



Hume Battery Energy Storage System Project

Meridian Energy Australia

State Significant Development Scoping Report

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 Author: Thomas Muddle
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Jacobs Group (Australia) Pty Limited
 ABN 37 001 024 095
 Leve 4, 12 Steward Avenue
 Newcastle West NSW 2302 Australia
 PO Box 2147 Dangar NSW 2309 Australia
 T +61 2 4979 2600
 F +61 2 4979 2666
 www.jacobs.com

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Executive Summary

Description of the Project

Meridian Energy Australia Pty Ltd proposes to develop the Hume Battery Energy Storage System (BESS) Project (the Project), to be constructed on WaterNSW land near the pre-existing Hume Dam Hydro Power Station in NSW. The project is proposed to be undertaken in the *Albury City Council Local Government Area* (LGA). Two locations for the BESS (northern area and southern area) within the WaterNSW land are under consideration with design and feasibility work ongoing to select a preferred location.

The estimated capex cost of the BESS project is \$33 million, constituting a system with a generation capacity of 20 Megawatts. The BESS would have storage capacity to facilitate maximum discharge for a two-hour period. During operation power generated by the Hume Dam Hydro Power Station would be used to charge the BESS during periods of low energy demand. This energy would then be available for distribution to the National Energy Market in periods of higher demand.

The BESS would be connected to the existing TransGrid transmission lines to Albury and the existing AusNet transmission line to Wodonga. The connection would be established via a short below ground cable to the existing switchyard which would require minor augmentation.

Strategic context of the project

The Project is wholly aligned with the Australian Energy Market Operator (AEMO) Integrated System Plan for the NEM (AEMO, 2018), Commonwealth, State and Regional energy and climate change policy. This Project aims to showcase the relevance and opportunities offered by coupling BESS with an existing hydropower generation asset that has its dispatchability restricted by water release regulations. Under the expected operation mode, charging the BESS during low electricity demand periods with hydropower output can provide a range of network services. These include the provision of:

- Wholesale energy market services
- Frequency Control Ancillary Services (FCAS), for all regulation and contingency services
- Fast Frequency Response (FFR) service
- System Restart Ancillary Services (SRAS)
- Network Support and Control Ancillary Services (NSCAS), for all service types
- Demand management services for local Network Service Providers (NSPs)
- Reliability support services for local NSPs, both planned and unplanned services. This is to be facilitated via islanding and grid-forming capabilities of the BESS solution.

Statutory framework

The Project would be considered as State significant development under the Environmental Planning and Assessment Act 1979. This scoping report is intended to support a request for Secretary's Environment Assessment Requirements (SEARs) which would then be addressed through the preparation of an Environmental Impact Statement (EIS).

An outline of the relevant matters and impacts of the project

The assessment of the likely environmental consequences of the Project has involved:

- Project development team workshops to understand the scale, risks and likely impacts associated with BESS projects
- Desktop review of relevant databases, historical aerial photography, reports associated with the original development of the Hume Dam and available background data
- Review of Department of Planning and Environment Draft Scoping and Environmental Impact Statement Guidelines
- Ecologist and archaeologist site walkover
- Consideration and anticipation of likely stakeholder concerns.

From this process, issues requiring further consideration are identified as:

- Heritage including both Aboriginal and non-Aboriginal heritage
- Biodiversity
- Water quality
- Construction traffic
- Risks.

Aboriginal heritage

A preliminary Aboriginal cultural heritage assessment has been undertaken with reference to the Due Diligence of Practice Code of Practice for the Protection of Aboriginal Objects in NSW published by the Office of Environment & Heritage (OEH).

A preliminary site inspection confirmed that the southern area has been subject to extensive ground disturbance from the construction of the Hume Dam. The northern area is less disturbed and located on a ridge and was identified as having low to moderate archaeological sensitivity. There were no Aboriginal objects or sites identified during the inspection.

Formal consultation under the *Aboriginal cultural heritage consultation requirements for proponents 2010* (OEH, 2010) has commenced and a site visit with Registered Aboriginal Parties was completed for the southern area which confirmed this area is free of Aboriginal heritage objects. A follow-up survey to the northern area of the site is proposed if safe access can be arranged. The outcomes of the Aboriginal cultural heritage impact assessment would be provided in the EIS along with mitigation measures developed in consultation with Registered Aboriginal Parties.

Biodiversity

Part 7 of the Biodiversity Conservation Act 2016 (BC Act) requires that an application for State significant infrastructure approval under Division 5.2 of the EP&A Act be accompanied by a biodiversity development assessment report unless the Secretary of the Department of Planning and the Chief Executive of the Office of Environment and Heritage determine that the proposed development is not likely to have any significant impact on biodiversity values.

A preliminary biodiversity assessment is provided within this scoping report and based on the highly disturbed nature of the site and the avoidance of native vegetation and habitat features to the extent possible in locating the Project and the low condition of plant community types present, it is considered unlikely that significant impacts to biodiversity values would occur.

Water quality

The Project would be located within an area mapped as “Sensitive Area” on the Albury Local Environment Plan Natural Resources Sensitivity—Water Map. The Project does not affect the operation of the Hume Dame or existing hydro generation assets and as such would have no implications for water availability or environmental flows. Water quality impacts could manifest in the absence of appropriate mitigation measures.

The EIS would describe measures to appropriately manage water quality risks including during the construction and operational stages.

Construction traffic

The Project would introduce additional traffic to local and regional roads during construction including the need for some oversize and overmass vehicle movements for the delivery of equipment. No material change to traffic would arise from the operation of the project. Private property access would be unaffected and no offsite parking would be required. The selection of the northern area may require the establishment of a new point of access off Hume Weir Road.

A traffic impact assessment would be undertaken focusing on construction impacts.

Risks

The Project would be sited to avoid flooding impacts and designed to manage geotechnical risks. The Project would introduce the storage of hazardous substances. The Project is also located within Bushfire prone land.

The EIS will incorporate the outcome of hazard studies for the selected technology and the Project design would address identified risks.

Stakeholder engagement

The Project is in its early development stage and environmental assessment is proceeding in parallel with the design and feasibility considerations and at this stage limited engagement beyond landowner (WaterNSW) and network operators (TransGrid and Ausnet) has occurred. Both Albury City Council and the member of the New South Wales Legislative Assembly has been briefed on the Project and expressed their support.

The Project is not expected to generate significant stakeholder interest due to the anticipated low level of impact. This is on the basis that the Project would have a short construction duration, typical construction processes and low intensity operational impacts consistent with the current, WaterNSW and Hume Hydro, land uses. As such Stakeholder engagement is expected to be targeted at keeping neighbours informed of the assessment process and anticipated Project impacts such that concerns can be addressed and managed through the design process. This is expected to be achieved through consultation with immediate neighbours, advertising the Project and how additional information can be obtained in the local media, and the hosting of an information session immediately prior to EIS exhibition.

The outcomes of consultation will be included the EIS and relevant technical studies

1. Introduction

1.1 Background

Meridian Energy Australia Pty Ltd (a subsidiary of Meridian Energy Limited) (collectively, Meridian) is an electricity operator and retailer operating in Australia and New Zealand. Meridian's focus is on producing and retailing energy from exclusively renewable sources, including hydro, wind, and solar energy. Meridian is the current owner of GSP Energy Pty Ltd, the operator of the Hume Dam Hydro Power Station (HPS), located at Lake Hume in southern NSW.

The HPS was commissioned in 1957, originally comprising of two 25MW turbines. These turbines were upgraded in 2000 to 29MW each. Meridian took over operation of the HPS following acquisition of GSP Energy Pty Ltd in 2018. The Hume Dam Hydro Power Station is currently Meridian's largest hydro power project in Australia based on annual energy production, transmitting power to both Albury in NSW, and Wodonga in Victoria.

While HPS can be dispatchable, its dispatchability is limited by the water release instructions and downstream water level requirements. Meridian now proposes the development of the Hume Battery Energy Storage System (BESS), to be connected to the existing switchyard currently servicing the HPS. The HPS is connected to both the AusNet (66kV) and TransGrid (132kV) networks where there is currently capacity for additional generation to be connected.

Accordingly, Meridian proposes to install a 20MW/40MWh battery energy storage system (BESS) to be co-located with the existing HPS in order to better respond to the needs of the National Energy Market and unlock new revenues streams.

As part of the Project development, Meridian is applying for ARENA's Advancing Renewables Fund and NSW State Government's Emerging Energy Fund for support. This project aims to showcase the relevance and opportunities offered by the solution of BESS coupling with an existing hydropower generation asset that has its dispatchability restricted by water release regulations. Under the expected operation mode, by charging the battery during low electricity demand period by the hydropower output, the BESS can be dispatched during the high demand period following the market signals, as a result, maximising the economic benefits of the electricity generated by the hydropower station. If proven successful, this solution can be replicated at other mid-scale run-of-river hydropower stations in Australia.

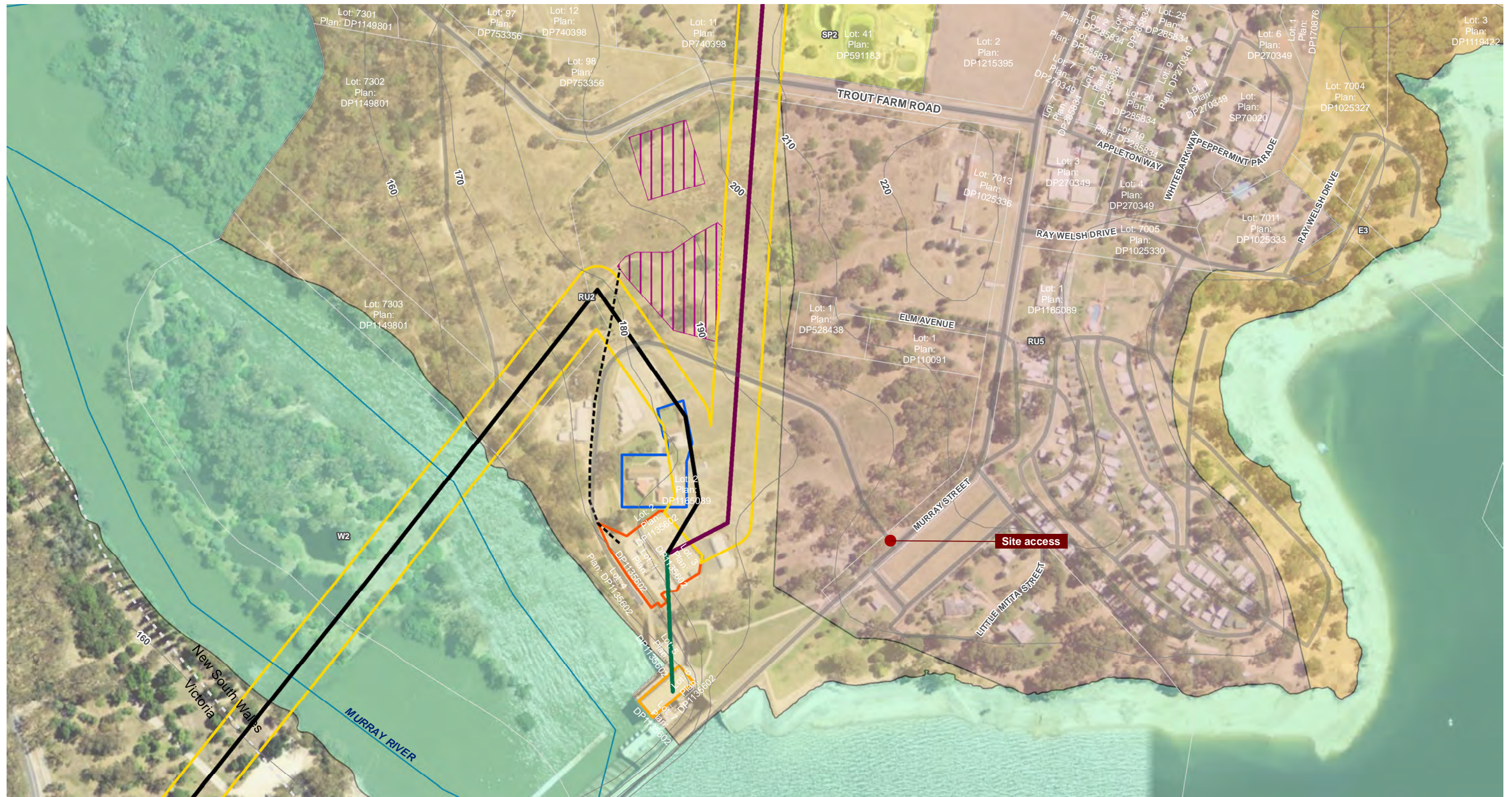
1.2 Project description

Meridian proposes to develop the Hume Battery Energy Storage System (BESS) Project, to be constructed on WaterNSW land near the pre-existing Hume Dam Hydro Power Station in NSW. The Project would be undertaken in the *Albury City Council Local Government Area* (LGA) and has an estimated capex cost of approximately \$33 million. The indicative Project and environmental context is provided in Figure 1.1 and Figure 1.2.

The Project would involve the construction, commissioning, operation and decommissioning of a BESS with a generation capacity of 20MW. The BESS would have storage capacity to facilitate maximum discharge for a two-hour period.

The project works are proposed to consist of:

- Installation, commissioning, and operation of a 20MW/40MWh BESS
- Ancillary upgrades to the existing substation switchyard
- Underground electricity network distribution feeder connections from the existing switchyard to the BESS
- Construction of fencing around the perimeter of the BESS compound.



Legend

- Site access
 - Proposed 11kV cable - From switchyard to battery
 - ▨ Potential battery locations
 - New South Wales/Victoria state boundary
 - Contours (10 metres)
 - Watercourse
 - Cadastral extent
- NSW LEP zoning**
- E3 Environmental Management
 - RU2 Rural Landscape
 - RU5 Village
 - SP2 Infrastructure
 - W2 Recreational Waterways
- 132 kV transmission line to Albury (NSW)
 - 66 kV transmission line to Wodonga (Victoria)
 - Connection from power station to switchyard
 - ▭ Existing power station
 - ▭ WaterNSW Offices
 - ▭ Meridian switchyard
 - ▭ Easement buffer for the 66kV line (22.86 m) and the 132 kV line (22.86 m)

0 100 200 m

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Data sources

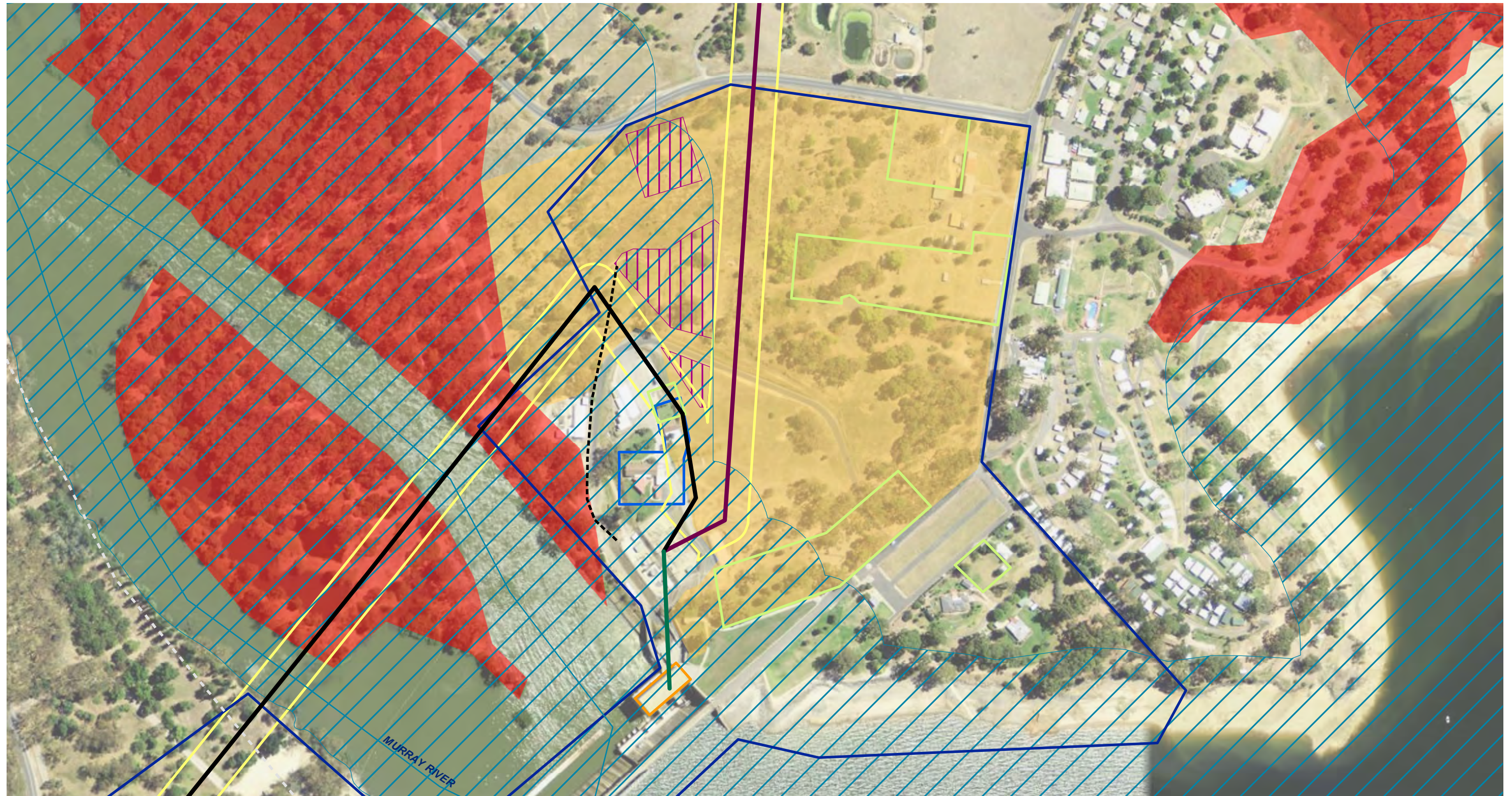
Jacobs 2019
NSW Spatial Services 2019
Geoscience Australia 2019
Imagery: Six Maps, NSW

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Figure 1.1 Indicative Project Location and Layout

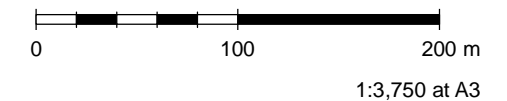


Legend

- Site access
- Proposed 11kV cable - From switchyard to battery
- New South Wales/Victoria state boundary
- Watercourse
- 132 kV transmission line to Albury (NSW)
- 66 kV transmission line to Wodonga (Victoria)
- Connection from power station to switchyard
- Existing power station
- WaterNSW Offices
- Potential battery locations
- WaterNSW switchyard
- LEP - Riparian Lands Watercourse
- Indicative S.170 heritage curtilage
- Indicative areas of high historical potential
- Easement buffer for the 66kV line (22.86 m) and the 132 kV line (22.86 m)

NSW Rural Fire Service - Bushfire Prone Land

- Vegetation Category 1
- Vegetation Category 2
- Vegetation Category 3
- Vegetation Buffer



Data sources

Jacobs 2019
NSW Spatial Services 2019
Geoscience Australia 2019
Imagery: ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, Aerogrid, IGN and the GIS User Community

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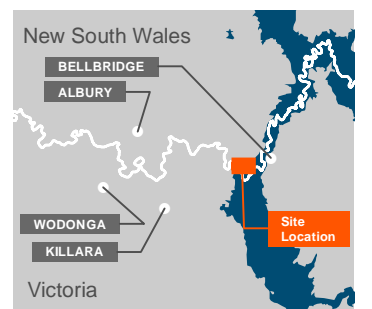


Figure 3 Hume BESS - Environmental Constraints

The maximum disturbance area for the project, including temporary construction areas and permanent footprint, would not exceed one hectare. Permanent infrastructure is anticipated to require a maximum 0.5 hectares. Batteries are expected to be mounted on concrete footings and be containerized or otherwise enclosed. Environmental controls for hazardous substances management would be provided and suitable for the selected technology in accordance with applicable guidelines.

The BESS is intended to have an operational life of 30 years and depending on the selected technology components may be replaced and or upgraded to extend this timeframe. Following the end of economic life, above ground components would be removed and land rehabilitated to achieve a safe, stable and non-polluting condition.

The Project description would be refined in the Environmental Impact Statement (EIS) to reflect the design status at the time.

1.3 Proponent

Meridian is the proponent for the Hume BESS and the current operator of the Hume Dam Hydro Power Station, located next to the proposed site of development. WaterNSW own the land on which the new development is proposed to be built, as well as the existing switchyard which is proposed to be upgraded as part of project works. This switchyard is currently in use by Meridian for the Hume Dam Hydro Power Station.

Meridian generates electricity exclusively from renewable energy sources, including hydro, wind, and solar energy. Meridian is 51% owned by the New Zealand Government and is Australasia's largest 100% renewable energy generator owning and operating ten hydro power stations and seven wind farms across the New Zealand and Australia.

Meridian is deeply committed to providing energy solutions in a sustainable manner, generating and retailing electricity from exclusively renewable sources. Meridian are dedicated to "working to build a better future for our team and the customers we sell power to" through sustainable business operation. Meridian conduct yearly carbon footprint analyses of their operations and monitor the activity of their electricity generating projects to ensure minimal environmental impact. Meridian's retail business Powershop Australia is certified as a carbon neutral retailer of electricity. The Hume BESS Project is a natural continuation of Meridian's commitment to providing reliable renewable energy solutions in Australia and New Zealand.

1.4 Summary of Planning and Assessment Process

The Hume Battery Energy Storage System Project is declared to be State Significant Development (SSD) in accordance with Schedule 1, Clause 20 of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) due to its estimated capital investment value. Accordingly, Meridian is lodging its application for approval for the project as SSD under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979*.

1.5 Purpose of Report

The purpose of this report is to support an application for Secretary's Environmental Assessment Requirements (SEARs) under Division 4.7 of the EP&A Act. Once issued, the SEARs will set out the matter to be addressed by Meridian in the Environmental Impact Statement (EIS) to be prepared and submitted for the project. This report documents the outcomes of the preliminary environmental risk analysis for the project and scopes the matters and impacts that are likely to be relevant to the Project.

