EnergyCo

Waratah Super Battery – Munmorah

Environmental Impact Statement

November 2022

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NSW GOVERNMENT

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			Name	Signature	Name	Signature	Date
S4	0	G Marshall E Ray D Chubb	G Marshall E Ray D Chubb		D Chubb		24/10/2022
S4	1	G Marshall	D Chubb		D Chubb		3/11/2022

Declaration

Project	Project name	Waratah Super Battery		
	Application no	SSI-48492458		
	Project location	Within the former Munmorah Power Station on the Central Coast of NSW		
Proponent	Proponent name	Energy Corporation of NSW		
	Address	20 Bond Street Sydney NSW 2000		
EIS prepared by:	Name	David Chubb	Sophy Townsend	Emily Kate Marsh
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	Qualification	BSci (Hons) (1992) MAppSci EnvMan (1996)	BEnvSc (Hons) (2000)	BBio&Con (2014) LLM EnvLaw (2019)
Declaration by Registered Environmental Assessment Practitioner	Name	Greg Marshall		
	Address	Level 15, 133 Castlereagh Street Sydney NSW 2000		
	Qualification	BE(Civil)(Hons), REAP R800009		
	Organisation	GHD		
Declaration	The undersigned declares that this EIS: – has been prepared in accordance with Schedule 2 and Part 10 of the Environmental Planning and Assessment Regulation 2021; – contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates; – does not contain information that is false or misleading; – addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project; – identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments; – has been prepared having regard to the Department's *State Significant infrastructure Guidelines – Preparing an Environmental Impact Statement*; – contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development; – contains a consolidated description of the project in a single chapter of the EIS; – contains an accurate summary of the findings of any community engagement; and – contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.			
	Signature			
	Date	3/11/2022		

Acknowledgement of Country

GHD acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. GHD is committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.

Terms and abbreviations

Term/abbreviation	Definition
ABCB	Australian Building Codes Board
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
APZ	Asset Protection Zone
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
AS/NZS	Australian Standards / New Zealand Standards
BAL	Bushfire attack level
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BMS	Battery Management System
BoM	Bureau of Meteorology
BPM	Bushfire protection measures
CCBFMC	Central Coast Bush Fire Management Committee
Central Coast LEP	Central Coast Local Environmental Plan 2022
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1997* (NSW)
CMSC Act	*Coal Mine Subsidence Compensation Act 2017* (NSW)
CO_2-e	Carbon dioxide equivalent
CS	Construction scenario
CSSI	Critical State Significant Infrastructure
Cth	Commonwealth
DA	Development Application
DAWE	Department of Agriculture, Water and the Environment
dBA	A – weighted decibels
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DISER	Department of Industry, Science, Energy and Resources
DISR	Department of Industry, Science and Resources (formerly Department of Industry, Science, Energy and Resources) (Commonwealth)
DP	Deposited plan
DPE	Department of Planning and Environment (NSW)
DPIE	Department of Planning Industry and Environment (NSW)
EII Act	*Electricity Infrastructure Investment Act 2020* (NSW)
EIS	Environmental Impact Statement
ELF	Extremely Low Frequency

Term/abbreviation	Definition
EMF	Electric and magnetic fields
EMS	Environmental Management Strategy
EnergyCo	Energy Corporation of NSW
EPA	Environmental Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979* / Regulation 2021 (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2021 (NSW)
EPBC	Environment Protection and Biodiversity Conservation
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPL	Environment Protection Licence
ESD	Ecologically sustainable development
EST	Energy Security Target
FM Act	*Fisheries Management Act 1994* (NSW)
GHD	GHD Pty Ltd
GPM	Generator Property Management Pty Ltd
GW	Gigawatts
Heritage Act	*Heritage Act 1977*
HEPA	Heads of EPAs Australia and New Zealand
HIPAP	Hazardous Industry Planning Advisory Paper
HV	High Voltage
Hz	Hertz (unit of measure of frequency)
IBRA	Interim Biogeographic Regionalisation for Australia
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICNRP Guidelines	Limiting Exposure to Time-varying Electric and Magnetic Fields (1hz – 100khz) (2010)
IPAC	Invasive Plants and Animals Committee
ISP	Integrated System Plan
kHz	Kilohertz (unit of measure of frequency)
kL	Kilolitres
kV	Kilovolt
kV/m	Kilovolt per metre
LEP	Local Environmental Plan
LFP	Lithium-iron-phosphate
LGA	Local Government Area
LoS	Level of Service
mbgl	Metres below ground level
mG	Milligauss
MNES	Matters of National Environmental Significance
MW	Megawatts
MWh	Megawatt hours
NCA	Noise catchment areas
NCC	National Construction Code
NEM	National Energy Market
NEMP	National Environmental Management Plan

Term/abbreviation	Definition
NFPA	National Fire Protection Association (USA)
NML	Noise Margin Low
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
NSW EPA	Environment Protection Authority of NSW
OEMP	Operations Environmental Management Plan
OSOM	Oversize over mass
PCT	Plant Community Type
PFAS	Per- and poly-fluoroalkyl substances
PHA	Preliminary Hazard Analysis
Planning Systems SEPP	State Environmental Planning Policy (Planning Systems) 2021
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
QNI	Queensland – New South Wales Interconnector
RE1	Scattered pockets of public areas
RE2	Scattered pockets of private areas
REZ	Renewable Energy Zone
RF Act	*Rural Fires Act 1997* (NSW)
RFS	Rural Fire Service
Roads Act	*Roads Act 1993* (NSW)
Resilience and Hazards SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
SANSW	Subsidence Advisory NSW
SCATS	Sydney coordinated adaptive traffic system
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SIA	Social Impact Assessment
SIDRA	A software model used to evaluate the performance of traffic intersections and networks.
SIPS	System Integrity Protection Scheme
SSD	State Significant Development
SSI	State Significant Infrastructure
TBDC	Threatened Biodiversity Data Collection
TfNSW	Transport for NSW
The Minister	Minister for Planning
Transport and Infrastructure SEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
UL	UL Solutions, a USA-based standards and safety body
VBB	Victorian Big Battery Fire
VL	Viewpoint location
V/m	volts per metre
VNI	Victoria – New South Wales Interconnector
WM Act	*Water Management Act 2000* (NSW)

Executive summary

Project overview

The NSW Government, through the Energy Corporation of NSW (EnergyCo), is developing the 'Waratah Super Battery' to ensure NSW continues to have reliable, affordable energy supplies following the planned closure of the Eraring Power Station in 2025. The Waratah Super Battery is designed to be a System Integrity Protection Scheme (SIPS) control and standby network battery system, dedicated to supporting the transmission grid. The battery component of the project is part of the SIPS and is designed primarily to provide reserve transmission capacity and stability, rather than additional electricity storage capacity.

The Waratah Super Battery would be the largest standby network battery in the Southern Hemisphere and together with other minor transmission upgrades, would allow Sydney, Newcastle, and Wollongong consumers to access more energy from existing and emerging electricity generation.

The Waratah Super Battery project will include:

– A SIPS system, designed to reserve and deploy battery power to support the NSW electricity grid when triggered by a contingency event.
– Up to 850 megawatts (MW) active power.
– Up to 1,680-megawatt hours (MWh) battery storage capacity.
– Connecting transmission and related infrastructure to connect the SIPS to the existing grid.
– Other infrastructure and services required for the project.

Outline of project need

In recent years, there has been an acceleration of plans for retirement and decommissioning of traditional fossil fuel (mainly coal) generators due to aging infrastructure together with an acceleration in deployment of large-scale renewable energy generators in the National Energy Market (NEM). Four of NSW's five remaining coal-fired generators are set to reach the end of their technical lives and close by 2032. The most recent closure announcement is the Eraring Power Station (capacity of 2,800 MW) which is scheduled to close in 2025, seven years earlier than previously scheduled.

As a result of announced and predicted generation closures, the Australian Energy Market Operator (AEMO) Energy Security Target Monitor Report (released in May 2022) identified and brought forward the projected breach of the 10-year Energy Security Target from 2029-30 to 2025-26 (AEMO 2022a). As coal-fired power stations close, and as more intermittent renewable energy generators enter the market (e.g., intermittent wind and solar), large-scale, highly efficient, and rapidly dispatchable back-up electricity generation (e.g., battery energy storage systems, pumped hydro, and gas) will be required and are critically important to the stability of the National Electricity Market (DPIE 2020). New transmission developments are also needed that increase transfer limits into Sydney, Newcastle, and Wollongong.

The Sydney Ring Project is a key project identified by AEMO (AEMO, 2022) that if implemented, would unlock access to already committed firm generation and storage capacity and bring the Energy Security Target closer to surplus in 2032-33 (AEMO, 2022b).

The Waratah Super Battery, a critical early component of the Sydney Ring Project, is being developed as a Priority Transmission Infrastructure Project, as set out under the NSW *Electricity Infrastructure Investment Act 2020* (EII Act), consistent with AEMO's identification of the project as an actionable NSW project in the 2022 Integrated System Plan. The Waratah Super Battery would operate in conjunction with a SIPS, providing a virtual transmission solution with the primary purpose of ensuring the reliability and security of the NSW electricity grid.

Site location and key characteristics

EnergyCo is proposing the Waratah Super Battery be developed within the former Munmorah Power Station site on the Central Coast of NSW, Figure ES.1.

Paper Size ISO A4

0 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Regional location of proposed Waratah Super Battery

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE ES-1

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12582669_EIS_ES_001_FigES1_ProjectLocation
Print date: 26 Oct 2022 - 12:19

Data source: NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; World Street Map: Esri, HERE, Garmin, Foursquare, METI/ NASA, USGS
World Street Map: Esri, HERE, Garmin, FAO, NOAA, USGS. Created by: mfredle

The Munmorah Power Station operated for approximately 50 years, before closing in June 2012. It has a total area of approximately 727 hectares and is owned by Generator Property Management Pty Ltd (GPM). GPM is a NSW government-owned company with responsibility for decommissioning, demolition, and remediation of former power station sites remaining in public ownership.

GPM is managing the rehabilitation of the former power station lands, and is undertaking further rehabilitation, remediation, and maintenance works in accordance with its existing approvals.

Three potential sites were considered within the former power station. The preferred site has an area of approximately 14 hectares and was previously used as the coal stockpile area for the power station. It was selected as compared to the other two options, it lacks significant environmental constraints, in particular heritage, biodiversity, and flooding. A recent aerial view of the preferred project site is provided in Figure ES.2.

Figure ES.2 Aerial view of the preferred project site at the former Munmorah Power Station (September 2022)

The proponent

The Energy Corporation of NSW (EnergyCo) is the proponent for the Waratah Super Battery project (Website: **Waratah Super Battery | EnergyCo NSW).**

EnergyCo is a statutory authority established under the *Energy and Utilities Administration Act 1987* (NSW) and the EII Act. EnergyCo is responsible for leading the delivery of Renewable Energy Zones (REZs) as part of the NSW Government's Electricity Infrastructure Roadmap (DPIE 2020).

EnergyCo has undertaken a detailed procurement process for the development and operation of the Waratah Super Battery. As a result, in mid-October 2022 the Minister for Energy announced that Transgrid will be appointed as the network operator of the project, and Akaysha Energy (Akaysha) will be appointed as the service provider for the project. In this regard, Transgrid will be responsible for operating the SIPS, while Akaysha will be responsible for constructing and operating the battery energy storage system.

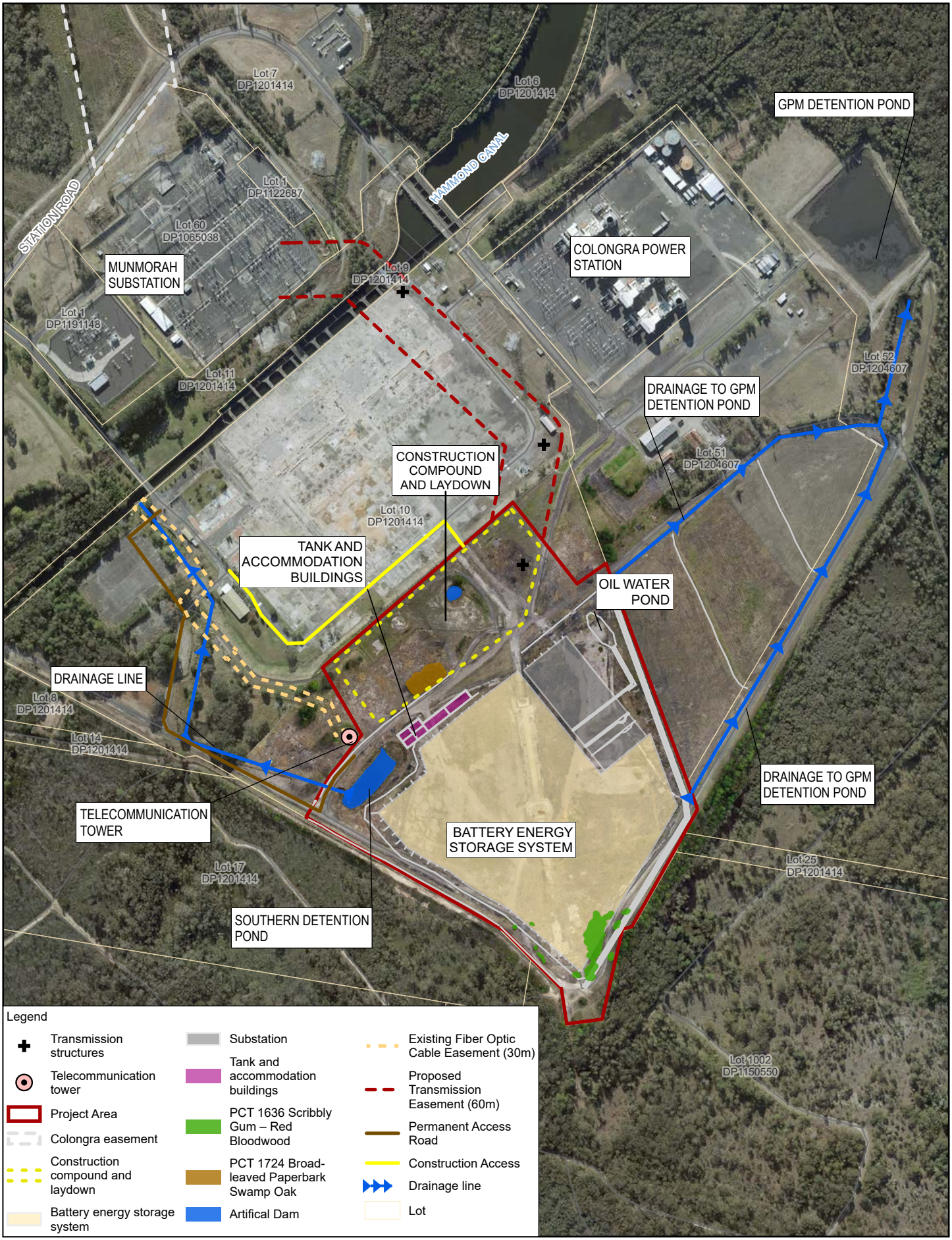
Key features of the project

The Waratah Super Battery project consists of a SIPS control and standby network battery system dedicated to supporting the transmission grid. The SIPS system is designed to reserve and deploy battery power to support the NSW electricity grid when triggered by a contingency event.

A summary of the key project components and functionality is provided in Table ES.1. The project site is shown in Figure ES.3.

Table ES.1 Overview of the Waratah Super Battery

Project element	Summary
Battery energy storage system capacity	– 850 MW active power. – 1,680 MWh battery storage capacity.
Size of individual battery units	– Up to 3.3 metres high, 1.6 metres wide, and 2.5 metres deep
SIPS operator/ NEM connection	– Transgrid/Munmorah Substation.
Service Provider (on behalf of EnergyCo)	– Akaysha Energy, selected via competitive tender process to develop and operate the project.
Battery technology	– Lithium iron phosphate
Availability	– 24 hours a day/seven days a week/365 days per year.
Project site area	Project site: 13.74 ha Easements: transmission 2.68 ha, access road 0.23 ha
Subdivision	Subdivision of 13.74 ha of Lot 10/ DP1201414 to create a lot(s) for the project site, and creation of easements for project-related infrastructure. Residual lot size approximately 19.42 ha.
Proposed infrastructure	– Battery energy storage system (including batteries, inverters, earthing, transformers, and switchgear).
Transmission and related infrastructure	– Switchyard on the project site – Overhead transmission line including three transmission line supporting structures (approximately 650 m and up to 45 m tall) and related infrastructure to connect to the existing Transgrid Munmorah Substation.
Ancillary infrastructure	– Upgraded permanent (internal) access road. – Site services, including power, water, on-site sewage management, stormwater drainage, and telecommunications. – Operation and maintenance building, storage yard, and light and heavy vehicle parking. – Signage and security. – No works outside the former Munmorah power station are required for the project. All main and ancillary project components would be located on part of Lot 10/ DP 1201414.
Estimated employment	Up to 150 construction (peak), 10-15 during operation.
Construction access/ permanent access roads	Via upgrades to existing paved or gravelled roads on site.
Construction worker parking	On-site at an existing hardstand area located south of Hammond Canal and west of the former power station.
Duration of construction (indicative)	18 months.



Paper Size ISO A4

0 50 100 150

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Project site and proposed site arrangement

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Date **1/11/2022**

FIGURE ES-3

Data source: Fibre Optic Easement - Energy Co; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service: .
Created by: mfredle

Construction

Key construction activities would involve the following:

– Clearing of remnant vegetation.
– Earthworks and site re-grading.
– Development of ancillary infrastructure and buildings.
– Establishment of a laydown area.
– Works including establishment of slabs to support battery modules, power conversion systems and transformer structures.
– Delivery, installation and electrical fit-out of the battery modules, power conversion systems and transformers.
– Installation of 330kV switchyard and 650 metres of overhead transmission line from the battery switchyard to the existing Munmorah Substation.
– Establishment of asset protection zones or other design solutions for bushfire protection.

Up to 150 personnel would be required during the construction peak, with the main construction phase occurring over a period of approximately 18 months. The majority of construction activities would be carried out during the following hours, consistent with the recommended standard hours of the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009):

– 7am-6pm Monday to Friday.
– 8am-1pm Saturdays.
– No work on Sundays or Public Holidays.

Operation

The battery component of the project is part of the SIPS and is designed to provide 24/7 reserve transmission capacity and assist network stability. The SIPS will be operated by Transgrid. It would respond to a SIPS signal and discharge based on network conditions as determined by the network operator. In this respect, the battery will have the capability to:

– Reduce potential network constraints and improve intra-network energy flow by avoiding potential overloading of transmission assets and reducing potential generating constraints
– Discharge when the network would require additional generation to maintain load balance e.g. when a substantial amount of generation may be lost due to a network contingency event or due to large generators becoming unavailable

Operation of the project will largely be undertaken remotely, however approximately 10 to 15 personnel would be required to attend the site on a regular basis to perform a variety of maintenance and operational activities.

Decommissioning and rehabilitation

The functional life of the battery units is expected to be 20 years, with units progressively replaced or upgraded as they are assessed to be degraded. At the end of their design life or agreed timetable, the batteries would either be disposed of and recycled at approved disposal facilities, or subject to confirmation, could be returned to the original equipment manufacturer for refurbishment and repurposing or recycling. If and when the project is decommissioned, the land would be rehabilitated to a standard agreed with the landowner, which may include pre-development conditions or other arrangements.

Planning approval process

The *Environmental Planning and Assessment Act 1979* (EP&A Act) (NSW) is the principal legislation regulating development in NSW. It establishes a regime for the making of development applications, assessment of their environmental impacts, and the determination of those applications. It also allows for the making of environmental planning instruments such as State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs).

Part 5, Division 5.2 of the EP&A Act provides for declaration, assessment, and approval of State Significant Infrastructure (SSI) and Critical State Significant Infrastructure (CSSI). The process for environmental assessment and approval of SSI and CSSI is set out as follows:

– Application for approval of the Minister for Planning (the Minister) to carry out development.
– Development of Planning Secretary's Environmental Assessment Requirements (SEARs).
– Preparation of an Environmental Impact Statement (EIS).
– Public exhibition of the EIS.
– Response to submission(s) received during public exhibition of the EIS.
– Preparation of Planning Secretary's Assessment Report.
– Determination regarding the development by the Minister.

On 2 September 2022, the Waratah Super Battery project was declared CSSI in accordance with section 5.13 of the EP&A Act and Schedule 5, section 30 of State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). The Minister for Planning is the consent authority, and the project is to be assessed in accordance with the provisions of Division 5.2 of the EP&A Act.

The project is not expected to result in a significant impact on any Matters of National Environmental Significance (MNES) and therefore approval is not required for the project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). As such, the project has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW).

Community and stakeholder engagement

Engagement with the community and other key stakeholders has been important for developing the project. Stakeholders were identified as those that may be interested in, or who may be affected by, the Waratah Super Battery and included:

– Government and technical stakeholders.
– Landowners.
– The wider community.

Community and stakeholder members were consulted on various aspects of the project using a range of tools and techniques including meetings, phone calls, letters, emails, website updates, and newsletters. These were supported by community feedback mechanisms, including a project-specific phone number and email address.

The general sentiment on the project from engagement activities was neutral to broad support. Support was generally associated with the beneficial use of the former Munmorah Power Station site and supportive of the initiative to support the integrity of the NSW power supply.

A number of local issues were raised by various stakeholder groups during the preparation of the Scoping Report and the EIS. These issues focused largely on the risk of fire, contaminated land, noise and maintenance of access to other site facilities.

Stakeholders will continue to be identified and consulted during the environmental impact assessment/approvals phase, and if approved, during the construction, operation, and decommissioning and rehabilitation phases of the Waratah Super Battery.

Environmental assessment

The project site has been selected and the project designed to avoid and/or minimise environmental and community impacts. However, there would be some temporary and permanent impacts during construction. For each environmental matter, the potential impacts associated with the construction, operation, and decommissioning and rehabilitation of the project has been identified and mitigation measures provided to eliminate or reduce potential impacts associated with the project. A summary of the key potential impacts and measures to manage them are summarised in Table ES.2.

Table ES.2 Summary of environmental, social, and economic impacts of the Waratah Super Battery

Issue	Summary of potential impacts
Biodiversity	While the project site is largely disturbed, the project would result in residual direct impacts to a total of 0.46 hectares of native vegetation in moderate condition. The direct impacts include 0.20 hectares of PCT 1636, and 0.26 ha of PCT 1724 (commensurate with Swamp Sclerophyll Forest Threatened Ecological Community). Outside of these mapped areas, the majority of the project site is already cleared and denuded. The areas of native vegetation are fragmented providing minimal fauna habitat and connectivity in the context of the surrounding landscape. Vegetation clearing outside of the mapped PCT 1636 and PCT 1724 consists of the removal of non-native plants including priority and high threat exotic species. The removal of 0.46 hectares of native vegetation is insignificant at the regional scale and is unlikely to threaten the persistence of populations of native plants and vegetation communities. The project would result in direct impacts for one threatened flora species recorded within the project site, Charmhaven Apple (*Angophora inopina*). Seventeen additional threatened flora and fauna species have the potential to be present within the project site. The project would remove up to 0.46 hectares of habitat resources for these species. The clearing of 0.46 hectares of native woodland and forest would include the removal of a relatively young forest with no large canopy trees harbouring hollows appropriate for fauna. The habitat is also fragmented and exists within a completely fenced site with limited fauna permeability. The removal constitutes a small proportion of available flora and fauna resources. Plot and transect data collected at the site corroborates this interpretation as no hollow bearing trees exist. Potential indirect impacts are considered limited as they would have a low likelihood and consequence due to a range of mitigation measures that would be implemented. No prescribed impacts are considered of high relevance to the project. A range of proposed mitigation and management measures have been proposed for residual impacts. These include measures that would be undertaken during the construction and operation of the project. Further surveys are proposed in the appropriate season in 2022 to confirm presence or absence of species assumed present, and to verify the impacts of the project.
Aboriginal and non-Aboriginal heritage	The heritage assessment indicates that the project is unlikely to result in any heritage-related impacts. No previously recorded Aboriginal heritage sites/objects have been recorded within the project site. The project site has been highly disturbed from the construction and demolition of the coal loader bunker associated with the former Munmorah Power Station. Based on the history of previous disturbance of the project site, and the visual inspection undertaken during the heritage assessment, it is highly unlikely that there would be Aboriginal sites/objects present within the project site. As such, it is highly unlikely that there would be impacts to Aboriginal heritage during construction, operation, or decommissioning and rehabilitation of the Waratah Super Battery. There are no statutory non-Aboriginal heritage listed items within the project site. Given the high historical levels of disturbance at the project site, it is not expected there would be any impacts to non-Aboriginal heritage during construction, operation, or decommissioning and rehabilitation of the Waratah Super Battery. Mitigation measures, specifically the implementation of unexpected finds protocols, would be implemented to avoid or minimise potential impacts to heritage during construction, operation, and decommissioning and rehabilitation of the Waratah Super Battery.
Land	The Munmorah Power Station, including the project site, is currently being assessed by the Environment Protection Authority (EPA) to determine whether regulation is required under the Contaminated Land Management Act 1997. Site contamination assessment within the project site indicates while some contamination is present, it is unlikely to constrain the development of the Waratah Super Battery project, subject to remediation by GPM. GPM has engaged a NSW EPA-accredited Site Auditor to review the works necessary to remediate historical contamination at the site to make it suitable for its future use as industrial land. These works would be completed prior to construction of the Waratah Super Battery. Based on these works being completed and site-specific controls being implemented in the form of a site management plan, there are expected to be minimal contamination risks associated with construction of the project. Construction of the project could increase the risk of erosion and sedimentation and potentially impact on sensitive receiving environments. There is potential for fuels and chemicals to spread into the surrounding environment, including into site soils and groundwater from accidental spills and leaks from equipment if not appropriately managed. It is unlikely that acid sulfate soils would be encountered due to the imported fill present at the site and the anticipated depth of disturbance likely to be less than 1.5 metres. A land use conflict risk assessment was carried out to identify land use compatibility and potential conflict between neighbouring land uses. Based on the risk evaluation conducted, residential development and recreational/ conservation land do not require management strategies to reduce the risk of conflict with the project. The risk of land use conflict with the project is considered low.

Issue	Summary of potential impacts
	Management procedures and safeguards as listed in Section 6.4.5 would be implemented to prevent risk scenarios occurring.
Visual	Based on a visibility assessment, it was determined that the project would only be visible from limited offsite locations. Five representative viewpoint locations were chosen from surrounding areas located nearest the project for consideration of potential visual impacts. Due to existing surrounding trees and vegetation, topography, distance, and the relatively low height of the battery storage, it is unlikely that the main component (the battery energy storage system) would be visible from the surrounding areas including from public roads and dwellings and impacts are predicted to be negligible. The transmission towers are the tallest elements of the project, however, due to their scale and intervening trees, vegetation and urban development, potential impacts at all five locations (viewpoints) were assessed as negligible.
Noise	An assessment of potential noise impacts during the construction phase has been undertaken against the ICNG during recommended standard construction hours. Construction noise levels during site preparation are predicted to result in noise levels above the NML at three residential receivers within the study area. These exceedances are not greater than 5 dBA above the NML (1-2 dBA) and are, therefore, able to be managed with reasonable and feasible mitigation measures. Noise modelling was undertaken based on available data using CadnaA computer software to predict operational noise levels at sensitive receivers and assessed against the NPfI project noise trigger levels during the day, evening, and night periods. The assessment was based on worst-case operating conditions likely to occur during these assessment periods and is considered a conservative assessment. The noise modelling indicates compliance at all residential sensitive receiver locations for all modelled operations during the day and evening periods and compliance should also be achieved during the night-time period for expected ambient conditions.
Transport	A traffic assessment was undertaken to determine the potential impact on traffic and transportation associated with the construction, operation, and decommissioning and rehabilitation of the project. Based on a review of traffic and transport facilities in proximity to the project site and an analysis of trip generation and trip distribution, including consideration of other major projects in the vicinity, it is expected that the project would have a negligible impact on the adjoining road and transport network. Mitigation measures would be implemented prior to construction and during construction to minimise impacts to traffic and transport networks and minimise environmental impacts associated with the movement of vehicles during construction, including the development of a construction traffic management sub-plan.
Water	A water impact assessment was undertaken to identify potential impacts to water (water use, surface water and flooding and groundwater) during the construction, operation, and decommissioning and rehabilitation of the project. Impacts were assessed based on the general nature of the proposed construction works and the existing site drainage and detention features at the site. Mitigation and management controls are proposed as part of detailed design development and construction planning to limit potential for off-site movement of any pollutants or contaminated sediments. Principally, this would be in the form of a construction soil and water management sub-plan. Detailed design would also include a review of site hydrology and drainage and detention infrastructure and incorporate measures to limit the potential for offsite impacts (quantity, velocity and quality). The assessment identified that by implementing standard mitigation measures to manage potential risks to water resources, no unacceptable impacts to water would be anticipated.
Hazards	The preliminary hazard assessment involved a preliminary risk screening of the project in accordance with the requirements of Resilience and Hazards SEPP. While the results of the dangerous goods and transport screening indicated that the project does not exceed any of the thresholds within the Resilience and Hazards SEPP, due to the potential for explosion and fire associated with the operation of the lithium-iron battery storage, the project was considered "potentially hazardous". The initial hazard identification process considered hazards during construction, operation, and decommissioning and rehabilitation. Fire starting as a result of construction and/or decommissioning and rehabilitation activities is considered a plausible event, as is the interaction with heavy machinery, but are unlikely to result in off-site impacts. Both would be managed through the preparation of a construction management sub-plan, and when required, a decommissioning and rehabilitation management sub-plan. During operation, fires started at the Waratah Super Battery are a credible risk and may pose off-site impacts. Given the risk, a Level 2 preliminary hazard assessment was conducted. The Level 2 assessment determined that the risk arising from the three thermal runaway scenarios does not exceed the individual fatality or injury risk criteria specified in the NSW Department of Planning and Environment's 2011 publication Hazard Industry Planning Advisory Paper (HIPAP) No. 4 – Risk Criteria for Land Use Safety Planning.

Issue	Summary of potential impacts
	The project presents a minimal electric and magnetic fields risk to the general public and workers as the electric and magnetic field levels are well below the levels contained within the ICNIRP guidelines. The preliminary hazard assessment demonstrates that the project could be designed, constructed, operated, and decommissioned in a manner that would meet relevant regulations, standards and policies. The project has also adopted a lithium-iron phosphate battery chemistry which poses a lower risk of thermal runaway. Therefore, the project does not pose any significant risk or offence to the environment or community.
Bushfire	The design of the project is inherently bushfire resilient being comprised of batteries housed within steel-walled housings (non-combustible) in which any vents are dust-proof (ember proof) with internal climate control to maintain internal operating temperatures within design parameters. Battery housings are secured on concrete pads with non-combustible crushed rock surface cover between pods, and all electrical connections are underground. Provision of a 25-metre asset protection zones on the western and southern sides of the Waratah Super Battery (the only locations where bushfire-prone vegetation is present within 100 metres of the project site) can achieve an acceptable degree of bushfire protection for the project, taking into account its design and its contained, steel walled structure. Proposed site access via extension of the existing access can meet the requirements of the Planning for Bushfire Protection guidelines (NSW Rural Fire Service (RFS), 2019), and the proposed all-weather access perimeter road around the battery energy storage system would provide suitable access for firefighting, and an appropriate defendable space. No part the overhead electrical transmission would be in proximity of a tree closer then the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines. With the recommended bushfire protection measures in place, the project can meet the aims and objectives of Planning for Bushfire Protection guidelines (NSW RFS 2019). Risks of vegetation fire ignition and spread during the construction, operation, and decommissioning and rehabilitation stages have been assessed and can be maintained at a low risk level with the implementation of the identified risk controls.
Social and economic	The social impact assessment considered the potential socio-economic impacts resulting from the construction and operation of the proposed Waratah Super Battery. During construction, potential social benefits include: – Direct and indirect procurement opportunities for local and regional businesses. – Potential employment opportunities for up to 150 workers in the local and regional area. – Increased patronage and expenditure at some local and regional businesses, particularly food and beverage businesses in Budgewoi. Construction activities are also expected to result in the following minor potential social impacts: – Reduced amenity from an increase in noise, vibration and dust and visual changes, which has the potential to affect recreational users of Koala Park and some local residents' wellbeing. – Increase in traffic volumes for local residents and road users. – Potential increased demand for local accommodation. Some impacts may be experienced by residents as a result of operation of the project, including: – Changes to local amenity (increased noise and visual impacts). – Negative perception due to the uncertainty about battery storage technology and bushfire risk associated with potential battery overheating may lead to stress and worry for some residents in the area. Most social impacts that are likely to occur during construction are temporary in nature and are expected to be minimised by the recommended mitigation measures. Mitigation and management measures have been recommended to avoid, minimise and manage potential social impacts, and enhance social benefits. This includes targeted and ongoing engagement with local and regional residents and stakeholders, accommodation strategy and a local procurement and Aboriginal employment plan. In relation to the economic benefits of the project, the project represents a major, direct capital investment of approximately $1 billion in the state of NSW which is further increased through the multiplier effect when considering indirect employment and other flow-on economic benefits. The project is needed to address a forecast breach of the energy security target and is critical to addressing energy cost, security and reliability issues for NSW residents. The Minister for Energy has directed the network operator to carry out the Waratah Super Battery project as a Priority Transmission Infrastructure Project under the EII Act. Ensuring that Priority Transmission Infrastructure Projects provide economic benefits to NSW residents is a fundamental consideration under the EII Act.

Issue	Summary of potential impacts
Waste	The project is not expected to generate large volumes of waste during construction, operation, or decommissioning and rehabilitation. Waste generated during construction would be managed using circular economy principles and the waste hierarchy approach of avoidance and reuse before consideration is given to disposal. Wastes would be managed in accordance with the waste provisions contained within the POEO Act and other relevant legislative and policy requirements. Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the NSW EPA (2014) Waste Classification Guidelines (NSW EPA 2014). At the end of their design life or agreed timetable, the batteries would either be disposed of and recycled at approved disposal facilities, or subject to confirmation, could be returned to the original equipment manufacturer for refurbishment and repurposing or recycling. The proposed approach to managing construction, operation and rehabilitation and decommissioning waste, including measures to facilitate segregation, recycling (including batteries) and prevent cross contamination would be documented in the respective waste management and spoil management sub-plans. With the implementation of these plans and the mitigation measures identified, waste management activities would not have a significant impact on the environment or human health.

Justification and conclusion

The Waratah Super Battery is considered to be justified because it:

– Responds to a critical, recognised need and is consistent with several state and federal government plans, policy, and guidelines with regards to planning for a reliable, affordable, and sustainable electricity future in NSW.
– Is proposed on a site which is already appropriately zoned for energy infrastructure, was formerly used for operation of the Munmorah Power Station, is remote from sensitive receivers and would not result in any foreseeable land use conflicts with surrounding developments.
– Provides major, short-term and long-term benefits to Sydney, including the Central Coast, Newcastle, Wollongong, and NSW.
– Would not result in significant, adverse environmental, social, or economic impacts.
– Is consistent with the principles of ecologically sustainable development, the objects of the EP&A Act and is considered to be in the public interest.

The project is considered critical to avoid a forecast breach of the EST and in supporting the NSW Government's electricity strategy and infrastructure roadmap. The project has been designed and assessed with regard to the matters for consideration under Section 5.16 of the EP&A Act, including the objects of the EP&A Act and is considered to be consistent with the principles of ecologically sustainable development and therefore in the public interest.

How can I comment on the project and/or the EIS?

Public exhibition

The EP&A Act requires exhibition of an EIS for public comment for a minimum period of 28 days.

During the exhibition period, the EIS can be viewed on the NSW Department of Planning and Environment's Major Projects website (available at: **Major Projects**).

Further information about the Waratah Super Battery is provided on the project website: **Waratah Super Battery | EnergyCo NSW**

Making a submission

Submissions about the project are invited during the exhibition period from any interested person or organisation. Submissions can be made to the NSW Department of Planning and Environment via the Major Project's website (available at: **Major Projects**) or in writing at:

Javier Canon
Planning and Assessment Team
Department of Planning and Environment
Locked Bag 5022
Parramatta NSW 2124.

Details on how to make a submission are provided on the project website and in other communication material. All submissions must be received before the close of the exhibition period (as detailed on the project website and the NSW Department of Planning and Environment's Major Projects website).

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1. Introduction

1.1 Background

1.1.1 Project overview

To ensure New South Wales (NSW) continues to have a reliable energy supply following the planned closure of the Eraring Power Station in 2025, the NSW Government is procuring a System Integrity Protection Scheme (SIPS) control and standby network battery system, dedicated to supporting the transmission grid.

The project, known as the 'Waratah Super Battery', includes:

– A SIPS system, designed to reserve and deploy battery power to support the NSW electricity grid when triggered by a contingency event.
– Up to 850 megawatts (MW) active power.
– Up to 1,680-megawatt hours (MWh) battery storage capacity.
– Connecting transmission and related infrastructure to connect the SIPS to the existing grid.
– Other infrastructure and services required for the project.

The battery component of the project is part of the SIPS and is designed primarily to provide reserve transmission capacity and stability, rather than additional electricity storage capacity. In this regard, the Waratah Super Battery would allow consumers to access more energy from existing electricity generators while maintaining network security.

The Waratah Super Battery would be the largest standby network battery in the Southern Hemisphere and together with other minor transmission upgrades, would allow Sydney, Newcastle, and Wollongong consumers to access more energy from existing electricity generation.

The proposed battery energy storage system, connecting transmission and related infrastructure, and ancillary infrastructure is referred to as 'the project' or 'the Waratah Super Battery'. The regional location of the Waratah Super Battery is shown in Figure 1.1.

1.1.2 Outline of project need

In recent years, there has been an acceleration of plans for retirement and decommissioning of traditional fossil fuel (mainly coal) generators due to aging infrastructure together with an acceleration in deployment of large-scale renewable energy generators in the National Energy Market (NEM).

Four of NSW's five remaining coal-fired generators are set to reach the end of their technical lives and close by 2032. The first to close will be AGL's Liddell Power Station (capacity of 2,000 MW) that will be retired in stages, with one unit closed in April 2022 and the remaining three units to be shut down in April 2023. Eraring Power Station (capacity of 2,800 MW) has recently been announced as closing in 2025, seven years earlier than scheduled. Vales Point Power Station (capacity 1,320 MW) is expected to close in 2029. Bayswater Power Station (capacity of 2,640 MW) is slated to be closed in 2032 and the last remaining coal-fired power station in NSW – Mount Piper Power Station (capacity 1,400 MW) – is predicted to close in 2040.

The NSW Electricity Infrastructure Roadmap (DPIE 2020) is the NSW Government's plan to deliver a modern electricity system for NSW. It focusses on delivering new large-scale generation, transmission, and storage to provide secure, reliable electricity; lower electricity bills; and around 90 million tonnes in carbon emission reductions in NSW.

The NSW Government has appointed the Australian Energy Market Operator (AEMO) as the Energy Security Target Monitor for the Electricity Infrastructure Roadmap. Under the appointment, AEMO is responsible for calculating and setting a 10-year Energy Security Target (EST) for NSW. This target is designed to ensure that there will be reliable supplies of electricity available to meet demands over the medium term. AEMO is also responsible for assessing and monitoring whether the firm capacity (generation, firming and storage, transmission capacity) is sufficient to meet the EST.

In May 2022, following Origin Energy's announcement regarding the planned early closure of Eraring Power Station in 2025, AEMO released an updated Energy Security Target Monitor Report. The report identified and brought forward a projected breach of the EST from 2029-30 to 2025-26 in addition to a general worsening from 2029-30 onward (Australian Energy Market Operator (AEMO) 2022a). Also forecast are major constraints on intra-regional transmission infrastructure between the outer and inner sub-regions of NSW that supply consumers in Sydney, Newcastle, and Wollongong during peak demand periods (AEMO 2022a).

As coal-fired power stations close, and as more intermittent renewable energy generators enter the market (e.g., wind and solar that are weather-dependent), large-scale, highly efficient, and rapidly dispatchable back-up electricity generation (e.g., battery energy storage systems, pumped hydro, and gas) will be required and is deemed critically important to the stability of the NEM (Department of Planning Industry and Environment (NSW) (DPIE) 2020). New transmission developments are also needed that increase transfer limits into Sydney, Newcastle, and Wollongong.

Numerous projects were described in the 2021 Energy Security Target Monitor Report that are designed to increase intra-regional transmission limits. As outlined in AEMO's 2020 Integrated System Plan, if HumeLink and the Sydney Ring Project, which includes the Waratah Super Battery (this project) were to be implemented, they would unlock access to approximately 2,500 MW of already committed firm generation and storage capacity. As a result, the Energy Security Target (EST) would be in surplus until 2032-33 when all four of the five existing coal-fired generators are predicted to have closed.

The Waratah Super Battery would operate in conjunction with the SIPS, providing a virtual transmission solution with the primary purpose of increasing transmission capacity from the regions of NSW into Sydney, Newcastle, and Wollongong.

The Waratah Super Battery, a critical early component of the Sydney Ring Project, is being developed as a Priority Transmission Infrastructure Project, as set out under the NSW *Electricity Infrastructure Investment Act 2020* (EII Act), consistent with AEMO's identification of the project as an actionable NSW project in the 2022 Integrated System Plan.

1.2 The proponent

The Energy Corporation of NSW (EnergyCo) is the proponent for the Waratah Super Battery project (Website: **Waratah Super Battery | EnergyCo NSW)**.

EnergyCo is a statutory authority established under the *Energy and Utilities Administration Act 1987* (NSW) and the EII Act, and forms part of NSW Treasury. EnergyCo is responsible for leading the delivery of Renewable Energy Zones (REZs) as part of the NSW Government's Electricity Infrastructure Roadmap (DPIE 2020).

In 2020, the EII Act identified that EnergyCo will be appointed as the Infrastructure Planner for the State's first five REZs in the Central-West Orana, New England, South-West, Hunter-Central Coast and Illawarra regions.

As the Infrastructure Planner for these REZs, EnergyCo will recommend network infrastructure projects and will work closely with communities, investors, and industry to coordinate investment in renewable energy generation, electricity networks and storage infrastructure in REZs for the long-term benefit of energy consumers, local communities, and industry in NSW.

EnergyCo has undertaken a detailed procurement process for the development and operation of the Waratah Super Battery. As a result, in mid-October 2022 the Minister for Energy announced that Transgrid will be appointed as the network operator of the project, and Akaysha Energy (Akaysha) will be appointed as the service provider for the project. In this regard, Transgrid will be responsible for operating the SIPS, while Akaysha will be responsible for constructing and operating the battery energy storage system.

As part of the procurement process, potential service providers were invited to either nominate their own site (or sites) for development of the Waratah Super Battery, or to use a potential site identified by EnergyCo within the former Munmorah Power Station on the Central Coast. The successful tenderer, Akaysha Energy, nominated the Munmorah site, and as such the Waratah Super Battery is proposed to be developed on the former Munmorah Power Station site.

1.3 Site location and setting

The Waratah Super Battery is proposed to be located on a site within the former Munmorah Power Station site at Colongra on the Central Coast of NSW. The regional location of the Waratah Super Battery is shown in Figure 1.1.

The site of the former Munmorah Power Station comprises multiple land parcels, with a total combined land area of approximately 727 hectares. The power station operated for a period of approximately fifty years prior to its closure in June 2012. In 2016, the former power station and its surrounding land area was transferred to Generator Property Management Pty Ltd (GPM). GPM is a NSW government-owned company with, amongst other things, responsibility for decommissioning, demolition and remediation of power station sites remaining in public ownership.

GPM has previously managed the demolition and rehabilitation of the former power station, and is undertaking further rehabilitation, remediation and maintenance works in accordance with its existing approvals.

The proposed site for the Waratah Super Battery (the project site) comprises part of Lot 10 /DP120141 of the former Munmorah Power Station. The site has an area of approximately 14 hectares and was previously used as a coal stockpile area for the former power station. As a result of its previous use, the site is highly suited to a development of this type and is already largely cleared and level.

Other project-related infrastructure, such as access roads and a short transmission line, would be located in easements outside Lot 10 and within the wider Munmorah Power Station site.

Further details of the suitability of the site and surrounding land uses are provided in Section 2.3.

1.4 The project

1.4.1 Key features

The key features of the Waratah Super Battery are summarised in Table 1.1. A detailed description of the project is provided in Chapter 3.

Table 1.1 Key features of the Waratah Super Battery

Project element	Summary
Battery energy storage system capacity	– 850 MW active power. – 1,680 MWh battery storage capacity.
Size of individual battery units	– Up to 3.3 metres high, 1.6 metres wide, and 2.5 metres deep
SIPS operator/ NEM connection	– Transgrid/Munmorah Substation.
Service Provider (on behalf of EnergyCo)	– Akaysha Energy, selected via competitive tender process to develop and operate the project.
Battery technology	– Lithium iron phosphate
Availability	– 24 hours a day/seven days a week/365 days per year.
Project site area	Project site: 13.74 ha Easements: transmission 2.68 ha, access road 0.23 ha
Subdivision	Subdivision of 13.74 ha of Lot 10/ DP1201414 to create a lot(s) for the project site, and creation of easements for project-related infrastructure. Residual lot size approximately 19 ha.
Proposed infrastructure	– Battery energy storage system (including batteries, inverters, earthing, transformers, and switchgear).
Transmission and related infrastructure	– Switchyard on the project site. – Overhead transmission line including three transmission line supporting structures (approximately 650 m and up to 45 m tall) and related infrastructure to connect to the existing Transgrid Munmorah Substation.

Project element	Summary
Ancillary infrastructure	– Upgraded permanent (internal) access road. – Site services, including power, water, on-site sewage management, stormwater drainage, and telecommunications. – Operation and maintenance building, storage yard, and light and heavy vehicle parking. – Signage and security. – No works outside the former Munmorah power station are required for the project. All main and ancillary project components would be located on part of Lot 10/ DP 1201414.
Estimated employment	Up to 150 construction (peak), 10-15 during operation.
Construction access/ permanent access roads	Via upgrades to existing paved or gravelled roads on site.
Construction worker parking	On-site at an existing hardstand area located south of Hammond Canal and west of the former power station.
Duration of construction (indicative)	18 months.

1.4.2 Related development

GPM is in the process of undertaking continued rehabilitation, remediation and maintenance works in accordance with its existing approvals (DA/413/2014) within the project site (and surrounds). These works include the partial removal and backfilling of the coal loader bunker, removing the remaining coal residue and other debris, erosion control measures, and weed management, including the removal of exotic pine trees.

1.5 Project approval process

The *Environmental Planning and Assessment Act 1979* (EP&A Act) (NSW) is the principal legislation regulating development in NSW. It establishes a regime for the making of development applications, assessment of their environmental impacts, and the determination of those applications. It also allows for the making of environmental planning instruments such as State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs).

Part 5, Division 5.2 of the EP&A Act provides for declaration, assessment, and approval of State Significant Infrastructure (SSI) and Critical State Significant Infrastructure (CSSI). The process for environmental assessment and approval of SSI and CSSI is set out as follows:

– Application for approval of the Minister for Planning (the Minister) to carry out development.
– Development of Planning Secretary's Environmental Assessment Requirements (SEARs).
– Preparation of an Environmental Impact Statement (EIS).
– Public exhibition of the EIS.
– Response to submission(s) received during public exhibition of the EIS.
– Preparation of Planning Secretary's Assessment Report.
– Determination regarding the development by the Minister.

On 2 September 2022, the Waratah Super Battery project was declared CSSI in accordance with section 5.13 of the EP&A Act and Schedule 5, Section 30 of State Environmental Planning Policy (Planning Systems) 2021 (Planning Systems SEPP). The Minister for Planning is the consent authority, and the project is to be assessed in accordance with the provisions of Division 5.16 of the EP&A Act.

The project is not expected to result in a significant impact on any Matters of National Environmental Significance (MNES) and therefore approval is not required for the project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). As such, the project has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW).

Further detailed of the statutory context for the project are provided in Chapter 4.

Paper Size ISO A4

0 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Energy Co
Waratah Super Battery - Munmorah
Environmental Impact Statement

Regional location of proposed Waratah Super Battery

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 1.1

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12582669_EIS_001_Fig1_1_ProjectLocation
Print date: 26 Oct 2022 - 12:05

Data source: NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; World Street Map: Esri, HERE, Garmin, Foursquare, METI/NASA, USGS
World Street Map: Esri, HERE, Garmin, FAO, NOAA, USGS. Created by: mfredle

1.6 Document purpose and structure

1.6.1 Purpose

The EIS for the Waratah Super Battery – Munmorah has been prepared to support the application for project approval in accordance with the EP&A Act. It has been prepared to address the SEARs issued by the NSW Department of Planning and Environment (DPE) in October 2022. A table that lists the requirements with a reference to the chapter/section of the EIS that deals with that requirement is presented in Appendix A.

This EIS has also been prepared with reference to the *State Significant Infrastructure Guidelines – Preparing an Environmental Impact Statement*, Appendix B to *the State Significant Infrastructure Guidelines* (DPIE 2021a) and *Undertaking Engagement: Guidelines for State Significant Projects* (DPIE 2021b).

1.6.2 Structure

The EIS is presented in two volumes:

– Volume 1. Includes a detailed description of the project, provides its strategic and statutory context, describes the community engagement undertaken to date, and assesses the potential impacts upon environmental, social, and economic aspects.
– Volume 2. Contains supporting information. This includes a series of specialist studies that have informed the overall environmental impact assessment presented in Volume 1.

The structure and content of Volume 1 is summarised in Table 1.2. Supporting information, including specialist studies, included in Volume 2 are listed in Table 1.3.

Table 1.2 Structure and content of Volume 1

Chapter No.	Chapter title	Content
-	Executive summary	Provides an overview of all aspects of the environmental impact assessment of the project.
1	Introduction	Provides background to the project (including the strategic context and objective of the project), an overview of the proponent and the project, and the approval pathway. It also outlines the document purpose and structure.
2	Strategic context	Explains the strategic need for the project, benefits, consistency with government plans, policies and guidelines, and outlines the alternatives considered during development of the project.
3	Project description	Provides a detailed description of the project. Includes a description of the project area, the physical layout and design, uses and activities, and timing (stages, phases, and sequencing) of the project.
4	Statutory context	Provides the statutory context of the project, including an outline of the relevant legislation and environmental planning instruments applicable to the project.
5	Engagement	Discusses engagement undertaken with the community, including government agencies. Outlines how the community engagement aims have been addressed, the key issues raised by the community, and the proposed future approach to community engagement.
6	Assessment of impacts	Provides an assessment of impacts during construction, operation, and decommissioning and rehabilitation of the following issues: – Biodiversity. – Aboriginal and non-Aboriginal heritage. – Land. – Visual. – Noise. – Transport. – Water. – Hazards. – Bushfire. – Social and economic.

Chapter No.	Chapter title	Content
		– Waste. – Air quality. – Cumulative impacts. – Sustainability. Provides management measures to avoid or reduce impacts associated with construction, operation, and decommissioning and rehabilitation of the project.
7	Environmental management	Provides an overview of the overall framework for the environmental management of the project.
8	Justification and conclusion	Provides an overview of the conclusions from the environmental impact assessment and discusses the project's justification on balance of environmental, social and economic considerations, including ecologically sustainable development (ESD).
9	References	Provides a list of references used throughout the EIS.

Table 1.3 Structure and content of Volume 2

Appendix	Appendix title
A	Secretary's Environmental Assessment Requirements
B	Statutory compliance table
C	Compilation of mitigation measures
D	Biodiversity Development Assessment Report
E	Contamination assessment
F	Aboriginal and non-Aboriginal heritage assessment
G	Noise and vibration assessment
H	Traffic data
I	Water impact assessment
J	Hazard and risk assessment
K	Social Impact Assessment

2. Strategic context

2.1 Project need

2.1.1 Overview

The energy sector is undergoing a major transformation from large fossil fuel (mainly coal) generation towards renewable (mainly wind and solar) generators (DPIE 2020 and Australian Energy Regulator 2020). With this transition to renewable energy, and with the variable nature of wind and solar generation, there is a need for investment in battery energy storage systems which are deemed critically important to the energy security and stability of the NEM (DPIE 2020a and Australian Energy Regulator 2020). Also required are new transmission developments that increase intra-regional transfer limits into the Sydney, Newcastle, and Wollongong areas to help alleviate major transmission constraints and to reduce EST deficits in the next decade, as predicted by AEMO (AEMO 2021 and AEMO 2022a).

This section outlines the need for the Waratah Super Battery. It outlines how our electricity system operates, how our electricity system is changing from fossil fuel generation towards renewable energy, and what action is needed to ensure a reliable electricity supply for consumers in NSW.

2.1.2 How the electricity system operates

2.1.2.1 Structure of the electricity system

Electricity supply in the eastern part of Australia is served by the NEM. It interconnects five regional market jurisdictions – Queensland, NSW (including the Australian Capital Territory), Victoria, South Australia, and Tasmania. Western Australia and the Northern Territory are not connected to the NEM.

The National Electricity Law and the National Electricity Rules are the main laws that regulate the NEM. They are enabled in NSW through the *National Electricity (New South Wales) Act 1997* (NSW).

Three national market bodies, each with unique functions, oversee the NEM. These are the:

– Australian Energy Market Operator (AEMO) – who operates the market.
– Australian Energy Market Commission (AEMC) – who makes the market rules.
– Australian Energy Regulator (AER) – who enforces the rules.

In addition to these national market bodies, there is the Energy Security Board. The Energy Security Board provides whole of system oversight for energy security and reliability to drive better outcomes for consumers and is comprised of an Independent Chair, Independent Deputy Chair, and the heads of AEMO, the AEMC and the AER.

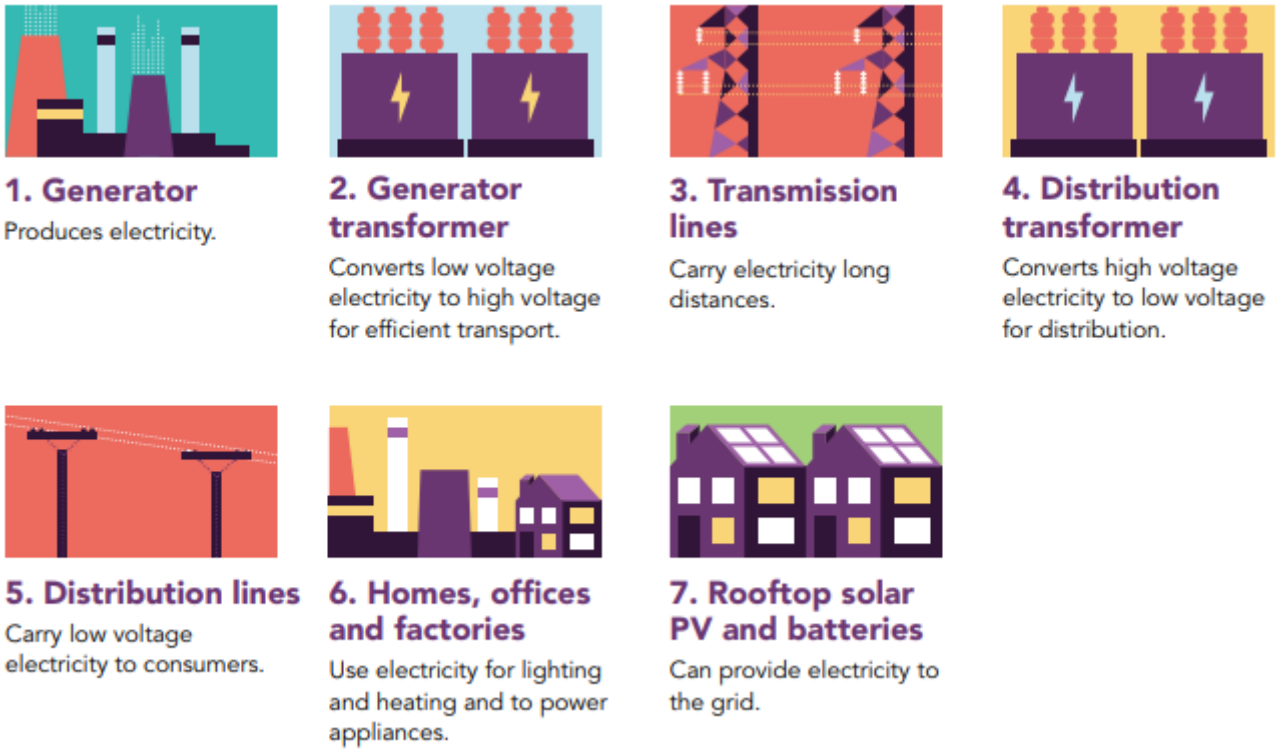
The NSW Government also has a range of powers to deal with an electricity supply emergency under the *Electricity Supply Act 1995* (NSW).

2.1.2.2 Electricity generation and transmission

Electricity is generated and transmitted to consumers via the electricity supply chain. There are four main components of the electricity supply chain:

1. **Generation –** changing raw energy (such as from the sun, wind, gas, or coal) into electricity.
2. **Transmission –** moving electricity from where it is generated at power stations to substations near where it is used by consumers. This is performed using high voltage powerlines (typically ‘poles and wires’), including interconnectors that move energy between states.
3. **Distribution –** moving electricity from substations to where it is used by households and businesses. This is performed using low voltage poles and wires. Electricity generated by rooftop solar panels can also flow back into this network.
4. **Retail –** selling electricity to households and businesses, including metering and billing. This is the direct interface between the electricity industry and consumers.

The electricity supply chain is shown in Figure 2.1.



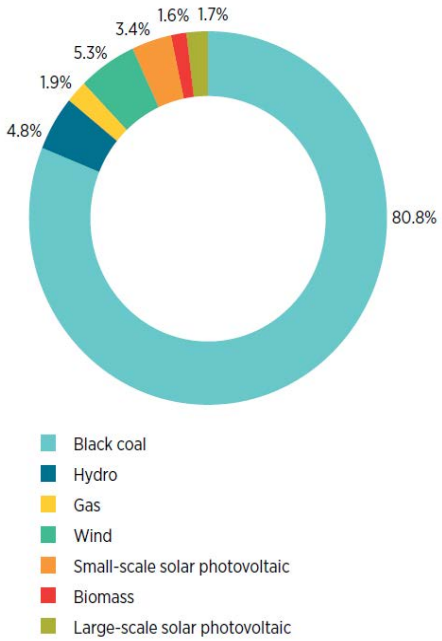
Source: The National Electricity Market (Australian Energy Market Operator 2020)

Figure 2.1 Components of the electricity supply chain

Electricity systems must be continuously balanced with respect to supply (generation) and demand (consumption) or else the system will become unstable, which would cause widespread blackouts and extreme economic costs for electricity users within the NEM (DPIE 2019). The balancing process is undertaken in real-time by dispatching generation to match the varying customer demand. This balancing act is undertaken by the AEMO in accordance with the National Electricity Law and National Electricity Rules (AEMO 2020).

2.1.2.3 Coal-fired generators dominate electricity generation in NSW

NSW has traditionally been powered mostly by coal-fired generators, which still provide around 80 per cent of the state's electricity. NSW also consumes electricity from gas, hydro, and bioenergy generators, and increasingly from wind and solar. Wind and solar electricity generation has tripled in the past five years, with just over seven per cent of electricity coming from wind and solar (including rooftop solar) (DPIE 2019) (refer to Figure 2.2).



Source: NSW Electricity Strategy (DPIE 2019).

Figure 2.2 Source of electricity generated in NSW (2018/2019)

2.1.3 How our electricity system is changing

2.1.3.1 Coal-fired generators are closing

In recent years, there has been a rapid decommissioning of coal-fired generators due to aging infrastructure. As these generators get older and reach the end of their technical lives, their parts become more fragile and liable to failure. This increases the risk of unplanned outages, reducing available capacity, and adversely impacting the reliability of the NEM.

Around one-third of Australia's coal-fired power stations closed between 2012 and 2017 (Australian National University 2018), including three coal-fired power stations in NSW. These were:

– Munmorah Power Station (capacity of 600 MW) – closed in July 2012.
– Redbank Power Station (capacity of 143.8 MW) – closed in August 2014.
– Wallerawang Power Station (capacity of 1,000 MW) – closed in November 2014.

Four of NSW's five remaining coal-fired generators are set to reach the end of their technical lives and close by 2032. The first to close will be the Liddell Power Station (capacity of 2,000 MW) that will be retired in stages, with one unit closed in April 2022 and the remaining three units to be shut down in April 2023. Eraring Power Station (capacity of 2,880 MW) has recently been announced as closing seven years earlier than scheduled in 2025. Vales Point Power Station (capacity 1,320 MW) is expected to close in 2028. The last to close will be Bayswater Power Station (capacity of 2,640 MW) intended to be closed no later than 2032, from its previously scheduled closure date of 2035 (Australian Energy Council 2016 and DPIE 2019) (refer to Figure 2.3). These four coal-fired power stations supply more than three quarters of the state's electricity and two thirds of the peak electricity demand in NSW (DPIE 2020a).

Assuming a 50-year technical life, the last remaining coal-fired power station in NSW – Mount Piper Power Station (capacity 1,400 MW) – is predicted to close in 2040 (refer to Figure 2.3).

If not managed appropriately, the closure of coal-fired power stations could result in a shortfall of affordable, reliable, and secure electricity for residents and businesses in NSW.

Source: Adapted from AEMO ISP 2020.

