Appendix A
Detailed Project Description

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1 Description of the Project

1.1 Introduction

This document provides the description of the Project, including details of how it will be built over the estimated five-year construction period and how it will be operated over its 100+ year life. The proposed phases of the Project comprise construction (including pre-construction activities) and operation, which are further broken down into different activities and described in Section 1.3.2.

The structure of this document is as follows:

- Section 1.2 – provides an overview of the Project, including a summary of the principles of the Project, guiding design principles used to develop the Project, and a summary of key Project elements including site infrastructure, and sequencing of the works.
- Section 1.3 – details the construction stages of the Project including pre-construction activities, a detailed overview of construction areas, construction activities, permanent infrastructure, temporary infrastructure, as well as traffic, transport, workforce requirements, and sequencing of the works.
- Section 1.4 – details the operational stage of the Project, including details surrounding the Project commissioning, maintenance, and progressive rehabilitation.

The description of the Project is based on feasibility and concept designs prepared by the Project's engineering and design consultants including AECOM, Lombardi, SMEC, Beca, Praxis and Local Government Engineering Services, with additional detailed design to be undertaken prior to construction. These designs are expected to be further refined as the Project develops.

The details outlined within this description form the basis for the environmental impact assessment undertaken.

The SEARs that are relevant to this description of the Project are as follows:

> … the EIS must include:
>
> …
>
> - a full description of the project accompanied by suitable maps and plans, including the:
>   - disturbance area;
>   - physical layout of the project over time, including sections of key components;
>   - key uses and activities to be carried out on site; and
>   - likely timing of the project including any stages, the key phases within each stage (site preparation, construction, commissioning, operation, decommissioning and rehabilitation) and the sequencing of these stages and phases.

1.2 Overview of the Project

1.2.1 Principles of the Project

The Project involves the construction and operation of a pumped hydro energy storage scheme which includes building two 'off river' water containment structures to create an upper and a lower reservoir (referred to as 'the upper dam and reservoir' and 'the lower dam and reservoir'), on an ephemeral tributary of the Macleay River (known as Fingerboard Crossing Creek). An underground power station complex, with pump-turbine/ motor-generator units and associated infrastructure, will be connected to the reservoirs by underground tunnelling. The power station complex will effectively have three operating modes: energy generating mode, pumping mode, and synchronous condenser (syncon) mode.

During the **energy generating** mode, water stored within the upper dam and reservoir is released and allowed to flow through the underground tunnels, generating electricity as it passes through the underground power station complex into to the lower dam and reservoir. The downhill flowing water spins the turbines within the power station causing the generator shaft to turn and thereby produce electricity by converting the water's potential energy (stored energy) into electrical energy that is then sent to the electricity grid.

During the **pumping** mode, electricity sourced from the grid is used to turn the generator shafts in reverse to the energy generating mode and act as a pump to draw water from the lower reservoir through the underground power station complex and tunnels back to the upper reservoir.

In the **syncon** mode, no water is required. Using excess electricity from the grid, the turbines spin freely. This operating mode is designed to improve stability and maintain voltages in the grid.

Figure 1.1 provides an illustration of the principles and workings behind the proposed pumped hydro system.

The Project will also require new access roads and one new, permanent single lane low-level bridge crossing of the Macleay River near Smiths Bluff, and one new, permanent single lane low-level bridge crossing of Carrolls Creek, which will connect the Project area to Kempsey Armidale Road and enable access for construction and eventual operation and maintenance of the Project. A temporary bridge will be utilised prior to the construction of the permanent bridge (the Eastern Access Temporary Bridge). A second temporary bridge about 600 m north-east of Georges Junction (the Western Access Temporary Bridge) will also enable access for construction of the Project. Both temporary access bridges will be decommissioned prior to operation. Additional shorter access roads will be required for the construction and maintenance of the transmission line between the Macleay River and transmission line (Line 965).

Power will be transmitted and received to the Project by way of the establishment of new transmission lines and associated infrastructure which will connect to the existing Line 965 which runs to the north of the project area, between Kempsey and Armidale. The section of Line 965 from the Project to Armidale will need to be upgraded, however, this upgrade does not form part of this application and will be subject to a separate approval process carried out by Transgrid.

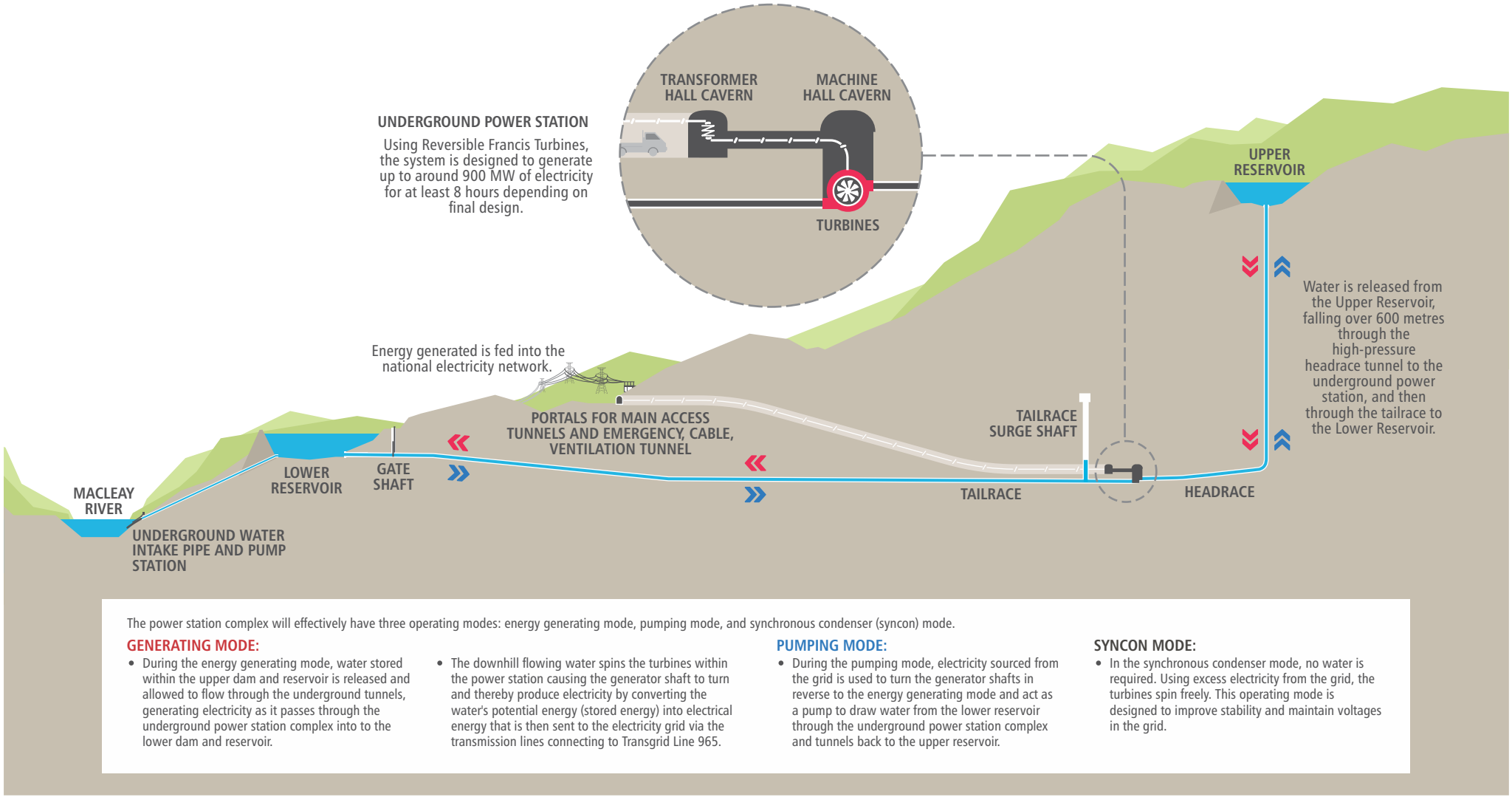


Figure 1.1.1 Illustration of the workings behind the Project

1.2.2 Guiding design principles and approach

Given the complexities of the Project, an iterative and risk-based design and assessment process was adopted in identifying and assessing potential environmental impacts (the design integration and assessment (DIAA) process, as shown in Figure 1.2). This process was undertaken to develop the design and construction methods with the guiding principles of avoiding and minimising environmental impacts where possible and engaging with key stakeholders throughout the process. The EIS has been prepared with consideration of impacts commensurate with the levels of risk identified through the DIAA process.

The challenges for the design team included the need to develop solutions that balance the need for ensuring a safe working environment for the construction of the Project, including the safe movement of plant, equipment, materials and personnel across the sites, with the need to preserve and protect the values of the area and the environmental constraints of the location. Throughout the design process, the objective was to identify and avoid sensitive locations, to minimise the construction envelope and maintain as much of the existing natural environment as is reasonable and feasible. As previously stated, the EIS is based on feasibility and concept designs provided by engineering and design consultants providing information sufficient to define a Project footprint, activities and resources required for the Project's planning purposes. Future design efforts will refine the design to a detail level suitable for construction commencement. While Project components are generally fixed, some refinements to the physical layout or design of certain components of the Project may be required following further investigation and design. Consistent with the DIAA process, the objective for the detailed design process is to optimise the design to meet construction requirements while continuing to minimise environmental impacts.

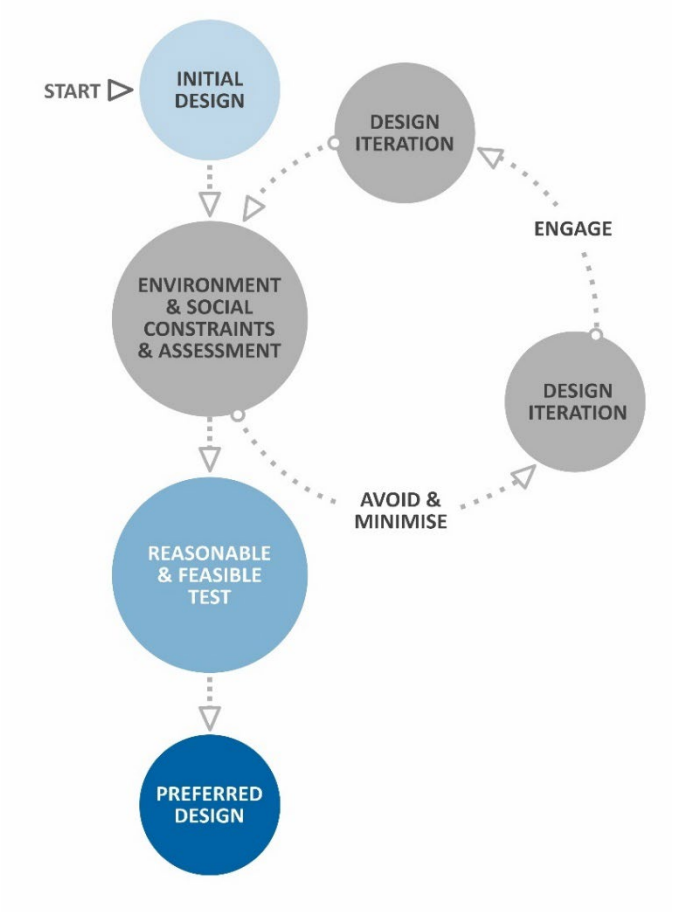


Figure 1.2 Design integration and assessment process

1.2.3 Key Project design elements

The Project will result in the creation of permanent infrastructure, both above and below the ground, which is required to operate the Project. The design of the infrastructure elements has taken into account the existing environment with careful consideration of its values, as well as maintaining public access during construction and operation to valued areas such as the National Trail along the Macleay River and Georges Junction campground.