2. Project Context

2.1 Location

The project site is located in southern NSW on the border of NSW and Victoria, adjacent to Lake Hume Village and approximately 10km east of Albury, lying within the *Albury City Council LGA*. The site sits adjacent to the Murray River and is about 300m north of the existing Hume Dam Hydro Power Station.

The proposed development site is on land currently owned by WaterNSW, which also hosts WaterNSW offices, the Hume Dam Hydro Power Station, and a WaterNSW-owned switchyard already in use by Meridian. Transmission lines stretch from the switchyard to Albury in NSW and Wodonga in Victoria.

The development site can be currently accessed via Murray Street in Lake Hume Village. Construction of a new access road would likely be required to link current roads to the proposed site of development.

The site has been subject to historic disturbance associated with the initial construction of Hume Dam and its subsequent upgrades. As a result, the site is sparsely vegetated and largely free of habitat for native fauna.

Two areas within the site are currently under consideration. For the purposes of the preliminary assessment these are described as the northern area and southern area. While assessments to date have focused on the southern area due to its more disturbed nature and closer proximity to the existing substation, it has been identified that it may have increased constructability issues associated with underground infrastructure. The northern area, while subject to less historic ground disturbance, may also prove beneficial from an environmental impact perspective as it is further away from listed heritage items, habitat features and drainage lines. Justification of the selected location would be provided in the EIS.

2.2 Surrounding Land Use

The major features of the area surrounding the project include:

- Lake Hume Village
- Hume Dam Hydro Power Station and WaterNSW Switchyard
- WaterNSW Offices.

The nearest residential receptor is located approximately 200 m from the development site and 90 m from the existing site entry.

2.2.1 Lake Hume Village

Lake Hume Village is a small tourist village located roughly 300 m east from the proposed BESS site. It hosts a tourist park, a resort, and several cottages and villas. Beach and boat ramp facilities are available via Lake Hume Village, allowing boat and human access to Murray River and Lake Hume. The village is largely a recreational area with less than 100 dwellings.

The project would require some thoroughfare from Murray Street to the proposed site, via the existing access road, through construction phases. This activity is not likely to have a large impact on Lake Hume Village, and no additional ongoing impact is anticipated following completion of construction.

One rural residential dwelling is also located 200 m north of the proposal across Hume Weir Road.

2.2.2 Hume Dam Hydro Power Station Switchyard

The Hume Dam Hydro Power Station is currently owned and operated by Meridian and is located on WaterNSW-held land around 200m from the proposed project site. It has been in operation since 1957 and is

currently capable of producing approximately 203GWh of energy annually. This station utilizes the existing switchyard, which services Albury and Wodonga.

Development of the BESS Project will likely affect operation of both the Hume Dam Hydro Power Station and the switchyard through construction and operation phases. Planned ancillary upgrades to the switchyard form part of the project construction phase, namely the proposed 11kV cable from the switchyard to the BESS. Power supply to areas serviced by existing lines may be temporarily affected during construction phases. Importantly, there will be no impacts on Meridian's ability to meet WaterNSW water release requirements during construction or operation.

The cumulative impacts of operating the project in regard to the Hume Dam Hydro Power Station and the existing switchyard would be considered as part of the EIS.

2.2.3 WaterNSW Offices

WaterNSW offices are located between the proposed site for the BESS and the existing switchyard.

Use of existing access roads may be required during the construction and operation phases of the BESS, potentially affecting access to these offices. Impacts of this disruption are likely to be minimal once the construction phase is complete.

3. Strategic justification

The National Electricity Market is currently experiencing unprecedented change. The NSW Energy Security Taskforce Final Report identified that the increasing penetration of intermittent renewable sources of electricity requires systems to respond more rapidly and flexibly. As such energy storage has emerged as a key component of the decarbonisation of the Australian electrical system. Energy storage allows the greater penetration of intermittent renewable energy sources while maintaining network stability and security. This is aligned with the need identified by the *Independent Review into the Future Security of the National Electricity Market* (the Finkel Review), that the National Electricity Market requires stable, dispatchable generation to balance network requirements as renewable generation fluctuates depending on the predominate solar and wind resources available at the time.

The potential for unserved energy and not meeting current reliability standards is projected to increase in New South Wales and Victoria after Liddell Power Station closes (announced as 2022). In worst case scenarios this could lead to controlled load shedding or loss of supply in NSW. There is also a need for dispatchable energy generation projects to be able to respond to carbon reduction policies such as the NSW Renewable Energy Action Plan.

The Finkel Review identified that “Enhanced system planning will ensure that security is preserved, and costs managed, in each region as the generation mix evolves. Network planning will ensure that new renewable energy resource regions can be economically accessed”. The Council of Australian Governments (COAG) endorsed this recordation and the Australian Energy Market Operator (AEMO) subsequently prepared and released an Integrated System Plan for the NEM in July 2018 (AEMO, 2018). The Integrated System Plan (ISP) identifies that:

The ISP modelling identifies investment portfolios that can minimise total resource costs and the targeted transmission investment, as well as the development of selected Renewable Energy Zones, necessary to achieve the lowest level of replacement investment costs.

To support an orderly transition, ISP analysis demonstrates that, based on projected cost, the least-cost transition plan is to retain existing resources for as long as they can be economically relied on. When these resources retire, the modelling shows that retiring coal plants can be most economically replaced with a portfolio of utility-scale renewable generation, storage, DER, flexible thermal capacity, and transmission.

Within the plan period, under AEMO’s Neutral ISP planning scenario, the analysis projects the lowest cost replacement (based on forecasted costs) for this retiring capacity and energy will be a portfolio of resources, including solar (28GW), wind (10.5 GW) and storage (17 GW and 90 GWh), complemented by 500 MW of flexible gas plant and transmission investment. This portfolio in total can produce 90 TWh (net) of energy per annum, more than offsetting the energy lost from retiring coal fired generation.

The Hume BESS Project would contribute to the storage requirements identified in the ISP.

3.1 Commonwealth policy context

At the Paris Climate Conference COP21 (COP21) agreement was reached "to achieve a balance between anthropogenic (human induced) emissions by sources and removals by sinks of greenhouse in the second half of this century". Following COP21, international agreements were made to:

- Keep global warming well below 2.0 degrees Celsius, with an aspirational goal of 1.5 degrees Celsius (based on temperature pre-industrial levels);
- From 2018, countries are to submit revised emission reduction targets every 5 years, with the first being effective from 2020, and goals set to 2050;
- Define a pathway to improve transparency and disclosure of emissions; and
- Make provisions for financing the commitments beyond 2020.

On 10 November 2016, Australia ratified the Paris Agreement and the Doha Amendment to the Kyoto Protocol, representing the Australian Government commitment to action on climate change. The Government's current climate change plan includes:

- Reducing emissions by 5 per cent below 2000 levels by 2020;
- Reducing emissions by 26 to 28 per cent below 2005 levels by 2030;
- Doubling Australia's renewable energy capacity to be achieved in 2020;
- Helping improve energy productivity by 40 per cent by 2030;
- Ensuring big business and Australia's largest emitters do their part and continue to reduce emissions;
- Helping expand and protect green spaces and iconic places such as the Great Barrier Reef;
- Spurring businesses, communities, households and individuals into ongoing action to reduce emissions;
- Investing in innovation and clean technology to help capture the opportunities of a cleaner future; and
- Managing climate risks by building resilience in the community, economy and environment.

In 2017, the Government reviewed its climate change policies to ensure they remain effective in achieving Australia's 2030 target and Paris Agreement commitments. A final report was released on 19 December 2017 which generally indicated the government's policies were on course to meet Australia's international climate change commitments.

More recently, the Commonwealth government has announced a priority of reducing energy prices including the potential for underwriting firm generation. As part of its priority of making energy more reliable, the government has recognised that:

"Energy storage is an increasingly important part of our electricity system as it allows us to ensure energy is always available even when the sun and wind are not".

Hume BESS Project is consistent with the Commonwealth government's climate change initiatives and facilitates the continued expansion of renewable energy generation by providing rapidly dispatchable energy storage capacity to respond to times of reduced renewable energy generation.

3.2 State policy context

The *NSW Climate Change Policy Framework* (OEH, 2016) represents the NSW Government position on responding to climate change and relates directly to how energy is generated and consumed in NSW. The *NSW Climate Change Policy Framework* aims to maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate and current and emerging international and national policy settings and actions to address climate change. Its aspirational long-term objectives are to achieve net-zero emissions by 2050 and make NSW more resilient to a changing climate.

In September 2013, the NSW Government released the *NSW Renewable Energy Action Plan* to guide NSW's renewable energy development and to support the former national target of 20 per cent renewable energy by 2020. The NSW Government's vision is for a secure, reliable, affordable and clean energy future for the State. The *NSW Renewable Energy Action Plan* positions the State to increase energy from renewable sources at least cost to the energy customer and with maximum benefits to NSW.

The *NSW Renewable Energy Action Plan* strategy is to work closely with NSW communities and the renewable energy industry to increase renewable energy generation in NSW. The plan details three goals and 24 actions to most efficiently grow renewable energy generation in NSW:

- Attract renewable energy investment and projects;
- Build community support for renewable energy; and
- Attract and grow expertise in renewable energy technology.

The *NSW Government Submission to the Review of the Renewable Energy Target* (NSW Government, 2014) confirmed the NSW Government's commitment to promoting energy security through diversity, particularly through increasing the supply of energy from renewable sources. It identifies that having a diversity of supply can help to protect energy customers from price sensitivity associated with fuel inputs, such as gas prices.

3.3 Regional Policy

The Department of Planning and Environment's *Riverina Murray Regional Plan 2036* includes a priority growth sector of renewable energy. Specifically, the *Riverina Murray Regional Plan 2036* includes Direction 11 to promote the diversification of energy supplies through renewable generation including the following actions:

- Encourage renewable energy projects by identifying locations with renewable energy potential and ready access to connect with the electricity network.
- Promote appropriate smaller-scale renewable energy projects using bioenergy, solar, wind, small-scale hydro, geothermal or other innovative storage technologies.

The Hume BESS Project is ideally located in relation to connections to the electricity network and would promote the innovative use of the existing hydro generation to generate energy when it is needed.

3.4 Project Opportunity

This project aims to showcase the relevance and opportunities offered by coupling BESS with an existing hydropower generation asset that has its dispatchability restricted by water release regulations. Under the expected operation mode, charging the battery during low electricity demand periods with hydropower output, the BESS can provide a range of services based on market signaling. These include the provision of:

- Wholesale energy market services
- Frequency Control Ancillary Services (FCAS), for all regulation and contingency services
- Fast Frequency Response (FFR) service
- System Restart Ancillary Services (SRAS)
- Network Support and Control Ancillary Services (NSCAS), for all service types
- Demand management services for local NSPs
- Reliability support services for local NSPs, both planned and unplanned services. This is to be facilitated via islanding and grid-forming capabilities of the BESS solution.

4. Statutory Framework

4.1 Approval under the Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the planning and approvals process in NSW. The EP&A Act provides for the making of Environmental Planning Instruments (EPIs), including Local Environmental Plans (LEP) and State Environmental Planning Policies (SEPPs), which set out requirements for particular localities and/or particular types of development. The applicable EPIs and the Environmental Planning and Assessment Regulation (2000) (EP&A Regulation) made under the EP&A Act, collectively determine the relevant planning approval pathway and the associated environmental assessment requirements for proposed development activities.

The environmental assessment pathway under the EP&A Act is generally dependent on the location, purpose and proponent (private or NSW public authority). The scale of the development, including level of impact and/or capital investment value, will further refine the assessment process. Development can be exempt (does not require any approval or assessment) or can require various forms of approvals and assessment under Part 4, Part 4 Division 4.7 or Part 5 Division 5.1 or 5.2 of the EP&A Act.

Part 4 applies to development that is permissible with development consent. Depending on the location, size and capital costs the consent authority for a development subject to Part 4 can be the local Council (generally referred to as local development) or the Independent Planning Commission or Minister for Planning for State significant development. The most likely approval pathway for the project is considered to be State significant development as described below.

Part 5, Division 5.1 and Division 5.2 apply to development that is permissible without consent and applies to development by or on behalf of Public Authority proponents almost exclusively. Where the Minister for Planning forms the opinion that a development is essential for the State on economic, environmental or social grounds, the Minister may declare a project both State significant infrastructure and critical State significant infrastructure in which case Division 5.2 would apply.

4.1.1 Development purpose

Development purpose is generally identified through reference to the definitions provided in the *Standard Instrument (Local Environmental Plans) Order 2006* (the Standard Instrument). The term electricity generating works is defined by the *Standard Instrument* as “a building or place used for the purpose of —

(a) making or generating electricity, or

(b) electricity storage.”

The primary purpose of the battery is to shift electricity generation to periods of higher value to the grid. This could take the form of charging the battery from the hydro power station and then discharging during peak demand periods or could be via charging the battery from grid power during low demand periods. Additionally, the battery could provide a new source of other valuable grid services such as frequency control which are currently predominantly provided by gas and coal fired thermal power stations.

Given the purpose of the BESS is to store energy in chemical form and generate electrical energy on demand in discharge mode, the development purpose can be defined as electricity generating works.

4.1.2 Land-use permissibility

The BESS is located on WaterNSW owned land, Lot 2, DP1165089 within the Albury City Council Local Government Area. Access directly off Hume Weir Road would need to traverse a second lot (Either lot 7013 DP1025336 or 7302 DP1149801). The site is within the application area of the Albury Local Environment Plan 2010 (LEP) and an area zoned RU2 Rural Landscape. The Land Use Table provided in Part 2 of the LEP (**Table 4 1**) specifies the land use objectives for each land use zone and categorises development within each zone as either permissible with or without consent or prohibited based on their primary purpose.

Table 4 1: Land use zones objectives and development permissibility as specified in the LEP

Zone	Objectives	Development permitted without consent	Development permitted with consent	Development prohibited
RU2 Rural Landscape	<p>To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.</p> <p>To maintain the rural landscape character of the land.</p> <p>To provide for a range of compatible land uses, including extensive agriculture.</p>	Environmental protection works; Extensive agriculture; Home-based child care; Home occupations	Agricultural produce industries; Aquaculture; Bed and breakfast accommodation; Dual occupancies; Dwelling houses; Farm buildings; Farm stay accommodation; Group homes; Hotel or motel accommodation; Intensive plant agriculture; Roads; Rural workers' dwellings; Secondary dwellings; Any other development not specified in item 2 or 4	Agriculture; Air transport facilities; Amusement centres; Boat building and repair facilities; Camping grounds; Car parks; Caravan parks; Cemeteries; Centre-based child care facilities; Commercial premises; Crematoria; Depots; Eco-tourist facilities; Entertainment facilities; Exhibition homes; Exhibition villages; Forestry; Freight transport facilities; Function centres; Health services facilities; Heavy industrial storage establishments; Home occupations (sex services); Industrial retail outlets; Industrial training facilities; Industries; Marinas; Mooring pens; Mortuaries; Passenger transport facilities; Places of public worship; Port facilities; Public administration buildings; Recreation facilities (indoor); Recreation facilities (major); Registered clubs; Residential accommodation; Respite day care centres; Restricted premises; Rural industries; Service stations; Sex services premises; Storage premises; Tourist and visitor accommodation; Transport depots; Truck depots; Vehicle body repair workshops; Vehicle repair stations; Warehouse or distribution centres; Wharf or boating facilities; Wholesale supplies.

As per table 2.1, *Energy Generating Works* are a permissible land use with consent in the RU2 Zone.

The site is also within land mapped in the LEP as Sensitive Area on the Natural Resources Sensitivity – Water Map. Section 7.2 of the LEP contains additional consideration requirements for land within the Sensitive Area as follows:

(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider any adverse impact from the proposed development on:

(a) the water quality of receiving waters, and

(b) the natural flow regime, and

(c) the natural flow paths of waterways, and

(d) the stability of the bed, shore and banks of waterways, and

(e) the flows, capacity and quality of groundwater systems.

(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

(a) the development is designed, sited and will be managed to avoid any adverse environmental impact, or

(b) if that impact cannot be avoided—the development is designed, sited and will be managed to minimise that impact, or

(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

Consideration would be given to water impacts and appropriate avoidance, management and mitigation measures developed as part of the EIS.

The *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP) is the primary planning instrument in NSW that sets out how local infrastructure projects, state services and utilities are approved. According to Clause 33, 34 and 36 of Division 4 of the ISEPP, electricity generation works is only permissible if the development is carried out by or on behalf of a public authority, or, if the development will be carried out on land in prescribed land use zones.

Under clause 34 Development for the purpose of electricity generating works may be carried out by any person with consent any land in a prescribed rural, industrial or special use zone. The RU2 Rural Landscape zone is prescribed for the purposes of clause 34. The project is as such permissible with consent through the application of ISEPP.

4.1.3 Development Category

The development category is determined by consideration of scale and capital investment value through consideration against the triggers for Designated Development contained within Schedule 3 of the EP&A Regulation and *State Environmental Planning Policy (State and Regional Development) 2011*.

Designated development

In accordance with Schedule 3, Clause 18 of *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) development for the purpose of electricity generating station(s) can be classified as Designated development if they supply or are capable of supplying:

(a) electrical power where:

(i) the associated water storage facilities inundate land identified as wilderness under the Wilderness Act 1987, or

(ii) the temperature of the water released from the generating station into a natural waterbody is more than 2 degrees centigrade from the ambient temperature of the receiving water, or

(b) more than 1 megawatt of hydroelectric power requiring a new dam, weir or inter-valley transfer of water, or

(c) more than 30 megawatts of electrical power from other energy sources (including coal, gas, wind, bio-material or solar powered generators, hydroelectric stations on existing dams or co-generation).

Given the proposed 20MW BESS unit is below the stipulated supply threshold in Clause 18 (c) the development is not declared Designated development.

State significant development

In accordance with Schedule 1, Clause 20 of *State Environmental Planning Policy (State and Regional Development) 2011* development for the purpose of electricity generating works or heat or their co-generation (using any energy source, including gas, coal, biofuel, distillate, waste, hydro, wave, solar or wind power) can be declared State significant development (SDD) if:

- (a) *has a capital investment value of more than \$30 million, or*
- (b) *has a capital investment value of more than \$10 million and is located in an environmentally sensitive area of State significance.*

Given the development purpose and estimated capital investment in excess of \$30 million, the proposed works is declared SDD and subject to assessment and approvals under Part 4, Division 4.7 to the *Environmental Planning and Assessment Act 1979*.

Under Section 4.41 of the EP&A Act, the following authorisations likely to be relevant to the proposal are not required for State significant development that is authorised by a development consent and accordingly the provisions of any Act that prohibit an activity without such an authority do not apply:

- a permit under section 219 ("Passage of fish not to be blocked") of the *Fisheries Management Act 1994*;
- an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*;
- an Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*;
- a bush fire safety authority under section 100B of the *Rural Fires Act 1997*;
- a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000*; and
- Division 8 of Part 6 of the *Heritage Act 1977* does not apply to prevent or interfere with the carrying out of State significant development that is authorized by a development consent granted after the commencement of this Division.

Under Section 4.42 of the EP&A Act an authorisation of the following kind cannot be refused if it is necessary for carrying out State significant development that is authorised by a development consent and is to be substantially consistent with the consent:

- an approval under section 15 of the Mine Subsidence Compensation Act 1996
- an environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (for any of the purposes referred to in section 43 of that Act); and
- a consent under section 138 of the Roads Act 1993.

On the basis that the generation capacity does not exceed 30 MW an environmental protection is unlikely to be required. Consent under the Roads Act would be required if a new connection to the local road network is required.

Land tenure

Except under certain circumstances, written landowner approval is required in order to lodge a development application. As the Project is proposed to be undertaken on land not owned by Meridian, a process of obtaining approval from WaterNSW (including legal right of access) has been commenced.

4.2 Biodiversity Conservation Act 2016

Part 7 of the Biodiversity Conservation Act 2016 (BC Act) requires that an application for State significant Development be accompanied by a "biodiversity development assessment report unless "the Secretary of the Department of Planning and the Chief Executive of the Office of Environment and Heritage determine that the proposed development is not likely to have any significant impact on biodiversity values".

The BC Act defines "biodiversity values" as follows:

- (a) vegetation integrity--being the degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state,*
- (b) habitat suitability--being the degree to which the habitat needs of threatened species are present at a particular site,*
- (c) biodiversity values, or biodiversity-related values, prescribed by the regulations.*

The regulations made under the BC Act relevantly prescribe the following as additional biodiversity values:

- (a) threatened species abundance--being the occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site,*
- (b) vegetation abundance--being the occurrence and abundance of vegetation at a particular site,*
- (c) habitat connectivity--being the degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range,*
- (d) threatened species movement--being the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle,*
- (e) flight path integrity—being the degree to which the flight paths of protected animals over a particular site are free from interference,*
- (f) water sustainability--being the degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site.*

Consideration of the impact of the Project on biodiversity values is provided in Section 5.2 and concludes no significant impacts to Biodiversity Values are likely. A biodiversity development assessment report would be prepared to accompany the EIS unless an exemption to the need for a biodiversity development assessment report is obtained.

4.3 National Parks and Wildlife Act 1974

Under Section 86 of the National Parks and Wildlife Act 1974 (NPW Act) it is an offence to harm or desecrate an Aboriginal object or Aboriginal place. Under the NPW Act harm an object or place includes any act or omission that:

- (a) destroys, defaces or damages the object or place, or*
- (b) in relation to an object—moves the object from the land on which it had been situated, or*
- (c) is specified by the regulations, or*
- (d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c), but does not include any act or omission that:*
 - (e) desecrates the object or place, or*
 - (f) is trivial or negligible, or*
 - (g) is excluded from this definition by the regulations.*

Clause 3A of the National Parks and Wildlife Regulations excludes the following from the definition of harm:

An act carried out in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW as published by the Department in the Gazette on 24 September 2010 is excluded from the definition of harm an object or place in section 5 (1) of the Act.