Figure 2.3 Announced retirement of power stations in NSW

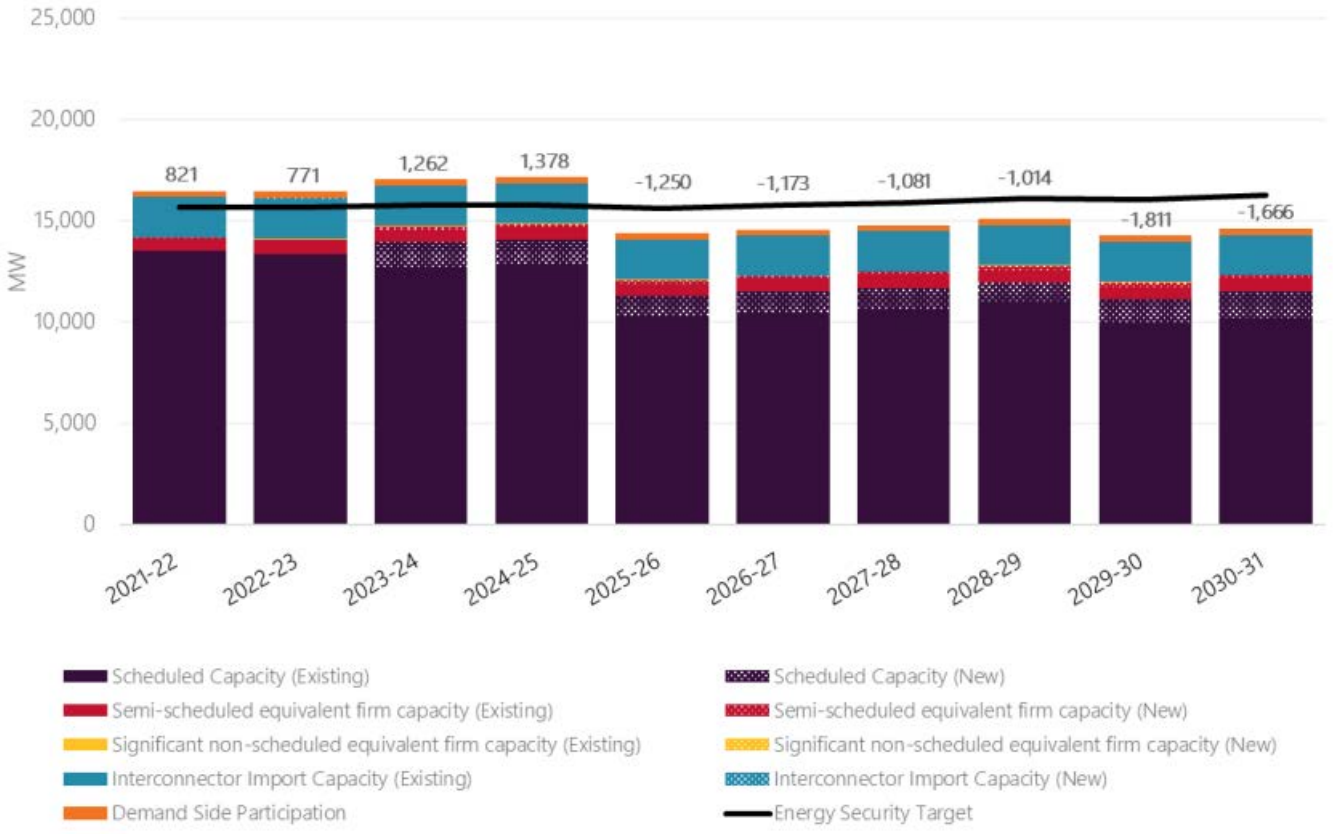
2.1.3.2 Projected shortfall of generation capacity

The NSW Electricity Infrastructure Roadmap (DPIE 2020a) enabled under the EII Act, is the NSW Government's plan to deliver a modern electricity system for NSW. It focuses on delivering new large-scale generation, transmission, and storage to provide secure, reliable electricity; lower electricity bills; and around 90 million tonnes in carbon emission reductions in NSW.

The NSW Government has appointed AEMO as the Energy Security Target (EST) Monitor for the Electricity Infrastructure Roadmap. Under the appointment, AEMO is responsible for calculating and setting a 10-year EST for NSW. This target is designed to provide market certainty as it ensures there will be reliable supplies of electricity available to meet demands over the medium term. AEMO is also responsible for assessing and monitoring whether the firm capacity (generation, firming and storage, transmission capacity) is sufficient to meet the EST under different scenarios.

The first Energy Security Target Monitor Report was released by AEMO in December 2021 and identified a possible breach of the EST i.e., a shortfall in generation capacity to meet customer demand from 2029-30 (AEMO 2021). In February 2022, Origin Energy announced the planned closure of the Eraring Power Station in August 2025, about seven years earlier than originally planned. Eraring is Australia's largest coal-fired power station with a capacity of 2,880 MW.

In light of this announcement, AEMO released an updated Energy Security Target Monitor Report in May 2022 that brought forward the projected breach of the EST in 2029-30 to 2025-26, as illustrated by the dip in the black line in Figure 2.4 (AEMO 2022a). The shortfall in generation capacity is forecast to worsen from 2029-30, with the retirement of Vales Point Power Station.



Source: Energy Security Target Monitor Report, May 2022 Further Report – Central Scenario (AEMO 2022).

Figure 2.4 Projected shortfall in generation capacity showing EST surplus or breach

2.1.4 Actions needed to ensure a reliable electricity supply

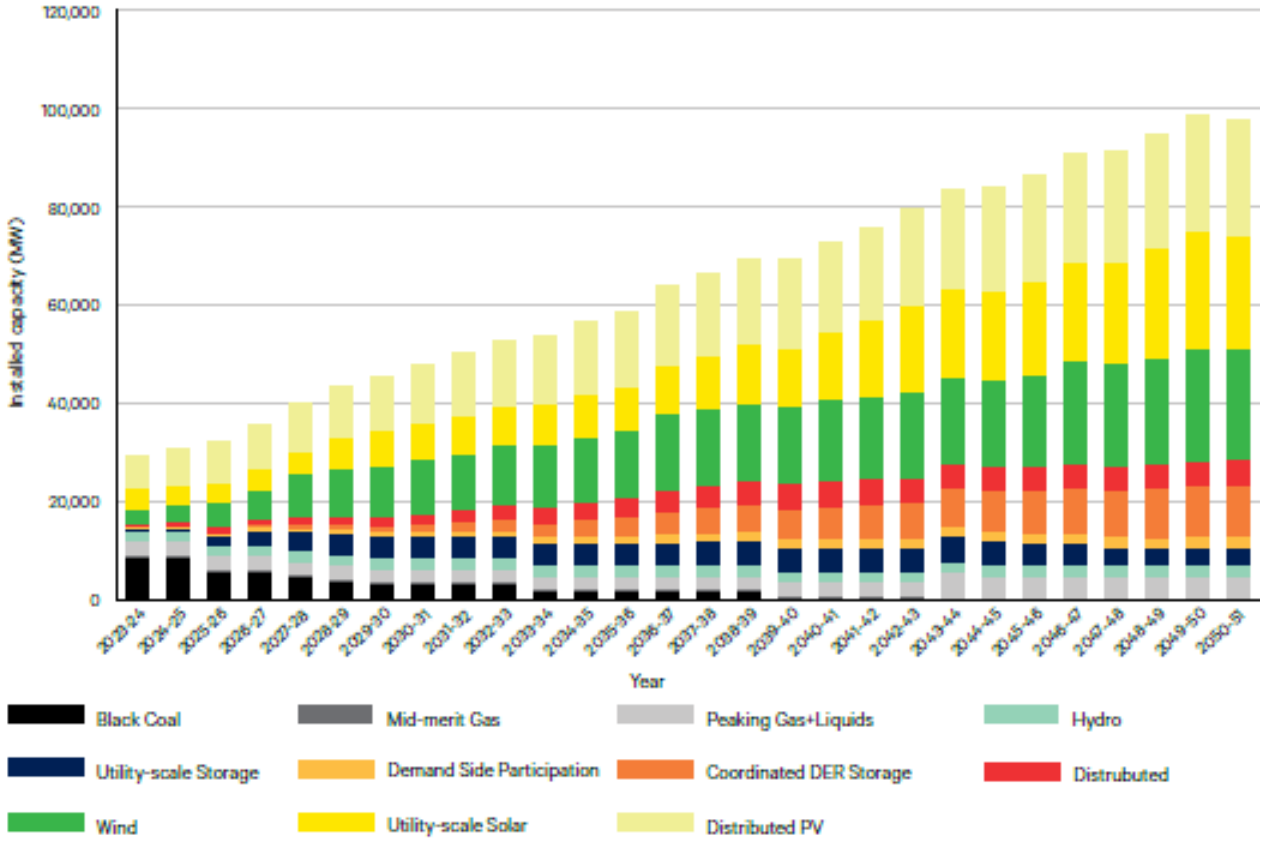
2.1.4.1 Firming technologies to balance the transition to renewable energy

The electricity market is undergoing a profound transformation from a relatively small number of large fossil fuel (mainly coal) generators towards a system of widely dispersed, relatively small-scale renewable (mainly wind and solar) generators (DPIE 2019, Australian Energy Regulator 2020, Transgrid 2022).

An ageing coal-fired generation fleet, coupled with technology and cost changes; and growing community concerns about the impact of fossil fuel generation on carbon emissions are among the factors driving the transition to renewable energy in Australia, including in NSW.

An ongoing challenge is to find the best way to keep the power system reliable, secure, and affordable as the power generation mix changes. Figure 2.5 shows the expected change in power generation mix to 2050.

Currently, wind and solar are the cheapest and cleanest forms of new electricity generation. However, the ability of these technologies to dispatch electricity is dependent on the weather and time of day. The weather-dependent nature of wind and solar generation creates a need for 'firming' or 'back-up' capacity (e.g., from battery energy storage systems, pumped hydro, and gas-peaking generators) to fill supply gaps when a lack of wind or sunshine curtails renewable plant. Renewables, firmed by dispatchable technologies, are the lowest cost form of new reliable electricity generation for the NEM.



Source: Transmission Annual Planning Report (Transgrid 2022).

Figure 2.5 Changing power generation mix in NSW (2023 – 2050)

2.1.4.2 New transmission to increase capacity into Sydney, Newcastle, and Wollongong

Additional interconnector capacity is expected to become available in the short-term, including Queensland – New South Wales Interconnector (QNI) Minor (2022-23), Victoria – New South Wales Interconnector (VNI) Minor (2023-24), and Project EnergyConnect (2025-26). However, forecast major constraints on intra-regional transmission infrastructure between the outer and inner sub-regions of NSW are expected to constrain this capacity from being available to consumers in the Sydney, Newcastle, and Wollongong areas during peak demand periods (AEMO 2022a).

A number of projects were described in the 2021 Energy Security Target Monitor Report (AEMO 2022a) that are designed to increase intra-regional transmission limits. These include the HumeLink Project and the Sydney Ring Project, as identified in AEMO's 2020 Integrated System Plan (ISP).

The HumeLink Project is a new 500 kilovolt (kV) transmission line which will connect Wagga Wagga, Bannaby, and Maragle. The Waratah Super Battery forms part of the Sydney Ring Program and is described in further detail below. If these projects are progressed, they would unlock access to approximately 2,500 MW of already committed firm generation and storage capacity.

As a result of these projects, the EST is predicted to be in surplus until 2032-33 when all the units have closed at Eraring Power Station and Vales Point Power Station. At this point, other new firm generation and storage capacity would be needed in NSW, such as the investments proposed in the NSW Electricity Infrastructure Roadmap (DPIE 2020a). Neither network project on its own is projected to entirely eliminate the forecast EST breach over the 10-year outlook (AEMO 2021).

2.1.4.3 Sydney Ring Project

The Waratah Super Battery forms part of the Sydney Ring Project that is designed to increase transfer capacity into the Sydney, Newcastle, and Wollongong area by approximately 5,000 MW. AEMO's 2022 ISP has recommended that the Sydney Ring Project should commence immediately to support REZ development in the NSW Electricity Infrastructure Roadmap and to maintain reliability of supply for consumers in NSW (AEMO 2022b).

AEMO recommends that combinations of the following options be considered for the Sydney Ring Project (AEMO 2022b):

– A northern network option – 500 kV link between the Eraring and Bayswater substations, also known as the Hunter Transmission Project.
– A southern network option – 500 kV link between Bannaby and a new substation in the locality of South Creek.
– Virtual transmission – a SIPS (i.e., the Waratah Super battery project).
– Other minor network upgrades – including, but not limited to, the uprating of relevant existing 330 kV lines (such as Bannaby – Sydney West 330 kV line).

The Waratah Super Battery would operate in conjunction with a SIPS, providing a virtual transmission solution with the primary purpose of increasing transmission capacity into Sydney, Newcastle, and Wollongong, and maintaining the reliability and security of the electricity grid. The Waratah Super Battery is the first stage of delivering the Hunter Transmission Project (which is the northern network option component of the Sydney Ring Project) and would provide a timely and efficient solution to bridge the gap between the earliest expected closure of Eraring Power Station and the commissioning of the Hunter Transmission Project.

Both the Waratah Super Battery, and the Hunter Transmission Project, are being developed as Priority Transmission Infrastructure Projects, as set out under the EII Act, consistent with AEMO's identification and treatment of these projects as actionable NSW projects in the 2022 ISP.

2.1.5 The transition to renewable energy

The NSW Government and the Australian Government have set a climate change goal to reach 'net zero emissions' (achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere) by 2050. These plans include (but are not limited to*) Net Zero Plan Stage 1: 2020 – 2030* prepared by the then NSW Department of Planning, Industry and Environment (DPIE) (2020b) and *Australia's Long Term Emissions Reduction Plan* prepared by the Australian Government Department of Industry, Science and Resources (DISR) (2021).

Increased interconnections and energy storage technologies, such as batteries, support various renewable energy developments and will help unlock the full potential of wind and solar resources within NSW. The Waratah Super Battery would support the transition to renewable energy in NSW.

2.1.6 Project benefits

The Waratah Super Battery would result in significant, positive, short-term benefits to the Central Coast, Sydney, Newcastle, Wollongong and to NSW. These benefits include:

Delivering a secure source of back-up electricity for NSW. The project would:

- Provide large-scale, reliable energy storage to help stabilise the grid and prevent blackouts as more intermittent renewables enter the grid and coal fired power generation exits the grid.
- Reinforce the electricity supply to Sydney, Newcastle, and Wollongong. The project is part of the Sydney Ring Project that will provide increased transfer capacity to Sydney, Newcastle, and Wollongong of approximately 2,500 MW.

Supporting a sustainable, green electricity future for NSW. The project would:

- Support the ongoing changeover in electricity generators, including the rapid development of renewable energy sources.
- Firms' renewable energy generation by storing energy when it is plentiful and discharging it when it is needed.
- Contribute to NSW's renewable energy target to cut greenhouse gas emissions by 35 per cent (compared to 2005 levels) by 2030 to achieve net-zero emissions by 2050.
- Increase interconnections and energy storage technologies, such as batteries, support various renewable energy developments and help unlock the full potential of wind and solar resources within NSW.

Reducing carbon emissions produced by the electricity sector in NSW. The project would:

- Facilitate the early closure of black coal generation in NSW.
- Provides for temporary storage of renewable energy

Reducing the price of electricity in NSW. The project would:

- Lower overall system costs. Batteries can respond to short-term market demands more rapidly and more cheaply than other technologies, such as gas.
- Reduce the risk of system outages.

Providing major investment in NSW. The project would inject around $1 billion capital investment into the NSW economy.

Supporting long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW. The project would:

- Support around 150 construction and 10 to 15 operational jobs for people on the Central Coast.
- Support numerous indirect jobs for people on the Central Coast, Sydney, Newcastle, and potentially other parts of NSW.
- Contribute to workforce diversification on the Central Coast, Sydney, Newcastle, and potentially other parts of NSW.
- Provide local business support for food and services on the Central Coast, Sydney, Newcastle, and potentially other parts of NSW.

Providing learning opportunities. The project would provide opportunities for school and community groups to learn about SIPS and battery technology and our future energy system.

2.2 Consistency with government plans and policies

State and federal government plans, polices, and guidelines have been established to plan for a reliable, affordable, and sustainable electricity future in NSW. A common theme across these plans, policies, and guidelines is the need to provide a reliable, affordable, and sustainable electricity future that supports a growing economy in NSW. The Waratah Super Battery is consistent with these plans, polices, and guidelines, as outlined in Table 2.1.

Table 2.1 Consistency with local, state, and federal plans, policy, and guidelines

Plan/policy/ guideline	Overview	Consistency with project objective and benefits
Local		
Long Term: Strategic Economic Development Strategy (Central Coast Council 2020a)	The strategy sets economic vision and values, objectives and targets, and priority actions for the Central Coast. The strategy sets goals for more jobs, building economic strength, sustainable growth, diversification, local investment, and community wellbeing. The strategy leads the way for a stronger, more agile, resilient, and innovative economy of the Central Coast.	✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.
Greater Lake Munmorah Structure Plan (Central Coast Council 2022a)	The plan was adopted by Central Coast Council in 2022. The plan sets a 20-year local land use framework that addresses housing and employment land supply, infrastructure provision, ecology, traffic, and transport. The project site is located just outside the study area of the Greater Lake Munmorah Plan.	✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.
State		
NSW Electricity Infrastructure Roadmap (DPIE 2020a)	The roadmap sets out a framework to deliver a modern electricity system for NSW. The framework focuses on delivering new large-scale generation, transmission, and storage to provide secure, reliable electricity, lower electricity bills, and around 90 million tonnes in carbon emission reductions in NSW. The roadmap declares five REZs. The roadmap is expected to: – Attract up to $32 billion in private investment for regional energy infrastructure by 2030. – Support an estimated 6,300 construction jobs, and 2,800 ongoing jobs in regional NSW. – Save around $130 a year on the average household electricity bill and $430 a year on the average small business electricity bill in NSW between 2023 and 2040. The roadmap will help NSW deliver on its ambitions to reach net zero emissions by 2050.	✓ Delivering a secure source of back-up electricity for NSW. ✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW. ✓ Reducing the price of electricity in NSW. ✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.
Net Zero Plan Stage 1: 2020 – 2030 (DPIE 2020b)	The plan is the foundation for the NSW Government's action on climate change and goal to reach net zero emissions by 2050. The plan aims to enhance the prosperity and quality of life for the people of NSW, while helping the state to deliver a 35% cut in emissions by 2030 compared to 2005 levels. It supports initiatives for electricity and energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste, and carbon financing. The plan priorities include: – Empowerment of consumers and business to make sustainable choices. – Investment in next wave of emission reduction innovation. – Drive uptake of proven emission reduction strategies. The implementation of the plan, together with the NSW Electricity Strategy (DPIE 2019), will result in more than $11.6 billion of new investment for NSW, including $7 billion in regional NSW. This will support the creation of almost 2,400 new jobs, including 1,700 jobs located in regional NSW.	✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW. ✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.

Plan/policy/ guideline	Overview	Consistency with project objective and benefits
NSW Electricity Strategy (DPIE 2019)	The strategy sets out a plan for a reliable, affordable, and sustainable electricity future that supports a growing economy in NSW. The strategy encourages an estimated $8 billion of new private investment in the electricity system, including $5.6 billion in regional NSW. It also supports an estimated 1,200 new jobs primarily in regional NSW. The plan targets three goals including: 1. Support for the market to deliver reliable electricity at the lowest price while protecting the environment. Firmed renewables are now the most cost-competitive form of new generation and cost less than the current wholesale electricity price. 2. Ensuring the state has enough energy to cope with unexpected generator outages during peak demand. Coal-fired generators are aging and are becoming less reliable. 3. Ensuring the state has sufficient power to deal with electricity emergencies. The strategy sets out actions that will support a competitive and low-cost energy market and deliver more resilient electricity supplies to NSW.	✓ Delivering a secure source of back-up electricity for NSW. ✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW. ✓ Reducing the price of electricity in NSW. ✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.
NSW 2040 Economic Blueprint (NSW Treasury 2019)	The blueprint identified challenges and risks and highlights major opportunities for the NSW Government to grow industries, innovate and improve the economy of NSW. The plan outlines the key aspirations for NSW to reach by 2040. These include: – The nation's first trillion-dollar economy. – Healthy, productive people. – Liveable and connected cities. – Productive, vibrant regions. – Innovative and world class businesses. – A sustainable environment with reliable and affordable energy. – Enhanced performance of government.	✓ Delivering a secure source of back-up electricity for NSW. ✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.
NSW Transmission Infrastructure Strategy (Department of Planning and Environment 2018)	The strategy is a plan to unlock private investment in priority energy infrastructure projects, to deliver secure, affordable, and clean energy to customers by 2040. The strategy is underpinned by several principles: – Lower energy bills. – A technology neutral approach to new energy generation projects. – Private sector led investment in transmission and generation. – Regional economic growth and increased job opportunities. – Ongoing secure and reliable energy to power the economy.	✓ Delivering a secure source of back-up electricity for NSW. ✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW. ✓ Reducing the price of electricity in NSW. ✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.

Plan/policy/ guideline	Overview	Consistency with project objective and benefits
Final Report from the Energy Security Taskforce (NSW Chief Scientist and Engineer 2017)	The report examines issues that need to be addressed to strengthen the longer-term resilience of the electricity system in NSW. The report considers the challenges of achieving a stable and reliable power system, which is characterised by low electricity costs and low emissions, while managing the transition to new forms of generation technologies in NSW.	✓ Delivering a secure source of back-up electricity for NSW. ✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW. ✓ Reducing the price of electricity in NSW.
NSW Climate Change Policy Framework (State of NSW and Office of Environment and Heritage 2016)	The policy outlines NSW's long-term objectives to become resilient to climate change and to achieve net-zero emissions by 2050. Policy directions include: – Create a certain investment environment by working with the federal government to manage transition. – Boost energy productivity, put downward pressure on household and business energy bills. – Capture co-benefits and manage unintended impacts of external policies. – Take advantage of opportunities to grow new industries. – Reduce risks and damage to public and private assets arising from climate change. – Reduce climate change impacts on health and wellbeing. – Manage impacts on natural resources, ecosystems, and communities.	✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW.
Making it Happen in the Regions: Regional Development Framework (NSW Department of Industry, date unknown)	A plan focused on providing quality services and infrastructure in regional NSW. It notes the importance of fast-tracking infrastructure projects that encourage business confidence, supports growing regional centres, private sector investment, job creation, and identifies and activates economic potential across regional NSW.	✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.
Central Coast Draft Regional Plan 2041 (Department of Planning, Industry, and Environment 2021f)	The regional plan was on placed on public exhibition from December 2021 to March 2022. Submissions received on the draft plan and the feedback will be incorporated into the final plan that will be released later in 2022. The plan focuses on Gosford as the regional city, and Erina, Tuggerah, Wyong and Warnervale as the strategic centres. The plan is a relevant consideration for planning proposals for the future use of the project site. Under the plan, opportunities are identified for the project site to connect into a biodiversity corridor which connects the coast to the foothills as well as opportunities to contribute to housing delivery around its fringe and provide employment generating opportunities for a range of light industrial, heavy industrial and renewable energy generating uses, utilising existing infrastructure from the former power station use.	✓ Supporting a sustainable, green electricity future for NSW. ✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.

Plan/policy/ guideline	Overview	Consistency with project objective and benefits
COVID-19 Recovery Plan (NSW Government 2020)	The plan focuses on building a job and economic resilient and self-sufficient city after facing the economic consequences of the pandemic. This is supported by infrastructure, advanced manufacturing and industries and skills of the future, including Investments in: – Infrastructure pipeline. The NSW Government is committing to a guaranteed $100 billion infrastructure pipeline over four years to drive employment growth and help create 88,000 direct jobs. – Fast tracking planning projects. Planning reforms will reduce the time taken to approve projects. This will allow decisions on major projects of state significance to be cut by 20 days (17% time saving).	✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.
Commonwealth		
2022 Integrated System Plan for the National Electricity Market (AEMO 2022b).	A whole of system plan that provides a coordinated generation and transmission investment plan to transition the NEM over the next 30 years. The plan has recommended that the Sydney Ring Project (which includes the Waratah Super Battery) should commence immediately to support REZ development in the NSW Electricity Infrastructure Roadmap and to maintain reliability of supply for consumers in NSW (AEMO 2022b).	✓ Delivering a secure source of back-up electricity for NSW. ✓ Reducing the price of electricity in NSW.
Australia's Long-term Emissions Reduction Plan: A Whole-of-economy Plan to Achieve Net Zero Emissions by 2050 (Department of Industry, Science, Energy and Resources (DISER) 2021)	A plan to achieve net zero emissions by 2050. The plan focuses on technology to help cut emissions while creating jobs and growing the economy of Australia. The plan outlines how we will: – Drive down the cost of low emissions technologies. – Deploy these technologies at scale. – Help our regional industries and communities seize economic opportunities in new and traditional markets. – Work with other countries on the technologies needed to decarbonise the world's economy. These actions will get Australia to net zero emissions while: – Preserving Australian jobs. – Taking advantage of new economic opportunities. – Positioning us as a leader as the world shifts to low-emissions technologies.	✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW. ✓ Reducing the price of electricity in NSW. ✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.
Technology Investment Roadmap: First Low Emission Technology Statement 2020 (DISER 2020b).	A strategy to accelerate the development and commercialisation of low emission technology. The strategic intent is to: – Preserve and create jobs, capture new opportunities, and revitalise regional economies. – Lower household living expenses with abundant, clean, and low-cost energy. – Build competitiveness by leveraging our comparative advantages. – Attract and retain the best minds in priority low emissions technology research fields.	✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW. ✓ Reducing the price of electricity in NSW. ✓ Providing major investment in NSW. ✓ Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.

Plan/policy/ guideline	Overview	Consistency with project objective and benefits
A Fair Deal on Energy (Australian Government Department of the Environment and Energy 2019).	The blueprint sets out three pillars to ensure a better energy future for Australia. The three pillars include: – Delivering an affordable and reliable energy system. – Putting energy consumers first. – Taking real and practical action to reduce emissions and meet international commitments. The key objectives to delivering a reliable, secure, and affordable energy supply are: – Maintaining and increasing supply of reliable electricity. – Increasing domestic gas supplies. – Promoting efficient investment in energy infrastructure. – Ensuring Australia's fuel security. The key objectives of putting energy consumers first are: – Improving market transparency and accountability. – Helping consumers reduce hills and navigate the energy market. – Expanding power to deal with misconduct. The key objectives to meet our international commitments are: – Encouraging emissions reduction across the economy. – Accelerating technological solutions. – Playing our part in shaping a better future.	✓ Delivering a secure source of back-up electricity for NSW. ✓ Supporting a sustainable, green electricity future for NSW. ✓ Reducing carbon emissions produced by the electricity sector in NSW. ✓ Reducing the price of electricity in NSW.

2.3 Alternatives investigated

2.3.1 Site selection and suitability

2.3.1.1 Justification and key constraints of the Munmorah Power Station site

The former Munmorah Power Station comprises a total land area of approximately 727 hectares, as shown in Figure 2.6. The Munmorah site is considered to be suitable for the development of the Waratah Super Battery for a number of reasons, including:

– The site is largely vacant and of suitable size to allow for the investigation of a number of potential site location options.
– The site is already owned by the NSW Government.
– The site, being the site of a former power station, is remote from sensitive receivers and largely clear of natural constraints e.g., flooding, vegetation, heritage, etc.
– The site is located in close proximity to an existing high-capacity substation with available bays for new transmission connections.
– The site is likely to be available in the short-term for development purposes.

As shown in Figure 2.6, infrastructure immediately surrounding the project site includes:

– A telecommunications tower immediately to the north-west.
– Colongra Power Station, approximately 250 metres to the north-east.
– Transmission lines and electrical distribution infrastructure to the north, including Munmorah Substation.
– Former Munmorah Power Station and associated lands to the north-west and north.

Within the locality of the project site are the residential suburbs of Doyalson, San Remo, Buff Point, Budgewoi and Halekulani with the latter being approximately 600 metres distant (and the others farther away).

Approximately 400 metres north-west of the project site is Koala Park.

To the south and west of the project site are the neighbouring suburbs of San Remo and Buff Point. About 650 metres to the north-east of the project site is Colongra Swamp Nature Reserve, and the residential area of Halekulani to the east. To the west of the project site are smaller parcels of industrial land and residential areas.

The broader area includes the coastal lakes of Lake Munmorah, approximately 1.2 kilometres to the south-east and Budgewoi Lake approximately two kilometres to the south-west of the project site. Approximately 300 metres north-west of the project site is Hammond Canal which is a man-made canal that links Lake Munmorah to Budgewoi Lake.

2.3.1.2 Land use compatibility

Prior to the power station closing in June 2012, the Munmorah Power Station co-existed with surrounding communities and sensitive waterways for a period of about 50 years. The site is generally remote from residential communities and heavily screened by mature vegetation and setback from public roads on all sides.

The land use zoning of the former Munmorah Power Station site and surrounding areas is shown in Figure 2.7.

The former Munmorah Power Station site is zoned SP2 Infrastructure under the *Central Coast Local Environmental Plan 2022* (Central Coast LEP). Koala Park and the area to its west and south which are also part of the former Munmorah Power Station site and indicated as controlled by Central Coast Council are also part of the SP2 zoning.

Small portions of land between the power station site and the Pacific Highway are zoned C2 Environmental Conservation and C3 Environmental Management.

Colongra Swamp Nature Reserve to the north-east of the site is zoned C1 National Parks and Nature Reserves. Lake Munmorah and Budgewoi Lake to the east and south of the site respectively are zoned W2 Recreational Waterways.

A small area immediately to the south of the site and an area also controlled by Central Coast Council is zoned C3 Environmental Management.

The suburbs to the west, south and east of the site, including San Remo, Buff Point and Halekulani are zoned R2 Low density residential.

Areas west of the site and between the northern boundary and the Pacific Highway are zoned RU6 Transition.

Scattered pockets of public (RE1) and private (RE2) recreation areas are also indicated in Figure 2.7.

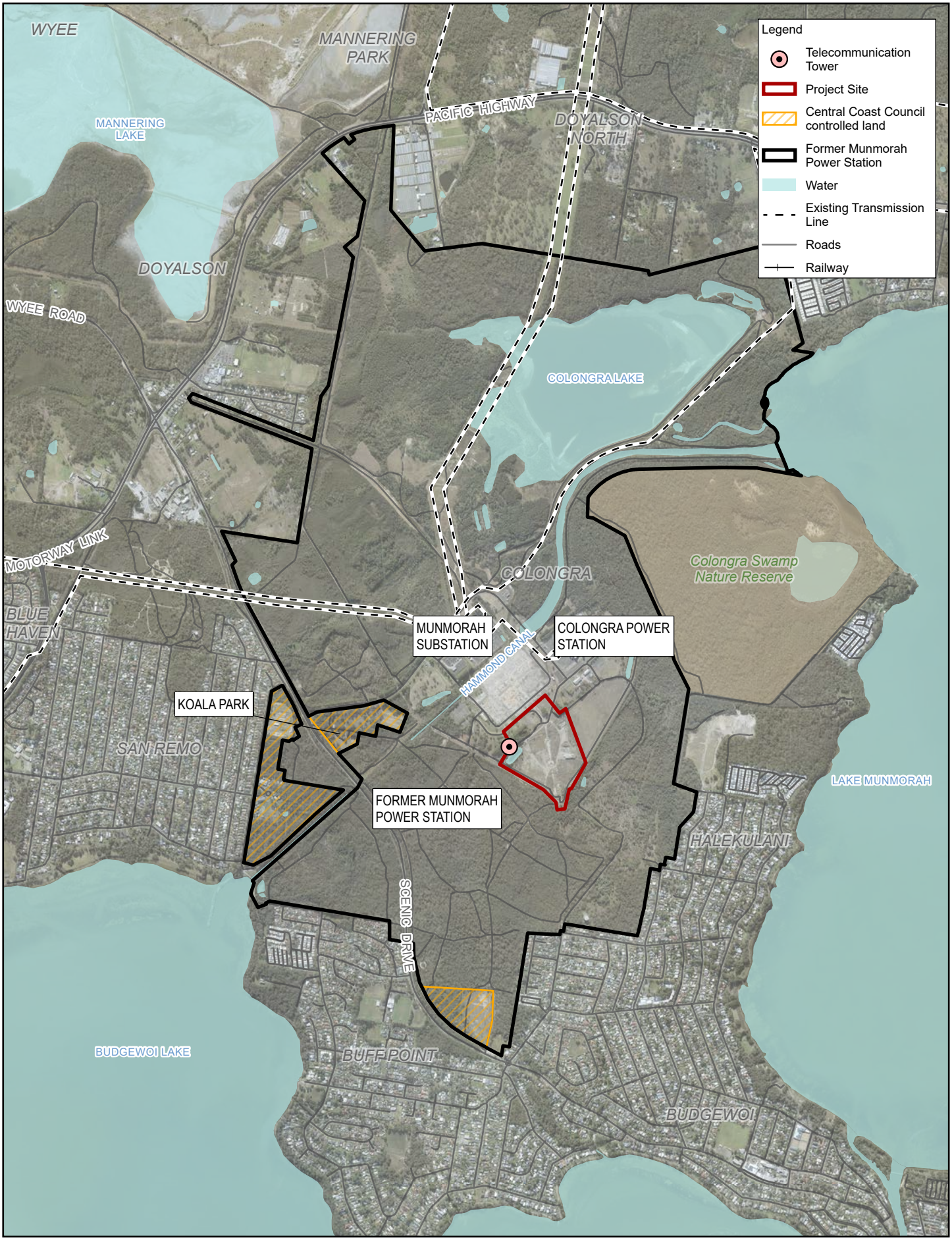
The Colongra Power Station is also situated at the former Munmorah Power Station site, immediately to the north-east of the project site for the Waratah Super Battery. The project site contains a right of access for Colongra Power for emergency egress should this be required. This right of access would be preserved in the development of the site for the project.

Potential for land use conflicts to arise has been addressed in a Land Use Conflict Risk Assessment in accordance with the Land Use Conflict Risk Assessment Guide (DPI, 2011) (refer to Section 6.4.4). The land use conflict risk assessment considered the potential land use conflicts from the project surrounding with residential development and recreational/ conservation areas. The assessment identified there is a low risk of conflict with surrounding land uses.

2.3.1.3 Ongoing decommissioning and remediation works

As outlined in Section 1.4.2, GPM is currently undertaking further rehabilitation, remediation and maintenance works at the site in accordance with its existing approvals.

GPM has removed most of the coal stockpile infrastructure, however, some infrastructure remains, and GPM is in the process of undertaking further rehabilitation on the project site under its existing approvals (DA 413/2014). These works will include the removal of remaining infrastructure (including the coal bunker and some stormwater detention and drainage infrastructure), surface ripping to mix soils, removing the remaining coal residue, erosion control measures, and weed management including removal of exotic pine trees. The site will then be revegetated with stabilising grasses.



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

EnergyCo
Waratah Super Battery - Munmorah
Environmental Impact Statement

Location of the former Munmorah Power Station site

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 2.6

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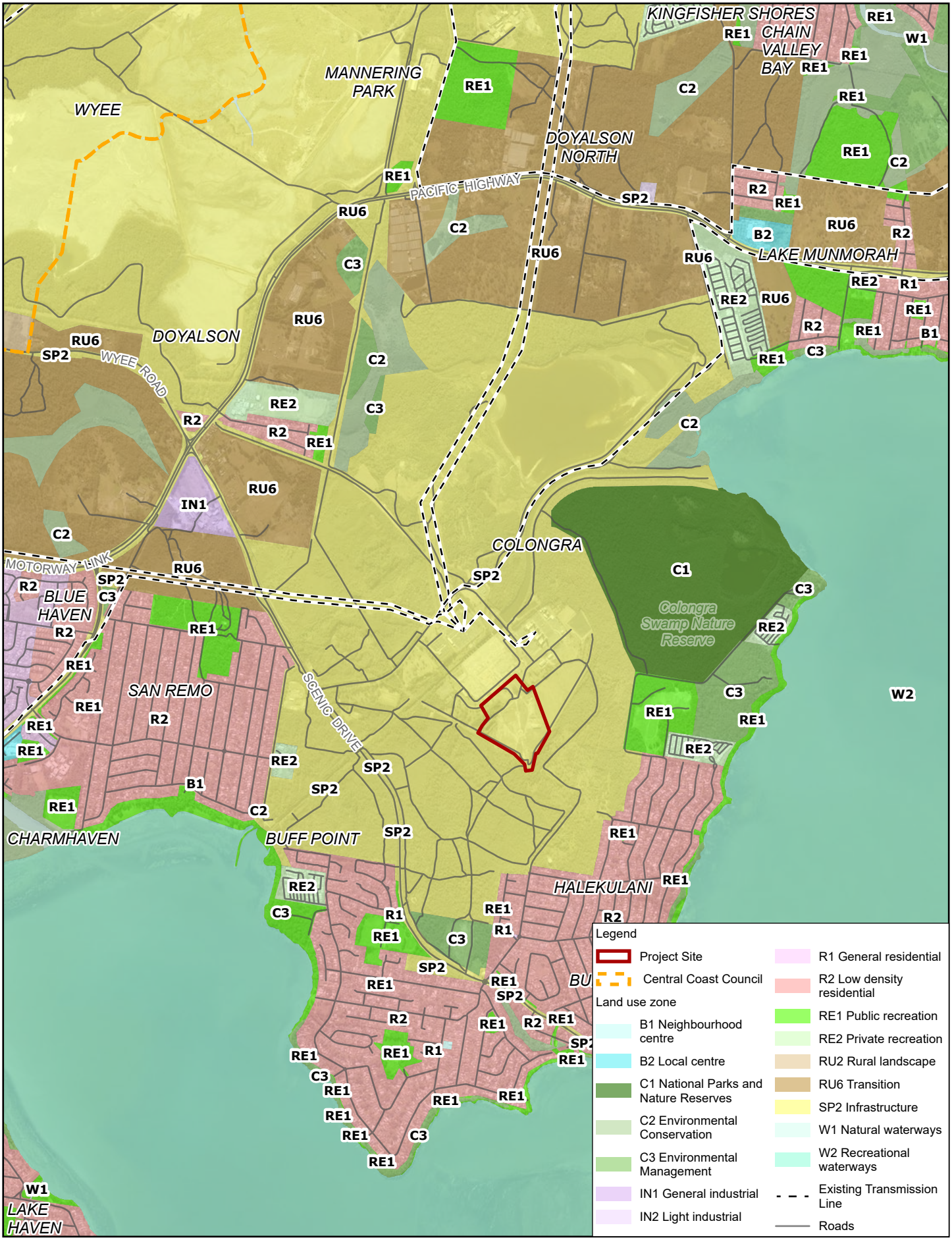

Paper Size ISO A4

0 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Energy Co
Waratah Super Battery - Munmorah
Environmental Impact Statement

Land use zoning of the former Munmorah Power Station and surrounding areas

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 2.7

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Print date: 26 Oct 2022 - 11:58

Data source: Fibre Optic Easement - Energy Co; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service: .
Created by: mfredle

2.3.2 Site location alternatives

Three potential sites within the former Munmorah Power Station were identified and evaluated for the potential development of the Waratah Super Battery. These were:

– Option A, located to the north of the Munmorah Substation.
– Option B, located to the west of the Munmorah Substation.
– Option C, located to the south of the Munmorah Substation.

The three potential sites are shown in Figure 2.9.

Of the three potential sites considered, Option C was selected as the preferred site for the Waratah Super Battery. Option A and Option B were considered less suitable from a location and land suitability perspective, and were considered to have greater flooding, biodiversity, heritage and/or potential contamination constraints for the proposed development. Additionally, establishing a transmission connection into the Munmorah Substation from these two sites would likely be more difficult given the constraints of existing infrastructure.

Comparatively, Option C (the preferred site for the Waratah Super Battery) is relatively flat, already cleared of vegetation, and lacks significant environmental constraints, in particular heritage and biodiversity. Option C is also free from flooding constraints. Figure 2.8 provides a recent aerial view of the Option C project site.

Development of the Waratah Super Battery on the Option C site has therefore been assessed in detail in this EIS as the preferred site alternative.

Figure 2.8 Aerial view of the preferred project site (Option C) at the former Munmorah Power Station (September 2022)

2.3.3 Site configuration alternatives

Three site configuration alternatives involving the two main project components, the battery area and switchyard, were investigated during the concept design process. The key site development considerations which had a strong bearing on the site layout options were:

– Maximising the area available for battery storage modules.
– Minimising the impact on existing environmental features.
– Maximising the utility of existing drainage infrastructure; that lead to the existing southern detention pond and along the south- eastern boundary of the site.
– Minimising the overall cost of the development.
– Providing efficient connection into the Munmorah Substation.
– Maintaining the emergency right of way to the Colongra Power Station.
– Feedback from stakeholders, principally GPM, Snowy Hydro, and TransGrid.

As a result of these considerations and stakeholder feedback, three locations for the switchyard were considered, being north of the southern detention basin, south of the southern detention basin, west of the former coal loader or to the east of the former coal loader.

Locating the switchyard north of the southern detention pond is not ideal as this portion of the site drains to the north onto the former power station site with limited area for retention of runoff.

Locating the switchyard in the western quadrant of the site is farthest from the proposed transmission easement and connection point at Munmorah Substation. The transmission line would have to cross over the site or traverse an extended distance around the perimeter of the site resulting in the loss of development area and additional cost.

The preferred site configuration is therefore for the switchyard to be located on the eastern quadrant of the site.

2.3.4 Battery technology alternatives

Currently, the most feasible option to develop the project within the required timeframe consists of lithium-iron batteries offered in the form of containerised or otherwise enclosed battery arrangements. The proposed battery technology to be specified for use on the project is lithium iron phosphate which has been recently adopted by most suppliers due to its lower fire safety risk when compared to most other lithium battery chemistries. Details of the potential fire safety risk of the project, including reports of incidents involving developments using other lithium-iron battery technologies, is provided in Section 6.9 of this EIS.

No alternative battery technologies were proposed by service providers during the procurement process facilitated by EnergyCo.

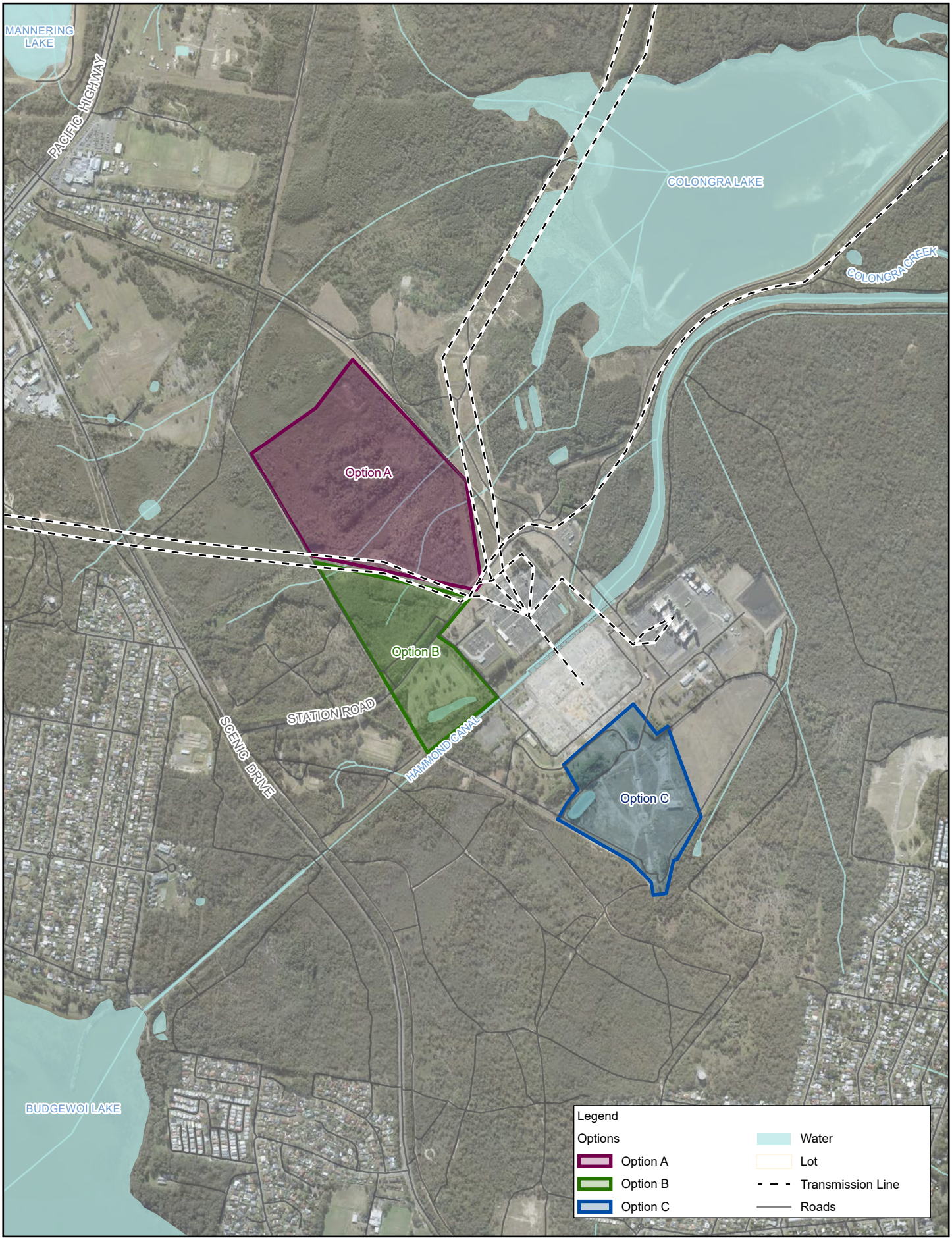
2.3.5 The do nothing alternative

The consequences of not proceeding with the project would include the following:

– Loss of energy security for NSW. Loss of large-scale, reliable stand-by energy storage required to stabilise the grid and prevent blackouts. Projected breach of the EST as early as 2025-2026. Loss of transfer capacity to Sydney, Newcastle, and Wollongong of up to approximately 5,000 MW (with other projects).
– Missed opportunity to support a sustainable, green electricity future for NSW. Lost opportunity to balance renewables by storing renewable energy when it is plentiful and discharging it when it is needed. Missed opportunity to support the changing electricity profile and rapid development of renewable energy in NSW.
– Loss in major investment in regional NSW. Loss of around $1 billion capital investment into the economy of NSW.
– Loss of training and long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW. Workforce diversification and training opportunities would be lost, along with around 150 construction jobs and 10-15 on-going (operational) jobs for people on the Central Coast, Sydney, Newcastle, and potentially other parts of NSW.
– Missed learning opportunities. Loss of opportunities for school and community groups to learn about battery technology and our future energy system.

Doing nothing would not be consistent with state, and federal government plans, polices, and guidelines that have been established to plan for a reliable, affordable, and sustainable electricity future in NSW.

The project is a critical response to avoid the projected shortfall in generation capacity and firm the NEM as more renewable generators enter the market, and more fossil-fuelled generators exit the market. Doing nothing is a not a prudent or viable response to the identified project need.



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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Site location alternatives at the former Munmorah Power Station

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FIGURE 2.9

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Data source: NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

3. Project description

3.1 Key project components

To ensure NSW continues to have a reliable energy supply following the planned closure of the Eraring Power Station in 2025, EnergyCo is proposing to develop the Waratah Super Battery, comprising a System Integrity Protection Scheme (SIPS) control and standby network battery system dedicated to supporting the transmission grid.

The project includes:

– A SIPS system, designed to reserve and deploy battery power to support the NSW electricity grid when triggered by a contingency event.
– Up to 850 megawatts (MW) active power.
– Up to 1,680-megawatt hours (MWh) battery storage capacity.
– Connecting transmission and related infrastructure to connect the SIPS to the existing grid.
– Other infrastructure and services required for the project.

The Waratah Super Battery would be the largest standby network battery in the Southern Hemisphere and together with other minor transmission upgrades, would allow Sydney, Newcastle, and Wollongong consumers to access more energy from existing electricity generation.

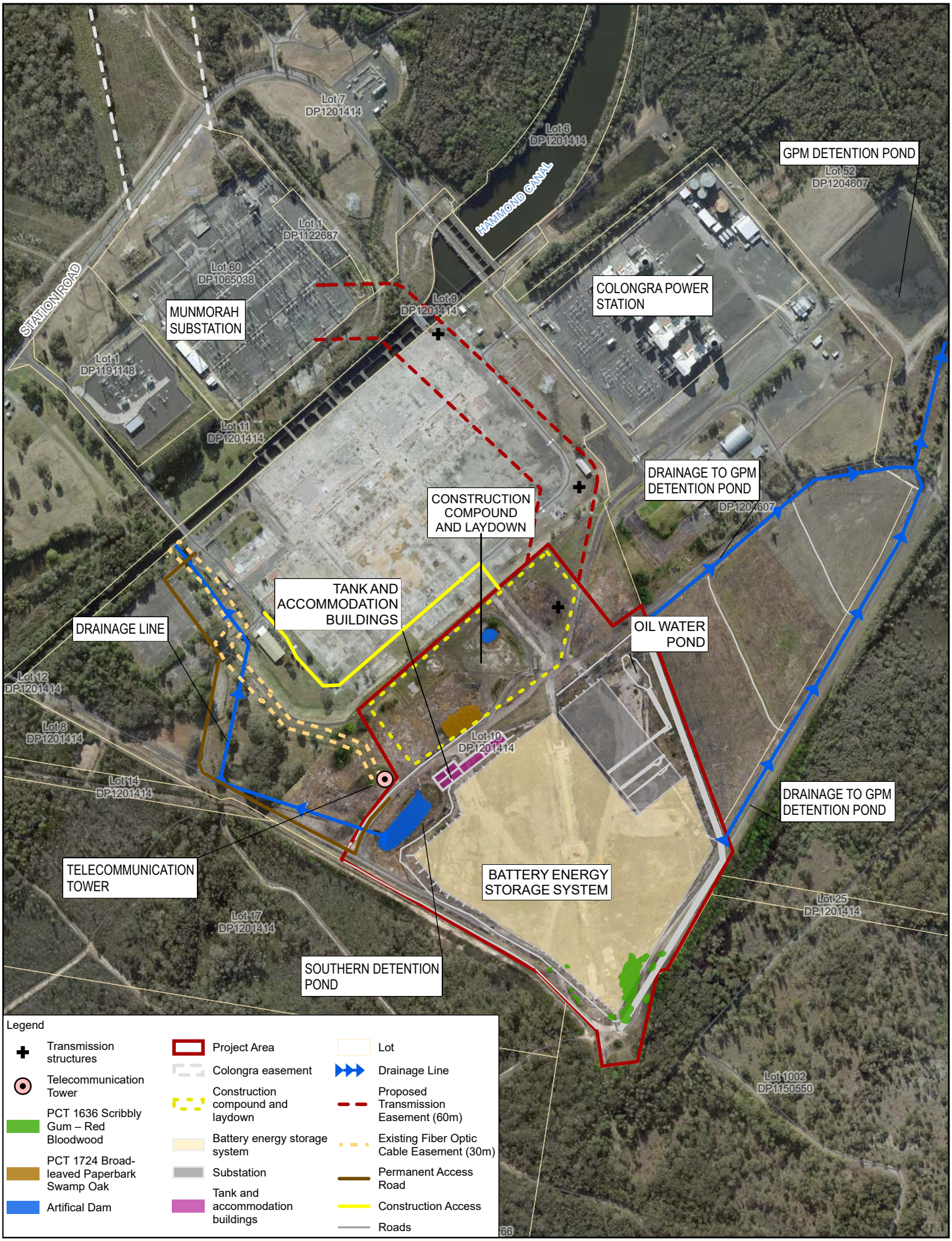
A summary of the key project components and functionality is provided in Table 3.1.

Table 3.1 Overview of the Waratah Super Battery

Project element	Summary
Battery energy storage system capacity	– 850 MW active power. – 1,680 MWh battery storage capacity.
Size of individual battery units	– Up to 3.3 metres high, 1.6 metres wide, and 2.5 metres deep
SIPS operator/ NEM connection	– Transgrid/Munmorah Substation.
Service Provider (on behalf of EnergyCo)	– Akaysha Energy, selected via competitive tender process to develop and operate the project.
Battery technology	– Lithium iron phosphate
Availability	– 24 hours a day/seven days a week/365 days per year.
Project site area	Project site: 13.74 ha Easements: transmission 2.68 ha, access road 0.23 ha
Subdivision	Subdivision of 13.74 ha of Lot 10/ DP1201414 to create a lot(s) for the project site, and creation of easements for project-related infrastructure. Residual lot size 19.42 ha.
Proposed infrastructure	– Battery energy storage system (including batteries, inverters, earthing, transformers, and switchgear).
Transmission and related infrastructure	– Switchyard on the project site – Overhead transmission line including three transmission line supporting structures (approximately 650 m and up to 45 m tall) and related infrastructure to connect to the existing Transgrid Munmorah Substation.
Ancillary infrastructure	– Upgraded permanent (internal) access road. – Site services, including power, water, on-site sewage management, stormwater drainage, and telecommunications. – Operation and maintenance building, storage yard, and light and heavy vehicle parking. – Signage and security. – No works outside the former Munmorah power station are required for the project. All main and ancillary project components would be located on part of Lot 10/ DP1201414.

Project element	Summary
Estimated employment	Up to 150 construction (peak), 10-15 during operation.
Construction access/ permanent access roads	Via upgrades to existing paved or gravelled roads on site.
Construction worker parking	On-site at an existing hardstand area located south of Hammond Canal and west of the former power station.
Duration of construction (indicative)	18 months.

A description of the battery energy storage system, the connecting transmission and related infrastructure, and the ancillary infrastructure is provided in Section 3.1.1 through Section 3.1.3. The proposed project infrastructure and existing site constraints is shown in Figure 3.1.



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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Site constraints map

FIGURE 3.1

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Data source: Fibre Optic Easement - Energy Co; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service: .
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3.1.1 Battery energy storage system

The battery energy storage system would be capable of discharging up to 850 MW, as required. This comprises nominally 700 MW of core service and an additional 150 MW of power capacity to maximise availability of the core service and also allows some capacity to be released at off-peak times for trading to put downward pressure on the cost to electricity users in NSW. It would consist of approximately 300 collector segments and 2,600 battery units (modular enclosures) arranged within the proposed battery storage area. The final layout of the units would be subject to detailed design.

Each battery unit would contain a group of lithium-iron-phosphate (LFP) batteries, housed within weather-proof enclosures. The battery energy storage system would also contain inverters, medium voltage transformers, switchgear, and associated control systems. The batteries and inverters have ventilating and air conditioning systems that maintain the equipment within safe operational temperature limits. For illustration, examples of some commercially available battery energy storage cabinets and battery units are provided in Figure 3.2.

The size of the individual battery units (battery segment) would be dependent on the selected suppliers but could be as large as 3.3 metres high, 1.6 metres wide, and 2.5 metres deep. A typical 'line up' for a battery includes a medium voltage transformer, inverter, and then a 1.2-metre spacing to the DC collector cabinet. The layout and spacing would designed in accordance with appropriate standard to ensure integrity of the system. These include:

– NFPA 855 – Standard for the Installation of Stationary Energy Storage Systems
– IFC 2021 – International Fire Code (IFC)
– UL9540A – Testing the fire safety hazards associated with propagating thermal runaway within battery systems.

Each battery unit would be mounted on concrete footings, built foundations, or piles.

The battery units would be connected via underground cables to a control room located in the administration building. The control room would provide a range of safety measures including:

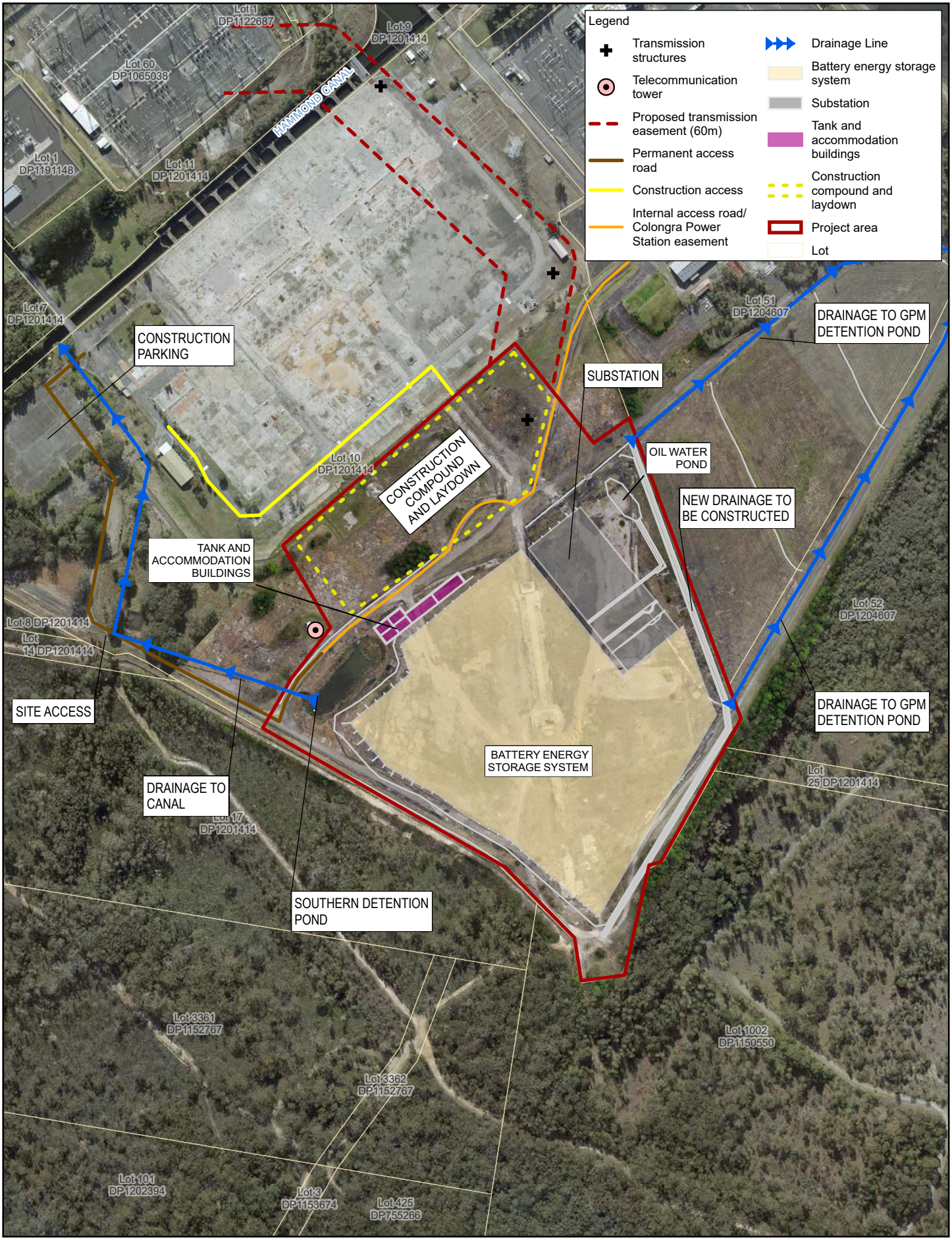
– Maintaining voltage levels and ensuring automatic cut-out in the event of electrical shorts.
– Preventing overcharging and current surges.
– Preventing overheating or other unplanned events.

The appearance of the proposed battery energy storage system would be determined by the equipment selection; however, it would be expected to be similar to the example provided in Figure 3.3. A site plan is shown in Figure 3.4.

The battery energy storage system would use equipment that has been tested for fire safety and fire protection systems and would be installed according to suppliers' recommendations and the Fire Safety Study. Additionally, fire water would be available on site (through mains and storage) to protect against fire propagation. Emergency water tanks with a minimum of 40,000 litres would be included on site. Detailed design would consider fire water reticulation around the site. A fire hydrant system would be installed in accordance with Australian Standards unless alternative systems are agreed with Fire and Rescue NSW through the development of the Fire Safety Study. All fire safety systems would be detailed in a Fire Safety Study prepared in consultation with Fire and Rescue NSW.

Figure 3.2 Example of a battery storage cabinet

Figure 3.3 Indicative layout of the Waratah Super Battery



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Site plan

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FIGURE 3.4

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3.1.2 Connecting transmission and related infrastructure

3.1.2.1 Switchyard

The proposed switchyard would provide the connection between the battery energy storage system and Munmorah Substation operated by Transgrid (refer to Figure 3.4). The switchyard would be designed at a nominal distribution voltage of 330 kV and consist of three transformer units.

The switchyard would be installed in the north-eastern area of the site, and directly adjacent to, the proposed battery energy storage system. It would comprise air insulated switchgear (switches, power circuits, power transformer, breakers, and other auxiliary equipment). A dedicated oil water pond would be installed adjacent to the switchyard to capture any spills from the site.

3.1.2.2 Transmission line and easement

An overhead, double circuit 330 kV transmission line would connect the proposed switchyard to the existing Munmorah Substation. The transmission line would be approximately 650 metres long and within a 60-metre-wide easement.

The proposed transmission line would run along the north-eastern boundary of the former Munmorah Power Station and would connect to two dedicated 330 kV feeder bays at the Munmorah Substation. The location of the feeder bays at the Munmorah substation would be advised by Transgrid. The transmission line would also maintain an appropriate distance from the Colongra Power Station transmission line in accordance with relevant standards.

The transmission lines would be supported by steel lattice towers varying in heights from 35 metres to 45 metres. At the connection point to the existing Munmorah Substation, either lattice towers or 25 to 35-metre-high monopoles would be used depending on detailed design considerations. Typical transmission structure types are shown in Figure 3.5.