Broadly, the Project has been categorised into three key components, which are further broken down in Table 1.1:

- pumped hydro-electric and generation works – including:
  - new upper and lower water storage dams, reservoirs and spillways
  - a new underground pumped hydro-electric power station and transformer hall
  - pressure shaft, water tunnels, access tunnels, portals and adits
  - tailrace surge shaft
  - intake and outlet structures
  - associated gates, shafts and screens
- transmission connection works – including:
  - new electricity transmission lines to connect the generation works to the existing electricity transmission network (Line 965)
  - a switchyard and substation
- ancillary development – including but not limited to:
  - access roads, two temporary bridges and two permanent bridges
  - on-site quarries, spoil emplacement areas, rock processing/crushing facilities and related infrastructure
  - utilities and communications infrastructure
  - construction pads containing assets such as workshops, concrete batching plants (CBPs), and offices
  - laydown and storage areas
  - construction accommodation (including temporary fly camps)
  - pumping infrastructure
  - operational facilities such as offices, and camps for staff
  - construction and operational power and water supplies.

The key Project elements are shown in Figure 1.3.

Table 1.1 Key Project elements

Project element	Description
Pumped hydro-electric and generation works	
Underground power station complex	An underground pumped hydro-electric power station located below the upstream end of the pumped hydro system to optimise the hydraulic arrangement of the Project. The power station complex consists of: • two main caverns, comprising: – the machine hall – the transformer hall • interconnecting tunnels and isolated phase busbar (IPB) galleries.
Dams and reservoirs	Two concrete faced rockfill dams (CFRD) and reservoirs, referred to as the upper dam and reservoir and lower dam and reservoir, with the following specifications:
	Upper dam and reservoir: • CFRD approximately 70 m high and 780 m long. A polymer or asphalt based liner may be added to the upstream face and/or base of the reservoir to prevent water losses. • reservoir covering a total area of approximately 20 hectares (ha) and an inundation extent of approximately 16.7 ha • reservoir height of approximately 881 m Australian Height Datum (AHD) at full supply level (FSL) and approximately 830 m AHD at minimum operating level (MOL) • total reservoir storage capacity of around 5.1 gigalitres (GL) at FSL.
	Lower dam and reservoir: • CFRD approximately 70 m high and 280 m long • reservoir covering a total area of approximately 24.7 ha and an inundation extent of approximately 21.6 ha • reservoir height of 250 m AHD at FSL, 215 m at MOL and 205 m AHD at lowest operating level (LOL) • total reservoir storage capacity of around 6.5 GL at FSL.
Water intake structures	Two intake structures, one at each reservoir, including: • a morning glory, vertical-type intake structure provided of a hood to prevent vorticity, situated at the upper dam and reservoir • a lateral intake structure, with head gates and stoplog slots, and an intake channel, at the lower dam and reservoir.
Spillways	Two concrete lined spillway chutes, one for each of the upper and lower dams and reservoirs. Both spillway crests will comprise of ungated ogee-shaped overflow weirs on the upstream ends of the spillway chutes.
Macleay River pump facility	A pump facility on the edge of the Macleay River, which will include an access road, duty and standby pumps for the initial fill and for ongoing reservoir top-ups as required.
Tunnels	Three main tunnels comprising of: • main access tunnel (MAT) • emergency, cable, ventilation tunnel (ECVT). • tailrace surge shaft ventilation tunnel (TSSVT) connected to the ECVT. The MAT will provide loop access to the power station complex from the MAT portal. The ECVT will provide services access and egress between the switchyard portal and the transformer hall. The ECVT portal will contain the station switchyard, control rooms, ventilation and firefighting equipment, with blast walls separating important equipment. The TSSVT will provide service access to the tailrace surge shaft, as well as ventilation service to the surge shaft.

Table 1.1 Key Project elements

Project element	Description
Power waterway	The power waterway will consist of: • an approximately 660 m deep, 6.4 m hydraulic diameter concrete lined vertical pressure shaft • an approximately 130 m long concrete lined high-pressure headrace tunnel, varying from 6.4 to 4.5 m diameter after the bifurcation • four 130 m long steel penstock tunnels, varying from 2.9 to 2.3 m diameter • four 60 m long steel draft tube tunnel at the exit of the draft tube cone an approximate 130 m long steel tailrace up to the tailrace surge shaft • an approximate 155 m deep and 18 m inner diameter surge shaft • an approximately 1,600 m long concrete lined tailrace tunnel.
Transmission connection works	
Connection works	The connection works will consist of: • an approximately 15 km long transmission alignment comprising, at a maximum, double circuit single tower 330 kV overhead infrastructure and single circuit single tower 132 kV overhead infrastructure connecting to Transgrid Line 965 • up to 25 transmission tower sites (approximately 50 m x 50 m) containing the 132 kV and 330 kV infrastructure • a transmission easement width of a maximum of approximately 105 m. Note: The upgrade of existing Line 965 will be the subject of a separate application.
Sub-station	Construction of a substation and associated connection infrastructure of up to 330 kV rating.
Switchyard	• A high voltage connection linking the connection transmission lines to the cables exiting the underground power station complex. The outdoor air insulated switchyard will likely include: – switchgear and control room – cable potheads – disconnector/earth switches – capacitive voltage transformer (VT) – lightning protection – security fencing, lighting and surveillance – surge arrestor.
Ancillary development (construction and operation)	
Access roads, access tracks and bridges	A variety of road works to improve existing access, and construction of new permanent roads to enable construction access, temporary establishment and use of construction sites, and general access to the Project area including transmission line infrastructure.
	The proposed main access will be via the construction of a new unsealed two-lane access road located to the east of the site (the Eastern Access Road (EAR)). The Main Access Road (MAR) will interface with the existing Kempsey-Armidale Road and will require the construction of two new single- or two-lane low-level bridge crossings over the Macleay River (referred to as Smiths Bluff Bridge and Carrolls Creek Bridge). A temporary bridge will be utilised prior to the construction of the Smiths Bluff permanent bridge (referred to as Eastern Access Temporary Bridge).
	A secondary, temporary access is proposed via the construction of a new, temporary bridge crossing of the Macleay River about 600 m north-east of Georges Junction (referred to as Western Access Temporary Bridge).

Table 1.1 Key Project elements

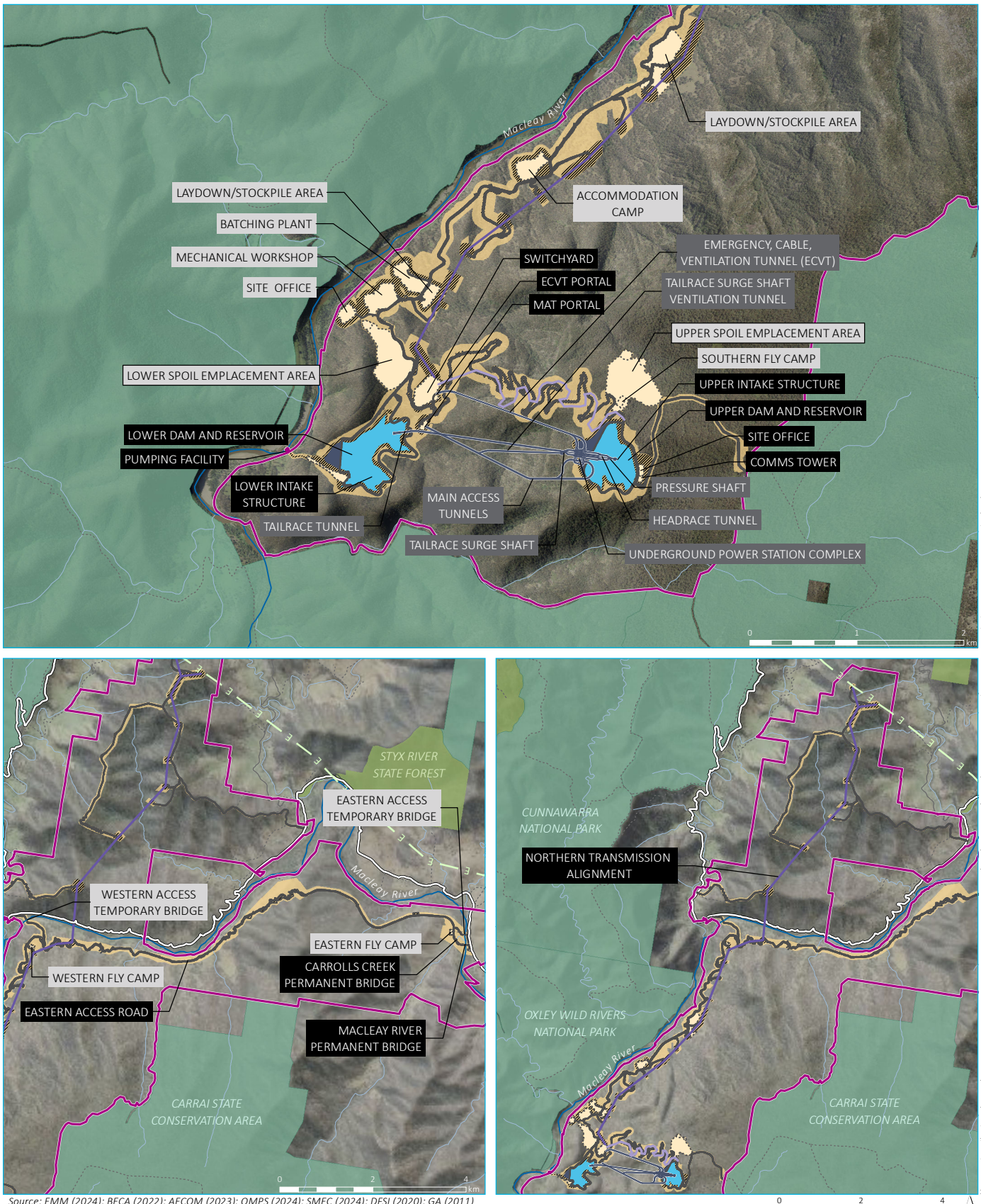
Project element	Description
	There will be approximately 66.7 km of permanent roads connecting the dams, surface works, portals, transmission assets and spoil sites. Some of these roads are existing roads, however approximately 29 km will be newly constructed roads. The key road components include: • Main Access Road (MAR) (approximately 4.7 km) • Eastern Access Road (EAR) (up to approximately 12.1 km) • Lower Dam Access Road (LDAR) (approximately 3.6 km) • Upper Dam Access Road (UDAR) (approximately 6.4 km) • access to portals and underground works • Upper Dam Emergency Egress Road (approximately 2.2 km). An initial mobilisation via Carrai Road to the Upper Dam Emergency Egress Road is also proposed, subject to agreement with NPWS. The road would be maintained to ensure all weather access only, with no widening and only minor surface pavement upgrades to the existing road being proposed as part of the Project. The initial mobilisation will be limited to equipment required to commence the construction of the UDAR. Access to the transmission infrastructure north of the Macleay River will be via two roads accessed from the Kempsey-Armidale Road. These two roads include the: • Northern Transmission Access Road (approximately 15 km) • Transmission Tower 8 Access Road (approximately 2.3 km). To support access along the transmission line easement south of the Macleay River and to each of the tower sites, a network of interconnecting access and maintenance tracks will be constructed largely utilising existing access tracks.
Surface works pads and facilities	There are four main construction pads in addition to surface portals which will be used temporarily during construction for different services (accommodation camp, construction site offices, workshop area, and laydown storage).
	Construction works will require the establishment of the following ancillary support infrastructure and areas: • main accommodation camp, which will temporarily accommodate the majority of workers as required throughout the construction period • temporary or fly camps that may be required prior to the main accommodation camp being constructed • works areas, which will contain ancillary facilities such as CBPs, mechanical and electrical workshops, a laboratory and various water treatment and wash areas • temporary stockpiling areas • permanent spoil emplacement areas, which prior to spoil placement may also be used as temporary works areas • staging areas • temporary site offices to be used during construction.
Communications	Communication infrastructure such as fibre optic cables are required for the operation of the Project and will be located: • on an overhead line linking the upper and lower dams and reservoirs (in conjunction with the electrical line) • buried in road corridors. The communication network will also include a communications tower near the upper dam and reservoir.