The Project is intended to be carried out in accordance with this Code of Practice. Further, under Section 4.41 of the EP&A Act an Aboriginal heritage impact permit under section 90 of the NPW Act is not required for approved State Significant Infrastructure. Formal consultation under the *Aboriginal cultural heritage consultation requirements for proponents 2010* (OEH, 2010) is being undertaken.

4.4 Heritage Act 1977

The *Heritage Act 1977* protects the natural and historical cultural heritage in NSW. It is designed to protect both listed heritage items, such as standing structures, and potential archaeological remains or relics. Different parts of the Heritage Act deal with these different situations. Eight records associated with the Hume Dam are listed under Section 170 of the Heritage Act as present on or in the vicinity of the site. A Heritage Impact Assessment will be completed to assess the impacts of the Project, the potential for archaeology in the Project area and recommendations mitigation (if appropriate) in keeping with the *State Agency Heritage Guide* (NSW Heritage Office 2005), which governs the management and maintenance of s.170 heritage items by their Agency owners.

4.5 Commonwealth Process under Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation relating to the environment. Under Part 3 of the EPBC Act, approval from the Australian Minister for the Environment is required for an action that:

- Has, will have, or is likely to have a significant impact on a matter of national environmental significance;
- Is undertaken on Commonwealth land and has, will have, or is likely to have a significant impact on the environment;
- Is undertaken outside Commonwealth land and has, will have or is likely to have a significant impact on the environment of Commonwealth land; and
- Is undertaken by the Commonwealth and has, will have or is likely to have a significant impact on the environment.

Matters of national environmental significance (MNES) include:

- World heritage properties;
- National heritage places;
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed);
- Nationally threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- The Great Barrier Reef Marine Park;
- Nuclear actions (including uranium mining); and
- A water resource, in relation to coal seam gas development and large coal mining development.

A search of the Commonwealth Protected Matters Search Tool has identified the following Matters of National Environmental Significance (MNES) listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), within 1 kilometre of the proposed development site:

- No World Heritage Properties;
- No National Heritage Places;
- No Commonwealth Marine Areas;
- Seven Wetlands of International Importance;
- Two listed Threatened Ecological Communities: Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia endangered Community likely to occur within area; and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland endangered Community likely to occur within area;
- 23 listed Threatened Species (includes four mammals, eight birds, one frogs, four plants, one insect, two reptiles and three fish);
- 12 listed Migratory Species;
- No Commonwealth Listed Heritage places; and
- No areas of Commonwealth Land.

It is generally the responsibility of the proponent of a proposed development to determine whether a project, or action, has the potential to impact upon a MNES and constitute the need for a referral to the Commonwealth for determination. In the event that the development is considered to be a Controlled activity, further assessment of MNES, particularly threatened species and ecological communities and migratory species would be required to conclude that no significant impact is likely.

Identified impacts to Commonwealth listed species would be required to be offset and unacceptable impacts may not be approved. Should a Commonwealth listed threatened species or population be identified and assessed as being at risk of an unacceptable level of impact, this would represent a potential fatal flaw to the proposal. The NSW State Significant Development assessment process is an accredited process for the purposes of assessment of Controlled activities under the EPBC Act.

5. Potential environmental impacts

The assessment of the likely environmental consequences of the Project has involved:

- Project development team workshops to understand the scale, risks and likely impacts associated with BESS projects
- Desktop review of relevant databases, historical aerial photography, reports associated with the original development of the Hume Dam and available background data
- Review of Department of Planning and Environment Draft Scoping and Environmental Impact Statement Guidelines
- Ecologist and archaeologist site walkover.

Table 5 1 provides preliminary consideration of environmental matters, identifies the environmental issues that require further assessment and management.

Table 5 1: Preliminary consideration of environmental matters

Environmental matter	Impact mechanism	Community interest	Further assessment required?
Acoustic	<p>The construction stage of the project is anticipated to generate noise that would be audible at a local level and may exceed noise management levels in the absence of mitigation. Standard construction noise management measures are expected to keep noise impacts below highly impacted levels.</p> <p>Operational noise is unlikely to be audible and the Project design would include treatments to avoid exceedance of operational noise management levels.</p>	Noise impacts are likely to be a concern for local stakeholders	While material noise impacts are not anticipated, noise impact assessment would be provided in the EIS to confirm anticipated noise impacts for both construction and operational stages. Project specific mitigation measures would be developed to achieve noise management levels.
Visual	<p>The Project would be visible to visitors to the Hume Dam wall as additional activity and infrastructure beyond the existing Hume Hydro and WaterNSW facilities.</p> <p>The Project is unlikely to be visible to private dwellings of local road users due to existing screening by vegetation and topography with additional screening able to be provided as necessary.</p>	Visual impacts are likely to be a concern for local stakeholders.	The potential visual impacts of the Project would be documented in the EIS.
Odour	The Project would not have odorous qualities, characteristics or attributes with potential to interfere with local amenity.	Odour impacts are not considered to be a community concern in relation to the Project.	No further assessment is proposed.
Microclimate	The project would not have the potential to affect local	Microclimate impacts	No further assessment

Environmental matter	Impact mechanism	Community interest	Further assessment required?
	or regional temperatures, rainfall, wind or solar access.	are not considered to be a community concern in relation to the Project.	is proposed.
Access	<p>The Project would introduce additional traffic to local and regional roads during construction including the need for some oversize and overmass vehicle movements for the delivery of equipment.</p> <p>No material change to traffic would arise from the operation of the project.</p> <p>Private property access would be unaffected and no offsite parking would be required. Should the northern location option be selected, a new access point from Hume Weir Road may be required. No road or intersection upgrades would be required for the southern location option.</p>	Construction traffic is considered likely to be a concern for local residents, Council and Transport for NSW.	A traffic impact assessment focusing on construction stage of the Project would be included in the EIS.
Built Environment	The Project would not impact the public domain, public infrastructure or other built assets. The use of local roads during construction would be considered in the traffic impact assessment.	Impacts to the Built Environment would be of concern to WaterNSW as the land owner but unlikely to be a concern of surrounding landholders.	No further assessment proposed. WaterNSW concerns would be addressed through consultation to negotiate tenure.
Aboriginal heritage	The Project would require ground disturbance. The southern area would limit disturbance to areas of prior disturbance or areas identified as free of potential for Aboriginal cultural value. The Northern area has been previously cleared but has low to moderate Aboriginal heritage potential.	Impacts of Aboriginal heritage are likely to be of concern to Aboriginal stakeholders and the community.	A preliminary heritage assessment is presented in Section 5.1. An Aboriginal cultural heritage impact assessment prepared in consultation with Registered Aboriginal Parties would be provided in the EIS.
Non-Aboriginal heritage	The Project would require ground disturbance and introduce new features within the vicinity of items listed under Section 170 of the Heritage Act.	Impacts on non-Aboriginal heritage are likely to be of concern to stakeholders.	A historic heritage assessment would be undertaken as part of the EIS and should impacts be identified a Statement of Heritage Impact would also be prepared.

Environmental matter	Impact mechanism	Community interest	Further assessment required?
Socio-economic	<p>The Project would provide construction jobs and during operation, increased reliability in the National Energy Market and facilitate the increased penetration of renewable energy. The storage of energy during low demand periods for use in high demand periods would provide an overall downward pressure on energy prices.</p> <p>The Project would be unlikely to impact community health, safety, services and facilities, cohesion, capital and resilience or housing.</p>	Community impacts are likely to be of interest to the general public.	Socio-economic impacts would be considered in the EIS.
Air	Localised dust emissions could eventuate during construction in the absence of mitigation measures. Standard management measures are available such that impacts would not eventuate off site.	Air quality impacts are unlikely to eventuate or be of concern to stakeholders.	No further assessment is proposed.
Biodiversity	The site is heavily disturbed and dominated by exotic species. Minor clearing of native vegetation would be required.	The Biodiversity impacts of the Project are expected to be of concern to Department of Planning, Infrastructure and Environment while the community would be expected to have biodiversity as a general concern.	<p>A preliminary biodiversity assessment is provided in Section 5.2.</p> <p>A Biodiversity Development Assessment Report would be prepared to support the EIS unless an exemption is agreed based on absence of significant impacts to biodiversity values.</p>
Land	The Project would have no long-term impact on soils or land capability. The site is currently used only for activities ancillary to the operation of the Hume Dam. The Project would be appropriately sited in consultation with WaterNSW such that no land use conflicts eventuate.	Land impacts are unlikely to be of concern to the community in relation to the Project.	No further assessment is proposed.
Water	The Project does not affect the operation of the Hume Dam or existing hydro generation assets and as such would have no implications for water availability or environmental flows. Water quality impacts could manifest in the absence of appropriate mitigation measures.	Water impacts are likely to be of concern to Stakeholders.	The EIS would describe measures to appropriately manage water quality risks including during the construction and operational stages.
Risks	The Project would be sited to avoid flooding impacts	Risks are likely to be	The EIS will

Environmental matter	Impact mechanism	Community interest	Further assessment required?
	<p>and designed to manage geotechnical risks.</p> <p>The Project would introduce the storage of hazardous substances.</p> <p>The Project is also located within Bushfire prone land.</p>	a key concern of the community.	incorporate the outcome of hazard studies for the selected technology and the Project design would address identified risks.

5.1 Due diligence heritage assessment

This preliminary Aboriginal cultural heritage assessment has been provided with reference to the Due Diligence of Practice Code of Practice for the Protection of Aboriginal Objects in NSW published by the Office of Environment & Heritage (OEH). The assessment has included:

- A search and review of the relevant Aboriginal heritage register - the Aboriginal Heritage Information Management System (AHIMS);
- A search of National, local and State heritage registers to identify any non-Aboriginal heritage items;
- A review of available ethnographic and historical literature, including local and regional Aboriginal land use information, relevant to the project area;
- A review of the current and historical land use practices, and
- Data from the Australian Heritage Database.

A targeted preliminary site inspection of the potential battery areas was undertaken on 28 June 2019.

5.1.1 Existing Environment

Lake Hume is a man-made reservoir on the Murray River and the lowest elevation in the lake bed, the old river channel, is the border of Victoria and NSW. The catchment of Lake Hume encompasses the upper Murray, the NSW Southern Mountain and South-West Slopes regions, and the Victorian Eastern Highlands and High Plains (Birch, 2003). This region has a complex geological history of deposition, deformation of strata and volcanic intrusions (Doughty 2003). This history and the weathering of these geological formations has resulted in a diverse topography that includes plateaus, mountains, dissected terrain and valleys, as well as incision features and sedimentary and volcanic fill features in the valleys (Rosengren and White 1997).

The comprehensive Kamminga (2003) survey of the area downstream of the Hume Dam did not locate any Aboriginal archaeological sites. Archaeological sites within the direct vicinity of the dam wall that were not already destroyed during the construction of the dam would have been redeposited further downstream due to the fast current, increased wave action and frequent flooding in this zone.

Historical context

Reliable historical records for the initial period of British settlement of the region around Lake Hume are rare (Andrews 1916). The first wave of British colonial settlement in northern Victoria occurred between 1835 and 1840 in an area east and north of the Ovens River in the counties of Bogong and Benambra (Andrews 1916). Spreadborough and Anderson (1983) have summarised the information about land ownership for this period and provide a map of pastoral runs.

Most descriptions of the countryside or the river at the time of European settlement relate to the Riverine Plains to the west of Albury where the country was already eminently suitable for grazing without clearing and pasture improvement. Explorers were quickly followed by squatters and European invaders (Kamminga, 2007).

There are few historical records for the initial period of British settlement of the region around Lake Hume. Explorers Hume and Hovell crossed into Victoria in November 1824 several miles above what is now Hume Dam. Soon thereafter the first wave of colonial settlement in northern Victoria occurred between 1835 and 1840 in an area east and north of the Ovens River (National Heritage Consultants, 2007).

British explorers were quickly followed by 'overlanders' and squatters. Overlanding activities involved moving large numbers of stock from NSW to new land in the Port Phillip district between the 1830s and 1850s in response to new markets created by gold rushes. The region attracted many settlers and by 1856 both sides of the Murray River were well populated. By the 1860s there were over 100 holdings in the vicinity of Albury. Within a decade selectors were displacing the squatters and by 1917 all the easily accessible arable land had been cleared. The descendants of many of these early settler families live in the region today and their names are perpetuated in the list of rural property owners at Lake Hume.

Mining also had a profound impact on the region during the late 19th and early 20th centuries. Evidence of this activity remains to this day. Notable twentieth century works and sites of cultural significance are many, not least of which is the construction of the Hume Dam itself, a massive public works undertaking between 1919 and 1936, further extended during the 1950's (Figure 5.1).

Construction of the dam involved establishment of large workers' villages at Mitta Mitta and Hume, while the resultant flooding of the Murray and Mitta Mitta valleys inundated numerous homesteads and several townships, including Old Tallangatta and Bowna. Bethanga Bridge was constructed through the period 1927 - 1930 and is listed on both the NSW and Victorian State Heritage Registers. The military presence in the area was first established with a camp at Bonegilla in 1940. Bonegilla also saw the establishment of a migrant camp in 1947, which was Australia's largest and longest operating migrant reception centre prior to its closure in 1971. (Kamminga, 2007).

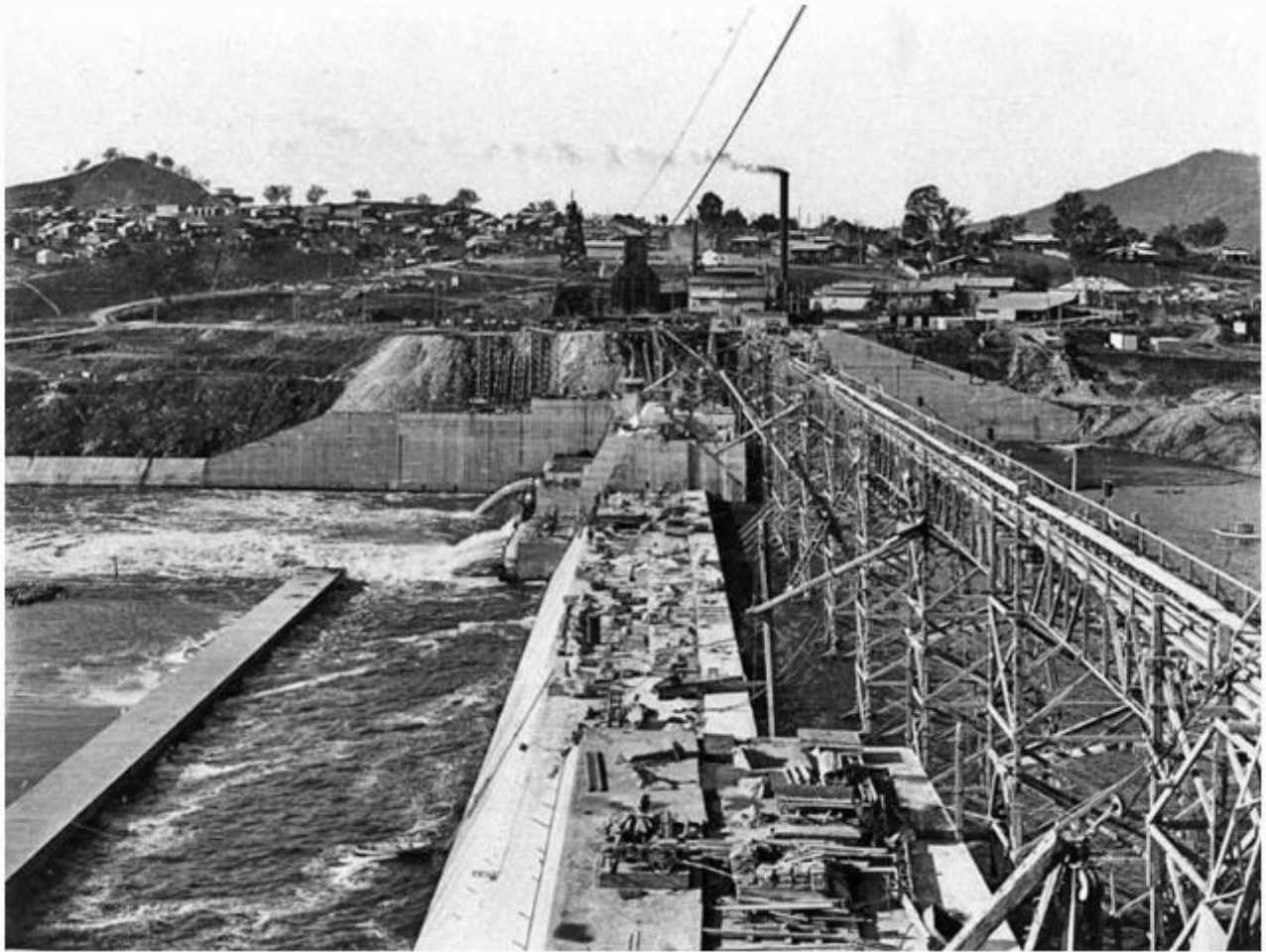


Figure 5.1: Picture showing construction of the Hume Weir. Source: Kamminga 2007.

Aboriginal context

In general, the contemporary evidence indicates that the Murray River was a natural boundary between Wiradjuri speakers in the north and Dhudhuroa speakers in the south (Barber 2002).

Historical records about the Aboriginal inhabitants of the Albury area is limited; even less is known about the people who inhabited the Murray River east of Albury (Barber 2002:8, 13; Clark et al. 2003). Aboriginal groups in the region were subjected to catastrophic dislocation during the 19th century. The introduction of virulent diseases such as smallpox, influenza and measles, conflict with British settlers, and loss of traditional lifestyle and resources, resulted in rapid depopulation in the region (Andrews 1912; see also Mulvaney and Kamminga 1999:66-69).

Illustrations of typical use of the area are presented in Figure 5.2 and Figure 5.3.



Figure 5.2: Aboriginal fowling on the Murray River before British settlement. 'Back Water of the Murray' (from Mitchell 1839, Vol. 2, facing page 319).

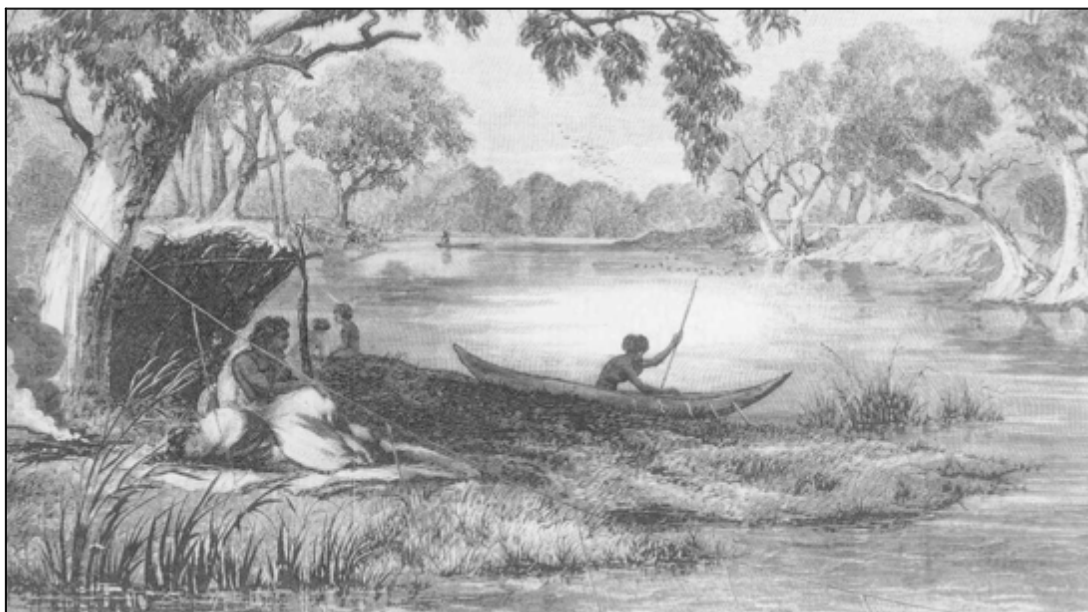


Figure 5.3: An Aboriginal camp on the Wakool River in 1872. This scene of a camp with bark canoe, fishing spears and shelter would have been typical of the Murray and Mitta Mitta Rivers in the Lake Hume area (from MDBC n.d. The River Murray).

Archaeological context

No previously recorded AHIMS sites are located within the assessment area.

The first large scale systematic archaeological survey carried out at the lake was commissioned by Goulburn-Murray Water and oversighted by a Steering Committee representing relevant Aboriginal community organisations, government departments and agencies involved in administering Lake Hume, and Victorian and NSW heritage regulatory agencies. A total of 441 sites (including isolated finds) were recorded during the field survey - 289 in Victoria and 152 in NSW. These sites comprised 358 artefact scatters, 79 isolated finds, three

possible scarred trees and one Aboriginal historic place. There were approximately 1.86 sites located per kilometre of survey transect within the study area.

O'Halloran (2000) undertook a thesis on submerged heritage, examining threats to archaeological sites on the bottomlands of Lake Hume. Kamminga (2002) undertook several interim reports on small areas subject to development works at Lake Hume, including: an assessment of Aboriginal stone artefacts on the bank of Lake Hume (Mitta Mitta Arm) at Tallangatta, Victoria; an examination of Aboriginal heritage sites at Ludlows Reserve; a study of the Aboriginal heritage sites at the proposed Kurrajong boat ramp site, Lake Hume, Victoria, and; a report on Indigenous heritage sites identified in the vicinity of the Tallangatta town water offtake site, Lake Hume, Victoria. Witter and Kelly (2002) conducted an archaeological survey of the Lake Hume foreshore, with analysis and risk assessment for proposed changes in the lake level. Goulburn-Murray Water commissioned Austral Archaeology (1998) to conduct a report on the nineteenth and early twentieth century settler heritage at Lake Hume, which examined archaeological excavations at the Hume Dam construction campsite.

There is sufficient information from historical records, previous heritage surveys in the Lake Hume area and region generally, Indigenous site registers, and contextual information of Lake Hume physiography and vegetation, to predict the kinds of site types most likely to be encountered in the assessment area. The most archaeologically sensitive areas at Lake Hume in general are considered to be elevated 'flats' on ridges and knolls, surficial sand bodies on valley floors, billabong margins, and areas of relict or modern river terrace.