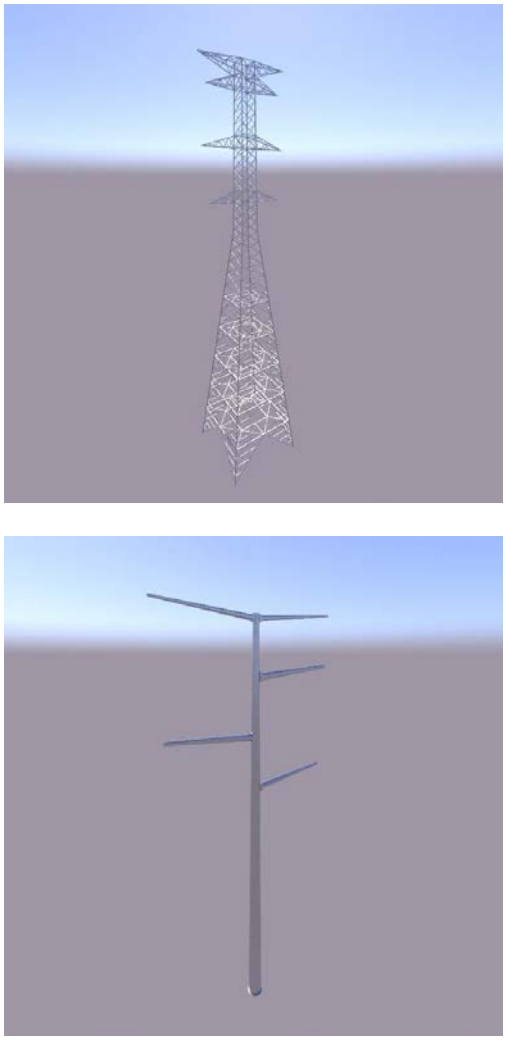


Figure 3.5 Typical lattice tower (top) and monopole (bottom) designs

3.1.3 Ancillary infrastructure

Ancillary infrastructure would be required to support the project. This ancillary infrastructure would include:

– Construction access. Construction access would be required for site equipment and heavy materials. Access to the project site would be via Station Road and the permanent GPM access road then through the demolished power station site to the project site on the northern boundary (refer to Figure 3.4). Access is generally along existing roads and hardstand with some earthworks/regrading between the former power plant site and the project site – a distance of about 50 metres. For the unsealed portion within the project site, a gravel road approximately five metres wide and 200 metres long would be required. The site contains a right of access for emergency egress for Colongra Power Station. This right of access would be preserved in the development of the project.
– Site services, including:
    - Power supplied to the site via step-down transformers at the switchyard with emergency power available if grid connection to Munmorah is lost.
    - Water and telecommunications supplied to the site via a new easement and connection through the GPM offices.

- Wastewater (sewage) contained and treated onsite using a proprietary system or removed periodically as necessary.

– Operation and maintenance building, storage yard, and light and heavy vehicle parking. The operation and maintenance building would include space for a site control room, employee facilities including office, meeting room, change room, ablutions, crib room, and first aid facility. The operation and maintenance building would also be used for repairs and preventative maintenance tasks for operational equipment. The operation and maintenance building would be located adjacent to the battery energy storage system. The building would be approximately 30 metres by 30 metres in size and would be constructed out of steel, insulation, and aluminium cladding. A storage yard measuring approximately 30 metres by 30 metres would be located adjacent to the operation and maintenance building and would be used for the storage of materials and equipment. Parking for heavy vehicles would also be provided for up to five heavy vehicles and 10 light vehicles at the proposed operation and maintenance building.
– Signage. Appropriate signage would be erected at various locations around the project site to comply with local standards and aid wayfinding.
– Security. Security controls installed at the project site would include perimeter fencing, internal fencing of key infrastructure, lighting and surveillance equipment, and a site gatehouse and security gating at the existing permanent access road. The switchyard would also have a separate security fence to comply with requirements of a 330 kV facility.
– Minor upgrades to the existing permanent (operational) access road around the west of the former power station site in order to provide a route that avoids the GPM site office.
– Site drainage. Drainage is currently contained by a number of channels surrounding the site due to its previous use as a coal loader and coal stockpile area. These drains discharge from three points; in the east from an existing site pond and from the north and western corners which flow offsite to the southern detention pond (refer to Figure 3.4). The battery pad area would be designed with a minimum one per cent gradient to drain to the existing drains in the north-east.

3.1.4 Subdivision

The project site is located within part of Lot 10/ DP1201414. The required land for the project site would require subdivision of approximately 13.74 hectares of Lot 10/ DP1201414. The proposed draft plan of subdivision is shown on Figure 3.6. The size of the residual lot would be approximately 19.42 hectares

Outside of the subdivision, easements would be required across the wider Munmorah site (Lot 10/ DP 1201414 for the purposes of electricity transmission (2.68 ha) to the Munmorah Substation, access to town water, drainage, and site access (0.23 ha).

No other easements or subdivision is anticipated to be required to develop the project.

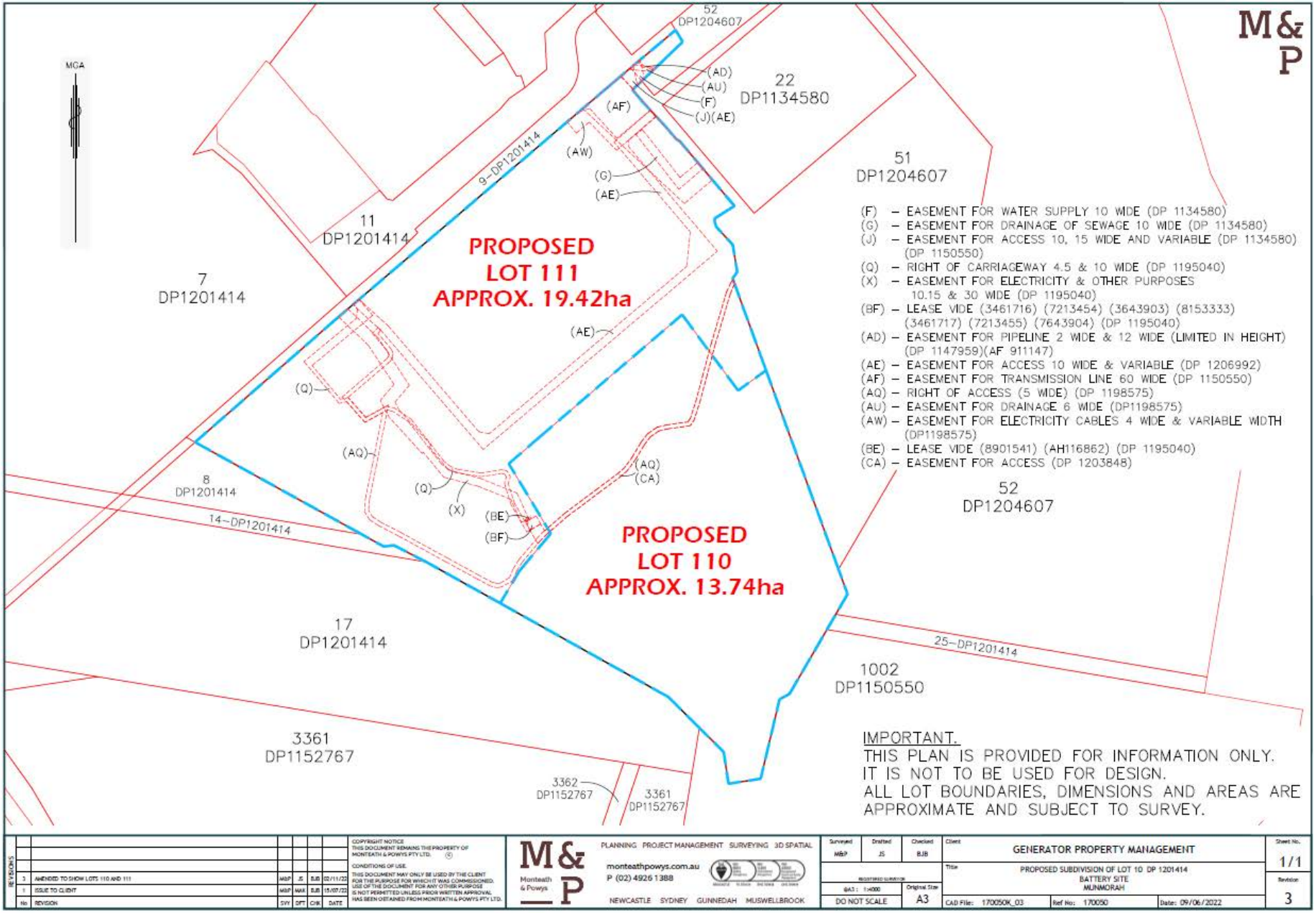


Figure 3.6 Proposed draft plan of subdivision

3.2 Construction

3.2.1 Remaining works by GPM

As outlined in Section 2.3, prior to construction commencing, GPM will complete any outstanding remediation and rehabilitation works to demolish remaining infrastructure (including the coal bunker and other concrete infrastructure), removing the remaining coal residue, contouring the landscape, installing erosion control measures and weed management, including the removal of exotic pine trees on the site.

These works are being progressed in accordance with existing approvals (DA 413/2014) and relevant Part 5 approvals and will be completed prior to possession of the site by the service provider.

3.2.2 Site preparation, construction, and commissioning

3.2.2.1 Site preparation

Site preparation works would involve:

- Formalising the construction access road from the existing internal access road into the project site. Access from the old power station site to the project site would need to be graded and compacted.
- Establishment of areas for laydown of materials and equipment. Temporary laydown areas would be established for the storage of materials and equipment on the project site. The hardstand area of the former power station may also be used as a temporary storage area.
- Establishment of temporary site offices and crib facilities. A number of buildings would be required to support the construction works. Temporary buildings would typically be transportable and demountable structures and would be removed once no longer needed.
- Removal of existing earthing on site. The project site forms part of the site of the former Munmorah Power Station. As a result, earthing conductors may still exist and may be connected to some part of the equipment that is still in service. Prior to construction, there would be a requirement to remove the existing earthing on site by implementing the safety procedures associated with the potential of encountering live conductors.
- Clearing and grubbing. Clearing and grubbing, including the removal of residual concreate slabs and drainage lines, would be undertaken progressively over the project site in parallel with other site preparation activities to minimise the areas of exposed ground and to reduce the potential for erosion. Where vegetation is removed, it would be stockpiled and stored on site, and may be chipped for use in erosion and sediment control. Subsurface vegetation would be grubbed to a depth suitable to facilitate construction of the proposed infrastructure.
- Earthworks and grading. Earthworks and grading would be necessary to provide a flat surface for construction and to provide adequate drainage. Topsoil and subsoil would be stripped and stockpiled separately. Topsoil would be stockpiled and maintained for redistribution at the surface. Subsoil, if suitable, would be stockpiled for use as road subbase or as backfill at the project site.
- Earthworks design would balance any cut and fill to minimise excess spoil. However, where excess spoil is required to be removed this would be disposed of at GPMs existing secure waste disposal facility on the broader Munmorah site.
- Installation (or relocation if necessary) of utilities and services. Utilities and services would be established progressively during site preparation and construction (extending to facility components as they are established). These services would include power, water, communications, waste collection, water management, and lighting.
- Installation of asset protection zones. Establishment of asset protection zones would be required to protect the project site from bushfires.
- Installation of site security facilities and infrastructure. Installation of security infrastructure would be required to secure the project site. Security measures would include perimeter fencing, internal fencing at key infrastructure, lighting and surveillance equipment, and a site gatehouse and security gating at the site entry road.

3.2.2.2 Construction

Construction would involve:

– Construction/installation of the battery energy storage system, including:
  - Detailed grading of the site to create level platforms for the installation of the battery foundations. The platforms would be designed with a minimum one per cent gradient for drainage purposes.
  - Installation of concrete slabs or foundations to support the battery containers/modules, power conversion systems, and transformers.
  - Installation and electrical fit out of the battery modules, power conversion systems, and transformers.
  - Installation of new earthing system. The design of the earthing system and the connection requirements to the earthing system would be determined based on the expected maximum fault levels.
– Construction/installation of connecting transmission and related infrastructure, including:
  - Installation of a switchyard adjacent to the battery energy storage system.
  - Installation of an overhead transmission line from the switchyard to the existing Munmorah Substation.
– Construction/installation of ancillary infrastructure, including:
  - Upgraded permanent access road.
  - Site drainage infrastructure including oil/water separation pond for runoff from the switchyard.
  - Site services, including water, sewage (via an on-site sewage management system), and communications (noting power would be supplied through the proposed switchyard connection).
  - Operation and maintenance building, light vehicle parking and heavy vehicle parking.
  - Signage and security.

Construction works are estimated to last 18 months with an additional six months for commissioning and testing periods with a maximum of 150 permanent employees on site at the peak of construction.

All buildings would be constructed in accordance with the relevant industry and regulatory standards including the Building Code of Australia.

Construction materials would comprise fill (soil and rock) sourced either on-site, or locally, and other materials such as wood, steel, and concrete that would be delivered to the project site, as needed. A temporary construction laydown area would be established near the construction entrance utilising the existing car park delivery vehicle waiting area, as required. Deliveries of the majority of components would be on a just-in-time basis being lifted directly in to position upon delivery, however, site clearance and preparation would provide additional laydown areas, as required, in early stages of construction.

Waste generated during construction would include construction waste, domestic waste, and wastewater. Construction waste and domestic waste would be managed by collecting, separating, and storing waste according to its potential for reuse, recycling, recovery, treatment and/or disposal. Waste would be stored in appropriate containers such as industrial bins or drums in dedicated waste collection areas for collection by appropriately licenced waste contractors. Wastewater would be managed on-site via regular truck removal.

3.2.2.3 Commissioning

Commissioning and testing would include final inspection and testing of all proposed facilities to ensure they operate as intended. This would include, but not be limited to, inspection and testing of the battery energy storage system, all communications and control systems, transformers, switchgear and switchyard equipment, power and water supply infrastructure, water management infrastructure, waste management facilities, and relevant ancillary components such as fire detection systems.

3.2.3 Access

Access to the Munmorah site would be via the existing Scenic Drive, Station Road and other existing internal access roads, which are adequate to service the project (refer to Figure 3.4). Once across Hammond Canal, heavy vehicles would access the project site during construction via existing internal roads and paved/disturbed surfaces of the former power station. Light vehicles would access the project site during construction and operation via the proposed permanent access road, which follows existing internal access roads and car parking areas of the former power station site.

3.2.4 Equipment and vehicles

Enabling and construction would likely require the following equipment and vehicles:

- Bulldozer.
- Front end loaders.
- Dump trucks.
- Water trucks.
- Excavators.
- Graders.
- Compactors and rollers.
- Concrete trucks and pumps.
- Elevated work platforms.
- Slew cranes or crawler cranes.
- Franna cranes.
- Manitou.
- Concrete saws and grinders.
- Scrapers.
- Backhoe.
- Generators.
- Light vehicles.

There would be several oversized over mass (OSOM) loads. These include three transformers and two prefabricated transmission structures, high voltage (HV) cable drum rolls, and construction equipment such as site shed(s) and civil construction equipment such as excavators, dozers, etc.

All other equipment is expected to be delivered on flat bed heavy vehicles (two battery segments per flatbed truck). During construction a maximum of 300 – 400 heavy vehicles (one-way movements) will occur at the site over the course of a week during peak activity.

3.2.5 Workforce

It is expected that up to approximately 150 full time equivalent people would be employed during construction of the project. Depending on skills and availability, the construction workforce may be sourced locally, regionally, or from interstate (if required). Most of the permanent workforce is likely to be based on the Central Coast or in Sydney or Newcastle.

3.2.6 Construction hours

The majority of construction activities would be carried out during the following hours, consistent with the recommended standard hours of the *Interim Construction Noise Guideline* (Department of Environment and Climate Change 2009):

- 7am-6pm Monday to Friday.
- 8am-1pm Saturdays.
- No work on Sundays or Public Holidays.

Work that would be carried out outside of the recommended standard construction hours may include:

- Work determined to comply with the relevant noise management level at the nearest sensitive receiver.
- The delivery of oversized materials and heavy equipment – for instance power transformers, as required by the NSW Police or other authorities for road safety reasons.

3.2.7 Staging

The project may be constructed in stages with the first 350 MW targeted to be installed by November 2024, with the balance to be installed in 2025.

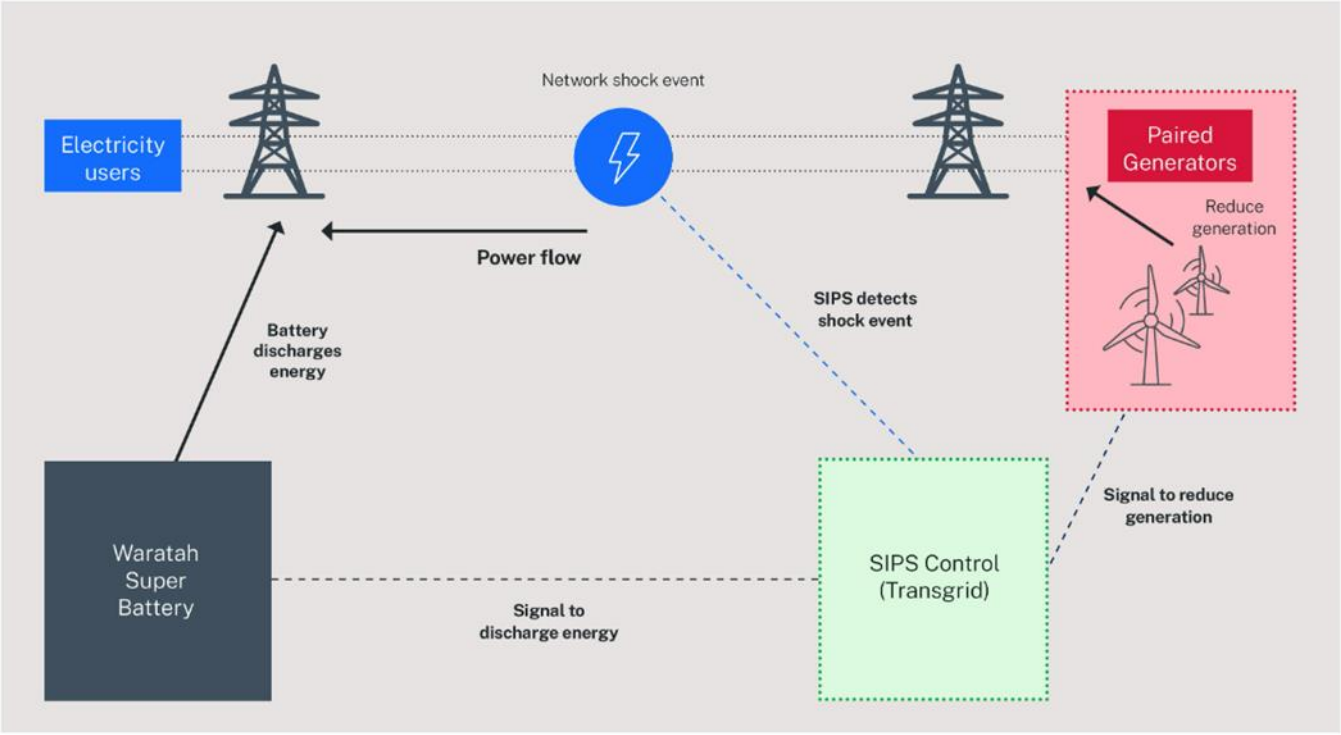
3.3 Operation

3.3.1 Site operation

The battery energy storage system would be operated by the service provider (Akaysha Energy), and the SIPS component of the project would be operated by the network operator (Transgrid). The Waratah Super Battery would respond to a SIPS signal and discharge based on network conditions as determined by the network operator. In this respect, the battery would have the capability to:

– Reduce potential network constraints and improve intra-network energy flow by avoiding potential overloading of transmission assets and reducing potential generating constraints.
– Discharge when the network would require additional generation to maintain load balance e.g., when a substantial amount of generation may be lost due to a network contingency event or due to large generators becoming unavailable.

During normal network conditions, the Waratah Super Battery would enable greater transmission capacity to supply Sydney, Newcastle and Wollongong load centres, from generators in regional NSW, through existing infrastructure, by acting as a ''shock absorber''. The additional transmission enabled by the Waratah Super Battery signals to Transgrid that it has guaranteed capacity in reserve and paired generators that are ready to ramp down generation at the same rate as the Waratah Super Battery ramps up generation if a shock event occurs. This process is shown in Figure 3.7. The paired generation will then ramp up at the same rate that the Waratah Super Battery ramps down when the shock event is over.



Source: EnergyCo

Figure 3.7 Summary of Waratah Super Battery operation

The SIPS will operate on a seasonal profile. This profile of operation provides sufficient energy storage capacity for the battery to respond to four shock events without charging in the extended summer period between November and March, and two events without charging in other months between April and October. This is appropriate as there is a higher likelihood of transmission line disturbances occurring during the extended summer period to which the SIPS will be required to respond, caused by higher risks such as bushfire and storm activities.

The SIPS would continue to operate for approximately 5 years to increase transmission capacity to Sydney, Newcastle and Wollongong load centres until the completion of the Hunter Transmission Project, referenced in Section 2.1.4.3. After this period the SIPS would be reviewed and if it is no longer required for grid stability, may be used as a merchant battery energy storage system (i.e. selling electricity to the grid).

The battery energy storage system will have an initial physical capacity of 850MW/1680MWh. The oversizing allows for degradation of the battery, to ensure that the system will still meet the required SIPS capacity of 700MW/1400MWh at the end of the 5 year SIPS period. This also allows the service provider to trade the additional capacity during the period, thereby reducing the cost to consumers.

The following activities would be carried out during operation of the Waratah Super Battery:

– Maintenance and management of equipment.
– Maintenance of transmission line corridor (trimming of vegetation).
– General office activities.
– Receipt of goods.
– Waste removal.

3.3.2 Access

During operations, light and heavy vehicles would access the project site via the proposed permanent access road off Station Road, which follows existing internal roads and carparking areas (refer Figure 3.4). Minor upgrades would be required to the existing road to facilitate the access, including resurfacing the roadways.

3.3.3 Equipment and vehicles

Equipment and vehicles that would be used during operation would include:

– Maintenance equipment.
– Light vehicles.

3.3.4 Power and water usage

To charge the battery, the power demand at the project site would be a maximum of 850 MW and would be imported through the proposed switchyard from the Munmorah Substation.

Water demand at the project site would be in the order of 110-150 kilolitres (kL) per annum based on 10-15 persons on site maximum. Water would be sourced from the existing watermain connection to the GPM site office. Water would be used primarily for potable purposes (e.g., drinking water, toilets), fire water storage and cleaning purposes.

If required, the fire suppression system would use town supply and reticulated around the site to hydrants (unless otherwise agreed with Fire and Rescue NSW). The fire system would include a 40,000 L fire water tank for supplemental or emergency water supply agreed with the relevant fire authorities.

3.3.5 Workforce

Operation of the project would largely be undertaken remotely, however, the site would be staffed at all times.

Approximately 10 to 15 maintenance personnel are likely to be required to attend the project site on a regular basis to perform a variety of maintenance and operational activities. Depending on skills and availability, the workforce may be sourced locally, regionally, or from interstate or further abroad, if necessary. The maintenance workforce would likely to be based on the Central Coast or in Sydney or Newcastle. Specialist skills for particular equipment maintenance (e.g., batteries and inverters) may be sourced from further afield, as required.

3.3.6 Operation hours

The proposed operations would be undertaken 24 hours per day, seven days per week, 365 days per year.

3.4 Decommissioning and rehabilitation

The functional life of the battery units is expected to be 20 years. However, units would be progressively replaced as they are assessed to be degraded and as such the project would continue to operate indefinitely. The initial life of the project is also anticipated to be 20 years with components anticipated to be replaced or upgraded, as required, with the potential to extend the life indefinitely. If and when required, decommissioning and rehabilitation would occur over approximately 12-24 months and would commence upon final closure of the Waratah Super Battery.

Upon final closure, all infrastructure, utilities, and disturbed areas would be decommissioned and rehabilitated to the pre-existing land use or other condition in consultation with relevant stakeholders. Where it is possible to do so, adaptive reuse of buildings, infrastructure, or utilities would be considered. The batteries within the battery energy storage system would either be disposed of and recycled at approved disposal facilities, or subject to confirmation, could be returned to the original equipment manufacturer for refurbishment and repurposing or recycling.

A detailed decommissioning and rehabilitation plan would be prepared prior to decommissioning of the Waratah Super Battery.

3.5 Timing

Construction and commissioning would indicatively occur over approximately 18-24 months and is currently planned to commence in early 2023 (subject to approvals). Operation is planned to commence in November 2024, with 350MW core service in place for operation during the summer months. The final stage (i.e., up to 850 MW) is planned to be in operation by March 2025 prior to the expected closure of Eraring.

4. Statutory context

4.1 Introduction

This chapter outlines the relevant statutory requirements for the Waratah Super Battery. It identifies:

– The legal pathway under which approval is sought, why the pathway applies, and who the decision-maker is.
– Relevant state approvals (outlining approvals that are not required for approved CSSI and approvals that are required and that should be substantially consistent with approved CSSI).
– Mandatory matters for consideration, including relevant state and local environmental planning instruments that have been considered but are not a mandatory consideration for CSSI.
– Relevant federal approvals.

A summary of the statutory requirements for the Waratah Super Battery is provided in Table 4.1, with further detail provided in Section 4.2 through Section 4.4. A detailed assessment of the statutory requirements is addressed in the relevant sections of the environmental impact assessment presented in Chapter 6 and a statutory compliance table is provided in Appendix B.

Table 4.1 Summary of statutory requirements

Category	Comment/requirement
Permissibility/land use zoning	The project site, and the majority of the wider Munmorah site, is zoned SP2 Infrastructure under Central Coast Local Environmental Plan 2022 (Central Coast LEP), and State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) also applies to the site. The identified purpose for the SP2 zone on the Munmorah site is 'electricity generating works', which are permissible with consent under the Central Coast LEP.
Power to grant approval	The project has been declared CSSI in accordance with section 5.13 of the EP&A Act and Schedule 5, section 30 of the Planning Systems SEPP. The Minister for Planning is the consent authority, and the project is to be assessed in accordance with the provisions of Division 5.2 of the EP&A Act.
Approvals required and that should be substantially consistent with approved CSSI	Any authorisations under certain legislation, identified in section 5.24 of the EP&A Act, cannot be refused if it is necessary for carrying out an approved SSI project and is to be substantially consistent with the SSI approval. In relation to the project, these authorisations could include: – An approval under section 22 of the *Mine Subsidence Compensation Act 1961* (repealed by the *Coal Mine Subsidence Compensation Act 2017* (CMSC Act)). – An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (POEO Act). – A consent under section 138 of the *Roads Act 1993* (Roads Act). Applicable to the project, an approval under section 22 of the CMSC Act would be required.
Approvals not required for approved CSSI	An authorisation under certain other legislation, identified in section 5.23 of the EP&A Act, is not required for approved State significant infrastructure. These include: – A permit under section 201, 205 or 219 of the *Fisheries Management Act 1994* (FM Act). – An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977* (Heritage Act). – An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974* (NPW Act). – A bush fire safety authority under section 100B of the *Rural Fires Act 1997* (RF Act). – 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* (WM Act). In relation to the project, none of these approvals would be applicable if it were not an approved CSSI.

Category	Comment/requirement
EPBC Act approvals	The project is not anticipated to result in a significant impact on any Matters of National Environmental Significance (MNES) under the Commonwealth EPBC Act. A referral under the EPBC Act has not been made for the project.
Pre-conditions to exercising the power to grant approval	Critical State significant infrastructure declaration.
Mandatory matters for consideration	Mandatory matters that must be satisfied before the consent authority may grant project approval include consideration of: – Accompanying Biodiversity Development Assessment report (BDAR), as required under Part 4 of the *Biodiversity Conservation Act 2016* (BC Act) (NSW). – Biosecurity matters as per the *Biosecurity Act 2015* (NSW). – Duty to notify (if required) under Section 60 of the *Contaminated Land Management Act 1997* (CLM Act) (NSW). – Transport and Infrastructure SEPP, State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP), and Central Coast LEP.

4.2 Planning approval pathway – NSW

4.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act is the principal legislation regulating development in NSW. It establishes a regime for the making of development applications, assessment of their environmental impacts, and the determination of those applications. It also allows for the making of environmental planning instruments such as SEPPs and LEPs.

Part 5, Division 5.2 of the EP&A Act provides for declaration, assessment, and approval of SSI and CSSI. The process for environmental assessment and approval of SSI and CSSI is set out as follows:

– Application for approval of the Minister for Planning (the Minister) to carry out development.
– Development of Planning SEARs.
– Preparation of an EIS.
– Public exhibition of the EIS.
– Response to submission(s) received during public exhibition of the EIS.
– Preparation of Planning Secretary's Assessment Report.
– Determination regarding the development by the Minister.

4.2.2 Critical State Significant Infrastructure

The project has been declared CSSI in accordance with section 5.13 of the EP&A Act and Schedule 5, Section 30 of the Planning Systems SEPP. Consequently, the Minister for Planning is the approval authority, and the project is to be assessed in accordance with the provisions of Division 5.2 of the EP&A Act.

4.2.2.1 Approvals not required for approved CSSI

Under section 5.23 of the EP&A Act, certain other approvals are integrated into the CSSI approval process and are not required to be separately obtained for the proposal. Such approvals are listed in Table 4.2. None of these are relevant to the Waratah Super Battery project.

Although approvals are not required under the legislation listed in Table 4.2, the objectives of the legislation have been considered in the environmental impact assessment for the Waratah Super Battery.

Table 4.2 Approvals that would not be required for the Waratah Super Battery (approved CSSI)

Legislation	Purpose/description	Approval required/not required
WM Act	The WM Act provides for the sustainable and integrated use and management of water resources in NSW. The WM Act controls the extraction of water, its use, and the carrying out of activities on or near water sources. Part 3 of the WM Act outlines the approval requirements for water use (section 89), management works approvals (section 90), and activity approvals other than aquifer interference (section 91). These approvals include two activity types, controlled activity approvals and aquifer interference approvals. A controlled activity approval allows the holder to carry out a specific controlled activity on waterfront land, defined as land within 40 metres of a river, lake, estuary, or shoreline. The project would not involve a water use approval or involve any water management works under the WM Act. No works are being carried out on waterfront land and, as such, a controlled activity approval is not required.	Not required for approved CSSI. The project would not affect water resources, other than the overhead transmission line across Hammond Canal.
NPW Act	The NPW Act provides for the protection of Aboriginal objects and places in NSW. Section 86 of the NPW Act states it is an offence to harm an Aboriginal object, defined as destroying, defacing, damaging or moving an object from the land. Section 87 states a defence to the harm or destruction of an Aboriginal object is the authorisation of an Aboriginal Heritage Impact Permit (AHIP) issued under section 90 of NPW Act.	Not required for approved CSSI. The project would not impact any known Aboriginal objects.
Heritage Act	The Heritage Act is concerned with all aspects of the conservation of heritage places and items, with items of state significance listed on the State Heritage Register. Part 4 of the Heritage Act states that approval must be obtained for works that have the potential to interfere with an item on the State Heritage Register or that is subject to an Interim Heritage Order.	Not required for approved CSSI. The project would not impact any heritage items.
FM Act	The objectives of the FM Act are to conserve, develop and share the fisheries resources of NSW for the benefit of present and future generations. Part 7 of the FM Act outlines a number of permits required for works within fisheries areas, including dredging or reclamation works (section 201), marine vegetation in protected areas (section 205) and fish passages (section 219).	Not required for approved CSSI. The project would not impact any fisheries resources.
RF Act	The objectives of the RF Act are to provide for the prevention, mitigation, and suppression of bush and other fires; for the co-ordination of bush firefighting and bush fire prevention; for the protection of persons from injury or death, and property from damage, arising from fires; and for the protection of infrastructure and environmental, economic, cultural, agricultural, and community assets from damage arising from fires. A bush fire safety authority must be obtained before developing in bush fire prone land under section 100B of the RF Act.	Not required for approved CSSI. The project does not require a bushfire safety authority under the Act.

4.2.2.2 Approvals required and that should be substantially consistent with approved CSSI

Under section 5.24 of the EP&A Act, certain other approvals are still required for CSSI, but must be substantially consistent with the CSSI approval. Such approvals are outlined in Table 4.3.

Table 4.3 Approvals that would be required for the Waratah Super Battery (approved CSSI)

Legislation	Purpose/description	Approval required/not required
FM Act	Part 7 of the FM Act outlines a number of permits required for works within fisheries areas including aquaculture. The project is not located within a fisheries area and would not require an aquaculture permit under section 144 of the FM Act	Not required.
CMSC Act	The object of the CMSC Act is to provide for a fair, efficient, and sustainable compensation framework for dealing with the impacts of coal mine subsidence. In particular, it provides for the provision of compensation for damage caused by subsidence resulting from coal mine operations, and assessment and management of risks associated with subsidence resulting from coal mine operations. Certain development within mine subsidence districts require approval.	Required – cannot be refused if necessary for carrying out approved CSSI

Legislation	Purpose/description	Approval required/not required
	The project site is located within a mine subsidence district, the Swansea North Entrance Mine Subsidence District, regulated by the Subsidence Advisory of NSW (SANSW). The project would, therefore, require approval from the Chief Executive of SANSW under section 22 of the CMSC Act.	
Mining Act 1992	The *Mining Act 1992* facilitates the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development. Mining leases are issued under Part 5 of the Act. The project would not include mining for mineral resources or any activity which would require a lease under the Act.	Not required.
Petroleum (Onshore) Act 1991	The *Petroleum (Onshore) Act 1991* facilitates the discovery and development of petroleum resources in NSW, having regard to the need to encourage ecologically sustainable development. The project would not include any activity which would develop any petroleum resources which would require a production lease.	Not required.
Pipelines Act 1967	The *Pipelines Act 1967* outlines the licensing application requirements for pipelines in NSW. A licence is required under section 11 to commence, or continue, the construction of a pipeline, alter or reconstruct a pipeline or operate a pipeline. The project would not include pipeline construction, alteration of an existing pipeline or operation of a pipeline. A pipeline licence will not be required for the project.	Not required.
Roads Act	The Roads Act provides for the classification of roads and requirements for carrying out road works within NSW. Section 138 requires consent from TfNSW to be obtained prior to any works which occur on or over a public road. The project would not require work to be carried out in, on, or over a public road. Consent under section 138 will not be required for the project.	Not required.
POEO Act	The objectives of the POEO Act are to protect, restore and enhance the quality of the environment, in recognition of the need to maintain ecologically sustainable development. The POEO Act provides for an integrated system of licensing and contains a core list of activities requiring an Environment Protection Licence (EPL) from the NSW EPA. These activities are called 'scheduled activities' and are listed in Schedule 1 of the POEO Act. The Munmorah Power Station site is subject to two EPLs (#759 GPM and #13036 Colongra Power Station) however the project would not include any scheduled activities listed under Schedule 1 of the POEO Act. Therefore no EPL will be required for the project.	Not required.

4.3 Mandatory matters for consideration

The mandatory matters that must be satisfied before the consent authority may grant project approval are discussed in Section 4.3.1 through Section 4.3.4.

4.3.1 Biodiversity Conservation Act 2016

The BC Act aims to maintain a healthy, productive, and resilient environment consistent with the principals of ecologically sustainable development. Importantly, it aims to conserve biodiversity in NSW.

Part 4 of the BC Act provides for the listing of threatened species and threatened ecological communities. Part 6 of the BC Act provides for a biodiversity offsets scheme for biodiversity values. Part 7 of the BC Act provides for biodiversity assessment and approvals under the EP&A Act and includes a test to determine whether a proposed development will significantly affect threatened species or ecological communities.

Section 7.9 of the BC Act states an application for SSI, including CSSI, under the EP&A Act is to be accompanied by a BDAR. Section 7.14 of the BC Act states the Minister, in making a determination, must take into account the likely impact of the development on biodiversity values assessed in the BDAR, and may require biodiversity offsets through the Biodiversity Offsets Scheme.

Biodiversity values are defined in the BC Act as:

– 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.
– Habitat suitability – being the degree to which the habitat needs of threatened species are present at a particular site.
– Biodiversity values, or biodiversity – related values, prescribed by the regulations.

The Biodiversity Conservation Regulation 2017 (BC Regulation) further defines the following as biodiversity values:

– Threatened species abundance – being the occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site.
– Vegetation abundance – being the occurrence and abundance of vegetation at a particular site.
– 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.
– Threatened species movement – being the degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle.
– Flight path integrity – being the degree to which the flight paths of protected animals over a particular site are free from interference.
– 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.

A BDAR has been undertaken for the Waratah Super Battery. It is summarised in Chapter 6, Section 6.2 and is included as Appendix D.

4.3.2 Biosecurity Act 2015

The *Biosecurity Act 2015* (NSW) provides the statutory framework to protect the NSW economy, environment, and community from the negative impact of pests, diseases, and weeds.

The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter.

In NSW, all plants are regulated through a general biosecurity duty to prevent, eliminate, or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated, or minimised, so far as is reasonably practicable. Any biosecurity matters encountered during the carrying out of the project would need to be managed in accordance with this duty.

4.3.3 Contaminated Land Management Act 1997

The CLM Act establishes a process for investigating and (where appropriate) remediating land that the NSW Environment Protection Authority (NSW EPA) considers to be contaminated significantly enough to require regulation under Division 2 of Part 3 of the Act. In particular, the objects of the Act are to:

– Set out accountabilities for managing contamination if the NSW EPA considers the contamination is significant enough to require regulation under Division 2 of Part 3.
– Set out the role of the NSW EPA in the assessment of contamination and the supervision of the investigation and management of contaminated sites.

– Provide for the accreditation of site auditors of contaminated land to ensure appropriate standards of auditing in the management of contaminated land.
– Ensure that contaminated land is managed with regard to the principles of ecologically sustainable development.

A search of the NSW EPA contaminated land database (undertaken on 8 August 2022) confirmed that the project site is not listed as a contaminated site under the CLM Act, however, is listed as a site currently under assessment by the NSW EPA. Section 60 of the CLM Act includes a 'duty to notify' where significant contamination is identified. This section would be relevant if any previously unidentified contamination is encountered during construction that exceeds notification thresholds. As outlined in Section 2.3.1.3, GPM is in the process of undertaking rehabilitation, remediation, and maintenance works in accordance with its existing approvals within the site of the former Munmorah Power Station. This includes the project site of the Waratah Super Battery. Contamination risks have been addressed in Chapter 6, Section 6.4.

4.3.4 State Environmental Planning Polices and Local Environmental Plans

Section 5.22(2) of the EP&A Act provides that environmental planning instruments do not apply to or in respect of CSSI. Although environmental planning instruments are not a mandatory consideration for CSSI, relevant environmental planning instruments have been considered in this EIS, as indicated in Table 4.4 and detailed further in Appendix B.

Table 4.4 Environmental planning instruments considered in the environmental impact assessment of the Waratah Super Battery

Environmental planning instrument	Purpose/ description	Consideration
Transport and Infrastructure SEPP	The Transport and Infrastructure SEPP provides the framework for transport and infrastructure development applicable to land use.	The project classifies as infrastructure applicable to the types listed in the Transport and Infrastructure SEPP. Chapter 2, Part 2.3 defines development controls for specific infrastructure, including: – Division 4: Electricity generating works or solar energy systems. The project, and specifically the proposed battery energy storage system, classifies as electricity generating works and would be situated on land in a prescribed zone being SP2 Infrastructure. – Division 5: Electricity transmission or distribution. The project, and specifically the proposed switchyard and aboveground transmission line, would classify as electricity transmission or distribution networks, which may be carried out by a public authority without consent on any land. The project would classify as development likely to affect an electricity distribution network as it would connect to the existing Munmorah Substation. The supply authority has been consulted through the preparation of the EIS. – Division 17: Roads and traffic. The project will generate about 140 vehicles per hour during construction. Traffic-generating development specified in Column 3 of the Table to Schedule 3 indicates that sites with access to classified roads or to road that connects to classified road which generates 50 or more motor vehicles per hour must give written notice to TfNSW of the intention to carry out the development. Additionally, the proponent is required to take into consideration any response from TfNSW within 21 days. TfNSW has been consulted through the preparation of the EIS. Potential impacts on roads have been addressed in Chapter 6, Section 6.7.

Environmental planning instrument	Purpose/ description	Consideration
Resilience and Hazards SEPP	The Resilience and Hazards SEPP aims to manage risks and build resilience related to hazards. Development controls related to hazardous development and offensive industry, remediation of land and the approach to planning within coastal management areas are included.	Chapter 2 of the Resilience and Hazards SEPP outlines coastal management areas and appliable development controls. A small portion of the project site (about 20 per cent) is located within a Coastal Environment Area defined under the Resilience and Hazards SEPP. The potential impacts on the project on the coastal management area and on the coastal environment (including coastal vulnerabilities and hazards) has been assessed as being negligible based on limited impacts observed during the former operation of the Munmorah Power Station. Chapter 3 of the Resilience and Hazards SEPP outlines the development assessment process in relation to hazardous and offensive industries. Hazards and risks posed by the project have been addressed in Chapter 6, Section 6.9. Chapter 4 of the Resilience and Hazards SEPP outlines the framework regarding remediation of contaminated land. GPM is in the process of undertaking rehabilitation, remediation and maintenance works in accordance with its existing approvals within the project site (and surrounds), as outlined in Section 2.3.1.3. Contamination risks have been addressed Chapter 6, Section 6.4.
Central Coast LEP	The Central Coast LEP sets out the environmental planning provisions administered by the Central Coast Council within the Central Coast Local Government Area (LGA).	The project site is located wholly within land zoned SP2 Infrastructure under the Central Coast LEP. The identified purpose for the SP2 zone is for 'electricity generating works' which are permissible with consent under the Central Coast LEP. Objectives of the SP2 Infrastructure zone are: – To provide for infrastructure and related uses. – To prevent development that is not compatible with or that may detract from the provision of infrastructure. – To recognise existing railway land, major roads and utility installations and to enable their future development and expansion. The project is located within the former Munmorah Power Station site and will enable future development. The project is therefore consistent with the objectives of the SP2 Infrastructure zone.

4.4 Other approvals – Commonwealth

4.4.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora and fauna, ecological communities, and heritage places defined as MNES. Approval from the Australian Government Minister for the Environment and Water is required for:

– An action which has, would have, or is likely to have a significant impact on MNES.
– An action likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or actions on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

An 'action' is considered to include a project, development, undertaking, activity, or series of activities. MNES include:

– World heritage areas.
– National heritage places.
– Wetlands of international importance (i.e., Ramsar wetlands).
– Nationally listed threatened species and ecological communities.
– Listed migratory species.
– Commonwealth marine areas.

– The Great Barrier Reef Marine Park.
– Nuclear actions.
– A water resource, in relation to coal seam gas development and large coal mining development.

The project would not have a significant impact on MNES and has, therefore, not been referred to DCCEEW. Approval is not required under the EPBC Act for the Waratah Super Battery. Impacts on MNES are addressed in Chapter 6, Section 6.2.

4.4.2 Native Title Act 1993

The *Native Title Act 1993* (Cth) provides for the recognition and protection of native title across Australia. Specifically, it provides for:

– The validation of past acts which may be invalid because of the existence of native title.
– A future regime in which native title rights are protected and conditions imposed on acts affecting native title land and waters.
– A process by which native title rights can be established and compensation determined, and by which determinations can be made as to whether future grants can be made, or acts done over native title land and waters.
– A range of other matters, including the establishment of a National Aboriginal and Torres Strait Islander Land Fund.

There are no registered native title claims within the vicinity of the project site of the Waratah Super Battery.

5. Community and stakeholder engagement

5.1 Introduction

The purpose of community and stakeholder engagement is to ensure that the community and other project stakeholders have an opportunity to be involved in the planning, design, and assessment of the Waratah Super Battery. Engagement has been undertaken in accordance with the Waratah Super Battery – Munmorah Community and Stakeholder Engagement Plan and with reference to Undertaking Engagement: Guidelines for State Significant Projects (DPIE 2021b) and the International Association for Public Participation.

The purpose and objectives of engagement for the project are outlined in Table 5.1.

Table 5.1 Objectives of engagement

Objective	Action
Open and inclusive	– Keep the community informed. – Promote participation. – Seek community input and accurately capture community views. – Build strong partnerships with the community. – Incorporate culturally appropriate practices when engaging with Aboriginal and Torres Strait Islander and culturally and linguistically diverse communities. – Conduct community participation initiatives in a safe environment.
Easy to access	– Outline in advance how and when the community can participate. – Use best practice community participation techniques. – Make relevant information available in plain English and translate information when engaging with linguistically diverse communities or people living with disabilities. – Incorporate visual representations to clearing illustrate possible impacts of the project. – Ensure information is accessible for groups who find it difficult to participate in usual community participation activities. – Stage events at convenient times and locations.
Relevant	– Establish what is up for discussion. – Ensure as many community members as possible can participate. – Recognise previous community input on neighbouring projects and similar issues. – Tailor activities to the: • Context, which could include location, type of application, stage of the assessment process, previous engagement undertaken. • Scale, nature and known impacts for the project. – Adjust activities (if necessary) in response to community interest ad participation preferences.
Timely	– Start community participation as early as possible and continue for an appropriate period. – Provide regular project updates to the community. – Ensure the community has reasonable time to provide input. – Facilitate ongoing discourse with local community networks. – Consider holidays and other community events when setting dates for engagement initiatives.
Meaningful	– Have planners and decision makers engage directly with the community. – Ensure responses to community input are relevant and proportionate. – Give genuine and proper consideration to community input. – Keep accurate records of community input and participation activities. – Regularly review the effectiveness of community participation initiatives. – Integrate community input into the evaluation process. – Comply with statutory obligations, protect privacy, and respect confidentiality. – Explain at the end of the project how community views were considered when reaching decisions.

5.2 Overview of engagement

5.2.1 Identification of stakeholders

Stakeholders were identified as those that may be interested in, or who may be affected by, the Waratah Super Battery. Stakeholders are listed in Table 5.2 and categorised into three main groups. These were:

– Government and technical stakeholders.
– Landowners.
– The wider community.

Stakeholders will continue to be identified and consulted during all project phases, including if approved, the construction, operation, and decommissioning and rehabilitation phases of the Waratah Super Battery.

Table 5.2 Community stakeholders consulted to date

Stakeholder group	Stakeholders
Government and technical stakeholders	
State Government departments	Department of Planning and Environment (DPE)
	NSW Environment Protection Authority
	NSW Rural Fire Service
	Transport for NSW
	Heritage NSW
	DPE Crown Lands
	DPE National Resources Access Regulator
	DPE Biodiversity Conservation Directorate
	Water NSW
	Fire and Rescue NSW
	Department of Regional NSW
	Hunter Water
	Sydney Trains
	Subsidence Advisory New South Wales
Local Government	Central Coast Council
Electricity distributors and/or retailers	Transgrid
	Origin
	Axicom
	Ausgrid
Key energy market bodies	AEMO
	IPART
Impacted landowners	
Landowners	Generator Property Management (GPM)
	Snowy Hydro

Stakeholder group	Stakeholders
Wider community	
Neighbours	Residents in surrounding suburbs
Indigenous organisations	Darkinjung Local Aboriginal Land Council
	Registered Aboriginal Parties

5.2.2 Engagement with community stakeholders

Stakeholders were engaged using a range of tools and techniques including meetings, phone calls, letters, emails, website updates, and newsletters (refer to Figure 5.1). These were supported by community feedback mechanisms, including a project-specific phone number and email address.

A summary of the community engagement undertaken predominantly in September 2022 is provided in Table 5.3.

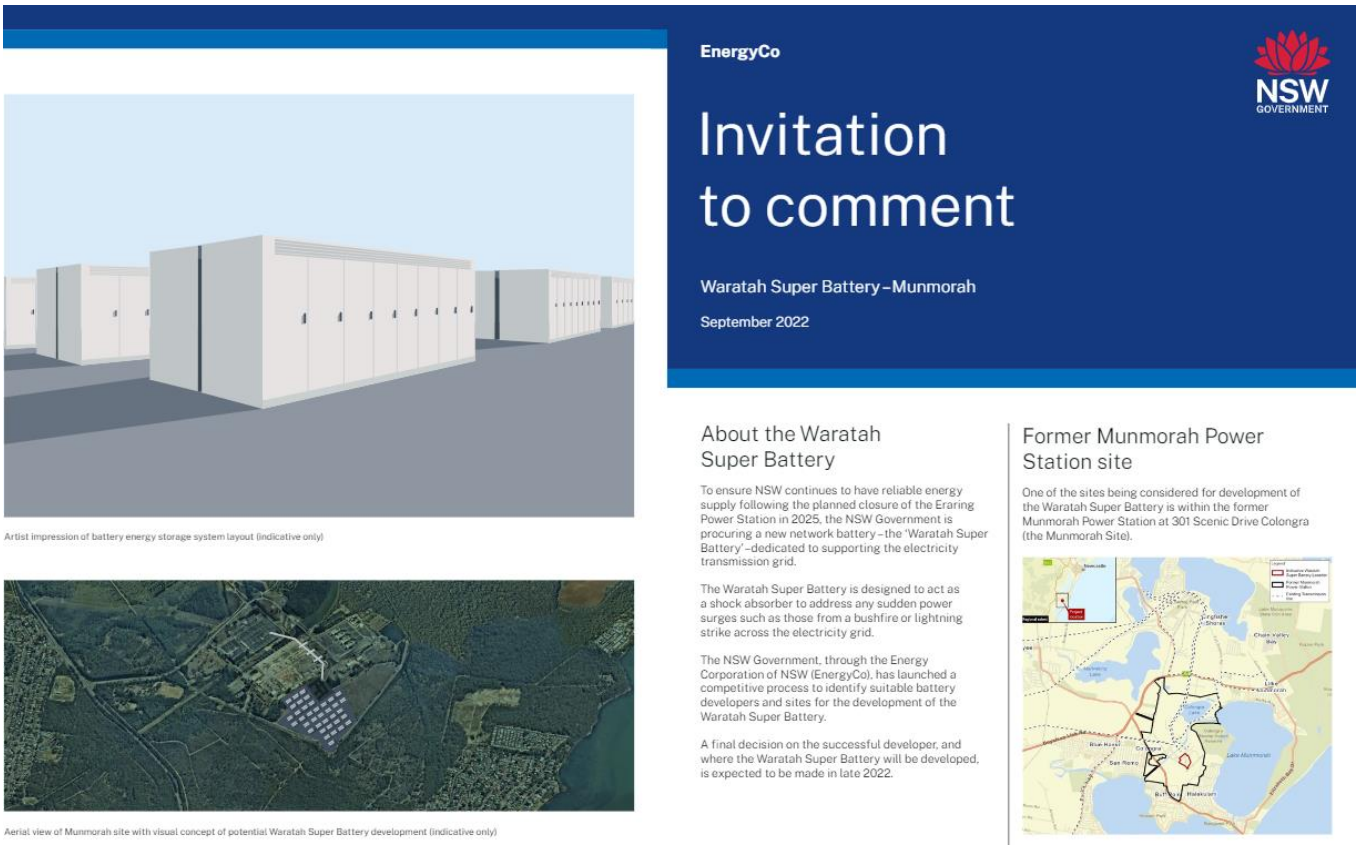


Figure 5.1 Front cover of the Waratah Super Battery Newsletter #1

Table 5.3 Community engagement undertaken to date

Engagement method	Targeted community stakeholder group	Purpose	Effort
Project website	All interested parties	To provide an overview of the project; an overview of the environmental impact assessment process and key findings; answers to frequently asked questions; and access to key documents.	Establishment and update, as required.
Newsletter	All interested parties	To provide an overview of the project; an overview of the environmental impact assessment process and key findings; answers to frequently asked questions; access to key documents; and to invite comments.	One project factsheet has been prepared to provide information on key items of interest on the project and contact details. The factsheet was uploaded to the project website and provided for the letter box drop. Further factsheets will be prepared during key stages in the project development.
Letterbox drop	Surrounding residences and business	To raise awareness about the project, provide information and advertise feedback opportunities and ongoing engagement.	The newsletter was distributed to approximately 2,700 residents and businesses surrounding the Munmorah Power Station site in September 2022.
Media	All interested parties	To update the broader community on the project progression and invite them to community information sessions to find out more and provide feedback.	Various EnergyCo Media releases and editorials in newspapers.
Enquiry lines (phone and email)	All interested parties	To provide community stakeholders with lines of enquiry to the project team.	Received four incoming phone call and email enquiries.

5.3 Sentiment and key issues raised during engagement

5.3.1 Sentiment

The general sentiment on the project from engagement activities was neutral to broad support. Support was generally associated with a good use of the former Munmorah Power Station site and supportive of the initiative to support the integrity of the NSW power supply.

5.3.2 Key issues raised during engagement

A number of issues were raised by various stakeholder groups during the preparation of the Scoping Report and the EIS. The key issues raised and the location of where the issue is addressed in the EIS, is provided in Table 5.4.

Table 5.4 Summary of issues raised during community engagement

Issue category	Key issue raised	Location addressed in EIS
Fire and hazard	Fire emanating from the battery units and bushfire protection	Section 6.9 and Section 6.10
Land and water	Contamination, groundwater, subsidence	Section 6.4 and Section 6.8
Noise	Noise impact on neighbouring communities	Section 6.6.
Access	Maintaining access for critical fuel delivery to the Colongra Power Plant	Section 6.7.
Biodiversity	Including potential impacts on animals crossing local roads	Section 6.2

5.4 On-going engagement

5.4.1 Engagement during exhibition of the EIS

Community engagement will continue during public exhibition of the EIS. Once the EIS is lodged with the DPE, the DPE will:

– Publish the EIS online via the Major Projects Planning Portal.
– Notify the public exhibition in accordance with the requirements in the EP&A Act and the EP&A Regulation.

Stakeholders who are interested in, or who may be potentially impacted by, the project will be encouraged to make a formal submission via DPE's Major Projects Planning Portal.

EnergyCo will also continue to consult with stakeholders during and following the exhibition period, via mechanisms similar to those outlined in Table 5.3 above.

5.4.2 Engagement following exhibition of the EIS

Following exhibition of the EIS, all stakeholder feedback will be reviewed and addressed in a Submissions Report. If further engagement is required to respond to the issues raised (e.g., to clarify issues of concern or to seek feedback on proposed refinements to the project), the details of that engagement will be outlined in the Submissions Report.

If responding to the submissions extends over a long period of time, regular updates (via the tools/techniques listed above) will be provided to the stakeholders regarding the status of the Waratah Super Battery.

5.4.3 Future engagement

If approved, engagement with key stakeholders would continue through construction, operation, and decommissioning and rehabilitation of the Waratah Super Battery. Details of the key methods of engagement that may be used during future stakeholder engagement are presented in Table 5.5.

Table 5.5 Methods that may be used during ongoing stakeholder engagement

Engagement method	Purpose
Meetings	To facilitate discussion about construction/operation activities and timing; impact on the stakeholder; and to seek feedback and comments for consideration.
Phone calls	To set up meetings with key stakeholders.
Emails	To facilitate ongoing liaison with key project stakeholders and to enable direct enquiries about construction/operation from the general community.
Website updates	To provide an overview of the construction/operation activities; answers to frequently asked questions; and access to key documents.
Subscriber update	Using an email database gathered during the planning and design phase, update subscribers on the progress of construction/operation and to provide reference sources for further information.
Newsletters	To update the community on the progress of construction/operation and to provide reference sources for further information.
Letters	To make contact with key project stakeholders during construction/operation.
Media	To update the community on the progress of construction/operation.
Enquiry lines (phone and email)	To provide community stakeholders with lines of enquiry to the construction/operation team.

6. Assessment of impacts

6.1 Introduction

A risk assessment was undertaken to identify the potential environmental, social, and economic matters that are likely to be impacted by the construction, operation, and decommissioning and rehabilitation of the Waratah Super Battery.

The following key issues were identified during the risk assessment and were assessed in detail in the EIS:

– Biodiversity.
– Aboriginal and non-Aboriginal heritage.
– Land.
– Visual.
– Noise.
– Transport.
– Water.
– Hazards.
– Bushfire.
– Social and economic.
– Waste.
– Cumulative impacts.

The above key issues were confirmed in the SEARs.

Other issues were identified during the risk assessment and included in the EIS:

– Air quality.
– Sustainability.

The environmental impact assessment for the project included the project site (shown in Figure 3.4) as well as areas to the north across the former power station where some upgrades to existing infrastructure would be undertaken. These include areas for the transmission easement where three support structures (lattice towers and a pole) would be constructed and upgrades to existing road infrastructure for temporary and permanent site access. These areas have already been cleared or developed by ongoing remedial activities by GPM, already provide existing infrastructure and/or have been historically disturbed as part of former operations or demolition activities associated with the power station. For this reason, the impact assessment focusses primarily on the project site.

The above issues are addressed in Section 6.2 through Section 6.15. A compilation of mitigation measures (excluding mitigation measures that are built into the physical layout and design of the project and captured in the project description) is provided in Appendix C.

6.2 Biodiversity

6.2.1 Overview

This section provides a summary of potential biodiversity impacts associated with the Waratah Super Battery. This section draws on a Biodiversity Development Assessment Report (BDAR), included as Appendix D. This section assesses the potential biodiversity impacts associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential biodiversity impacts associated with the Waratah Super Battery. The assessment has been prepared in accordance the SEARs (refer to Appendix A).

6.2.2 Methodology

6.2.2.1 Government plans, policies, and guidelines

The BDAR was prepared with reference to the following plans/policies/guidelines:

- Biodiversity Assessment Method (BAM) 2020 (DPIE, 2020).
- BAM 2020 Operational Manual Stage 1 (DPE, 2022a).
- BAM 2020 Operational Manual Stage 2 (DPIE, 2019a).
- Guidance for the Biodiversity Development Assessment Report Template (DPE, 2022a).
- Biodiversity Assessment Method Calculator Version 1.4.0.00 (DPE, 2022b)
- BAM Calculator User Guide (OEH, 2018a).
- NSW BioNet Threatened Biodiversity Data Collection (TBDC) (DPE, 2022b).
- NSW Biodiversity Assessment Method (BAM) flora and fauna survey guidelines:
  - Surveying threatened plants and their habitats. NSW survey guide for the Biodiversity Assessment Method (DPIE, 2020a).
  - NSW Survey Guide for Threatened Frogs. A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE, 2020c).
  - Species credit' threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH, 2018b).
  - Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method Survey Guide (DPE, 2022c).

6.2.2.2 Desktop assessment

A database review was undertaken to identify the extent and condition of landscape features within the project site including the following:

- Interim Biogeographic Regionalisation for Australia (IBRA) bioregions and IBRA subregions.
- Rivers, streams, estuaries, and wetlands.
- Habitat connectivity.
- Karst, caves, crevices, cliffs, rocks, or other geological structures.
- Areas of outstanding biodiversity value.
- NSW (Mitchell) landscape.
- Soil hazard features.

Information sources used in the desktop assessment to identify these landscape features included:

- IBRA mapping. Version 7.0 (DAWE 2012).
- Fisheries Spatial Data Portal mapping (DPI 2022a).
- Atlas of Groundwater Dependent Ecosystems mapping (GDE) (Bureau of Meteorology (BoM) 2022b).
- Aerial photographs and satellite imagery of the project and buffer area using Nearmap (11 August 2022).
- NSW Biodiversity Values Mapping (DPE 2022c).
- NSW (Mitchell) Landscapes mapping and landscape descriptions (DECC 2008a).
- eSPADE online Soil landscapes mapping tool (DPIE 2022f).
- NSW BioNet Vegetation Classification PCT mapping (DPE 2022d).

6.2.2.3 Field surveys

Staged surveys of the project site were conducted with reference to the threatened species survey guidelines for targeted species and in accordance with the BAM 2000 during June and September 2022. Figures detailing the survey effort for the flora and fauna surveys are included in Appendix D.

Field survey methodologies included:

– Initial site stratification, preliminary investigation of biodiversity values, and vegetation mapping.
– BAM plot surveys.
– Incidental threatened flora surveys.
– Fauna habitat assessment.
– Opportunistic fauna surveys.
– Targeted surveys for threatened flora.
– Targeted surveys for threatened fauna.

The survey effort is summarised in Table 6.8 and is described in further detail in Appendix D.

Table 6.1 Summary of survey techniques and timing

Stage	Date	Survey Technique
Initial site stratification and vegetation mapping / BAM assessment survey	22 June 2022	Vegetation mapping
Sampling of vegetation and stratification of vegetation mapping	22 June 2022 / 3 August 2022	– Plot-based vegetation survey – Vegetation integrity plots
BAM assessment survey: Sampling of vegetation integrity plot / transects and targeted surveys for threatened flora and ecological communities	3 August 2022 6 September 2022	– Plot-based vegetation survey – Vegetation integrity plots – Systematic traverses for threatened flora

The field surveys were undertaken between June and September 2022. Survey conditions were generally appropriate to support the survey techniques employed and species targeted. Notably:

– Minimum nightly temperatures were above 10 degrees Celsius (°C) during the survey period when ultrasonic call recorders were deployed targeting threatened microbat species.
– Minimum nightly temperatures were above 8.9 °C and daytime temperatures were mild during the survey period when camera traps were deployed targeting threatened mammal species.

Bureau of Meteorology (BoM) records for the survey dates are provided in Appendix D.

6.2.3 Existing environment

The project site, including ancillary infrastructure components eg proposed transmission easement and access roads, have been subject to significant ground disturbance and clearing due to previous use as a stockpile and loading area to transfer coal to the now decommissioned Munmorah Power Station. Small, fragmented patches of vegetation exist amongst the cleared and denuded areas which are regularly maintained by GPM. GPM is currently in the process of rehabilitating the Munmorah Power Station site under consent number DA/413/2014. On the project site, this involves the partial removal of the coal loader structure, sedimentation basin and weed removal.

Most of the project site is highly modified and disturbed, with vegetated areas separated by exotic grassland, existing roads, and hardstand. A small detention basin exists within the project site which at the time of surveys, harboured vegetation dominated by pine trees. The boundary of the lot is delineated by a chain-link barbed wire fence.

Landscape features of the project site and locality are summarised in Table 6.2 with further detail provided in Appendix D.

