wind Farm proposes up to 120 WTGs with approximately 285 metres tip height. It would be located both east and west of Maude Road, approximately 65 kilometres east of Balranald and 30 kilometres north east of Moulamein. Construction is expected to commence in 2016 and take 2 to 2.5 years to complete.	Approximately 50 kilometres west of the Project.	The project study area is relatively distant and currently used mainly for grazing plus with small areas of dryland and irrigated cropping. It is expected that there would be minimal impact to these activities once the project is in operation. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be small.

Project	Details	Location	Cumulative Impacts
			As for Baldon Wind Farm, there would be no cumulative impact on aerial agriculture.
Wilan Wind Farm	Wilan Wind Farm would consist of around 138 WTGs with a generation capacity of approximately 800 megawatts. It is located approximately 25 kilometres east of Balranald., north of the Sturt Highway. Construction is expected to occur between 2025 and 2028.	Approximately 80 kilometres west of the Project.	The project study area is distant and is currently used mainly for grazing with some areas of dryland and irrigated crops. It is expected that there would be minimal impact to these activities once the Proposal is in operation. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be small. As for Baldon Wind Farm, there would be no cumulative impact on aerial agriculture.
Yanco Delta Wind Farm	Yanco Delta Farm would consist of up to 225 WTGs with a generation capacity of approximately 1,500 megawatts. It is located approximately 10 to 40 kilometres north west of Jerilderie. The EIS has been publicly exhibited and the proponent is responding to submissions.	Approximately 60 kilometres south east of the Project	The land is relatively distant from the Project and most of the project area is currently used for low intensity dryland sheep grazing with some mixed dryland grazing and cropping activities. A small area of land is expected to be removed from agricultural production resulting in a relatively small loss of agricultural production. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be small. As for Baldon Wind Farm, there would be no cumulative impact on aerial agriculture.
Currawarra Solar Farm	Currawarra Solar Farm is located around 25 kilometres north east of Deniliquin at Mayrung. The proposal is for a solar farm of around 195 megawatts capacity with approximately 654,200 solar panels. The project was approved in May 2018.	Approximately 70 kilometres south of the Project	The land is distant from the Project and is currently utilised for broad scale cropping activities. Grazing would continue during the operation phase. This project will reduce regional crop production.

Project	Details	Location	Cumulative Impacts
	Construction is expected to take 18 months, but it has not commenced.		However, as The Plains Wind Farm would have little or no impact on crop production, there would be no cumulative impact in this regard. The overall cumulative impact on regional agricultural production would also be small.
Hay Solar Farm	The project features a 110 megawatts solar farm with 300,000 panels across approximately 660 hectares. It was approved in 2017 and has a proposed 12-month construction period.	Approximately 20 kilometres north of the Project.	The project area is currently used for grazing. Grazing would possibly continue during the operation phase. The Hay Solar Farm is relatively small in the context of the total regional grazing area. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be small.
Keri Keri Solar Farm	The project features a 400 megawatts solar farm across approximately 1,322 hectares. A scoping report has been prepared and SEARs have been issued. Construction is expected to begin in 2024 for a period of 18-24 months	Approximately 80 kilometres west of the Project.	The land is currently used for low intensity grazing. Grazing would continue during the operation phase. The Keri Keri Solar Farm is relatively small in the context of the total regional grazing area. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be very small.
Lang's Crossing Solar Farm	The project is located approximately 1.6 kilometres north-east of the town centre of Hay and on an area of approximately 21 hectares. The project has been approved.	Approximately 20 kilometres north of the Project.	The project is very small in the context of the total regional agricultural area. The impacts of this project on agriculture would be very low and therefore the cumulative impact on regional agricultural production would also be very small.
Pottinger Solar Farm	Pottinger Solar Farm would consist of up to 500 hectares of solar panels with a generation capacity of approximately 300 megawatts. It is located approximately 60 kilometres south of	Approximately 5 kilometres south east of the Project.	The project study area is currently used for grazing. The Pottinger Solar Farm is relatively small in the context of the total regional grazing area. The