Database searches of Aboriginal Heritage Information Management System (AHIMS) and the Victorian Aboriginal Sites Register maintained by Aboriginal Affairs Victoria indicate that the following types of Aboriginal site have been previously recorded in the immediate vicinity of Lake Hume:

- Open site (also called 'open-air site'), which usually comprises or includes a scatter of stone artefacts eroded from topsoil (also called 'lithic scatter') and which may still retain Aboriginal objects or features below the ground;
- Isolated stone artefact;
- Isolated hearth;
- Scarred tree;
- Stone procurement place or stone quarry, and
- Hatchet head grinding locality.

Given the disturbed context of the assessment area, it not expected that these site types will be present, and if they do are likely to have been impacted by previous disturbance from the construction of the weir.

5.1.2 Site Visit

A site visit was carried out by William Truscott (Project Archaeologist, Jacobs) on the 28 June 2019. No Aboriginal objects were observed during the site inspection.

Southern area

The southern area for the proposed works are located in a broad gully (Figure 5.4). This gully runs from north east to south west before emptying into the Murray River.



Figure 5.4: General view of the southern area (facing east)

The proposed location of the cable between the assessment area and the existing switchyard, is adjacent to the existing bitumen road (Figure 5.5). This roadway has either been cut into the slope of the hillside or built up using fill for the extent within which the cable is to be installed.



Figure 5.5: Roadside where proposed cable between assessment area and switchyard is to be installed (facing south)

The majority of the southern area has no or negligible archaeological potential. Due to the extensive levelling carried out to the east of the gully, there is no archaeological potential within southeastern third of the assessment area (Figure 5.6). The tracks that cross the gully have been excavated with a machine (Figure 5.7), and as a consequence much of the base of the gully has no archaeological potential. The extensive areas of moderate slope located to the west of the gully (Figure 5.8) also have negligible archaeological potential, as these slopes are not suitable for Aboriginal occupation. Whilst heavily grassed, there were areas with the upper gully that had clearly been disturbed and contained substantial amounts of imported material (Figure 5.9).



Figure 5.6: Areas to the east of the gully that have undergone extensive levelling (facing northwest)

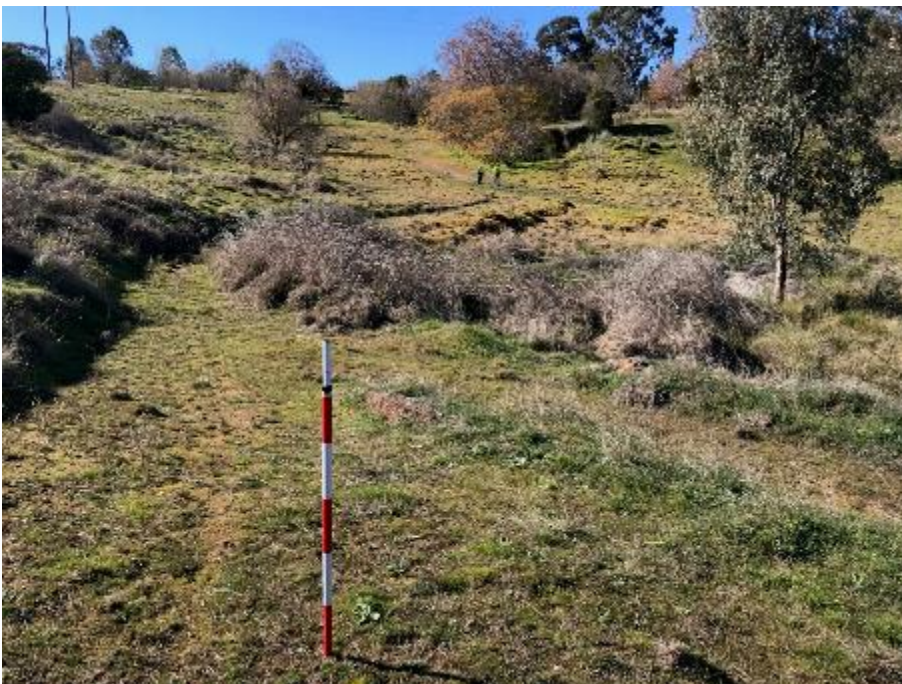


Figure 5.7: Track cut into hillslope (facing northeast)



Figure 5.8: Moderate slope to the west of the gully (facing southwest)



Figure 5.9: Disturbance identified in upper gully (facing east)

Areas adjacent to the small wetland (Figure 5.10) in the lower, or south eastern part of the assessment area have unknown archaeological potential. This wetland could be a recent landscape feature, and there are significant amounts of disturbance immediately adjacent that were obscured by thick vegetation at the time of the site inspection.



Figure 5.10: Small wetland located to the southwest of the assessment area (facing northwest)

There were two mature river red gums (Figure 5.10) identified within the assessment area, however these trees were located on the bank levelled ridge to the west of the gully and did not have any modifications or scarring.



Figure 5.11: Mature eucalypts located within the assessment area (facing east)

Northern Area

The northern area is on a broad ridge area (Figure 5.12). There were no clear disturbances at this location and, given the elevated position in the landscape as well as proximity to the Murray River, there is some limited archaeological potential in this location.



Figure 5.12: Broad ridge in north of assessment area (facing south east)

5.1.3 Recommendations – Aboriginal heritage

Aboriginal occupation of the Lake Hume region extends back millennia and the archaeological evidence suggest a pattern of exploitation of a diverse range of terrestrial and aquatic food resources by highly mobile groups of Aboriginal people. The assessment area has however undergone considerable development pressure since the late 19th century. In particular, the construction and upgrade of the Hume Weir site has resulted in the disturbance of soils and landforms and it is highly unlikely that tangible remains of Aboriginal cultural heritage have been retained with the assessment area.

The northern location option on ridge areas in the north west of the site appears to be relatively undisturbed and has low-moderate potential to contain Aboriginal objects. If impacts to these more intact areas cannot be avoided, further assessment with consultation with the Local Aboriginal Land Council would be required.

The southern location option has been subject to survey in the presence of Registered Aboriginal Parties and assessment has confirmed that no, or negligible, archaeological potential remains.

Formal consultation including a site visit by registered Aboriginal parties to the southern location option has been completed. This consultation and investigation would be updated to incorporate the findings of additional consultation on the northern location option. An Aboriginal cultural heritage assessment would be provided with the EIS.

5.1.4 Recommendations – Non-Aboriginal heritage

The potential battery locations are located within the heritage curtilage of the state significant Hume Dam. Although not endorsed by the heritage council, the Hume Dam Conservation Management Plan (Urbis, 2013) is the primary management document for the Dam and its curtilage. The proposed battery locations are located between two identified heritage precincts, the Hume Dam Works Compound to the south, and the Elm Avenue and Blast Shed Precinct to the east. The CMP identifies a number of areas of high archaeological potential (Refer to Figure 1.2) based on the analysis of previous site plans. It notes that these zones are indicative only and that archaeology may not be limited solely to these areas.

The heritage areas represent the former construction village (1919-1937), construction phase of later upgrade works (1950-1961) and other built structures. Potential for archaeology relating to former workers cottages,

former barracks and mess buildings is also present. Any archaeology relating to the Former Construction Villages in the NSW encampment area is considered to be of State significance and graded as an Exceptionally significant element to the Dam as a heritage item.

Given the proposed footprint as currently presented, there will be no direct impacts to identified built heritage, heritage precincts and/or areas of high archaeological potential (as identified in the CMP). The proposed buried cable between the existing power station and batteries is proposed to run along the current roadway, in proximity to the heritage listed Nissan Huts but sufficiently removed to be of no direct impact.

Where major excavation in other areas that may be undisturbed, and archaeological assessment is recommended as per *Conservation Policy 24: When undertaking major excavation works at the site, potential impact on archaeological relics should be considered in an REF or similar assessment*. The CMP does not offer a definition of what level of excavation qualifies as 'major', but given that excavations for footings and trenching for conduits will be required, best practice recommends that an archaeological assessment be completed.

With the current level of information available and with assumptions to the quality of the CMP it would appear that the Project would not significantly impact non-Aboriginal heritage values. It is recommended that a Heritage Impact Assessment and accompanying Archaeological Assessment be completed to assess in detail the impacts of the proposal, the potential for archaeology in the proposal area and recommendations for mitigation (if appropriate). This recommendation is in keeping with both the CMP conservation policies, and the *State Agency Heritage Guide* (NSW Heritage Office 2005), which governs the management and maintenance of s.170 heritage items by their Agency owners.

5.2 Preliminary biodiversity impact assessment

A background review was conducted to identify threatened flora and fauna species, populations and ecological communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Assessment Act 1999* (EPBC Act) whose habitats and distribution are expected to occur within the study area. The review focussed on relevant literature and database searches as described below and focused on the land within a 10 -kilometre radius of the site. The databases searched included:

- BioNet – (database for Atlas of NSW Wildlife) and OEH Threatened Biodiversity Data Collection;
- Department of Environment and Primary Industries (DEPI, 2016) Victorian Biodiversity Atlas interactive map;
- NSW OEH (2016c) Vegetation Types Database;
- The federal Department of Environment and Energy Protected Matters Search Tool; NSW Department of Primary Industries freshwater threatened species distribution maps (DPI, 2016);
- OEH BioNet Vegetation Classification System database;
- BAM Calculator Predicted Species, and
- Department of Environment and Energy directory of important wetlands.

Spatial data used in the assessment included:

- Available regional vegetation mapping: Riverina Regional Native Vegetation Map Version v1.0 - VIS_ID 4469;
- Mitchell Landscapes Version V3.1 (NPWS, 2002);
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (DoEE, 2017);
- Key fish habitat maps (DPI, 2007), and
- Aerial photographs.

Likelihood of occurrence for each species identified in the desktop search was assigned based on knowledge of the species' preferred habitats and known distributions, confirmed against the assumed habitat in the study area. Verified sightings of threatened species were also used to determine a species' presence in the area.

The likelihood of occurrence table (Appendix A) assesses all threatened species which may occur at the site based on their known previous presence in the broader 10 km search area. The table indicates which search the species was identified in, as well as the species known range/habitat, and the assessed likelihood of occurrence at the site, rated as unlikely or low through to high likelihood.

In order to validate the likelihood assessment and record ecological values present at the site, a site visit was conducted by an ecologist on 28 June 2019. The study area was assessed for the presence of native vegetation and the suitability of habitat for threatened species.

Flora species were identified in the field where possible. Where this was not possible, samples were collected for later identification. The botanical naming nomenclature used for flora species was consistent with that of the NSW Herbarium. Vegetation was classified as Plant Community Types (PCTs) in accordance with the NSW Vegetation Classification System database.

Signs of fauna presence were also recorded in the field. A general habitat assessment was conducted in order to establish the likelihood of occurrence of threatened flora and fauna species and important habitat corridors.

The aim of the site visit was to identify:

- Any Matters of National Environmental Significance (MNES) as listed under the EPBC Act;
- The potential occurrence of threatened species, threatened populations and ecological communities, as listed under the NSW BC Act;
- General ecological values, including vegetation communities, significant species, fauna habitat values, including terrestrial and aquatic habitats, hollow-bearing habitat trees and other important habitats;
- Species movement corridors and other landscape ecological characteristics;
- Ecological values that may be indirectly impacted by the proposed works;
- The need to conduct further detailed field surveys;
- The presence of priority weeds, as listed under the *Biosecurity Act 2015*, and
- Other ecological values that should be avoided by the proposed activity.

The total plant species list is presented in Appendix A. It is likely that plant species diversity was under represented, as the survey was conducted outside the ideal survey period of spring/summer.

5.2.1 Existing environment

Landscape context

The study area is located in the southern extent of the NSW South Western Slopes Bioregion (IBRA 7) which extends from Albury through central New South Wales (Thackway and Creswell 1995). The study area is located within the Inland Slopes subregion within the Albury – Oaklands Hills and Foothills landscape characterised by isolated hills and rises with shallow gritty loam amongst rock outcrops. (Department of Environment and Climate Change, 2002).

Vegetation and habitat

The study area is situated in a predominately cleared rural landscape that has highly modified vegetation and habitat which is mostly dominated by exotic grassland with scattered mature paddock trees. Less modified native vegetation is situated along the edges of the Murray River to the south west.

A total of 47 plant species were observed in the study area of which 32 (68 %) are exotic / weed species. The list of flora species recorded is provided in Appendix B. The landscape has undulating hills that rise abruptly from the Murray River floodplain. The majority of the study area has evidence of past land use change including vegetation clearing, pasture improvement and possible soil excavations which has resulted in an understorey dominated by exotic flora species.

To date, survey effort has focussed on the southern area but for the purposes of this assessment, the northern area can be extrapolated as containing predominantly exotic grasslands with a vegetated strip along Hume Weir Road that is yet to be identified. The classified vegetation and approximate extent within the southern area and fauna habitats is summarised in Table 5-2 and illustrated in Figure 5.13.

Table 5-2 Vegetation communities, extent and associated fauna within the southern area

Vegetation community (PCT)	Status	Associated potential threatened species and important fauna habitats	Approximate area within southern area (m ²)
Native Vegetation			
Severely Modified White Box Lowland Woodland <i>(White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion 226)</i>	White Box Yellow Box Blakely's Red Gum Woodland (Endangered BC Act)	Moderate to low quality fauna habitat for: <ul style="list-style-type: none"> Scarlet Robin Painted Honeyeater Regent Honeyeater Varied Sittella Eastern False Pipistrelle Yellow-bellied Sheath-tail-bat Gang Gang Cockatoo Squirrel Glider Little Lorikeet Dusky Woodswallow Hollow bearing tree	124
Severely Modified Derived Grassland (White Box) <i>(White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion 226)</i>		Moderate to low quality fauna habitat for: <ul style="list-style-type: none"> Diamond Firetail Dusky Woodswallow 	947
Moderately Modified Carex Wetland <i>(River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion 5)</i>	N/A	Moderate to low quality fauna habitat for: <ul style="list-style-type: none"> Sloane's Froglet Dusky Woodswallow 	725
Severely Modified River Red Woodland <i>(River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion 5)</i>		Moderate to low quality fauna habitat for: <ul style="list-style-type: none"> Painted Honeyeater Regent Honeyeater Varied Sittella Little Lorikeet Dusky Woodswallow 	958
Planted Native Trees and Shrubs	N/A	Marginal habitat for: Dusky Woodswallow	141
Sub-total (Native Vegetation)			2,895
Exotic Vegetation			
Exotic Grassland	N/A	Marginal habitat	8,813
Exotic Trees and Shrubs		Marginal habitat	561

Vegetation community (PCT)	Status	Associated potential threatened species and important fauna habitats	Approximate area within southern area (m ²)
Sub-total (Exotic Vegetation)			9,374
Total			12,269

Survey to date has determined that none of the threatened flora species recorded from background review are expected to occur on the site.

Some foraging and sheltering habitat for fauna is present in the form of large paddock trees located within the southern area. Although mostly dominated with exotic groundcover, the site provides some food resources and shelter for fauna. There were large flowering *Eucalyptus* trees and numerous mistletoe (*Amyema* sp.) suitable for foraging of common nectar feeding birds and mammals, as well as potential threatened species such as vulnerable Little Lorikeet (*Glossopsitta pusilla*), Black-chinned Honeyeater (*Melithreptus gularis gularis*), Squirrel Glider (*Petaurus norfolcensis*) listed under BC Act, and Painted Honeyeater (*Grantiella picta*) and Grey-headed Flying-fox (*Pteropus poliocephalus*) listed under both BC Act and EPBC Act.

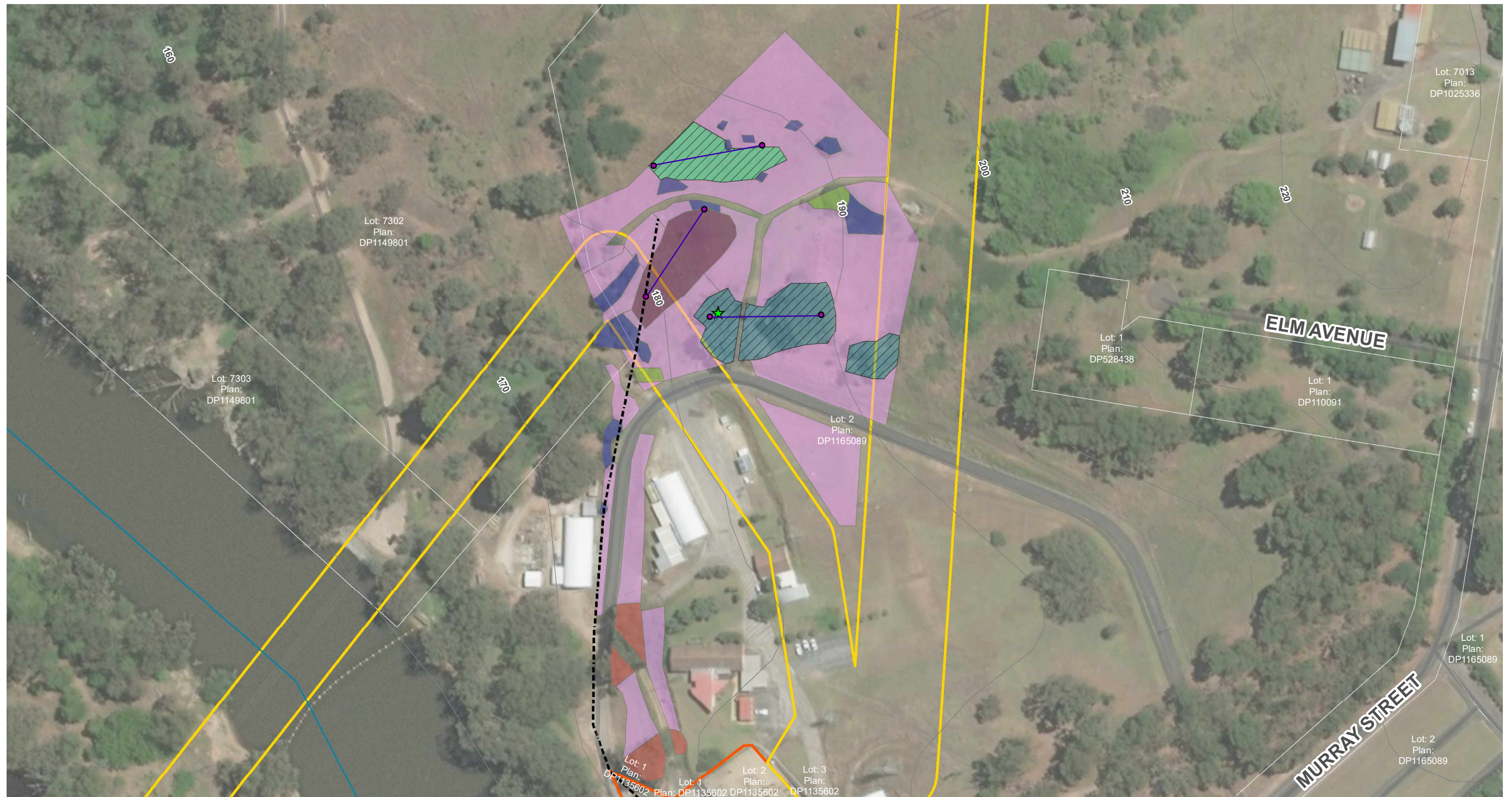
There was a single hollow bearing tree (White Box) containing multiple hollows on the edge of southern area and several very large trees (*River Red Gums*). These trees can provide important nesting and roosting habitat for many fauna species, including hollow-dependent threatened species such as vulnerable Squirrel Glider, Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) and Gang Gang Cockatoo (*Callocephalon fimbriatum*) listed under BC Act.

An ephemeral *Carex appressa* dominated wetland occurs within the study area containing native tree and shrub plantings on the edge. This wetland was dry at the time of survey, but may fill with water during heavy rainfall and drains into the Murray River. This wetland is potential habitat for Sloane's Froglet (*Crinia sloanei*) listed vulnerable under BC Act and endangered under the EPBC Act.

Threatened Ecological Communities

There was one Threatened Ecological Community identified in the southern area. Endangered *White Box Yellow Box Blakely's Red Gum Woodland* listed under the BC Act was present as modified remnants consistent with PCT 226). Although heavily disturbed, remnants showed a regenerating overstorey and midstorey of trees and shrubs from a single mature (parent) White Box tree (*Eucalyptus albens*) and a parent Hickory Wattle (*Acacia implexa*) (See Photograph 3). There was also a derived grassland indicative of this TEC. It was mostly dominated by exotic grass Wild Oats (*Avena* sp.) but also comprised diagnostic understorey species with a low abundance and cover of Kangaroo grass (*Themeda triandra*), Weeping Grass (*Microlaena stipoides*), Many-flowered Mat-rush (*Lomandra multiflora*), Wattle mat-rush (*Lomandra filiformis*) (See Photograph 4).

The desktop review indicated twelve TECs with potential to occur in the locality. One of these includes the *White Box Yellow Box Blakely's Red Gum Woodland* listed under the BC Act. The other eight are unlikely to be present in the study area. Remnants of PCT 226 do not meet the listing criteria for White Box- Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland under the EPBC Act as patches comprise less than 50% of native perennials in groundcover.