Table 6.2 Landscape features of the study area – terrestrial and aquatic ecology

Landscape feature	Description
Location and existing land uses	The project site is located at 301 Scenic Drive, Colongra, 2259 on title Lot 10 DP1201414. The site is bordered to the north-east by the Colongra Power station. Directly south, southeast and southwest is undeveloped vegetated land zoned for Electricity generating works under the Central Coast Council LEP. The project site and subject land have been historically cleared and are considered heavily degraded due to the sites previous use for coal fired electricity generation.
Local Government Area	Central Coast LGA
Geological features	There are no karst, caves, crevices, cliffs, rocks or other geological features of significance located within the project site or known to occur within the assessment area. However, within the assessment area there may be a microbat roost site. Previous ecological survey suggests this site is located within riparian areas north-west of the project site further up Hammond Canal towards Colongra Lake (Niche, 2020; 2021). However, this species was not recorded using the potential roost site (Niche, 2020; 2021). Whilst there are records of cave roosting micro-bats species, including the Large-eared Pied Bat (*Chalinolobus dwyeri*), in the locality, these are mainly concentrated to the west of the subject land where cliff faces and other similar geographic features occur (DPE, 2022e). The presence of cave roosting micro-bats species within the subject land would likely be from foraging individuals. There are no areas of geological significance within the project site.
Soils	The project site is mapped as a Disturbed terrain soil landscape which is indicative of extensive ground disturbance caused by human activity generally containing soil, rock, building and waste materials with the vegetation completely cleared (DPIE, 2022f). This soil type is highly variable and extensively modified. Coastal potential acid sulfate soils occur in every coastal estuary in NSW and are common to mangrove and saltmarsh areas. They comprise natural sediments that contain iron sulfides found less than a metre above sea level and affect more than 260,000 hectares of land. They can reduce the pH of waterways, deoxygenate waterways, and harm aquatic life such as fish and benthos (DECC, 2007). Acid sulfate soil risk mapping in the broader project site indicates that there is a high probability of occurrence of acid sulfate soils within the waterways and lakes including Hammond Canal and Lake Colongra. (DPIE, 2022f) (see further detail in Section 6.4.3).
Hydrology (rivers, streams and wetlands)	The project site is not intersected by any rivers, streams, estuaries or wetlands. However, there are several rivers, streams, estuaries and wetland features located within the surrounding locality, including: – Hammond canal located to the north-west and north-east of the subject land. – Lake Munmorah located approximately 1.1 km east of the subject land. – Colongra Lake located approximately 1.1 km north of the subject land. – Budgewoi Lake located approximately 1.5 km south-west of the subject land. – Colongra Swamp Nature Reserve located approximately 650 m north-east of the subject land. – A patch of Coastal Wetland and proximity area as listed in the Resilience and Hazards SEPP located approximately 1.1 km north-east of the subject land (within the Colongra Swamp Nature Reserve). – Several small 1st and 2nd order streams.
Connectivity	The project site does not harbour patches of vegetation that can contribute to a consistent corridor and fauna habitat connectivity. This is due to the site's past use as an active underground coal mining site to support surface infrastructure. It is predominantly devoid of contiguous native vegetation. The subject land does have the potential to provide plant-pollinator interactions. This may include connectivity for pollinators like insects and other vertebrates as well as other pollination mechanisms such as windblown seed (Prendagast *et al.,* 2022). The existing security fencing topped with several rows of barbed wire is a significant barrier to fauna movement. Any habitat connectivity that may serve as potential movement corridors for threatened species is, therefore, likely to be limited to highly mobile species. The project site provides limited foraging and nesting opportunities for woodland birds, owls, raptors and bats and these species would likely fly over to surrounding areas of higher quality habitat.
Climate	The site is set within a temperate climate with a mean annual rainfall of 1127.9 millimetres. The highest rainfall tends to occur in February and March. Mean daily maximum temperature is 25.0 °C and mean daily minimum temperature is 10.2 °C (BoM 2022b).
IBRA Bioregions and Subregions	Sydney Basin IBRA bioregion and Wyong IBRA subregion (Department of Agriculture, Water and the Environment (DAWE) 2012)

Landscape feature	Description
NSW (Mitchell) Landscape	Gosford - Cooranbong Coastal Slopes and Sydney - Newcastle Coastal Alluvial Plains.
Areas of outstanding biodiversity value	None.
Landscape features listed in the SEARs	No additional landscape features were identified in the SEARs for the project.

6.2.3.1 Native vegetation

The project site contains large areas of cleared and modified land with areas of planted mixed native and exotic trees/shrubs and native vegetation cover. Numerous high threat exotics (HTW) species were also observed within the project site. No areas within the project site are mapped as native vegetation on the NSW State Vegetation Type Map (DPE, 2022i).

The project site covers an area of about 14 hectares The area and percent of native vegetation cover within the project site was assessed to be 0.46 hectares and 0.3 per cent, respectively. The remainder of the project site is associated with the following areas:

– Cleared areas.
– Highly disturbed native / exotic vegetation.
– Human-made dams, ponds, and other waterbodies.
– Buildings.
– Planted mixed native and exotic trees / shrubs.
– Roads and hardstands.

Degraded vegetation in the project site comprises pioneer species wattle and hop bush which often inhabit disturbed sites. Other vegetation in these areas included isolated cultivar species and pine plantations dominated by *Pinus pinaster* (Cluster Pine) with an exotic understorey and no shrub layers. Existing human-made dams, ponds and other waterbodies were highly disturbed due to regulated management and previous use as sedimentation basins. Little to no native species were associated with these areas. Native vegetation within the project site is mapped on Figure 6.1.

6.2.3.2 Plant community types

Two plant community types (PCTs) have been identified within the project site. The PCTs mapped within the project site are summarised in Table 6.3 and are shown in Figure 6.1.

Table 6.3 Plant community types in the project site

PCT	PCT justification	BC Act status	EPBC Act status	Extent in project site (ha)
PCT - 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast	In identifying candidate PCT 1636 within the subject area, IBRA subregional distribution and dominance of *Angophora costata* (Sydney Red Gum), *Corymbia gummifera* (Red Bloodwood), and *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum) in the canopy were used as the main diagnostic factors. These species were co dominant in patches within the area in question, and positive indicators of the PCT. The location of the vegetation in space also matches the PCT description which describes PCT 1636 as eucalypt dominated Woodland with a shrubby mid-stratum and a graminoid ground cover occurring on coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie which aligned to the surveyed floristics. The substrate is sandstone with moist sandy soils and the elevation is usually under 100 m (ELA, 2017). All the above factors are indicative of PCT 1636.	Not listed	Not listed	0.20 ha
PCT - 1724: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	PCT 1724 was selected due to the characteristic species of its upper stratum specifically *Melaleuca quinquenervia* and *Livistona australis* as well as conforming to the IBRA Sydney Basin IBRA bioregion and Wyong sub-region. The vegetation in question contained *Melaleuca quinquenervia* and *Callistemon salignus* with diagnostic species *Dianella caerulea*, fitting the description of the PCT data in the BioNet Vegetation Classification system. This PCT is identified as Swamp Open Forest with areas of standing water dominated by Melaleucas with the ground stratum a mix of sedges; ferns grasses and graminoid species. All the above factors are indicative of PCT 1724.	Endangered in some vegetation zones	Does not meet the condition threshold (DAWE, 2021)	0.26 ha

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

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Waratah Super Battery - Munmorah
Environmental Impact Statement

Plant community type

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 6.1

Data source: Imagery, captured by Energy Co on September 2022; Fibre Optic Easement - Energy Co; Fibre Optic Easement - Energy Co; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

6.2.3.3 Vegetation zones

PCTs identified during field surveys were further split into broad condition classes resulting in the vegetation zones shown in Figure 6.2. The structure, species composition, and condition of the vegetation zones within the project site are summarised in Table 6.4 and described further in Appendix D. Plant species lists and plot data are also provided in Appendix D along with benchmark values for each PCT.

Table 6.4 Vegetation integrity scores

Vegetation zone ID	Plot ID	Composition condition score	Structure condition score	Function condition score (where relevant)	Vegetation integrity score	Hollow bearing trees present?
Zone 1 – PCT - 1636	Q03	32.9	63.5	80.0	55.1	No
Zone 2 – PCT - 1724	Q04	71.8	37.8	53.9	52.7	No

6.2.3.4 Threatened ecological communities

One threatened ecological community (TEC) listed under the BC Act was recorded in the project site during the field surveys. PCT 1724 contains characteristic plant species listed in Part of the Final Determination for Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and Southeast Corner Bioregions and is listed as an endangered ecological community under the BC Act, and is commensurate with *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland*, listed as an endangered ecological community under the EPBC Act.

The extent of confirmed TEC Swamp Sclerophyll Forest within the project site is provided in Table 6.5.

Table 6.5 TECs within the project site

TEC name	Profile ID (from TBDC)	BC Act status	EPBC Act status	Associated vegetation zones within the subject land	Area within subject land (ha)
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	10786	E	Not listed. Vegetation did not meet the EPBC listing condition threshold (DAWE, 2021)	Zone 2	0.26

6.2.3.5 Flora species

One threatened flora species was identified within the project site, *Angophora inopina* (Charmhaven Apple), mapped within PCT 1636 (one young individual). A full list of flora species recorded within the project site and adjoining study area is provided in Appendix D.

Several weed species were recorded in the project area. These included:

– Ten Priority Weed Species listed under the *Biosecurity Act 2015* (NSW).
– Three Weeds of National Significance listed under the Australian Weeds Strategy 2017 to 2027 (Invasive Plants and Animals Committee (IPAC) 2017).
– Ten-six High Threat Exotics listed in the BAM.

Weed species recorded in the project site and surrounding area are listed in Appendix D.

Paper Size ISO A4

0 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

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Vegetation zones

FIGURE 6.2

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12582669_EIS_018_Fig6_2_VegetationZones
Print date: 26 Oct 2022 - 10:40

Data source: Imagery, captured by Energy Co on September 2022; Metromap Tile Service: . Created by: mfredle

6.2.3.6 Fauna species habitat suitability

No threatened fauna species were recorded during the field surveys.

Opportunistic diurnal bird surveys were undertaken in the project site which consists of non-tidal areas only and no migratory shorebird species were identified. Habitat conditions on the project site are not suitable for migratory shorebirds as there is no waterbodies present with minimal vegetation.

No important habitat is mapped within the project site. Important habitat for migratory species was not identified within the project site.

6.2.3.7 Threatened species survey results

One threatened flora species, *Angophora inopina* (Charmhaven Apple) was identified within the project site via threatened species transects. No further threatened flora species were recorded within the project site during field surveys for the project.

No threatened fauna species were recorded within the project site.

Six threatened flora and 11 threatened fauna species are assumed to be present, as surveys were not able to be conducted in the appropriate season. Threatened species survey methods and effort and a complete list of assumed species are included in Appendix D.

6.2.3.8 Prescribed additional biodiversity values

Prescribed impacts are the impacts on biodiversity values which are not related to, or are in addition to, native vegetation clearing and habitat loss. Relevant prescribed impacts and the suite of threatened species that use or rely on the habitat values or would be affected by the impact, must be assessed in accordance with the BAM. Prescribed impacts relevant to the project site include:

– Non-native vegetation:
  - Non-native vegetation accounts for most of the project site. Some non-native vegetation areas occur along the boundary of the project site. This is mown/slashed and will act as an asset protection zone for bushfire safety purposes.
  - Fauna species may utilise non-native vegetation areas transiently as they are highly mobile. Raptors and large forest owls may hunt in the area if suitable prey species are present, as well as threatened microbats who may forage over the area on occasion. No mammals or arboreal mammals are anticipated to be able to move freely through the area due to existing fencing surrounding the project site.
  - Areas of non-native vegetation and cleared areas support limited shelter, roosting or breeding habitat for the species that could potentially occur. Given the lack of shelter and other resources of relevance for threatened fauna species, the areas of non-native vegetation and cleared land have minimal value for these species.
– Habitat connectivity:
  - The project site provides little to no habitat connectivity due to predominantly being void of continuous vegetation and does not provide fauna movement corridors because of security fencing topped with barbed wire surrounding the property.
  - The project site does not contribute to connectivity to the surrounding landscape and provides limited opportunities for highly mobile fauna that would fly over the site to adjacent higher quality habitat.
– Water bodies, water quality and hydrological processes:
  - Two small water bodies would be removed as part of the project. These human-made dams are of low ecological value due to historical clearing and other disturbance and do not provide important habitat for potential species.
– Vehicle strikes:
  - There is no major risk to threatened fauna due to vehicle collision due to barriers to fauna movement surrounding the site. Highly mobile species may be at risk, however, vehicle speed limits are likely to be implemented as part of new facility operation.

6.2.4 Direct impacts

6.2.4.1 Residual direct impacts

The project would result in residual direct impacts to a total of 0.46 hectares of native vegetation in moderate condition. The direct impacts include 0.20 hectares of PCT 1636 and 0.26 hectares to PCT 1724, the latter being commensurate with Swamp Sclerophyll Forest TEC. Approximately 0.06 hectares of PCT 1636 would be retained outside of the project site boundary.

Outside of these mapped areas, most of the project site is already cleared and denuded. The areas of native vegetation are fragmented providing minimal fauna habitat and connectivity in the context of the surrounding landscape. Vegetation clearing outside of mapped PCT 1636 and PCT 1724 consists of the removal non-native plants including priority and HTW species. The removal of 0.46 hectares of native vegetation is insignificant at the regional scale and is unlikely to threaten the persistence of populations of native plants and vegetation communities.

6.2.4.2 Change in vegetation integrity score

The project would result in the clearing of the entire project site. All future composition, structure and function scores would be entered as 0 for vegetation zones 1 and 2.

6.2.4.3 Removal of TEC and threatened flora species

The project requires the removal of TEC Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Vegetation Zone 1) and a single Charmhaven Apple specimen listed as vulnerable and located in Vegetation Zone 2. The TEC and threatened flora would be offset in accordance with the corresponding vegetation zone impact area (refer to Section 6.2.8).

The removal of 0.46 ha of native vegetation is insignificant at the regional scale and is unlikely to threaten the persistence of populations of native plants and vegetation communities. 0.06 hectares of PCT 1636 is being retained outside the project site boundary.

6.2.4.4 Removal of habitat and habitat resources

The 0.46 hectares of vegetation that would be removed provides habitat resources for native fauna species, including threatened species. The project would result in direct impacts on habitat for the 18 threatened flora and fauna species that were recorded or assumed present within the subject land and vicinity and assumed to use resources in the subject land.

The clearing of 0.46 hectares of native woodland and forest would include the removal of a relatively young forest with no large canopy trees harbouring hollows appropriate for fauna. The habitat is also fragmented and exists within a completely fenced site with limited fauna permeability. The removal constitutes a small proportion of available flora and fauna resources.

6.2.5 Impacts on MNES

The following threatened species are listed under the EPBC Act and were either detected within the project site or were presumed to be present due to the lack of survey effort during the appropriate survey periods:

- *Angophora inopina* (Charmhaven Apple) – Vulnerable (recorded within the subject land).
- *Asperula asthenes* (Trailing Woodruff) – Vulnerable.
- *Chalinolobus dwyeri* (Large-eared Pied Bat) – Vulnerable.
- *Corunastylis* sp. Charmhaven NSW896673) – Critically Endangered.
- *Cryptostylis hunteriana* (Leafless Tongue Orchid) – Vulnerable.
- *Heleioporus australiacus* (Giant Burrowing Frog) – Vulnerable.
- *Litoria aurea* (Green and Golden Bell Frog) – Vulnerable.
- *Persicaria elatior* (Tall Knotweed) – Vulnerable.

One of these species, *Angophora inopina* (Charmhaven Apple) was the only species detected within the project site. An assessment of significance is provided for this species (refer to Appendix D). As this species has been recorded in many locations surrounding the project site, the loss of the one specimen is unlikely to result in a significant impact to an important population (Niche 2020; 2021; DotE 2013a).

Other listed presumed species were assessed in the BDAR to have either a low likelihood of occurrence or have no suitable potential habitat within the project site. As such, the project is considered unlikely to have any significant impact on MNES.

6.2.6 Indirect impacts

Residual indirect impacts on biodiversity values may include:

– Weed invasion and edge effects.
– Introduction and spread of weeds, pests, and pathogens.
– Noise and light impacts on fauna.

These residual indirect impacts are discussed in Section 6.2.6.1 through Section 6.2.6.3.

6.2.6.1 Weed invasion and edge effects

'Edge effects' can include increased noise and light or erosion and sedimentation at the interface of intact vegetation and cleared areas. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna. Edge effects would result from construction activities and then continue to affect vegetation and habitats retained outside the project footprint.

Altered environmental conditions along new edges can allow invasion by pest animals specialising in edge habitats and/or change the behaviour of resident animals. Edge zones can be subject to higher levels of predation by introduced mammalian predators and native avian predators.

Due to adequate buffer distances between the project site and vegetated areas on adjacent properties, edge effects are expected to be limited.

6.2.6.2 Introduction and spread of weeds, pests, and pathogens

Disturbance associated with vegetation clearing and vehicle traffic during construction increase the potential for the spread, introduction, and establishment of weed and pest species, and diseases and pathogens.

Weed species are effective competitors for food and habitat resources and have the potential to exclude native species and modify the composition and structure of vegetation communities and can decrease habitat values for native fauna. To further mitigate the risk of pathogens being brought onto and/or spread through the site, machinery brought to project site would be washed down and inspected to be free of soils, seeds, and other organic material.

6.2.6.3 Noise and light impacts on fauna

Noise levels during the construction period would result in an increase above existing background levels for the duration of construction. Noise levels would vary during the construction period, with some activities being louder and producing higher levels of vibration than others. Noise, vibration, and light have been shown to have a variety of impacts on fauna, including changing foraging behaviour, impacting breeding success and changing species occurrences. Fauna most at risk would be those residing near the works area, and in particular any species that may be nesting, roosting, or denning in the area. Some fauna may vacate areas in proximity to the project site during construction. Hollow-bearing trees in adjacent areas may provide nesting habitat for species, including the threatened Squirrel Glider and a variety of threatened microbat and forest owl species.

However, consequences are considered minimal due to the existing nature of the project site and its previous use as a power station where fauna in the area are likely to be accustomed to the noise. Given the temporary nature of the works, and the availability of alternate habitat in surrounding areas, it is unlikely the temporary increase in noise and light during construction would significantly impact fauna that occur in the surrounding location.

6.2.7 Prescribed impacts

Prescribed impacts may include:

– Non-native vegetation.
– Habitat connectivity.
– Waterbodies, water quality, and hydrological processes.
– Vehicle strike.

These prescribed impacts are discussed in Section 6.2.7.1 through Section 6.2.7.4.

6.2.7.1 Non-native vegetation

The majority of the project site is comprised of cleared or non-native vegetation, including *Pinus pinaster* (Cluster Pine), exotic grassland, and other weeds. Remaining areas of non-native vegetation would be removed as part of the project. These can provide habitat for highly mobile common fauna species. Mobile threatened species may also occur but are unlikely to rely on these areas for foraging and nesting habitat.

Generally, the non-native vegetation within the project site provides limited habitat value for both common and threatened species and the consequences of its removal are considered low, having little to no impact.

6.2.7.2 Habitat connectivity

PCTs 1724 and 1636 provide isolated pockets of potential fauna habitat, with little to no connections to the wider landscape. These vegetated areas do not contribute to broader ecological corridors and provide limited opportunities for highly mobile fauna species that can fly over the site as they move between areas of higher quality habitat.

Fauna that may fly over the project site would continue to do so if the project is approved. Less mobile species are more at risk of consequences associated with vegetation removal, however, fauna access to the project site is currently inhibited by fences. In this context, the project site is unlikely to comprise a key link in a habitat corridor, or to be critical to the ongoing connectivity in the local area.

6.2.7.3 Waterbodies, water quality, and hydrological processes

Two small artificial dams (approximately 0.16 hectares) within the project site are being removed as part of the rehabilitation and remediation works undertaken by GPM. The removal of these dams does not form part of this assessment. The dams are likely to provide limited ecological functionality and values due to surrounding disturbance from the decommissioned facility.

6.2.7.4 Vehicle strike

Threatened species such as microbats, gliders, planigales, phascogales, and owls are unlikely to experience a significant risk of vehicle strike during the construction phase as vehicle movements would occur during daylight hours when these species are inactive. Raptors and other woodland birds may be at risk of vehicle strike during the day, however, considering the lack of habitat within the project site and use of existing access to the development footprint, the overall likelihood is low.

The vehicle strike rate would likely reduce during the operational phase and return to existing levels. Few threatened species are at particular risk from vehicle strike and, as such, the consequences of vehicle strike are relatively minor.

6.2.8 Offsetting

6.2.8.1 Impacts requiring offset

Impacts associated with the project that require offsetting comprise the removal of approximately 0.46 ha of native vegetation and associated habitat. Ecosystem credits that would be required to offset the impacts of the project are listed in Table 6.6.

Table 6.6 Impacts that require an offset – ecosystem credits

Vegetation zone	PCT name	TEC	Impact area (ha)	Current VI score	Future VI score	Change in VI score	Biodiversity risk weighting	Number of ecosystem credits required
Zone 1	PCT 1636: Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast	No	0.20	55.1	0	-55.1	1.75	7
Zone 2	PCT: 1724: Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.26	52.7	0	-52.7	2	5
Total credits								**12**

The loss of habitat (ha) or individuals associated with each assumed present species and its associated habitat area of PCT 1636 and PCT 1724 is provided in Table 6.7. Further surveys are proposed in the appropriate season in 2022 to confirm presence or absence of species assumed present, and to verify the impacts of the project.

Table 6.7 Impacts that require an offset – species credits

Common name	Scientific name	BC Act status	EPBC Act status	Loss of habitat (ha) or individuals	PCT	Biodiversity risk weighting	Number of species credits required
Charmhaven Apple	*Angophora inopina*	V	V	0.20 ha	PCT 1636	2	6
Trailing Woodruff	*Asperula asthenes*	V	V	0.46 ha	PCT 1636 PCT 1724	2	13
Netted Bottle Brush	*Callistemon linearifolius*	V	-	5 individuals	Limited to PCT 1636	1.5	8
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	0.20 ha	PCT 1636	2	6
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	0.46 ha	PCT 1636 PCT 1724	3	18
-	*Corunastylis* sp. Charmhaven NSW896673)	CE	CE	0.20 ha	PCT 1636	3	8
Wallum Froglet	*Crinia tinnula*	V	-	0.46 ha	PCT 1636 PCT 1724	1.5	9
Leafless Tongue Orchid	*Cryptostylis hunteriana*	V	V	0.20 ha	PCT 1636	1.5	4
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	0.20 ha	PCT 1636	1.5	4
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	0.46 ha	PCT 1636 PCT 1724	2	13
Green and Golden Bell Frog	*Litoria aurea*	E	V	0.46 ha	PCT 1636 PCT 1724	2	13
Green-thighed Frog	*Litoria brevipalmata*	V	-	0.46 ha	PCT 1636 PCT 1724	1.5	9
-	*Maundia triglochinoides*	V	-	0.26 ha	PCT 1724	2	7
Tall Knotweed	*Persicaria elatior*	V	V	0.26 ha	PCT 1724	2	7
Squirrel Glider	*Petaurus norfolcensis*	V	-	0.46 ha	PCT 1636 PCT 1724	2	13
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	0.46 ha	PCT 1636 PCT 1724	2	13
Common Planigale	*Planigale maculata*	V	-	0.46 ha	PCT 1636 PCT 1724	2	13
Mahony's Toadlet	*Uperoleia mahonyi*	E	-	0.46 ha	PCT 1636 PCT 1724	2	13
Total credits							**177**

6.2.9 Mitigation measures

Mitigation measures proposed to avoid or minimise potential impacts to biodiversity during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.8. These measures would be included in the issue-specific environmental management sub-plans for the Waratah Super Battery.

Table 6.8 Mitigation measures – biodiversity

No.	Outcome	Mitigation measure	Timing
B1	Protection of terrestrial ecology during construction of the project.	Prepare a flora and fauna management sub-plan prior to construction of the project.	Pre-construction
B2	Site workers made aware of the ecological values of the project site, protection measures to be implemented, and penalties for breaches during construction.	All workers are to be provided with an environmental induction prior to starting work on site. This would include information on the ecological values of the site, protection measures to be implemented to protect biodiversity and penalties for breaches.	Pre-construction
B3	Site workers made aware of areas to be protected during construction.	Prepare plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features, threatened plants and TECs in the vicinity of work areas and revegetation areas.	Pre construction Construction
B4	Avoidance of unnecessary vegetation and habitat removal and the transmission of weeds or disease.	Prior to the commencement of any work in or adjoining areas of native vegetation, a survey would be carried out to mark the construction impact boundary. The perimeter of this area would be fenced using high visibility fencing and clearly marked as the limits of clearing. All vegetation outside this fence line would be clearly delineated as an exclusion zone to avoid unnecessary vegetation and habitat removal and the transmission of weeds or disease. Fencing and signage would be maintained for the duration of the construction period. Fencing would be designed to allow fauna to exit the site during clearing activities.	Pre construction Construction
B5	Prevention of weed and pathogen spread and establishment	Wash and disinfect machinery entering the site prior to work on site to prevent the potential spread of weeds, Cinnamon Fungus and Myrtle Rust/Exotic Rust Fungi in accordance with the national best practice guidelines for Phytophthora (O'Gara *et al.* 2005), the Myrtle Rust factsheet (Department of Primary Industries (DPI) 2015) for hygiene control and the NSW hygiene guidelines for wildlife (DPIE 2020d). Implement protocols to prevent the introduction or spread of chytrid fungus following the NSW hygiene guidelines for wildlife (DPIE 2020d).	Construction
B6	Protection of unexpected threatened species and inclusion in offset strategy, if required.	Prepare an unexpected finds protocol that details measures to be undertaken if threatened flora and fauna not previously recorded in the project site are detected during clearing or construction activities, or if additional occurrences of threatened species previously recorded in the broader area, but not previously recorded at a specific location, are recorded during clearing or construction activities. Include any unexpected finds in the offset strategy, as required.	Construction
B7	Protection of fauna and fauna habitat.	Protocols for the management of fauna and habitats would be included in the flora and fauna sub-plan. These would include (if required): – A procedure for the felling of hollow-bearing trees to prevent or minimise mortality of fauna. – Salvage of hollows and logs where practicable.	Construction

No.	Outcome	Mitigation measure	Timing
		– Temporary frog-proof fencing should be installed where required such as roadside drains and detention ponds near the project site to be retained to prevent frogs from being injured or killed by equipment. – Management of any trenches or drill sites to prevent fauna from becoming trapped or injured.	
B8	Protection of fauna and fauna habitat.	Undertake pre-clearing surveys prior to construction by a suitably qualified ecologist. Ensure surveys and inspections, and any subsequent relocation of species, is undertaken in accordance issue-specific environmental management sub-plans. Include the following specific surveys: – Surveys for roosting microbats for any man-made structures to be removed. – Searches for nest trees in vegetation to be removed. – Identification of hollow-bearing trees and logs requiring fauna management during removal.	Construction

6.2.10 Conclusion

The project would result in residual direct impacts to a total of 0.46 hectares of native vegetation in moderate condition. The direct impacts include 0.20 hectares of PCT 1636, and 0.26 hectares of PCT 1724 (commensurate with Swamp Sclerophyll Forest TEC). Outside of these mapped areas, the majority of the project site is already cleared and denuded. The areas of native vegetation are fragmented providing minimal fauna habitat and connectivity in the context of the surrounding landscape. Vegetation clearing outside of the mapped PCT 1636 and PCT 1724 consists of the removal non-native plants including priority and HTW species. The removal of 0.46 hectares of native vegetation is insignificant at the regional scale and is unlikely to threaten the persistence of populations of native plants and vegetation communities.

The project would result in direct impacts for one threatened flora species recorded within the project site, Charmhaven Apple (*Angophora inopina*). Seventeen additional threatened flora and fauna species were assumed present within the project site as the seasonal timing of surveys did not allow for the presence or absence of these species to be confirmed. If present, the project would remove up to 0.46 hectares of habitat resources for these species.

The clearing of 0.46 hectares of native woodland and forest would include the removal of a relatively young forest with no large canopy trees harbouring hollows appropriate for fauna. The habitat is also fragmented and exists within a completely fenced site with limited fauna permeability. The removal constitutes a small proportion of available flora and fauna resources. Plot and transect data collected at the site corroborates this interpretation as no hollow bearing trees exist.

Potential indirect impacts are considered limited as they would have a low likelihood and consequence due to a range a mitigation measures that would be implemented. No prescribed impacts are considered of high relevance to the project.

A range of proposed mitigation and management measures have been proposed for residual impacts. These include measures that would be undertaken during the construction and operation of the project. Further surveys are proposed in the appropriate season in 2022 to confirm presence or absence of species assumed present, and to verify the impacts of the project. The results would be reported in the project Submissions Report.

6.3 Aboriginal and non-Aboriginal heritage

6.3.1 Overview

This section provides a summary of potential impacts to Aboriginal and non-Aboriginal heritage associated with the Waratah Super Battery. This section draws on a heritage assessment, included as Appendix J. This section assesses the potential impacts to heritage associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential impacts to heritage associated with the Waratah Super Battery. The assessment has been prepared in accordance the SEARs (refer to Appendix A) and include the project site and easements.

6.3.2 Methodology

6.3.2.1 Government plans, policies, and guidelines

The heritage assessment was prepared with reference to the NSW Office of Environment and Heritage Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (Code of Practice) (DECCW 2010) and the Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010).

6.3.2.2 Desktop assessment

A range of archaeological and historical data was reviewed for the project site and its surrounds. This literature and data review was used to determine if known heritage sites were located within the project site, to facilitate site prediction on the basis of known regional and local site patterns, and to place the project site within an archaeological and heritage management context.

Searches were undertaken of the following statutory and non-statutory heritage registers:

– Statutory listings:
  - Aboriginal Heritage Information Management System (AHIMS).
  - Atlas of Aboriginal Places.
  - World Heritage List.
  - The National Heritage List (Australian Heritage Council).
  - The Commonwealth Heritage List.
  - The State Heritage Register.
  - Section 170 Heritage and Conservation Register(s).
  - Heritage schedule(s) from the Central Coast LEP.
– Non-statutory listings:
  - The State Heritage Inventory.
  - The Register of the National Estate.
  - Register of the National Trust of Australia (NSW).
  - Australian Institute of Architects, Heritage Buildings List.
  - Engineers Australia (Engineering Heritage Recognition Program).

A review of previous archaeological studies undertaken with the region was also undertaken that included:

– Munmorah Power Station Tuggerah Lakes NSW; Nomination for Award of Historic Engineering Marker Prepared for Engineering Heritage Australia (Newcastle) (Engineering Heritage Australia 2017).
– Aboriginal Archaeological Assessment and Statement of Heritage Impact; Proposed Gas Pipeline for Munmorah Power Station. Report to Delta Electricity (Heritage Concepts Pty Ltd 2005).
– Aboriginal Archaeological Test Excavation Report; Proposed Gas Pipeline for Munmorah Power Station. Report to Delta Electricity (Heritage Concepts Pty Ltd 2008).

Additional sources of historical information included regional and local histories, historic reports and theses, parish maps, and where available, other maps, such as portion plans.

6.3.2.3 Field surveys

A visual assessment was undertaken in order to determine the presence, or likelihood of occurrence, of heritage items within the project site. The visual assessment was undertaken by a qualified archaeologist in July 2022.

6.3.2.4 Aboriginal consultation

The project was advertised in the Central Coast News on 1 July 2022. A response was received from Heritage NSW and all groups identified by Heritage NSW were sent letters inviting registration in the project. Thirteen Registered Aboriginal Party (RAPs) expressed interest in the project.

An onsite RAP meeting and site inspection was held on 12 October 2022. Five RAPs attended this meeting. The meeting provided an overview of the project, results of the heritage assessment and opportunity for input. There was consensus at the meeting that given the nature of disturbance at the site, the proposed level of assessment was considered appropriate.

6.3.3 Existing environment

The project site is located within the coal storage area and other areas associated with the former Munmorah Power Station and Munmorah Substation. Further disturbance has occurred as a result of the subsequent demolition activities and construction of new buildings and associated site infrastructure e.g. access roads, transmission line easements, etc as illustrated in Figure ES-2, Figure 6.3 and Figure 6.4.

6.3.3.1 Aboriginal heritage

No previously recorded Aboriginal heritage sites/objects have been recorded within the project site.

Two previously recorded Aboriginal sites listed as potential archaeological deposits with associated artefacts have been recorded over 1.4 kilometres to the north of the project site, as per the AHIMS search results. In addition, no Aboriginal heritage sites/objects previously recorded during archaeological studies undertaken at the former Munmorah Power Station occur within the project site.

The site walkover confirmed the disturbed nature of the project site, as shown in Figure 6.5 and Figure 6.6. Based on the history of previous disturbance of the project site, ongoing activities by GPM and the site walkover undertaken during the heritage assessment, it is highly unlikely that there would be Aboriginal sites/objects present within the project site of the Waratah Super Battery.

6.3.3.2 Non-Aboriginal heritage

There are no statutory non-Aboriginal heritage listed items within the project site of the Waratah Super Battery.

The former Munmorah Power Station (which includes the coal loader bunker on the project site) has been nominated as an Historic Engineering Marker by Engineering Heritage Australia and is on the Engineering Heritage Recognition Program List. Most of the aboveground coal stockpile infrastructure located on the project site has been removed as part of the rehabilitation and remediation works by GPM. GPM is in the process of undertaking further rehabilitation, remediation, and maintenance works in accordance with its existing approvals within the project area (and surrounds). These works will include the partial removal and backfilling of the coal loader bunker, removing the remaining coal residue and other debris, any required erosion control measures, and weed management including removal of exotic pine trees.

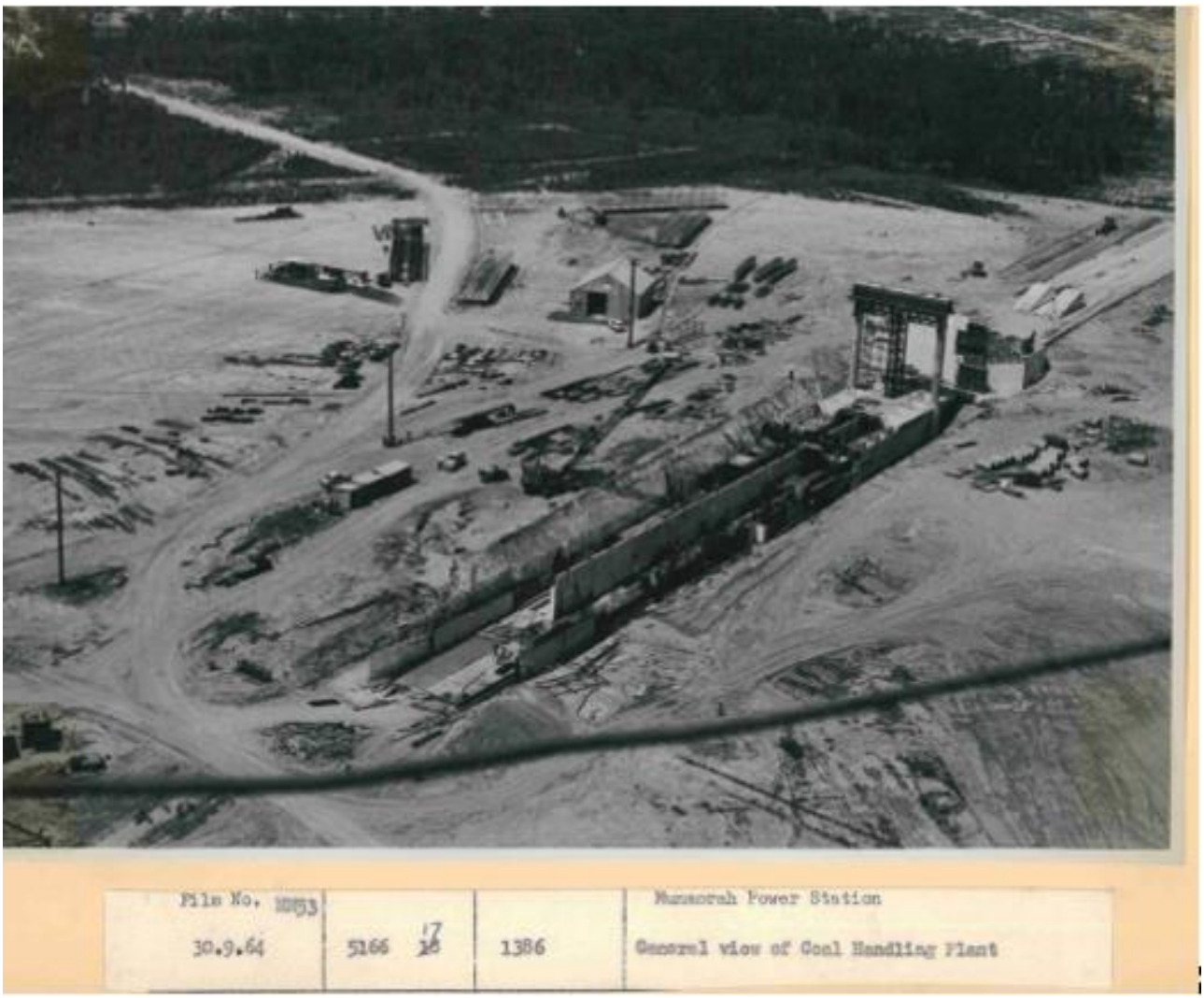


Figure 6.3 Construction of the coal loader bunker at the former Munmorah Power Station (1964)

Note: Blue/green line denotes project site for the Waratah Super Battery

Figure 6.4 Extract of aerial image showing construction of the former Munmorah Power Station (1965)

Figure 6.5 Current view of project site looking east (left) and north (right)

Figure 6.6 Current view of coal loader bunker entrance and remaining hardstand

6.3.4 Potential impacts

6.3.4.1 Construction

Impacts to Aboriginal heritage are highly unlikely during the construction of the Waratah Super Battery. No previously recorded Aboriginal heritage sites/objects have been recorded within the project site. Historical photos and the site walkover confirmed that there was little likelihood of in-situ cultural material remaining. It is highly unlikely that there would be Aboriginal sites/objects present within the project site given the history of previous disturbance of the project site from the construction of the coal loader bunker associated with the former Munmorah Power Station. However, mitigation measures in terms of an unexpected finds protocol and heritage inductions were requested by the RAPs.

There would be no impact to non-Aboriginal heritage during the construction of the Waratah Super Battery. There are no statutory non-Aboriginal heritage listed items within the project site.

The former Munmorah Power Station has been nominated as an Historic Engineering Marker by Engineering Heritage Australia and is on the Engineering Heritage Recognition Program List, a non-statutory heritage list. In addition, most of the aboveground coal stockpile infrastructure located on the project site has already been removed by GPM. Some infrastructure remains, and GPM is in the process of undertaking further rehabilitation, remediation and maintenance works in accordance with its existing approvals within the project site (and surrounds). Construction of the project would only impact on the coal loader bunker area of the former Munmorah Power Station. These works will include the partial removal and backfilling of the coal loader bunker, removing the remaining coal residue and other debris, any required erosion control measures and weed management including removal of exotic pine trees.

6.3.4.2 Operation

No impacts to Aboriginal or non-Aboriginal heritage are anticipated during the operation of the Waratah Super Battery.

6.3.4.3 Decommissioning and rehabilitation

Impacts to Aboriginal heritage are highly unlikely during the decommissioning and rehabilitation of the Waratah Super Battery. No previously recorded Aboriginal heritage sites/objects have been recorded within the project site. It is also highly unlikely that there would be Aboriginal sites/objects present within the project site given the history of previous disturbance of the project site from the construction of the coal loader bunker associated with the former Munmorah Power Station.

There would be no impact to non-Aboriginal heritage during the decommissioning and rehabilitation of the Waratah Super Battery. There are no statutory non-Aboriginal heritage listed items within the project site.

6.3.5 Mitigation measures

Mitigation measures proposed to avoid or minimise potential impacts to Aboriginal and non-Aboriginal heritage during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.9. These measures would be included in the issue-specific environmental management sub-plans for the Waratah Super Battery.

Table 6.9 Mitigation measures – Aboriginal and non-Aboriginal heritage

No.	Outcome	Mitigation measure	Timing
H1	Protection of unexpected heritage objects/sites.	Implement cultural heritage awareness induction training for all personnel prior to commencing construction on-site.	Construction
H2	Protection of unexpected heritage objects/sites.	In the event of an unexpected archaeological/heritage item find during construction, works within the area would cease and a suitably qualified heritage professional would be engaged to assess the significance and management of the finds. An unanticipated discovery protocol would be implemented that details measures to be undertaken if heritage objects/sites not previously recorded in the project site are detected during clearing, ground disturbance, or construction activities. Example unanticipated discovery protocols are provided in Appendix J.	Construction
H3	Protection of unexpected skeletal remains.	In the unlikely event that human remains are discovered during construction, all works would cease in the immediate vicinity. The discovery would be reported to Enviroline, Heritage NSW, the local police, and the RAPs. Further assessment would be undertaken to determine if the remains were Aboriginal or non-Aboriginal. An unanticipated discovery protocol would be implemented that details measures to be undertaken if suspected human skeletal remains are detected during clearing, ground disturbance, or construction activities. Example unanticipated discovery protocols are provided in Appendix J.	Construction

6.3.6 Conclusion

The heritage assessment indicates that the project is unlikely to result in any heritage-related impacts.

No previously recorded Aboriginal heritage sites/objects have been recorded within the project site. The project site has been highly disturbed from the construction and demolition of the coal loader bunker associated with the former Munmorah Power Station. Based on the history of previous disturbance of the project site, consultation with Aboriginal stakeholders, and the visual inspection undertaken during the heritage assessment, it is highly unlikely that there would be Aboriginal sites/objects present within the project site. As such, it is highly unlikely that there would be impacts to Aboriginal heritage during construction, operation, or decommissioning and rehabilitation of the Waratah Super Battery.

There are no statutory non-Aboriginal heritage listed items within the project site. As such, there would be no impacts to non-Aboriginal heritage during construction, operation, or decommissioning and rehabilitation of the Waratah Super Battery.

The former Munmorah Power Station has been nominated as an Historic Engineering Marker by Engineering Heritage Australia and is on the Engineering Heritage Recognition Program List. Construction of the project would only impact on the coal loader bunker area at the former Munmorah Power Station. However, most of the aboveground coal stockpile infrastructure located on the project site has already been removed by GPM.

Mitigation measures, specifically the implementation of unanticipated discovery protocols, would be implemented to avoid or minimise potential impacts to heritage during construction, operation, and decommissioning and rehabilitation of the Waratah Super Battery.

6.4 Land

6.4.1 Overview

This section assesses the potential impacts on land associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential impacts on land associated with the Waratah Super Battery. The assessment has been prepared in accordance with the SEARs (refer to Appendix A), and an Environmental Site Investigation report has been prepared (Appendix E).

6.4.2 Methodology

6.4.2.1 Government plans, policies, and guidelines

The land assessment has been prepared with reference to the following plans/policies/guidelines:

– National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013).
– Contaminated Sites: Guidelines for consultants reporting on Contaminated Sites (EPA 2020).
– National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA), Per- and poly-fluoroalkyl substances (PFAS) National Environmental Management Plan (NEMP) (Version 2.0), January 2020.
– Department of Primary Industries Land Use Conflict Risk Assessment Guide (DPI 2011).

6.4.2.2 Desktop assessment

The desktop assessment was carried out to identify the soils, geological characteristics, and potential for contamination at the project site. The desktop assessment included the following:

– Review of publicly available information pertaining to soils, geology and hydrogeological conditions.
– Review of publicly available information including but not limited to Lotsearch EnviroPro report, Council, and the NSW Environmental Protection Authority records.
– An assessment of the project site in the context of historical contamination and works in accordance with the CLM Act to remediate the site fit for future use as industrial land including the following reports:
    - Consulting Earth Scientists (CES), Preliminary Site Investigation, Former Munmorah Power Station (Ref CES170608-GPM-AW), July 2018.

- CES, PFAS Investigation Report (Ref. CES170608-GPM-AI), July 2019.
- CES, AEC4 – Coal Stack Above Ground Storage Tanks Investigation Report (Ref. CES170608-GPM-BL), June 2019.
- CES – Environmental Site Investigation Report – Waratah Super Battery Site (Ref. CES170608-GPM-DP), DRAFT, 30 September 2022.

6.4.2.3 Field surveys

Site investigations have been undertaken by Consulting Earth Scientists on behalf of GPM during 2022 and in accordance with the requirements of the CLM Act to investigate the potential for contamination and formulate a remedial action plan for the former Munmorah Power Station site, including the project site.

6.4.3 Existing environment

6.4.3.1 Natural features and constraints

A summary of the natural geological and hydrogeological features of the project site and surrounding areas is provided in Table 6.10. Additional details regarding the surface and groundwater resources at the project site and potential impacts are provided in Section 6.8.3.

Table 6.10 Existing environment – land

Topography	The project site is located on the former coal stockpiling area of Munmorah Power Station and has been highly modified from the original landform. The terrain is mostly flat and relatively low lying at an elevation between ten and 15 metres Australian Height Datum (m AHD). Slopes are between ten and fifteen per cent.
Hydrology	Located in the western portion of the project site is a settling basin (southern detention pond), constructed as a sediment control structure for the former coal stockpile area. A perimeter drainage channel is located along the northern boundary of the project area. Approximately 300 metres northwest of the project site is Hammond Canal which is a man-made canal that links Lake Munmorah to Budgewoi Lake. A natural creek / drainage line is present along the south-eastern boundary of the site. Both the drainage line and creek are reportedly to be generally dry. Colongra Swamp Nature Reserve is located approximately 600 metres northeast of the project site and contains an area of standing water, Lake Munmorah is located approximately 1.2 kilometres east and Budgewoi Lake is located approximately 1.7 kilometres south of the project site. Colongra Swamp Nature Reserve is listed as an important coastal wetland under State Environment Planning Policy (Biodiversity and Conservation) 2021. The project site is not within a flood planning area. The probable maximum flood level is approximately 300 metres away at its nearest point to the site which is within Hammond Canal immediately to the north of Colongra Power Station. Section 6.8 contains more information in relation to surface and groundwater resources.
Soils and salinity	NSW Department of Planning, Industry and Environment Soil Landscape Map of Central and Eastern NSW recorded disturbed terrain across the project site. Subsurface conditions at the site are anticipated to comprise anthropogenic fill to shallow depths or residual soil overlying sedimentary rock. Soils at the site typically comprise fill up to three metres deep overlying residual sandy clay soils. These natural residual soils have a moderate to high erosion hazard based on the Doyalson soil landscape via eSpade (DPIE 2022f). The north of the project site is mapped as land with potential Class 5 Acid Sulfate Soil (ASS). There are no Class 1-4 soils within the project site or within 500 metres of the project site. Acid Sulfate Soil (ASS) mapping indicates the proposed site is 'disturbed terrain' to depths greater than four metres (DPIE 2022f). While Hammond Canal, north of the site, has a high probability of ASS in bottom sediments, it is anticipated that residual soils underly the fill and therefore will not be ASS. However, the fill material (which is excavated from the Munmorah Power Station site) may contain alluvial soils which are ASS. The project site is not mapped as dry land salinity, according to the NSW Office of Environment and Heritage's Dryland Salinity Map.
Geology	According to the NSW Seamless Geology dataset, the project site is underlain by Early Triassic aged Munmorah Conglomerate, comprising sandstone, polymictic conglomerate, minor siltstone, white claystone, and coal seams beneath which is other deposits of the Clifton Subgroup and Narrabeen Group (of which the Munmorah Conglomerate is a part) and Newcastle Coal Measures.

Topography	The project site is located on the former coal stockpiling area of Munmorah Power Station and has been highly modified from the original landform. The terrain is mostly flat and relatively low lying at an elevation between ten and 15 metres Australian Height Datum (m AHD). Slopes are between ten and fifteen per cent.
	Other nearby geological features include a dyke in the north-eastern portion of the project area. Further dykes are recorded in the proximity to the project area. These north-west to south-east trending dykes are perpendicular to the axis of the Macquarie Syncline, located to the north-west of the site. According to the NSW Department of Industry, Resources & Energy there are no rock units of naturally occurring asbestos potential within the project area.
Hydrogeology	A search of the Bureau of Meteorology Australian groundwater explorer database identified 43 groundwater bores located within a one kilometre radius of the project site. Five are located within 100 metres of the project and are licenced for monitoring purposes. The bores were drilled to a maximum of 6.8 metres and groundwater levels were recorded between 2.6 and 4.9 metres below ground level (m bgl) within the Quaternary deposits / Munmorah Conglomerate. The closest bore licenced for non monitoring purposes is approximately 990 metres east of the site and is licensed for water supply. The bore was drilled to 20 metres and standing water level is recorded as 5 m bgl within shale (possibly the Dooralong shale); its reported yield is 0.1 L/s. Groundwater is understood to flow locally towards the northeast. Investigation of these groundwater bores indicates that groundwater levels were recorded between four and eight metres below ground level. It was also noted that hydrocarbon fuel odours and sheen were present in groundwater samples (CES 2019).
Crown Land	The project site does not contain any Crown Land. The nearest area of Crown Land is a portion of land zoned RE1 Public Recreation located approximately 550 metres east of the project site (refer Figure 2.7).
Mining, quarries, mineral or petroleum rights	The project site is located in a designated Mine Subsidence District (Swansea North Entrance). The underground workings of the Great Northern Seam from two collieries which supplied coal to Munmorah Power Station exist beneath the site; being Munmorah Colliery (closed in 2005) and decommissioned and rehabilitated Endeavour (formerly Newvale No.2) Colliery at a depth of approximately 150-170 metres. A portion of the western side of the site adjacent to and including the perimeter road is subject to underground workings from the former Munmorah Colliery. The eastern part of the site is underlain by the workings of the Endeavour Colliery. Consolidated Coal Lease (CCL) 720 and 721 cover the majority of the former Munmorah Power Station site. CCL720 is held by Centennial Munmorah Pty Ltd (expires in 2023) and covers the eastern half of the project site which includes the decommissioned and rehabilitated Endeavour (formerly Newvale No.2) Colliery. CC721 is held by Centennial Mannering Pty Ltd and expires in 2026. It abuts the northern perimeter of the site and extends toward Doyalson and Doyalson North and includes a part of the Mannering Colliery including surface facilities.
Historical land use	The former Munmorah power station is a now demolished coal-fired power station. Power generation began in 1967 and ended in 2012. The project site was previously used for coal stockpiling and other uses, including as a laydown area during the demolition of the power station. Demolition of the former power station was completed in 2018. The area of the project site is cleared and currently vacant.

6.4.3.2 Contamination

A search of the NSW EPA contaminated land database (undertaken in August 2022) confirmed that the contamination at the Munmorah Power Station, including the project site is currently being assessed by the EPA to determine whether regulation is required under the CLM Act.

The Munmorah Power Station including the project site is recorded on the NSW EPA PFAS Investigation Program.

The project site was used as the former power station coal stockpiling and other power station uses including a laydown area during the demolition of the power station. Ancillary plant that supported the coal stockpiling included an above ground storage tank and oil water separator, a bunker and the southern detention pond. To the northeast of the project site was a former fire training area.

CES has sampled and analysed soil, sediment, surface water and groundwater over several phases of site investigation (2019 and 2022). These investigations indicated that fill (including coal tailings) was up to 1.1 metres below ground level (mbgl), with the residual soil and bedrock below. In 2022, groundwater levels were recorded in bores between 2.6 and 6.9 mbgl.

Historical contamination investigations completed by CES on behalf of GPM have identified the presence of residual coal and various other contaminants in soil and groundwater at the project site, generally at low levels, including PFAS and asbestos along with hydrocarbons and volatile organic substances.

The most recent report prepared for the site (CES, 2022 Appendix E) indicates while some contamination is present, it is unlikely to constrain the development of the Waratah Super Battery project, subject to remediation by GPM. To facilitate this, GPM has engaged a NSW EPA-accredited Site Auditor to review the works necessary to remediate the historical contamination to make it suitable for its future use as industrial land. The Auditor has identified the following activities to be completed:

– Preparation of a Remediation Action Plan which will include the following:
  - Removal of residual coal deposits, including coal rejects.
  - Remediation and validation of asbestos 'hotspots' and hydrocarbons, including further work to identify and remove the residual buried services containing the potential asbestos-containing materials.
  - Source and run off management controls for PFAS.
  - PFAS containing materials considered for re use onsite, should be assessment in accordance with PFAS NEMP 2.0 (HEPA 2020) and seek appropriate regulatory approvals for reuse.
  - Management of surface water and sediments in the southern detention pond.
  - Preparation of a CEMP and OEMP for the site remediation activities.
  - Any other works required by the NSW EPA-accredited Site Auditor.

These works would be completed by GPM under their existing approvals prior to construction of the project. On completion, GPM will procure a site audit statement in accordance with the CLM Act confirming that the project site is suitable for the proposed commercial/industrial land use. Based on these works being completed and site-specific controls being implemented in the form of a site management plan, there are expected to be minimal contamination risks associated with construction and operation of the project.

6.4.3.3 Mining and subsidence

Consolidated Coal Lease CCL 720 and CCL 721 cover the majority of the site as shown in Figure 6.7. Lease CCL 720 is held by Centennial Munmorah Pty Limited and expires in 2023, with the decommissioned and rehabilitated Endeavour Colliery (formerly Newvale No.2 Colliery) existing within the lease. Lease CCL 721 is held by Centennial Mannering Pty Ltd and expires in 2026. CCL 721 covers a part of the Mannering Colliery including the surface facility. It is sub-leased to Lake Coal Pty Ltd and novated to Great Southern Energy Pty Ltd (trading as Delta Coal) who operate the adjacent Chain Valley Colliery and became the operator of Mannering Colliery in 2013 under agreement with Centennial.

Coal mine workings in the Great Northern Seam from Endeavour Colliery (RT786, formerly Newvale No.2 Colliery) and abandoned Munmorah Colliery (RT695) underly the site at around 150 to 170 m below the surface, including within the current Mannering Colliery lease CCL 721.

Mining of the Great Northern Seam commenced in the early 1950s with the Munmorah State Coal Mine and Endeavour Colliery (previously known as Newvale No.2 Colliery). Endeavour Colliery ceased operation in 1999, following which Centennial Coal acquired the two mines in 2002 and renamed them as Munmorah Colliery in 2005. Operations ceased in 2012.

Mining was first workings with the bord-and-pillar method, with secondary mining in the form of pillar extraction. While longwall mining occurred within Munmorah Colliery, it did not occur in the vicinity of the site.

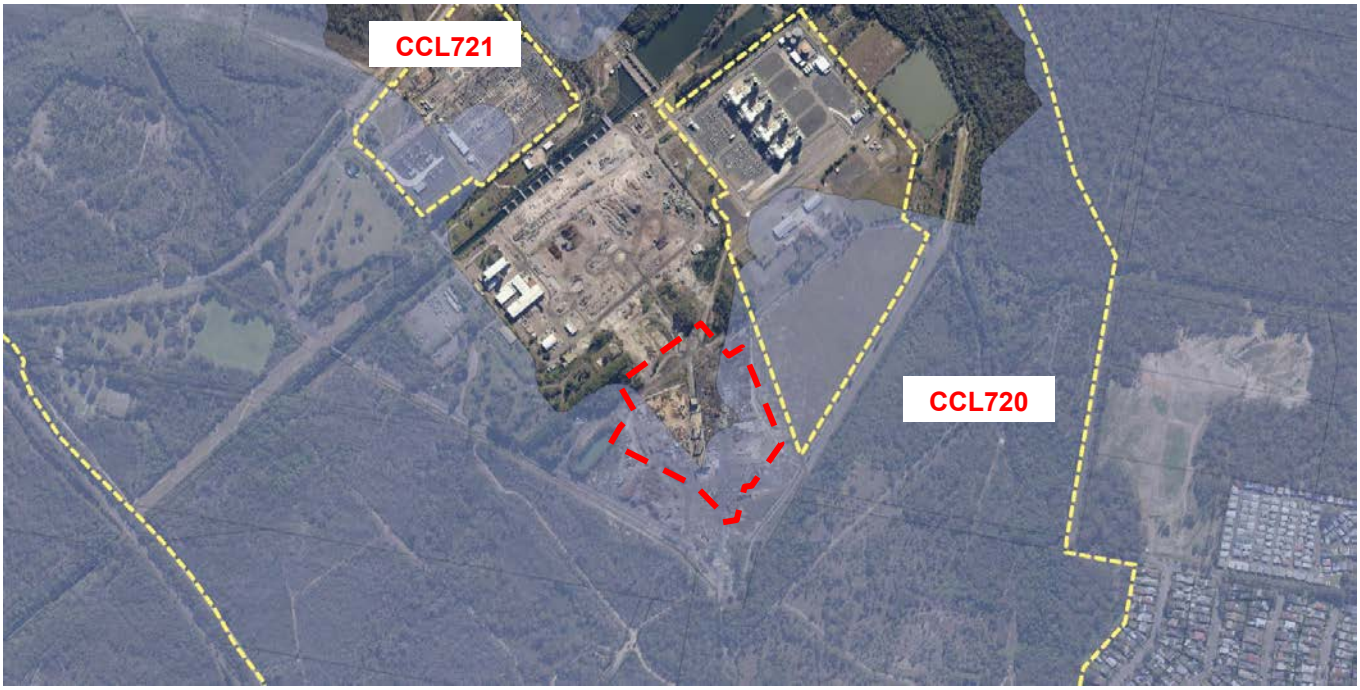


Figure 6.7 General area of mine workings (NSW Planning Portal, Government of NSW, 2022)

6.4.4 Potential impacts

6.4.4.1 Construction

6.4.4.1.1 Erosion and sedimentation

Site fill and residual soil material presents a moderate to high erosion hazard which will be further assessed via geotechnical investigation during design development.

Sediment and erosion controls would be implemented and managed in accordance with the *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) with site specific recommendations to be included based on future proposed geotechnical investigation and recommendations.

Further details of proposed erosion and sedimentation controls to be implemented to limit impacts on surface water quality are provided in Section 6.8.

6.4.4.1.2 Acid sulfate soils

It is unlikely that acid sulfate soils would be encountered due to the fill present at the site and the anticipated depth of disturbance likely to be <1.5 metres. The nearest Class 1-4 soils are at Colongra Swamp Nature Reserve > 500 metres from the site.

6.4.4.1.3 Contamination

GPM has engaged a NSW EPA-accredited Site Auditor to review the technical studies prepared by CES. CES are preparing these technical studies to document the works necessary to remediate historical contamination at the site to make it suitable for its future use as industrial land, i.e. the Waratah Super Battery.

Due to the historical use of the site and the potential for latent contamination, any spoil arising from construction activities such as land reprofiling, foundations or underground services will require appropriate management during construction. Spoil and groundwater can be managed through standard construction practices documented in the remediation CEMP. Should surplus material occur not able to be reused on site, a waste classification assessment is required prior to disposal at the GPM licenced disposal site or an appropriately licenced off-site facility.

Any PFAS containing materials considered for reuse onsite would be assessed in accordance with the PFAS NEMP 2.0 (HEPA 2020) and seek appropriate regulatory approvals for reuse.

Excavation would be required at the former power station site for the foundation of the transmission towers and is likely to encounter contaminated material. Locating the towers would be undertaken in consultation with GPM to avoid as far as practicable known contaminated areas. Excavations in this area would be subject to GPM approval and controls including the disposal of waste material.

There is potential for further contamination of soils during construction from spills or leaks of hydrocarbon fuels and chemicals used in construction, that may result in contamination of soil and / or water if not managed appropriately, although these can be satisfactorily managed through application of standard construction mitigation measures documented in the Construction Environmental Management Plan (CEMP).

6.4.4.1.4 Land subsidence

Consultation with Subsidence Advisory NSW (refer Chapter 5) indicated that the subsidence risks vary across the project site. Bord-and-pillar and pillar extraction workings of the Great Northern Seam exist under the site at around 150 to 170 m depth. Punching failure of the pillars into the softened claystone floor and pillar failure due to crushing under abutment loading have the potential to result in surface subsidence at the site, presenting potential trough subsidence and cracking hazards to the proposed development, which would need to be considered in detailed design. Due to the depth of workings (>150 m), development of potholes is not considered a hazard.

Subsidence Advisory NSW has also contacted the leaseholder of the active mining lease who has advised that future mining is unlikely.

6.4.4.2 Operation

6.4.4.2.1 Erosion and sedimentation

During operation, site runoff will be directed toward installed catchment drains and detention facilities. Surfaces beneath the battery storage area and switchyard will be gravelled which will stabilise the soil and reduce the movement of sediment.

The risks of any PFAS contaminated materials reused on site will be managed via a long-term management plan specific to those areas in which it is placed and may include specific design controls such as covering the materials with an impervious surface. This will limit water ingress and possible movement of PFAS and sediment.

The risks to water quality during operation including proposed controls is addressed in Section 6.4.4.2.

6.4.4.2.2 Contamination

The project includes the operation of a battery energy storage system and other electrical transmission infrastructure which are considered low risk in terms of the potential for contamination to occur. The operation of the project is not anticipated to result in contamination impacts. All other existing contamination at the site, except PFAS if it occurs (refer above) will be controlled via the remediation action plan and/or the site remediation OEMP will be outline controls and procedures to limit the exposure of contaminated materials.

Potential contamination resulting from spills from operation and maintenance activities, should they occur, would be addressed through the mitigation measures presented in Chapter 7, specifically through a project Operational Environmental Management Plan.

6.4.4.2.3 Land use

A land use conflict risk assessment was carried out in accordance with the Department of Primary Industries Land Use Conflict Risk Assessment Guide (DPI, 2011) to identify land use compatibility and potential conflict between neighbouring land uses.