Project	Details	Location	Cumulative Impacts
	Hay and 15 kilometres north east of the locality of Booroorban. Construction is expected to occur in 2026.		impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be very small.
Southdown Solar Farm	The proposed Southdown Solar Farm is a utility-scale renewable energy project of up to 130 megawatts output on 390 hectares, to be located approximately 10 kilometres south of Deniliquin. A scoping report has been prepared and SEARs have been issued. Construction of the project is expected to take approximately 15 months	Approximately 85 kilometres south of the Project	The project area is distant and currently used for grazing and cropping. Grazing would be considered during the operation phase. The Southdown Solar Farm is small in the context of the total regional grazing area. This project will reduce regional crop production by a small amount. However, as The Plains Wind Farm would have little or no impact on crop production, there would be no cumulative impact in this regard. The overall cumulative impact on regional agricultural production would be small.
Tarleigh Park Solar Farm	Tarleigh Park Solar Farm is located 23 kilometres south east of Deniliquin at Blighty and would generate up to 90 megawatts from 290,000 solar panels on 250 hectares. The project was approved in May 2018. Construction is expected to take 12 months, but it has not commenced.	Approximately 140 kilometres south east of the Project	The land is distant from the Project and is currently utilised for irrigated and dryland cropping. Grazing would likely continue during the operation phase. This project will reduce regional crop production by a small amount. However, as The Plains Wind Farm would have little or no impact on crop production, there would be no cumulative impact in this regard. The overall cumulative impact on regional agricultural production would also be small.
The Plains Solar Farm	The Plains Solar Farm aims to have a generating capacity of 400 megawatts with approximately 600,000 to 800,000 solar panels. It is located east of the Cobb Highway, approximately 30 kilometres south of Hay. Construction is expected to occur between 2026 and 2028.	Within the Project investigation area	The land is currently used for grazing. The Plains Solar Farm is relatively small in the context of the total regional grazing area. Grazing may continue on the solar panel area. The impacts of this project on agriculture would be low and therefore the cumulative impact on regional agricultural production would also be small.

8 Management of impacts

The mitigation measures that would be implemented to avoid or minimise potential agricultural impacts are listed in Table 8-1.

Table 8-1
Mitigation measures – agriculture

Impact	Environmental safeguard	Timing
Impact of structures	Permanent structures and temporary construction compounds would be located where possible to avoid or minimise impacts, or as agreed with the affected landowner.	Detailed design and construction
Disruption Impacts	The following measures would be implemented to minimise disruption to agricultural activities. - Landowners would be consulted regarding any required adjustments to property infrastructure (fences, access tracks, etc) and the proposed timing and location of construction works, especially where some restriction on vehicular or stock movements would be necessary. - Property infrastructure (such as gates) would be managed in accordance with landowner requirements (provided access is not limited or restricted). - Any damage to property infrastructure caused by construction would be repaired in a timely manner in consultation with the landowner. - Use of existing roads, tracks and other existing disturbed areas would be prioritised. - Where access is required across open spaces, care would be exercised to ensure that minimum damage is caused to the surface by confining vehicular or plant movement, as far as possible, to one route.	Detailed design and construction
Fire	A bushfire plan would be prepared for the Project and would include mitigation measures applicable to construction and operation activities undertaken during the bushfire danger period.	Construction and operation
Rehabilitation	Disturbed areas would be stabilised and appropriately rehabilitated in line with approval conditions and contractual agreements with landowners following the completion of construction at each location. This would be carried out in consultation with the relevant landowners.	Construction
Livestock disturbance	Procedures would be implemented so that potential impacts or conflicts between livestock and construction activities are appropriately managed. Procedures would be developed in consultation with affected landowners and would include management of: noise intensive activities during sensitive periods within the livestock production cycle (such as lambing and calving),	Construction and operation