Legend

- Site access
- Proposed 11kV cable - From switchyard to battery
- ▭ Potential battery locations
- New South Wales/Victoria state boundary
- Contours (10 metres)
- Watercourse
- ▭ Cadastral extent

WaterNSW switchyard

Typical easement buffer for the 66kV line (15 m) and the 132 kV line (20 m)

Plot_transects

★ Hollow bearing tree

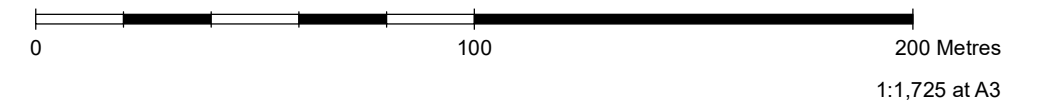
TEC

White Box Yellow Box Blakely's Red Gum Woodland (Endangered BC Act)

Vegetation_Hume

Veg_Comm_2

- Exotic Grassland
- Exotic Trees and Shurbs
- Moderately Modified Carex Wetland
- Planted Native Trees and Shrubs
- Severely Modified Derived Grassland
- Severely Modified River Red Woodland
- Severely Modified White Box Lowland Woodland



Data sources

Jacobs 2019
NSW Spatial Services 2019
Geoscience Australia 2019
Imagery: ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGrid, IGN and the GIS User Community

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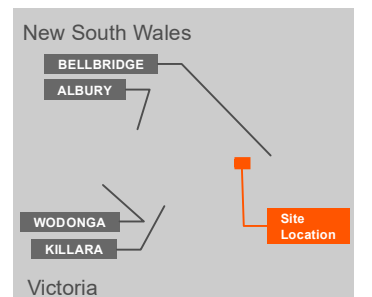


Figure 5.13: Biodiversity values within the Southern area



Figure 5.14: White Box hollow bearing tree in Severely Modified White Box Lowland Woodland (PCT 226) on southern edge of study area



Figure 5.15: Moderately Modified Carex Wetland (PCT 5) facing north east showing dominated *Carex appressa* with patches of Blackberry



Figure 5.16: Photograph 3 Severely Modified White Box Lowland Woodland (PCT 226) facing access gate showing regenerating overstory and disturbed understory.



Figure 5.17: Severely Modified Derived Grassland (White Box) (PCT 226) showing Kangaroo Grass tussocks (brown) amongst green Wild Oats.

Threatened flora

Fourteen threatened flora species have been previously recorded or considered to have the potential to occur in the locality based on modelled habitat and the presence of suitable habitat. All threatened flora species records are considered unlikely to occur due to unsuitable habitat in the study area. The list of threatened flora species considered in this assessment is provided in Appendix A.

Threatened fauna

Of the 61 threatened fauna species identified in the desktop assessment, fourteen species have a moderate potential to occur in the study area based on the presence of suitable habitat within or in proximity to the study area and are provided in **Table 5-3**. The remaining species have either a low or unlikely chance of occurring which is a reflection of their dependence on high quality habitats, not present at the site, and the small study area (refer to Appendix A). These species have been assessed with consideration of the available habitats within the study area and the worse-case extent of potential impacts. The study area is unlikely to provide important permanent habitat and most threatened foraging bird and mammal species are likely to pass through the study area between areas of higher quality habitat, particularly along the Murray River corridor.

Table 5-3 Threatened fauna with a moderate likelihood of occurrence in the study area

Species		Status		Potential habitat in the study area	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act		
Regent Honeyeater	<i>Anthochaera Phrygia</i> (<i>Xanthomyza phrygia</i>)	CE	CE	Potential foraging habitat in nectar producing River Red Gum and White Box trees during flowering periods. No potential breeding habitat.	Moderate
Diamond Firetail	<i>Stagonopleura guttata</i>	-	V	Potential foraging habitat feeding on grass seeds in Severely Modified Derived Grassland (White Box). No potential breeding habitat.	Moderate
Scarlet Robin	<i>Petroica boodang</i>	-	V	Potential foraging habitat	Moderate
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	-	V	Potential foraging habitat	Moderate
Painted Honeyeater	<i>Grantiella picta</i>	V	V	Foraging habitat on Mistletoes in River Red Gum and White Box trees.	Moderate
Varied Sittella	<i>Daphoenositta chrysoptera</i>	-	V	Potential foraging habitat	Moderate
Gang Gang Cockatoo	<i>Callocephalon fimbriatum</i>	-	V	Potential foraging habitat	Moderate
Little Lorikeet	<i>Glossopsitta pusilla</i>	-	V	Potential foraging habitat	Moderate
Dusky Woodswallow	<i>Artamus cyanopterus</i>	-	V	Potential foraging habitat	Moderate
Swift Parrot	<i>Lathamus discolor</i>	CE	E	Potential foraging habitat (winter flowering White Box)	Moderate
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	-	V	Potential foraging habitat	Moderate

Species		Status		Potential habitat in the study area	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act		
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	-	V	Potential foraging habitat	Moderate
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	Potential foraging habitat	Moderate
Sloane's Froglet	<i>Crinia sloanei</i>	E	V	Potential breeding and foraging habitat in depressions and moist areas.	Targeted survey complete and species not present on site.

Migratory species

Twenty migratory species are predicted to occur in the study area based on the desktop review (see Appendix A). The Cattle Egret (*Ardea ibis*) and the Great Egret (*Ardea alba*) are the only migratory species considered likely to utilise habitats near or within the study area. The Intermediate Egret (*Ardea intermedia*) was observed nearby the study area in a dead tree on the bank of the Murray River and may also utilise habitats in the study area.

Weeds

Weeds are managed under the *Biosecurity Act 2015*. Noxious weeds are now known as 'priority weeds' that are allocated to new management arrangements to prevent, eliminate, minimise or manage and/or control the risk of weed spread and establishment.

Three priority weeds declared for the Albury Region are present within the study area shown in Table 5-4. Species were in low to moderate abundance within the study area.

Table 5-4 Priority weeds present within the study area

Priority Weed	Duty	Weed of National Environmental Significance (WONS)
Bridal Creeper (<i>Asparagus asparagoides</i>)	Prohibition on dealings Must not be imported into the State or sold	Yes
Blackberry (<i>Rubus fruticosus</i> species aggregate)	Prohibition on dealings Must not be imported into the State or sold	Yes
<i>Genista monspessulana</i>	Regional Recommended Measure Land managers should mitigate the risk of new weeds being introduced to their land. Plant should not be bought, sold, grown, carried or released into the environment. Notify local control authority if found.	No

5.2.2 Issues for consideration

The key ecological constraints identified include:

- Small areas of mapped endangered *White Box Yellow Box Blakely's Red Gum Woodland* (BC Act);
- Potential foraging habitat for threatened fauna habitat (woodland birds, Grey-headed Flying Fox and microbats);

- Potential wetland habitat for Sloane's Froglet; and
- Single hollow bearing tree on edge of study area which may provide potential shelter and nesting opportunities for some listed threatened woodland birds and tree-roosting bat species.

Part 7 of the Biodiversity Conservation Act 2016 (BC Act) requires that an application for State significant development approval under Division 4.7 of the EP&A Act be accompanied by a biodiversity development assessment report unless the Secretary of the Department of Planning and the Chief Executive of the Office of Environment and Heritage determine that the proposed development is not likely to have any significant impact on biodiversity values. Preliminary consideration of the likelihood of significant impacts to biodiversity values as described in Section 1.5 of the BC Act is provided in **Table 5-5** while tests of significance under Part 7.3 for species with a moderate likelihood of occurrence are provided in Appendix C. It is concluded that based on the highly disturbed nature of the site and the avoidance of native vegetation and habitat features to the extent possible in locating the Project and the low condition of plant community types present, it is considered unlikely that significant impacts to biodiversity values would occur. A BDAR would be prepared to support the EIS unless an exception for the need is obtained.

6. Stakeholder engagement

6.1 Consultation to date

Meridian has held discussions with WaterNSW as the land owner and has obtained general endorsement that the Project could be accommodated within the site. Meridian will continue consultation with WaterNSW to facilitate access for environmental investigations with the ultimate aim of securing appropriate tenure for the construction and operation of the BESS.

Both Albury City Council and the member of the New South Wales Legislative Assembly have been briefed on the Project and expressed their support.

Meridian has held discussions with TransGrid and AusNet to ascertain that capacity to connect to the network is available. Formal consultation to secure necessary connection agreements will run in parallel to the Environmental Assessment Process.

6.2 Planned Consultation

The Project is not expected to generate significant stakeholder interest due to the anticipated low level of impact of the project. This is on the basis that the Project would have a short (less than 12 month) construction duration, typical construction processes and low intensity operational impacts consistent with the current, WaterNSW and Hume Hydro, land uses. As such stakeholder engagement is expected to be targeted at keeping neighbours informed of the assessment process and anticipated Project impacts such that concerns can be addressed and managed through the design process. This is expected to be achieved through direct consultation with immediate neighbours, advertising the Project and how additional information can be obtained in the local media, and the hosting of an information session immediately prior to EIS exhibition.

Meridian will engage with all key stakeholders during preparation of the EIS. Stakeholder groups, with an interest in the project are expected to include:

- The NSW Planning, Industry and Environment cluster regarding the environmental assessment and land use implications of the project;
- Albury Council to provide a Project briefing and to describe likely impacts to Council services (Roads, Water, Waste etc);
- Albury Local Emergency Management Committee and rural fire services to provide a Project briefing and ascertain emergency management requirements in relation to bushfire, hazards and flooding;
- Transport for NSW regarding any need for oversize over mass transport;
- Local land owners, farm managers and nearby residents, and
- Aboriginal stakeholders.

6.3 Identified and anticipated stakeholder issues

Due to the project location and nature of the project, concerns raised or anticipated include:

- Social and amenity impacts including visual amenity, construction workforce accommodation and transport, traffic, noise and vibration, air quality impacts, risks and hazards;
- Impacts to biodiversity, heritage and water quality;
- Potential for property value to be adversely affected, and
- Whether other options were considered.

Meridian will develop a consultation plan for the EIS once SEARs are received and the outcomes of consultation will be included in the EIS and relevant technical studies. The purpose of the consultation plan is to ensure ongoing and effective communication with key stakeholders and the community.

7. Summary and next steps

This document provides a description of the Project, existing information on environmental context and potential for environmental impacts and has been prepared in support of an application for the SEARs. An EIS will then be prepared addressing these SEARs. The EIS is intended to be placed on public exhibition in accordance with Division 4.7 of the EP&A Act.

Table 5-5 Consideration of potential impacts to biodiversity values consistent with s1.5 of the BC Act

Biodiversity Value	Meaning	Relevant	Explain and Document potential impacts	
			Information required	Applicant to Complete
Vegetation abundance	Occurrence and abundance of vegetation at a particular site.	✓	<p>Where vegetation is present on the development site, provide a map on digital aerial photography or the best available imagery of the development site showing:</p> <ul style="list-style-type: none"> native vegetation (including grasslands and other non-woody vegetation types) and non-native vegetation, and the area of land that is directly impacted by the proposed development, including related infrastructure such as roads, pipelines, access tracks, temporary material stockpiles, asset protection zones and powerlines, if applicable. <p>Describe how the proposed development avoids impacts on native vegetation and identify the likelihood and extent of any remaining impacts including removal of isolated or cultivated native plants.</p>	<p>The proposed footprint, 11kV cable and associated access have been located wherever possible to avoid areas of native vegetation. Some areas of native vegetation are however found in or in close proximity to the proposed sites and access routes. Moderately and severely modified native vegetation includes the following plant community types and associated threatened ecological communities:</p> <ul style="list-style-type: none"> White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCT 226); consistent with White Box <i>Yellow Box Blakely's Red Gum Woodland</i> - endangered ecological community listed under the BC Act. River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion (PCT 2). <p>At a worst case, the maximum disturbance area in the study area will be >5000 m² (100 m x 50 m), with permanent infrastructure requiring approximately 3000 m² (100 m x 30 m), and would be placed in exotic grassland to the extent possible. Access tracks already exist through the site. The access route is within the area mapped as PCT 226 and White Box <i>Yellow Box Blakely's Red Gum Woodland</i> - endangered ecological community and would be avoided. Minor pruning of overhanging branches on trees and shrubs may be required along track. Removal of woody trees and shrubs, saplings, and woody debris would be avoided.</p> <p>The proposed 11kV cable would potentially remove 100 m² of</p>

Biodiversity Value	Meaning	Relevant	Explain and Document potential impacts	
			Information required	Applicant to Complete
				<p>PCT 2 (Carex wetland) via trenching. This wetland is dominated by <i>Carex appressa</i> and trenching would unlikely impact on the abundance of this species, in absence of restoration measures.</p> <p>The proposed works and access paths are unlikely to have a significant impact on vegetation abundance either individually or cumulatively.</p>
Vegetation integrity	Degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state	✓	Describe any impacts on the vegetation integrity of identified plant communities.	<p>No impacts to native vegetation integrity are required at proposed work locations and are within cleared and disturbed locations (exotic grassland) and do not require clearing for either the establishment of works areas or access.</p> <p>The access route is within the area mapped as PCT 226 and White Box Yellow Box Blakely's Red Gum Woodland - endangered ecological community and would be avoided. Minor pruning of overhanging branches on trees and shrubs may be required along track and are unlikely to affect the integrity of this already severely disturbed community. The establishment of batteries are expected to be mounted on a concrete footings and be containerized or otherwise enclosed to an approximate 3000 m² (100 m x 30 m) within exotic grassland to the extent possible.</p> <p>These works would cause some disturbance, but the vegetation affected is unlikely to be significantly or permanently altered and is likely to return to a similar condition in the absence of ongoing disturbance.</p> <p>The vegetation is in very low condition (moderately to severely modified state) and the works in these areas are unlikely to impact vegetation integrity in the absence of restoration</p>

Biodiversity Value	Meaning	Relevant	Explain and Document potential impacts	
			Information required	Applicant to Complete
				<p>measures. The precise locations of access routes would be designed to avoid the removal or substantial damage of any mature trees, rock outcrops or very large woody debris. Following completion of proposed the works and access tracks the area would be rehabilitated generally in accordance with the Department of Planning and Environment (2017b) Rehabilitation Code of Practice.</p> <p>The proposed 11kV cable would potentially remove 100 m² of PCT 2 (Carex wetland) via trenching. Vegetation integrity at this location is already very low and is unlikely to change any future score values.</p> <p>Measures will also be put in place at all locations to prevent any further introduction or spread of weeds and plant pathogens that could have an adverse effect on native vegetation integrity.</p> <p>With these measures in place, the works are unlikely to have a significant impact on vegetation integrity.</p>
Threatened species habitat	Degree to which the habitat needs of threatened species are present at a particular site	✓	<p>Identify any threatened species or ecological communities or their habitat on the development site. In addition to native vegetation, habitat may include non-native vegetation, human made structures, rocks, karst, caves, crevices, cliffs and other geological features of significance.</p> <p>Describe how the proposed development avoids impacts on habitat suitability and identify the likelihood and extent of any remaining impacts including the removal or modification (e.g. noise, light etc.) of threatened species habitat or</p>	<p>Threatened ecological communities and species that may be affected by the proposed works include:</p> <ul style="list-style-type: none"> White Box Yellow Box Blakely's Red Gum Woodland - endangered ecological community listed under BC Act; comprises PCT226. Only overhanging branches over existing access tracks would likely occur. Parrots: Gang-gang Cockatoo, Little Lorikeet; and honeyeaters: Painted Honeyeater and Regent Honeyeater may forage habitat where there would be very minor modifications. Any large trees possibly suitable for nesting would be avoided. Sloane's Froglet; minor modification to possible Carex

Biodiversity Value	Meaning	Relevant	Explain and Document potential impacts	
			Information required	Applicant to Complete
			ecological communities.	<p>wetland habitat, which will be remediated.</p> <ul style="list-style-type: none"> • Small birds; Scarlet Robin, Dusky Woodswallow, Varied Sittella, Diamond Firetail, minor modification to foraging habitat only as pre-clearance checks of habitat for active nests would be undertaken to avoid impacts on nest sites. • Squirrel Glider; minor modification to possible foraging habitat only, possibly suitable as hollow nesting sites would be avoided. • Tree-roosting bats; Yellow-bellied Sheathail Bat, Eastern False Pipistrelle; minor modification to foraging habitat only as any large trees or dead stags possibly suitable for roosting would be avoided. • Grey-headed Flying-fox; minor modification to foraging habitat only as known and possible suitable camp sites would be avoided. • The site has been inspected by an ecologist and there is unlikely to be threatened flora habitat given the very disturbed understorey throughout the study area. <p>The works would be undertaken while minimising impacts on habitat in general and specifically avoiding habitat features likely to be important to threatened species.</p> <p>With these measures in place, the impact on the habitat of threatened species, populations and ecological communities is unlikely to be significant.</p>
Threatened species abundance	Occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site	✓	Describe how the proposed development avoids impacts on threatened species abundance and identify the likelihood and extent of any remaining impacts including whether the proposed development is likely to result in	<p>Impacts on the abundance of threatened ecological communities are discussed under the previous heading.</p> <p>Threatened animals likely to utilise the affected habitat are listed under the previous heading. As the works would be undertaken so as to avoid likely sheltering and breeding sites</p>

Biodiversity Value	Meaning	Relevant	Explain and Document potential impacts	
			Information required	Applicant to Complete
			vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.	for animals it is unlikely that it would cause mortality and thereby reduce the abundance of any species. The temporary and small reduction in habitat associated with the works is also unlikely to reduce the carrying capacity of the habitats. It is unlikely that an ecologically significant proportion of any threatened species, population or ecological communities would be lost as a result of the works. The works are unlikely to significantly impact the abundance of any threatened species, population or ecological community.
Habitat connectivity	Degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range	✓	Identify whether the development site contributes to habitat connectivity. Describe how the proposed development avoids impacts on habitat connectivity and identify the likelihood and extent of any remaining impacts.	Habitats encompassing the sites contribute substantially to wildlife habitat connectivity at local and regional scales. Given the very small extent, highly modified state and the relatively minor vegetation removal required for access and trenching, the works are unlikely to have any appreciable impact on habitat connectivity.
Threatened species movement	Degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle	✓	Describe how the proposed development avoids impacts on threatened species movement and identify the likelihood and extent of any remaining impacts.	Habitats encompassing the study are unlikely to be regionally important for the movement of threatened species, given the very fragmented nature of vegetation patches in the landscape. Fauna are likely to pass through to better condition habitats along the Murray River. Given that the site is mostly fenced, and very small extent, highly modified state and the relatively minor vegetation removal required for access and trenching, the works are unlikely to have any appreciable impact on movement ability of threatened species across the landscape.

Biodiversity Value	Meaning	Relevant	Explain and Document potential impacts	
			Information required	Applicant to Complete
Flight path integrity	Degree to which the flight paths of protected animals over a particular site are free from interference	✓	<p>Identify whether flight paths of protected animals occur over the development site.</p> <p>Describe how the proposed development avoids impacts on flight path integrity and identify the likelihood and extent of any remaining impacts.</p> <p>For proposed wind farms, describe any impacts of wind turbine strikes on protected animals.</p>	<p>Flight path integrity is the degree to which the flight paths of protected animals over a particular site are free from interference. There will be no increase in structure height that would affect species movement or interfere with the current flight paths of any protected species.</p> <p>The movement of migratory, nomadic or local species is likely to continue unaltered as no obstacles will be placed in the flight path of any species. Importantly, no important habitats along the flight path of any species will be affected and the project does not impose an increased collision risk to flying species.</p> <p>The proposed works are highly unlikely to affect the current flight paths of any species as no new obstacles will be constructed and permanent containers do not present a substantial or high-risk (i.e. they are not of low visibility or fast-moving).</p> <p>The sites are located in the East Asia-Australasia Flyway which includes the migratory routes of Arctic breeding birds in the far north of Siberia and Alaska down through East and South-east Asia to Australia and New Zealand. Migratory birds arrive in Australia in November and December in the non-breeding season. The landscape within the study area is part of the broader non-breeding area for migratory birds that spend the summer season in Australia. However, the sites do not provide any habitat for migratory wetland birds or migratory raptors which are particularly susceptible to collision due to their size and flight behaviour. Impacts to the East Asia-Australasia Flyway are therefore negligible.</p> <p>Another example is a smaller scale migrant such as the Swift</p>

Biodiversity Value	Meaning	Relevant	Explain and Document potential impacts	
			Information required	Applicant to Complete
				<p>Parrot. This species breeds in Tasmania and migrates across Bass Strait to mainland Australia in Autumn. During winter the birds disperse across Victoria and New South Wales with small numbers also recorded in the Australian Capital Territory, South Australia and Queensland. Once Swift Parrots arrive on the mainland, they move across the landscape in search of food. The specific pathways used on the mainland are currently unknown and are likely to differ widely based on food availability and competition. Foraging habitat is present in the study area as winter flowering White Box, but is considered to be marginal due to it having a low density of trees and only scattered paddock trees located nearby. As such, it is unlikely a significant proportion of the species population will visit the study area. If birds were to fly over, the current flight path would not be interfered with as there will be no appreciable increase in structure height.</p> <p>The flight paths of altitudinal migrants, for example the Scarlet Robin, which move locally down from the Great Dividing Range to the lower altitudes in autumn and winter but are similarly unlikely to be affected.</p> <p>Local species such as the White-bellied Sea-Eagle, and irregular visitors such as Little Eagle, may use the nearby Murray River as a foraging ground and a movement pathway (they will however also fly over adjacent land habitat). These species are high flyers and are unlikely to fly near to the project while they are moving around the Murray River.</p> <p>The flight paths of the Grey-headed Flying-fox are unlikely to be affected by the project. This species occupies habitats on the coastal lowlands, tablelands and slopes of southeast Australia from Bundaberg to Geelong in one large</p>

Biodiversity Value	Meaning	Relevant	Explain and Document potential impacts	
			Information required	Applicant to Complete
				interconnected population. The presence of the Grey-headed Flying-fox in an area is dependent on food availability and this species will move between camps to find food. In the locality, the greatest numbers of Grey-headed Flying-foxes are found in summer and most bats disperse to the coast of northern New South Wales and Queensland areas in winter. The Grey-headed Flying-fox is able to move freely over and between buildings and the project will not have an effect on the current flight paths of this species.
Water sustainability	Degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site.	✓	Describe how the proposed development avoids impacts on water sustainability and identify the likelihood and extent of any remaining impacts (including from subsidence or upsidence resulting from underground mining or other development).	Although the study area is near the Murray River, the proposed works are located on upper slopes from river at a suitable distance and would be bunded and otherwise managed to ensure that no significant runoff of sediment or other pollutants will occur during the works.

Appendix A. Likelihood of occurrence of threatened species, populations and ecological communities

Table C-1 Likelihood of occurrence of Threatened Ecological Communities (BC & EPBC Act) identified as potentially occurring within the study area.