Based on the existing characteristics and features at and adjacent to the project site described in Section 2.3.1, and the risk matrix in Table 6.11, the risk of land use conflicts according to the probability of occurrence and the consequence of the impact is provided in Table 6.12. Probability ‘A’ is described as ‘almost certain’ to probability ‘E’, which is described as ‘rare’. The level of consequence starts at 1 – Severe to 5 – Negligible.

Table 6.11 Land use conflict risk ranking matrix (DPI, 2011)

	Probability				
	A	B	C	D	E
	Almost Certain	Likely	Possible	Unlikely	Rare
1. Severe	25	24	22	19	15
2. Major	23	21	18	14	10
3. Moderate	20	17	13	9	6
4. Minor	16	12	8	5	3
5. Negligible	11	7	4	2	1

Table 6.12 Initial land use conflict risk evaluation

Land use	Details	Probability	Consequence	Risk Ranking
Residential development	The residential suburbs of Doyalson, San Remo, Buff Point, Budgewoi and Halekulani surround the project site. Halekulani is the closest suburb being approximately 600 metres away. Unmitigated impacts may include: – Noise – Dust – Traffic – Vibration – Visual – Property value.	D	3	9
Recreation/ Conservation areas	Koala Park (400 metres north-west) and Colongra Swamp Nature Reserve (650 metres north-east) are located in close proximity to the project site and potential impacts may include: – Noise – Dust – Traffic – Vibration – Visual.	D	3	9

Based on the LUCRA Guide (DPI 2011) a ranking of 25 is the highest magnitude of risk, considered to be a highly likely, very serious event. A rank of 10 or below is considered to be low risk. The assessed risk of conflict to future residential development and recreation/conservation areas are both assessed as low risk (9).

Based on the risk ranking above, residential development and recreational/ conservation land do not require management strategies to reduce the risk of conflict with the project. However as documented in Chapter 7, a range of management actions are outlined to reduce the potential for impact from specific environmental issues. As shown in Table 6.13, the revised risk rankings following the implementation of these proposed management actions are 5 and therefore considered acceptable and low risk of conflict. Provided the recommended mitigation measures are implemented, it is anticipated the project will not result in land use conflict in the area in which it is proposed.

Table 6.13 Revised land use conflict risk evaluation including proposed management actions

Land use	Details	Probability	Consequence	Risk ranking
Residential development	Management strategies/mitigation for the potential impacts are outlined in the relevant sections of the EIS.	D	4	5
Recreational/ conservation areas	The proposal is unlikely to have any noticeable impact on the Koala Park and Colongra Swamp Nature Reserve. Management strategies/mitigation for the potential impacts are outlined in the relevant sections of the EIS.	D	4	5

6.4.4.3 Decommissioning and rehabilitation

The scope of future decommissioning and rehabilitation of the site will be agreed with the landowner and will also determine the scope of activities to be undertaken, specifically in relation to excavation and removal of in-ground structures. The risks of disturbance of soils/ contamination and related impacts will thus be identified. It is anticipated that all decommissioning activities will be undertaken in accordance with a decommissioning management plan and in accordance with appropriate Work Health and Safety procedures. The decommissioning management plan will identify the scope of activities to be undertaken, identify sensitive receivers, and the procedures and protocols to be adopted to ensure the minimisation of impacts to identified receivers.

6.4.5 Mitigation measures

Mitigation measures proposed to avoid or minimise potential impacts on land during construction, operation, and decommissioning and rehabilitation are listed in Table 6.14. These measures would be included in the issue-specific environmental management sub-plans for the Waratah Super Battery.

Table 6.14 Mitigation measures – land

No.	Outcome	Mitigation measure	Timing
L1	Further geotechnical testing	Further geotechnical testing and assessment would be undertaken to determine geotechnical requirements for project-related infrastructure and manage environmental risks including potential erosion and scour, and subsidence.	Design
L2	Management of subsidence	A mine subsidence assessment would be undertaken to guide the future design with the intent that the serviceability of the battery and transmission structures are not compromised if a subsidence event occurs. Further consultation with Subsidence Advisory NSW in relation to subsidence risks and issues related to other continuing titles within the project site.	Design
L3	Site suitable for proposed use	Prior to construction occurring at the site, a statement by a NSW Site Auditor is to be provided by GPM indicating that the site is suitable for its intended use. The Site Audit Statement will detail the measures required to manage any residual contamination at the project site.	Design
L4	Contamination management subplan	Potential contamination-related impacts associated with the project will be managed by the implementation of a CEMP that includes (but not limited to): – Reference to and incorporation of any CEMP/OEMP controls or procedures for the site arising from the site Remediation Action Plan and Site Audit Statement. – Preparation of a spoil management plan including procedures for handling and storing contaminated and uncontaminated spoil in accordance with the *Protection of the Environment Operations (Waste) Regulation 2014* and protocols for undertaking appropriate sampling and analysis to support waste classification and tracking for any soil surplus. – An unexpected finds protocol, including encountering asbestos containing materials and contaminated soils or groundwater during construction works. – Any PFAS containing materials considered for re use onsite should be assessed in accordance with PFAS NEMP 2.0 (HEPA 2020) and seek appropriate regulatory approvals for reuse.	Construction

6.4.6 Conclusion

This section assessed the potential impacts on land associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential associated with the Waratah Super Battery.

Site contamination assessment within the project site indicates while some contamination is present it is unlikely to constrain the development of the Waratah Super Battery project, subject to remediation. GPM has engaged a NSW EPA-accredited Site Auditor to review the works necessary to remediate historical contamination at the site to make it suitable for its future use as industrial land ie the Waratah Super Battery. Remediation works on the project site would be completed prior to construction of the Waratah Super Battery.

Based on these works being completed and site-specific controls being implemented in the form of a site management plan, there are expected to be minimal contamination risks associated with construction of the project.

Construction of the project could increase the risk of erosion and sedimentation and potentially impact on sensitive receiving environments. There is potential for fuels and chemicals to spread into the surrounding environment, including into sites soils and groundwater from accidental spills and leaks from equipment if not appropriately managed.

It is unlikely that acid sulfate soils would be encountered due to the imported fill present at the site and the anticipated depth of disturbance likely to be <1.5 metres.

Historical board and pillar mine workings under the site have the potential to cause surface subsidence in the form of trough subsidence and cracking hazards.

A land use conflict risk assessment was carried out to identify land use compatibility and potential conflict between neighbouring land uses. Based on the risk evaluation conducted, residential development and recreational/ conservation land do not require management strategies to reduce the risk of conflict with the project. The risk of land use conflict with the project is considered low.

Management procedures and safeguards as listed in Section 6.4.5 would be implemented to prevent risk scenarios occurring.

6.5 Visual

6.5.1 Overview

This section assesses potential visual impacts associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential impacts associated with the Waratah Super Battery. The assessment has been prepared in accordance the SEARs (refer to Appendix A).

6.5.2 Methodology

6.5.2.1 Government plans, policies, and guidelines

This Visual Impact Assessment (VIA) was prepared with reference to the Guideline for Landscape Character and Visual Impact Assessment Environmental Impact Assessment Practice Note EIA-N04 (TfNSW 2020).

6.5.2.2 Desktop assessment

A VIA was undertaken to determine the visibility of the project from surrounding areas and any potential visual impacts associated with the construction, operation, and decommissioning and rehabilitation of the project on these areas. The assessment included:

– Desktop review of the existing environment of the project site and surrounds, including identification of potential sensitive visual receivers.
– Identification the project's level of visibility (through the preparation of a zone of theoretical visibility diagram), its ability to be accommodated within the surrounding landscape and consequential potential visual impacts during construction, operation, and decommissioning and rehabilitation.

– Assessment of potential visual impacts during the construction, operation, and decommissioning and rehabilitation of the project from potential visible areas.
– Identification of mitigation measures to minimise the potential impact to visual amenity.

6.5.2.3 Visual impact assessment

6.5.2.3.1 Overview

The evaluation of potential impacts on visual amenity is based on the sensitivity of the viewpoint (and the visual receiver it represents) to change, and the magnitude of change that is likely to occur.

The assessment considers the likely impacts of the project. The level of effects on a view depends on factors such as the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view, and distance from the project.

Steps undertaken to assess visual impacts include:

– Identification and mapping viewpoint locations.
– Undertaking assessment of visual impacts, comprising:
  - Sensitivity of visual receivers to the proposed change, based on: susceptibility of visual receivers to change, and value attached to views.
– Magnitude of visual impact, based on:
  - size or scale of change, geographical extent of effects, and duration and reversibility of impacts.

An assessment is then undertaken of the overall level of significance of the visual impacts in relation to the existing view.

6.5.2.3.2 Sensitivity

The sensitivity of each viewpoint is dependent on the:

– Importance of the view, its existing scenic qualities, and the presence of other existing man-made elements in the view.
– Type of visual receiver and their likely interest in the view.

The sensitivity criteria used in the visual impact assessment is provided in Table 6.15.

Table 6.15 Sensitivity criteria (visual) (Source: Transport for NSW)

Rating	Criteria
High	Occupiers of residential properties, at home or going to or from, with long viewing periods, within proximity to the proposed development; Communities that place value upon the urban landscape and enjoyment of views of their setting.
Moderate	Outdoor workers who have a key focus on their work who may also have intermittent views of the study area; Viewers at schools, or similar, when outdoor play and recreation areas are located within proximity but viewing periods are limited; Occupiers of residential properties with long viewing periods, at a distance from or screened from the study area.
Low	Road users in motor vehicles, trains or on transport routes that are passing through or adjacent to the study area and therefore have short-term views; Viewers indoor at their place of work, schools or similar.
Negligible	Viewers from locations where there is screening by vegetation or structures where only occasional screened views are available and viewing times are short; Road users in motor vehicles, trains or on transport routes that are passing through/adjacent to the study area and have partially screened views and short viewing times.

6.5.2.3.3 Magnitude

The magnitude of change to views and visual amenity depends on the nature, scale and duration of the change that is expected to occur. The magnitude of a change also depends on the loss, change or addition of any feature in the field of view of the receiver including an assessment of the level to which the change contrasts with the existing view or expected view of the landscape. This includes the degree of any change to the backdrop to, or outlook from a viewpoint.

The magnitude of change criteria used in the visual impact assessment is provided in Table 6.16.

Table 6.16 Magnitude of change criteria (visual) (Source: Transport for NSW)

Rating	Criteria
High	A substantial/obvious change to the existing view due to total loss of, or change to, elements, features or characteristics of the view. Would cause a view to be permanently changed and its quality diminished.
Moderate	Discernible changes in the existing view due to partial loss of, or change to elements, features or characteristics of the view, however, has potential to be partly mitigated. The change would be out of scale with the existing view and would leave an adverse impact on the view.
Low	Minor loss or alteration to one or more key view elements, features or characteristics, or the introduction of components that may be visible but may not be uncharacteristic within the existing view.
Negligible	Almost imperceptible or no change in the view as there is little or no loss of/or change to the elements, features or characteristics of the view.

6.5.2.3.4 Significance of impacts

The combination of sensitivity and magnitude determines the significance of the impact on the landscape character or representative viewpoint. The matrix used to determine the significance of visual impact is provided in Table 6.17.

Table 6.17 Significance of impact matrix (Source: Transport for NSW)

		Magnitude of impact			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.5.2.3.5 Visual receivers

Assessment of visual impacts deals with the effects of change and development on the views available to people and their visual amenity. It assesses how the surroundings of individuals or groups of people may be specifically affected by changes in the context and character of views because of the change or loss of existing elements of the landscape and/or the introduction of new elements.

Visual receivers have been considered in terms of the views they are likely to obtain from any key vantage points, such as dwelling windows, where there is particular interest in the view. Visual receivers are identified based on:

– Proximity of the receivers to the project, as the most affected visual receivers are anticipated to be located closest to the project, unless located at an elevated vantage point.
– Type of receiver, as different viewer types would have different perceptions of the change.

Based on the analysis of the existing landscape and visual environment, sensitive visual receivers were identified, and viewpoint locations selected as representative locations for assessment. It should be noted that the receiver locations are representative of an area not a specific property or location. This is generally because not all sensitive receiver viewpoints are accessible.

6.5.2.4 Field surveys

A visual inspection of the Waratah Super Battery site was undertaken in addition to review of available aerial and Google Street view imagery. Images included are from Google Street View to assist in the understanding of visual impacts. The years that the images were taken has been noted under the image as they vary from image to image depending on when they were taken.

Google Street View images are captured using cars that have special cameras mounted on the roof that take photographs as they drive down public streets. Each car uses 15 cameras that snap 360-degree views at a height of 2.4 metres (8.2 feet). This is important to note as the images are generally slightly higher than the average human adult eye (1.7 metres) providing a higher perspective for these views.

6.5.3 Existing environment

The project site is located in an area of low-lying, coastal marshlands with a generally level landform, approximately 35 kilometres south of the city centre of Newcastle. The project would be located on industrial land associated with the former Munmorah Power Station, near the Colongra Power Station approximately 100 metres to the north. Central Coast lakes including Lake Munmorah, Budgewoi, and Tuggerah Lakes are also located to the east and south, as are the coastal beaches of Budgewoi and Birdie Beach (refer Figure 1.1).

There are large tracts of trees and vegetation immediately surrounding the project site including Colongra Swamp as well as undeveloped, vegetated coastal sand dunes that visually isolate the project site from the surrounding existing suburban areas of Doyalson to the north, San Remo to the west, Buff Point to the south and Halekulani to the east. The nearest residential areas are located approximately 600 metres to the southeast.

An existing telecommunications tower and transmission lines are present at the project site connecting to the Munmorah substation and extend into the surrounding landscape following easements to the north towards Doyalson North and west to San Remo (refer Figure 3.1). The existing visual environment also includes the four exhausts from Colongra Power Station. These structures are variously taller and/or at a higher elevation than proposed infrastructure at the project site.

6.5.4 Potential impacts

6.5.4.1 Construction

During construction, construction traffic would likely access the project site via the Scenic Drive. Parking for construction workers would be outside the project site on land within the adjacent former power station.

The main construction activities would include site establishment, vehicle movement, and preparation for operation, which would include the following main visual activities:

– Earthmoving equipment for civil works within the project site.
– Earthworks including foundations and trenches.
– Movement of trucks, forklifts, drilling rigs, excavators, and 50 tonne mobile crane.
– Construction of internal access roads and associated drainage, where required.
– Stockpiles of excavated materials.
– Construction compound including a site office and amenities.
– Laydown areas.

Visual impacts from the construction of the project are likely to be negligible. Activities would be of a short duration. These activities would not be visible from surrounding locations due to a range of factors including existing surrounding trees and vegetation, topography, and distance which act to buffer the project site from surrounding areas.

6.5.4.2 Operation

Viewshed and visibility

The extent of the viewshed is influenced by a combination of factors including elevation, landform and vegetation. A zone of theoretical visibility has been identified based on digital terrain modelling (LIDAR) and the three proposed transmission towers as they would be the tallest project elements and may be visible to surrouding areas (refer Figure 6.5). Trees and buildings were included in the model to provide a greater degree of accuracy.

A zone of theoretical visibility (or viewshed) was generated using the following method:

– Establishment of elevation models for both ground, 35-metre high transmission towers, and existing vegetation from LIDAR data.
– Applying points to tops of transmission structures.
– Using GIS to identify locations from which these points have unobstructed views.

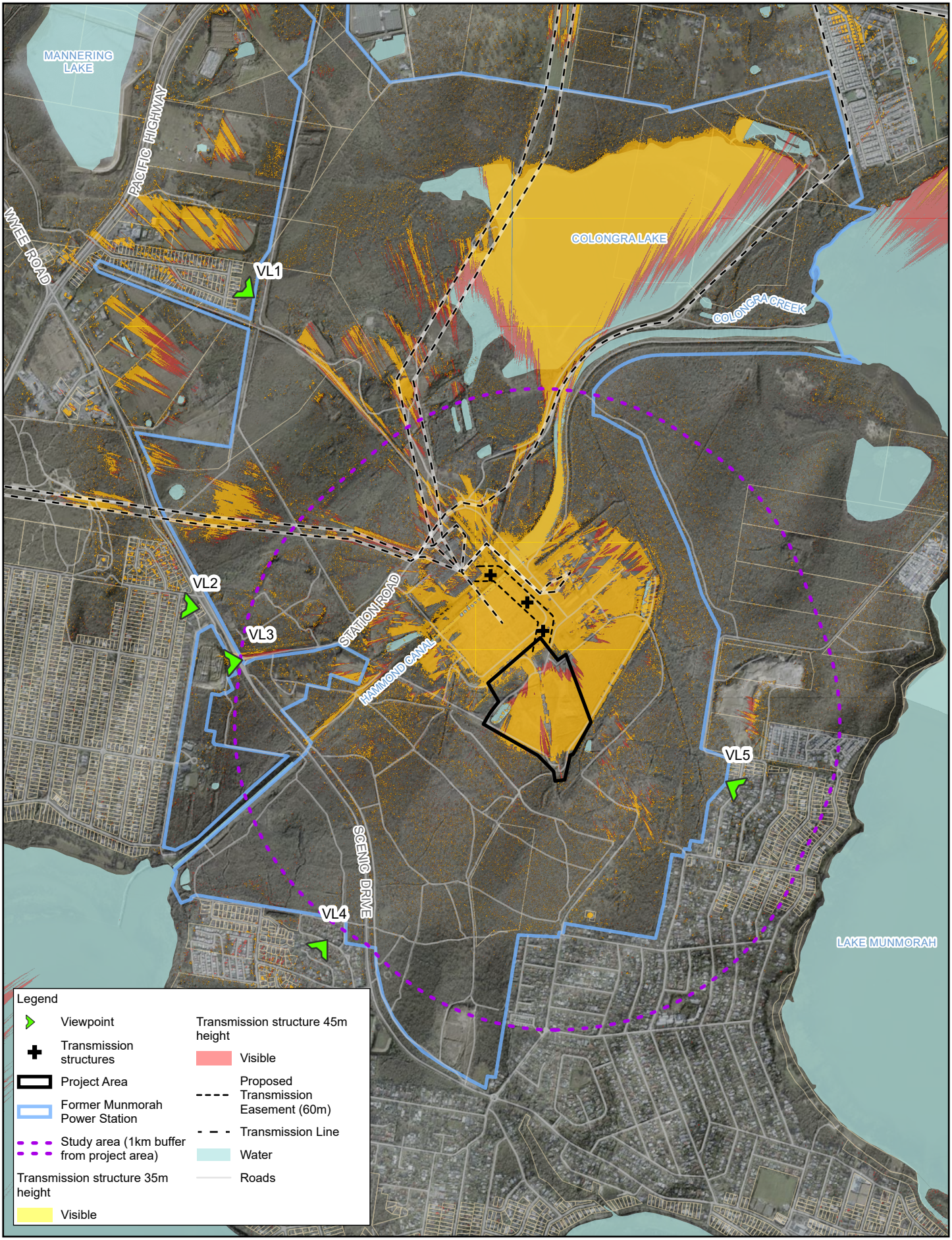
The viewshed identification of the transmission structures is calculated on the basis that they are taller and, therefore more likely to be visible. However, it is also noted that they would also be less visually obtrusive than the battery energy storage system which would be much lower to the ground (approximately 3.3 metres high) and not visible from the same areas or at all.

Based on the zone of theoretical visibility, five locations were identified where sensitive receivers in the vicinity of the project site might be impacted by the project. These locations (or viewpoints) are described in Table 6.18.

The viewpoints are assessed in Section 6.5.4.2.1 through Section 6.5.4.2.5.

Table 6.18 Viewpoint locations

Viewpoint	Location	Description
Viewpoint location 1 (VL1)	Suburban residential area located in Doyalson, approximately 2.0 km to the northwest of the project site.	VL1 is located in the suburb of Doyalson in the Central Coast LGA. The viewpoint represents nearby residential receivers and local road users to the north.
Viewpoint location 2 (VL2)	Suburban residential area located in San Remo approximately, 1.2 km to the west of the project.	VL2 is in the suburb of San Remo in the Central Coast LGA. The viewpoint represents nearby residential receivers and local road users to the west.
Viewpoint location 3 (VL3)	Scenic Drive located approximately 1.0 km to the southwest of the proposal	VL3 is located travelling north or south along the Scenic Drive carriageways representing road users.
Viewpoint location 4 (VL4)	Suburban residential area located in Buff Point approximately, 1.2 km to the southwest of the project.	VL4 is located in the suburb of Buff Point in the Central Coast LGA. The viewpoint represents nearby residential receivers and local road users to the southwest.
Viewpoint location 5 (VL5)	Suburban residential area located in Halekulani, approximately 700 m to the southeast of the project.	VL5 is located in the suburb of Halekulani in the Central Coast LGA. The viewpoint represents nearby residential receivers and local road users to the east.



Paper Size ISO A4

0 1 Kilometres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Energy Co
Waratah Super Battery - Munmorah
Environmental Impact Statement

Zone of Theoretical Visibility

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 6.8

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12582669_EIS_009_Fig6_8_ZonalAssessment
Print date: 26 Oct 2022 - 12:03

Data source: Digital Terrain Model - NSW Spatial Services, 2014; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap
Tile Service: . Created by: mfredle

6.5.4.2.1 Viewpoint location 1: Doyalson residential area

Viewpoint location 1 (VL1) is located in Doyalson, approximately 2.0 kilometres northwest of the project (refer to Figure 6.8 and Figure 6.9). The dual, 155 metre height emission stacks in the background have now been removed and were at the location of the project site. They provide a relative height for comparison with the proposed 35 metres or 45 metres high transmission towers that are unlikely to be seen from this location as they will be significantly shorter and thinner.

A viewpoint assessment for VL1 is provided in Table 6.19. Visual impacts for VL1 are assessed as neglibible during operation (refer to Table 6.20).

Source: Google Street image 2010

Figure 6.9 Southeast view from Barton Road near Wentworth Avenue towards the project

Table 6.19 L1 Viewpoint assessment

Criteria	Comments
Description of existing view	VL1 consists of views from low density, suburban residential private properties and local streets. The existing topography is generally level, gently sloping up to the west to an elevation of approximately 20 metres. Views towards the project site include suburban development in the foreground including power poles and wires. It is noted that most dwelling types in this area are one story. It is also noted that infrastructure currently present on site, including existing telecommunications tower and transmission towers, do not appear to be visible from this location.
Anticipated change to view	There is no anticipated change to the view due to foreground trees, vegetation and buildings likely obscuring views of the project including the transmission towers. Individual battery units (up to 3.3 metres high) will not be visible. Ancillary infrastructure such as the upgraded construction access road, administration and maintenance buildings, storage yard and parking will not be visible. Other infrastructure such as perimeter and internal fencing, lighting and surveillance, and a site gatehouse and gating at the site access road will not be visible.
Sensitivity to change	The sensitivity to change is **moderate** as the existing views are from residential development with potentially long viewing times. Overhead wires and power poles along the street lower the overall sensitivity rating. Existing infrastructure such as transmission towers and wires and telecom towers can be seen in the mid to long distance view, also lowering the sensitivity.
Magnitude of change	The magnitude of change is considered **negligible** as there will be no change to the view due to the relatively small height and width of the transmission towers and presence of the existing vegetation, visible infrastructure and residential development in the view.
Visual impact rating	The resultant rating of visual impact during operation when combining Sensitivity and Magnitude is assessed as **negligible.** Visibility is unlikely from this location or so insignificant that it is virtually imperceptible.

Table 6.20 Visual impact rating table for VL1

Sensitivity	Magnitude of impact				
		High	**Moderate**	**Low**	**Negligible**
	High	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.5.4.2.2 Viewpoint location 2: San Remo residential area

Viewpoint location 2 (VL2) is located in San Remo, approximately 1.2 kilometres west of the project (refer to Figure 6.8 and Figure 6.10). The two, 155 metre height emission stacks have now been removed and were at the location of the project site. They provide a relative height for comparison with the proposed 35 metres or 45 metres high transmission towers that are unlikely to be seen from this location as they are significantly shorter and thinner.

A viewpoint assessment for VL2 is provided in Table 6.21. Visual impacts for VL2 are assessed as neglibible during operation (refer to Table 6.22).

Source: Google Street image 2010

Figure 6.10 East view from Alpine Avenue towards the project

Table 6.21 L2 Viewpoint assessment

Criteria	Comments
Description of existing view	VL2 consists of low density, suburban residential private properties, and local streets. The existing topography is generally level, gently sloping up towards the east to a height of approximately 25 metres. An area of dwellings to the north at Alpine Avenue at an approximate elevation of 35 metres, may potentially have views over the immediate landscape to the east towards the project site although these views include suburban development in the foreground including power poles and wires. It is noted that any potential views of the project site would likely be from the second storey and most dwelling types in this area are one storey. Views are at more than 1.0 kilometre from the project and infrastructure currently present on site, including existing transmission towers, does not appear to be visible from this location.
Anticipated change to view	There are no anticipated changes due to foreground trees, vegetation and buildings obscuring views of the project site. Individual battery units (up to 3.3 metres high) will not be visible. Ancillary infrastructure such as the upgraded construction access road, administration and maintenance buildings, storage yard and parking will not be visible. Other infrastructure such as perimeter and internal fencing, lighting and surveillance, and a site gatehouse and gating at the site access road will not be visible.

Criteria	Comments
Sensitivity to change	The sensitivity to change is **moderate**, as the existing views consist of residential development with overhead wires and power poles in the foreground and transmission towers and wires also in generally close visual proximity.
Magnitude of change	The magnitude of change is considered **negligible** due to the presence of the existing vegetation, overhead poles and wires and residential development that all but entirely screen views of the project site. If proposal elements are visible, they will be small objects in the distance with the presence of other infrastructure in the view thereby visually absorbing and potential change.
Significance of impact	The resultant rating of visual impact during operation when combining Sensitivity and Magnitude is assessed as **negligible.** Visibility is unlikely from this location or so insignificant that it is virtually imperceptible.

Table 6.22 Visual impact rating table for VL2

		Magnitude of impact			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.5.4.2.3 Viewpoint location 3 (VL3): A49 Scenic Drive, Colongra

Viewpoint location 3 (VL3) is located on Scenic Drive, approximately 1.0 kilometre west of the project area at the junction of Station Road in the suburb of Colongra (refer to Figure 6.8 and Figure 6.11).

A viewpoint assessment for VL3 is provided in Table 6.23. Visual impacts for VL3 are assessed as neglibible during operation (refer to Table 6.24).

Source: Google Street image 2021

Figure 6.11 View east from the A49 Scenic Drive at Station Road towards the project

Table 6.23 L3 Viewpoint assessment

Criteria	Comments
Description of existing view	VL3 consists of views from Scenic Drive east along Station Road towards the project. Views towards the project site are from vehicles travelling along northbound and southbound carriageways, however, are limited as a visual barrier along Station Road has been formed from the existing trees and vegetation along Scenic Drive and Station Road. Infrastructure currently present on site, including existing transmission towers, does not appear to be visible from this location.
Anticipated change to view	Visual changes are minimal from this vantage point as the main elements of the project are screened by existing trees. Individual battery units (up to 3.3 metres high) will not be visible. Ancillary infrastructure such as the administration and maintenance buildings, storage yard and parking are unlikely to be seen. Other infrastructure such as the upgraded construction access road, perimeter fencing, lighting and surveillance, and a site gatehouse at the site access road are visible however constitute relatively minor elements within the view subject to their design, location and extent.
Sensitivity to change	The sensitivity to change is **low** as visual receivers are in moving vehicles on a highway with posted speeds of 70 km/h. The north-south orientation of Scenic Drive means that visual receivers views are not directed towards the project at this location.
Magnitude of change	The magnitude of change is considered **negligible**, as there is likely to be only minimal changes to Station Road and the project site entry. Upgrades to Station Road are likely to be received as positive visual impacts.
Significance of impact	The resultant rating of visual impact during operation when combining Sensitivity and Magnitude is assessed as **negligible**. Minimal amount of change associated with the upgrade to Station Road that may be perceived as having a positive visual impact.

Table 6.24 Visual impact rating table for VL3

		Magnitude of impact			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.5.4.2.4 Viewpoint location 4 (VL4): Buff Point residential area

Viewpoint location 4 (VL4) is located in Buff Point, approximately 1.2 kilometres southwest of the project (refer to Figure 6.8 and Figure 6.12).

A viewpoint assessment for VL4 is provided in Table 6.25. Visual impacts for VL4 are assessed as neglibible during operation (refer to Table 6.26).

Source: Google Street image 2015

Figure 6.12 VL4: Representative view from the Buff Point residential area northeast towards the project

Table 6.25 L4 Viewpoint assessment

Criteria	Comments
Description of existing view	VL4 consists of low density, suburban residential private properties, and local streets in the suburb of Buff Point. The existing topography is generally level, with a relatively small amount of undulation in the landform at an approximate elevation of 15-20 metres above sea level. The dwelling types in this area are predominantly one storey and single family residences. Infrastructure currently present on site, including existing transmission towers, does not appear to be visible from this location.
Anticipated change to view	Although the view is slightly elevated above the site, there are no changes anticipated from the proposal including the transmission towers due to the presence of vegetation and residential development in the foreground and the relatively level terrain.
Sensitivity to change	The sensitivity to change is moderate, as occupants of the residential properties would have long viewing periods with a value placed on their landscape setting, however, views are generally screened by existing foreground vegetation or other residences in the views.
Magnitude of change	The magnitude of change is considered negligible, as there is no visibility of the project expected due to the presence of existing vegetation and residential development in the foreground that will screen views of all the elements including the transmission towers.
Significance of impact	The resultant rating of visual impact during operation when combining Sensitivity and Magnitude is assessed as negligible. There is no change to the view based on the assessment.

Table 6.26 Visual impact rating table for VL4

		Magnitude of impact			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.5.4.2.5 Viewpoint location 5 (VL5): Halekulani residential area

VL5 is located in Halekulani residential area, approximately 700 metres southeast of the project (refer to Figure 6.8 and Figure 6.13).

A viewpoint assessment for VL5 is provided in Table 6.27. Visual impacts for VL5 are assessed as neglibible during operation (refer to Table 6.28).

Source: Google Street image 2015

Figure 6.13 VL5: Representative view from the Halekulani residential area northwest towards the project

Table 6.27 L5 Viewpoint assessment

Criteria	Comments
Description of existing view	VL5 consists of views towards the project site from low density suburban residential private properties and local streets in the suburb of Halekulani. The existing topography is generally level, with a relatively small amount of undulation in the landform at an approximate elevation of 20 metres above sea level. The dwelling types in this area are predominantly one storey, single family residences, with occasional two storey dwelling types. Infrastructure currently present on site, including existing transmission towers, does not appear to be visible from this location.
Anticipated change to view	There is no anticipated change to the view due to foreground trees, vegetation and residential development likely obscuring views of the project including the transmission towers. Individual battery units (up to 3.3 metres high) will not be visible. Ancillary infrastructure such as the upgraded construction access road, administration and maintenance buildings, storage yard and parking will not be visible. Other infrastructure such as perimeter and internal fencing, lighting and surveillance, and a site gatehouse and gating at the site access road is also unlikely to be visible.
Sensitivity to change	The sensitivity to change is moderate as the existing views are from residential development with potentially long viewing times.
Magnitude of change	The magnitude of change is considered negligible as there is no change to the view due to the relatively small height and width of the transmission towers and other site elements and presence of the existing vegetation, visible infrastructure and residential development in the foreground.
Significance of impact	The resultant rating of visual impact during operation when combining Sensitivity and Magnitude is assessed as negligible. There is no change to the view based on the assessment.

Table 6.28 Visual impact rating table for VL5

		Magnitude of impact			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High-Moderate	Moderate	Negligible
	Moderate	High-Moderate	Moderate	Moderate-Low	Negligible
	Low	Moderate	Moderate-Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

6.5.4.3 Decommissioning and rehabilitation

Decommissioning and rehabilitation activities would likely include the removal of the battery energy storage system and associated infrastructure.

Visual impacts from the decommissioning and rehabilitation of the project are likely to be negligible. These activities would not be visible from surrounding locations due to a range of factors including existing surrounding trees and vegetation, topography and distance.

6.5.5 Mitigation measures

Visual impacts are predicted to be negligible during construction, decommissioning and rehabilitation of the project, and also negligible at the five locations (viewpoints) assessed during operation. On this basis, no mitigation measures would be required.

6.5.6 Conclusion

Based on a desktop visibility assessment, it was determined that the project would potentially only be visible from limited offsite locations. Five representative viewpoint locations were chosen from surrounding areas located nearest the project for consideration of potential visual impacts based on the Zone of Theoretical visibility mapping.

Due to existing surrounding trees and vegetation, topography, distance, and the relatively low height of the battery storage, it is highly unlikely that the main component (the battery energy storage system) would be visible from the surrounding areas including from public roads and dwellings and impacts are predicted to be negligible. The transmission towers are the tallest elements of the project, however, due to their lack of mass and relatively narrow proportion in the overall landscape, intervening trees, vegetation and urban development, potential impacts at all five locations (viewpoints) were assessed as negligible.

6.6 Noise

6.6.1 Overview

This section provides a summary of potential noise and vibration impacts associated with the Waratah Super Battery. This section draws on a noise and vibration assessment, included as Appendix G. This section assesses the potential noise and vibration impacts associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential noise and vibration impacts associated with the Waratah Super Battery. The assessment has been prepared in accordance the SEARs (refer to Appendix A).

6.6.2 Methodology

6.6.2.1 Government plans, policies, and guidelines

The noise and vibration assessment was prepared with reference to the following plans/policies/guidelines:

– Interim Construction Noise Guideline (ICNG) (DECC, 2009).
– Noise Policy for Industry (NPfI) (EPA, 2017).
– Assessing Vibration: A Technical Guideline (DEC, 2006).
– BS 7385-2:1993 Evaluation and measurement for vibration in buildings Part 2 – Guide to damage (British Standards, 1993).
– NSW Road Noise Policy (RNP) (DECCW, 2011).

6.6.2.2 Desktop assessment

Noise and vibration modelling was undertaken to estimate the potential noise and vibration impacts associated with the construction and operation of the project. The assessment included:

– Identification of the existing noise levels.
– Review of anticipated construction methodology, and identification of potential construction equipment.
– Review of the proposed operations and identification of source noise levels of the operational equipment.
– Assessment of the potential for construction noise and vibration impacts.
– Assessment of the potential operational noise and road traffic noise impacts.

Full details of the methodology and compliance with noise criteria for construction and operation applied in the assessment is provided in Appendix G.

6.6.2.3 Field surveys

Noise monitoring was undertaken from 17 to 26 August 2022 in two locations representative of residential areas to quantify and characterise the existing ambient noise environment of the study area. The study area was defined as about 1.5 kilometres surrounding the project site. An overview of the study area and noise monitoring locations is presented in Figure 6.14.

6.6.3 Existing environment

The project would be located within the former Munmorah Power Station at Colongra on the Central Coast of NSW. Within the locality of the project site are the residential suburbs of Doyalson, San Remo, Buff Point, Budgewoi and Halekulani with the latter being about 600 metres to the south east.

Locations representative of the worst affected residential receivers have been included in the model. The nearest sensitive receivers to the project site are residences about 600 metres to the south east.

Noise catchment areas (NCAs) are used to classify areas of different noise environments. For this assessment, the residential receivers have been categorised into two discrete NCAs. The dominant noise sources surrounding the project site include the Central Coast Highway, Colongra Power Station and other industrial premises in the area. Residential receivers have been classified into the two NCAs based upon their proximity to these noise sources as follows:

– NCA1: Residences located further than 100 metres from Central Coast Highway.
– NCA2: Residences located directly adjacent to the Central Coast Highway.

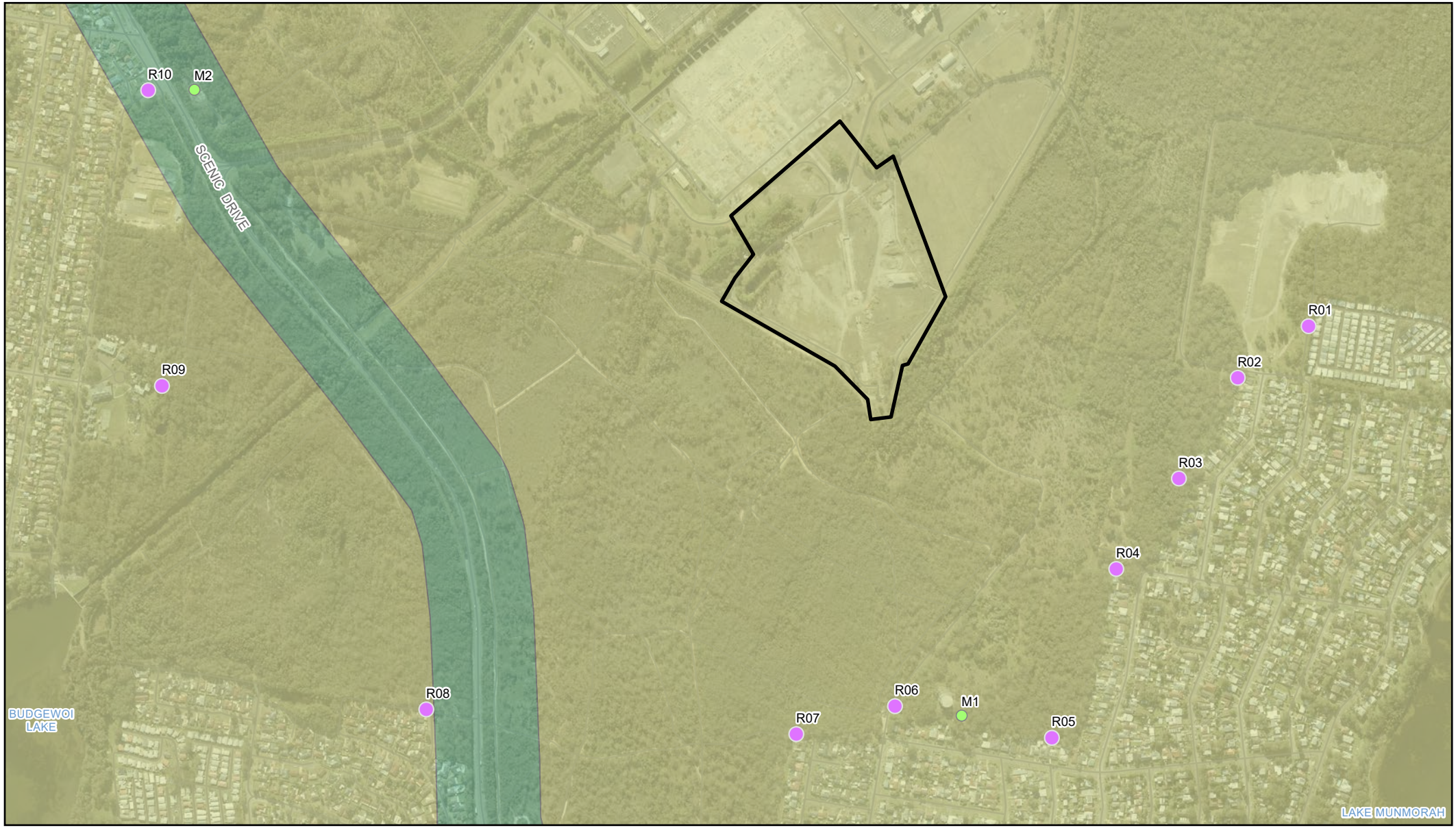
Sensitive receivers and NCAs are presented on Figure 6.14. While there are other recreational sensitive receivers closer to the project, the criteria for recreational areas are less stringent than for residential receivers. Therefore, if there are no (or limited) exceedances at residential receivers, there are unlikely to be recreational receivers impacted.

Ambient noise levels quantified during the site assessment are presented in Table 6.29.

Table 6.29 Unattended noise monitoring results, dBA

Location	Rating Background Level[1] (RBL), $L_{A90(Period)}$			Ambient noise descriptors[1] $L_{Aeq(period)}$		
	Day	Evening	Night	Day	Evening	Night
M1	35	35	30	46	43	43
M2	48	42	30 (28)	55	53	50

Notes:
The *Noise Policy for Industry (NPI)* defines day, evening and night-time periods as:
– Day: 7am to 6pm Monday to Saturday and 8am to 6pm Sunday
– Evening: 6pm to 10pm
– Night: 10pm to 7am Monday to Saturday and 10pm to 8am Sunday.



Legend

- Monitoring locations
- Receivers
- Project Site
- NCA1
- NCA2
- Roads

Paper Size ISO A4

0 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Energy Co
Waratah Super Battery - Munmorah
Environmental Impact Statement

Project site and sensitive receivers

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 6.14

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Print date: 26 Oct 2022 - 11:50

Data source: Metromap Tile Service: . Created by: mfredle

6.6.4 Potential impacts

6.6.4.1 Construction noise

Construction noise levels have been predicted at representative sensitive receivers with consideration to the acoustic requirements of the ICNG. The predicted L_{Aeq} noise level and noise management levels (NML) for each receiver are presented in Table 6.30. The noise modelling assumes that the two loudest items of equipment in the scenario are operating at maximum capacity simultaneously at the closest distance between the construction works and the receiver. As such, the predicted noise levels are often highly conservative and actual noise levels are likely to be lower than the levels predicted for the majority of the time.

The noise modelling results show that there are some exceedances of the NMLs at identified residential receivers during construction scenario 1 (CS1) shown in red font. Locations of residential receivers are presented on Figure 6.14.

Table 6.30 Summary of predicted noise levels at residential receivers during construction

Receiver	NCA	NML	CS1	CS2	CS3
R01	NCA1	45	45	42	37
R02	NCA1	45	47	44	39
R03	NCA1	45	44	41	36
R04	NCA1	45	42	39	34
R05	NCA1	45	39	36	31
R06	NCA1	45	47	44	39
R07	NCA1	45	46	43	38
R08	NCA2	58	36	33	28
R09	NCA1	45	35	32	27
R10	NCA2	58	41	38	33

As shown in the table, the predicted exceedances are 1-2 dB above the noise management levels at receivers R02, R06 and R07 (refer Figure 6.14) but only during construction scenario 1. As mentioned above, given the conservative assessment method, it is unlikely that this very low level of exceedance would be observed.

The construction of the project is likely to involve a workforce of up to about 150 people. Heavy vehicles would access the project site during construction via the former Munmorah Power Station. Light vehicles would access the project site during construction and operation via Central Coast Highway and an existing permanent access road off Station Road, Colongra.

Existing traffic volumes along the Central Coast Highway are about 1500 vehicles during the peak hour, as such the construction traffic generation is not expected to contribute to the current road traffic noise level at residences along this road. Additionally, no receivers are located on Station Road and as such no impacts are predicted from traffic generation during construction of the project.

Cumulative noise impacts are detailed in Section 6.14.

6.6.4.2 Construction vibration

The construction vibration assessment adopted safe working distances from the CNVS (TfNSW 2019) for human comfort and cosmetic damage from vibration intensive equipment likely to be used during construction of the project. The most vibration intensive activities associated with the construction works are anticipated to be excavation works during site preparation.

Excavation works have the potential to exceed the cosmetic damage criteria should these works occur within 22 metres of a sensitive receiver building. No buildings have been identified within 22 metres of excavation works and as such, no adverse cosmetic damage vibration impacts are anticipated as a result of the project.

Excavation activities have the potential to exceed the human comfort vibration criteria should these works occur within 73 metres of residences, while vibratory rolling works have the potential to exceed human comfort levels within 100 metres. As the nearest residential receivers are about 600 metres south-east from the project, no human comfort vibration impacts are anticipated from construction of the project.

Due to the large distances between the project site and the nearest residential receivers and structures, no construction vibration impacts are anticipated to occur.

6.6.4.3 Operation

Noise modelling was undertaken to predict the project noise levels during operation. Four scenarios were modelled based on a maximum battery discharge for 30 minutes and varying ambient temperatures during the operation of the project.

Predicted noise levels at the representative worst-case receivers (refer to Figure 6.14) are presented in Table 6.31 below. The noise modelling indicates compliance is predicted at all sensitive receiver locations for all modelled operations during the day and evening periods.

Compliance should also be achieved during the night time period. However there is the possibility that an exceedance could occur during the night time period under extreme ambient conditions i.e., if night time temperatures were to exceed 35°C. The five year temperature history indicates that this scenario has never occurred at night and the maximum night time temperature reached has been 35°C. As such no significant impacts are expected to occur.

Table 6.31 Operational noise modelling results, dBA

Receiver	Project noise trigger levels			S1 (ambient <35°C)	S2 (ambient 35°C)	S3 (ambient 40°C)	S4 (ambient >40°C)
	Day	Evening	Night				
R01	40	40	35	29	33	35	38
R02	40	40	35	31	34	36	39
R03	40	40	35	29	34	36	39
R04	40	40	35	30	34	36	39
R05	40	40	35	26	31	33	36
R06	40	40	35	29	33	35	39
R07	40	40	35	28	32	35	38
R08	48	43	35	24	29	31	34
R09	40	40	35	21	27	29	32
R10	48	43	35	24	27	29	32

The potential for sleep disturbance is considered for short-duration, high level noise events. In this case, significant maximum noise level events are not anticipated to occur during the night and as such, no further assessment of sleep disturbance is deemed necessary.

6.6.4.4 Decommissioning and rehabilitation

The potential noise and vibration impacts associated with decommissioning and rehabilitation would be similar to those for construction but would be fully assessed prior to future decommissioning of the Waratah Super Battery.

6.6.5 Mitigation measures

Mitigation measures proposed to avoid or minimise potential noise and vibration impacts during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.32. These measures would be included in the issue-specific environmental management sub-plans the Waratah Super Battery.

Table 6.32 Mitigation measures – amenity (noise and vibration)

No.	Outcome	Mitigation measure	Timing
NV1	Site inductions	All employees, contractors and subcontractors will receive an environmental induction. The induction must at least include: – all noise and vibration mitigation measures – relevant licence and approval conditions – permissible hours of work – any limitations on high noise generating activities – location of nearest sensitive receivers – construction employee parking areas – designated loading/unloading areas and procedures – site opening/closing times (including deliveries) – environmental incident procedures.	Construction
NV2	Schedule activities to minimise noise impact	All activities on site will be confined between the hours of 7am to 6pm from Monday to Friday and 8am to 1pm on Saturday, with the exception of the following activities: – the delivery of oversized plant of structures – emergency work to avoid the loss of life or damage to property, or to prevent environmental harm.	Pre-construction / Construction
NV3	Construction Noise and Vibration Sub Plan	A Construction Noise and Vibration Management Plan will be prepared as part of the CEMP and implemented during construction. The plan will detail processes, responsibilities and measures to manage noise and vibration and minimise the potential for impacts during construction. The Construction Environmental Management Plan CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.	Pre-construction / Construction
NV4	Out of hours works	An out of hours works procedure will be developed as part of the CEMP for the project if these works are required. This should include a detailed construction noise and vibration assessment for the potential construction activities proposed to occur out of hours. An out of hours works application form for any works outside of the approved working hours for the project will be required. A description of the works, justification and management measures would also be included as part of the application.	Pre-construction / Construction
NV5	Plant noise levels	The noise levels of plant and equipment should have an operating sound power lower or similar to the levels presented in Appendix G.	Pre-construction / Construction
NV6	Maintain equipment	Regularly inspect and maintain equipment to ensure it is in good working order. Also check the condition of mufflers. Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.	Construction
NV7	Equipment design	Battery supplier selection and the site layout would ensure project noise trigger levels outlined in Appendix G would not be exceeded at any sensitive receivers.	Detailed design / Pre-construction
NV8	Complaints handling	To address situations where noise emission levels are perceived by residents to be a problem, procedures will be development for receiving, handling, responding to and reporting community complaints.	Operation
NV9	Noise monitoring qualifications	All attended noise monitoring is to be carried out by a suitably qualified noise specialist. Records of routine equipment calibration and testing are to be maintained by the qualified noise specialist undertaking the monitoring	During operation
NV10	Operational noise monitoring	Noise monitoring is to be carried out at commissioning and/or following the commencement of operations, inclusive of any staging of operations, when the battery is both operating in standby and discharge modes. Operational noise monitoring should be repeated following any major changes to battery configuration / supplier or maintenance activities which is likely to have an impact on noise emissions.	During operation

6.6.6 Conclusion

An assessment of potential noise impacts during the construction phase has been undertaken against the ICNG during recommended standard construction hours. Construction noise levels during site preparation are predicted to result in noise levels above the NML at three residential receivers within the study area. These exceedances are not greater than 5 dBA above the NML (1-2 dBA) and are, therefore, able to be managed with reasonable and feasible mitigation measures outlined in Section 6.6.5.

Noise modelling was undertaken based on available data using CadnaA computer software to predict operational noise levels at sensitive receivers and assessed against the NPfI project noise trigger levels during the day, evening, and night periods. The assessment was based on worst-case operating conditions likely to occur during these assessment periods and is considered a conservative assessment. The noise modelling indicates compliance at all residential sensitive receiver locations for all modelled operations during the day and evening periods and compliance should also be achieved during the night-time period.

6.7 Transport

6.7.1 Overview

This section assesses the potential traffic and transport impacts associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential impacts associated with the Waratah Super Battery. The assessment has been prepared in accordance the SEARs (refer to Appendix A).

6.7.2 Methodology

6.7.2.1 Government plans, policies, and guidelines

The traffic and transport assessment was prepared with reference to the following plans/policies/guidelines:

– Guide to Traffic Management – Part 3: Traffic Studies and Analysis (Austroads 2020).
– Guide to Traffic Management – Part 12: Integrated Transport Assessments for Developments (Austroads 2020) and the complementary Supplement (Austroads Guide Supplements) (Roads and Maritime Services (RMS) 2013).

6.7.2.2 Desktop assessment

The desktop assessment included the following tasks:

– Review the traffic/transport infrastructure and services in proximity to the project site.
– Determine the peak hours of network activity.
– Undertake SIDRA 9 intersection modelling for the intersections of interest based on the current traffic volumes and intersection configuration.
– Quantify the vehicle trips associated with the project (construction activity only).
– Distribute the construction vehicle trips onto the adjoining road network in accordance with traffic patterns identified from the surveys.
– Determine the background traffic growth in proximity to the project site.
– Undertake SIDRA 9 modelling in a construction horizon year accounting for the expected traffic volumes.

6.7.2.3 Field surveys

Turning movement counts were undertaken on 18 August 2022 at the intersections of Pacific Highway / Scenic Drive / Wyee Road and Scenic Drive / Station Road during the following time periods:

– AM peak: 6:30 am – 9:30 am.
– PM peak: 4:30 pm – 7:30 pm.

6.7.3 Existing environment

6.7.3.1 Road hierarchy

6.7.3.1.1 Functional hierarchy

Functional road hierarchy involves the relative balance of the mobility and access functions of a road. Transport for NSW (TfNSW) define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility to high accessibility and low mobility. These road classes are:

– Arterial Roads – generally controlled by TfNSW, typically no limit in flow and designed to carry vehicles long distance between regional centres.
– Sub-Arterial Roads – can be managed by either TfNSW or local council. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a sub region or provide connectivity from arterial road routes (regional links).
– Collector Roads – provide connectivity between local roads and the arterial road network and typically carry between 2,000 and 10,000 vehicles per day.
– Local Roads – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

A summary of the key roads in proximity to the project site is provided in Section 6.7.3.1.2 through Section 6.7.3.1.4.

6.7.3.1.2 Scenic Drive

Scenic Drive (also referred to as the Central Coast Highway), which forms part of the A49 Motorway, begins at Kariong. It intersects the Pacific Highway and Wyee Road at a signalised intersection.

Scenic Drive functions as a sub-arterial road and intersects Station Road at a priority controlled (stop) intersection.

Scenic Drive is constructed to a rural road standard and has a single traffic lane in each direction, as shown in Figure 6.15.

A speed limit of 70 kilometres per hour applies to Scenic Drive.

Source: Google Maps (2022)

Figure 6.15 Scenic Drive at the intersection with Station Road

6.7.3.1.3 Station Road

Station Road is a private road with no line-markings provided and a 40 kilometres per hour speed limit, as shown in Figure 6.16.

Station Road primarily provides access to the former Munmorah Power Station and the Colongra Power Station.

The first 100 metres of Station Road provides access/egress to and from Koala Park and is open to the general public. To the east of Koala Park, only vehicles associated with the operation of the Colongra Power Station are permitted on Station Road (boom gate).

Source: Google Maps (2022)

Figure 6.16 Station Road at the intersection with Scenic Drive

6.7.3.1.4 Pacific Highway

The Pacific Highway is an arterial road that connects Sydney to Brisbane via a number of coastal communities. It provides an alternate route to the Pacific Motorway which runs generally parallel and further inland which re-joins the Pacific Highway at Hexham north of Newcastle. In proximity to the project site, the Pacific Highway provides a dual carriageway with two lanes in either direction as shown in Figure 6.17.

In proximity to the project site, the Pacific Highway has a speed limit of 80 kilometres per hour.

Source: Google Maps (2022)

Figure 6.17 Pacific Highway viewed north from Scenic Drive

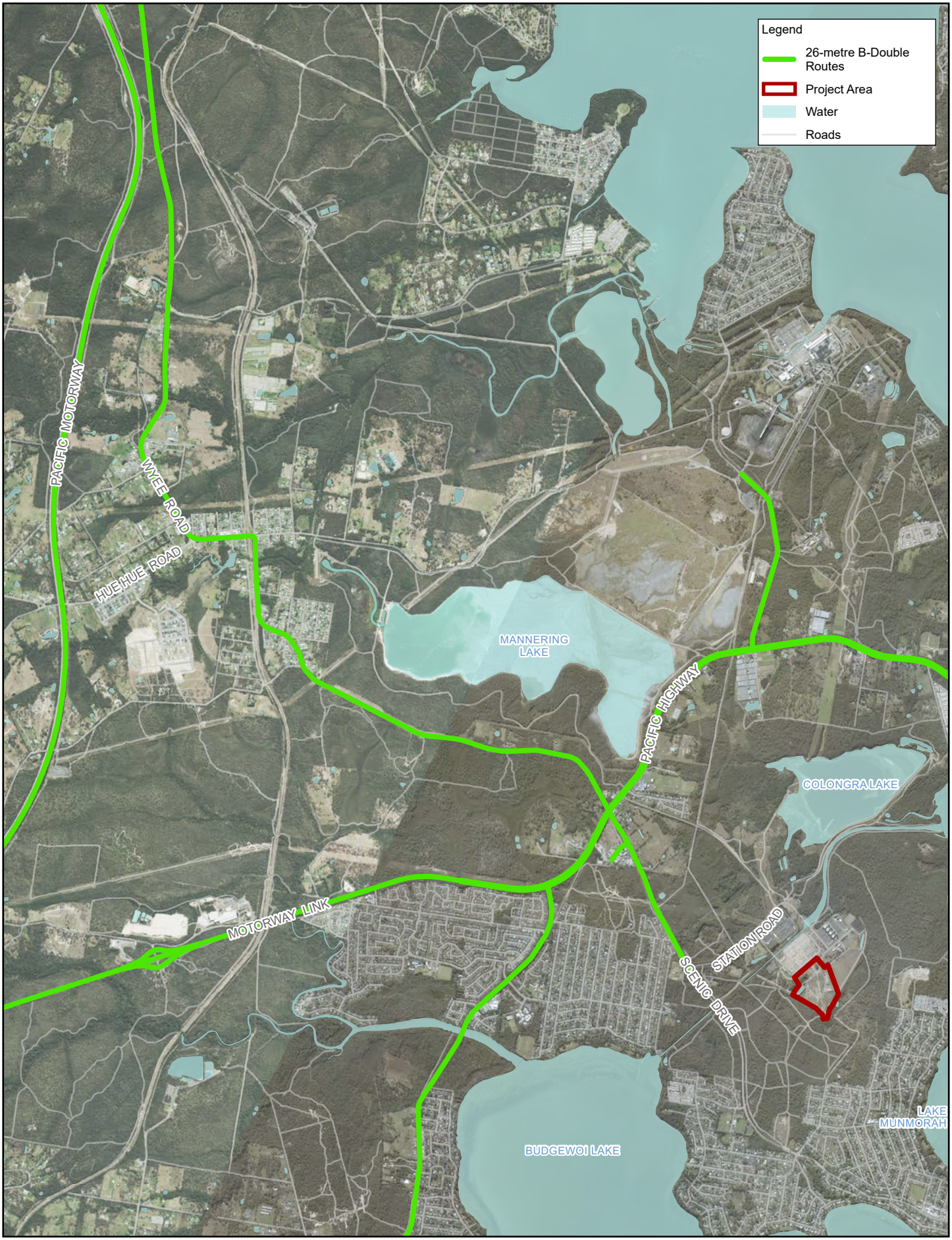
6.7.3.2 Road network operation

6.7.3.2.1 Freight routes

Outputs from the TfNSW Restricted Access Vehicle (RAV) map shows the 26-metre B-double routes on:

– Pacific Highway (A43)
– The Pacific Motorway (M1)
– Scenic Drive between Pacific Highway and Station Road.

The data indicates that heavy vehicles can access/egress the project site to and from the north for deliveries from Newcastle Port (refer to Figure 6.18).



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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26-metre B-double routes – 2022

Project No. **12582669**
Revision No. **0**
Date **31-Oct-22**

FIGURE 6.18

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12582669_EIS_005_Fig6_18_BWideRoad
Print date: 31 Oct 2022 - 14:16

Data source: B-Double Routes - TfNSW, 2022; Waterways - DFSI, 2022; Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

6.7.3.2.2 Active transport and public transport

There are typically no formal pedestrian or bicycle facilities provided in the vicinity of the project site, which reflects the relatively remote location of the surrounding area.

There are two public bus stops that are currently located on either side of Scenic Drive in proximity to Station Road. The following bus services operate from these stops:

– Bus service 92 – Lake Haven to Budgewoi and Toukley (loop service).
– Bus service 94 – Budgewoi to Tuggerah via San Remo and Wyong.
– Bus service 96 – Budgewoi to Wyee via Blue Haven.

6.7.3.3 Crash data

Crash data for the last five years of data (2016 – 2020) from The Centre for Road Safety indicates that there were four crashes recorded along Scenic Drive in proximity to Station Road. Three of these crashes resulted in moderate injuries and one was a “non-casualty” crash.

Analysis of the five-year crash data indicate that:

– One crash resulted in a head-on collision of two vehicles.
– One crash resulted from a vehicle driving off the road carriageway.
– One crash resulted from two vehicles travelling in the same direction side swiping each other.
– One crash resulted from two vehicles travelling in adjacent directions colliding.

6.7.3.4 Current traffic volumes

To identify the traffic volumes in the proximity of the project site, turning movement counts were undertaken on Thursday 18 August 2022 at the intersections of Pacific Highway / Scenic Drive / Wyee Road and Scenic Drive / Station Road (refer to Figure 6.19). The turning movement counts were undertaken for the following time periods:

– AM peak: 6:30 am – 9:30 am.
– PM peak: 4:30 pm – 7:30 pm.

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Revision No. **0**
Date **31-Oct-22**

Traffic survey locations

FIGURE 6.19

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12582669_EIS_007_Fig6_19_TrafficSurvey
Print date: 31 Oct 2022 - 14:20

Data source: Degree of Crash - TfNSW, 2022; Waterways - DFSI, 2022; Roads, Railways - DCS, 2022; Metromap Tile Service: . Created by: mfredle

Analysis of the traffic count data indicate that the peak hours of traffic activity are as follows:

– Pacific Highway / Scenic Drive / Wyee Road: AM peak hour 7:30 am – 8:30 am and PM peak hour 4:30 pm – 5:30 pm.
– Scenic Drive / Station Road: AM peak hour 8:00 am – 9:00 am and PM peak hour 4:30 pm – 5:30 pm.

The peak hour traffic volumes identified in the traffic surveys are shown in Figure 6.20.

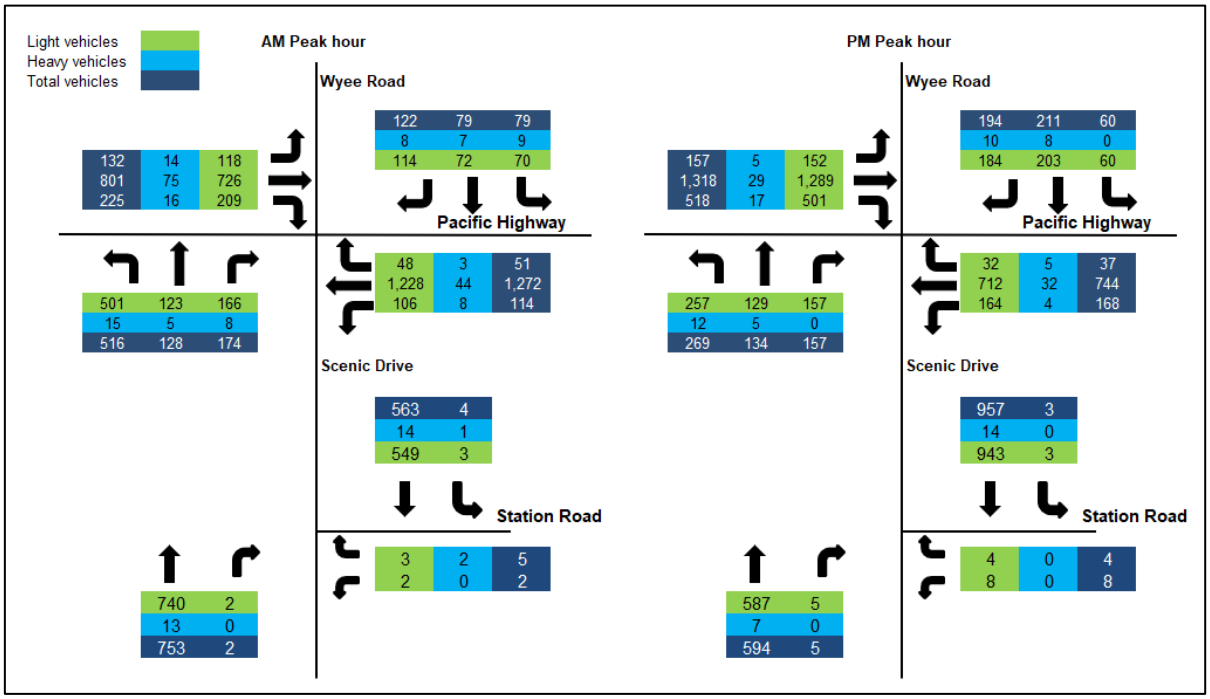


Figure 6.20 Weekday peak hour traffic volumes (2022)

The data indicates that:

– Traffic on the Pacific Highway is predominantly westbound in the AM peak and eastbound in the PM peak.
– Traffic on Scenic Drive is predominantly northbound in the AM peak and southbound in the PM peak.
– Traffic volumes along Station Road during peak periods are very low, in the order of 20 vehicles per hour or less in total.