Impact	Environmental safeguard	Timing
	- vehicle movements and other activities within the vicinity of livestock, and - movement of stock away from potential stressors created by construction activities.	
Biosecurity - construction	Construction activities would conform to the biosecurity protocols of the landowners including recording of the details for all persons entering the properties, all project vehicles to be washed down prior to entering any agricultural areas, all vehicles to be washed down when moving between paddocks with known weed infestations. Temporary fencing will be installed around facilities (such as the construction compound, concrete batching plants, materials storage and laydown areas) during construction. New or existing infestations of any priority weed or unidentified weed would be reported to the appropriate weeds authority. Where present within the permanent footprint, weeds would be managed in accordance with the <i>Biosecurity Act 2015</i> and the relevant regional strategic weed management plans and in consultation with the Project landowners	Construction
Access impacts - operation	Fencing and access arrangements, such as locked gates and requirements for opening and closing of gates, would be determined in consultation with landowners. Any damage caused by ENGIE during maintenance activities would be repaired promptly.	Operation
Biosecurity - operation	Project activities would conform to the biosecurity protocols of the landowners including recording of the name, location, date and time of visit for all persons entering the properties, all project vehicles to be washed down prior to entering any agricultural areas, all vehicles to be washed down when moving between paddocks with known weed infestations. Permanent security fencing will be installed around operational facilities including the BESS, operations and maintenance facility and substations.	Operation
Weed management	Where present within the permanent footprint, weeds would be managed in accordance with the Biosecurity Act 2015 and the relevant regional strategic weed management plans and in consultation with the Project landowners. The land around transmission line structures and other project infrastructure would be monitored for the spread of weeds by birds. The project area would be monitored for pest animal numbers, and appropriate control measures taken, if required. New infestations of any priority weed or unidentified weed would be reported to the appropriate weeds authority.	Operation
Decommissioning	The project area will be returned the condition agreed with the landowners in their contractual agreements.	Decommission

Impact	Environmental safeguard	Timing
	Underground infrastructure (such as cables and footings) may be removed where practical to a depth of 0.3 metres below ground surface but may otherwise remain. Any contamination or waste would be removed or managed in consultation with the landowners and according to regulations. Weed infestations would be controlled during the decommissioning process, if possible.	

9 Conclusion

The impact of the Project on agricultural activities would be small. The magnitude of these impacts would be constrained by the following factors.

- The relatively small amount of agricultural land permanently removed from production compared to the total Project area and the total regional agricultural land.
- The continued grazing on most of the Project area during operation.
- The little or no impact on cropping land.
- The relatively low agricultural productivity of the Project area.
- The low level of cumulative impacts.
- The relatively low biosecurity risk in the Project area, further reduced after mitigation measures are implemented.
- Effective mitigation measures would be implemented to reduce the impacts of the Project on the agricultural industry.

The impact of the Project on agricultural productivity at a regional scale would be minimal due to the above factors.

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Attachment 1 NSW DPI Sheep Budgets



MERINO EWES (20 micron) - Merino Rams

Farm Enterprise Budget Series - Oct 2022 (ave. wool and sheep price 1 Apr to 30 Sep)

Flock size: 1000 ewes
Ewe body weight: 59 kgs
DSE rating: 2.32 DSEs/ewe

INCOME

	number	class	kg /hd	\$/kg
Wool	960	ewes	5.64	\$8.60
Shear	404	ewe hoggets	5.64	\$9.69
	20	rams	7.50	\$8.61
	413	ewe lambs	1.18	\$4.37
Crutch	1020	adults	0.40	\$6.26
	413	lambs	0.30	\$6.26
Sheep Sales	number	class	\$ /hd	
	177	CFA ewes	\$152.66	(26.0 kg cwt)
	4	CFA rams	\$165.40	
	430	weth weaners	\$92.53	(4 months)
	187	ewe hoggets	\$221.00	(16 months)

Fodder	tonnes	type	value per tonne
Graz/fodder crop	0 t	0	\$0 /t

A. Total Income:

VARIABLE COSTS

Replacements	number	class	cost (\$)/hd	reps
	4	rams	\$2,000.00	
cartage	4	rams	\$55.00	

Wool Harvesting & Selling Costs

Shearing	1777	ewes/hogg/lmb	\$9.01	1
	20	rams	\$12.48	1
Crutching	1413	ewes/lamb	\$1.76	1
	20	rams	\$3.02	1
Wool tax			1.50%	
Commission, warehouse, testing charges			\$44.10/ bale	
Wool - cartage	49	bales	\$16.00	
- packs	49	packs	\$14.00	