Threatened Ecological Community	Status	Habitat preferences	Likelihood of occurrence
<i>Acacia melvillei</i> Shrubland in the Riverina and Murray-Darling Depression bioregions	Endangered (BC)	In south western NSW <i>Acacia melvillei</i> typically occurs on sandhills and undulating sand plains. The community occurs on red-brown, sandy loam soils as scattered patches grading into surrounding woodlands dominated by Belah and Western Rosewood, White Cypress Pine (<i>Callitris glaucophylla</i>) or sand plain mallee.	Unlikely. Not observed at study area.
<i>Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions</i>	Endangered (BC)	Serpentinite Shrubby Woodland is restricted to soils derived from serpentinite in the Tumut-Coolac-Gundagai area. The largest occurrence is on the Honeysuckle range to the east of Tumut which extends from Argalong to the Murrumbidgee River. There are other smaller areas near Coolac and Gundagai. Vegetation growing on soils derived from serpentinite in the Coolac-Tumut area	Unlikely. Not observed at study area.
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions / <i>Allocasuarina luehmannii</i> Woodland in the Riverina and Murray-Darling Depression Bioregions	Endangered (EPBC/BC)	Buloke Woodlands occur throughout the Riverina bioregion, except for immediately adjacent to major rivers, including the Murray River intrusion of Riverina into the adjoining Murray-Darling Depression bioregion. Buloke Woodlands is restricted to near freshwater river systems (notably the Murray and Wimmera Rivers) or adjacent to sites of ground water discharge.	Unlikely. Not observed at study area.
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia / Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Endangered (EPBC/BC)	Predominantly occurs on the drier edge of the temperate grassy eucalypt woodland belt (375-700 mm rainfall) ranging from central New South Wales through northern and central Victoria into South Australia. Grey Box Grassy Woodlands usually occur in flat to undulating landscapes, such as plains, low slopes and rises, or occasionally in drainage depressions. Patches of this community tend to occur on relatively productive soils.	Unlikely. Not observed at study area.

Threatened Ecological Community	Status	Habitat preferences	Likelihood of occurrence
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Endangered (BC)	Tall woodland or open forest dominated by Fuzzy Box Eucalyptus conica, often with Grey Box Eucalyptus microcarpa, Yellow Box Eucalyptus melliodora, or Kurrajong Brachychiton populneus. Buloke Allocasuarina luehmannii is common in places. Shrubs are generally sparse, and the groundcover moderately dense, although this will vary with season. Alluvial soils of the South West Slopes, Brigalow Belt South and Darling Riverine Plains Bioregions. Mainly in the Dubbo-Narromine-Parkes-Forbes area. Community occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on undulating plains or flats of the western slopes. Community often occurs upslope from River Red Gum communities above frequently inundated areas of the floodplain. It also occurs on colluvium soils on lower slopes and valley flats	Low. Not observed at study area.
Natural Grasslands of the Murray Valley Plains	Critically Endangered (EPBC)	The ecological community occurs predominately across the southern parts of the Riverina bioregion and extends into parts of the Murray Darling Depression and NSW South-Western Slopes bioregions. The Riverina bioregion is made up of a plain that lies in the southern part of the Murray-Darling Basin. The Riverina Bioregion has a temperate to semi-arid climate, with hot summers and cool winters and average annual rainfall ranges from approximately 300 to 500 mm.	Unlikely. Not observed at study area.
Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion	Critically Endangered (BC)	Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion varies in structure from tall mallee woodland with an open to mid-dense shrub layer and ground cover (sparseness perhaps an artifact of grazing history), to open or very dense mallee shrubland, with or without Broombush (Melaleuca uncinata). The variant of the community dominated by Bull Mallee and White Mallee tends to occur on plains to the east and north of West Wyalong on red earths including the aeolian soil known as parna.	Unlikely. Not observed at study area.
Weeping Myall Woodlands / Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	Endangered (EPBC/BC)	The ecological community generally occurs on flat areas, shallow depressions or gilgais on raised alluvial plains. These areas are not associated with active drainage channels and are rarely, if ever, flooded. The ecological community occurs on black, brown, red-brown or grey clay or clay loam soils.	Unlikely. Not observed at study area.

Threatened Ecological Community	Status	Habitat preferences	Likelihood of occurrence
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	Endangered (BC)	In the Riverina bioregion and the far south-western portion of the NSW South Western Slopes bioregion, the community is typically associated with prior streams and aeolian source-bordering dunes, which are scattered within an extensive alluvial clay plain dominated by chenopod shrublands. Sandhill Pine Woodland typically occupies red-brown loamy sands with alkaline sub-soils on the alluvial plain of the Murray River and its tributaries, and on parts of the sandplain in south-western NSW.	Unlikely. Not observed at study area.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered (EPBC)	It occurs on the lowland plains of southern NSW and generally limited to plains, lower slopes and stony rises and in some cases gilgai depressions and seasonally filled drainage lines at elevations below 500 metres. In the Riverina, these wetlands occur in the riparian system where water is sourced from over land flooding over alluvial deposits.	Unlikely. Not observed at study area.
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions	Endangered (BC)	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland typically forms an open-forest, woodland or open woodland that transitions into grassland at low tree cover. The canopy is dominated by <i>Eucalyptus pauciflora</i> , <i>E. rubida</i> , <i>E. stellulata</i> and <i>E. viminalis</i> either as single species or in combinations. It occurs within 600 to 1400 metres altitude.	Unlikely. Not observed at study area.
White Box Yellow Box Blakely's Red Gum Woodland	Critically Endangered (EPBC) Endangered (BC)	Box gum woodlands are characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees. It occurs on the western slopes and tablelands of the Great Dividing Range. White Box is generally more prevalent in the western regions such as the Riverina bioregion. It occurs on fertile soils.	Present. Not observed at study area.

*Preferred habitat information adapted from The NSW Environment & Heritage Threatened Species website (<http://www.environment.nsw.gov.au/threatenedspecies/index.htm>) and the Department of the Environment Species Profile and Threats Database (<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>) 2015.

Table B: Likelihood of occurrence of Threatened Flora (BC & EPBC Act) identified as potentially occurring within the study area.

Species		Status		Distribution and habitat requirements*	No. of records and source+	Potential likelihood to occur in the study site
Scientific name	Common name	EPBC Act	BC Act			
<i>Acacia phasmoides</i>	Phantom Wattle	V	V	The species is only known from one location in NSW: Woomagarma National Park in Greater Hume Shire. It is also found at Burrowa-Pine Mountain National Park in Victoria. Grows in shrubby woodland on sandy, granitic soil near creeks or in rocky crevices.	OEH	Unlikely
<i>Amphibromus fluitans</i>	River Swamp Wallaby Grass	V	V	It has been recorded recently in lagoons beside the Murray River near Cooks Lagoon. River Swamp Wallaby Grass grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels.	PMST, OEH, DEPI	Low
<i>Caladenia rosella</i>	Rosella Spider Orchid	PE	E	The single NSW collection of the Rosella Spider Orchid (located in Albury) is undated, but is estimated to have been collected before 1896. Today the species is found near Melbourne in Victoria, but is listed as endangered because less than 200 plants are known to exist.	OEH	Unlikely
<i>Caladenia concolor</i>	Crimson Spider-orchid	V	E	One population is known near the study area from the Nail Can Hill Crown Reserve near Albury. Habitat is regrowth woodland on granite ridge country that has retained a high diversity of plant species, including other orchids. The dominant trees are Blakely's Red Gum (<i>Eucalyptus blakelyi</i>), Red Stringybark (<i>E. macrorhyncha</i>), Red Box (<i>E. polyanthemos</i>) and White Box (<i>E. albens</i>); the diverse understorey includes Silver Wattle (<i>Acacia dealbata</i>), Hop Bitter-pea (<i>Daviesia latifolia</i>), Common Beard-heath (<i>Leucopogon virgatus</i>), Spreading Flax-lily (<i>Dianella revoluta</i>) and Poa Tussock (<i>Poa sieberiana</i>).	PMST	Low
<i>Caladenia tensa</i>	Greencombe Spider-orchid	E	-	This species is known to occur from south central NSW, Victoria and South Australia. It grows on red-brown sandy loam soils in open woodland in Yellow Gum (<i>Eucalyptus leucoxylon</i>) and Black Box Woodlands, Mallee and Heathlands.	PMST	Low
<i>Cullen parvum</i>	Small Scurf-pea	-	E	A small population was recently reported from near Jerilderie (although it has not been relocated). In recent years, two populations have been recorded in travelling stock reserves south-west of Wagga Wagga, and a population reputedly exists on a roadside near Galong. Another population has recently been discovered on private land near Young. Large populations have been recorded in grassy gaps in the Red Gum Woodlands of Barmah State Park, just across the border in Victoria. Extensive suitable habitat probably occurs across the border in NSW.	OEH	Low

Species		Status		Distribution and habitat requirements*	No. of records and source+	Potential likelihood to occur in the study site
Scientific name	Common name	EPBC Act	BC Act			
<i>Glycine latrobeana</i>	Clover Glycine	V	E	The Clover Glycine is endemic to south-eastern Australia, known from South Australia, Victoria, Tasmania and recently in Kosciusko National Park. It grows in grassland and grassy woodland habitats and sometimes in dry forests and rarely in heathlands. It can grow in a range of soils including alluvial derived from sandstone, mudstones, granite, basalt and clay with a high loam content.	PMST	Low
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	-	E	In NSW, Austral Pillwort has been recorded from suburban Sydney, Khancoban, the Riverina between Albury and Urana (including Henty, Walbundrie, Balldale and Howlong) and at Lake Cowal near West Wyalong. The population at Lake Cowal is the only known extant population in NSW. The species has also been recorded in the Australian Capital Territory, Victoria, Tasmania, South Australia and Western Australia. Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. Most of the records in the Albury-Urana area were from table drains on the sides of roads.	OEH	Low
<i>Prasophyllum petilum</i>	Tarengo Leek Orchid	E	E	Natural populations are known from a total of five sites in NSW. These area at Boorowa, Captains Flat, Ilford, Delegate and a newly recognised population c.10 k SE of Muswellbrook. Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with River Tussock Poa labillardieri, Black Gum Eucalyptus aggregata and tea-trees Leptospermum spp. at Captains Flat and within the grassy groundlayer dominated by Kanagaroo Grass under Box-Gum Woodland at Ford (and Hall, ACT).	PMST	Unlikely
<i>Prasophyllum validum</i>	Sturdy Leek-orchid	V	-	The Sturdy Leek-orchid <i>Prasophyllum validum</i> is a tall, slender, deciduous terrestrial orchid endemic to south-eastern Australia, where it occurs in Victoria and South Australia. Little is known of the ecology or biology of the species, although it seems to prefer relatively dry woodland habitats. Currently 18 populations containing about 3,200 plants are known. There is no information on previous distribution or abundance, although substantial areas of woodland habitats have been cleared.	PMST	Unlikely
<i>Senecio garlandii</i>	Woolly Ragwort	-	V	is daisy is found between Temora, Bethungra and Albury and possibly Burrinjuck near Yass. The largest populations are at The Rock and Mt Tabletop (and surrounds). There is a single population in Victoria at Chiltern.	OEH	Unlikely
<i>Swainsona murrayana</i>	Slender Darling-pea	V	V	Extremely rare in northern and western Victoria where usually found in seasonally inundated flats and around lakes. Flowers Aug.-Nov. ²	DEPI	Low

Species		Status		Distribution and habitat requirements*	No. of records and source+	Potential likelihood to occur in the study site
Scientific name	Common name	EPBC Act	BC Act			
<i>Swainsona sericea</i>	Silky Swainson-pea	-	V	Found from the Northern Tablelands to the Southern Tablelands, as well as inland slopes and plains of NSW. It is also found in South Australia, Victoria and Queensland. Its stronghold population grows in Natural Temperate Grasslands and Snow Gum Woodland on the Monaro.	OEH	Low

* Distribution and habitat requirement information adapted from:

Australian Government Department of the Environment <http://www.environment.gov.au/biodiversity/threatened/index.html>

NSW Office of Environment and Heritage <http://www.environment.nsw.gov.au/threatenedspecies/>

+ Data source includes

Number of records from the NSW Office of Environment and Heritage Wildlife Atlas record data (Accessed March 2016);

Number of records from the VIC Department of Environment and Primary Industries Victorian Biodiversity Atlas (Accessed March 2016); and

Identified from the Protected Matters Search Tool (PMST) Australian Government Department of Environment <http://www.environment.gov.au/epbc/pmst/index.html>

Key:

EP = endangered population

CE = critically endangered

E = endangered

V = vulnerable

PE = Presumed Extinct

Table C: Likelihood of occurrence of Threatened Fauna (BC & EPBC Act) identified as potentially occurring within the study area.

Species		Status		Distribution and habitat requirements*	Source+	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act			
BIRDS						
Dusky Woodswallow	<i>Artamus cyanopterus</i>	-	V	The Dusky Woodswallow has two separate populations. The eastern population is found from Atherton Tableland, Queensland south to Tasmania and west to Eyre Peninsula, South Australia. The other population is found in south-west Western Australia. The Dusky Woodswallow is found in open forests and woodlands, and may be seen along roadsides, urban parks and golf courses.	OEH	Moderate
Regent Honeyeater	<i>Anthochaera Phrygia</i> (<i>Xanthomyza phrygia</i>)	CE	CE	Temperate woodlands and open forests of the inland slopes of south-east Australia. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. There are recent and regular records of this species in Chiltern Box-Ironbark National Park to the south of the study area.	PMST, OEH 1	Moderate
Australasian Bittern	<i>Botaurus poiciloptilus</i>	E	E	Occurs from south-east Queensland to south-east South Australia, Tasmania and the south-west of Western Australia. Occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats.	PMST, OEH	Unlikely
Bush Stone-curlew	<i>Burhinus grallarius</i>	-	E	Open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch.	DEPI	Low
Gang Gang Cockatoo	<i>Callocephalon fimbriatum</i>	-	V	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	OEH	Moderate
Speckled Warbler	<i>Chthonicola sagittata</i> (<i>Pyrholaemus sagittatus</i>)	-	V	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt re-growth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.	OEH, DEPI	Low

Species		Status		Distribution and habitat requirements*	Source+	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act			
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	-	V	Endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	OEH	Low
Varied Sittella	<i>Daphoenositta chrysoptera</i>	-	V	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticated bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	OEH	Moderate
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>	-	V	The Purple-crowned Lorikeet occurs across the southern parts of the continent from Victoria to south-west Western Australia. It is uncommon in NSW, with records scattered across the box-ironbark woodlands of the Riverina and south west slopes, the River Red Gum forests and mallee of the Murray Valley as far west as the South Australian border, and, more rarely, the forests of the South Coast. The species is nomadic and most, if not all, records from NSW are associated with flowering events. Found in open forests and woodlands, particularly where there are large flowering eucalypts. Also recorded from mallee habitats.	OEH	Low
Little Lorikeet	<i>Glossopsitta pusilla</i>	-	V	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in apples (<i>Angophora</i> sp.), paperbarks (<i>melaleuca</i> sp.) and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country (e.g. paddocks, roadside remnants) and urban trees also help sustain viable populations of the species.	OEH	Moderate

Species		Status		Distribution and habitat requirements*	Source+	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act			
Painted Honeyeater	<i>Grantiella picta</i>	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i> .	PMST	Moderate
Swift Parrot	<i>Lathamus discolor</i>	E	E	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Ironbark (<i>E. sideroxylon</i>), and White Box (<i>E. albens</i>).	PMST, OEH	Moderate
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	-	V	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	OEH, DEPI	Low
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	-	V	Extends south from central Queensland, through NSW, Victoria into south eastern South Australia, though it is very rare in the last state. In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees.	OEH	Moderate
Turquoise Parrot	<i>Neophema pulchella</i>	-	V	Range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	DEPI	Low

Species		Status		Distribution and habitat requirements*	Source+	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act			
Blue-billed Duck	<i>Oxyura australis</i>	-	V	Endemic to south-eastern and south-western Australia. It is widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas. Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed, but prefers to dive if approached. Partly migratory, with short-distance movements between breeding swamps and overwintering lakes with some long-distance dispersal to breed during spring and early summer. Usually nest solitarily in Cumbungi over deep water between September and February. They will also nest in trampled vegetation in Lignum, sedges or Spike-rushes, where a bowl-shaped nest is constructed. The most common clutch size is five or six. Males take no part in nest-building or incubation.	OEH	Low
Scarlet Robin	<i>Petroica boodang</i>	-	V	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and re-growth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps.	OEH	Moderate (Species was observed in better quality Box Gum Woodland north of the study area)
Plains-wanderer	<i>Pedionomus torquatus</i>	CE	E	The Plains-wanderer has declined greatly since European settlement. Areas where the species was formerly common and is now so reduced in numbers that it is effectively extinct include eastern NSW, south-western Victoria, and south-eastern South Australia. Its current stronghold is the western Riverina of southern NSW. Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species, including a number of state and nationally threatened species. Habitat structure appears to play a more important role than plant species composition. Preferred habitat of the Plains-wanderer typically comprises 50% bare ground, 10% fallen litter, and 40% herbs, forbs and grasses. Most of the grassland habitat of the Plains-wanderer is <5 cm high, but some vegetation up to a maximum of 30 cm is important for concealment, as long as grass tussocks are spaced 10-20 cm apart. During prolonged drought, the denudation of preferred habitats may force birds into marginal denser and taller grassland habitats that become temporarily suitable.	PMST	Unlikely

Species		Status		Distribution and habitat requirements*	Source+	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act			
Superb Parrot	<i>Polytelis swainsonii</i>	V	V	Found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree.	PMST, OEH	Low
Australian Painted Snipe	<i>Rostratula australis</i>	E, M	E	Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	PMST	Low
Diamond Firetail	<i>Stagonopleura guttata</i>	-	V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (<i>Eucalyptus pauciflora</i>) Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	OEH, DEPI	Moderate
MAMMALS						
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, bullocke <i>Allocasuarina luehmannii</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	PMST	Low
Squirrel Glider	<i>Petaurus norfolcensis</i>	-	V	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey.	OEH, DEPI	Low
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	-	V	Patchy distribution around the coast of Australia. Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest.	DEPI	Unlikely

Species		Status		Distribution and habitat requirements*	Source+	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act			
Koala	<i>Phascolarctos cinereus</i>	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	PMST	Unlikely
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V	V	Generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	PMST	Moderate
REPTILES						
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra / Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with a predominantly native grassy groundlayer, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites.	PMST	Unlikely
<i>Delma impar</i>	Striped Legless Lizard	V	V	The Striped Legless Lizard occurs in the Southern Tablelands, the South West Slopes and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma and Tumut areas. Also occurs in the ACT, Victoria and south-eastern South Australia. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass <i>Themeda australis</i> , spear-grasses <i>Austrostipa</i> spp. and Poa tussocks <i>Poa</i> spp., and occasionally wallaby grasses <i>Austrodanthonia</i> spp. Sometimes present in modified grasslands with a significant content of exotic grasses. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter.	PMST	Unlikely

Species		Status		Distribution and habitat requirements*	Source+	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act			
AMPHIBIANS						
<i>Crinia sloanei</i>	Sloane's Froglet	E	V	Sloane's Froglet has been recorded from widely scattered sites in the floodplains of the Murray-Darling Basin, with the majority of records in the Darling Riverine Plains, NSW South Western Slopes and Riverina bioregions in New South Wales. It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats.	OEH	Moderate
<i>Litoria raniformis</i>	Southern Bell Frog	V	E	A largely aquatic species found among vegetation within or at the edges of permanent water – streams, swamps, lagoons, farm dams and ornamental ponds. Often found under debris on low, often flooded river flats. Frequently active by day. The species is currently widespread throughout the Murray River valley and has been recorded from six Catchment Management Areas in NSW: Lower Murray Darling, Murrumbidgee, Murray, Lachlan, Central West and South East. Found mostly amongst emergent vegetation, including <i>Typha</i> sp. (bullrush), <i>Phragmites</i> sp. (reeds) and <i>Eleocharis</i> sp.(sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams.	PMST	Low
INVERTEBRATES						
<i>Synemon plana</i>	Golden Sun Moth	CE	E	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses <i>Austrodanthonia</i> spp. Grasslands dominated by wallaby grasses are typically low and open - the bare ground between the tussocks is thought to be an important microhabitat feature for the Golden Sun Moth, as it is typically these areas on which the females are observed displaying to attract males. Habitat may contain several wallaby grass species, which are typically associated with other grasses particularly spear-grasses <i>Austrostipa</i> spp.	PMST	Unlikely
FISH						
<i>Bidyanus bidyanus</i>	Silver Perch	V (FM Act)	CE	Rivers, lakes and reservoirs, preferring areas of rapid flow. Swims near surface. ¹	PMST	Unlikely
<i>Maccullochella macquariensi</i>	Trout Cod	E (FM Act)	CE	The Trout Cod is endemic to the southern Murray-Darling river system, including the Murrumbidgee and Murray Rivers, and the Macquarie River in central NSW. The last known reproducing population of Trout Cod is confined to the Murray River below Yarrawonga downstream to Tocumwal.	DEPI 5	Unlikely

Species		Status		Distribution and habitat requirements*	Source+	Potential likelihood to occur in the study site
Common name	Scientific name	EPBC Act	BC Act			
<i>Maccullochella peelii</i>	Murray Cod	-	V	The Murray Cod utilises a diverse range of habitats from clear rocky streams, such as those found in the upper western slopes of NSW (including the ACT), to slow-flowing, turbid lowland rivers and billabongs. Preferred microhabitat consists of complex structural features in streams such as large rocks, snags, overhanging stream banks and vegetation, tree stumps, logs, branches and other woody structures. Such structures reduce or influence stream flows and provide Murray Cod with shelter from fast-flowing water. Strongly associated with structural woody habitat (>68% cover), deeper (>2.4 m), slower water (<0.2 m s ⁻¹) closer to river banks. ⁶	PMST	Unlikely
<i>Macquaria australasica</i>	Macquarie Perch	E	E	Cool, clear water of rivers, lakes and reservoirs. Prefers slow-flowing, deep rocky pools. ¹	PMST	Unlikely

* Distribution and habitat requirement information adapted from:

Australian Government Department of the Environment <http://www.environment.gov.au/biodiversity/threatened/index.html>

NSW Office of Environment and Heritage <http://www.environment.nsw.gov.au/threatenedspecies/>

NSW Department of Primary Industries: Fisheries <http://www.dpi.nsw.gov.au/fisheries>

+ Data source includes

Number of records from the NSW Office of Environment and Heritage Wildlife Atlas record data (Accessed March 2016);

Number of records from the VIC Department of Environment and Primary Industries Victorian Biodiversity Atlas (Accessed March 2016); and

Identified from the Protected Matters Search Tool (PMST) Australian Government Department of Environment <http://www.environment.gov.au/epbc/pmst/index.html>

Key:

EP = endangered population

CE = critically endangered

E = endangered

V = vulnerable

M = migratory

Table D: Likelihood of occurrence of Migratory Species (EPBC Act) identified as potentially occurring within the study area.