The traffic survey data is provided in Appendix I.

6.7.3.5 Current intersection performance

The performance of an existing road network is largely dependent on the operating performance of key intersections, which are critical capacity control points on the road network.

The criteria for evaluating the operational performance of intersections are provided in the Guide to Traffic Generating Developments (RMS 2002) and are reproduced in Table 6.33. The criteria for evaluating the operational performance of intersections are based on a qualitative measure (i.e., Level of Service – A to F (LoS A to LoS F)), which is applied to each band of average vehicle delay.

Table 6.33 Level of Service criteria for intersections

Level of Service	Average delay per vehicle (seconds/veh)	Traffic signals, roundabouts	Give way and stop signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over Capacity Unstable operation	Over Capacity Unstable operation

Source: Guide to Traffic Generating Developments (RMS 2002)

SIDRA 9 intersection modelling software was used to determine the current intersection level of performance given the existing intersection layouts and signal phasing informed by SCATS data (from 18 August 2022) that was purchased from TfNSW.

The results of the SIDRA intersection modelling analysis, based on the existing traffic volumes and road geometry, are summarised in Table 6.34.

Table 6.34 SIDRA modelling results – Weekday AM and PM peak (2022 existing scenario)

Intersection/ movement	AM Peak			PM Peak		
	Av Delay (sec)	LoS	95th % Queue (m)	Av Delay (sec)	LoS	95th % Queue (m)
Pacific Highway/Scenic Drive/Wyee Road						
Scenic Drive	50	D	104	95	F	98
Pacific Highway (north-east)	103	F	278	98	F	167
Wyee Road	41	C	28	119	F	109
Pacific Highway (south-west)	45	D	98	95	F	334
Total	68	E	-	99	F	-
Scenic Drive/Station Road						
Scenic Drive (south-east)	0	A	0	0	A	0
Station Road	17	B	1	15	B	1
Scenic Drive (north-west)	0	A	0	0	A	0
Total	17	B	1	15	B	1

The SIDRA results indicate that:

– The intersection of Pacific Highway/Scenic Drive/Wyee Road currently operates at an average LoS E and LoS F in the AM and PM peak respectively and, therefore, operates at or above capacity with excessive delays if an incident were to occur.
– The intersection of Scenic Drive/Station Road currently operates with a LoS B in AM and PM peak periods.

6.7.4 Trip generation

6.7.4.1 Construction

6.7.4.1.1 Light vehicles

It is expected that up to 150 full-time equivalent people would be employed during the construction of the project. Most of the construction workforce is likely to be based on the Central Coast or in Sydney or Newcastle.

It is expected that workers would typically access the project site in the morning and depart the site in the afternoon. It has been assumed that peak worker vehicle activity coincides with the adjoining road network peak periods as a conservative assumption.

It is also expected that there would be opportunities for workers to carpool. For the purposes of this assessment, it has been assumed that there would be an average occupancy rate of 1.25 workers per vehicle (i.e., one in four cars has an occupancy of two workers). Accordingly, during construction, 120 light vehicles would be expected to access the project site in the morning, and 120 light vehicles would be expected to egress the site in the afternoon.

Construction would occur over approximately 18 months and is planned to commence in June 2023 and be completed towards the end of 2024. It is unlikely that workers would access or egress the project site in a single hour. Accordingly, the assumption of 120 worker trips in a single hour provides a conservative analysis of the construction impacts of the project.

Some workers could catch a bus to the project site. However, to be conservative, it has been assumed all workers would drive to and from the project site.

6.7.4.1.2 Heavy vehicles

During construction a maximum of 300 – 400 heavy vehicles (one-way movements) will occur at the site over the course of a week during peak activity.

As detailed in Section 3.2.6, construction activity would occur six days a week, typically between 7am – 6pm.

On average, this equates to approximately 50 – 65 trucks to access/egress the project site over the course of the day and to approximately five – six truck movements per hour.

To be conservative, it has been assumed that 10 trucks would access/egress the project site in a single hour including allowance for over-dimensional vehicles which may be required to travel outside of the peak road network periods.

6.7.4.1.3 Total construction traffic

The construction of the Waratah Super Battery is expected to generate up to 370 vehicle trips per day, as follows:

– 120 inbound and 120 outbound light vehicle trips (240 in total)
– 65 inbound and 65 outbound heavy vehicle movements (130 in total)

For the purposes of this assessment, the highest hourly traffic generation for the project under the peak construction scenario is assumed to be up to 140 vehicle trips in total, which would consist of the following:

– AM peak hour:
  - 10 inbound heavy vehicle movements
  - 10 outbound heavy vehicle movements
  - 120 inbound light vehicle trips.
– PM peak hour:
  - 10 inbound heavy vehicle movements
  - 10 outbound heavy vehicle movements
  - 120 outbound workers.

It is noted that:

– Access to the project site would occur via the sub-arterial (Scenic Drive) and arterial (Pacific Highway) road network. There would not be a requirement for construction vehicles to traverse local roads in proximity to the project site.
– Construction activity would occur over an (approximately) 18-month period, and the impacts associated with the construction traffic would be relatively short.

6.7.4.1.4 Over dimension/oversized vehicles

During construction, three transformers and two transmission supporting structures would be delivered to the project site via over dimension vehicles.

The contractor would be required to apply for permits from Transport for NSW and Central Coast Council, with the submission of suitable traffic management and transportation routes to be agreed, subject to the required size of the vehicle. Oversize vehicles may require specific traffic control (i.e., vehicle escort).

Oversized vehicles would use designated heavy vehicle routes or routes approved by Transport for NSW. Additionally, oversized traffic movements would be carried out, where possible, outside peak road network periods, thereby minimising the impacts on the road network.

6.7.4.2 Operation

As mentioned previously, the operation of the project would largely be undertaken remotely. However, approximately 10 to 15 full-time equivalent personnel are likely to be required to attend the project site on a regular basis to perform a variety of maintenance and operational activities.

The proposed operations would be undertaken 24-hours per day, seven days per week, 365 days per year. Operation is planned to commence in December 2024.

Typically, there would not be a requirement for heavy vehicles to regularly access the project site when the battery is operational.

The impacts of the vehicle activity associated with the operation of the project are expected to be negligible.

6.7.4.3 Decommissioning and rehabilitation

The volume of vehicles associated with decommissioning and rehabilitation of the project is currently unknown. However, it is expected to be less than the construction vehicle activity. Traffic impacts would be determined prior to closure and mitigation measures to eliminate or reduce traffic and transport impacts would be detailed in a decommissioning and rehabilitation management plan prepared for the project.

6.7.5 Trip distribution

The construction light vehicle trips have been distributed onto the local road network in accordance with the patterns identified in the traffic surveys, as follows:

– In the AM peak hour, the majority of vehicles would access the project site from the south on Scenic Drive.
– In the PM peak hour, the majority of vehicles would egress the project site to the south on Scenic Drive.

For heavy vehicles, it has been assumed half would access/egress the project site to/from the south via the Pacific Highway, and half would access/egress the project site to/from the north via the Pacific Highway.

The heavy vehicle construction routes to and from the site will be detailed as part of the construction traffic management sub-plan, that will be prepared prior to the commencement of construction activities.

The peak hour construction vehicle trips associated with the project are shown in Figure 6.21.

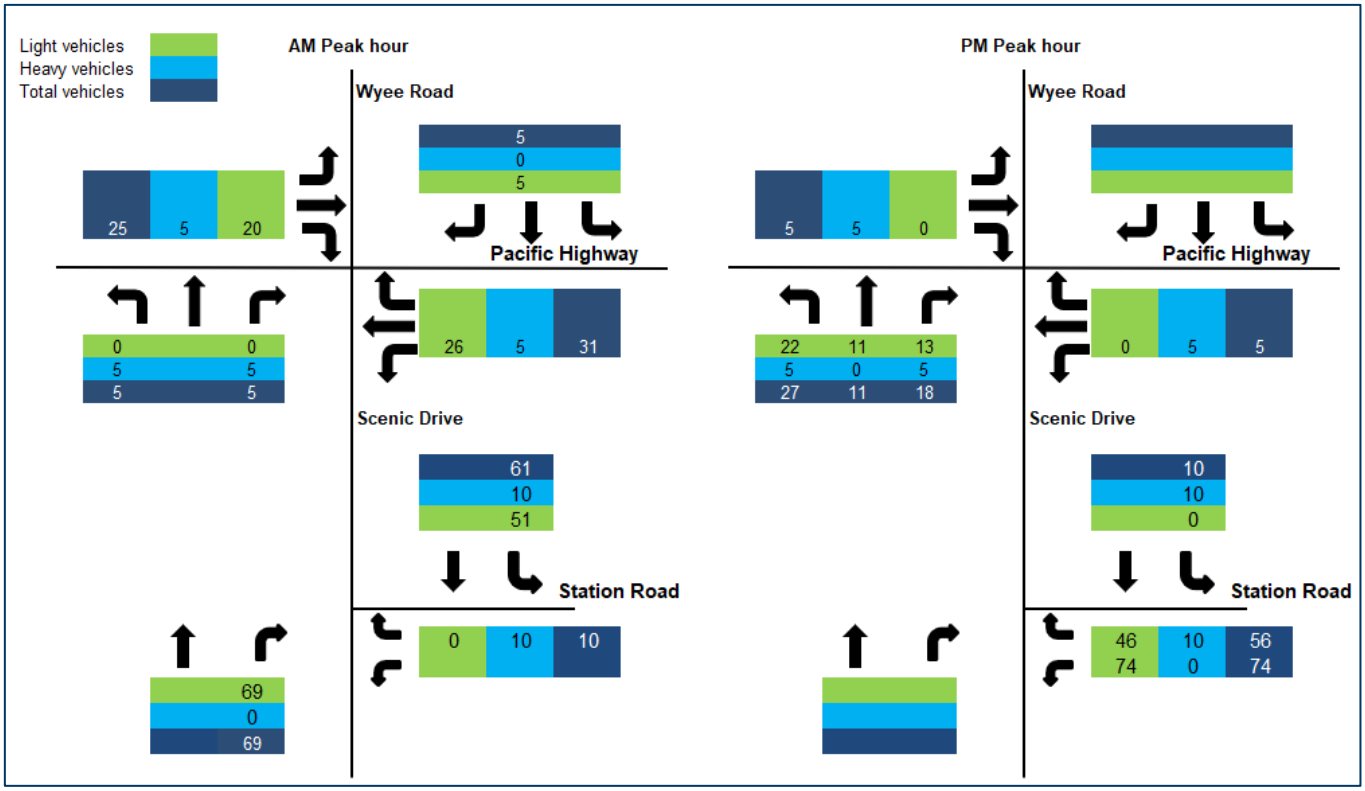


Figure 6.21 Peak hour construction vehicle trips

6.7.6 Potential impacts

6.7.6.1 Impacts to the road network

Construction of the project is expected to occur over approximately 18 months and is planned to commence in June 2023 and be completed at the end of 2024.

Intersection traffic modelling, using the SIDRA 9 modelling software, has been undertaken for the following two scenarios in the 2024 horizon year:

– A 'no-build' scenario, accounting for background traffic growth (assumed 1.5 per cent) and trips associated with other approved major developments (refer below).
– A 'build' scenario, accounting for the background traffic growth and the expected peak construction traffic associated with the project.

A search of the DPE major projects data base was undertaken to identify state significant projects in the general proximity to the project site which could contribute to cumulative traffic impacts over and above background traffic growth. These projects are listed in Table 6.35.

Table 6.35 State significant developments

Project	Assessment stage	Relevance
St Philip's Christian College Charmhaven (SSD-14082938)	Prepare EIS	The St Philip's Christian College project is about 5.6 kilometres southwest of the project site and proposes the construction of a new school for 1,500 students. There is potential for the two projects to be constructed concurrently.
Chain Valley Colliery Consolidation Project (SSD-17017460)	Prepare EIS	The Chain Valley Colliery Consolidation Project is about 5.6 kilometres north of the project site and proposes to consolidate the Chain Valley Colliery (CVC) and Mannering Colliery (MC) consents, align extraction and production rates and extend the approved mining area. There is potential for the two projects to be constructed concurrently

Project	Assessment stage	Relevance
Colongra Power Station Mod 4	Determination	The Colongra Power station is about 490 metres northeast of the project site. It was approved in 2006 with four modifications approved since, modification 4 the most recent approval in July 2022. The modification approved the amendment for emergency exceedance of air emission limits.

A review of the available information regarding these developments is provided in the following sub-sections.

6.7.6.1.1 St Phillip's Christian College

The scoping report for the St Phillip's Christian College (Barr Property and Planning 2021) indicates that the school is expected to commence operation in 2024. Initially, there would be a population of 500 students, which would expand to 1,500 in an unspecified timeframe. Accordingly, there is expected construction activity at the school that would coincide with the construction activity of the Waratah Super Battery. Information on the expected construction vehicle activity associated with the proposed school is not currently available.

Based on the locations of the two sites, the following assumptions are considered appropriate:

– Construction vehicles accessing/egressing the school site from the south would utilise the Pacific Highway and would not traverse the intersection with Scenic Drive.
– Construction vehicles accessing/egressing the school site from the north would traverse the Pacific Highway at its intersection with Scenic Drive.
– An additional (assumed) 40 light (worker) vehicles and 10 heavy vehicles associated with the construction of the Christian College would traverse the Pacific Highway at its intersection with Scenic Drive during the morning and afternoon peak hour.

6.7.6.1.2 Chain Valley Colliery

The scoping report for the Chain Valley Colliery (Umwelt 2021) indicates that the project would provide for:

– Underground mining in the Eastern Mining Area.
– Extension of the Life of Mine to 2029.

Additional information in the scoping report indicates that:

– The Chain Valley Colliery and Mannering Colliery are currently approved to employ 390 full time equivalent employees.
– Both the Chain Valley Colliery and Mannering Colliery are not operating at full production rates, and the proposed construction and operation staff associated with the Consolidation Project would not exceed the approved workforce levels.
– Laden truck numbers (given the only minor infrastructure proposed) associated with construction and deliveries would not exceed approved truck movements associated with the approved operations.
– There is unlikely to be any change to employee and truck impacts on the adjoining road network, other than that associated with extending the life of the mine.
– Schedules of shifts and road haulage would aim to avoid peak traffic periods.
– All management of vehicle movements would continue to be undertaken as per the mine's current Traffic Management Plan.

As the vehicle activity associated with the Chain Valley Colliery would fall within their approved workforce levels, no additional vehicle trips have been accounted for.

6.7.6.1.3 Colongra Power Station

The Colongra Power Station operates under a ministerial consent that permits an output of 660 megawatts via four turbines. The development consent imposes limits on nitrogen oxide (NO_2) emissions for turbine stack discharge points.

In October 2020, the power station's EPL was varied to permit the temporary exceedance of air concentration limits during emergency circumstances.

As part of Modification 4 of Colongra Power Station, Snowy Hydro Limited have submitted a request that the concentration limited emergency exemptions granted under the EPL is also permitted under their current planning approval. The modification was approved by the NSW Government in July 2022.

The available data does not suggest that there is any expected increase in vehicle activity associated with the proposed modification at the Colongra Power Station.

6.7.6.1.4 Cumulative impact assumptions

For the purposes of analysis, it has been assumed that:

– An additional (assumed) 40 light (worker) vehicles and 10 heavy vehicles associated with the construction of the Christian College would traverse the Pacific Highway at its intersection with Scenic Drive during the morning and afternoon peak hour.
– As the vehicle activity associated with the Chain Valley Colliery would fall within their approved workforce levels, no additional vehicle trips have been accounted for.
– The modification at the Colongra Power Station will not generate any additional traffic.
– There will be a 1.5 per cent annual growth rate in traffic on Wyee Road, Station Road, Pacific Highway and Scenic Drive

The expected 2024 'no-build' traffic volumes are provided in Figure 6.22, and the 2024 'build' volumes are provided in Figure 6.23.

The SIDRA outputs for the 2024 horizon year are provided in Table 6.36.

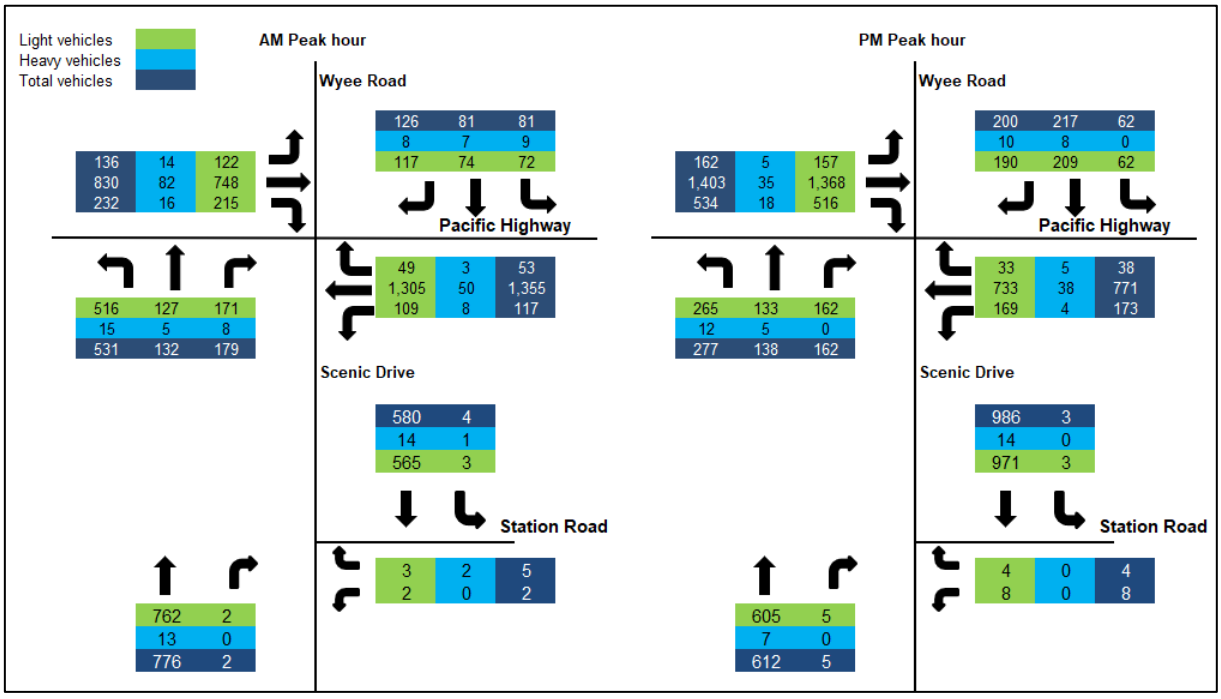


Figure 6.22 No-build traffic volumes (2024)

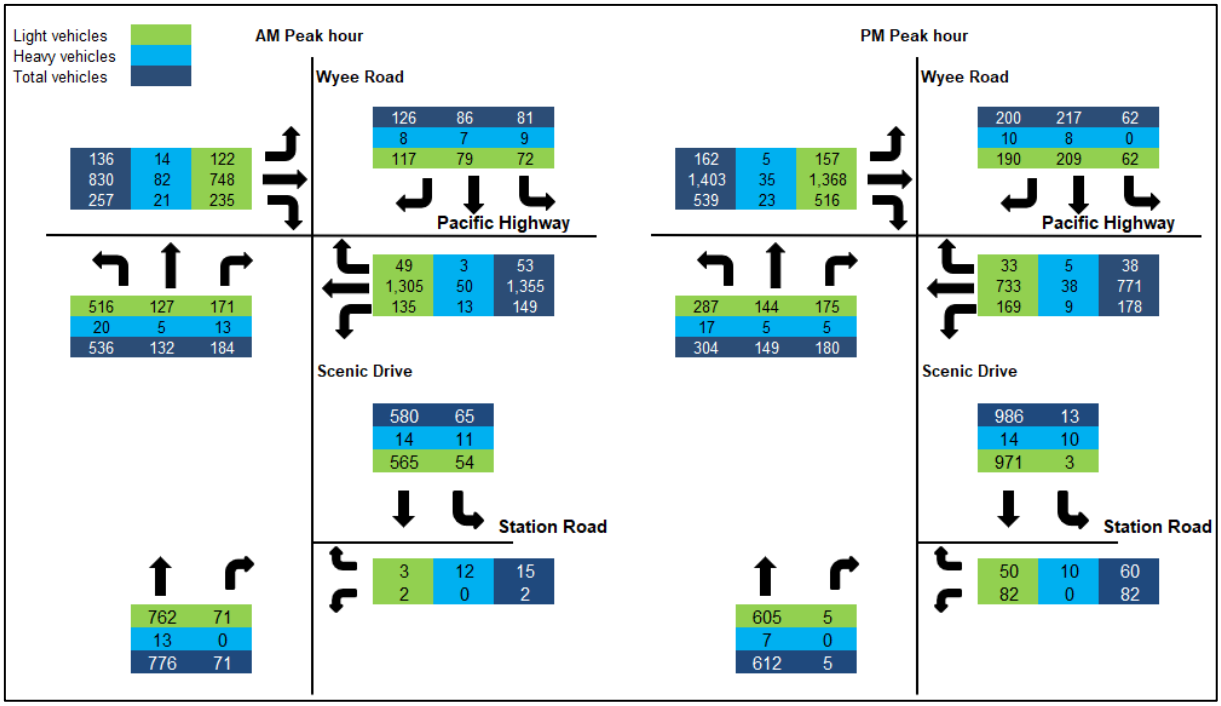


Figure 6.23 Build traffic volumes (2024)

Table 6.36 Intersection performance (2024)

Intersection	No-build scenario (including other major developments)						Build scenario					
	AM Peak			PM Peak			AM Peak			PM Peak		
	Av Delay (sec)	LOS	95th % Queue (m)	Av Delay (sec)	LOS	95th % Queue (m)	Av Delay (sec)	LOS	95th % Queue (m)	Av Delay (sec)	LOS	95th % Queue (m)
Pacific Highway/Scenic Drive/Wyee Road												
Scenic Drive	55	D	111	104	F	102	64	E	114	107	F	120
Pacific Highway (north-east)	147	F	356	119	F	196	170	F	390	118	F	196
Wyee Road	41	C	29	130	F	121	41	C	30	162	F	149
Pacific Highway (south-west)	48	D	109	122	F	372	58	E	139	160	F	422
Total	**88**	**F**	**-**	**120**	**F**	**-**	**102**	**F**	**-**	**143**	**F**	**-**
Scenic Drive/Station Road												
Scenic Drive (south-east)	0	A	0	0	A	0	1	A	4	0	A	0
Station Road	17	B	1	16	B	1	31	C	4	28	B	16
Scenic Drive (north-west)	0	A	0	0	A	0	1	A	0	0	A	0
Total	**17**	**B**	**-**	**16**	**B**	**-**	**31**	**C**	**-**	**28**	**B**	**-**

The SIDRA modelling results (refer Appendix I) indicates that in the 2024 horizon year of analysis:

– The intersection of Pacific Highway/Scenic Drive/Wyee Road would operate with a LoS F in both the 'build' and 'no-build' scenario.
– There would be an increase in average delay of about 14 second in the AM peak and 23 seconds in the PM peak.
– The intersection of Scenic Drive/Station Road would operate with an acceptable LoS for both the 'build' and 'no-build' scenario with an increase in delay of up to 14 seconds in the AM and 12 seconds in the PM peak. Vehicles turning into Scenic Drive from Station Road would be subject to longer delays. However, the analysis indicates that these would be within acceptable limits.

Consultation with the owners of the Colongra Power Station has highlighted the importance of regular diesel deliveries to their site which is accessed from Station Road. Mitigation measures and requirements of the construction traffic management sub-plan would target the priority of these deliveries and ensure access to the power station is maintained at all times, unless otherwise agreed.

6.7.6.2 Impacts to public transport/active transport

The expected vehicle activity associated with the construction, operation, and decommissioning and rehabilitation of the project is expected to have a negligible impact on the active transport infrastructure in proximity to the project site.

No changes to existing bus operations are required to facilitate the construction, operation, or decommissioning and rehabilitation of the project. The bus stop located on Scenic Drive would remain operational at all times. Pedestrian access to this bus stop would also be maintained.

The increased vehicle activity, particularly associated with the construction of the project, may cause minor additional delays to bus services during peak periods of road network activity.

6.7.6.3 Impacts to parking

Sufficient parking would be provided on-site to support the demands of workers during the construction, operation, and decommissioning and rehabilitation of the project. There is a large area within and adjacent to the project site to support the parking activity of the expected 120 construction worker vehicles.

A permanent car park would be constructed for the operational staff (and visitors) working at the Waratah Super Battery.

6.7.7 Mitigation measures

In accordance with a review of the existing traffic facilities and the assessment of the impacts associated with the construction traffic, no road upgrades or other traffic control is required to support the construction of the Waratah Super Battery.

Mitigation measures proposed to avoid or minimise traffic and transport impacts during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.37. These measures would be included in the issue-specific environmental management sub-plans for the Waratah Super Battery.

Table 6.37 Mitigation measures – traffic and transport

No.	Outcome	Mitigation measure	Timing
T1	Minimise impacts to traffic and transport networks.	Develop a construction traffic management sub-plan, prior to construction. Include, at a minimum, the following management measures: – Preparation of a Traffic Guidance Scheme, detailing adequate road signage at construction work sites to inform motorists and pedestrians of the work site ahead to ensure that the risk of road accidents and disruption to surrounding land uses is minimised. – Maintain accessibility for pedestrians and cyclists. – Indicate routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses. – Implement measures to manage traffic flows around the area affected by the construction of the project, including, as required, regulatory and direction signposting, line marking, and variable message signs and all other traffic control devices necessary for the implementation of the construction traffic management sub-plan. – Undertake consultation with the relevant road authorities during preparation of the sub-plan. Ensure the performance of project traffic arrangements is monitored during construction.	Pre-construction
T2	Minimise impacts to the operation of the Colongra Power Station.	Ensure trucks used for the delivery of diesel to the Colongra Power Station are unimpeded.	Construction
T3	Minimise environmental impacts associated with the movement of vehicles.	Monitor the roads leading to and from the project site and take necessary steps to rectify any road deposits caused by site vehicles, to maintain the safety of road users. Where possible, offset the construction vehicle activity from peak periods of road network activity.	Construction
T4	Minimise environmental impacts associated with the movement of vehicles.	Induct employees and contractors to raise awareness and understanding of traffic and transport mitigation measures to be implemented during construction via the CEMP.	Construction

6.7.8 Conclusion

A traffic assessment was undertaken to determine the potential impact on traffic and transportation associated with the construction, operation, and decommissioning and rehabilitation of the project. Based on a review of traffic and transport facilities in proximity to the project site (including road hierarchy, road network operation, freight routes, active transport and public transport, crash data, current traffic volumes, and current intersection performance) and an analysis of project trip generation and trip distribution (including consideration of other major projects in the vicinity), it is expected that the project would have a negligible impact on the adjoining road and transport network.

Mitigation measures would be implemented prior to construction and during construction to minimise impacts to traffic and transport networks and minimise environmental impacts associated with the movement of vehicles during construction, including the development of a construction traffic management sub-plan.

6.8 Water

6.8.1 Overview

This section provides a summary of potential impacts to water (surface water and groundwater) associated with the Waratah Super Battery. This section draws on a water impact assessment, included as Appendix H. This section assesses the potential impacts to water associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential impacts to water associated with the Waratah Super Battery. The assessment has been prepared in accordance the SEARs (refer to Appendix A).

6.8.2 Methodology

6.8.2.1 Government plans, policies, and guidelines

The water impact assessment was prepared with reference to the following plans/policies/guidelines:

– NSW Aquifer Interference Policy (Department of Trade and Investment, Regional Infrastructure and Services 2012).
– National Water Quality Management Strategy (NWQMS) (Water Quality Australia 2018).
– Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council (ANZECC) 2000 and Australian and New Zealand Governments (ANZG) 2018).
– Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (EPA 2022).
– Managing Urban Stormwater, Soils and Construction, Volume 1 (the 'Blue Book') (Landcom 2004).

6.8.2.2 Desktop assessment

A qualitative water impact assessment was undertaken to estimate the potential impacts to water associated with the construction, operation, and decommissioning and rehabilitation of the project. The assessment included:

– Review of the existing environment (regional context, site history, topography, climate, hydrology and hydrogeology, soils and geology, site contamination, and existing water quality).
– Identification of potential risks during construction, operation, and decommissioning and rehabilitation of the project, with relation to the following areas:
  - Flooding, in terms of impact on and impact from the project.
  - Water sourcing and security.
  - Surface water quality.
  - Groundwater.
– Identification of project-specific mitigation measures to manage the potential for impacts to water.

6.8.2.3 Field surveys

Field surveys were not undertaken as part of the water impact assessment for the Waratah Super Battery.

6.8.3 Existing environment

6.8.3.1 Climate

The local climate and meteorology (weather) within the project area is of critical importance when assessing the potential for air quality impacts at sensitive receptors.

The Bureau of Meteorology (BoM) operates a network of automatic weather stations (AWS) across Australia. A BoM AWS typically measures critical meteorological parameters including wind speed, wind direction, temperature, relative humidity, and pressure, with some stations also measuring cloud coverage. The nearest AWS to the project site is the BoM AWS located at the Norah Head, approximately eight kilometres southeast of the project site.

6.8.3.1.1 Temperature

Monthly mean temperature statistics for data measured at BoM Norah Head AWS for the period 2017 through 2021 are shown in Figure 6.24. The 50th percentile monthly maximum and minimum temperatures are used to show the typical temperature range for each month of the year, as well as the monthly average temperature.

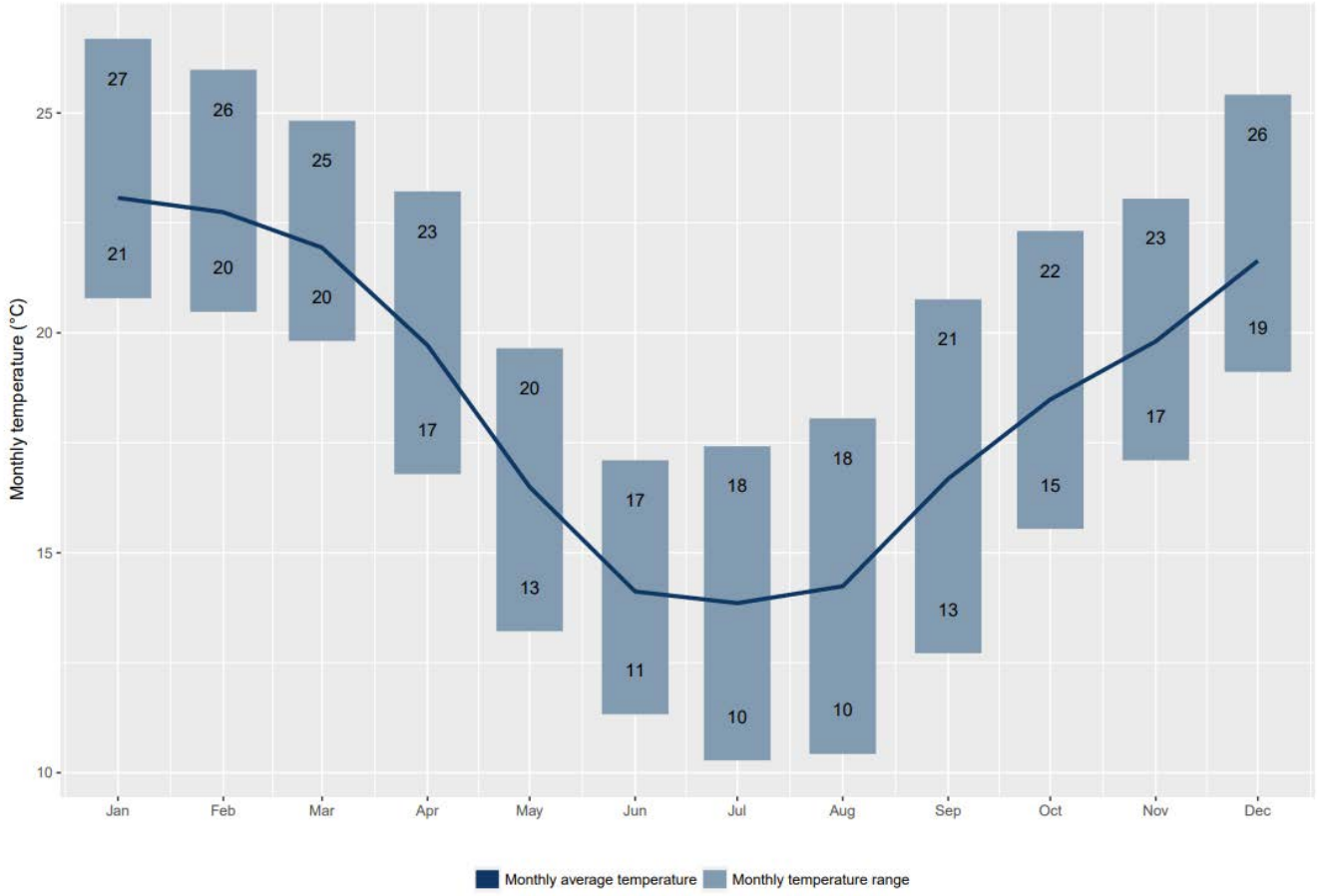


Figure 6.24 Monthly climate temperature statistics from BoM Norah Head AWS (2017-2021)

6.8.3.1.2 Rainfall

Monthly rainfall statistics for data measured at BoM Norah Head AWS for the period 2017 through 2019 are shown in Figure 6.25. Flooding in 2020 significantly affected the data averages, therefore, the time period has been reduced to show the general rainfall outside of extreme conditions. The statistics shown include average monthly rainfall amount (millimetres) and average number of days per month where rainfall is greater than 0.25 millimetres.

The data shows that the number of rain days and the total rainfall amounts are greater during the autumn and winter months.

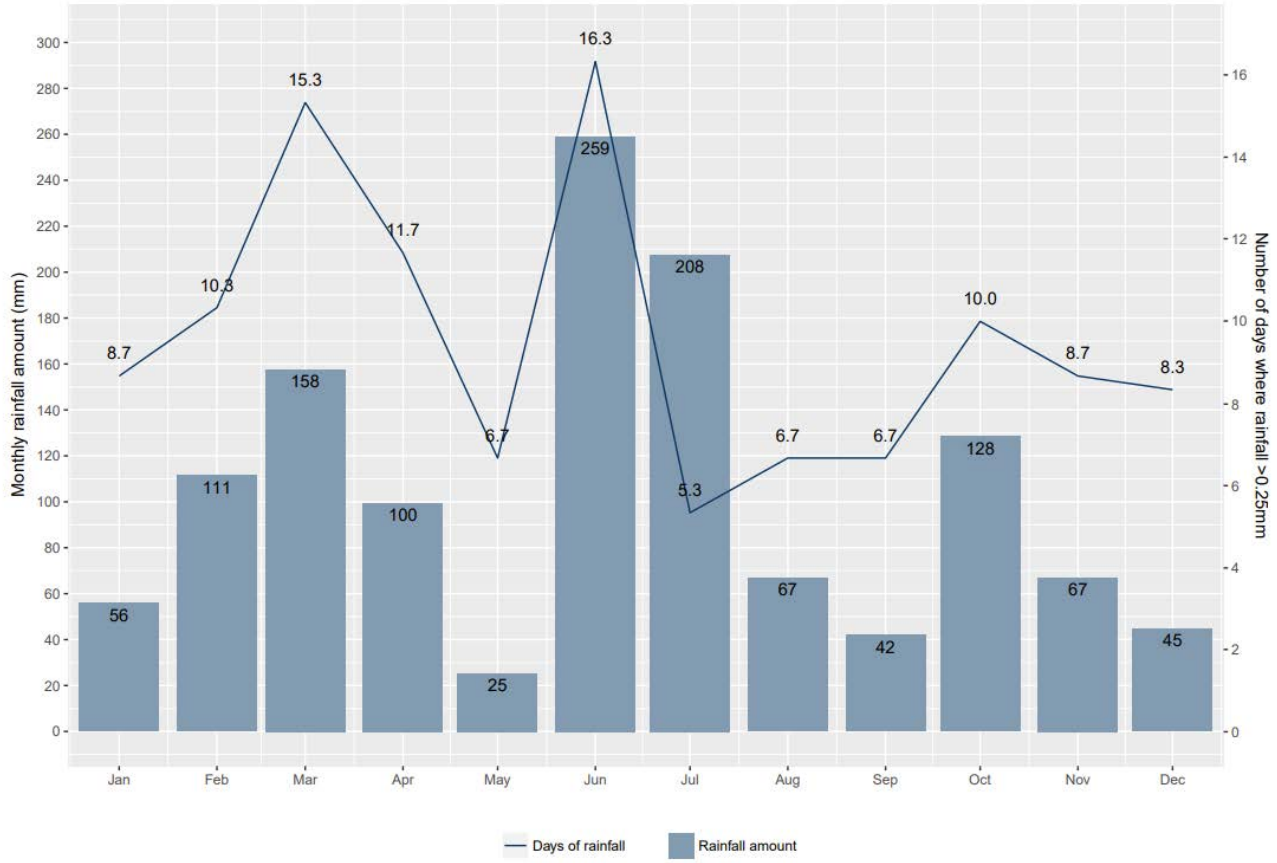


Figure 6.25 Average monthly rainfall collected from BoM Norah Head AWS (2017-2019)

6.8.3.2 Surface water and drainage

The project site is located within the Macquarie Tuggerah regional catchment in proximity to the Tuggerah Lakes which are a series of hydraulically connected coastal lagoons. The project site currently drains into Lake Munmorah with existing drainage conveying runoff into Hammond Canal and via an unnamed waterway, which both drain into Lake Munmorah (refer to Figure 6.26). Lake Munmorah ultimately flows into the ocean, however, has long residence times due to limited dilution from tidal waters from the narrow opening at the Entrance. Despite its proximity to Lake Munmorah, the project site is not flood prone and is located above the Probable Maximum Flood level of the Tuggerah Lake system.

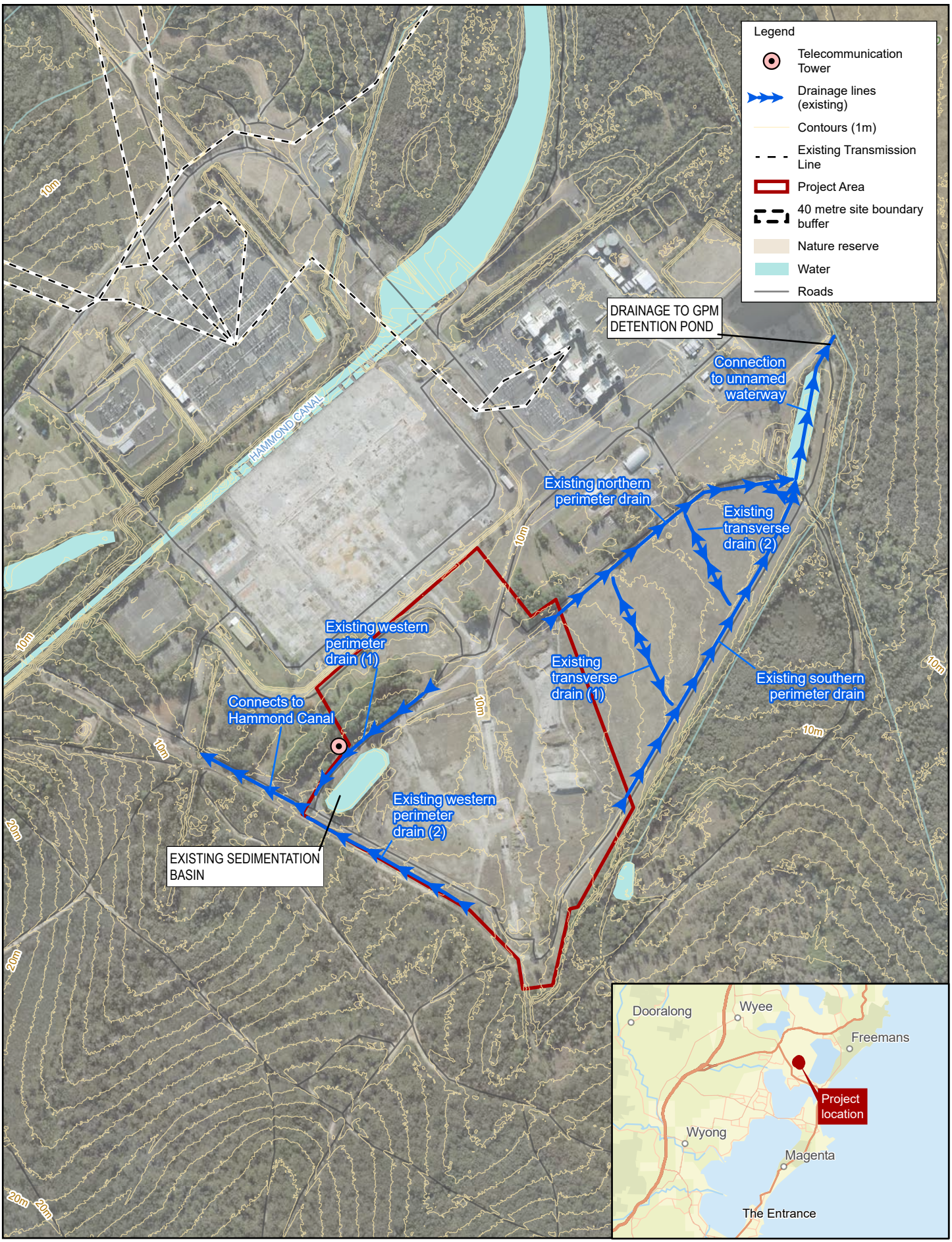
Catchment-wide developments have resulted in increased sediment loads in Tuggerah Lakes in recent decades, which has negatively affected water quality in the lake system and resulted in an increase in the volume of typical urban pollutants and heavy metal loading (Central Coast Council 2020b). Despite the relatively long average retention time for the northern lakes, the former Munmorah Power Station is unlikely to have resulted in negative water quality impacts apart from minor temperature and salinity changes (Glamore *et al* 2020).

6.8.3.3 Groundwater

Local groundwater conditions are relatively shallow and of low permeability (Consulting Earth Scientists 2019). The depth of groundwater varies but has generally been recorded at levels between four to eight metres below ground level and flows in a northerly direction towards the former Munmorah Power Station and Hammond Canal.

Previous groundwater quality studies and a site contamination assessment have shown that throughout the former Munmorah Power Station area, some concentrations of groundwater contamination, such as PFAS contamination (Consulting Earth Scientists 2022), exceed the site assessment criteria in select areas, however, generally low levels of contaminants have been observed. Potential impacts to groundwater quality were likely to be the result of the historical operation of the Munmorah Power Station (CES 2019).

Further information about groundwater resources and historical contamination at the site is provided in Section 6.4.3.



Paper Size ISO A4

0 50 100 150

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Department of Planning Industry & Environment
Waratah Super Battery - Munmorah
Environmental Impact Statement

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

Drainage features at the project site

FIGURE 6.26

\\ghdnet\ghd\AU\Newcastle\Projects\21\12582669\GIS\Maps\Deliverables\12582669_EIS.aprx
12582669_EIS_014_Fig6_26_SiteDrainage
Print date: 26 Oct 2022 - 12:04

Data source: Flood Inundation - Central Coast Council 2022; NPWS Reserves, Waterways - DFSI, 2022; Crown Land, Roads, Railways - DCS, 2022; Metromap Tile Service:
World Street Map: Esri, HERE, Garmin, Foursquare, FAO, METI/NASA, USGS. Created by: mfredle

6.8.4 Potential impacts

6.8.4.1 Construction

6.8.4.1.1 Water sourcing and security

Water would be required during construction to enable the works including dust suppression, compaction of earthworks and washdown and cleaning and would be sourced from retention basins, or external sources. Water demands during construction are anticipated to be relatively modest and similar to existing projects at the project site, such as the construction of the Colongra Power Station and the decommissioning of the Munmorah Power Station. Construction water demand would be calculated based on the proposed construction staging, however is estimated to be 30ML for dust suppression and compaction, and 0.5ML potable water for construction staff drinking water, cribs rooms, toilets etc. During detailed design, a construction water balance would be undertaken to confirm the water requirements and ensure sustainable access to water sources.

6.8.4.1.2 Surface water quality

Construction activities such as site levelling and excavation pose a potential risk to downstream water quality associated with the mobilisation of sediment. Impacts to surface water quality during construction may include:

– ‘Typical’ sedimentation risks such as increased turbidity from mobilised suspended solids that apply to most major construction projects. These risks can be appropriately managed through the implementation of appropriate strategies in accordance with Managing Urban Stormwater, Soils and Construction (Landcom 2004).
– ‘Non-typical’ sedimentation risks such as mobilisation of contaminated materials. These risks would be managed as per the requirements of the site environmental management plan for the remediation activities currently underway by GPM and specific measures incorporated as part of the soils and water management plan (refer below).
– Handling of materials (such as hydrocarbons, metals, fuels, oils) during construction may pose a risk to downstream water quality.

With the implementation of appropriate mitigation measures, including the preparation of a soil and water management plan based on the requirements of the ‘Blue Book’, the project is not anticipated to result in unacceptable water quality risks during construction.

6.8.4.1.3 Groundwater

Construction of the project would involve some surface levelling and excavation activities; however, excavation is not anticipated to exceed the observed groundwater depth and, accordingly, interaction with the local aquifer is not anticipated. No direct impacts or interaction with local groundwater conditions are anticipated during construction of the project.

6.8.4.2 Operation

6.8.4.2.1 Flooding

The project site would be levelled and contoured to assist drainage into existing transverse and perimeter drains and detention features. However, the site is already generally flat and it is not expected that these activities would result in a redistribution of runoff.

The project site is not flood prone and proposed site drainage would be reviewed as part of detailed design to ensure sufficient capacity is provided to avoid localised flooding.

6.8.4.2.2 Water sourcing and security

During operation, only minor water requirements are anticipated e.g., for ablutions, kitchen use, etc (refer Section 3.3.4). This water would be sourced via a new connection through the GPM offices located at the former Munmorah Power Station. No impacts to water sources during operation are predicted.

6.8.4.2.3 Surface water quality

Generally, operation of the project poses a reduced risk to water quality compared to the construction phase, with key risks generally limited to the handling of higher risk materials (such as hydrocarbons, metals, alkalinity, fuels, oils, and mineral oils) that may result in mobilisation into downstream waterways.

Additional surface water quality impacts may also occur as a result of increasing the impervious areas of the site which may increase the volume of runoff. While this will be relatively small compared to the runoff from the local catchment, potential changes to runoff quality may include increasing pollutants typically associated with urbanisation (including nitrogen, phosphorus, and gross pollutants). Detailed design would include reviewing site hydrology and changes as a result of the development and ensuring sufficient drainage capacity, including detention facilities are provided to mitigate potential adverse impacts.

With the implementation of the recommended mitigation measures, the project is not anticipated to result in unacceptable impacts to surface water quality during operation.

6.8.4.2.4 Groundwater

The operation of the project site is not anticipated to have any interaction with the local aquifer and thus no impacts to groundwater are anticipated during operation.

6.8.4.3 Decommissioning and rehabilitation

Impacts associated with decommissioning and rehabilitation are not anticipated to be worse than during construction or operation either for surface water or groundwater. On this basis, the project is not anticipated to result in additional risks post-operation beyond those documented in this assessment for the construction and operation stages.

6.8.5 Mitigation measures

Mitigation measures proposed to avoid or minimise potential impacts on water during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.38, with further detail provided in Appendix H. These measures would be included in the issue-specific environmental management sub-plans for the Waratah Super Battery.

Table 6.38 Mitigation measures – water

ID	Outcome	Measure	Timing
W1	Appropriate management of stormwater drainage to prevent flooding.	Review site hydrology and proposed stormwater drainage requirements to allow stormwater to be appropriately managed (quantity, velocity and quality) and in accordance with relevant requirements. This would include consideration of climate change impacts and the site's location relative to adjacent sensitive receivers. Consider opportunities for a dual-use stormwater system to manage risks to water quality during emergencies such as fire.	Design
W2	Appropriate management of water source(s).	Undertake a construction water balance and identify appropriate sources of water in the required quantities.	Pre-construction
W3	Impacts to surface water quality are eliminated/reduced.	Develop and implement a construction soil and water management sub-plan. Include a monitoring and maintenance program, an unexpected finds procedure, as well as a trigger action response plan.	Pre-construction, construction
W4	Impacts to surface water quality are eliminated/reduced.	Develop and implement a decommissioning and rehabilitation soil and water management sub-plan. Include a monitoring and maintenance program, an unexpected finds procedure, as well as a trigger action response plan. Risks should be re-assessed based on proposed activities following operation.	Decommissioning and rehabilitation

6.8.6 Conclusion

A water impact assessment was undertaken to identify potential impacts to water (water use, surface water and flooding and groundwater) during the construction, operation, and decommissioning and rehabilitation of the project.

Impacts were assessed based on the general nature of the proposed construction works and the existing site drainage and detention features at the site. Mitigation and management controls are proposed as part of future design development and construction planning to limit potential for off-site movement of any pollutants or contaminated sediments. Principally, this would be in the form of a construction soil and water management sub-plan. Detailed design would also include a review of site hydrology and drainage and detention infrastructure and incorporate measures to limit the potential for offsite impacts (quantity, velocity and quality).

The assessment identified that by implementing standard mitigation measures to manage potential risks to water resources, no unacceptable impacts to water would be anticipated.

6.9 Hazards

6.9.1 Overview

This section provides a summary of potential hazards and risks associated with the Waratah Super Battery. This section draws on a Preliminary Hazard Analysis (PHA), included as Appendix F. This section assesses the potential hazards and risks associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential hazards and risks associated with the Waratah Super Battery. Bushfire risk was not assessed in the PHA and was assessed separately in Section 6.10. The assessment has been prepared in accordance with the SEARs (refer to Appendix A).

6.9.2 Methodology

6.9.2.1 Government plans, policies, and guidelines

The hazard and risk assessment was prepared with reference to the following plans/ policies/guidelines:

– Resilience and Hazards SEPP.
– NSW Department of Planning and Environment, Hazardous Industry Planning Advisory Paper No 4 – risk criteria for land use safety planning, 2011.
– NSW Department of Planning and Environment, Hazardous Industry Planning Advisory Paper No 6 – guidelines for hazard analysis, 2011.
– NSW Department of Planning and Environment, Multi-level risk assessment, 2011.
– International Commission on Non-Ionizing Radiation Protection, Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic Fields (1 Hz – 100 kHz), 2010.
– UL 9540 – Standard for safety of energy storage systems and equipment, 2021.
– AS 2067 – Substations and high voltage installations exceeding 1 kV a.c., 2016.
– AS/ NZS 5139 – Electrical installations - Safety of battery systems for use with power conversion equipment, 2019.
– NFPA 855: Installation of stationary energy storage systems, 2020.

6.9.2.2 Desktop assessment

The hazard assessment involved a desktop assessment that included two steps. These were:

– Risk screening. The risk screening process involved the identification of classes and quantities of dangerous goods to be used, stored, or produced on site with an indication of storage locations. The quantities of dangerous goods were then assessed against the threshold quantities in the Resilience and Hazards SEPP. If any of the threshold quantities are exceeded, then a PHA is required. In this instance, a PHA was required by the SEARs and is included in Appendix F.

– Preliminary hazard analysis:
  - Hazard identification. Hazard identification involved a qualitative assessment documenting possible events that could lead to a possible off-site incident. The assessment then lists potential causes of the incident, as well as identification of operational and organisational safeguards to prevent the incidents from occurring or to mitigate their impact. The hazard identification was conducted for the whole life cycle of the project.
  - Hazard analysis. For hazards identified as having potentially off-site impacts, a detailed analysis is completed to determine the risk to people, property, and the environment at the proposed location and in the presence of controls. Criteria of acceptability are used in the analysed hazards to determine if the project is classified as a 'hazardous industry'. The hazard analysis aims to demonstrate that the project would not impose an unacceptable level of risk to surrounding land uses.

Further details of the methodology used to prepare the PHA are provided in Appendix F.

6.9.2.3 Field surveys

No field surveys were required regarding hazard and risks associated with the Waratah Super Battery.

6.9.3 Existing environment

The project site has an area of approximately 14 hectares and is relatively flat. It is mostly cleared (except for some small patches of native vegetation) and heavily disturbed from its previous use as a coal stockpile area for the former Munmorah Power Station.

Infrastructure immediately surrounding the project site includes:

– Telecommunications tower immediately to the north-west.
– Colongra Power Station, approximately 250 metres to the north-east.
– Transmission lines and electrical distribution infrastructure to the north, including Munmorah Substation.
– Former Munmorah Power Station and associated lands to the north-west and north. This includes the Colongra gas pipeline which is more than 300 metres to the north of the project site.

Within the locality of the project site are the residential suburbs of Doyalson, San Remo, Buff Point, Budgewoi and Halekulani with the latter being approximately 600 metres distant (and the others farther away). Other public areas of interest are:

– Hammond Canal which is a man-made canal that links Lake Munmorah to Budgewoi Lake, approximately 300 metres north-west of the project site.
– Koala Park, approximately 400 metres north-west of the project site.
– Colongra Swamp Nature Reserve, approximately 650 metres to the north-east of the project site.
– Lake Munmorah, approximately 1.2 kilometres to the south-east of the project site.
– Budgewoi Lake, approximately 2 kilometres to the south-west of the project site.

6.9.4 Potential impacts

6.9.4.1 Construction

Construction of the project would require the use of chemicals and dangerous goods (e.g., paint, solvents, diesel, general oils and lubricants, cleaning products). There would be minimal storage of these chemicals, and no stockpiling would occur during construction of the project. None of the dangerous good thresholds in the Resilience and Hazards SEPP would be exceeded during construction of the project. This element of the project lifecycle is not considered potentially hazardous.

Amenity impacts from the project e.g., from noise and construction dust are addressed in Section 6.6 and Section 6.11, respectively.

The construction hazard identification included the following scenarios:

- Vehicle interactions on public roads.
- Vehicle interactions within the project site.
- Natural hazards (flooding, earthquake, lightning).
- Fire started within the project site (hot works).
- Loss of containment of chemicals, including dangerous goods.
- Contact with chemicals, including dangerous goods.
- Contact with electricity.

These hazards are typical for any battery construction project and would be controlled through implementation of a construction management plan. None of the above-listed events could lead to significant off-site impacts, therefore, they are not assessed further in the PHA.

6.9.4.2 Operation

6.9.4.2.1 Risk screening

Excluding the lithium-iron batteries, operation of the project would require minimal use of chemicals and dangerous goods. Lithium-iron, refrigerant, coolant, and transformer oil (contained within the transformers only) would be required for battery energy storage system operation. Spare storage of these materials would not be required onsite. Lithium-iron batteries are a Class 9 dangerous good (miscellaneous dangerous goods and articles). Transformer oil is a Class C2 dangerous good (combustible liquid). Neither Class 9 or C2 dangerous goods have a SEPP threshold, so none of the dangerous good thresholds would be exceeded during operation of the project, as per the Resilience and Hazards SEPP. However, based on industry knowledge of the battery storage technology, and considering that large battery energy storage system are a relatively new technology, the project has been considered ‘potentially hazardous’ and a Level 2 PHA has been prepared for the Waratah Super Battery.

Operation of a battery energy storage system would not normally result in emissions of pollutants so to be considered potentially offensive. An assessment of noise and vibration from the operation of the project has been undertaken with findings provided Section 6.6.

6.9.4.2.2 Hazard identification

The operational hazard identification included the following scenarios:

- Vehicle interactions within the project site.
- Natural hazards (flooding, earthquake, lightning, bushfire).
- Loss of containment of chemicals, including dangerous goods.
- Contact with chemicals, including dangerous goods.
- Contact with electricity.
- Electrical installation and exposure to electric and magnetic fields (EMF).
- Thermal runaway of lithium-iron batteries.
- Impact damage of lithium-iron battery assemblies.

Most of these hazards would be controlled through implementation of a safety management system and would not result in any significant off-site impacts. The only scenarios that could lead to significant off-site impacts and required further assessment in the hazard analysis were:

- Thermal runaway (fire) of lithium-iron batteries.
- Electrical installation and exposure to EMF.

6.9.4.2.3 Hazard analysis

6.9.4.2.3.1 Hazards

Lithium-iron batteries

Lithium-iron batteries are regulated as Class 9 miscellaneous dangerous goods and articles. Lithium-iron batteries contain electrolyte and lithium in various forms, along with other metals. Lithium-iron batteries use an intercalated lithium compound as one electrode material, compared to the metallic lithium used in a non-rechargeable lithium battery. The electrolyte, which allows for ionic movement, and the two electrodes are the constituent components of a lithium-iron battery cell.

Lithium-iron batteries can pose unique safety hazards since they contain a combustible or flammable electrolyte and may be kept pressurised. If a battery cell is charged too quickly, it can cause a thermal runaway from overvoltage, or dendrite formation (short circuit), leading to potential fires and explosions. Because of these risks, testing standards are more stringent than those for acid-electrolyte batteries, requiring both a broader range of test conditions and additional battery-specific tests. There are also different types of battery chemistry associated with lithium-iron batteries. There is an industry-wide trend for stationary batteries to use lithium-iron phosphate chemistry rather than more conventional lithium chemistries due to a significant reduction in thermal runaway (fire) risk. The reason for the risk reduction is that lithium-iron phosphate batteries have a high chemical and thermal stability and a high temperature tolerance so provide a higher level of safety.

It has been confirmed that lithium-iron phosphate batteries will be used for the Waratah Super Battery in part due to the their improved safety characteristics. General data from associated equipment guides have been utilised and referenced for the consequence and likelihood calculations.

The refrigerant used in the batteries is typically a dangerous goods Class 2.2 by virtue of the pressure at which it is stored, but with release and partial combustion, could form small quantities of fluorinated hydrocarbons or hydrofluoric acid in the immediate area of the fire (Tesla, 2017). This could cause a localised environmental impact from acidified fire-fighting water that would need to be contained and disposed of in a suitable manner.

EMF

EMF are part of the natural environment. Electric fields are present in the atmosphere and static magnetic fields are created by the earth's core. EMF is also produced wherever electricity or electrical equipment is in use. Transmission lines, electrical wiring, household appliances, and electrical equipment all produce power frequency EMF.

An electronic field is the force that fills the space around every electric charge, including any powered electrical appliance or conductor (e.g., transmission line). Electric fields are measured in volts per metre (V/m) or kilovolt per metre (kV/m). They occur both naturally and from power generation and are produced every time electricity flows or there is an electrical force. The higher the voltage/ force the stronger the electric field. Electric fields are strongest closest to the source and their level reduces quickly with distance. Most materials act as a shield or barrier to electric fields.

Fields of different frequencies interact with the body in different ways. In Australia, transmission lines and other electrical devices and infrastructure, including substations, operate at a frequency of 50 hertz. This frequency falls within the Extremely Low Frequency (ELF) range of 0 to 300 hertz (Hz) adopted by the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) has adopted the ICNIRP Guidelines for Limiting Exposure to Time-varying Electric and Magnetic Fields (1hz – 100khz) (International Commission on Non-Ionizing Radiation Protection (ICNIRP) 2010). The ICNIRP Guidelines express limits in terms of exposure conditions for the general public and workers (occupational exposure) for ELF EMF. The exposure limits specific to high voltage overhead power lines at 50 Hz are displayed in Table 6.39.

Table 6.39 Exposure limits for overhead high voltage power lines (50 Hz)

Exposure characteristics	Electric field strength (V/m)	Magnetic flux density (milliGauss – mG)
Occupational		
Whole working day	10,000	10,000
General public		
Up to 24 hours per day	5,000	2,000

6.9.4.2.3.2 Hazard scenarios

Thermal runaway of lithium-iron batteries

The key hazard for battery systems is thermal runaway. There are a number of causes of thermal runaway and the following scenarios were identified as being credible risks for further analysis:

- Scenario 1: Latent battery failure caused by a manufacturing fault or transport/handling issues.
- Scenario 2: Overcharging.
- Scenario 3: Overheating within containers.

Thermal runaway from hot joints is considered to be incorporated into the battery failure rate in scenario one. Thermal runaway from operational or maintenance handling damage is considered to be minimal and incorporated into the risk of scenario three. It has been adopted as a worst case, irrespective of the battery technology adopted for this project.

Electrical installations and exposure to EMF

They key hazard for electrical installations is EMF. During operation, the following sources of EMF would be present on the project site:

- Onsite switchyard.
- 330 kV transmission lines (two) between the switchyard and connecting into the Munmorah Substation.

6.9.4.2.3.3 Consequence assessment

Thermal runaway of lithium-iron batteries

The conditions in Table 6.40 were used in the consequence determination. Any one of the three scenarios listed above could result in a thermal runaway, so the consequence is relevant for all three scenarios.