Sheep Health

	number	class		
Broadspectrum	1020	adults/hoggets	\$1.59	2
	421	ewe lambs	\$0.74	3
	430	wether lambs	\$0.74	1
Narrowspectrum	1020	adults/hoggets	\$0.39	1
	421	ewe lambs	\$0.20	1
Lice control	1797	adults/Hog/wean	\$1.64	1
Fly control (long acting)	1020	Adults	\$2.34	1
Fly control (short acting)	413	ewe weaners	\$0.50	1
Vaccination- 6 in 1	1020	Adults	\$0.38	1
	890	lambs	\$0.38	2
Mark (includes OJD)	890	lambs	\$6.32	1
Scanning	1000	ewes	\$0.80	1

Livestock Selling Costs

Livestock cartage	798	sale sheep	\$2.50
Commission on sheep sales			4.50%
Levies (Yard dues, MLA Transaction levy and LLS rates)			

Pasture maintenance	232 ha	@	\$73 /ha
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Fodder

Ewes/hoggets	1020	3.5 kg/hd/week	\$0.33 /kg	10 weeks
Ewe lambs	413	2.8 kg/hd/week	\$0.33 /kg	12 weeks
Wether lambs	430	2.8 kg/hd/week	\$0.33 /kg	0 weeks
Total feed		49,169 kg	@	\$330
Graz/fodder crop	0 ha	@	\$0 /ha	

B. Total Variable Costs:

	excl. fodder	incl. fodder
GROSS MARGIN (A-B)	\$108,332.18	\$92,106.48
GROSS MARGIN /EWE	\$108.33	\$92.11
GROSS MARGIN /DSE	\$46.69	\$39.70
GROSS MARGIN /HA	\$466.95	\$397.01

This budget should be used as a GUIDE ONLY and should be changed by the grower to take account of movements in commodity and input prices, changes in seasonal conditions and individual farm characteristics. Estimated prices are GST exclusive.

ASSUMPTIONS MERINO EWES (20 micron) - Merino Rams

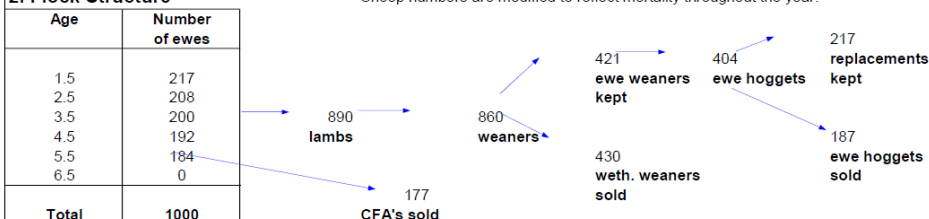
1. Flock Parameters

Flock mortality	4%	Ram %	2%
Productive life	5 years	Marking %	89%
Ewe body weight	59 kg	Weaning %	86%
DSE rating /ewe	2.32	Weaning age	3 months
Stocking rate/ha	10 dse's		

Pasture maintenance = 90kg/ha single super @ \$730t + \$7.00/ha application

2. Flock Structure

Sheep numbers are modified to reflect mortality throughout the year.



3. Wool Prices

Merino Ewe	Micron	AWEX Type	Clean price	Yield	Greasy price	Specifications (all 35n/ktex)	Proportion of Clip
- Fleece GTM	20	MF5B.	\$14.22	65%	\$9.27	1%VMB, 90mm	75%
- Skirtings/bellies	19	MP5B.	\$13.12	56%	\$7.32	4.8%VMB, 80mm	20%
- Cardings	20	MZ2B.	\$7.12	52%	\$3.69	2.9%VMB.	5%
					\$8.60	used in budget	

4. Sensitivity Tables - Changes in Gross Margin \$/DSE (includes fodder)

Wool Cut kg/hd	Adult Greasy Wool Price \$/Kg greasy				
	\$4.30	\$6.45	\$8.60	\$10.75	\$12.90
2.82 kg	\$25.35	\$27.82	\$30.29	\$32.77	\$35.24
4.23 kg	\$27.57	\$31.27	\$34.98	\$38.69	\$42.40
5.64 kg	\$29.82	\$34.76	\$39.70	\$44.64	\$49.59
7.05 kg	\$32.03	\$38.21	\$44.39	\$50.57	\$56.74
8.46 kg	\$34.28	\$41.69	\$49.11	\$56.52	\$63.94