Table 1.1 Key Project elements

Project element	Description
Utilities during construction	• Construction water will be supplied to water storage systems either via groundwater bores, or via pumping of water from the Macleay River to support camp operations, the CBP, dust suppressions and other activities across the site. • Construction power will be supplied primarily by use of portable diesel generators and supported where possible by leveraging off existing electricity distribution infrastructure running through the generation site.
Utilities for operation	Alignment and length of utilities (electricity, water, etc.) will be combined into a single corridor (total length of about 5.4 km).
Water diversion and water treatment facilities	• Site drainage will include a combination of cross drainage culverts, drainage pits and pipe, open channels/open drains (vegetated, rock-lined or concrete), levees/bunds, and detention basins. • Various water treatment plants will be used for construction drainage and water treatment facilities – for the main accommodation camp, temporary or fly camps, CBP, tunnel, etc. • Specific discharge locations are planned for stormwater and surface water runoff and will be determined during detailed design or construction planning.
Laydown/stockpile areas	Temporary laydown/stockpile areas will be utilised across the Project area, with a total allocated stockpile area of around 119,600 m^2.
Spoil emplacement areas	To accommodate spoil generated through excavation of the reservoirs, underground caverns and tunnels, two permanent spoil placement locations have been identified with a capacity to store around 3.55 million cubic metres (Mm^3) of material. Dead storage space within the reservoirs is not anticipated to be used for spoil placement, but is available if required. One construction laydown area within the construction envelope has been identified as providing further surplus storage capacity (around 300,000 m^3) however assessment and approval of this area would be sought separately, if the storage is required.
Ancillary operational facilities	Primary operation of the Project can be undertaken remotely and will require minimal onsite operational staff, other than for maintenance activities. Operational facilities include maintenance housing, work area, car parking, workshop and storage, control room and switchgear, water treatment plant, office area, heating, ventilation and air conditioning (HVAC), backup generators and Macleay River pump facility.
Other	
Construction	• Construction duration of around five years. • Construction workforce of over 600 workers at construction peak.
Rehabilitation	Rehabilitation of areas disturbed during pre-construction and construction will be undertaken progressively where practical during all stages and phases of the Project. Progressive rehabilitation will occur over about 62.7 ha including spoil emplacement areas and areas used for construction ancillary facilities no longer needed during operation. At the end of the Project's life, 194.7 ha in total will be rehabilitated to native ecosystem (including native vegetation and rock landscape). Approximately 152.1 ha will be retained permanently for the water storages and access roads, subject to agreement with relevant landowners/land managers.
Operation	• The Project will provide 900 MW of electricity generating capacity and up to eight hours of energy storage at full generating capacity. • Maintenance and operational activities will include power station operations, infrastructure inspections, maintenance to assets, vegetation management, auditing and compliance and other activities. • It is expected that the operation of the new power station will require around 20 full-time workers, and up to 30 additional contractors for regular and ad hoc maintenance and repairs.
Hours of operation	• Construction of the Project will be 24/7 and 365 days per year. • Operation of the Project will be 24/7 and 365 days per year.

Table 1.1 Key Project elements

Project element	Description
Project timeline	It is anticipated construction will commence in around early to mid-2025 and continue for a 5 year period. Operations are anticipated to commence at the end of 2030 and have an operational life of 100+ years. Rehabilitation activities will continue after operations commence. The Project phases are outlined in Section 1.3.
CIV	Estimated to be a base cost of approximately $1.97 billion.



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Source: EMM (2024); BECA (2022); AECOM (2023); OMPS (2024); SMEC (2024); DFSI (2020); GA (2011)

KEY

- Project area
- Disturbance footprint
- Construction envelope
- Surface works

Project operational elements

- Power and communications lines
- Transmission overhead lines
- Tunnels, portals, intakes, shafts
- Permanent road
- Reservoir
- Dam wall

Existing environment

- Macleay River
- Watercourse/drainage line
- Kempsey-Armidale Road
- Vehicular track
- Existing transmission line
- NPWS reserve

Label format

- SURFACE PERMANENT INFRASTRUCTURE
- UNDERGROUND PERMANENT INFRASTRUCTURE
- TEMPORARY INFRASTRUCTURE
- PERMANENT SPOIL EMPLACEMENT

Overview of key project elements

Oven Mountain Pumped Hydro Energy Storage Project
Updated Project Description
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Figure 1.3

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1.2.4 Project area terminology

Approval for the Project is being sought based on feasibility and concept designs is common for projects of this size and scale. To accommodate minor changes and amendments to the design as it progresses, a 'Project area', 'construction envelope', 'disturbance footprint' and 'operational footprint' approach is being adopted for the Project. This approach is aimed at ensuring environmental impacts are assessed as accurately as possible, whilst accounting for the current level of design and the likelihood of design refinements occurring as the Project progresses towards construction.

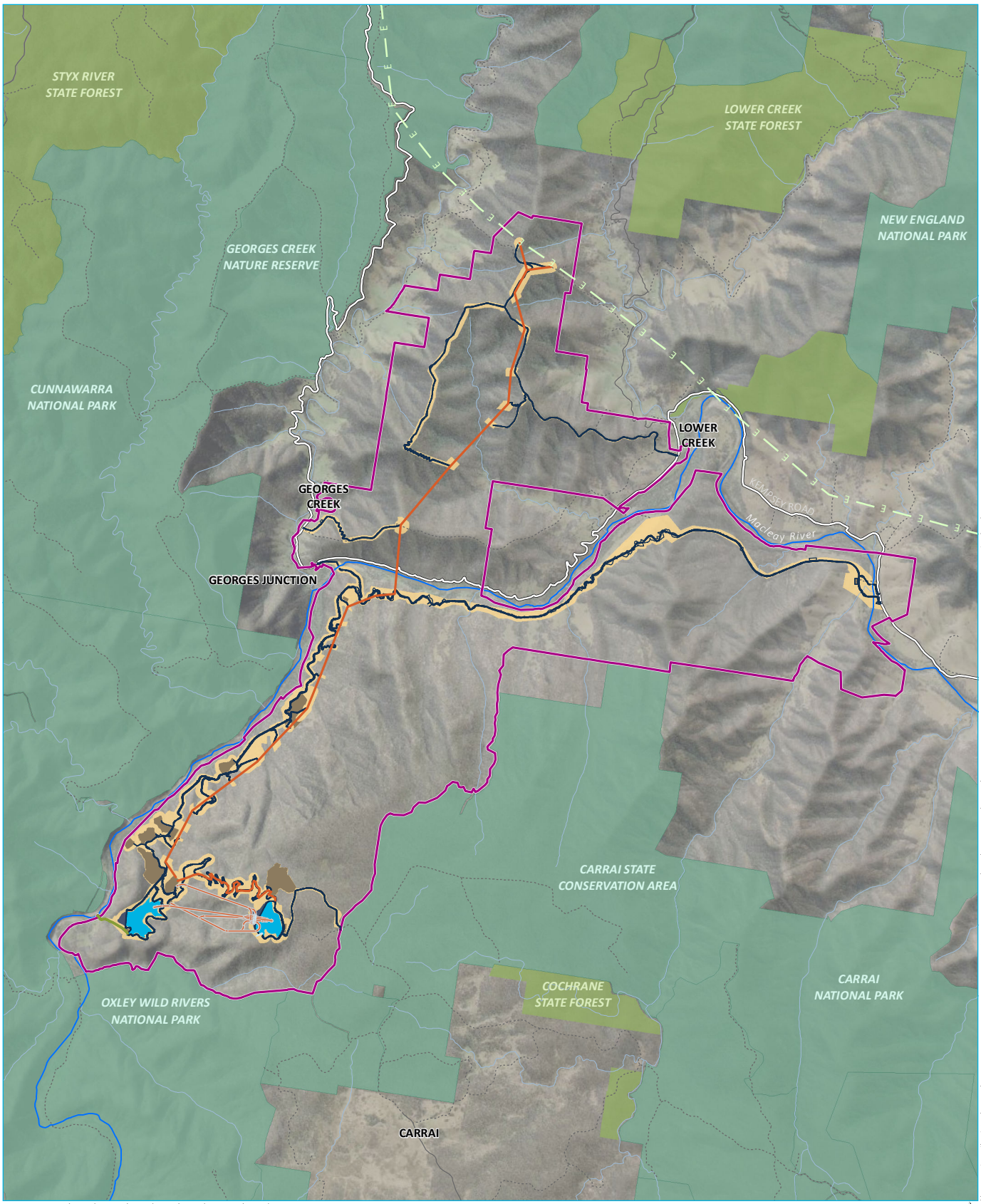
The ***Project area*** is the broader area within which the Project will be built and operated, and the extent within which direct impacts from the Project are anticipated. Importantly the Project area does not represent a footprint for the construction works, but rather indicates an area that was investigated during environmental assessments. The Project area has been further divided into different areas to facilitate the assessment of direct impacts from the Project.