Table 6.40 Consequence determination assumptions

Parameter	Symbol	Value	Comment
Assumed average container surface temperature during thermal runaway reaction	T_1	400 °C	Trigger temperature for thermal runaway is lower (about 70-80 °C) The individual cells may exceed 600 °C [1]
Surrounding air temperature	T_2	22 °C	Average outside air temperature for Norah Head [2]
Height of containerised battery unit	L_1	2.896 m	Height of an ABB PowerStore [3]
Height of an average person	L_2	1.8 m	Average height of a person

[1] Tesla, 2017, Lithium-iron battery emergency response guide – Tesla Powerpack system, Powerwall and sub-assembly, all sizes, pages 7 and 9
[2] Bureau of Meteorology website, summary statistics for Norah Head AWS, accessed August 2022 Climate statistics for Australian locations (bom.gov.au)
[3] ABB, 2020, e-mesh PowerStore modular: flexible and scalable energy storage system, page 4

The heat experienced between a battery fire and a person in the vicinity, can be estimated by the radiation between two parallel plates/ flat surfaces. This calculation therefore estimates the net radiant heat exchanged between the surface of the containerised battery unit that is on fire and a person standing opposite this surface at a given distance.

The distances to provide the indicated radiated heat outputs from a thermal runaway event are listed in Table 6.41.

Table 6.41. Summary of heat radiation consequences

Release Scenario	Maximum Distance Downwind of Release to Heat Radiation		
	4.7 kW/m^2 (heat radiation level that can cause injury)	12.6 kW/m^2 (heat radiation level that can cause fatality)	23 kW/m^2 (heat radiation level that can cause property damage)
Single container battery thermal runaway event (container reaches 400 °C)	4.11 m	2.06 m	1.05 m

The release events are worst case as they assume no intervention to limit the release. For the release scenarios, some level of intervention would be expected. Additionally, the battery units are containerised, so, whilst a fire may start within the container, the container walls will also inhibit a portion of the radiated heat. As such, the zones of effect can be considered conservative.

The radiant heat distances calculated in Table 6.41 align with the guidance from the codes, although, to protect the general public from injury, a distance of four metres or more from the boundary is recommended.

Separation distance between containers is important to limit the potential for overheating adjacent containerised batteries. The most relevant guidance for battery energy storage system separation distances comes from the United States of America. As the layout of the units has not been finalised, the design should align with guidance on separation distances as set out by the most recently released codes, shown in Table 6.42. The 2021 Victorian Big Battery fire highlighted the importance of having a functioning battery monitoring system throughout all life-cycle periods (including commissioning). Additionally, the findings from the Victorian Big Battery fire indicate that appropriate thermal testing, such as the inclusion of a variety of environmental conditions, is needed when determining final battery energy storage system layout.

Table 6.42. Battery energy storage system separation distance references

Standard/ Code	Separation distance reference	Comments
NFPA 855 – Standard for the Installation of Stationary Energy Storage Systems 2020	1 m to adjacent ESS units and adjacent walls. 3 m from buildings, roads, boundary, hazardous or combustible materials. 3 m clearance of combustible vegetation.	-
AS 5139 – electrical installations (safety of battery systems for use with power conversion equipment) 2019	0.6 m between equipment.	Less relevant because standard focus is on battery system and all other equipment within a battery system room, not specifically between units.
UL 9540 – Standard for Safety of Energy Storage Systems and Equipment 2021	1 m to adjacent ESS units and adjacent walls (reduced distances require a large-scale fire test via valid thermal testing process).	UL 9540A (Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems) found to be invalid with high winds (Victorian Big Battery Fire (VBB) findings 2022) (Fisher Engineering Inc and Energy Safety Response Group, 2022).

Standard/ Code	Separation distance reference	Comments
Fisher Engineering Inc and Energy Safety Response Group, 2022, Fire report of technical findings from the Victorian Big Battery Fire	These units had a spacing of 0.15 m to the sides and back of each unit with 2.4 m in front of each unit, after using UL 9540A. Fire escalation was determined to be due to environmental conditions (such as high wind) not being considered in UL 9540A and a weakness in the thermal roof design. Additionally, during commissioning several monitoring and protection systems were switched to off-line service mode, which allowed the initial fault to go undetected and resulted in the total loss of two battery units.	Fire escalated between units separated by 0.15 m. Highlights importance of a functioning battery monitoring system.

Electrical installations and exposure to EMF

The layout of the switchyard and the selection of equipment would be undertaken during detailed design and have regard to relevant design, safety and building codes and standards. The principles of prudent avoidance would be implemented, and careful positioning and selection of equipment is likely to result in exposure levels at the boundary of the substation being similar to existing background levels. Fencing around the switchyard (and the wider site) would ensure that members of the public would be at negligible risk of exposure from the substation. Access to the switchyard would only be available to suitably trained workers.

While the rest of the electrical equipment to be located on site would generate magnetic fields, due to their voltage levels and substantial distance to the nearest sensitive receivers they are likely to comply with limits for both public and occupational exposure. Exposure levels are likely to be close to background levels at the property boundary. Security fencing to be erected around the site would also prevent accidental access to the site by members of the public and, therefore, limiting their exposure.

The proposed route for the overhead transmission line would run along the north-eastern boundary of the former Munmorah Power Station. It would be about 650 metres long. The route does not go beyond the site or through residential areas.

TransGrid (2020) has indicated that the magnetic flux from typical HV transmission lines, such as those seen on the transmission line for the project, are:

– 10 – 200 mG directly under a HV transmission line for people performing ground-based activities.
– 2 – 50 mG at the edge of a HV transmission line easement (typically 22.5 to 35 metres from the centre line) for people performing ground-based activities.

These magnetic fields are well below the levels contained within the interim guidelines on limits of exposure (see Table 6.39).

As the consequent impact is not considered significant, no further discussion is needed within the PHA.

6.9.4.2.3.4 Likelihood estimation

The likelihood of the three thermal runaway (fire) scenarios occurring during operation of the project could be different, so all three have been assessed. The results of the frequency analysis for the three scenarios are summarised in Table 6.43 to Table 6.46. The assignment of the frequency and probability values has been made based on industry failure frequencies, specialist risk management judgement, and the quantified consequences.

It is important to note that the determination of ‘absolute values’ for assigned probabilities is less important than consistently using ‘comparative’ or ‘relative’ values. The overall aim is to provide a ranking to compare with risk criteria.

Table 6.43 Scenario 1: Latent battery failure frequency

ID	Parameter	Value	Reference
A	Batteries per rack	18	ABB Design specs
B	Racks per container	2	ABB Design specs
C	Number of containers	2,800	Project specs
D	Total number of battery units	100,800	Calculated = A*B*C

ID	Parameter	Value	Reference
E	Manufacturing fault rate (failure per battery per year)	1/100,000	Assumed – includes battery faults and connection / joint faults using lithium iron phosphate chemistry
F	Latent battery failure frequency (per year)	1.1	Calculated = D*E
G	Percentage of faults leading to thermal runaway	30 %	Professional judgement
H	Effectiveness of fusible separators in preventing thermal runaway	95 %	Professional judgement
I	Thermal runaway from latent battery failure frequency (per year)	0.015	Calculated = F*G*(1-H)
J	Thermal runaway from latent battery failure (years)	66	Calculated = 1/I

Table 6.44 Scenario 2: Overcharging

ID	Parameter	Value	Reference
K	Storage capacity per battery (hrs)	4	ABB Design specs
L	Number of charges per container per year	365	Assumed
N	Total number of charges for all containers per year	1,022,000	Calculated = L*C
O	charging failure rate (failure per charge per year)	1/10,000,000	Assumed – driver is circuit and protective components but includes checks and battery management systems – both voltage, current and thermal sensing
P	Thermal runaway from charging failure frequency (per year)	0.102	Calculated = N*O
Q	Thermal runaway from charging failure (years)	9.8	Calculated = 1/P

Table 6.45 Scenario 3: Overheating within containers

ID	Parameter	Value	Reference
R	HVAC systems per container	2	ABB Design specs
S	Total number of HVAC units	5,600	Calculated = R*C
T	HVAC fault rate (failure per battery per year)	1/10,000	Assumed
U	HVAC failure frequency (per year)	0.56	Calculated = S*T
V	Percentage of faults leading to thermal runaway	50 %	Professional estimation
W	Effectiveness of fusible separators in preventing thermal runaway	95 %	Professional estimation
X	Thermal runaway from latent battery failure frequency (per year)	0.014	Calculated = U*V*(1-W)
Y	Thermal runaway from latent battery failure (years)	71	Calculated = 1/X

Table 6.46 Total frequency for all thermal runaway events

ID	Parameter	Value	Reference
Z	Combined thermal runaway frequency (per year)	0.13	Calculated = I+P+X
AA	Combined thermal runaway events (years)	7.6	Calculated = 1/Z

6.9.4.2.3.5 Risk assessment

Combining the consequence assessment with the frequency estimation provides the risk of thermal runaway events occurring. A summary of the onsite and offsite risk assessment results is shown in Table 6.47 and Table 6.48. Full details of the calculations are provided in Appendix F.

Table 6.47 Risk assessment results – onsite

Parameter	Value	Reference
Frequency of fatality (per annum)	5.5×10^{-06}	Calculated
Frequency of injury (per annum)	4.9×10^{-04}	Calculated
Frequency of property damage (per annum)	0.13	Calculated

Table 6.48 Risk assessment results – offsite

Parameter	Value	Reference
Frequency of fatality (per annum)	0	Calculated
Frequency of injury (per annum)	0	Calculated
Frequency of property damage (per annum)	0	Calculated

6.9.4.2.3.6 Risk analysis

The risk criteria for land use and safety planning within HIPAP 4 (Department of Planning, 2011) include onsite and offsite fatality values, as well as offsite injury and property damage values. The HIPAP 4 fire and explosion risk criteria are summarised in Table 6.49.

Table 6.49 HIPAP 4 risk criteria

Impact	Onsite Criteria	Offsite Criteria
Fatality (12.6 kW/m^2 & 21 kPa)	5.00×10^{-05}	1.00×10^{-06}
Serious injury (4.7 kw/m^2 & 7 kPa)	–	5.00×10^{-05}
Property damage (23 kw/m^2 & 14 kPa)	–	5.00×10^{-05}

The assessment of fatality, injury and property damage for any thermal runaway event against HIPAP 4 risk criteria is summarised in Table 6.50. As shown in the table, there are no expected offsite impacts given the proposed location, and as such the risk of injury, fatality or property damage is negligible and complies with HIPAP 4. The onsite fatality risk also complies with HIPAP 4.

Table 6.50 HIPAP 4 risk criteria compliance for thermal runaway events

Event	Frequency per year	Interval years	HIPAP 4 Compliance
Offsite property damage	0	0	Complies
Offsite serious injury	0	0	Complies
Offsite fatality	0	0	Complies
Onsite fatality	5.5×10^{-06}	183,000	Complies

In order to ensure no offsite impact occurs, and subject to detailed design, the Waratah Super Battery should be located at least 4.5 metres from the site boundary to ensure compliance with HIPAP guidelines. The current design has an asset protection zone between the battery energy storage system and the boundary much greater than 4.5 metres. Also, the greater the distance between the Waratah Super Battery and the site boundary, the better the facility can manage the battery energy storage system fire hazard whilst allowing for future growth and expansion of battery storage capacity.

The project would manage potential fire risks through mitigation, as outlined in a battery management plan. Specific management of potential bushfire risk will occur as per recommendations in Section 6.10.

A strong wind may have the ability to carry the smoke laterally beyond the site. although offsite health effects from smoke, which could include small quantities of fluorinated hydrocarbons or hydrofluoric acid, are considered low risk given the lack of combustible material available for a prolonged fire event and the distance to residential areas. Additionally, the fluorinated hydrocarbons and hydrofluoric acid could cause a localised environmental impact from acidified fire-fighting water that should be contained and disposed of in a suitable manner.

A battery management plan should be developed and implemented to capture the following key battery safety requirements (Occupational Safety and Health Administration, 2019, Battery University, 2017 and Tesla, 2017):

- Batteries will be stored as per manufacturer specifications.
- Installation of equipment will be in accordance with manufacturer's instructions and by qualified personnel.
- Ensure lithium-iron batteries and associated equipment are tested and certified to ISO 9001, with internal verification processes such as receipt and filing of certification details.
- Compliance to AS/ NZS 5139:2019 (Electrical installations – Safety of battery systems for use with power conversion equipment).
- Verification of installation quality and operational values is required for each battery container.
- A battery energy storage system commissioning plan is developed and includes confirmation that Battery Management System (BMS) is activated and operating during commissioning.
- The battery system will be insulated, containerised and bunded.
- Installation of bollards/ protective barriers around key areas.
- The location of the Waratah Super Battery should be at least 4.5 metres from the core development area boundary, based on preliminary radiant heat contours for public injury, and confirmed by appropriate modelling (thermal and other).
- Separation distances between battery containers should be confirmed by the Waratah Super Battery designer/ supplier through appropriate thermal testing/ modelling and comply with AS 2067 (Substations and high voltage installations exceeding 1 kV a.c.). Industry guidance recommends at least 1 metre where possible or a 1-hour minimum fire barrier should be installed if separation distances cannot be achieved.
- Ensure lithium-iron batteries includes protections and circuit controls, such as:
  - Integrated circuit control systems to avoid voltage drift.
  - Current sensing circuits to avoid short circuiting.
  - Built-in positive temperature coefficient to protect against current surges.
  - Circuit interrupt device that opens at excess pressure.
  - Safety vent to release gases on excessive pressure build-up.
  - Separator that inhibits ion-flow when exceeding a certain temperature threshold.
- BMS to properly manage the batteries state of change, including battery balancing devices, to avoid deterioration and individual cell over/ under voltage during operation.
- Ensure lithium-iron batteries and associated equipment are located within a temperature controlled and ventilated location that does not exceed the manufacturer temperature range specification.
- Thermal sensing of the cells to avoid over heating of cells.
- An inspection and maintenance regime for the batteries, HVAC and associated equipment.
- A hot joint monitoring program for battery terminals and connections.
- The lithium-iron batteries storage area will be protected from flooding, based on the annual exceedance probability for the area and subsequent suitable selection of freeboard.
- Avoidance of damaging lithium-iron batteries. Regularly inspect them for signs of damage, such as bulging/cracking, hissing, leaking, rising temperature, and smoking.
- The lithium-iron batteries will have a fire detection system.
- A protocol in place for damaged batteries that will include the following actions:
  - Immediately remove a battery from service and place it in an area away from flammable materials if any sign of damage is present.
  - Before moving a damaged battery, wait a period of time to observe if there is any smoke, as this may be an indication that a thermal reaction is in progress. A damaged battery will also be monitored after removal for evidence of smoke, flame, leakage of electrolyte, leakage of coolant, or signs of heat.
- Follow manufacturer’s guidance on how to extinguish small battery fires, which could include using water. If the fire of a burning lithium-iron battery cannot be extinguished, allow the container to burn out on its own in a controlled and safe manner, using water to cool the outside container.

– A battery emergency response plan to be enacted in the event of a battery energy storage system fire, following consultation with emergency service providers. This will be regularly reviewed and tested to ensure relevance.

Conservative generic data on lithium-iron batteries was used to assess quantities and consequence impacts, a review and confirmation that the risk assessment calculations are still valid is required once detailed design is finalised. Lithium iron phosphate (LFP) batteries are likely to be adopted by the supplier due to their lower fire safety (thermal runaway) risk due to lower self-initiation points when compared to most other lithium battery chemistries.

6.9.4.3 Decommissioning and rehabilitation

6.9.4.3.1 Risk screening

Decommissioning of the project would likely require the use of chemicals and dangerous goods (e.g., diesel, general oils and lubricants, cleaning products). It is expected that there would be minimal storage of these chemicals, and no stockpiling would occur during decommissioning of the project. Similar to construction, none of the dangerous good thresholds are expected to be exceeded during decommissioning of the project, as per the Resilience and Hazards SEPP. This element of the project lifecycle is not considered potentially hazardous.

Impacts from offensive aspects of the project from decommissioning and rehabilitation noise and vibration and dust are referenced in Sections 6.6 and 6.11 respectively.

6.9.4.3.2 Hazard identification

The expected decommissioning hazard identification includes the following scenarios:

– Vehicle interactions on public roads.
– Vehicle interactions within the project site.
– Natural hazards (flooding, earthquake, lightning, bushfire).
– Fire started within the project site (hot works and battery fires).
– Loss of containment of chemicals, including dangerous goods being removed.
– Contact with chemicals, including dangerous goods during removal.
– Contact with electricity during isolation and removal.

These hazards would be controlled through implementation of a decommissioning management plan. None of the above-listed events could lead to significant off-site impacts, therefore, they are not assessed further in a PHA.

6.9.5 Mitigation measures

Mitigation measures proposed to avoid or minimise potential hazards and risks during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.51. These measures would be included in the issue-specific environmental management sub-plans for the Waratah Super Battery.

Table 6.51 Mitigation measures – hazards and risk

No.	Outcome	Mitigation measure	Timing
HR1	Eliminate/reduce risk of thermal runaway event	– Select lithium iron phosphate chemistry for the battery type. – Reassess risk of a thermal runaway event occurring once detailed design is confirmed. – Subject to revised modelling using project specific information, the battery should be located at least 4.5 metres from the site boundary. – Design, install and operate the battery energy storage system in accordance with manufacturers requirements, relevant design codes and electrical standards, informed by recent battery incidents and in accordance with a project specific Battery Management Plan (see HR4). – Conduct of a fire safety study for the proposed design. – Install a dedicated fire suppression system in the unlikely event of a fire. – Consult with relevant authorities during design development including access provisions, levels of training, site fire facilities, etc.	Design
HR2	Eliminate/reduce risk of EMF exposure	– Design and selection of electrical equipment to adopt prudent avoidance principles – Install fit for purpose electrical systems. – Fence and sign all areas containing high voltage equipment e.g., switchyard to minimise risk of accidental entry by untrained personnel.	Design
HR3	Eliminate/reduce risk of construction/ decommissioning accidents	– Prepare a construction management plan, and when needed, a decommissioning plan, to manage construction/ decommissioning-related risks, including traffic management, designated pedestrian areas within the core development site and bushfire management. – Develop safe work method statements to guide construction/ decommissioning activities, including crane operation, installation of electrical equipment and chemical handling procedures. – Provide appropriate Personal Protective Equipment to all staff	Construction / decommissioning
HR4	Eliminate/reduce risk of thermal runaway event	Prepare and implement a Battery Management Plan which would include a Fire Safety Study approved by Fire and Rescue NSW. The Fire Safety Study is to capture the key battery safety requirements outlined in relevant publications including Occupational Safety and Health Administration, 2019, Battery University, 2017 and Tesla, 2017. Key aspects of the plan should include: – Compliance with all manufacturer's installation and operational requirements. – Quality certification for supply and installation activities. – Minimum battery container separation distances. – Systems for monitoring, control and management of battery charging activities. – Inspection and maintenance requirements. – Emergency response and preparedness.	Commissioning / Operation

6.9.6 Conclusion

This section addressed the hazard and risk component associated with the Waratah Super Battery. The risk of a bushfire event is considered in Section 6.10. Specifically, an assessment of potential hazards and risks associated the battery energy storage system for the project.

The preliminary hazard assessment involved a preliminary risk screening of the project in accordance with the requirements of Resilience and Hazards SEPP. While the results of the dangerous goods and transport screening indicated that the project does not exceed any of the thresholds within the Resilience and Hazards SEPP requirements, due to the potential for explosion and fire associated with the operation of the lithium-iron battery storage, the project was considered "potentially hazardous".

The initial hazard identification process considered hazards during construction, operation, and decommissioning and rehabilitation. Fire starting as a result of construction and/or decommissioning and rehabilitation activities is considered a plausible event, as is the interaction with heavy machinery, but are unlikely to result in off-site impacts. Both would be managed through the preparation of a construction management sub-plan, and when required, a decommissioning and rehabilitation management sub-plan.

During operation, fires started at the Waratah Super Battery are a credible risk and may pose off-site impacts. Given the risk, a Level 2 hazard assessment was conducted. The Leve 2 assessment determined that the risk arising from the three thermal runaway scenarios does not exceed the individual fatality or injury risk criteria specified in the NSW Department of Planning and Environment's 2011 publication HIPAP No. 4 – Risk Criteria for Land Use Safety Planning.

The project presents a minimal EMF risk to the general public and workers as the EMF levels are well below the levels contained within the ICNIRP guidelines.

The preliminary hazard assessment demonstrates that the project could be designed, constructed, operated, and decommissioned in a manner that would meet relevant regulations, standards and policies. The project has also adopted a Lithium-iron phosphate battery chemistry which poses a lower risk of thermal runaway. Therefore, the project does not pose any significant risk or offence to the environment or community.

6.10 Bushfire

6.10.1 Overview

This section assesses the potential bushfire risks associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential bushfire risk associated with the Waratah Super Battery. This section draws on a Plant Community Type assessment, undertaken pursuant to completing the biodiversity assessment (refer to Appendix D). The assessment has been prepared in accordance the SEARs (refer to Appendix A).

6.10.2 Methodology

6.10.2.1 Government plans, policies, and guidelines

The bushfire assessment was prepared with reference to the following plans/policies/guidelines:

– Planning for Bushfire Protection (NSW RFS, 2019).
– Australian Standard AS/NZS ISO 31000:2018 Risk management – Guidelines.
– Central Coast Bush Fire Risk Management Plan 2020-2025 (Central Coast Bush Fire Management Committee (CCBFMC) 2020).

6.10.2.2 Desktop assessment

A desktop assessment was used to determine land slope, noting that land within 150 metres of the project site is generally level, and therefore would have no significant effect on potential bushfire behaviour.

Separation distance between bushfire prone vegetation and the proposed battery units were conducted by inspection of aerial mapping and the following tools:

– NSW Government e-Planning Spatial Viewer – map layer for Bushfire Prone Land.
– Bushfire history mapping presented in the Central Coast Bush Fire Risk Management Plan 2020-2025 (CCBFMC 2020).

6.10.2.3 Field surveys

A vegetation assessment was conducted during field surveys of biodiversity values (refer to Section 6.2). The results of the vegetation assessment were used to verify the desktop assessment (refer to Section 6.10.4.2) and in the determination of Bushfire Attack Levels (BALs) and Bushfire Protection Measures (BPMs) required for the proposed development.

6.10.3 Existing environment

At a local scale, the project would be located within the former Munmorah Power Station site, which is situated on low-lying land between Budgewoi Lake and Munmorah and Colongra Lakes. These lakes are within approximately 1.5 kilometres to the north, east and south of the project site. Lake shoreline areas at Budgewoi Lake and Lake Munmorah are extensively developed with residential suburbs including Blue Haven, San Remo, Buff Point, Budgewoi, and Halekulani. The landscape to the north and north-west is highly fragmented by further lakes (Mannering Lake and the southern reaches of Lake Macquarie) and cleared and developed lands in the Doyalson and North Doyalson area. Accordingly, large landscape scale fires impacting the project site are not credible, however, bushfire spread across approximately 1 to 1.5 kilometres of native vegetation (mostly dry sclerophyll forest) toward the project site is possible. In adverse fire danger conditions, a vigorous, relatively short-lived fire (which would burn itself out within a few hours, constrained by the presence of lakes and suburban areas) burning through native vegetation west of the project site is the credible worst-case scenario for the site.

The Central Coast Bush Fire Risk Management Plan 2020-2025 (CCBFMC 2020) applies to the project site and surrounding areas. The project site is located within the area identified as the ‘Snowy Hydro power station’ (the Colongra Power Station) and assessed to be a ‘very high’ bushfire risk on the basis that the consequences of fire impact could be ‘catastrophic’ if the power station was damaged or destroyed by fire, and fire impact likelihood is ‘possible’. The establishment and systematic maintenance of Asset Protection Zones (APZ) is a key risk treatment strategy identified for asset protection, complemented by regular inspection and maintenance of road access and fire trail networks.

The project area is well-served by fire and emergency response services. The nearest NSW Fire and Rescue station is at Doyalson, approximately 1.6 kilometres from the project site entrance, and NSW RFS have a brigade station at Lake Munmorah, approximately seven kilometres from the project site, thus facilitating rapid response to any bushfires igniting in the area.

The fire history of the Central Coast area around the southern reaches of Lake Macquarie is highly variable. With the high and dispersed population of the area, human causes of fire are the dominant cause, with lightning-caused fires mostly occurring in western parts of the Central Coast LGA in the Watagan Range and foothill areas. The Central Coast Bush Fire Risk Management Plan 2020-2025 (CCBFMC 2020) records that an average of 843 bush and grass fires start within the whole of the Central Coast LGA each year, however, on average only six to eight (<1 per cent) of these are classifiable as major fires. Dense vegetation structure and near-absence of bark char on fibrous barked trees along the Central Coast Highway west of the project site indicates the dry sclerophyll forests west of the project site have not been burnt for more than 20 years. The last major fires to impact the general vicinity of Lake Munmorah area were in 2013, when bushfires burnt north of the Lake Munmorah area.

6.10.4 Site bushfire assessment and protection measures

A site bushfire assessment has been undertaken in accordance with the site assessment methodology set out in Appendix 1 of Planning for Bushfire Protection (NSW RFS 2019).

6.10.4.1 Bushfire-prone land

An assessment of bushfire-prone land has been undertaken using the NSW Government's ePlanning Spatial Tool by examining the Bushfire Prone land layer. Vegetation Category 1 is considered to be the highest risk for bush fire. It is represented as red on the bush fire prone land map. This vegetation category has the highest combustibility and likelihood of forming fully developed fires including heavy ember production. The yellow area is a bushfire prone buffer extending 100 meters from the Category 1 vegetation in accordance with the NSW Rural Fire Service *Guide for Bush fire prone land mapping Version 5b* (2015) (refer to Figure 6.27). Accordingly, the principal bushfire threat is from the vegetation adjacent the project site, primarily from the south-west through to the south-east. Due to the extensively cleared nature of the project site, bushfire threat from within the project site is low.

6.10.4.2 Vegetation formation

Areas mapped as having Category 1 vegetation cover, and within 150 metres of the project site, were assessed during field assessments conducted for the biodiversity assessment. The following Plant Community Types (PCT) were identified:

– PCT 3583 Hunter Coast Lowland Scribbly Gum forest (Dry Sclerophyll Forest; shrubby sub-formation).
– PCT 4028 Estuarine Swamp Oak Twig-rush forest (Forested wetland).

Under the Planning for Bushfire Protection guidelines (RFS 2019) the PCTs listed above are classifiable as 'Forest' vegetation formation.

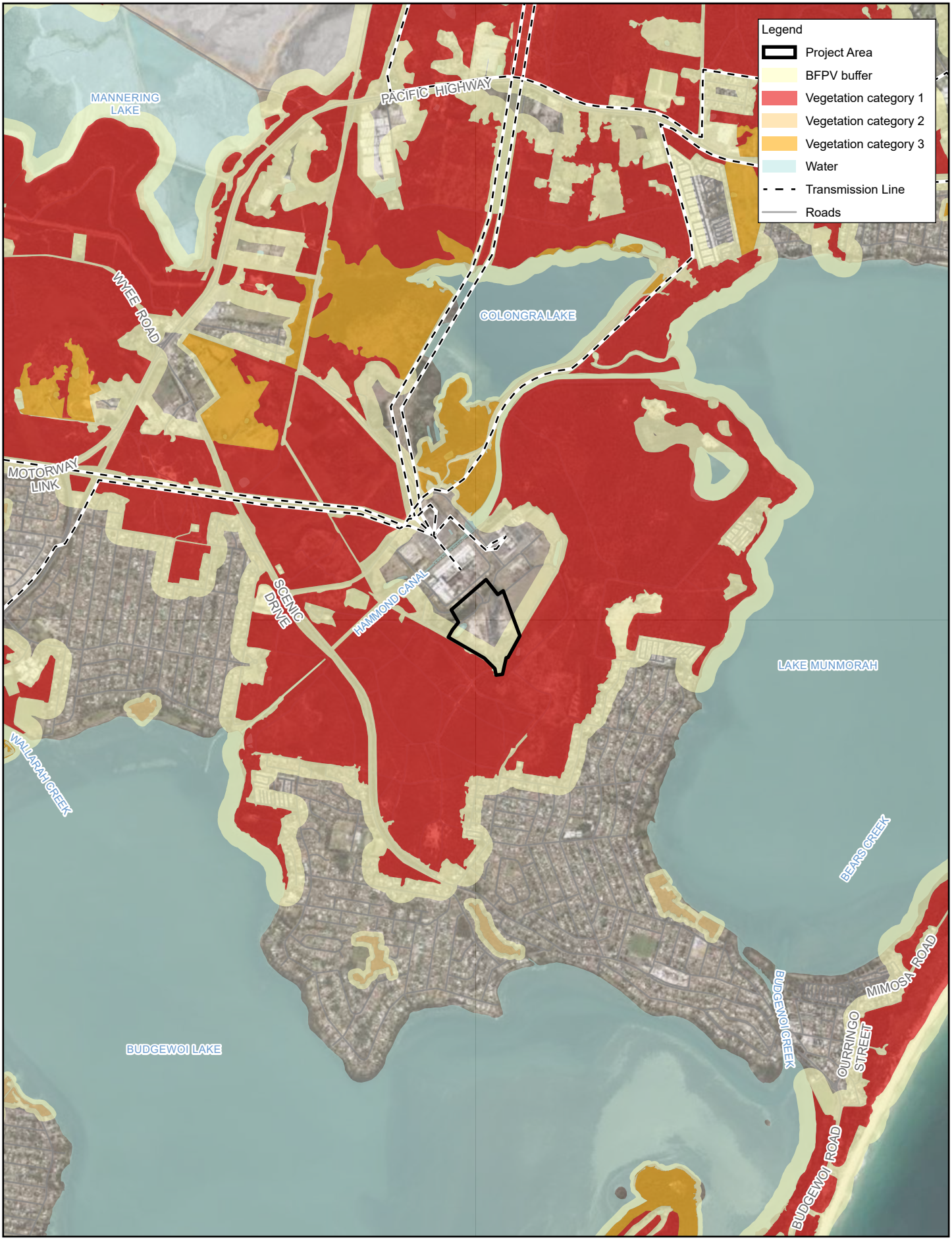
Apart from a 0.75-hectare patch of Dry Sclerophyll Forest in the north-west corner of the project site, which is more than 280 metres from the project, all other vegetation within the project site is not mapped as being bushfire prone vegetation. The project site has been extensively cleared to facilitate construction and operation of the former Munmorah Power Station in the north of the site, and the coal conveyor apparatus and stockpiling area in the south of the site. There are some small patches of planted and remnant vegetation (all less than one hectare and numerous fragmented patches less than 0.25 hectares, and some planted tree strips) near the centre and western parts of the site which are all classifiable as Low Threat Vegetation Exclusions under AS 3959:2018 and the Planning for Bushfire Protection guidelines (RFS 2019). Cleared areas were identified to be occupied by degraded land and areas of grass-dominated managed vegetation.

6.10.4.3 Slope

All vegetated areas within 150 metres of the project site are effectively on level land. Variation in slope within this area is minimal, and thus slope is assessed to have a negligible influence on bushfires approaching the project site. Accordingly, an effective slope of 0 degrees has been assumed for the purpose of the bushfire assessment.

6.10.4.4 Fire weather

The project site is located within the Central Coast LGA, which lies within the Greater Sydney Region weather district. For the purposes of the bushfire assessment, a Forest Fire Danger Index of 100 is assumed.



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Energy Co
Waratah Super Battery - Munmorah
Environmental Impact Statement

Bushfire prone land mapping in the vicinity of the project site

Project No. **12582669**
Revision No. **0**
Date **26/10/2022**

FIGURE 6.27

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12582669_EIS_015_Fig6_27_Bushfire
Print date: 26 Oct 2022 - 12:07

Data source: Waterways - DFSI, 2022; Roads, Railways - DCS, 2022; Bushfire Prone Land - RFS, 2022; NSW_Imagery: © Department of Customer Service 2020.
Created by: mfredle

6.10.4.5 Bushfire Attack Level

The BAL for the project and the nearest extent of bushfire prone vegetation has been assessed with the results shown in Table 6.52.

Table 6.52 BAL assessment results

Waratah Super Battery aspect	Nearest bushfire prone vegetation formation	Effective slope class	Distance from proposed facility structures to bushfire prone vegetation	Likely worst-case BAL for all proposed buildings
South-west	Forest	Flat	≥25 m	BAL 29 or lower
South-east	Forest	Flat	≥25 m	BAL 29 or lower
All other aspects	Not applicable – no bushfire prone vegetation within 100 metres			

6.10.4.6 Bushfire protection measures

This section outlines the BPMs recommended to manage the risk of bushfire to the Waratah Super Battery.

The Planning for Bushfire Protection guidelines (NSW RFS 2019) requires application of a suite of BPMs which, in aggregate, provide an adequate level of protection for a development. BPMs assessed under the Planning for Bushfire Protection guidelines (NSW RFS, 2019) include:

– APZ requirements.
– Performance requirements for building design and construction.
– Access arrangements.
– Water supply and utilities.
– Emergency management arrangements.

These BPMs are addressed in Sections 6.10.4.6.1 to 6.10.4.6.6.

6.10.4.6.1 Asset Protection Zones

APZs are cleared or partially cleared buffer zones between bushfire hazards and buildings, in which fuels are managed in perpetuity to reduce building exposure to radiant heat, flame contact, and ember attack. APZ dimensions are relative to the construction standard (based on assessed BAL) for a building. Under the Planning for Bushfire Protection guidelines (NSW RFS 2019), the project would be considered an industrial facility and fall within a group of building classes (Class 5 to 8) under the National Construction Code (NCC) for which the NCC does not apply any specific bushfire performance requirements for design and construction. Accordingly, BALs are not mandated for bushfire protection for construction of the project, and thus no specific APZ dimensions relating to BAL are mandated either. The Planning for Bushfire Protection guidelines (NSW RFS 2019) establishes a minimum APZ width of 10 metres for windfarms and solar farms but does not explicitly mention battery energy storage systems or associated switchyards, requiring the exercise of professional judgment by experienced practitioners

There are three main functional areas incorporated within the Waratah Super Battery (refer to Figure 3.1):

– The battery energy storage system facility area.
– The switchyard area.
– The office buildings and water tanks area.

These areas are served by site drainage and access roads and would have security fencing around the entire area.

No deemed-to-satisfy provisions under the NCC apply for bushfire protection for construction of the Waratah Super Battery however the following is relevant:

– The battery storage facility area is comprised of batteries housed within steel-walled housings (non-combustible) in which any vents are dust-proof (ember proof) with internal climate control to maintain internal operating temperatures within design parameters. Battery housings are secured on concrete pads with non-combustible crushed rock surface cover between pads, and all electrical connections are underground. Accordingly, the battery storage facility design and construction have inherent resilience to radiant heat and to ember attack.
– The switchyard area is comprised of electrical switching and transformer equipment designed for operation in an open-air environment, mounted on a concrete pad with adjoining crushed rock ground cover. Exposed electrical equipment is non-combustible. Accordingly, the switchyard design and construction have inherent resilience to ignition by radiant heat and to ember attack.
– The office facilities and water tanks area (four offices and two tanks) is at the northern end of the battery storage facility area. The office facilities provide office-type working space for on-site personnel involved in management of the battery energy storage system. Under the NCC, office buildings are classifiable as Class 5 buildings and the NCC does not apply specific performance standards for such. The location of the proposed office buildings is approximately 200 metres from the nearest bushfire prone vegetation to the north-west, noting that the small patch of planted and remnant vegetation (approximately 0.6 hectares) is classifiable as a Low Threat Vegetation Exclusion.

The facility design would include automatic fire detection system and depending on the chosen design may also incorporate an inert gas fire suppression system. The design of each battery energy storage system unit is such that should one battery cell within a unit suffer thermal runaway, the operation of the unit would be stopped automatically before being likely to spread to other units. Should a fire eventuate within a unit, the automatic fire detection system would trigger the suppression system, if fitted. The fire detection and suppression system would operate such as to mitigate the risk of combustion within the battery energy storage system spreading within the battery energy storage system compound or to surrounding vegetation.

6.10.4.6.2 Recommended APZ

A minimum APZ of 25 metres is proposed for the western and southern section, unless the service provider is able to demonstrate, in consultation with the Rural Fire Service NSW, that a smaller APZ would achieve individual performance criteria. The APZ would be maintained to Inner Protection Zone standard, noting that Section 8.3.5 of the Planning for Bushfire Protection guidelines (NSW RFS 2019) requires a minimum APZ of 10 metres. No APZ is required for other sections, as no bushfire hazard is present from these directions.

The proposed 25-metre APZ would ensure the project is exposed to a BAL no greater than BAL 29, to which the non-combustible, ember proof battery energy storage system housings are resilient. The 25 metre APZ in conjunction with the sections not exposed to bushfire hazard also serves to provide a defendable space around the Waratah Super Battery.

6.10.4.6.3 Performance requirements for building design and construction

As outlined in Section 6.10.4.6.1, the Waratah Super Battery would be considered part of a group of building classes (Class 5 to 8) under the NCC, to which no specific design or construction bushfire performance requirements apply. Accordingly, BALs do not apply as deemed-to-satisfy provisions for bushfire protection for construction of the project and it is not appropriate to apply a BAL building construction standard to the Waratah Super Battery. The recommended APZ (refer to Section 6.10.4.6.2) has been designed to reduce the effect of flame contact and excess radiant heat on the assets to a radiant heat flux of 29 kW/m² or less, to which the non-combustible, ember proof battery energy storage system pods are resilient.

6.10.4.6.4 Access arrangements

For industrial developments including battery energy storage system facilities, the Planning for Bushfire Protection guidelines (NSW RFS 2019) require that safe site access to/from the public road system is provided for firefighters providing property protection during a bushfire and for occupant egress for evacuation.

A minimum six-metre-wide (two lane) bitumen-sealed all weather access road is proposed to provide access from the north-western corner of the project site, heading east along the northern perimeter of the Waratah Super Battery connecting to Station Road Station Road is of a similar configuration and standard.

A battery energy storage system perimeter road (loop) providing all-weather access around the full perimeter of the Waratah Super Battery is also to be constructed as part of the project. The perimeter road would provide safe operational access to structures and water supply for emergency services while occupants are seeking to evacuate the area. The perimeter road running along the eastern edge of the battery energy storage system is located approximately 200 metres from bushfire prone vegetation to the west of the site, thus providing access and egress which is safe under active fire threat situations from the west. The perimeter road would be designed and constructed in accordance with Table 5.3b of the Planning for Bushfire Protection guidelines (NSW RFS 2019).

6.10.4.6.5 Water supply and utilities

For industrial developments including battery energy storage system facilities, the Planning for Bushfire Protection guidelines (NSW RFS 2019) requires that adequate services of water be provided for the protection of buildings during and after the passage of bushfire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.

The project site is connected to water supply able to be accessed and extended for fire protection purposes at the battery energy storage system facility. Unless otherwise agreed with Fire and Rescue NSW the Waratah Super Battery would be fitted with a reticulated water supply with fire hydrant, spacing, design and sizing compliant with the relevant clauses of AS 2419.1:2005.

Fire hydrant flows and pressures would comply with the relevant clauses of AS 2419.1:2005. Hydrants are not to be located within road carriageways, and suitable access to hydrant location would be provided for Category 1 fire appliances to within four metres of each hydrant.

Electrical power connection within the Waratah Super Battery is to be by overhead transmission lines. Lines are to be installed with short pole spacings of around 30 metres, unless crossing gullies, gorges or riparian areas. No part of a tree is to be closer to a power line then the distance set out in ISSC3 *Guideline for Managing Vegetation Near Power Lines*.

No gas connection is proposed for the project.

6.10.4.6.6 Emergency management arrangements

An emergency management plan, incorporating bushfire emergency management arrangements would be required for the Waratah Super Battery.

A ‘Bushfire Emergency Management and Evacuation Plan’ would be prepared in accordance with the RFS document ‘A Guide to Developing a Bushfire Emergency Management and Evacuation Plan’ for the construction and operation phases of the project.

6.10.5 Potential impacts

Section 8.3.9 of the Planning for Bushfire Protection guidelines (NSW RFS 2019) identifies a range of development types classified as hazardous industries. Power generating works are among the development types classifiable under the Planning for Bushfire Protection guidelines (NSW RFS 2019) as hazardous industries. The Waratah Super Battery is not a power generating facility, it is a power storage facility which receives power supply from generators for storage and is then discharged into the grid, as required.

While not a power generating facility, a bushfire risk assessment has been conducted covering both the construction, operation and decommissioning and rehabilitation phases of the development.

6.10.5.1 Construction

Three activities during construction were identified as potential fire ignition sources. These include:

– On-site hot works.
– Sparks from metal on metal or rock friction during ground engaging machinery operation.
– Discarded cigarette butts from smokers.

The risk assessment of the potential fire ignition sources during construction is provided in Table 6.53. Prevention and mitigation measures are included in the risk assessment with bushfire risk reduction measures focussed on fire prevention and fire suppression at the ignition site at the time of ignition as a contingency measure.

Table 6.53 Construction phase works bushfire risk assessment

Potential ignition source	Prevention and mitigation measures	C[1]	L[1]	Risk[2]
Vegetation fire ignition and uncontrolled spread caused by on site hot works.	– All hot works prohibited on days of Extreme and Catastrophic Fire Danger. – At all other times: • Hot works requires inclusion in the Job Safety Analysis (JSA). • All hot work would require issue of a hot work permit. • All fire prevention measures (fuel free clearance zone around hot work site; wetting down measures and spark guards) specified in the JSA and/or hot work permit to be implemented. • Fire extinguishers or other fire response apparatus required by the JSA and/or hot work permit must be present at the work site. • Upon completion of hot works, appropriate checks to be undertaken to ensure no fire or smouldering material remains.	Min[3]	Rare[4]	Low
Vegetation fire ignition and uncontrolled spread caused by sparks from earthmoving operations	– Prohibited on days of Severe, Extreme and Catastrophic Fire Danger – Grass fire ignition prevention requires inclusion in the JSA for all earthmoving and hole boring works – Fire extinguisher to be carried on all earthmoving machinery and present at all hole boring operations.	Mod	Rare	Low
Grass fire ignition and uncontrolled spread caused by cigarette butts discarded by smokers	– No smoking on project site except in designated smoking areas at the construction office site or laydown areas.	Mod	Rare	Low

Notes:
1. C = Consequence; L = Likelihood.
2. Risk, Consequence and likelihood descriptors and risk matrix at Appendix F
3. Consequence (of vegetation fire ignited by project activities) assessed on the basis of fire occurrence on days other than Extreme or Catastrophic, due to activity prohibitions under such fire danger ratings.
4. Likelihood (of vegetation fire ignited by project activities) assessed on the basis of risk controls (prevention and mitigation) being implemented, noting that there will be negligible vegetation present in sections of the site where hot works and earthmoving machinery will be used.

6.10.5.2 Operation

Three activities during operation were identified as potential fire ignition sources. These include:

– Thermal runaway in battery cell igniting fire in the Waratah Super Battery cell potentially spreading to other cells.
– Lightning strike impacting the Waratah Super Battery causing fire.
– Asset failure/electrical fault causing electrical fire in the Waratah Super Battery or switchyard equipment.

The design of the Waratah Super Battery and switchyard (high voltage electrical equipment installed within a security-fenced, outdoor compound comprising a non-combustible blue metal base and absence of vegetation sources and 25-metre surrounding APZ) would preclude the potential for bushfire ignition.

The risk assessment of the potential fire ignition sources during operation of the project is provided in Table 6.54 incorporating the provisions outlined previously in Section 6.10.4.6. Prevention and mitigation measures are included in the risk assessment with bushfire risk reduction measures focussed on fire prevention and fire suppression at the ignition site at the time of ignition as a contingency measure.

Table 6.54 Waratah Super Battery operation phase works bushfire risk assessment

Potential Ignition source	Prevention and mitigation measures	C[1]	L[1]	Risk[2]
Bush fire ignition-caused thermal runaway in battery cell igniting fire in Waratah Super Battery cell potentially spreading to other cells and escalating to a bushfire.	– Project design to minimise potential for thermal runaway. – Incorporation of a fire/smoke detection and suppression system integrated into the Waratah Super Battery to prevent fire spread within. – 25-metre APZ for the western and southern sections and maintaining existing 'no hazard' for other sections of the project site minimising potential for fire to spread from the Waratah Super Battery to fire-prone vegetation.	Mod[3]	Very unlikely[4]	Low
Lightning strike impacting the Waratah Super Battery causing fire.	– Installation of lightning protection system for the Waratah Super Battery. – Incorporation of a fire detection and suppression system integrated into the Waratah Super Battery to prevent lightning-caused fire spread within the Waratah Super Battery – 25-metre APZ for the western and southern sections and maintaining existing 'no hazard' for other sections of the project site minimising potential for fire to spread from the Waratah Super Battery to fire-prone vegetation.	Mod	Very unlikely	Low
Asset failure/electrical fault causing electrical fire in the Waratah Super Battery or switchyard equipment.	– Electrical fault protection/fuse system which isolates power in the event of electrical faults. – Non-combustible above-ground components minimising potential for flaming combustion. – 25-metre APZ for the western and southern sections and maintaining existing 'no hazard' for other sections of the project site minimising potential for fire to spread from Waratah Super Battery to fire-prone vegetation.	Mod	Very unlikely	Low

Notes:

1. C = Consequence; L = Likelihood.
2. Risk, Consequence and likelihood descriptors and risk matrix at Appendix F
3. Consequence (of vegetation fire ignited by project activities) assessed on the basis of grass fire occurrence on days other than Extreme and Catastrophic, due to activity prohibitions under such fire danger ratings.
4. Likelihood (of vegetation fire ignited by project activities) assessed on the basis of risk controls (prevention and mitigation) being implemented

6.10.5.3 Decommissioning and rehabilitation

The potential bushfire risks associated with decommissioning and rehabilitation would be similar to those assessed for construction but would be fully assessed prior to future decommissioning of the Waratah Super Battery.

6.10.6 Mitigation measures

Mitigation measures proposed to avoid or minimise potential bushfire risks during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.55. These measures would be included in the issue-specific environmental management sub-plans for the Waratah Super Battery.

Table 6.55 Mitigation measures – bushfire risk

No.	Outcome	Mitigation measure	Timing
BR1	Reduce potential bushfire radiant heat flux exposure of Waratah Super Battery assets to tolerable levels.	Implement a 25-metre-wide APZ along the western and southern side of the project site (no APZ required to east and north as no bushfire prone vegetation present within 100 metres), unless a performance based solution adequately demonstrates that a smaller APZ would meet the aims and objectives of the Planning for Bushfire Protection guidelines .	Design
BR2	Provide appropriate access for fire appliances to facilitate Waratah Super Battery protection during bushfire.	Provide a vehicular access track around the Waratah Super Battery, consistent with access standards in Planning for Bushfire Protection (NSW RFS 2019).	Design
BR3	Bushfire emergency plans in place establishing preparedness and response arrangement for a bushfire emergency.	Prepare a 'Bushfire Emergency Management and Evacuation Plan' in accordance with the RFS document 'A Guide to Developing a Bushfire Emergency Management and Evacuation Plan' for the construction and operation phases of the project.	Construction and Operation
BR4	Waratah Super Battery bushfire prevention.	Establish a 'hot works management system' for both construction and operation phases to prevent accidental bushfire ignition from hot works on site.	Construction and Operation

6.10.7 Conclusion

The design of the project is inherently bushfire resilient being comprised of batteries housed within steel-walled housings (non-combustible) in which any vents are dust-proof (ember proof) with internal climate control to maintain internal operating temperatures within design parameters. Battery housings are secured on concrete pads with non-combustible crushed rock surface cover between pods, and all electrical connections are underground. Provision of an appropriate APZ on the western and southern sides of the Waratah Super Battery (the only locations where bushfire-prone vegetation is present within 100 metres of the project site) is required. An APZ of 25 metres is proposed unless the service provider is able to demonstrate, in consultation with the Rural Fire Service NSW, that a smaller APZ can achieve an acceptable degree of bushfire protection for the project, taking into account its design and its contained, steel walled structure.

Proposed site access (via extension of the existing access) can meet the requirements of the Planning for Bushfire Protection guidelines (NSW RFS 2019), and the proposed all-weather access perimeter road around the battery energy storage system would provide suitable access for firefighting, and an appropriate defendable space.

If required by the Fire Safety Study, the Waratah Super Battery would be fitted with a reticulated water supply with fire hydrant, spacing, design and sizing compliant with the relevant clauses of AS 2419.1:2005, with hydrant flows and pressures to be compliant with the relevant clauses of AS 2419.1:2005. Overhead electrical transmission lines would be installed with short pole spacing of a maximum of 30 metres, and no part of a tree would be closer to a power line then the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.

With the recommended bushfire protection measures in place, the project can meet the aims and objectives of Planning for Bushfire Protection guidelines (NSW RFS 2019).

Risks of vegetation fire ignition and spread during the construction, operation, and decommissioning and rehabilitation stages have been assessed and can be maintained at a low risk level with the implementation of the identified risk controls.

6.11 Social and economic

6.11.1 Overview

This section provides a summary of potential social and economic impacts associated with the Waratah Super Battery. This section draws on a Social Impact Assessment (SIA), included as Appendix K. This section assesses the potential social and economic impacts associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential social and economic impacts associated with the Waratah Super Battery. The assessment has been prepared in accordance the SEARs (refer to Appendix A).

6.11.2 Methodology

6.11.2.1 Government plans, policies, and guidelines

The SIA was prepared with reference to the following plans/policies/guidelines:

– Social Impact Assessment Guideline for State Significant Projects (DPIE 2021a).
– Technical Supplement - Social Impact Assessment Guideline for State Significant Projects (DPIE 2021b).
– International Association for Impact Assessment International Principles for Social Impact Assessment (Vanclay, F. 2003) and Social Impact Assessment: Guidance for assessing and managing the social impacts of projects (Vanclay et al. 2015).

6.11.2.2 Desktop assessment

A scoping exercise was undertaken to inform the SIA Scoping Tool used for the SIA. The scoping exercise identified the potential social values that may experience change, and defines the social locality, or study area, for the SIA. The social locality for this SIA includes a local study area and a regional study area.

The scoping of social issues and the social study area were informed by the following:

– The project description (Chapter 3).
– The findings of the Waratah Super Battery Scoping Report (GHD 2022).
– Outcomes of stakeholder consultation activities (Chapter 5).
– The findings of other technical studies prepared for the EIS (Chapter 6).

6.11.2.3 Field surveys

Field surveys were not undertaken as part of the SIA for the Waratah Super Battery.

6.11.3 Existing environment

6.11.3.1 Local study area

The project site is located within the former Munmorah Power Station and adjacent to the existing Colongra Power Station in the suburb of Colongra. There are no residential areas in Colongra, which is largely zoned as Special Purpose (SP1) for Infrastructure Electricity Generation Works under the Central Coast LEP. Other land uses in Colongra include Environmental Conservation, National Parks and Nature Reserves, and Environmental Management.

Colongra is bordered by Scenic Drive, which travels along the southern edge of the suburb, bordering the residential suburbs of San Remo, Buff Point, and Halekulani. Scenic Drive is a part of the Central Coast Highway. It is a busy road which provides a connection between the coastal community of Budgewoi and inland to Doyalson, which connects with the Pacific Highway. Halekulani and the broader area are serviced by a local bus network, which has a number of stops along Scenic Drive. There are two recreational facilities located in Colongra – Koala Park and Colongra Swamp Nature Reserve (refer Figure 2.6).

Koala Park is located about 400 metres south-west of the project site. It includes a sports field, two tennis courts and a disc golf course which are all unlocked and free for public use (Central Coast Council 2022b). Koala Park contains facilities such as barbeques, toilets, and picnic tables (Fly Spot 2022).

Koala Park is also used for local events and festivals organised by the community. The GOATS Family Festival is an annual festival held during April in Koala Park which hosts free live entertainment, market stalls, and performers (Central Coast Council 2019). The festival is organised by the Epicentre San Remo, a not-for-profit, charitable organisation supported by Central Coast Council.

Colongra Swamp Nature Reserve is located approximately 650 meters from the project site on the north-eastern edge of the suburb along Lake Munmorah. Nearby waterways include Hammond Canal, Lake Munmorah, Colongra Creek, and Lake Colongra. The Lake Munmorah and Colongra Swamp Nature Reserve walking track is a 14-kilometre out-and-back trail which is utilised by walkers and cyclists. The nature reserve is also used for birdwatching and fishing. The Colongra Swamp Nature Reserve bush regeneration group meet once per month on a Sunday morning to engage in weeding and vegetation activities, and record observations of habitat and natural wildlife within the reserve (National Parks and Wildlife Service 2022).

The closest residential areas to the proposed Waratah Super Battery are in the western portion of Halekulani. The closest residents are located in Halekulani, about 600 meters from the project site (refer Figure 2.6). There are also two retirement villages located 700 metres from the project site on the shore of Lake Munmorah, known as Ingenia Lifestyle Lake Munmorah and Lakeside Leisure Village.

6.11.3.2 Regional study area

The Central Coast LGA is characterised by its laid-back and liveable setting and is valued for its natural environment. The region has a number of challenges and opportunities as it grows, including promoting a diverse economy and industry, investing in infrastructure and affordable housing and conserving the environment (Central Coast Council 2018).

The analysis of the social locality found that overall, the social study area is characterised by:

– A higher proportion of Aboriginal and Torres Strait Islander population living in the local study area (7.2 per cent, or 194 people) compared to Central Coast LGA (4.9 per cent, or 17,047 people).
– A lower proportion of people who speak a language other than English at home compared to the Central Coast LGA.
– A low rental vacancy rate in the Central Coast LGA, which has experienced considerable decline since 2019. As of August 2022, the rental vacancy rate was 0.9 per cent.
– A limited supply of short-term accommodation available in Halekulani is likely to be occupied during the warmer months (December, January, and February) and school holiday periods when tourism is at its peak.
– A higher proportion of certificate level education attainment in both Halekulani (52.1 per cent), compared to the Central Coast LGA (40.2 per cent).
– A lower labour force participation (47.2 per cent) when compared to the Central Coast LGA (56.0 per cent). This may be attributed to the higher median age in Halekulani when compared to the Central Coast LGA, and higher proportion of retirees and senior age cohorts which would likely not be in the workforce.
– Health care and social assistance is the predominant industry of employment in Halekulani, which is consistent with the Central Coast LGA.
– A higher proportion of technician and trade workers in Halekulani, compared to the Central Coast LGA.
– A lower median weekly individual income and median weekly household income in Halekulani, compared to the Central Coast LGA.

6.11.4 Potential impacts

6.11.4.1 Construction

A summary of potential social and economic impacts during the construction of the project are detailed in Table 6.56, with further detail provided in Appendix K. The residual significance is determined by implementation of mitigation measures outlined in Section 6.11.5.

Table 6.56 Social impacts - construction

Potential change as a result of the project	Impact description	Stakeholders affected	Social impact category	Residual significance
Amenity and character				
Changes to local amenity (increased noise, dust, vibration, and visual impacts).	The nearest residential area is Halekulani, located more than 600 metres from the project site, which is separated from the project site by a large, vegetated buffer. This reduces the likelihood that most local residents would experience changes to local amenity due to construction activities (e.g., increased noise, dust and vibration, and visual impacts). However, some residents living along Scenic Drive may experience a negligible increase in noise due to construction vehicles travelling to and /from the site. This may disturb some residents along this road.	Local residents of Halekulani	Way of life	Low Negative
	Users of Koala Park and Colongra Swamp Trail have the potential to experience changes to local amenity during construction. The Koala Park recreation area is located about 400 metres from the project site on Koala Street and is accessed via Station Road, which is the main access road to the project site. Parts of Colongra Swamp Trail are located about 220 metres from the project site. While some users of the park and trail may hear construction activities at times, this is not expected to deter most users from visiting/using the facilities.	Users of Koala Park and Colongra Swamp Trail	Way of life	Low Negative
Access and connectivity				
Increased traffic during construction along haulage routes	Scenic Drive and Station Road would be used as haulage routes during construction, which would be used by construction traffic. This has the potential to result in intermittent minor delays for people travelling along these routes, however, this is expected to be negligible.	Local residents of Halekulani	Accessibility	Low Negative
	Users of Koala Park and Colongra Swamp may experience delays or detours when accessing these areas due to changed traffic conditions and increased construction traffic. Most users of Koala Park are not expected to be deterred; however, this could disrupt community events held at the park (e.g., GOATS family festival held in April). Users of Colongra Swamp may not be able to access the Colongra Swamp Trail from the north-eastern access point, and may need to use the western access point, which may increase travel time. This has the potential to deter some recreational users from visiting Colongra Swamp.	Users of Koala Park and Colongra Swamp	Accessibility	Low Negative
	Changes to perceptions of safety for some road users due to increased heavy vehicle traffic along local roads, which may lead to feelings of decreased safety for pedestrians walking along these routes and walking to Koala Park.	Local residents of Halekulani Recreation users at Koala Park	Accessibility	Low Negative

Potential change as a result of the project	Impact description	Stakeholders affected	Social impact category	Residual significance
Housing and accommodation				
Increased demand for short-term accommodation during construction	About 150 full time equivalent people would be employed during construction of the project. It is expected that most construction workers would be sourced from the Central Coast, Sydney, or Newcastle. These workers are not expected to require accommodation, as they would likely travel to the project site each day for their shifts. A small number of workers with specialist skills may be sourced from further afield. These workers may require temporary accommodation in the local area. Due to the short-term nature of construction contracts, these workers are likely to be accommodated in short-term accommodation options such as tourist parks and holiday accommodation. The social baseline identified that there is limited availability of short-term accommodation in the social locality, and availability is likely to fluctuate depending on tourism demands.	Accommodation providers	Livelihoods	Low Negative
	While the workforce needs of the project have the potential to result in minor reduced availability for tourists, use of short-term accommodation by construction workers would also be a short-term benefit for local accommodation providers.	Accommodation providers	Livelihoods	Low Neutral
Economy and business				
Local spend	There is potential for a small number of local and regional businesses to participate in procurement opportunities during construction. Local businesses may also benefit from construction workers spending wages at local businesses, particularly retail and food and beverage businesses located in nearby suburbs such as Budgewoi which may be visited by workers during their breaks and is located about nine minutes' drive from the project. This may increase revenue at these businesses in the short-term.	Local and regional businesses	Livelihoods	Low Positive
Employment opportunities	About 150 full time equivalent people would be employed during construction of the project. There would be increased demand for skilled and unskilled workforce during construction of the project, which may lead to increased temporary employment opportunities for local and regional residents.	Skilled and unskilled residents	Livelihoods	Low Positive

The project would result in a major, direct capital investment of approximately $1 billion in the state of NSW which is further increased through the multiplier effect when considering indirect employment and other flow-on economic benefits. As outlined in Section 2.1, the project is needed to address a forecast breach of the energy security target and is critical to addressing energy cost, security and reliability issues for NSW residents. The Minister for Energy has directed the network operator to carry out the Waratah Super Battery project as a Priority

Transmission Infrastructure Project under the EII Act. Ensuring that Priority Transmission Infrastructure Projects provide economic benefits to NSW residents is a fundamental consideration under the EII Act.

6.11.4.2 Operation

A summary of potential social impacts during the operation of the project are detailed in Table 6.57, with further detail provided in Appendix K. The residual significance is determined by implementation of mitigation measures outlined in section 6.11.5.

Table 6.57 Social impacts – operation

Potential change as a result of the project	Impact description	Stakeholders affected	Social impact category	Residual significance
Amenity and character				
Changes to local amenity (increased noise and visual impacts).	While there would be visual changes to the landscape as well as changes to amenity (including increased noise and visual impacts), this is not expected to be noticeable for most local residents given the distance between the site and residential areas. Further, the project is located within an existing industrial area, therefore, these visual changes would be consistent with the existing character and is, therefore, not expected to result in a social impact.	Local community	Way of life	Low Negative
Economy and business				
Employment opportunities	Operation of the project would largely be undertaken remotely, however, up to 10-15 personnel are likely to be required, which may lead to minor increased employment opportunities for local and regional residents.	Skilled workforce	Livelihoods	Low Positive
Community wellbeing				
Uncertainty of new technology	Potential for some local community members to experience stress resulting from concerns about: – Uncertainty about battery storage technology. – Bushfire risk associated with potential battery overheating.	Local community	Health and wellbeing	Low Negative

6.11.4.3 Decommissioning and rehabilitation

The potential social and economic risks associated with decommissioning and rehabilitation would be similar to those assessed for construction but would be fully assessed prior to future decommissioning of the Waratah Super Battery.

6.11.5 Mitigation measures

Mitigation measures proposed to avoid or minimise potential social and economic impacts during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.58. These measures would be included in the issue-specific environmental management sub-plans the Waratah Super Battery.

Table 6.58 Mitigation measures – socio-economic

No.	Outcome	Mitigation measure	Timing
SE1	Implementation of ongoing, regular, and transparent communication with stakeholders	EnergyCo would continue to manage and deliver community and stakeholder engagement in the lead up to construction of the project. This would help to ensure that: – The community and stakeholders have a high level of awareness of all processes and activities. – The community and stakeholders are made aware of any potential disturbances and/or disruptions well in advance of them occurring. – Accurate and accessible information is made available. – A timely response is given to issues and concerns raised by the community. – Feedback from the community is encouraged. – Opportunities for input are provided.	Pre-construction
SE2	Ongoing community engagement during construction activities	A project-specific communication management plan would be developed by the service provider in accordance with the Community and Stakeholder Engagement Strategy and implemented to define the specific requirements for engagement during delivery of the project. This would be developed and implemented to ensure that residents and stakeholders are notified in a timely manner about works activities and potential for impacts, accurate information is accessible, and enquiries and complaints are managed in a timely manner. The plan would include approaches and protocols to: – Communication and notification with potentially affected residents and stakeholders about work activities and potential for impacts. – Communication accurate project information. – Requirements for the complaints management system to be implemented throughout the duration of the project, including 24-hour, seven days a week phone line, postal and email address for written enquiries, and publication of contact details.	Construction
SE3	Non resident workforce accommodation	An accommodation strategy would be developed for the project to plan for the accommodation needs of any non-resident workers. The strategy would include: – Information to be shared by EnergyCo about workforce and accommodation requirements in a timely manner in line with the Community and Stakeholder Engagement Strategy. – Plan for the responsible use of local accommodation in suburbs near to the site.	Construction
SE4	Local and Indigenous employment and procurement	EnergyCo would develop and implement an industry and Aboriginal participation plan in its contract with the service provider.	Construction

6.11.6 Conclusion

The SIA assessed the potential social and economic impacts resulting from the construction and operation of the proposed Waratah Super Battery.