Species		Status	Distribution and habitat requirements	Potential likelihood to occur in the study site	Source
Common name	Scientific name				
Common Sandpiper	<i>Actitis hypoleucos</i>	Marine, Migratory (CAMBA, JAMBA, ROKAMBA)	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.		
Fork-tailed Swift	<i>Apus pacificus</i>	Migratory	Aerial, over open country, from semi deserts to coasts, islands, sometimes over forests or cities. ¹	Moderate	PMST
Great Egret, White Egret	<i>Ardea alba</i>	Marine, Migratory (CAMBA, JAMBA)	Shallows of rivers, estuaries, tidal mudflats, freshwater wetlands; sewage ponds, irrigation areas, larger dams etc. ¹	Low	PMST
Intermediate Egret	<i>Ardea intermedia</i>	Marine	Wetlands, prefers freshwater swamps, billabongs, floodplains and wet grasslands with dense aquatic vegetation, and is only occasionally seen in estuarine or intertidal habitats.	Present (nearby)	-
Cattle Egret	<i>Ardea ibis</i>	Marine, Migratory (CAMBA, JAMBA)	Stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats, drains. ¹	Moderate	PMST
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	Marine, Migratory (CAMBA, JAMBA, ROKAMBA)	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	Low	
Curlew Sandpiper	<i>Calidris ferruginea</i>	CE, Marine, Migratory (CAMBA, JAMBA, ROKAMBA)	The breeding range of the Curlew Sandpiper is mainly restricted to the Arctic of northern Siberia, including Yamal Peninsula east to Kolyuchiskaya Gulf, Chokotka Peninsula, and also New Siberian Island. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in salt works and sewage farms.	Low	
Pectoral Sandpiper	<i>Calidris melanotos</i>	Marine, Migratory (CAMBA, JAMBA, ROKAMBA)	In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Low	

Species		Status	Distribution and habitat requirements	Potential likelihood to occur in the study site	Source
Common name	Scientific name				
Latham's Snipe	<i>Gallinago hardwickii</i>	Marine, Migratory (CAMBA, JAMBA, ROKAMBA)	Freshwater or brackish wetlands, preferring to be close to protective vegetation cover. ¹	Low	OEH, PMST
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Marine, Migratory (CAMBA)	Coasts, inlands, estuaries, inlets, large rivers, inland lakes, reservoirs. ¹	Low	OEH
White-throated Needletail	<i>Hirundapus caudacutus</i>	Marine, Migratory (CAMBA, JAMBA, ROKAMBA)	Widespread in eastern and south-eastern Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps.	Moderate	PMST
Caspian Tern	<i>Hydroprogne caspia</i>	Marine, Migratory (JAMBA)	Found in extensive wetlands, on coastal and interior beaches and sheltered estuaries. The Caspian Tern lives equally well in fresh water and saline environments.	Low	OEH
Black-faced Monarch	<i>Monarcha melanopsis</i>	Migratory	Widespread in eastern Australia. Mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	Low	PMST
Rainbow Bee-eater	<i>Merops ornatus</i>	Migratory (JAMBA)	Open woodland with sandy, loamy soil; sand ridges, sandpits, riverbanks, road-cuttings, beaches, dunes, cliffs, mangroves, rainforests, woodlands, golf courses. ¹	Low	OEH, PMST
Yellow Wagtail	<i>Motacilla flava</i>	Migratory	Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves. Increasing records in NSW suggest this species is an occasional but regular summer visitor to the Hunter River region. ³	Low	PMST
Satin Flycatcher	<i>Myiagracyano leuca</i>	Marine, Migratory	Predominantly forests, in particular thick vegetation in gullies ³	Low	PMST
Eastern Curlew	<i>Numenius madagascariensis</i>	CE, Marine, Migratory (CAMBA, JAMBA, ROKAMBA)	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sand flats, often with beds of seagrass.	Low	PMST

Species		Status	Distribution and habitat requirements	Potential likelihood to occur in the study site	Source
Common name	Scientific name				
Glossy Ibis	<i>Plegadis falcinellus</i>	Migratory (CAMBA)	Well vegetated wetlands, wet pastures, rice fields, floodwaters, floodplains, brackish or occasionally saline wetlands, mangroves, mudflats; occasionally dry grasslands. ¹	Low	OEH, PMST
Rufous Fantail	<i>Rhipidura rufifrons</i>	Marine, Migratory	Occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (<i>Eucalyptus microcorys</i>), Mountain Grey Gum (<i>E. cypellocarpa</i>), Narrow-leaved Peppermint (<i>E. radiata</i>), Mountain Ash (<i>E. regnans</i>), Alpine Ash (<i>E. delegatensis</i>), Blackbutt (<i>E. pilularis</i>) or Red Mahogany (<i>E. resinifera</i>); usually with a dense shrubby understorey often including ferns.	Low	P<ST
Common Greenshank	<i>Tringa nebularia</i>	Migratory (CAMBA, JAMBA, ROKAMBA)	Mudflats, estuaries, saltmarshes, margins of lakes; wetlands, claypans, fresh and saline; commercial saltfields and sewage ponds. ¹	Low	PMST
<p>* Distribution and habitat requirement information adapted from:</p> <p>Australian Government Department of the Environment http://www.environment.gov.au/biodiversity/threatened/index.html</p> <p>NSW Office of Environment and Heritage http://www.environment.nsw.gov.au/threatenedspecies/</p> <p>+ Data source includes</p> <p>Number of records from the NSW Office of Environment and Heritage Wildlife Atlas record data (Accessed March 2016);</p> <p>Number of records from the VIC Department of Environment and Primary Industries Victorian Biodiversity Atlas (Accessed March 2016); and</p> <p>Identified from the Protected Matters Search Tool (PMST) Australian Government Department of Environment http://www.environment.gov.au/epbc/pmst/index.html</p> <p><u>Key:</u></p> <p>EP = endangered population</p> <p>CE = critically endangered</p> <p>E = endangered</p> <p>V = vulnerable</p> <p>M = migratory</p>					

Appendix B. Flora species list

Class/Family	Scientific Name	Common Name	Status
Flowering Plants - Monocotyledons			
ASPARAGACEAE	<i>Asparagus asparagoides</i>	Bridal Creeper	ix
CYPERACEAE	<i>Carex appressa</i>	Tussock Tassel-sedge	
JUNCACEAE	<i>Juncus australis</i>		
LOMANDRACEAE	<i>Lomandra filiformis</i>		
LOMANDRACEAE	<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	Many-flowered Mat-rush	
POACEAE	<i>Avena</i> sp.	Wild Oats	i
POACEAE	<i>Briza maxima</i>	Quaking Grass	i
POACEAE	<i>Bromus diandrus</i>	Great Brome	i
POACEAE	<i>Cenchrus clandestinus</i> (syn. <i>Pennisetum clandestinum</i>)	Kikuyu	i
POACEAE	<i>Cynodon dactylon</i>	Common Couch	n
POACEAE	<i>Hordeum</i> sp.	Barley Grass	i
POACEAE	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	
POACEAE	<i>Paspalum dilatatum</i>	Paspalum	i
POACEAE	<i>Phalaris aquatica</i>	Canary Grass	i
POACEAE	<i>Poa annua</i>	Winter Grass	i
POACEAE	<i>Themeda triandra</i>	Kangaroo Grass	
Flowering Plants - Dicotyledons			
AMYGDALACEAE	<i>Prunus</i> sp.		l, c
APOCYNACEAE	<i>Vinca major</i>	Greater Periwinkle	i
ASTERACEAE	<i>Arctotheca calendula</i>	Cape Dandelion	i
ASTERACEAE	<i>Cirsium vulgare</i>	Spear Thistle	i
ASTERACEAE	<i>Hypochaeris radicata</i>	Catsear	i
ASTERACEAE	<i>Sonchus oleraceus</i>	Common Sow-thistle	i

Class/Family	Scientific Name	Common Name	Status
BORAGINACEAE	<i>Echium plantagineum</i>	Pattersons Curse	i
FABACEAE-FABOIDEAE	<i>Genista monspessulana</i>	Montpellier Broom	ix
FABACEAE-FABOIDEAE	<i>Cytisus proliferus</i>	Tree Lucerne	i
FABACEAE-FABOIDEAE	<i>Pisum sativum</i>	Field Pea	i
FABACEAE-FABOIDEAE	<i>Robinia pseudoacacia</i>	Black Locust	l, c
FABACEAE-MIMOSOIDEAE	<i>Acacia implexa</i>	Hickory Wattle	
FABACEAE-MIMOSOIDEAE	<i>Acacia parramattensis</i>	Parramatta Wattle	c
GERANIACEAE	<i>Geranium sp.</i>	Geranium	
HALORAGACEAE	<i>Gonocarpus tetragynus</i>	Poverty Raspwort	
LORANTHACEAE	<i>Amyema sp.</i>	Mistletoe	
MALVACEAE	<i>Modiola caroliniana</i>	Red-flowered Mallow	i
MELIACEAE	<i>Melia azedarach</i>	White Cedar	c
MYRTACEAE	<i>Eucalyptus albens</i>	White Box	
MYRTACEAE	<i>Eucalyptus camaldulensis</i>	River Red Gum	
OLEACEAE	<i>Ligustrum lucidum</i>	Large-leaf Privet	ix
ONAGRACEAE	<i>Oenothera stricta</i> subsp. <i>stricta</i>	Common Evening Primrose	i
OXALIDACEAE	<i>Oxalis pes-caprae</i>	Soursob	i
PLANTAGINACEAE	<i>Plantago lanceolata</i>	Plantain	i
POLYGONACEAE	<i>Rumex crispus</i>	Curled Dock	i
ROSACEAE	<i>Rubus fruticosus</i> agg.	Blackberry	ix
RUBIACEAE	<i>Galium aparine</i>	Cleavers	i
SALICACEAE	<i>Salix babylonica</i>	Weeping Willow	i
SCROPHULARIACEAE	<i>Verbascum blattaria</i>	Moth Mullein	i
SOLANACEAE	<i>Solanum nigrum</i>	Black Nightshade	i
VERBENACEAE	<i>Verbena bonariensis</i>	Purple Top	i
KEY			

Class/Family	Scientific Name	Common Name	Status
<p>ABBREVIATIONS:</p> <p>i = introduced (i.e. not indigenous to Australia)</p> <p>ix = priority weed declared under the <i>Biosecurity Act 2015</i></p> <p>n = native Australian species not considered to be indigenous to the site</p> <p>c = cultivated (i.e. planted on the site)</p> <p>t = listed as a threatened species under State and/or Commonwealth legislation</p> <p>spp. = unidentified species²</p> <p>sp. aff. = unidentified species with characteristics similar to the indicated species or genus²</p> <p>? = unconfirmed species²</p> <p>r = RoTAP species (Briggs and Leigh 1996)</p> <p>var. = variety</p> <p>subsp. = subspecies</p> <p>cv. = cultivar (i.e. a anthropogenic form of the species)</p> <p>agg. = an aggregate of several yet to be defined species</p> <p>NOTES:</p> <p>1. A sample flora assemblage obtained from a short term survey, such as the present one, cannot be considered to be comprehensive, but rather indicative of the actual flora assemblage. It can take many years of flora surveys to record all of the plant species occurring within any area, especially species that are only apparent in some seasons.</p> <p>2. Not all species can be accurately identified in a 'snapshot' survey due to absence of flowering or fruiting material, etc.</p> <p>SCIENTIFIC NAMES & AUTHORITIES:</p> <p>Scientific names & families are those used in the Flora of New South Wales as maintained by the Royal Botanic Gardens (http://plantnet.rbgsyd.gov.au).</p> <p>Orders and higher taxa are based on Angiosperm Phylogeny Group (2003).</p> <p>For sake of simplicity, scientific names in this list do not include authorities. These can be found in the Flora of New South Wales.</p>			

Appendix C. Significance assessments – BC Act

Assessed biodiversity	Section 7.3 of the BC Act - Test for determining whether proposed development or activity likely to significantly affect threatened species or their habitats					Conclusion	
	(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction: OR (b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	(c) in relation to the habitat of a threatened species or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity,	iii) the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species or ecological community in the locality.	(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),		(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
Threatened Ecological Communities							
White Box Yellow Box Blakely's Red Gum Woodland (Endangered)	The proposed works would have no anticipated impact that would place this threatened ecological community at risk of extinction.	At a worst case, the maximum disturbance area in the study area will be >5000 m ² (100 m x 50 m), with permanent infrastructure requiring approximately 3000 m ² (100 m x 30 m), and would be placed in exotic grassland to the extent possible. Access tracks already exist through the site. The access route is within the area mapped as PCT 226 and White Box Yellow Box Blakely's Red Gum Woodland - endangered	The existing vegetation patch is already highly fragmented, disturbed and isolated. The proposed works would not fragment this ecological community	Minor pruning of overhanging branches on trees and shrubs may be required along existing track. However no trees or shrubs would be removed and would not affect the long-term survival of the community.	There are no declared areas of outstanding biodiversity value within or in close proximity to the site. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.	The works will contribute slightly to the impact of the <i>clearing of native vegetation</i> KTP. The impact is not significant in the context of the extent of habitat in the locality, and this threatened ecological community would not be subject to any clearing, except minor pruning. The works may also contribute slightly to weed-related KTPs. Weed invasion will be limited through weed control activities and is unlikely to significantly affect this community.	Not significant

Assessed biodiversity	Section 7.3 of the BC Act - Test for determining whether proposed development or activity likely to significantly affect threatened species or their habitats						Conclusion
	(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction: OR (b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	(c) in relation to the habitat of a threatened species or ecological community:			(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	
		(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity,	iii) the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species or ecological community in the locality.			
		ecological community and would be avoided. Minor pruning of overhanging branches on trees and shrubs may be required along track. Removal of woody trees and shrubs, saplings, and woody debris would be avoided. The proposed works would not remove any of this threatened ecological community					
Birds							
Nectar-feeding birds: <ul style="list-style-type: none">Little LorikeetRegent HoneyeaterBlack-chinned Honeyeater	The habitat affected may be used occasionally for foraging, particularly nectar producing native trees. Native trees are unlikely to be removed and unlikely to be important foraging habitat for the species due to its location and level of disturbance. The works are unlikely to have a significant adverse effect on the life cycle of the species.	At a worst case, the maximum disturbance area in the study area will be >5000 m² (100 m x 50 m), with permanent infrastructure requiring	The works will not result in fragmentation of habitat for the species. The species is highly mobile and will freely fly long distances over open areas to move between roost sites and foraging sites. The works will not	The habitat to be affected is unlikely to be used as breeding habitat. A single hollow-bearing tree for Little Lorikeet offer suitable nesting features, however this tree is on the edge of the study area and will not be	There are no declared areas of outstanding biodiversity value within or in close proximity to the site. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.	The works will contribute slightly to the impact of the <i>clearing of native vegetation</i> KTP, in relation to minor pruning of overhanging branches on trees and shrubs may along the track and some loss of	Not significant

Assessed biodiversity	Section 7.3 of the BC Act - Test for determining whether proposed development or activity likely to significantly affect threatened species or their habitats						Conclusion
	(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction: OR (b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	(c) in relation to the habitat of a threatened species or ecological community:			(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	
		(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity,	iii) the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species or ecological community in the locality.			
<ul style="list-style-type: none">Painted HoneyeaterSwift Parrot		approximately 3000 m ² (100 m x 30 m), and would be placed in exotic grassland to the extent possible. No removal of important nectar-producing trees is likely. Minor pruning of overhanging branches on trees may be required.	affect the movement of the species between habitat patches.	removed. Much of the study area is potential foraging habitat but is unlikely to be important for the species due to its location and level of disturbance. The habitat is not considered to be important to the long-term survival of these species in the locality.		Carex wetland. The impact is not significant in the context of the extent of habitat in the locality. The works may also contribute slightly to weed-related KTPs. Weed invasion will be limited through weed control activities and is unlikely to significantly affect the species.	
Woodland birds: <ul style="list-style-type: none">Diamond FiretailDusky WoodswallowVaried SittellaScarlet Robin	These species may occur in the study area based on the presence of records and suitable habitat. The habitat affected may be used occasionally for foraging but is unlikely to be important foraging habitat for the species due to its location and level of disturbance. The works are unlikely to have a significant adverse effect on the life cycle of these species.	At a worst case, the maximum disturbance area in the study area will be >5000 m ² (100 m x 50 m), with permanent infrastructure requiring approximately 3000 m ² (100 m x 30 m), and would be placed in exotic grassland to the extent possible. No removal of important habitat features for these species is likely.	The works will not result in fragmentation of habitat for the species. The species is highly mobile and will freely fly long distances over open areas to move between roost sites and foraging sites. The works will not affect the movement of these species between habitat patches.	The habitat to be affected is unlikely to be used as breeding habitat. It may be used for foraging but is unlikely to be important foraging habitat for the species due to its location and level of disturbance. The habitat is not considered to be important to the long-term survival of these species in the locality.	There are no declared areas of outstanding biodiversity value within or in close proximity to the site. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.	The works will contribute slightly to the impact of the <i>clearing of native vegetation</i> KTP, in relation to minor pruning of overhanging branches on trees and shrubs may along the track and some loss of Carex wetland. The impact is not significant in the context of the extent of habitat in the locality. The works may also contribute slightly to weed-related KTPs. Weed invasion will be limited through weed	Not significant

Assessed biodiversity	Section 7.3 of the BC Act - Test for determining whether proposed development or activity likely to significantly affect threatened species or their habitats						Conclusion
	(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction: OR (b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	(c) in relation to the habitat of a threatened species or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, (iii) the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species or ecological community in the locality.	(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.			
		Minor pruning of overhanging branches on trees may be required.				control activities and is unlikely to significantly affect the species.	
Gang Gang Cockatoo	A single hollow bearing tree offering suitable nesting opportunities is on the edge of the study area. No loss of hollow bearing trees will occur. The species is also likely to use the study area for perching and foraging. However, the habitat is unlikely to be important for these species due to its location and level of disturbance. The works are unlikely to have a significant adverse effect on the life cycle of these species.	At a worst case, the maximum disturbance area in the study area will be >5000 m ² (100 m x 50 m), with permanent infrastructure requiring approximately 3000 m ² (100 m x 30 m), and would be placed in exotic grassland to the extent possible. No removal of important habitat features for these species is likely. Minor pruning of overhanging branches on trees may be required.	The works will not result in fragmentation of habitat for the species. The species are highly mobile and will freely fly long distances over open areas to move between roost sites and foraging sites. The works will not affect the movement of these species between habitat patches.	The habitat to be affected is unlikely to be used as breeding habitat. No loss of hollow bearing trees will occur. Much of the study area is low quality potential foraging habitat but is unlikely to be important for the species due to its location and level of disturbance. The habitat is not considered to be important to the long-term survival of these species in the locality.	There are no declared areas of outstanding biodiversity value within or in close proximity to the site. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.	The works will contribute slightly to the impact of the <i>clearing of native vegetation</i> KTP, in relation to minor pruning of overhanging branches on trees and shrubs may along the track and some loss of Carex wetland. The impact is not significant in the context of the extent of habitat in the locality. The works may also contribute slightly to weed-related KTPs. Weed invasion will be limited through weed control activities and is unlikely to significantly affect the species.	Not significant
Mammals							
Insectivorous bats:	A single hollow-bearing tree offering suitable roosting opportunities for tree-roosting bats is located on the	At a worst case, the maximum	The works will not result in fragmentation of	The habitat to be affected is unlikely to be used as	There are no declared areas of outstanding biodiversity value	The works will contribute slightly to the	Not significant

Assessed biodiversity	Section 7.3 of the BC Act - Test for determining whether proposed development or activity likely to significantly affect threatened species or their habitats						Conclusion
	(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction: OR (b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	(c) in relation to the habitat of a threatened species or ecological community:			(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	
		(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity,	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity,	iii) the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species or ecological community in the locality.			
<ul style="list-style-type: none">Yellow-bellied Sheathtail-batEastern False Pipistrelle	edge of the study area. No loss of hollows trees will occur. Bridges and culverts may provide roosting opportunities. There is unlikely to be a maternity roost in the study area for cave-dwelling species. All the species are likely to forage in the vegetation in the study area. The potential breeding habitat for hollo-dependent species affected is unlikely to be important due to its location, level of disturbance, and the amount of higher quality habitat in the locality. The works are unlikely to have a significant adverse effect on the life cycle of these species.	disturbance area in the study area will be >5000 m ² (100 m x 50 m), with permanent infrastructure requiring approximately 3000 m ² (100 m x 30 m), and would be placed in exotic grassland to the extent possible. No removal of important habitat features for these species is likely. Minor pruning of overhanging branches on trees may be required.	habitat for these species. These species are highly mobile and will freely fly long distances over open areas to move between roost sites and foraging sites. The works will not affect the movement of these species between habitat patches.	breeding habitat (no maternity roosts identified during surveys). No loss of hollow bearing trees will occur. Habitat may be used for foraging but is unlikely to be important foraging habitat for the species due to its location and level of disturbance. The habitat is not considered to be important to the long-term survival of these species in the locality.	within or in close proximity to the site. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.	impact of the <i>clearing of native vegetation</i> KTP, in relation to minor pruning of overhanging branches on trees and shrubs may along the track and some loss of Carex wetland. The impact is not significant in the context of the extent of habitat in the locality. The works may also contribute slightly to weed-related KTPs. Weed invasion will be limited through weed control activities and is unlikely to significantly affect the species.	
Grey-headed Flying-fox	The habitat affected may be used occasionally for foraging, particularly nectar producing native trees. Native trees are unlikely to be removed and are unlikely to be important foraging habitat for the species due to its location and level of disturbance. The nearest roosting colonies are within Albury, none where identified in the study area. The works are unlikely to have a significant adverse effect on the life cycle of the species.	At a worst case, the maximum disturbance area in the study area will be >5000 m ² (100 m x 50 m), with permanent infrastructure requiring approximately 3000	The works will not result in fragmentation of habitat for these species. These species are highly mobile and will freely fly long distances over open areas to move between roost sites and foraging sites. The works will not affect the movement of	The habitat to be affected is unlikely to be used as breeding habitat, and no roosting colony was identified within the study area. Much of the study area is potential foraging habitat but is unlikely to be important for the species due to its	There are no declared areas of outstanding biodiversity value within or in close proximity to the site. The proposed activity is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.	The works will contribute slightly to the impact of the <i>clearing of native vegetation</i> KTP, in relation to minor pruning of overhanging branches on trees and shrubs may along the track and some loss of Carex wetland. The	Not significant

Assessed biodiversity	Section 7.3 of the BC Act - Test for determining whether proposed development or activity likely to significantly affect threatened species or their habitats						Conclusion
	(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction: OR (b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	(c) in relation to the habitat of a threatened species or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, (iii) the importance of the habitat to be removed, modified fragmented or isolated to the long-term survival of the species or ecological community in the locality.			(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	
		m ² (100 m x 30 m), and would be placed in exotic grassland to the extent possible. No removal of important nectar-producing trees is likely. Minor pruning of overhanging branches on trees may be required.	these species between habitat patches.	location and level of disturbance. The habitat is not considered to be important to the long-term survival of these species in the locality.		impact is not significant in the context of the extent of habitat in the locality. The works may also contribute slightly to weed-related KTPs. Weed invasion will be limited through weed control activities and is unlikely to significantly affect the species.	
Sloane's Froglet	The habitat with Carex wetland has potential foraging opportunities for Sloane's Froglet, particularly if wetland fills with water (was dry during survey). Although there is potential breeding habitat present within the study area, the wetland lacks typical features suitable for breeding such as small stemmed sedges and grasses. There may be minor modifications of Carex Wetland due to trenching but this is unlikely to alter the function and health of the wetland. The wetland would be remediated to its current form. The works are unlikely to have a significant adverse effect on the life cycle of the species.	Approximately 100 m ² of Carex wetland may be trenched for the proposed 11kV cable. This is considered to cause a minor modification to the habitat, but is unlikely to alter the function and health of the wetland. The wetland would be remediated to its current form.					