The ***construction envelope*** represents the maximum extent of where disturbance may occur during the construction of the Project. To derive the construction envelope, buffers have been applied to key Project elements and infrastructure. The buffers used to derive the final construction envelope area reflect the confidence around the current siting of the asset or infrastructure, and the likelihood that some amendments may be required prior to commencing the construction works which will be identified in the detailed design phase. The construction envelope for the Project covers an area of around 768 ha.

Located entirely within the bounds of the construction envelope sits the ***disturbance footprint***, a smaller area that has been derived directly from the current level of design. The disturbance footprint represents the physical disturbance that can be expected as part of the construction works. As the design is refined, the final siting of the disturbance footprint can move within the construction envelope, subject to the recommended environmental management measures, and provided it does not exceed any limits as defined by the construction envelope. It is proposed that most of the disturbance footprint will be rehabilitated, and land formed at the completion of the Project. However, other parts will be retained after construction which are necessary for the ongoing operation and maintenance of the new power station (operational footprint). The disturbance footprint for the Project covers an area of around 367 ha.

Progressively, and at the end of construction, temporary components that are required to support the construction of the Project will be rehabilitated and returned to a state representing its previous use. The exceptions to this are the areas required for permanent operation of the Project, which would be retained (referred to as the ***operational footprint*****)**. The operational footprint of the Project covers an area of around 280 ha. Approximately 62.7 ha would be progressively rehabilitated during and following completion of construction.

The Project area, construction envelope and disturbance footprint are shown in Figure 1.4. An overview of the operational footprint at the completion of the Project is shown in Figure 1.5.



Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

0 1 2 km

GDA 1994 MGA Zone 56

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KEY

Project area
Construction envelope
Surface works

Project operational elements
Power station
Pump station
Tunnels, portals, intakes, shafts
Transmission overhead lines
Permanent road
Dam wall
Reservoir
Spillway

Existing environment
Macleay River
Watercourse/drainage line
Major road
Minor road
Vehicular track
Existing transmission line
NPWS reserve
State forest

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Project areas overview

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Figure 1.4

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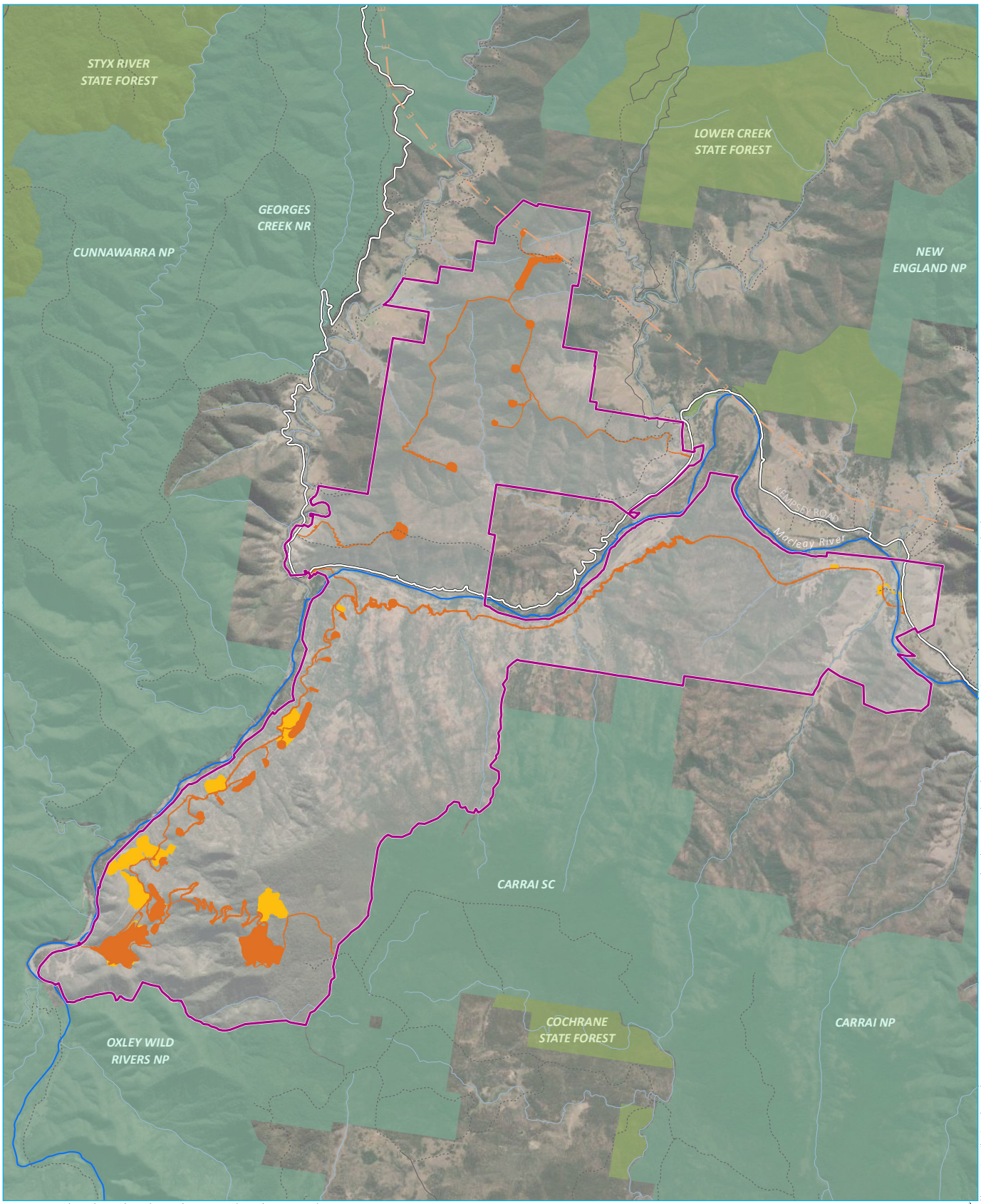

Source: EMM (2024); ABS (2021); DFSI (2020, 2021); GA (2011, 2020)

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KEY

- Project area
- Operational footprint
- Progressive rehabilitation

Existing environment

- Macleay River
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Existing transmission line
- NPWS reserve
- State forest

Operational footprint overview

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Figure 1.5

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1.3 Construction

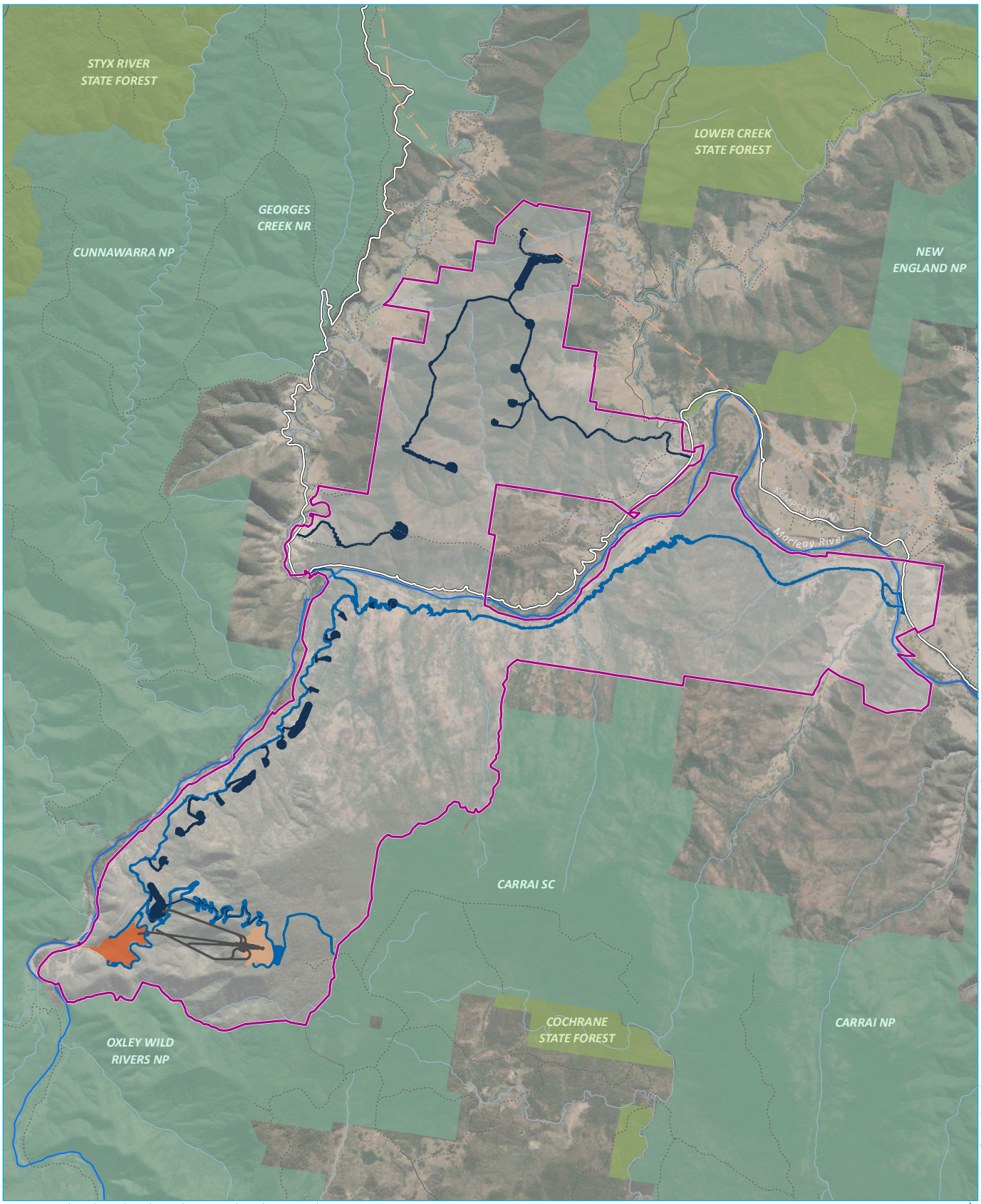
The development of the Project will require significant construction related activities to be undertaken and key supporting infrastructure to be established. This section outlines the key infrastructure that form the construction phase of the Project.