During construction, potential social benefits include:

– Direct and indirect procurement opportunities for local and regional businesses.
– Potential employment opportunities for up to 150 workers in the local and regional area.
– Increased patronage and expenditure at some local and regional businesses, particularly food and beverage businesses in Budgewoi.

Construction activities are also expected to result in the following minor potential social impacts:

– Reduced amenity from an increase in noise, vibration and dust and visual changes, which has the potential to affect recreational users of Koala Park and some local residents' wellbeing.
– Increase in traffic volumes for local residents and road users.
– Potential increased demand for local accommodation.

Some impacts may be experienced by residents as a result of operation of the project, including:

– Changes to local amenity (increased noise and visual impacts).
– Negative perception due to the uncertainty about battery storage technology and bushfire risk associated with potential battery overheating may lead to stress and worry for some residents in the area.

Most social impacts that occur during construction are temporary in nature and are expected to be minimised by the recommended mitigation measures. Mitigation and management measures have been recommended to avoid, minimise and manage potential social impacts, and enhance social benefits. This includes targeted and ongoing engagement with local and regional residents and stakeholders, accommodation strategy and a local procurement and Aboriginal employment plan.

In relation to the economic benefits of the project, the project represents a major, direct capital investment of approximately $1 billion in the state of NSW which is further increased through the multiplier effect when considering indirect employment and other flow-on economic benefits. As outlined in Section 2.1, the project is needed to address a forecast breach of the energy security target and is critical to addressing energy cost, security and reliability issues for NSW residents. The Minister for Energy has directed the network operator to carry out the Waratah Super Battery project as a Priority Transmission Infrastructure Project under the EII Act. Ensuring that Priority Transmission Infrastructure Projects provide economic benefits to NSW residents is a fundamental consideration under the EII Act.

6.12 Waste

6.12.1 Overview

This section assesses the potential waste management impacts associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to promote opportunities for recycling of waste and reduce potential waste management impacts associated with the Waratah Super Battery. The assessment has been prepared in accordance the SEARs (refer to Appendix A).

6.12.2 Methodology

6.12.2.1 Government plans, policies, and guidelines

The waste management assessment was prepared with reference to the following plans/policies/guidelines:

– NSW Waste and Sustainable Materials Strategy 2041 Stage 1: 2021-2027 (DPIE 2021c).
– NSW Circular Economy Policy Statement: Too Good to Waste (NSW EPA 2019).
– Waste Classification Guidelines (NSW EPA 2014).

6.12.2.2 Desktop assessment

A desktop assessment was carried out, which included the following tasks:

– Identifying potential waste generating activities during construction, operation, and decommissioning and rehabilitation of the project.
– Identifying potential waste types, indicative quantities, and preliminary waste classifications in accordance with relevant legislation and guidelines.
– Identifying environmental issues and consequences if waste is not managed appropriately.
– Identifying waste management options for key waste streams.
– Providing measures to avoid, reduce and manage wastes in accordance with waste hierarchy and circular economy principles.

6.12.2.3 Field surveys

Field surveys were not undertaken as part of the waste assessment for the Waratah Super Battery.

6.12.3 Potential impacts

6.12.3.1 Construction

Potential impacts during construction relate to generation and management of waste and associated potential impacts if waste is not managed appropriately.

The key waste streams expected to be generated during construction are:

– Vegetation from site preparation (clearing and grubbing) activities.
– General solid waste and wastewater (grey water and sewage) from temporary construction site offices and crib facilities.

The indicative quantities of these waste streams based on the estimated number of construction personnel are provided in Table 6.59.

In addition to these, minor quantities of other waste streams such as building materials (e.g., concrete, asphalt, aggregate, timber formwork, scrap metals), other offcuts, cable, and packaging materials may also be generated.

Table 6.59 Estimated key waste streams quantities – construction

Waste stream	Estimated quantity
Vegetation	92 t
General waste from construction site offices and crib facilities	40 t
Wastewater (grey water and sewage) from construction site offices and crib facilities	4,100 kL

Spoil would also be generated, however, preliminary cut and fill estimates indicate that there would be a net deficit of spoil (that is, a requirement to import a small quality of fill into the site) from site preparation, earthworks, and services connections (refer to Table 6.60). This would be confirmed during the detailed design of the project.

Table 6.60 Preliminary cut and fill balance

Item	Cut (m^3)	Fill (m^3)	Balance (m^3)
Battery pad	6,500	7,500	-1000
Switching pad	2,500	2,000	500
Transformer pad	1,000	2,000	-1000
Total	**10,000**	**11,500**	**-1,500**

The key waste streams that may be produced from construction activities, and their likely classifications are listed in Table 6.61.

Table 6.61 Key waste streams and classification – construction

Activity	Waste streams that may be produced	Likely classification of waste streams
Operation of temporary construction site offices and crib facilities	Food and other organic waste	General solid waste (putrescible)
	Wastewater (grey water and sewage)	Liquid waste
	General waste (such as waste paper and cardboard, containers (plastic, glass, metals), pallets, plastic film wrap, cable reels, and metal straps/bands, polystyrene and other packaging waste)	General solid waste (non-putrescible)
	Electrical and electronic waste	General solid waste (non-putrescible)

Activity	Waste streams that may be produced	Likely classification of waste streams
	Waste from vehicle/plant equipment maintenance and operation of vehicle/plant (such as adhesives, lubricants, waste fuels and oils, chemicals, engine coolant, batteries, tyres etc)	General solid waste (non-putrescible) – drained oil filters (mechanically crushed), rags and oily rags (only if they contain non-volatile petroleum hydrocarbons and no free liquids) Restricted waste, hazardous waste
Site preparation including earthworks, and installation/relocation of services	Vegetation	General solid waste (non-putrescible)
	Spoil (virgin excavated natural material/excavated natural material, contaminated soils)	General solid waste (non-putrescible) Restricted waste, hazardous waste and/or special waste
	Redundant utilities waste such as wiring and piping	General solid waste (non-putrescible) Restricted waste, hazardous waste and/or special waste
Construction of foundations, buildings, systems, and other infrastructure including services connections, installation and electrical fit out of battery modules, power conversion systems, and transformers, installation of switchyard and overhead transmission line	General building and construction waste (concrete, timber, scrap metals, cable and packaging materials etc)	General solid waste (non-putrescible)
Construction of paved areas, driveways, and parking areas	Concrete, asphalt, aggregate	General solid waste (non-putrescible)

The potential impacts associated with aspects of waste generation and management during construction are summarised in Table 6.62.

Table 6.62 Potential impacts associated with waste generation and management – construction

Aspect of waste management	Potential impacts
Generation of waste, including excavation and handling	– Dust from excavation, handling, and movement of waste – Erosion and sedimentation due to runoff from exposed surfaces – Sediment laden/contaminated runoff and leachate generation, which if located close to receiving waterbodies, could impact water quality and aquatic ecosystems – Noise from plant and equipment movement – Human health risks due to handling of contaminated soils or materials
Storage and segregation of waste	– Odours and dust from stockpiling/storage of wastes – Human health risks due to storage of contaminated soils or materials – Sediment laden/contaminated runoff and leachate generation, which if located close to receiving waterbodies could impact water quality and aquatic ecosystems – Waste build-up from irregular or disrupted collections – Cross contamination of soils due to improper segregation and storage – Attracting pests and disease vectors
Waste transportation	– Dust from loading waste onto vehicles and movement of waste on haul roads – Road traffic noise from waste collection vehicles and movement of spoil – Traffic generated by haulage of waste to reuse/disposal facilities – Odours from loading waste onto vehicles and movement of waste collection vehicles to disposal or recycling facilities – Mud tracking on road from waste collection vehicles – Unlawful transport and disposal – Incorrect classification of waste materials

Aspect of waste management	Potential impacts
Non-classified or incorrectly classified waste transport and disposal	– Regulatory non-compliance – Contamination of receiving facility – Contamination of soils, groundwater and/or surface water – Unlicensed waste contractors transporting waste
Unlicensed waste contractors transporting waste	– Regulatory non-compliance – Potential illegal dumping of waste – Potential for disposal at unlawful unlicensed receival sites

The potential impacts to land and water associated with excavating and disturbing soil, including contaminated soil and materials, are considered in Section 6.3 and Section 6.8. Other potential indirect impacts to air quality, noise and vibration, and hazard and risks associated with the generation, storage, handling, and transporting wastes have been considered in the respective sections for these environmental matters (refer to Section 6.11, Section 6.6 and Section 6.5).

Construction waste management activities would not have a significant impact on the environment or human health assuming:

– The mitigation measures provided in relevant chapters noted above are implemented.
– Construction wastes are managed as described below and in Table 6.63.
– Additional waste mitigation measures are implemented, as listed in Table 6.66.

Waste generated during construction would be managed using circular economy principles and the waste hierarchy approach of avoidance and reuse before consideration is given to disposal. Wastes would be managed in accordance with the waste provisions contained within the POEO Act and other relevant plans, policies, and guidelines listed in Section 6.12.2.1.

Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the NSW EPA (2014) Waste Classification Guidelines (NSW EPA, 2014). The Waste Classification Guidelines provide direction on the classification of waste, specifying requirements for management, transportation, and disposal of each waste category.

The proposed approach to managing construction waste, including measures to facilitate segregation and prevent cross contamination, is provided in Table 6.63. Additional mitigation measures, proposed as an outcome of the assessment, are provided in Table 6.66.

The recycling and disposal facilities for each waste type would be determined based on availability/capacity, waste licensed to be accepted, and confirmed waste classifications. The facilities would be documented in a construction waste management plan to be prepared for the project, prior to construction commencing.

Table 6.63 Management of construction waste

Waste type	Management
Spoil (excavated natural material/virgin excavated natural material)	The project would be designed to adhere to the natural ground profile, where practicable, in order to reduce earthworks and minimise surplus spoil generation. Topsoil and subsoil would be stripped and stockpiled separately. Topsoil would be stockpiled and maintained for redistribution at the surface. Subsoil would be stockpiled for use as road subbase or as backfill at the project site. Where possible, excavated materials would be reused onsite for construction fill or landscaping purposes, if suitable. There is currently expected to be a net deficit of spoil, which would be confirmed during detailed design. However in the event there is surplus spoil material that cannot be reused, it would be stockpiled on site. Options to recycle spoil would be investigated where practicable. Should off-site disposal be required, the material would be classified in accordance with the NSW EPA (2014) Waste Classification Guidelines (NSW EPA 2014) and taken to an appropriately licensed facility by an authorised contractor.

Waste type	Management
Spoil (contaminated soils)	Any surplus actual or suspected contaminated soils would be classified in accordance with the NSW EPA (2014) Waste Classification Guidelines (NSW EPA 2014). Once classified, the soil would be managed, transported, and disposed of in accordance with the requirements for the relevant classification and work, health, and safety regulatory requirements. This includes transport by an authorised contractor and disposal at an appropriately licensed facility that is lawfully able to receive the classification of waste. Further information about the management of contamination soil is provided in Chapter 6.3).
Vegetation	Clearing would be minimised by placing temporary infrastructure in areas that have been previously cleared, degraded, or have naturally lower above ground biomass. Areas to be cleared would be marked to reduce incidental clearing. As far as practicable, cleared material would be chipped, mulched, and stockpiled for reuse on-site. Materials with special habitat value, such as hollow-bearing logs or trees, would be selectively removed for reuse, or placed in nearby bushland. Otherwise, the material would be removed for off-site reuse in accordance with The Mulch Order 2016 (NSW EPA 2016) or sent for recycling at a suitably licensed facility. Priority weeds would be disposed of in accordance with relevant guidelines/requirements, as discussed in Section 6.2.
General building and construction waste (concrete, asphalt, timber, scrap metals, cable, and packaging materials etc) and redundant utilities waste (wiring and piping)	General building and construction waste would be classified in accordance with the NSW EPA (2014) Waste Classification Guidelines and directed to a waste management facility that is lawfully permitted to accept that type of waste. General building and construction waste would be managed in accordance with the waste hierarchy. Where space constraints permit, waste would be segregated and stockpiled on site, with materials such as concrete, metals, and asphalt separated and sent to a construction and demolition waste recycling facility. Other recyclable materials would be sent for recycling as a mixed waste stream. Opportunities for take back agreements in procurement would be identified e.g., packaging and pallets etc. The disturbance, movement and disposal of hazardous or special waste including asbestos containing materials, would be carried out in accordance with the Work Health and Safety Regulation 2017 and relevant guidelines. Temporary buildings established for the construction phase would typically be transportable and demountable structures and would be removed off-site for reuse once no longer needed.
Food and other organic waste	Putrescible waste would be stored in designated bins and collected by an authorised contractor for disposal to a suitably licensed facility.
General waste (such as waste paper and cardboard, containers (plastic, glass, metals), pellets, plastic film wrap, cable reels, and metal straps/bands, polystyrene, and other packaging waste etc)	Labelled and colour coded receptacles would be provided at the construction site office and crib room for general waste from construction personnel to ensure source separation of recyclable materials and residual landfill waste. These wastes would be collected on a regular basis by authorised and appropriately licensed waste collection contractors for offsite recycling or disposal.
Electrical and electronic waste	Electrical and electronic waste would be segregated and sent for recycling to a suitably licensed facility.
Waste from vehicle/plant equipment maintenance and operation of vehicle/plant (such as adhesives, lubricants, waste fuels and oils, chemicals, engine coolant, batteries, tyres etc)	Waste from construction vehicle and plant maintenance activities would be collected and stored in designated waste storage areas for collection by an authorised contractor for disposal off site. Any potentially hazardous waste would be stored separately in clearly labelled receptacles and disposed of in accordance with its waste classification. Waste oil and oil filters would be stored in separate recycling bins and collected by an authorised contractor, and recycled off site, where feasible. Tyres would be collected by an authorised contractor for recycling at a facility licensed to receive tyres (including tyre pieces).
Wastewater (greywater and sewage)	An on-site sewage management system would be developed to manage wastewater. Wastewater would be managed on site using a propriety on site wastewater treatment system trucked off site.

6.12.3.2 Operation

Potential impacts during operation also relate to the generation and management of waste and associated potential impacts if waste is not managed appropriately.

The key operational waste streams would be as follows:

– Spent batteries.
– Food waste, general waste, and wastewater (grey water and sewage) from offices and maintenance staff.
– General waste, lubricants, oils, and chemicals from maintenance activities.
– Vegetation trimmings from transmission line corridor maintenance.

Only minimal quantities of operational wastes are anticipated based on the small number of site personnel and minimal ongoing maintenance requirements of the facility.

The key waste streams that may be produced during operation, and their likely classifications are listed in Table 6.64.

Table 6.64 Key waste streams and classification – operation

Activity	Waste streams that may be produced	Likely classification of waste streams
General battery storage system, transmission line and switchyard operation and maintenance	Spent batteries (subject to recycling opportunities refer below table)	Hazardous waste (if not recycled)
	Food and other organic waste	General solid waste (putrescible)
	Wastewater (grey water and sewage)	Liquid waste
	General waste (such as waste paper and cardboard, containers (plastic, glass, metals), pellets, plastic film wrap, and other packaging waste etc)	General solid waste (non-putrescible)
	Electrical and electronic waste	General solid waste (non-putrescible)
	Lubricants, oils, chemicals	General solid waste (non-putrescible) – drained oil filters (mechanically crushed), rags and oily rags (only if they contain non-volatile petroleum hydrocarbons and no free liquids) Restricted waste, hazardous waste
	Vegetation	General solid waste (non-putrescible)

The proposed approach to managing operational waste, including measures to facilitate segregation and prevent cross contamination, is provided in Table 6.65. Additional mitigation measures, proposed as an outcome of the assessment, are provided in Table 6.65.

Table 6.65 Management of operation waste

Waste type	Management
Spent batteries	A detailed examination of battery life and the feasibility and opportunities for recycling of spent batteries would be undertaken prior to operations commencing. Pending the outcomes of this examination, as a first preference, spent batteries would be recycled at approved battery recycling facilities, or subject to confirmation, could be returned to the original equipment manufacturer for refurbishment and repurposing or recycling. Where spent batteries are unable to be recycled or returned to the manufacturer, they would be disposed of at a suitably licensed facility.
Food and other organic waste	Food and other organic waste would be stored in designated bins and collected by an authorised contractor for disposal to a suitably licensed facility.
Wastewater (grey water and sewage)	An on-site sewage management system would be developed to manage wastewater. Wastewater would be managed on site using a propriety on site wastewater treatment system

Waste type	Management
General waste (such as waste paper and cardboard, containers (plastic, glass, metals), pellets, plastic film wrap, and other packaging waste etc)	General waste would be managed in accordance with the waste hierarchy. Labelled and colour coded receptacles would be provided at the admin/control building and workshop/warehouse for general waste from operational personnel to ensure source separation of recyclable materials and residual landfill waste. These wastes would be collected on a regular basis by authorised and appropriately licensed waste collection contractors for offsite recycling or disposal.
Electrical and electronic waste	Electrical and electronic waste would be segregated and sent for recycling to a suitably licensed facility.
Lubricants, oils, chemicals	Waste from any workshop or maintenance activities would be collected and stored in designated waste storage areas for collection by an authorised contractor for disposal off site. Any potentially hazardous waste or chemicals would be stored separately in clearly labelled receptacles and disposed of in accordance with its waste classification. Waste oil and oil filters would be stored in separate recycling bins and collected by an authorised contractor, and recycled off site, where feasible.
Vegetation	As far as practicable, vegetation waste from transmission line corridor maintenance would be chipped and/or mulched and reused on-site. Otherwise, the material would be removed for off-site reuse in accordance with The Mulch Order 2016 (NSW EPA 2016) or sent for recycling at a suitably licensed facility. Priority weeds would be disposed of in accordance with relevant guidelines/requirements, as discussed in Section 6.2.

6.12.3.3 Decommissioning and rehabilitation

Prior to demolition, all wastes and operating chemicals would be removed and disposed of in accordance with the requirements of Protection of the Environment Operations (Waste) Regulation 2014 (EPA 2014b) and the NSW EPA (2014) Waste Classification Guidelines (NSW EPA 2014a).

Where it is possible to do so, adaptive reuse of buildings, infrastructure, or utilities would be considered.

Prior to any demolition, an assessment of all buildings, civil infrastructure, plant, batteries, and equipment would be undertaken to identify which materials are able to be reused or recycled. All plant, equipment and other materials suitable for reuse (e.g., sale) or recycling would be classified and removed from the site for direct reuse or transferred to suitably licensed waste recovery or recycling facilities. Material unsuitable for reuse or recycling would be classified and removed from the site for disposal at a suitably licensed waste disposal facility.

An updated investigation of opportunities and feasibility of recycling of batteries would also be undertaken. As far as practical the batteries within the battery energy storage system would be recycled at approved battery recycling facilities, or subject to confirmation, could be returned to the original equipment manufacturer for refurbishment and recycling. Where spent batteries are unable to be recycled, they would be disposed of at a suitably licensed facility.

6.12.4 Mitigation measures

Mitigation measures proposed to avoid or minimise potential impacts with regards to waste during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.66. These measures would be included in the issue-specific environmental management sub-plans for the Waratah Super Battery.

Table 6.66 Mitigation measures – waste

No.	Outcome	Mitigation measure	Timing
WA1	Waste generation is minimised during construction.	Ensure that detailed design includes a focus on optimising earthworks to minimise excess spoil volumes and maximise the reuse of material on site. where practicable.	Design
WA2	Waste is classified and managed in accordance with regulatory requirements.	Classify waste in accordance with the Waste Classification Guidelines (NSW EPA 2014) and manage in accordance with the POEO Act and associated regulations.	Construction and operation

No.	Outcome	Mitigation measure	Timing
WA3	Construction waste is stored, segregated, handled, transported, and recovered or disposed of appropriately and in accordance with circular economy and waste hierarchy principles.	Prepare a construction waste management sub-plan prior to construction of the project. Adopt the circular economy principles and the waste hierarchy contained in the *Waste Avoidance and Resource Recovery Act 2001*. Detail processes, responsibilities, and measures to manage waste and resource use, and minimise the potential for impacts during construction.	Construction
WA4	Operational waste is stored, segregated, handled, transported, and recovered or disposed of appropriately and in accordance with circular economy and waste hierarchy principles.	Prepare an operation waste management sub-plan prior to operation of the project. Adopt the circular economy principles and the waste hierarchy contained in the *Waste Avoidance and Resource Recovery Act 2001* including a commitment to recycle batteries as far as practical. Detail processes, responsibilities, and measures to manage waste and resource use and minimise the potential for impacts during operation.	Operation
WA5	Decommissioning and rehabilitation waste is stored, segregated, handled, transported, and recovered/recycled or disposed of appropriately and in accordance with circular economy and waste hierarchy principles.	Prepare a decommissioning and rehabilitation waste management sub-plan prior to closure of the project. Include details on all relevant legislative and regulatory requirements and details of the proposed waste classification, demolition waste stockpiling, storage, handling and reuse, recycling, and disposal requirements. Also include an investigation of opportunities and feasibility of recycling of batteries. Undertake a detailed examination of battery life and investigate opportunities and feasibility of recycling spent batteries prior to operations commencing if not able to be returned to the manufacturer or supplier.	Operation, decommissioning and rehabilitation

6.12.5 Conclusion

The project is not expected to generate large volumes of waste during construction, operation, or decommissioning and rehabilitation.

Waste generated during construction would be managed using circular economy principles and the waste hierarchy approach of avoidance and reuse before consideration is given to disposal. Wastes would be managed in accordance with the waste provisions contained within the POEO Act and other relevant legislative and policy requirements.

Should waste be found to be unsuitable for reuse or recycling, disposal methods would be selected based on the classification of the waste material in accordance with the NSW EPA (2014) Waste Classification Guidelines (NSW EPA 2014).

The proposed approach to managing construction, operation and rehabilitation and decommissioning waste, including measures to facilitate segregation and prevent cross contamination would be documented in the respective waste management and spoil management sub-plans.

With the implementation of these plans and the mitigation measures identified, waste management activities would not have a significant impact on the environment or human health.

6.13 Air quality

6.13.1 Overview

This section assesses the potential air quality impacts associated with the construction, operation, and decommissioning and rehabilitation of the project and provides mitigation measures to reduce potential air quality impacts associated with the Waratah Super Battery.

6.13.2 Methodology

6.13.2.1 Government plans, policies, and guidelines

The air quality assessment was prepared with reference to the following plans/policies/guidelines:

– Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (the Approved Methods) (NSW EPA 2016).
– Guidance on the Assessment of Dust from Demolition and Construction (IAQM Guidance) (Institute of Air Quality Management 2014)

6.13.2.2 Desktop assessment

A qualitative air quality impact assessment was undertaken to estimate the potential air quality impacts associated with the construction, operation, and decommissioning and rehabilitation of the project. The assessment included:

– Review of the existing environment (land use, ambient air quality, and meteorology).
– Review of the proposed construction methodology, including equipment and processes.
– Identification of construction activities which may lead to emissions.
– Identification of nearby sensitive receptors to construction activities.
– A qualitative air quality assessment with a focus on construction particulates and dust.
– Identification of project-specific mitigation measures to manage the potential for dust impacts.

6.13.2.3 Assessment criteria

Assessment criteria for the project were taken from the Approved Methods.

The objective of the criteria is ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution. There is an obligation during construction and operation of the project to comply with the criteria.

Relevant assessment criteria for the primary pollutants associated with construction and operation of the project are presented in Table 6.67. The criteria apply to the total impact (increment plus background) and must be reported as the 100th percentile (maximum).

Table 6.67 Air quality impact assessment criteria

Pollutant	Averaging period	Impact location	Impact type	Criteria (µg/m^3)
TSP	Annual	Sensitive receptor	Cumulative	90
PM_{10}	24 hour	Sensitive receptor	Cumulative	50
	Annual	Sensitive receptor	Cumulative	25
$PM_{2.5}$	24 hour	Sensitive receptor	Cumulative	25
	Annual	Sensitive receptor	Cumulative	8
Deposited dust	Annual (maximum increase)	Sensitive receptor	Cumulative	2 g/m^2/month
	Annual (maximum total)	Sensitive receptor	Cumulative	4 g/m^2/month

6.13.2.4 Field surveys

Field surveys were not undertaken as part of the qualitative air quality assessment for the Waratah Super Battery.

6.13.3 Existing environment

6.13.3.1 Ambient air quality

DPE operates air quality monitoring stations (AQMS) in many locations across NSW. The nearest stations to the project site are the Morisset and Wyong AQMS which are located approximately 9.8 kilometres northeast and 12.7 kilometres southwest of the project site, respectively. The Morisset AQMS was commissioned in November 2020 and, as such, has not been included in the ambient air quality summary.

A summary of the ambient air quality data recorded at the AQMS is provided in Table 6.68. There are no exceedances of the criteria. Annual average concentrations of both $PM_{2.5}$ and PM_{10} were both elevated in 2019 due to bushfires in the state. Data from the most recent year (2021) shows better air quality than the previous four years and may be due to higher-than-average rainfall and minimal major bushfire events.

Table 6.68 Summary of available background air quality data recorded at DPE Wyong AQMS

Pollutant	Averaging Period	Concentration (µg/m^3)				
		2017	2018	2019	2020	2021
Wyong						
PM_{10}	Maximum 24 hour average	63.4	138.3	166.8	90.5	41.2
	Annual average	15.9	17.8	21.2	15.7	13.3
$PM_{2.5}$	Maximum 24 hour average	20.4	18.1	185.3	63.9	14.2
	Annual average	5.5	6.1	9.4	5.4	4.7

6.13.3.2 Climate and meteorology

The local climate and meteorology (weather) within the project area is of critical importance when assessing the potential for air quality impacts at sensitive receptors.

6.13.3.2.1 Temperature

Monthly mean temperature statistics for data measured at the Bureau of Meteorology (BoM) Norah Head AWS for the period 2017 through 2021 were reviewed. The 50th percentile monthly maximum and minimum temperatures range from 27/21 °C (Jan) to 17/11 (Jun).

6.13.3.2.2 Rainfall

Monthly rainfall statistics for data measured at BoM Norah Head AWS for the period 2017 through 2019 were reviewed. Flooding in 2020 significantly affected the data averages, therefore, the time period was reduced to show the general rainfall trends outside of this anomalous year.

The data indicate that the most number of rain days occurred, on average over the three year data period, in March, April, June and October. The maximum average rainfall occurred in June and July and was 259 and 208 millimetres respectively.

The data also shows that the number of rain days and the total rainfall amounts are greater during the autumn and winter months.

6.13.3.2.3 Wind

The average wind rose over the period 2017-2021 was generated from information obtained from BoM. The following features are observed:

– The average wind speed measured was 4.7 metres per second (m/s).
– Calm conditions (wind speeds less than 0.5 m/s) occurred 0.8 per cent of the time.
– High wind speeds (winds greater than 5 m/s which are often attributed to dust lift off) mostly occur from the northeast and south.
– Winds generally occur from all directions except from the east.

6.13.3.3 Sensitive receptors

The nearest sensitive receptors are located in the suburb of Halekulani, approximately 600 metres southeast of the project site at the nearest point. To the west of the project site are the neighbouring suburbs of San Remo and Buff Point, about 1.4 kilometres west and 1.3 kilometres southwest, respectively.

Sensitive habitats in the vicinity includes Colongra Swamp located approximately 640 metres northeast of the project site.

6.13.4 Potential impacts

6.13.4.1 Construction

A detailed assessment is required as per the IAQM Guidance where there is a human receptor within:

– 350 metres of the boundary of the site; or
– 50 metres of the route(s) used by construction vehicles on the public highway, up to 500 metres from the site entrance(s).

As there are no human receptors within these distances, a detailed assessment is not required for this project. Regardless, the activities expected to produce the largest dust emissions have been identified and mitigation measures provided to manage these emissions.

A detailed construction methodology is provided in Section 3.2. A summary of the construction activities that would emit dust and the estimated dust emission magnitude is provided in Table 6.69. Activities which generally are a significant source of dust are trucks travelling on unpaved roads, excavations associated with bulk earthworks, importing and spreading fill, and stockpiles. Construction would occur over approximately 18 months and is planned to commence by June 2023.

Most high-speed winds which contribute to dust lift off, occur from the south and northeast, meaning that dust impacts would occur to the north and southwest (downwind). There are no identified sensitive receptors to the north of the project site and the nearest receptors to the southwest are approximately 1.3 kilometres away. Heavy vegetation surrounding the project site would also reduce wind speeds and dust impacts on the surrounding environment.

Table 6.69 Construction dust emissions

Construction stage	Description	Comparison with IAQM	Dust emission magnitude
Demolition	Demolition and rehabilitation of site is part of the Munmorah Power Station demolition (responsibility of GPM) and therefore is not assessed here.	-	-
Earthworks	– Upgrading of access roads – Clearing of any remaining vegetation – Stripping of topsoil and subsoil – Installation and relocation of temporary services	Total disturbed land area of approximately 14 hectares (>10,000 m^3).	Large
Construction	– Establishment of concrete slabs or foundations – Installation of electrical fit out, switchyard, and overhead transmission line – Upgrade of access road – Installation of site services – Construction of administration and maintenance buildings and required parking areas	Total building volume conservatively estimated >100,000 m^3.	Large
Trackout	Establishment and paving of construction access roads would be completed at the start of the construction process.	Minimal dust impacts as no unpaved access roads in use.	Small

The project site is currently occupied by a former coal loader structure. Demolition of this structure will be undertaken by GPM under its current approval.

The dust emission magnitude has been identified as large for earthworks and construction, and small for trackout. Due to the distance between the receptors and the project site, dust impacts are not expected to be significant regardless of the estimated dust emission magnitude and the proposed mitigation measures would reduce this risk even further (refer Section 6.13.5). Contamination risks and management measures are provided in Section 6.3.

6.13.4.2 Operation

The following activities would be carried out during operation of the project:

– Maintenance and management of equipment.
– Maintenance of transmission line corridor (trimming of vegetation).
– General office activities.
– Receipt of goods.
– Waste removal.

Operational activities, such as maintenance vehicle movements, are not expected to produce any significant emissions to air and, therefore, have not been further assessed. There is the potential for air quality impacts associated with fires, however the risk of health impacts arising from this smoke would be low, as described in section 6.9.4.2.3.6. Risk of fire and associated air quality impacts is considered in Section 6.9.

6.13.4.3 Decommissioning and rehabilitation

Upon final closure, all infrastructure, utilities, and disturbed areas would be decommissioned and returned to the pre-existing land use in consultation with relevant stakeholders.

Decommissioning and rehabilitation of the project is expected to produce similar or less emissions (and, therefore, impacts) than construction and, therefore, have not been further assessed.

6.13.5 Mitigation measures

Mitigation measures proposed to avoid or minimise potential air quality impacts during construction, operation, and decommissioning and rehabilitation of the project are listed in Table 6.70. These measures would be included in the issue-specific environmental management sub-plans the Waratah Super Battery.

Table 6.70 Mitigation measures – air quality

No.	Outcome	Mitigation measure	Timing
AQ1	Dust emissions are minimised during construction.	Prepare a construction dust control protocol that details management measures, a method for recording dust complaints, and monitoring requirements.	Pre-construction
AQ2	Dust emissions are minimised during construction.	On days with forecast and actual high winds (i.e., over 10 m/s), reduce work effort accordingly if wind-blown dust is observed to be leaving the site boundary.	Construction
AQ3	Dust emissions are minimised during construction.	Undertake dust suppression, as required, using water sprays, water extension agents, soil stabilising polymers or other media on: – Unpaved work areas subject to traffic or wind. – Spoil and aggregate stockpiles. – During the loading and unloading of dust generating materials. – Unpaved access tracks.	Construction
AQ4	Dust emissions are minimised during construction.	If the works are creating levels of dust which may significantly impact on public amenity, modify or stop the works until the dust hazard is reduced to an acceptable level.	Construction
AQ5	Ignition risk, spills, and air emissions are minimised during construction and operation.	Maintain plant and equipment in good condition to minimise ignition risk of fuel or chemicals, spills, and air emissions that may cause nuisance.	Construction and operation

6.13.6 Conclusion

The main emissions to air are dust and particulate matter during construction of the project. Dust emissions would primarily occur during the earthworks and construction stages of the project due to the scale of the construction activities occurring. The potential air quality impacts would be minor due to the distance between the project site and the nearest receptors and would be managed by the provided mitigation measures. Operational activities, as well as decommissioning and rehabilitation, are not expected to produce any significant emissions to air.

6.14 Cumulative impacts

Cumulative impacts are compounding environmental and community impacts caused by present or reasonably foreseeable future activities. Cumulative impacts may arise from the interaction of the construction or operational activities of the project and other proposed projects in the area.

6.14.1 Identification of relevant projects

The assessment of cumulative impacts focused on the project's interaction with other projects in the locality where construction and/or operational timeframes are likely to be concurrent and impacts could reasonably expect to accumulate.

A search of the DPE Major Projects database was undertaken on 5 September 2022 to identify other State Significant Development (SSD) and State Significant Infrastructure (SSI) projects within the vicinity of the project that may be relevant to the cumulative impact assessment. To be considered relevant, nearby projects needed to be of similar size, within reasonable proximity and have a timeframe that may overlap with the project. The identified projects are outlined in Table 6.71.

Table 6.71 Relevant existing/future projects for cumulative impact assessment

Project	Assessment stage	Relevance
St Philip's Christian College Charmhaven (SSD-14082938)	Prepare EIS	The St Philip's Christian College project is about 5.6 kilometres southwest of the project site and proposes the construction of a new school for 1,500 students. There is potential for the two projects to be constructed concurrently.
Chain Valley Colliery Consolidation Project (SSD-17017460)	Prepare EIS	The Chain Valley Colliery Consolidation project is about 5.6 kilometres north of the project site and proposes to consolidate the Chain Valley Colliery and Mannering Colliery consents, align extraction and production rates and extend the approved mining area. There is potential for the two projects to be constructed concurrently
Colongra Power Station Mod 4	Determination	The Colongra Power station is about 490 metres northeast of the project site. It was approved in 2006 with four modifications approved since, modification 4 the most recent approval in July 2022. The modification approved the amendment for emergency exceedance of air emission limits.

6.14.2 Cumulative impact screening

There may be potential for cumulative noise and traffic impacts with the St Phillip's Christian College Charmhaven and the Chain Valley Colliery Consolidation Project, however, details of these projects are currently limited while the EISs are being prepared. On the basis of the information available, these two projects are more than five kilometres distant from the project site and it is, therefore, unlikely that cumulative impacts would arise during construction or operation.

In relation to the most recent modification for the Colongra Power Station (approved in July 2022), the project is unlikely to affect air quality except during construction, however, the parameters for which approval was granted are unlikely to be the same as those temporarily generated during the construction phase of the project. Therefore, no cumulative (air quality) issues are likely.

Any major maintenance activities undertaken at the power station may require intensive periods of heavy vehicles or materials to be transported to the site. In addition, the facility receives regular deliveries of diesel which need to be maintained. Any potential for cumulative traffic impacts or congestion which may interrupt these deliveries would be discussed in advance with the operator of the power station to ensure they are able to continue, as required.

6.15 Sustainability

Sustainability outcomes for the project would be informed by the following statutory requirements and other policies:

– National Construction Code (Australian Building Codes Board (ABCB 2022)
– NSW Government Resource Efficiency Policy (GREP) (State of NSW and Office of Environment and Heritage 2019).
– NSW Climate Change Policy (State of NSW and Office of Environment and Heritage 2016).
– NSW Net Zero (DPIE 2020b).
– NSW Circular Economy Policy Statement: Too Good to Waste (NSW EPA 2019).

There are also a number of voluntary sustainability frameworks used on major building and infrastructure projects that drive industry best practice and outcomes that often goes beyond minimum regulatory standards. Whilst a formal sustainability rating is not being proposed for this project there is a commitment to:

– Integrate a number of best practice sustainability features.
– Review additional stretch initiatives to potentially adopt for the project.

The sustainability initiatives that would be implemented to align the project with the above documents are outlined in Table 6.72.

Table 6.72 Sustainability initiatives

Sustainability category	Industry best practice initiatives to be adopted	Additional stretch initiatives to be reviewed and adopted, where feasible
Governance and leadership	– Define minimum sustainability targets prior to detailed design and construction phase of the project. This may include informal alignment or targeting formal certification under the Infrastructure Sustainability Rating Tool. – Sustainability targets and management practices are to be included as part of the overall Environmental Management Strategy (EMS).	– The appointed contractor should: • Be ISO 14001 accredited. • Complete sustainability training as part of worker inductions. • Have in place an employee well-being program. • Have in place a diversity and inclusion program and an action plan.
Climate risk and adaptation	– A high-level climate risk screening using published data (such as NSW Adapt) to be undertaken by the project team in the subsequent phase of the project. – The project team communicates the asset's exposure to climate change risks to the proponent (EnergyCo).	– Carry out a detailed climate risk assessment in accordance with AS5334:2013 Climate change adaptation for settlements and infrastructure. – Implement physical and operational adaptation responses for all high and extreme risks into design.
Energy use	**Design** – Buildings to adopt passive design and energy efficient building services to minimise energy and carbon emissions and achieve minimum 10% reduction over National Construction Code DTS building. – Buildings to be fully electrified to support net zero enabled design. – Energy metering of facilities to enable on-going energy management. – Include electrical capacity and connection points in car parking facilities for future provision of electric vehicle charging infrastructure.	**Design** – Use of roof mounted solar PV on operations and maintenance building. – Solar powered external lighting. – Buildings to achieve 20% reduction over National Construction Code DTS building. – Include provision of electric vehicle charging for 5% of parking.

Sustainability category	Industry best practice initiatives to be adopted	Additional stretch initiatives to be reviewed and adopted, where feasible
	Construction – Solar/battery powered construction lighting. – Temporary lighting should be direction/adjustable. – Implement management practices that help to reduce fuel consumption.	**Construction** – Use of electric vehicles for product and materials movement on-site. – Increased substitution of Biodiesel (e.g., B5) and bioethanol (e.g., E10) fuel in construction, equipment, and vehicles to reduce fossil fuel consumption.
	Operation – Implement ongoing energy monitoring and management. – Office equipment is to meet the minimum energy performance, as required by NSW GREP. – Purchase minimum 6% GreenPower as per NSW GREP.	**Operation** – Purchase higher proportion of GreenPower than minimum GREP requirements of 6%.
Materials	**Design** – Utilise recycled supplementary cementitious materials (SCM) in concrete applications (e.g., fly ash, GGBFS). – Utilise recycled aggregates in concrete and asphalt mixes (e.g., recycled concrete aggregate (RCA), recycled asphalt pavement (RAP)). – Utilise recycled products for binder replacement in asphalt mixes (e.g., crumb rubber, soft plastics, ink cartridge waste). – Increase design life and durability of elements, i.e., thicker pavement, double dip galvanizing to reduce the need for maintenance. – Facility to be designed to standard product dimensions, where possible, to reduce contraction wastage.	**Design** – Select products with verified third party certification such as Environmental Product Declarations and sourced from certified environmentally responsible suppliers. – Sustainably source timber products from a forest certified and/or reused products (e.g., FSC / PEFC certified timbers). – Structural and reinforcing steels to be produced using high percentages of recycled steel feed materials. Reinforcing steels to be sourced from a manufacturer that utilises energy efficient processes (e.g., Electric Arc Furnace). – Design for disassembly to allow materials to be recovered, reused, or recycled at end of facility life, where possible.
	Construction – Optimise cut and fill volumes to reduce bulk earthworks.	**Construction** – Local sourcing – set a minimum kilometres radius to procure materials.
	Operation – Maintain facility in accordance with recommended practice to reduce need for replacement or major upgrade.	**Operation** – Not applicable.
Water	**Design** – Water fittings and fixtures for facilities to meet minimum NSW GREP requirements. – Water sensitive urban design measures to manage stormwater discharge volumes and water quality.	**Design** – Rainwater capture for facilities to offset landscape irrigation and toilet flushing.
	Construction – Management practices that help to reduce water consumption. – Reuse of site collected water	**Construction** – Not applicable.
	Operation – Maintain stormwater system to prevent downstream pollution.	**Operation** – Not applicable.

7. Environmental management

7.1 Overview

This chapter provides an overview of the strategic environmental management framework which would apply during all stages of development of the Waratah Super Battery. It describes the overarching environmental management strategy and associated issue-specific environmental management subplans that would be developed and implemented to avoid, mitigate, and manage the potential environmental impacts associated with the construction, operation, and decommissioning and rehabilitation of the Waratah Super Battery.

7.2 Environmental management strategy

An environmental management strategy would be developed to provide the overall strategic framework for environmental management of the Waratah Super Battery. The strategy developed would acknowledge and implement the requirements of any site contamination operational environmental management plan applying to the site, as a result of the remediation action plan currently being prepared by GPM.

The environmental management strategy developed would overarch associated issue-specific environmental management subplans and contractor construction work method statements/protocols for the Waratah Super Battery, as shown in Figure 7.1.

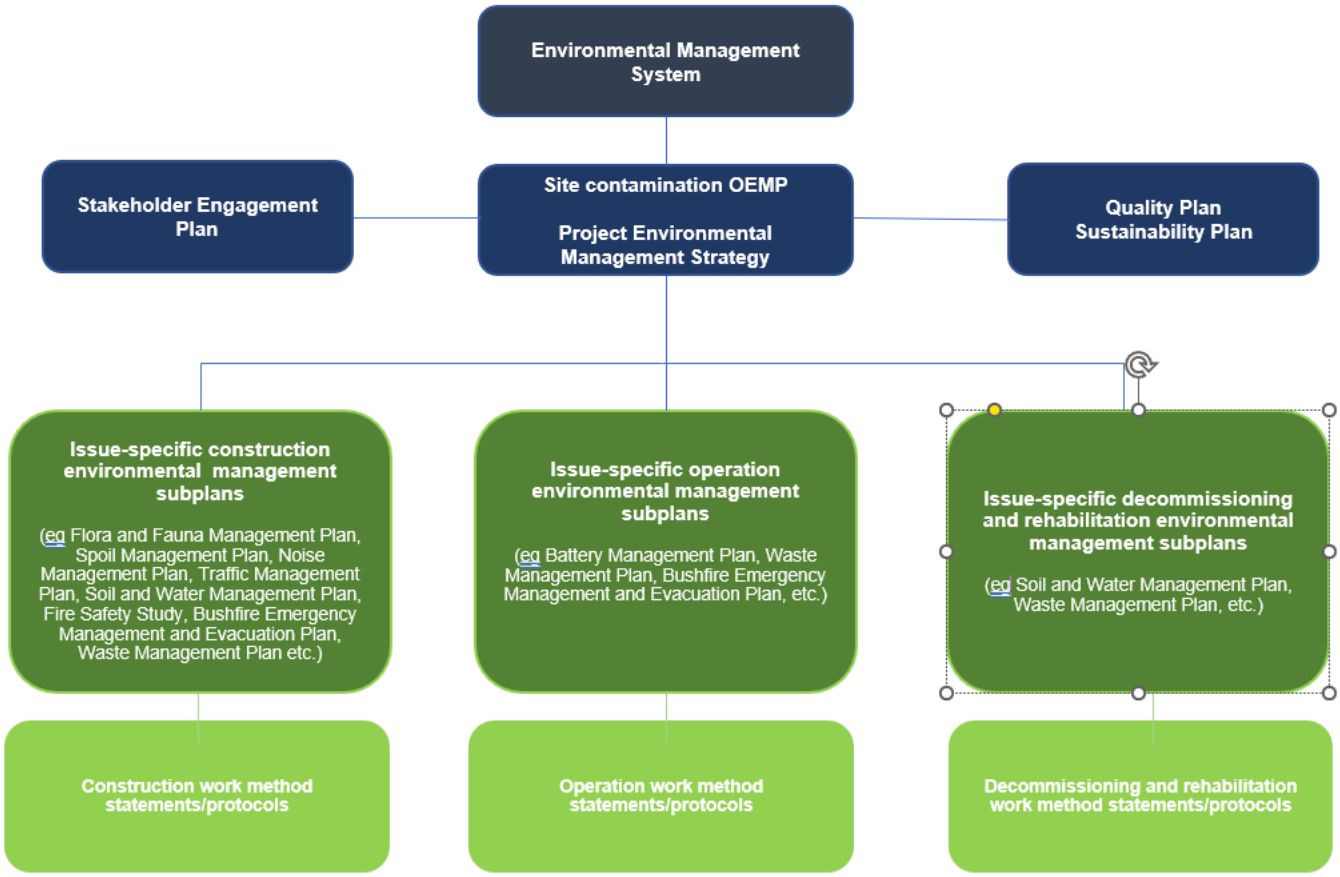

Figure 7.1 Structure of environmental management strategy for the Waratah Super Battery

The environmental management strategy would be prepared in accordance with the mitigation measures and commitments detailed in this EIS and the subsequent CSSI Infrastructure Approval, if the project is approved by the NSW Minister for Planning. It would also be prepared in accordance with any other statutory or licensing requirements that apply to the project at the time.

The purpose of the environmental management strategy would be to ensure that environmental management measures outlined in the issue-specific environmental management plans are incorporated into a comprehensive framework to facilitate appropriate management throughout the life of the Waratah Super Battery. The environmental management strategy would include requirements to:

– Ensure that controls are properly implemented, regularly monitored, and audited to assess their effectiveness.
– Ensure processes for resourcing and implementing the environmental management strategy are developed to provide certainty of delivery.
– Demonstrate compliance with statutory, legislative and consent conditions.
– Minimise impacts on the community and the environment.
– Ensure timely and efficient response to environmental incidents and complaints.
– Monitor, review, and report on environmental impacts of construction, operation, and decommissioning and rehabilitation activities.

The environmental management strategy would be developed to be consistent with policies or standards in place at the time, such as Australian Standards (AS)/New Zealand Standards (NZS) 14001:2015 Environmental Management Systems.

7.3 Issue-specific environmental management subplans

7.3.1 Requirements

The issue-specific environmental management subplans to be developed and implemented as part of the environmental management strategy and would include various construction environmental management subplans, operation environmental management subplans, and decommissioning and rehabilitation environmental management subplans. The issue-specific environmental management subplans would be living documents and would be reviewed and amended, as necessary, over the life of the Waratah Super Battery.

The issue-specific environmental management subplans would be prepared in accordance with the mitigation measures and commitments detailed in this EIS and the subsequent CSSI Infrastructure Approval, if the project is approved by the NSW Minister for Planning. They would also be prepared in accordance with any other statutory or licensing requirements that apply to the project at the time.

In addition to the above requirements, the issue-specific environmental management subplans would be developed to be consistent with any other overarching plans, policies or standards in place at the time, such as:

– ISO 14001:2015 Environmental Management Systems.
– NSW Environmental Management Plan Guideline (DPIE 2020).

The issue-specific environmental management subplans would also make reference to the relevant industry standard guidelines for specific issues and activities. For example, erosion and sedimentation would be managed in accordance with *Soils and Construction: Managing Urban Stormwater Volume 1* (the ‘Blue Book’).

7.3.2 Content and structure

The content of the issue-specific environmental management subplans would follow the same basic structure, similar to that outlined in Table 7.1 and accordance with the requirements listed in Section 7.3.1.

Table 7.1 Example content of issue-specific environmental management subplans

Chapter	Content
Introduction	– Purpose, scope, and objectives of the plan. – Identification of the conditions of consent to which the plan relates and where in the document these are addressed.
Project description	– Project overview. – Site location. – Scope of works. – Timing of activities.
Community and stakeholder engagement	– How the community and other stakeholders will be informed about the project status and environmental performance. – How complaints and enquiries will be managed.
Environmental management framework	– Relationship to environmental management system. – Environmental management structure and responsibilities. – Legal and compliance requirements. – Training and awareness. – Environmental risk assessment. – Hold points. – Environmental management measures. – Environmental monitoring program. – Environmental inspections. – Environmental control maps or plans. – Environmental management documents. – Compliance monitoring and reporting. – Environmental auditing. – Environmental incident and emergency planning, preparedness, and response. – Corrective and preventative actions. – Review and revision.

7.4 Work method statements/protocols

Work method statements/protocols would be developed for construction, operation, and decommissioning and rehabilitation of the Waratah Super Battery. These work method statements/protocols would contain instruction for contractors (during construction and decommissioning and rehabilitation) and for employees (during operation) on how to implement the environmental management measures outlined in the issue-specific environmental management subplans. Each contractor would likely develop their own work method statements/protocols.

7.5 Mitigation measures

A compilation of mitigation measures (excluding mitigation measures that are built into the physical layout and design of the project and captured in the project description) is provided in Appendix C. These mitigation measures would be incorporated into the environmental management strategy and environmental management plans developed for the construction, operation, and decommissioning and rehabilitation of the Waratah Super Battery.

8. Justification and conclusion

8.1 Justification

The Waratah Super Battery is considered to be justified because it:

– Responds to a critical, recognised need and is consistent with several state and federal government plans, policy, and guidelines with regards to planning for a reliable, affordable, and sustainable electricity future in NSW.
– Is proposed on a site which is already appropriately zoned for energy infrastructure, was formerly used for operation of the Munmorah Power Station, is remote from sensitive receivers and would not result in any foreseeable land use conflicts with surrounding developments.
– Provides major, short-term and long-term benefits to Sydney, the Central Coast, Newcastle, Wollongong, and NSW.
– Would not result in significant, adverse environmental, social, or economic impacts.
– Is consistent with the principles of ecologically sustainable development, the objects of the EP&A Act and is considered to be in the public interest.

8.1.1 A critical, recognised need

In recent years, there has been an acceleration of plans for retirement and decommissioning of traditional fossil fuel (mainly coal) generators due to aging infrastructure together with an acceleration in deployment of large-scale renewable energy generators in the NEM. Four of NSW's five remaining coal-fired generators are set to reach the end of their technical lives and close by 2032.

The NSW Government has appointed the AEMO as the Energy Security Target Monitor for the Electricity Infrastructure Roadmap. Under the appointment, AEMO is responsible for ensuring that there will be reliable supplies of electricity available to meet demands over the medium term.

In May 2022, AEMO released an updated Energy Security Target Monitor Report that brought forward a projected breach of the Energy Security Target from 2029-30 to 2025-26 (AEMO 2022a). Numerous projects were described in the 2021 Energy Security Target Monitor Report that are designed to increase intra-regional transmission limits, including the Waratah Super Battery (this project). If HumeLink and the Sydney Ring Project, including the Waratah Super Battery were implemented, they would unlock access to approximately 2,500 MW of already committed firm generation and storage capacity. As a result, the EST would be in surplus until 2032-33 when four of the five existing coal-fired generators are predicted to have closed.

The Waratah Super Battery, a critical early component of the Sydney Ring Project (refer Section 2.1, is being developed as a Priority Transmission Infrastructure Project, as set out under the EII Act, consistent with AEMO's identification of the project as an actionable NSW project in the 2022 Integrated System Plan.

8.1.2 A suitable site, appropriately zoned

The former Munmorah Power Station comprises a total land area of approximately 727 hectares. An area of approximately 14 hectares is required for the Waratah Super Battery and is considered suitable as it is already appropriately zoned for energy infrastructure and is owned by the NSW Government. The site is currently vacant and is remote (approximately 600 metres) from the nearest residential receivers. There are no anticipated land use conflicts likely to arise from the proposed reuse of the site for the proposed project.

A number of alternatives were investigated as part of the design process (refer Section 2.3) and included the site location within the former Munmorah Power Station site, configuration of major project components and alternate battery technologies. The proposed site located south of the former Munmorah Power Station is already highly disturbed from historical operational activities, has good access to the NEM and existing utility supplies.

There is a critical imperative to proceed with the project at the site to avoid a forecast breach of the EST. The proposed site has been chosen through a deliberate process, including a market sounding in which parties were invited to offer alternative development sites. The project is an actionable NSW project under the EII Act and the consequences of not proceeding would result in very significant economic and social costs for NSW, and particularly electricity consumers in Sydney, Newcastle, and Wollongong. The benefits detailed in the section below would also not be realised.

8.1.3 Provides major, short-term and long-term benefits

The Waratah Super Battery would result in significant, positive, short-term and long-term benefits to the Central Coast, Sydney, Newcastle, Wollongong and to NSW. These benefits include:

– Delivering a secure source of back-up electricity for NSW.
– Supporting a sustainable, green electricity future for NSW.
– Reducing carbon emissions produced by the electricity sector in NSW.
– Reducing the price of electricity in NSW.
– Providing major investment in NSW.
– Creating long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially further afield in NSW.

8.1.4 Results in no significant environmental, social, or economic impacts

A combination of desktop and site surveys and investigations were undertaken to verify the characteristics of the existing environment and assess the potential environmental, social, and economic impacts during construction, operation, and decommissioning and rehabilitation of the Waratah Super Battery. Given the short- and medium-term nature of the construction and operation stages of the project and the risks of potential impacts, the assessment focussed on these key stages of the project.

The key environmental issues were identified as comprising: biodiversity, heritage, land, visual, noise, transport, hazards, social impact, economic and waste. The EIS concludes that many of the potential impacts identified would be able to be addressed either through ongoing design investigations and management actions eg historical contamination issues, battery fire risks, bushfire potential or through mitigation measures recommended as part of the EIS. Ongoing consultation with other site users e.g., Snowy Hydro and the surrounding community would also continue throughout the construction and operation phase.

The identified social issues likely to occur would generally be of a low or neutral impact. Impacts that occur during construction would be temporary and mitigation and management measures have been recommended to avoid, minimise and manage potential social impacts, and enhance social benefits.

The project represents a major, direct capital investment of approximately $1 billion in the state of NSW which is further increased through the multiplier effect when considering indirect employment and other flow-on economic benefits. As outlined in Section 2.1, the project is needed to address a forecast breach of the energy security target and is critical to addressing energy cost, security and reliability issues for NSW residents.

8.1.5 Consistent with the principles of ecologically sustainable development

The principles of ecologically sustainable development include:

– The precautionary principle – Where there are threats of serious or irreversible environmental damage, a lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
– Inter-generational equity – The present generation should ensure that the health, diversity, and productivity of the environment are maintained or enhanced for the benefit of future generations.

– Conservation of biological diversity and ecological integrity – Conservation of biological diversity and ecological integrity should be a fundamental consideration.
– Improved valuation, pricing, and incentive mechanisms – Includes the recognition of the principles that the costs of environmental externalities should be internalised, and that the polluter should bear the costs associated with environmental pollution.

8.1.5.1 Precautionary principle

The site has been selected in order to reuse a former industrial site which is suitable for the proposed development and is consistent with other existing uses of the site.

Desktop and field investigations have been undertaken to ensure that the potential environmental, social, and economic impacts of the project are understood with a high degree of certainty. The assessments undertaken have adopted accepted scientific methodologies and have taken into account relevant statutory and government agency plans, policies, and guidelines.

The project has been designed to avoid environmental impacts, where possible, and to reflect the findings of the specialist studies undertaken. Mitigation and management measures have been proposed to minimise environmental, social, and economic impacts. None of the potential impacts are considered likely to result in serious or irreversible environmental impacts if the recommended mitigation and management measures are implemented effectively.

8.1.5.2 Inter-generational equity

The project would deliver inter-generational equity by providing the means to transition from the existing fossil-fuelled generators to renewable energy sources, thus ensuring the health, diversity and productivity of the environment is maintained for the benefit of future generations. The project would deliver a secure source of back-up electricity and support a reliable, affordable and sustainable electricity future for NSW consumers.

The project has the potential to lead to some environmental risks during operation and also, during decommissioning and rehabilitation. There would be potential risks of hazards e.g., battery fire during operation, as well as interaction with historical contamination during decommissioning and rehabilitation works (depending on scope). However, implementation of the precautions and protocols included in the mitigation measures would help reduce the likelihood of a significant impact that would diminish the health, diversity, or productivity of the environment for present or future generations.

8.1.5.3 Conservation of biological diversity and ecological integrity

The site location was selected in part to minimise direct and indirect impacts on native vegetation, TECs, threatened species and their habitat (refer Section 2.3.2).

The project would result in residual direct impacts to a total of 0.46 hectares of native vegetation (commensurate with Swamp Sclerophyll Forest TEC) in moderate condition. Outside of these mapped areas, the majority of the project site is already cleared and denuded. The areas of native vegetation are fragmented providing minimal fauna habitat and connectivity in the context of the surrounding landscape. The removal of 0.46 hectares of native vegetation is considered insignificant at the regional scale and is unlikely to threaten the persistence of populations of native plants and vegetation communities.

Potential indirect impacts are considered limited are as they would have a low likelihood and consequence due to a range a mitigation measures that would be implemented. No prescribed impacts are considered of high relevance to the project.

A range of mitigation and management measures have been proposed for residual impacts, including further surveys in the appropriate season in 2022 to confirm presence or absence of species assumed present, and to verify the impacts of the project. The results would be reported in the project Submissions Report.

8.1.5.4 Improved valuation, pricing, and incentive mechanisms

The environmental impact assessment has identified the potential environmental, social, and economic impacts of the project and identified mitigation and management measures, where appropriate, to manage potential impacts. If approved, the project would be undertaken in accordance with these mitigation and management measures. These requirements would result in an economic cost to the proponent, indicating that environmental resources have been given appropriate valuation in the development of the project.

The project has been designed with an objective of minimising potential impacts on the surrounding environment. This indicates that the project has been developed with consideration of environmental outcomes.

8.2 Consideration of the objects of the EP&A Act

The project has been developed with consideration of the objects of the EP&A Act, as outlined in Table 8.1.

Table 8.1 Consideration of the project against the objects of the EP&A Act

Object	Response
To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The project would result in a significant direct investment of approximately $1 billion into the NSW economy. Additional benefits would include flow-on jobs and services. Reuse of the former Munmorah Power Station site would also ensure the conservation of environmental resources being industrial land. The project would result in a major overarching social and economic benefits to electricity consumers in Sydney, Newcastle, and Wollongong during operation.
To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision making about environmental planning and assessment.	The project is consistent with the principles of ESD, as outlined in Section 8.1.5.
To promote the orderly and economic use and development of land.	The project would be located on land appropriately zoned SP2 Infrastructure and would reuse currently vacant industrial land on which the Munmorah Power Station formerly operated. By targeting land which was formerly (and currently) used for similar purposes and has good access to the NEM, the project would promote the orderly and economic use of the land.
To promote the delivery and maintenance of affordable housing.	This object is not relevant to the project.
To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities, and their habitats.	A comprehensive biodiversity assessment has been undertaken to identify potential adverse impacts on biodiversity. The assessment demonstrates that the project would not have a significant impact on any local populations of native biota, including threatened and endangered species, populations, or ecological communities listed under the BC Act or the EPBC Act.
To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	There are no Aboriginal heritage items identified within the project site that would be affected by the project. The infrastructure proposed as part of the project would be similar to other existing infrastructure of the Colongra Power Station and transmission substation.
To promote good design and amenity of the built environment.	Good design and amenity of the built environment has and would continue to be considered during ongoing project development. Early consideration was given to the configuration of the site and placement of the main project components with a view to optimising the site layout in conjunction with minimising the potential for social and environmental impact.
To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	A preliminary hazard assessment has been completed for the project that has identified initial risks and recommended further studies and mitigation measures to be implemented based on ongoing design and procurement of infrastructure components. Importantly, a lithium-iron-phosphate battery chemistry has been adopted which is determined to have a lower fire risk than other battery systems currently in operation around Australia.

Object	Response
	The design, construction and maintenance of the project would be undertaken in accordance with manufacturer requirements and other applicable standards and relevant design codes and guidelines.
To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	EnergyCo is seeking planning approval in accordance with Part 5, Division 5.2 of the EP&A Act. Consultation has included various energy industry bodies and regulators, state government agencies, Central Coast Council, and the community.
To provide increased opportunity for community participation in environmental planning and assessment.	As outlined in Chapter 5, consultation with the community was undertaken by means of a project website, community newsletter, letterbox drop, and media releases by EnergyCo and maintenance of enquiry lines (phone and email) prior to exhibition of the EIS. Exhibition of the EIS would provide additional opportunities for community participation in the approvals process.

8.3 Conclusion

Environmental investigations have been undertaken to assess the potential impacts from the construction, operation, and decommissioning and rehabilitation of the project in accordance with relevant environmental legislation and government plans, policies, and guidelines.

Based on the findings of the environmental impact assessment, the project would result in some temporary, minor adverse impacts during construction (e.g., temporary elevated levels of dust, noise, and traffic generation). There would be an increased potential for hazards and risks during operation. However, implementation of the proposed mitigation measures and included in the various issue-specific environmental management subplans would ensure that there would be no significant impact from the project on the environment or the community.

The project would provide both short-term and long-term benefits including delivering a secure source of back-up electricity for NSW, supporting a sustainable, green electricity future for NSW, reducing carbon emissions produced by the electricity sector in NSW, and reducing the price of electricity in NSW, providing major investment in NSW. The project would also create training and long-term job opportunities on the Central Coast, Sydney, Newcastle, and potentially other parts of NSW.

The project is considered critical to avoid a forecast breach of the EST and in supporting the NSW Government's electricity strategy and infrastructure roadmap. The project has been designed and assessed with regard to the matters for consideration under Section 5.16 of the EP&A Act, including the objects of the EP&A Act and is considered to be consistent with the principles of ecologically sustainable development and therefore in the public interest.

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