Appendix D. Significance Assessments – EPBC Act

D.1.1 Critically Endangered and Endangered

Broad-headed Snake (<i>Hoplocephalus bungaroides</i>) impact criteria	Significant Impact
1) <i>Lead to a long-term decrease in the size of an important population</i>	
<p>The Broad-headed Snake is a nocturnal reptile that shelters in crevices and under flat rocks on exposed cliff edges during autumn, winter, and spring; moving into large tree hollows during the summer months.</p> <p>No individuals were observed during surveys, and the single record for the species in the vicinity occurs in habitat on the opposite side of Kangaroo River to the proposal area. However, the species is highly cryptic and due to the presence of suitable habitat within the study area there remains potential for the species to exist there.</p> <p>Only three locations adjacent to and within the proposal area was observed to have suitable winter habitat (autumn, winter, spring) such as flat sandstone rocks on an exposed cliff edges. These locations would be avoided by the proposal. Therefore, high condition habitats with tree hollows in the proposal area within 500 metres of escarpments are considered suitable for foraging and shelter during summer for this species. This includes 0.3 hectares of Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion, and 0.88 hectares in Silvertop Ash - Red Bloodwood - Sydney Peppermint heathy open forest on moist sandstone plateaux, southern Sydney Basin Bioregion likely to be important suitable summer habitat for this species.</p> <p>The removal and disturbance of this area may impact a small number of individuals; however it is not expected to significantly decrease the population.</p>	No
2) <i>Reduce the area of occupancy of an important population</i>	
<p>As discussed above, the proposal would not impact any winter habitat of the Broad-headed Snake within the area. However, 1.18 hectares of potential summer foraging and sheltering habitat will be removed during construction. Given the high level of connectivity that the area has with nearby Morton National Park, and the large amount of potential habitat located there, it is not expected that the vegetation removal will considerably reduce the area of occupancy for the population. Additionally, the rocky habitats favoured by the snakes for most of the year will not be impacted by the proposal.</p>	No
3) <i>Fragment an existing important population into two or more populations</i>	

Broad-headed Snake (<i>Hoplocephalus bungaroides</i>) impact criteria	Significant Impact
<p>The project footprint will not fragment any existing areas of rocky escarpments or outcrops, which are the main habitat areas for the species.</p> <p>Any vegetation clearance from the edges of the existing roadways are not expected to increase fragmentation of the population beyond what it is already experiencing.</p>	No
<p>4) <i>Adversely affect habitat critical to the survival of the species</i></p>	
<p>According to the Department of Environment and Energy (DoEE 2013), habitat critical to the survival of the species refers to areas that are necessary:</p> <ul style="list-style-type: none"> • For activities such as foraging, breeding, roosting or dispersal • For the long-term maintenance of the species • To maintain genetic diversity and long term evolutionary development, or • For the reintroduction of populations or recovery of the species <p>While the project will result in the clearing of approximately 1.18 ha of potential foraging habitat, this habitat is not considered critical to the survival of the species. Given the high level of connectivity that the area has with nearby Morton National Park, and the large amount of potential habitat located there, it is not expected that the vegetation removal will considerably reduce the area of occupancy for the population. Additionally, the rocky habitats favoured by the snakes for most of the year will not be impacted by the proposal.</p>	No
<p>5) <i>Disrupt the breeding cycle of an important population</i></p>	
<p>The Broad-headed Snake mates from autumn to spring, with litters produced every two years. Young are born between January and April. Juvenile snakes do not disperse to forested habitats during the summer months, they remain in rocky habitats.</p> <p>Given that breeding and reproduction occurs within the rocky escarpment areas of the snake's habitat, and those areas will be avoided by the project, it is not expected that the proposal would result in any disruption to the breeding cycle of the population.</p>	No
<p>6) <i>Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i></p>	

Broad-headed Snake (<i>Hoplocephalus bungaroides</i>) impact criteria	Significant Impact
As described above, the vegetation clearance required for the project footprint would remove 1.18 ha of summer habitat only, and avoid key sheltering and breeding habitat in the rocky sandstone areas. Additionally, the area is well connected to high quality habitat areas in Morton National Park. It is not considered likely that the project would result in a species decline.	No
7) <i>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat</i>	
<p>The Approved Conservation Advice for the Broad-headed Snake lists invasive species such as foxes, and feral cats as a key potential threat to the species due to predation. Additionally, feral goats can disturb the snake habitat. Fauna surveys have identified foxes already present within the study area, however it is unlikely that any of the actions associated with the proposal would increase the proliferation of foxes in such a way as to impact the Broad-headed Snake. The risks of introducing feral goats and cats is very low.</p> <p>Given the nature of the project, the introduction of weeds is considered likely, particularly along the road verge of the expanded road. These are unlikely to successfully spread to the escarpment areas in such a way as to impact the snake habitat.</p>	No
8) <i>Introduce disease that may cause the species to decline</i>	
<p>There are no known diseases that impact the Broad-headed Snake that are likely to be introduced by this project.</p> <p>There is a low possibility that the equipment used may result in the spread or proliferation of Phytophthora (root rot) fungus, which would impact on the eucalyptus that the Broad-headed snake may shelter in during the summer. However, this fungus is not currently widespread in New South Wales, and the risks from Phytophthora are considered minimal.</p>	No
9) <i>Interferes substantially with the recovery of the species</i>	
<p>There is no published recovery plan for this species. Key threats to the species identified in the conservation advice and relevant to this project include:</p> <p>Introduction of feral animals: refer to section 7 above</p> <p>Vehicle strike: Vehicle strike is listed as a key potential threat to the species in the Approved Conservation Advice. Generally, the increase in traffic as a result of this project is likely to be construction traffic only. Given the species nocturnal nature, it is unlikely that an increase in construction vehicles along the road will increase the risk of vehicle strike, as the species mainly travels at night.</p>	No

Broad-headed Snake (<i>Hoplocephalus bungaroides</i>) impact criteria	Significant Impact
The project is not considered likely to interfere with the recovery of the species.	
Conclusion	
In conclusion, the proposed action is not likely to result in significant impacts to the Broad-headed Snake. Critical areas of rocky habitat will not be impacted by the proposal, and the vegetation removal will be limited to a small amount of summer foraging and sheltering habitat, which is not considered critical for the species.	No

D.1.2 Vulnerable

Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) impact criteria	Significant Impact
1) <i>Lead to a long-term decrease in the size of an important population</i>	
<p>There are no specific populations listed in the SPRAT profile or conservation advice for the species.</p> <p>The local populations of the species in the study area are considered to form an important population as they are:</p> <ul style="list-style-type: none"> large and hence may constitute key source populations for dispersal <p>Based on this assessment process, the population of the species in the study area can be considered an important population. Therefore, by this assessment process, the study area is likely to contain an important population of this species within suitable habitat.</p> <p>The Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) was identified in the survey area during the surveys. All forest and woodland habitat in the survey area is considered foraging habitat critical to the survival of the species. The Grey-headed Flying-fox exists as a single interconnected population in Australia. As such, it is considered an important population.</p> <p>There are no roost camps in the survey area or construction footprint and the proposed action will not impact on any known permanent roosting, breeding / maternity site. Therefore, it is likely that the impacts of construction and operation of the proposed action would be confined to loss of feeding habitat caused by direct clearing or damage to native vegetation during the construction phase. There is also a low risk of vehicle strike during operation.</p> <p>The proposed action would directly remove up to 40 hectares of potential foraging habitat. The project will remove narrow strips of native vegetation (in</p>	No

Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) impact criteria	Significant Impact
<p>varying condition) along tracks, pipeline and larger areas of native vegetation for construction of surge tower, cavern, spoil sites, surface infrastructure and temporary laydowns. The affected area of foraging habitat would represent a small percentage of the total extent of important foraging vegetation types present within a 50 kilometre radius of the proposed action and the six nationally important roost camps within a 50 kilometres radius (Kangaroo Valley, Moss Vale, Berry, Nowra (Bugong Creek, Brinawarr and Bomaderry Creek). Given the relative widespread nature of similar native vegetation and planted vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of regional populations, the proposed action is not expected to lead to a long-term decrease in the size of an important population.</p>	
<p>2) <i>Reduce the area of occupancy of an important population</i></p>	
<p>The area of occupancy of the Grey-headed Flying-fox is not known but the species exists as one interconnected population along the eastern Australian coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. The area occupied by this species will remain the same after the proposed action. No impact to area of occupancy is expected.</p>	No
<p>3) <i>Fragment an existing important population into two or more populations</i></p>	
<p>Highly mobile species such as bats are expected to be less impacted by fragmentation. The Grey-headed Flying-fox is particularly well adapted to accessing widely spaced habitat resources given its mobility and preference for seasonal fruits and blossom in differing parts of the landscape. The proposed action would not fragment an important population of the Grey-headed Flying-fox. Individuals will still be able to disperse between roosts along the east Australian coast.</p>	No
<p>4) <i>Adversely affect habitat critical to the survival of the species</i></p>	
<p>This species typically exhibits very large home range and Grey-headed Flying-fox is known to travel distances of at least 50 kilometres from roost sites to access seasonal foraging resources. There are no known roost camps within the survey area or the construction footprint and the construction footprint does not provide critical roosting habitat. However, there are six nationally important roost camps within a 50 kilometres radius (Kangaroo Valley, Moss Vale, Berry, Nowra (Bugong Creek, Brinawarr and Bomaderry Creek). The draft recovery plan for the Grey-headed Flying-fox identifies critical foraging habitat for this species as:</p> <ul style="list-style-type: none"> • Productive during winter and spring, when food bottlenecks have been identified • Known to support populations of >30,000 individuals, within an area of 50 kilometre radius of a camp site 	No

Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) impact criteria	Significant Impact
<ul style="list-style-type: none"> Productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (Sept-May) Productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes Known to be continuously occupied as a camp site. <p>Native vegetation within the construction footprint would constitute critical foraging habitat. However, the affected area of critical foraging habitat would represent a small percentage of the total extent of important foraging vegetation types present within a 50 kilometre radius of the camp sites described. Given the relative widespread nature of similar vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of regional populations, the proposed action is not expected to adversely affect foraging habitat critical to the survival of this species in this region.</p>	
<p>5) <i>Disrupt the breeding cycle of an important population</i></p>	
<p>As stated above there would be a minor impact on foraging habitat identified as important during the breeding cycle of the species. The proposed action would not directly impact on a known roost camp / breeding or maternity site.</p>	No
<p>6) <i>Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i></p>	
<p>No evidence of a roost camp has been identified within the survey area. Further, there would be a relatively minor impact on critical foraging habitat as a result of the proposed action. This impact is not expected to lead to a decline in the species in this region.</p>	No
<p>7) <i>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat</i></p>	
<p>The potential for weed invasion was considered possible with a project of this nature and appropriate controls are required during construction and operation of the project. Unless the proposed activity includes very careful soil management, weed monitoring and management and intensive vegetation restoration, weed proliferation is likely to occur on the newly created road edge. Weeds have potential to invade the adjacent edges of clearings and tracks, particularly in areas with fertile shale soils. This impact would be restricted to areas immediately adjacent to the proposed activity and would not substantially affect the broader vegetated areas. Given the high floristic value of the patch and proximity to the National Park, native vegetation is likely to be more resilient to weed invasion and many weeds controlled by National Parks staff either directly or through hazard reduction burns. The management of invasive species would be managed under the CEMP and during operation of the pipeline using best practice methods.</p>	No

Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) impact criteria	Significant Impact
8) <i>Introduce disease that may cause the species to decline</i>	
There are no known disease issues affecting this species in relation to the proposed action. The proposed action would be unlikely to increase the potential for significant disease vectors to affect local populations.	No
9) <i>Interferes substantially with the recovery of the species</i>	
<p>The Draft National Recovery Plan for the Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) outlines the following actions:</p> <ul style="list-style-type: none"> • Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes across their range • Enhance winter and spring foraging habitat for Grey-headed Flying-foxes • Identify, protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes • Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture • Provide information and advice to managers, community groups and members of the public that are involved with controversial flying-fox camps • Produce and circulate educational resources to improve public attitudes toward Grey-headed Flying-foxes, promote the recovery program to the wider community and encourage participation in recovery actions • Monitor population trends for the Grey-headed Flying-fox • Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts • Oversee a program of research to improve knowledge of the demographics and population structure of the Grey-headed Flying-fox • Maintain a National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan. <p>The recovery actions listed above are largely not applicable to the proposed action and accordingly the proposed action is not expected to interfere substantially with the recovery of the species.</p>	No
Conclusion	

Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) impact criteria	Significant Impact
<p>The Grey-headed Flying-fox would experience a small reduction in extent of suitable foraging habitat from the proposed action. No breeding camps or other important habitat will be impacted. The proposed action is unlikely to reduce the population size of the Grey-headed Flying-fox or decrease the reproductive success of this species. The proposed action would not interfere with the recovery of the Grey-headed Flying-fox and will not contribute to the key threats to this species. After consideration of the factors above, an overall conclusion has been made that the proposed action is unlikely to result in a significant impact to the Grey-headed Flying-fox.</p>	No

Grey-headed Flying Fox (*Pteropus poliocephalus*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

Lead to a long-term decrease in the size of an important population

There have been no roost camps identified in the project boundary to date and the work would not directly impact on any known breeding / maternity site. There is an active colony on the Macquarie River, approximately five kilometres upstream of the project. It is likely that the impacts would be confined to loss of feeding habitat caused by clearing or damage to native vegetation. The works would directly remove up to 0.24 ha of potential foraging habitat. This area of habitat may be defined as a portion of the potential area of occupancy for feeding life-cycle attributes of the population. The affected area of foraging habitat would represent a small percentage of the total extent of important foraging vegetation types present within a 50 kilometre radius of the project boundary (<0.01%). Given the relative widespread nature of similar vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of regional populations, the works are not expected to lead to a long-term decrease in the size of an important population.

Reduce the area of occupancy of an important population

The proposed works would result in the loss of approximately 0.24 ha of foraging habitat in the form of River Red Gum Trees providing nectar food resources. These impacts are not expected to reduce the area of occupancy of the population.

Fragment an existing important population into two or more populations

There is currently a high degree of habitat fragmentation across the study area. Highly mobile species such as bats are expected to be less impacted by fragmentation and the Grey-headed Flying-fox is particularly well adapted to accessing widely spaced habitat resources given its mobility and preference for seasonal fruits and blossom. The work would not fragment an important population of the Grey-headed Flying-fox.

Adversely affect habitat critical to the survival of the species

Habitat critical to the survival of a species refers to areas that are necessary for activities such as:

- Foraging, breeding, roosting, or dispersal,

- For the long-term maintenance of the species including the maintenance of other species essential to the survival of the species, such as pollinators,
- To maintain genetic diversity and long-term evolutionary development,
- For the reintroduction of populations or recovery of the species.

There is an active colony on the Macquarie River, approximately five kilometres upstream of the project. The proposed area of habitat loss represents a small percentage of the potential foraging habitat for the Grey-headed Flying-fox within a 50 kilometre radius of the study area and known roost camps in the region. This species typically exhibits very large home ranges and Grey-headed Flying-fox are known to travel distances of at least 50 kilometres from roost sites to access seasonal foraging resources. No evidence of a camp site has been identified within the study area.

The draft recovery plan for the Grey-headed Flying-fox identifies critical foraging habitat for this species as:

- Productive during winter and spring, when food bottlenecks have been identified,
- Known to support populations of >30,000 individuals, within an area of 50 kilometre radius,
- Productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (Sept-May),
- Productive during the final stages of fruit development and ripening in commercial crops affected by Grey-headed Flying-foxes,
- Known to be continuously occupied as a camp site.

The work would temporarily remove up to 540 m² of foraging habitat however vegetation will be avoided where possible. The affected area of foraging habitat would represent a small percentage of the total extent of important foraging vegetation types present within a 50 kilometre radius of the project boundary. Given the relative widespread nature of similar planted vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of regional populations, the work is not expected to adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of an important population

As stated above there would be a minor impact on foraging habitat identified as important during the breeding cycle of the species. The work would not directly impact on a known roost camp / breeding or maternity site.

Modify, destroy, remove, or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Approximately 0.24 ha of foraging habitat would be removed from the area. This reduction in foraging habitat is not expected to have a significant impact on the species. This habitat would be replaced or re-instated in accordance to the mitigation measures outlined in Section 5. The removal of this habitat is unlikely to cause the species to decline.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat

There is a possibility that the proposed works would introduce some weeds into the area where work is being undertaken. This would be managed with weed control protocols. It is unlikely that any weeds introduced would become invasive or impact upon the bat species.

Introduce disease that may cause the species to decline

It is unlikely that the proposed works would introduce diseases which would result in a species decline.

Interferes substantially with the recovery of the species

The Draft National Recovery Plan for the Grey-headed Flying-fox (*Pteropus poliocephalus*) outlines the following actions:

- Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes across their range
- Enhance winter and spring foraging habitat for Grey-headed Flying-foxes
- Identify, protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes
- Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture
- Provide information and advice to managers, community groups and members of the public that are involved with controversial flying-fox camps
- Produce and circulate educational resources to improve public attitudes toward Grey-headed Flying-foxes, promote the recovery program to the wider community and encourage participation in recovery actions
- Monitor population trends for the Grey-headed Flying-fox
- Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts
- Oversee a program of research to improve knowledge of the demographics and population structure of the Grey-headed Flying-fox
- Maintain a National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan

The recovery actions listed above are largely not applicable to the work as they focus on priority conservation lands which are outside of the study area.

Given the relative widespread nature of similar vegetation in the locality and abundance of higher quality foraging habitat within the feeding range of regional populations, the works are not expected to interfere substantially with the recovery of the species.

D.1.3 Conclusion

The Grey-headed Flying-fox will suffer a very small reduction in extent of suitable foraging habitat from the works. No roosting camps or other important habitat will be impacted. The works are unlikely to reduce the population size of the Grey-headed Flying-fox or decrease the reproductive success of this species. The work will not interfere with the recovery of the Grey-headed Flying-fox. Based on the above, it is considered that the work is unlikely to result in a significant impact to the Grey-headed Flying-fox.

D.1.4 Migratory species

Assessments of significance completed for migratory has found that the proposal is unlikely to significantly impact on any migratory species.

The list of species which are considered to have a moderate chance of occurring in the study area is shown below. The background searches and field investigations found no evidence to suggest that an area of 'important habitat' exists at the site for a migratory species, or that the study area is occupied by an ecologically significant proportion of the populations of these migratory species. It is therefore unlikely that the proposed works would impact on any listed migratory species.

An area of 'important habitat' for a migratory species is:

- Habitat used by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- Habitat that is of critical importance to the species at particular life-cycle stages, and/or
- Habitat used by a migratory species which is at the limit of the species range, and/or
- Habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species. Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates). These factors have been considered in the following assessment.

Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species

The proposed temporary removal of regrowth vegetation provides only marginal habitat for these migratory birds species and are very unlikely to support important habitat. This is further supported by the generally poor condition of vegetation within.

There are no breeding records from the site or surrounds and the extent of habitat remaining in the study area would provide sufficient resources to sustain future visitation. The proposal would not reduce populations of a migratory species nor substantially reduce the extent of potential habitat in the region.

Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species

There is no evidence to suggest that an area of important habitat exists in the study area for any listed migratory species. Suitable measures would be incorporated into the proposal to control the spread of weeds during the construction and operation and these are to be detailed in a habitat restoration plan.

Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species

There is no evidence to suggest that an area of important habitat exists or that the study area is occupied by an ecologically significant proportion of a population of a migratory species.