1.3.1 Construction areas

To assist in detailing the key infrastructure associated with the Project, the footprint has been divided into five 'construction areas' (Figure 1.6). The construction areas are centred around the generation components in the south of the Project area, with only transmission lines and access roads occupying the north of the Project area. The degree of construction related activities that are to be undertaken within each construction area varies, dependant on the infrastructure within each. The five construction areas used to describe the Project are:

- upper dam and reservoir
- lower dam and reservoir
- underground works
- access roads and bridges
- transmission infrastructure (northern and southern areas).

Details of these construction areas are provided in the following sections.



Source: EMM (2024); ABS (2021); DFSI (2020, 2021); GA (2011, 2020)

0 2 4 km

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KEY

- Project area
- Underground works
- Transmission infrastructure
- Access roads and bridges
- Lower dam and reservoir
- Upper dam and reservoir

Existing environment

- Macleay River
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Existing transmission line
- NPWS reserve
- State forest

Overview of Project construction areas

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Figure 1.6

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i Upper dam and reservoir

Situated approximately 2.5 km east of the Macleay River on the south-east end of the Project area, this area contains the upper reservoir itself, the upper intake structure, emergency egress road, and the spoil emplacement areas to the north of the reservoir. The upper dam and reservoir area is displayed in Figure 1.7 with detail on Project elements, purpose, and description provided in Table 1.2.

Table 1.2 Upper dam and reservoir construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Final land use	Long-term use
Upper dam and reservoir	The upper dam and reservoir forms the headwater of the new power station, storing water to be used for the hydro-electric power generation. The upper dam and reservoir will include the construction of a 70 m high, 780 m long CFRD, a concrete lined spillway chute, a temporary concrete encased diversion conduit, and morning glory style intake.	Rockfill for the dam wall will be taken from a quarry situated within the reservoir inundation area to the east of the dam wall. Approximately between 400,00 500,000 m^3 of spoil is expected to be generated during the reservoir excavation in addition to about 534,000 m^3 of aggregates to be used in the construction of the dam.	Permanent infrastructure	The structures associated with the upper reservoir will remain in place and continue to be utilised throughout the duration of the Project's life.
Upper intake structure	Water is drawn in through the upper intake structure from the reservoir into the tunnels during generation mode and to replenish water into the reservoir during pumping mode. The structure will utilise trash racks designed to prevent the ingress of logs and other foreign materials into the waterway headrace tunnel.	The intake will be upward facing and constructed from reinforced concrete. The intake will have a stoplog structure to facilitate maintenance and emergency situations, as well as steel trash racks.	Permanent infrastructure	The structure will remain in place and continue to be utilised throughout the duration of the Project's life.
Site office	A site office located adjacent to the reservoir will be constructed for administrative purposes during the construction and operation phases.	The office will be constructed to minimise environmental impacts.	Permanent infrastructure	The office will remain in place and continue to be utilised throughout the duration of the Project's life.
Communications tower	A secondary redundant communication path is required to complement the fibre optic path (via transmission line). This allows for back-up communication with the national electricity market (NEM) participants including the Australian Energy Market Operator (AEMO), and Transgrid. Further, the tower will enhance radiocommunications within the site.	The tower will be sized to allow clear line of sight towards Armidale or similar. The tower will likely be a free-standing lattice tower and be supplemented with a fenced communications control building (and associated access) including power supply, back-up power (batteries and/or generation), electronic controls.	Permanent infrastructure	The tower will remain in place and continue to be utilised throughout the duration of the Project's life. During its life span it would provide mobile coverage to all users (including the public) in the vicinity of the tower.

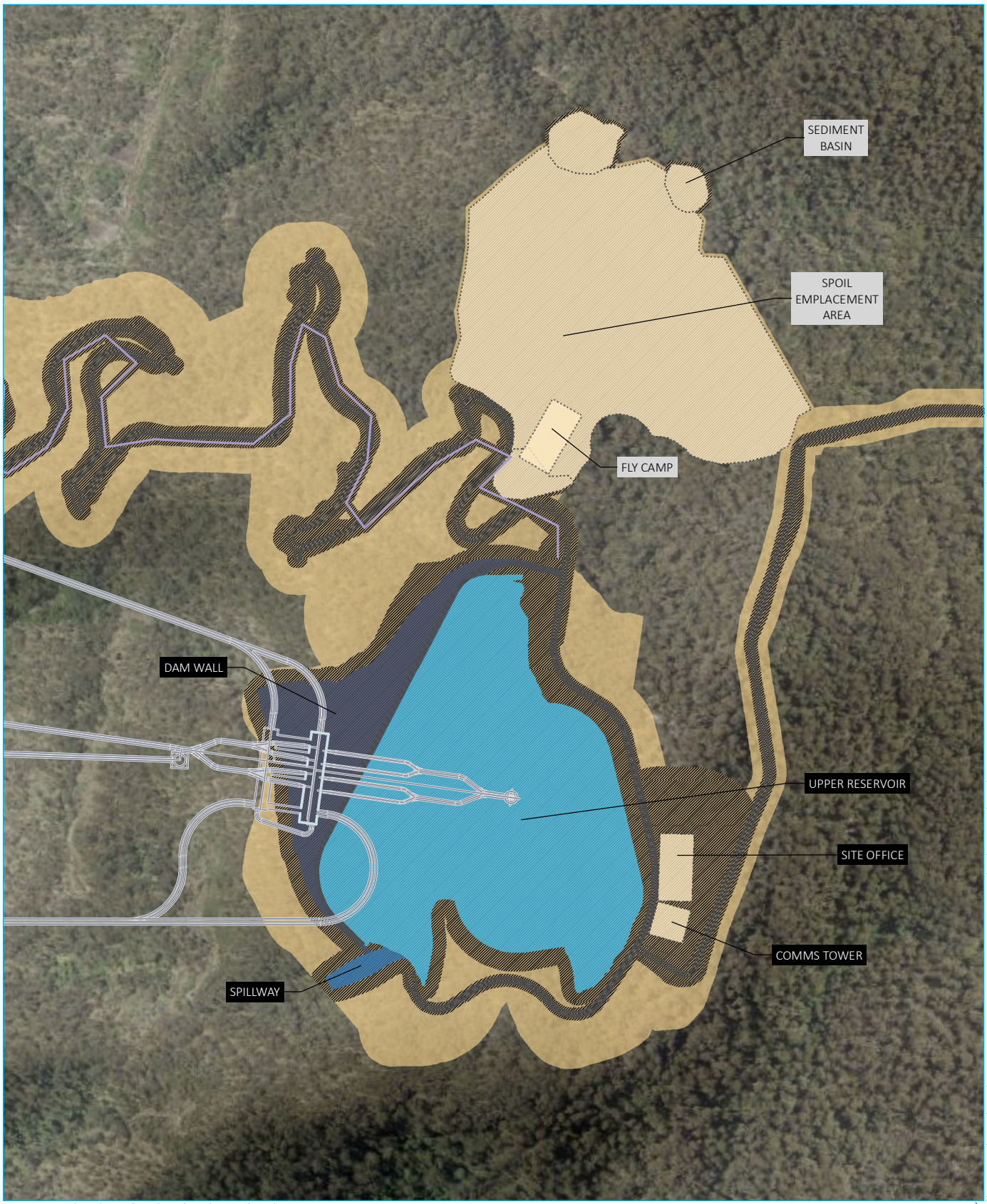
Table 1.2 Upper dam and reservoir construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Final land use	Long-term use
Spoil emplacement area	Spoil will be generated from excavation and surface works throughout the construction phase. One spoil emplacement area will be situated near the upper reservoir. The site has been selected as it is close to construction areas and likely to have a minimal impact on major water courses.	Vegetation clearing will commence across the spoil emplacement site along with minor earthworks. Spoil will be placed to minimise erosion.	New rehabilitated landform	The spoil emplacement area will be land formed to integrate into the existing topography, and progressively rehabilitated.
Fly camp (Southern)	Fly camps will provide small scale temporary work accommodation for workers completing initial road works until the main accommodation camp is completed. They will be required for around the first year of construction.	Vegetation clearing and conventional earthworks will be the primary action required during construction. The camps will comprise primarily mobile structures and facilities.	Rehabilitated consistent with previous use.	Fly camp areas will be rehabilitated prior to operation.

ii Lower dam and reservoir

The lower dam and reservoir construction area will be the most heavily developed construction area. It is located nearer to the eastern bank of the Macleay River, with all permanent components set to be constructed outside of the 10,000-year flood level. Key components of the construction area include the lower reservoir, spoil emplacement areas, and accommodation for workers, as well as various workshops and service areas to support the construction effort. The lower dam and reservoir area is displayed in Figure 1.8 with detail on Project elements, purpose, and description provided in Table 1.3.

The design provides for the location of the main accommodation camp. However, its location may change as part of the detailed design phase to an alternate location within the construction envelope.



Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

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KEY

- Project area
- Disturbance footprint
- Construction envelope

Project operational elements

- Underground power station complex
- Tunnels, portals, intakes, shafts
- Permanent road
- Power and communications lines
- Surface works
- Upper dam spillway
- Reservoir
- Dam wall

Existing environment

- Vehicular track

Label format

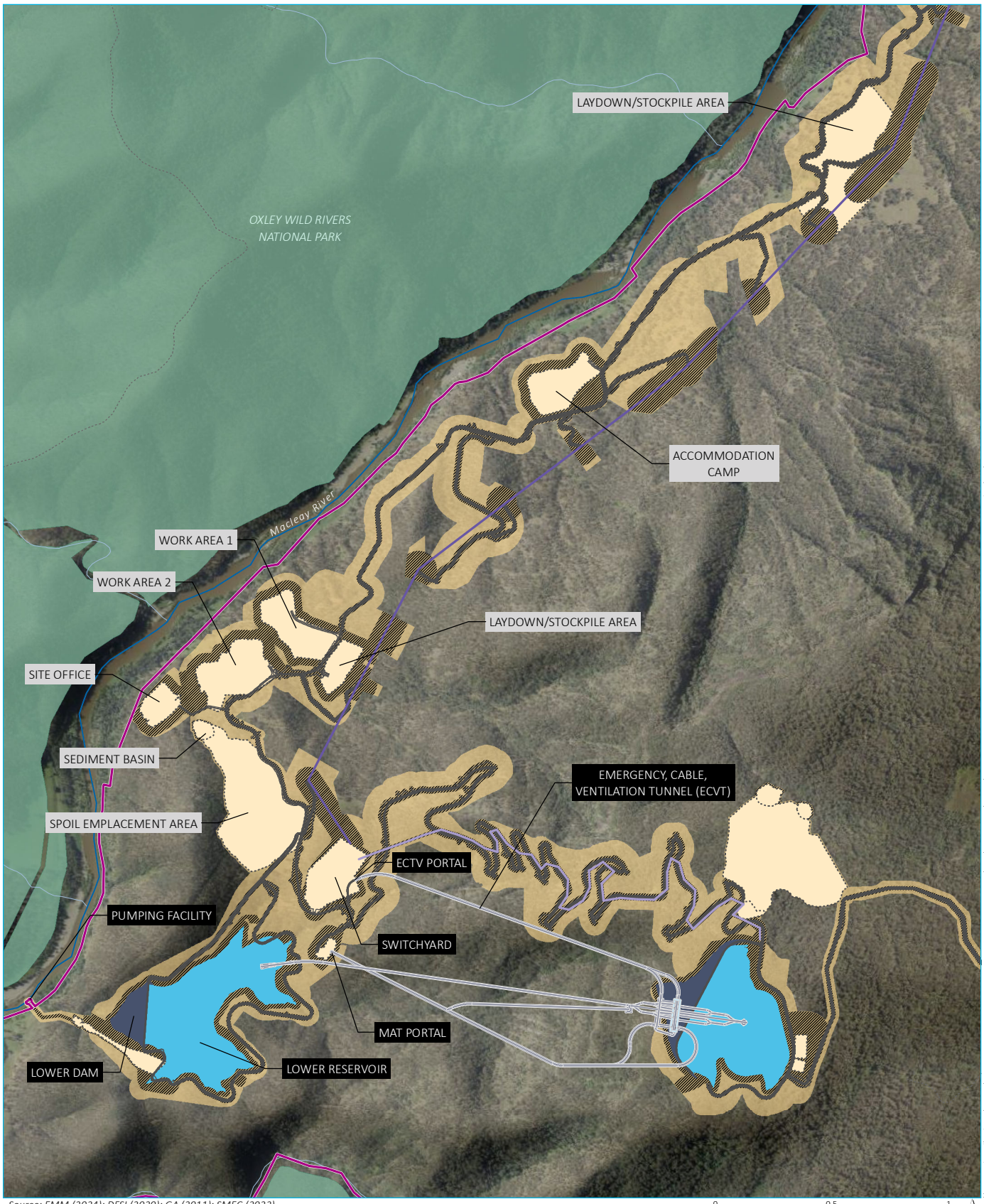
SURFACE PERMANENT INFRASTRUCTURE

TEMPORARY INFRASTRUCTURE

Upper dam and reservoir construction area

Oven Mountain Pumped Hydro Energy Storage Project
Updated Project Description
OMPS Pty Ltd
Figure 1.7

EMM creating opportunities



Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

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KEY

- Project area
- Disturbance footprint
- Construction envelope

Project operational elements

- Underground power station complex
- Tunnels, portals, intakes, shafts
- Permanent road
- Power and communications lines
- Transmission overhead lines
- Surface works
- Reservoir
- Dam wall

Existing environment

- Macleay River
- Watercourse/drainage line
- Kempsey-Armidale Road
- Vehicular track
- Existing transmission line
- NPWS reserve

Label format

SURFACE PERMANENT INFRASTRUCTURE

TEMPORARY INFRASTRUCTURE

The lower dam and reservoir construction area

Oven Mountain Pumped Hydro Energy Storage Project
Updated Project Description
OMPS Pty Ltd
Figure 1.8

EMM creating opportunities

Table 1.3 Lower dam and reservoir construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Final land use	Long-term use
Works area 1	Works Area 1 will be used as a hub for civil activities. It will consist of an 18,000 m^2 upper area used for aggregate storage and a 36,000 m^2 lower area which will include a CBP, laboratory, concrete wash, and stormwater sediment pond.	Vegetation clearing and conventional earthworks will be the primary action required during construction.	Rehabilitated consistent with previous use.	Works Area 1 will be rehabilitated following the construction phase. Integrated revegetation will be used to minimise environmental effects.
Works area 2	Works Area 2 is a 36,500 m^2 area that will contain the electrical and mechanical services area. It will include electrical and mechanical workshops, laydown areas, a warehouse, storage and maintenance workshops.	Vegetation clearing and conventional earthworks will be the primary action required during construction.	Rehabilitated consistent with previous use.	Works Area 2 will be rehabilitated following the construction phase. Integrated revegetation will be used to minimise environmental effects.
Laydown/stockpile areas	There will be four areas used for stockpiling and material laydown, covering a total area of 119,600 m^2. One area is located along the MAR (between transmission towers 14–16), one area is located in proximity to the batching plant, one area is located near Georges Junction, and one is located near the Eastern Access Temporary Bridge on the eastern side of the Macleay River. The largest of the four areas has also been flagged as available for other ancillary uses, to provide further flexibility as the detailed design progresses.	Vegetation clearing and conventional earthworks will be the primary action required during construction.	Rehabilitated consistent with previous use.	The laydown/stockpile areas will be rehabilitated following the construction phase.
ECVT portal	Adjacent to the ECVT portal will be the station switchyard. The ECVT will provide secondary access and egress during the operational period of the Project. Infrastructure at the ECVT portal will include a building containing switchgear and control room, and ECVT ventilation fans to provide fresh or extract air to the underground power station complex and tunnels.	Vegetation clearing and conventional earthworks will be the primary action required during construction.	Permanent infrastructure.	The ECVT portal and the infrastructure associated to this area will continue to be used throughout the life of the Project.

Table 1.3 Lower dam and reservoir construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Final land use	Long-term use
MAT portal	The MAT portal will provide primary access to the underground power station complex via MAT1. A small service building will be constructed near the MAT portal for first aid and administrative purposes.	The MAT portal will have a footprint of approximately 3,000 m^2. 30,000 bank cubic metres (m^3) of spoil are expected to be generated during the excavation of the MAT1 and portal.	Permanent infrastructure.	The MAT portal and the infrastructure associated to this area will continue to be used throughout the life of the Project.
Spoil emplacement area	Spoil will be generated from excavation and surface works throughout the construction phase. The spoil emplacement area is located to the north of the lower reservoir. This area has been selected as it is close to underground construction adits and likely to have a minimal impact on major water courses.	Vegetation clearing will commence across the spoil emplacement area and minor earthworks will be completed. Spoil will be placed and compacted in layers of similar composition to minimise erosion.	New rehabilitated landform	The spoil emplacement will be land formed to integrate into the existing topography, and progressively rehabilitated.
Site offices	Temporary offices will be constructed for administrative purposes during the construction phase.	The offices will be constructed across three level pads to minimise environmental impacts. The total area of the pads will be approximately 13,000 m^2.	Rehabilitated consistent with previous use.	The site office areas will be rehabilitated following the construction phase. Integrated revegetation will be used to minimise environmental effects.
Lower dam and reservoir	The lower dam and reservoir will contain tailwater for the underground power station. The lower reservoir will include the construction of a 70 m high, 280 m long CFRD a concrete lined spillway chute, and a concrete lined diversion tunnel.	Rockfill for the dam wall will be taken from a quarry situated within the reservoir inundation area to the east of the dam wall. Approximately 466,000 m^3 of aggregates for the dam are expected to be extracted from the quarry, alongside approximately 664,000 m^3 of spoil. The reservoir will be filled from the Macleay River. It is expected that this filling will take around 6–9 months, dependent on the hydrology at the time filling occurs.	Permanent infrastructure	The structures associated with the lower reservoir will remain in place and continue to be used throughout the duration of the Project's life.

Table 1.3 Lower dam and reservoir construction area – Project elements, purpose, and description

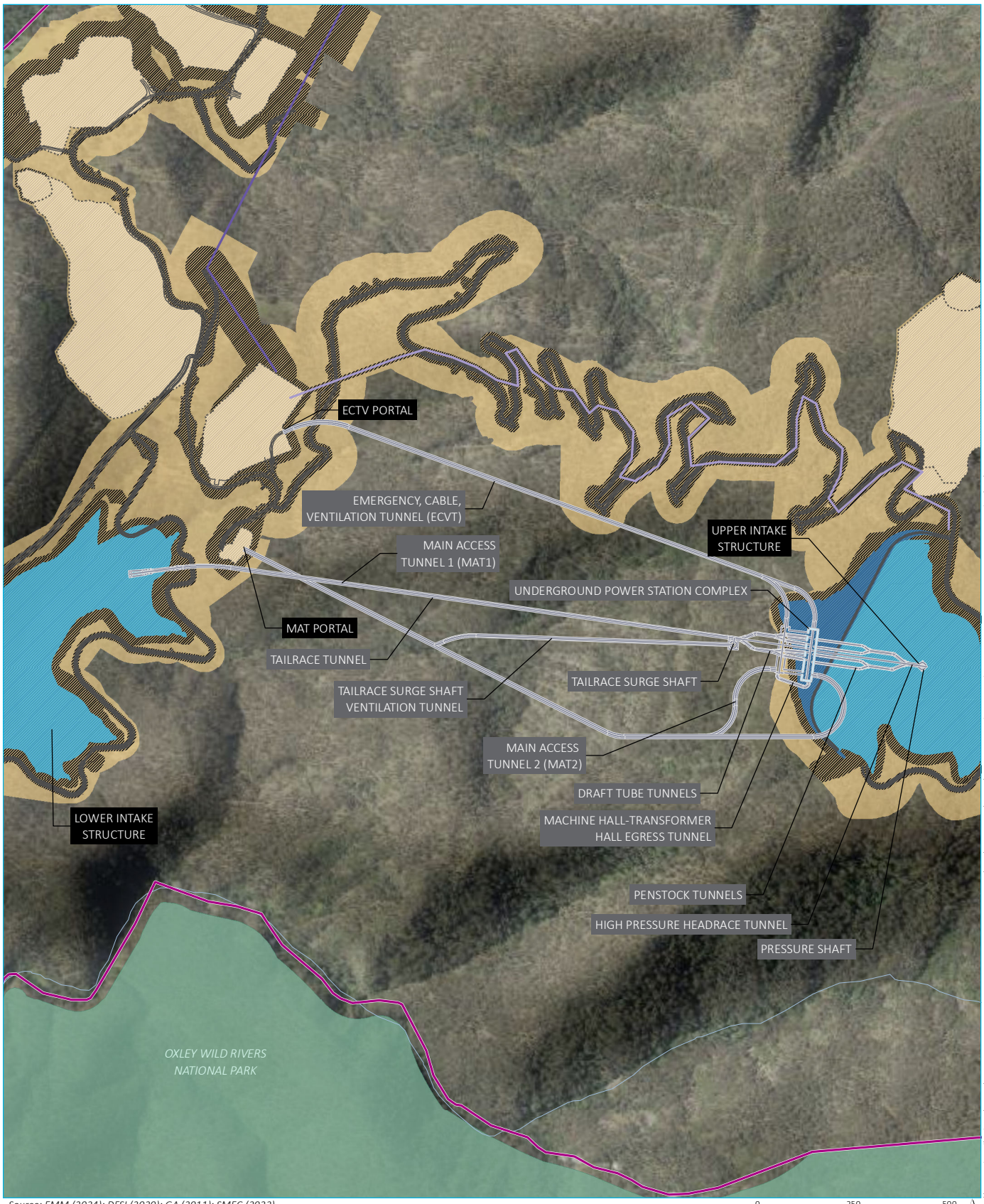
Element	Purpose	Method summary – during construction	Final land use	Long-term use
Lower intake structure	The lower intake structure will draw water from the reservoir into the tailrace tunnel during pumping mode and to release water into the lower reservoir during generation mode. As with the upper intake structure, the lower intake structure will employ trash racks to prevent foreign objects being introduced to the waterways.	The lower intake structure will be laterally oriented and founded in rock. A lower intake gate shaft with head gates and stoplog slots will also be constructed to allow for inspection and maintenance of the lower gate seals.	Permanent infrastructure	The structure will remain in place and continue to be used throughout the duration of the Project's life.
Main accommodation camp	The main accommodation camp will provide temporary worker accommodation for the majority of the onsite workforce (around 600 people). This will be required throughout the construction period. A variety of facilities will be constructed to support them.	The camp area will have an area of 35,000 m^2. Vegetation clearing and conventional earthworks will be the primary action required during construction. As stated previously, the location of the main accommodation camp may change as part of the detailed design phase to an alternate location within the construction envelope.	Rehabilitated consistent with previous use.	The accommodation camp pad will be rehabilitated following the construction phase.
Macleay River pump facility	The pumping facility will be used for the initial filling of the lower reservoir, and for subsequent top ups as required periodically throughout operations.	Duty and backup (standby) pumps will be installed in a below ground pump well or small shed on the east side of the Macleay River. An access road, river intake and power supply will also be implemented.	Permanent infrastructure	The lower reservoir will require periodic top ups. As such, the pump facility will continue to be used sporadically throughout the Project's life.