Hog. Wool Cut kg/hd	Hogget Greasy Wool Price \$/Kg greasy				
	\$4.85	\$7.27	\$9.69	\$12.11	\$14.54
2.82 kg	\$32.86	\$34.03	\$35.21	\$36.38	\$37.55
4.23 kg	\$33.94	\$35.70	\$37.45	\$39.21	\$40.97
5.64 kg	\$35.01	\$37.36	\$39.70	\$42.04	\$44.39
7.05 kg	\$36.09	\$39.02	\$41.95	\$44.88	\$47.81
8.46 kg	\$37.13	\$40.65	\$44.16	\$47.68	\$51.20

Ewe hoggets \$/Hd	Value of wether weaners \$/Hd				
	\$46.27	\$69.40	\$92.53	\$115.66	\$138.80
\$110.50	\$23.01	\$27.10	\$31.20	\$35.29	\$39.38
\$165.75	\$27.26	\$31.35	\$35.45	\$39.54	\$43.64
\$221.00	\$31.51	\$35.61	\$39.70	\$43.80	\$47.89
\$276.25	\$35.76	\$39.86	\$43.95	\$48.05	\$52.14
\$331.50	\$40.02	\$44.11	\$48.21	\$52.30	\$56.40

CFA ewes \$/Hd	Weaning %				
	43%	65%	86%	108%	129%
\$76.33	\$8.12	\$21.08	\$34.14	\$47.31	\$60.37
\$114.50	\$10.91	\$23.86	\$36.92	\$50.09	\$63.15
\$152.66	\$13.69	\$26.64	\$39.70	\$52.87	\$65.93
\$190.83	\$16.47	\$29.42	\$42.48	\$55.65	\$68.71
\$229.00	\$19.25	\$32.20	\$45.26	\$58.43	\$71.49

Note: The above sensitivity tables vary price and quantities by +/- 25% and +/- 50%.

Crutching \$/hd	Total shearing cost \$/hd				
	\$4.50	\$6.76	\$9.01	\$11.26	\$13.51
\$0.88	\$43.69	\$41.96	\$40.24	\$38.51	\$36.79
\$1.32	\$43.42	\$41.69	\$39.97	\$38.24	\$36.52
\$1.76	\$43.15	\$41.43	\$39.70	\$37.98	\$36.25
\$2.20	\$42.88	\$41.16	\$39.43	\$37.71	\$35.98
\$2.64	\$42.61	\$40.89	\$39.17	\$37.44	\$35.72

Ewes/hoggets kg/hd/wk	Grain price \$/Tonne				
	\$165.00	\$247.50	\$330.00	\$412.50	\$495.00
1.7 kg	\$44.45	\$43.33	\$42.21	\$41.09	\$39.97
2.6 kg	\$43.83	\$42.39	\$40.96	\$39.52	\$38.09
3.5 kg	\$43.20	\$41.45	\$39.70	\$37.95	\$36.20
4.3 kg	\$42.57	\$40.51	\$38.45	\$36.38	\$34.32
5.2 kg	\$41.94	\$39.57	\$37.19	\$34.82	\$32.44

Note: The feeding sensitivity tables vary quantities/cost by +/- 25% and +/- 50%.

Sheep and wool prices thanks to MLA market reporting, AuctionsPlus and AWEX. Wool cuts based on wether trial data

This budget should be used as a GUIDE ONLY and should be changed by the grower to take account of movements in commodity and input prices, changes in seasonal conditions and individual farm characteristics. Estimated prices are GST exclusive.

MERINO WETHERS (20 micron)

Farm Enterprise Budget Series - Oct 2022 (ave. wool and sheep price 1 Apr to 30 Sep)

Flock size: 1000 wethers
Wether body weight: 59 kgs
DSE rating: 1.18 DSEs/wether

INCOME

	number	class	kg /hd	\$/kg
Wool				
Shear	980	wethers	6.06	\$8.70
	174	wethers 4 month	1.26	\$4.37
Crutch	990	wethers	0.40	\$6.26
Sheep Sales	number	class	\$ /hd	
	159	CFA wethers	\$156.56	(26.0 kg cwt)
Fodder	tonnes	type	value per tonne	
Graz/fodder crop	0 t	0	\$0 /t	

A. Total Income:
VARIABLE COSTS

Replacements	number	class	cost (\$)/hd	
	174	wethers	\$92.53	(4 months)
Cartage	174	wethers	\$2.50	