iii Underground works construction area

The underground works construction area encompasses all the subterranean elements of the Project. The waterway tunnels linking the upper and lower reservoirs, the power station complex, and the tunnels used to access them are key components of this construction area.

Tunnelling will be undertaken using either road headers or drill and blast methodologies, or a combination of the two. In general, tunnel excavation is expected to progress at a rate of approximately 6 m/day. This rate may vary and is largely dependent on the geology of the rock being excavated, hydrogeological conditions, and the method of excavation (e.g. drill and blast vs road headers).

As a result of the underground excavations, large volumes of suitable spoil are expected to be generated. Where suitable, spoil will be re-used as a construction material (e.g. aggregate for the construction of concrete structures) and for use within the reservoir dam wall. For spoil that does not meet the required specifications, and for any excess volumes, these will be transported to the designated spoil emplacement areas. The underground works area is displayed in Figure 1.9 with detail on Project elements, purpose, and description provided in Table 1.4.



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Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

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KEY

- Project area
- Disturbance footprint
- Construction envelope

Project operational elements

- Underground power station complex
- Tunnels, portals, intakes, shafts
- Permanent road
- Power and communications lines
- Transmission overhead lines
- Surface works
- Reservoir
- Dam wall

Existing environment

- Watercourse/drainage line
- Kempsey-Armidale Road
- NPWS reserve

Label format

SURFACE PERMANENT INFRASTRUCTURE

UNDERGROUND PERMANENT INFRASTRUCTURE

Underground power station complex

Oven Mountain Pumped Hydro Energy Storage Project
Updated Project Description
OMPS Pty Ltd
Figure 1.9

EMM creating opportunities

Table 1.4 Underground works construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Final land use	Long-term use
MAT1	The MAT1 will provide the primary access to the underground power station complex. The MAT1 will be approximately 1,860 m in length, with a D-shaped profile and diameter of around 8 m. During construction, the MAT1 will be the key route used for transporting spoil from the cavern and other tunnels during excavation.	A combination of drill and blast and road headers may be used during the excavation of the MAT1.	N/A (underground)	The tunnel will be retained permanently to enable access to the underground power station complex. This will be necessary for on-going operational and maintenance purposes.
MAT2	The MAT2 bifurcates off from MAT1 to provide direct access to the transformer hall. This tunnel will be approximately 300 m long and will have the same cross-sectional dimensions as the MAT.	A combination of drill and blast and road headers may be used during the excavation of the MAT2.	N/A (underground)	The tunnel will be continually used for maintenance and operational purposes, particularly related to transformer hall maintenance.
Machine hall and -transformer hall egress tunnel	This tunnel is approximately 106 m long tunnel that connects the southern side of the power station cavern to the southern side of the transformer hall. It will have a D--shaped cross section with a diameter of 4 m.	A combination of drill and blast and road headers may be used during the excavation of the machine -hall transformer hall egress tunnel.	N/A (underground)	The tunnel will be continually used for maintenance and operational purposes.
ECVT	The ECVT will connect the switchyard portal and the northern end of the power station cavern. It will allow ventilation of the caverns, surge shaft, the laying of cables between the switchgear building and the transformer hall, and an additional exit route. Its profile will be D-shaped with a diameter of 7 m.	A combination of drill and blast and road headers may be used during the excavation of the ECVT tunnel.	N/A (underground)	The tunnel will be continually used for maintenance and operational purposes.
Underground power station complex	The power station complex houses the main mechanical and electrical equipment of the power station, including the turbines and generators. The power station complex consists of a machine hall that houses the generator units and a transformer hall.	The power station complex will be excavated using a combination of drill and blast and road headers with the current design having a total excavated volume of around 154,000 m^3. This volume may change with detailed design refinement. Excavated material will be transported to the surface via the MAT and tailrace tunnels.	N/A (underground)	Accessible via the MAT, the power station complex will remain in use for the duration of the operation of the Project.

Table 1.4 Underground works construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Final land use	Long-term use
Tailrace surge shaft ventilation tunnel	This tunnel will provide permanent access and services to the top of the downstream tailrace surge shaft. It will be approximately 630 m long and will have a D-shaped cross section with a diameter of around 6 m.	Drill and blast or road headers may be used during the excavation of the tailrace surge shaft ventilation tunnel.	N/A (underground)	The tunnel will be used continually for maintenance and operational purposes.
Pressure shaft	The pressure shaft vertically connects the upper reservoir to the high pressure headrace tunnel. The current design has a pressure shaft internal diameter of around 6.4 m to limit the maximum flow into the generation units.	The pressure shaft tunnel will be constructed using raise-bore construction methodology to accommodate its vertical orientation.	N/A (underground)	The pressure shaft will support operation of the power station throughout the Project's life.
High pressure headrace tunnel	The high-pressure headrace tunnel connects the base of the pressure shaft to the penstock tunnels. This tunnel will be lined with concrete as required.	A combination of drill and blast and road headers may be used during the excavation of the high-pressure tunnel.	N/A (underground)	The high-pressure tunnel will support operation of the power station throughout the Project's life.
Penstock tunnels	The penstock tunnels split the flow for each of the machine units in the power station. The current design has penstocks being steel-lined and with diameters of between 2.3 m and 2.9 m. The design of these penstocks may change with design refinement.	A combination of drill and blast and road headers may be used during the excavation of the penstock tunnels. Access to excavate the penstock tunnels will be via the headrace construction adit.	N/A (underground)	The penstock tunnels will support operation of the power station throughout the Project's life.
Draft tube tunnels	The draft tube tunnels are used to convey water from each of the machines during generation mode and allow convergence into the single tailrace tunnel. They also act to divide the flow into streams to supply each machine during pumping mode. The current design has draft tube tunnels steel lined, with a diameter of around 3.3 m and a length of approximately 60 m. The design of the draft tube tunnels may change with design refinement.	Access for excavation to the draft tube tunnels will be via the tailrace tunnel. The final 10 to 20 m will be excavated from the power station cavern. A combination of drill and blast and road headers may be used during the excavation of the draft tube tunnels.	N/A (underground)	The draft tube tunnels will support operation of the power station throughout the Project's life.
Tailrace surge shaft	The tailrace surge shaft is a vertical shaft located on the lower reservoir side of the underground power station complex. The tailrace surge shaft improves the hydraulic system stability of the tailrace tunnel.	The tailrace surge shaft will be constructed using raise-bore construction methodology to accommodate its vertical orientation.	N/A (underground)	The tailrace surge shaft will support operation of the power station throughout the Project's life.

Table 1.4 Underground works construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Final land use	Long-term use
Tailrace tunnel	The tailrace tunnel conveys water between the draft tube tunnels to the lower reservoir during generation and pumping modes. The current design has a diameter of around 6.2 m. In addition to its use as a watercourse during the Project's operational phase, it will be used to transport spoil during the excavation process.	It will be constructed early in the construction programme via the lower intake portal. A combination of drill and blast and road headers may be used during the excavation of the tailrace tunnel.	N/A (underground)	The tailrace tunnel will support operation of the power station throughout the Project's life.
Various adits	Five adits will be excavated and will provide access to the pressure shaft, the penstocks, the tailrace surge shaft, the machine hall, and the tailrace during construction. The current design has adits between 159 m and 268 m in length.	A combination of drill and blast and road headers may be used during the excavation of the various adit tunnels	N/A (underground)	The machine hall adit will continue to be used to route the power station ventilation ducts. All other adits will be closed with concrete plugs at the tunnel end.

iv Access roads construction area

Access roads will be constructed throughout the Project area to enable safe transportation of workers, visitors, materials, equipment and deliveries across the Project construction areas. The Project area will primarily be accessed via the Eastern Access Temporary Bridge and EAR, Western Access Temporary Bridge and the MAR. Permanent bridges will be used once the EAR construction is completed. The location of all planned roads is shown in Figure 1.10.

In general, the roads will be unsealed or gravel, have widths of up to 8.0 m, allow for two-way movements and varying speed limits of up to 30-70 km/h according to terrain with a general design speed of 50 km/hr. Table 1.5 provides an overview of the access roads that are proposed across the Project area.