Wool Harvesting & Selling Costs

				reps
Shearing	1154	wethers	\$9.01	1
Crutching	990	wethers	\$1.84	1
Wool tax			1.50%	
Commission, warehouse, testing charges			\$44.10/ bale	
Wool - cartage	36	bales	\$16.00	
- packs	36	packs	\$14.00	

Sheep Health

Broadspectrum	826	wethers	\$1.59	2
	174	weaners	\$0.74	2
Narrowspectrum	1000	wethers	\$0.39	1
Lice control	1154	wethers	\$1.64	1
Fly control (long acting)	1000	wethers	\$2.34	1
Vaccination- 6 in 1	1000	wethers	\$0.38	1

Livestock Selling Costs

Livestock cartage	159	CFA wethers	\$2.50
Commission on sheep sales			4.50%
Levies (Yard dues, MLA Transaction levy and LLS rates)			

Pasture maintenance	118 ha	@	\$73 /ha
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Fodder

			Supplementary feed @ \$330 /t	
Wethers	826	3.5 kg/hd/week	\$0.33 /kg	4 weeks
Wether weaners	174	2.8 kg/hd/week	\$0.33 /kg	10 weeks
Total feed		16,308 kg	@	\$330
Graz/fodder crop	0 ha	@	\$0 /ha	

B. Total Variable Costs:

GROSS MARGIN (A-B)
GROSS MARGIN /WETHER
GROSS MARGIN /DSE
GROSS MARGIN /HA

excl. fodder
\$29,127.70
\$29.13
\$24.68
\$246.84

incl. fodder
\$23,746.14
\$23.75
\$20.12
\$201.24

This budget should be used as a GUIDE ONLY and should be changed by the grower to take account of movements in commodity and input prices, changes in seasonal conditions and individual farm characteristics. Estimated prices are GST exclusive.

MERINO EWES (20 micron) - Merino Rams

Farm Enterprise Budget Series - Oct 2022 (ave. wool and sheep price 1 Apr to 30 Sep)

Flock size: 1000 ewes
Ewe body weight: 59 kgs
DSE rating: 2.32 DSEs/ewe

INCOME

	number	class	kg /hd	\$/kg
Wool	960	ewes	5.64	\$8.60
Shear	404	ewe hoggets	5.64	\$9.69
	20	rams	7.50	\$8.61
	413	ewe lambs	1.18	\$4.37
Crutch	1020	adults	0.40	\$6.26
	413	lambs	0.30	\$6.26
Sheep Sales	number	class	\$ /hd	
	177	CFA ewes	\$152.66	(26.0 kg cwt)
	4	CFA rams	\$165.40	
	430	weth weaners	\$92.53	(4 months)
	187	ewe hoggets	\$221.00	(16 months)

Fodder	tonnes	type	value per tonne
Graz/fodder crop	0 t	0	\$0 /t

A. Total Income:

VARIABLE COSTS

Replacements	number	class	cost (\$)/hd	reps
	4	rams	\$2,000.00	
cartage	4	rams	\$55.00	

Wool Harvesting & Selling Costs

Shearing	1777	ewes/hogg/lmb	\$9.01	1
	20	rams	\$12.48	1
Crutching	1413	ewes/lamb	\$1.76	1
	20	rams	\$3.02	1
Wool tax			1.50%	
Commission, warehouse, testing charges			\$44.10/ bale	
Wool - cartage	49	bales	\$16.00	
- packs	49	packs	\$14.00	

Sheep Health	number	class		
Broadspectrum	1020	adults/hoggets	\$1.59	2
	421	ewe lambs	\$0.74	3
	430	wether lambs	\$0.74	1
Narrowspectrum	1020	adults/hoggets	\$0.39	1
	421	ewe lambs	\$0.20	1
Lice control	1797	adults/Hog/wean	\$1.64	1
Fly control (long acting)	1020	Adults	\$2.34	1
Fly control (short acting)	413	ewe weaners	\$0.50	1
Vaccination- 6 in 1	1020	Adults	\$0.38	1
	890	lambs	\$0.38	2
Mark (includes OJD)	890	lambs	\$6.32	1
Scanning	1000	ewes	\$0.80	1

Livestock Selling Costs

Livestock cartage	798	sale sheep	\$2.50
Commission on sheep sales			4.50%
Levies (Yard dues, MLA Transaction levy and LLS rates)			

Pasture maintenance	232 ha	@	\$73 /ha
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Fodder

Ewes/hoggets	1020	3.5 kg/hd/week	\$0.33 /kg	10 weeks
Ewe lambs	413	2.8 kg/hd/week	\$0.33 /kg	12 weeks
Wether lambs	430	2.8 kg/hd/week	\$0.33 /kg	0 weeks
Total feed		49,169 kg	@	\$330
Graz/fodder crop	0 ha	@	\$0 /ha	

B. Total Variable Costs:

	excl. fodder	incl. fodder
GROSS MARGIN (A-B)	\$108,332.18	\$92,106.48
GROSS MARGIN /EWE	\$108.33	\$92.11
GROSS MARGIN /DSE	\$46.69	\$39.70
GROSS MARGIN /HA	\$466.95	\$397.01

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Attachment 2

Local priority species of concern – Riverina LLS

Common name	Scientific name
Agapanthus	<i>Agapanthus praecox</i>
Bathurst burr	<i>Xanthium</i> spp.
Bear-skin fescue	<i>Festuca gautieri</i>
Bitter stonecrop	<i>Sedum acre</i>
Blackberry nightshade	<i>Solanum nigrum</i>
Blue heliotrope	<i>Heliotropium amplexicaule</i>
Box elder	<i>Acer negundo</i>
Bridal creeper	<i>Asparagus asparagoides</i>
Buffalo burr	<i>Solanum rostratum</i>
Caltrop	<i>Tribulus terrestris</i>
Camel thorn	<i>Alhagi pseudalhagi</i>
Cape tulips	<i>Moraea flaccida</i> and <i>M. miniata</i>
Capeweed	<i>Arctotheca calendula</i>
Columbus grass	<i>Sorghum x alnum</i>
Common heliotrope	<i>Heliotropium europeum</i>
Devil's claw	<i>Ibicella lutea</i> or <i>Proboscidea louisianica</i>
English ivy	<i>Hedera helix</i>
Flax-leaf fleabane	<i>Conyza bonariensis</i>
Fountain grass	<i>Cenchrus setaceus</i>
Galenia	<i>Galenia pubescens</i>
Galvanised burr	<i>Sclerolaena birchii</i>
Gazania	<i>Gazania linearis</i>
Golden dodder	<i>Cuscuta campestris</i>
Harrisia cactus	<i>Harrisia martinii</i> and <i>H. tortuosa</i>
Himalaya honeysuckle	<i>Leycesteria formosa</i>
Honey locust	<i>Gleditsia triacanthos</i>
Horehound	<i>Marrubium vulgare</i>
Johnson grass	<i>Sorghum halepense</i>
Khaki weed	<i>Alternanthera pungens</i>
Lippia	<i>Phyla canescens</i>
Long leaf willow primrose	<i>Ludwigia longifolia</i>
Noogoora burr	<i>Xanthium occidentale</i>
Patterson's curse	<i>Echium plantagineum</i>
Privet (broad-leaf)	<i>Ligustrum lucidum</i>
Privet (narrow-leaf)	<i>Ligustrum sinense</i>
Red rice	<i>Oryza rufipogon</i>
Reed canary grass	<i>Phalaris arundinacea</i>
Reed sweetgrass	<i>Glyceria maxima</i>
Rhus tree	<i>Toxicodendron succedaneum</i>
Scotch & Illyrian thistles	<i>Onopordum</i> spp.
Silk forage sorghum	<i>Sorghum</i> spp. hybrid cv. "Silk"
Spanish heath	<i>Erica lusitanica</i>
Spiny burrgrass	<i>Cenchrus longispinus</i>
Spiny emex	<i>Emex australis</i>
St Barnaby's thistle	<i>Centaurea solstitialis</i>
St John's wort	<i>Hypericum perforatum</i>
Star thistle	<i>Centaurea calcitrapa</i>
Sweet briar rose	<i>Rosa rubiginosa</i>
Tangled hypericum	<i>Hypericum triquetrifolium</i>
Tree of heaven	<i>Ailanthus altissima</i>