Temporary or fly camps will be required for the construction workforce prior to the construction and operation of the main accommodation camps. The indicative location of these camps are sited close to the access road construction areas, and discussed further in Section 1.3.4.

a Eastern access

The EAR will be the main access route to the site during construction and run approximately parallel to the Macleay River. The EAR will run from the Kempsey-Armidale Road at Smiths Bluff in the eastern part of the Project area. A component of this road will be a temporary bridge across the Macleay River (the Eastern Access Temporary Bridge), a permanent bridge over Carrolls Creek near its confluence with the Macleay River (Carrolls Creek Bridge) and a permanent bridge over the Macleay River 200 m south east of Carrols Creek Bridge (Macleay River Permanent Bridge). Once near Georges Junction, on the south side of the MacLeay River, the EAR connects to the MAR which then provides access to the main construction and generation areas of the Project.

A construction work area including laydown and temporary fly camp (see Section 1.3.4) will be established and will provide the initial access and accommodation for the road works. A work area will be established along the length of the road during construction.

b Western access

A secondary access route to the site during construction will be from the Western Access Temporary Bridge as an extension to the existing road on the north side of the Macleay River. This temporary bridge will connect the western side of the project area through the existing road to the Kempsey-Armidale Road. This access also connects to the MAR which then provides access to the main construction and generation areas of the Project.

A construction work area including laydown will be established on the northern side of the river to support the initial installation of the temporary bridge and provide materials for road works from this access location. A temporary fly camp will be established on the southern side of the river (see Section 1.3.4) to provide initial worker accommodation for the road works until the main camp is constructed.

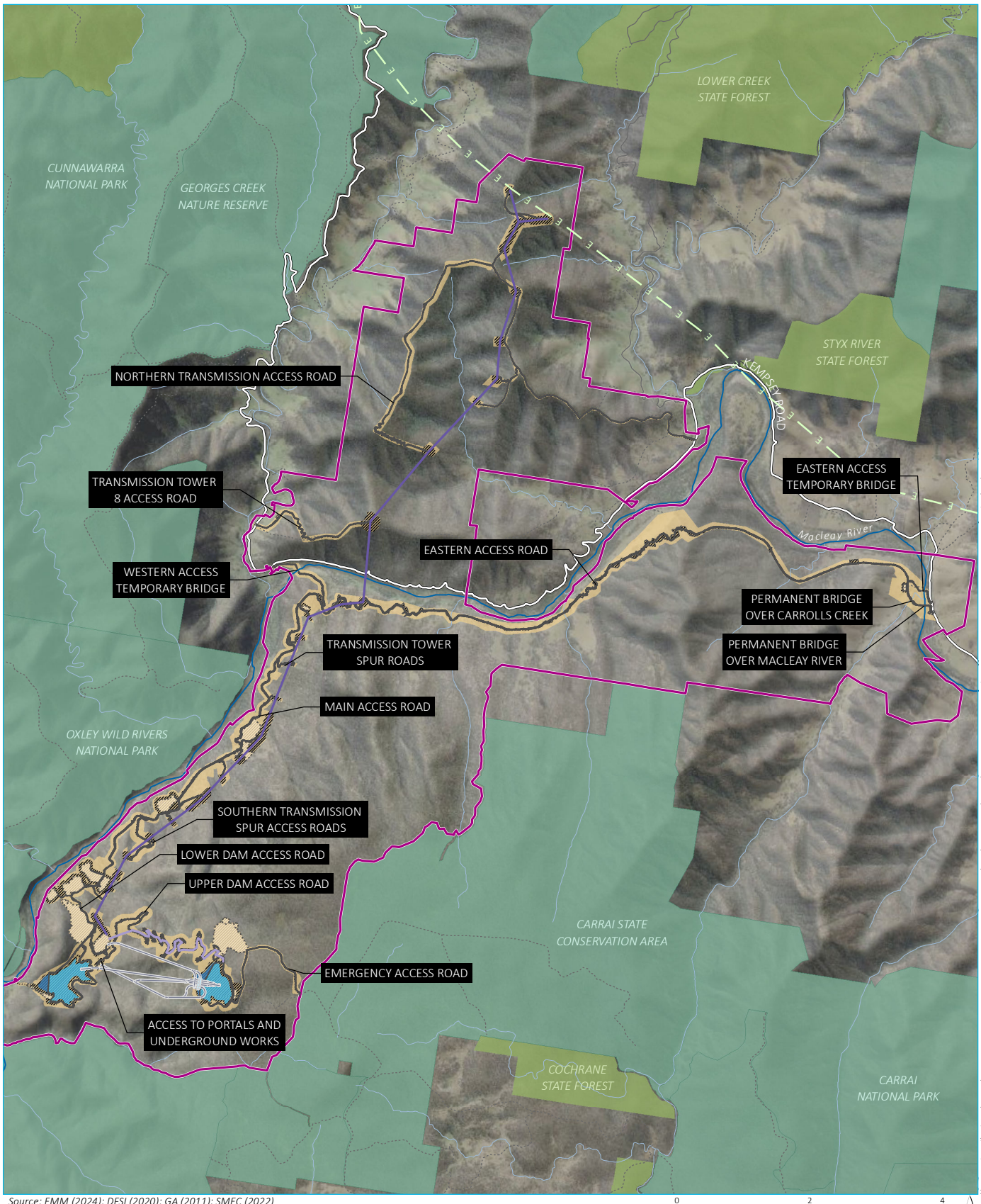
c Transmission access

Several short transmission spur roads run off the MAR to provide access to the transmission tower sites within the southern transmission construction area.

Two other access roads originating from the Kempsey Armidale Road will be constructed, the Northern Transmission Access Road and Transmission Tower Site 8 Access Road, both of which will build upon existing trails north of the Macleay River to facilitate the construction and maintenance of transmission line towers in the northern transmission construction area.

d Emergency egress

An emergency egress road will be established from the upper dam and reservoir to link with existing fire trails in the Carrai State Conservation Area. This trail will utilise an existing access track and would be used for emergency egress in the case of a bushfire or flooding or the like. The road could also be used by NPWS and RFS fire crews to access the Project area for bushfire purposes. It is also intended to use this road for an initial mobilisation to the upper reservoir work area, subject to agreement with NPWS.



Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Surface works

Project operational elements

- Underground power station complex
- Tunnels, portals, intakes, shafts
- Power and communications lines
- Transmission overhead lines
- Permanent road
- Reservoir
- Dam wall

Existing environment

- Macleay River
- Watercourse/drainage line
- Kempsey-Armidale Road
- Minor road
- Vehicular track
- Existing transmission line
- NPWS reserve
- State forest

Label format

SURFACE PERMANENT INFRASTRUCTURE

Access roads construction area

Oven Mountain Pumped Hydro Energy Storage Project
Updated Project Description
OMPS Pty Ltd
Figure 1.10

EMM creating opportunities

Table 1.5 Roads construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Rehabilitated to previous use	Long-term use
EAR including permanent Smiths Bluff Bridge and Carrols Creek Bridge.,	Provides primary access to generation related construction areas of the Project from the existing Kempsey-Armidale Road.	The EAR will be a two-lane, unsealed road with a length of approximately 12.1 km. A new low-level bridge of up to two lanes over the Macleay River and Carrolls Creek forms part of the EAR. A temporary bridge may be utilised prior to the construction of the permanent bridge.	Permanent infrastructure	The EAR will be used and maintained on an ongoing basis throughout the life of the Project.
Eastern Access Temporary Bridge	Provides temporary crossing of Macleay River from the existing Kempsey-Armidale Road, to allow construction of the EAR.	A temporary bridge spanning Macleay River and connecting unsealed access roads.	Temporary infrastructure	Access tracks will be maintained on an ongoing basis. Any tracks and bridges that are not required as part of the Project's operations will be decommissioned and rehabilitated.
Western Access Temporary Bridge	Provides secondary access to generation related construction areas of the Project from the existing Kempsey Armidale Road.	A temporary bridge spanning Macleay River and connecting unsealed access roads.	Temporary infrastructure	Access tracks will be maintained on an ongoing basis. Any tracks and bridges that are not required as part of the Project's operations will be decommissioned and rehabilitated.
Main Access Road	The MAR links the EAR to lower generation site. The MAR originates near George's Junction and continues south before connecting with the LDAR. It will include spurs to allow access to nearby transmission line towers.	The MAR will be around 4.7 km long, with a nominal pavement depth of 400 mm. It will consist of two lanes.	Permanent infrastructure	The MAR will be used and maintained on an ongoing basis throughout the life of the Project.
Lower Dam Access Road	The LDAR travels south-west through the lower dam and reservoir construction area. At its endpoint it meets the lower reservoir access track, which continues to the lower intake, spillway, river pumping facility and left abutment.	The LDAR will be around 3.6 km long, with a nominal pavement depth of 400 mm. It will consist of two lanes.	Permanent infrastructure	The LDAR will be used and maintained on an ongoing basis throughout the life of the Project.

Table 1.5 Roads construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Rehabilitated to previous use	Long-term use
Upper Dam Access Road	Branching off from the LDAR, the UDAR will connect to the upper dam and reservoir and used for construction and operation. The road may include temporary spurs to allow access to nearby transmission and communication line towers and various other construction areas.	The UDAR will be around 6.4 km long, with a nominal pavement depth of 400 mm. It will consist of two lanes.	Permanent infrastructure	The UDAR will be used and maintained on an ongoing basis throughout the life of the Project.
Northern Transmission Access Road	The Northern Transmission Access Road provides access to the northern section of the transmission connection works. The road will connect to the Kempsey-Armidale Road via a new intersection near Lower Creek and provide access to tower sites 1, 26 and 2 through to 7.	The Northern Transmission Access Road will be around 15 km long and will be unsealed roads. A large portion of this road will be established by widening and upgrades to existing fire trails.	Permanent infrastructure	The Northern Transmission Access Road will be used and maintained on an ongoing basis throughout the life of the Project.
Transmission Tower Site 8 Access Road	The Transmission Tower Site 8 Access Road provides access to the northern section of the transmission connection works. The road will connect to the Kempsey-Armidale Road via a new intersection north of George's Junction and provide access to tower site 8.	The Transmission Tower Site 8 Access Road will be around 2.3 km long and will be unsealed.	Permanent infrastructure	The Transmission Tower Site 8 Access Road will be used and maintained on an ongoing basis throughout the life of the Project.
MAT Portal Road	The MAT Portal Road will split from the LDAR before passing by the switchyard, ECVT portal, and the MAT portal. It will provide permanent access, and support construction of the underground works around the underground power station complex.	The MAT Portal Road will be around 1 km long, and will have a nominal pavement depth of 400 mm. It will consist of two lanes.	Permanent infrastructure	The MAT Portal Road will be use and maintained on an ongoing basis throughout the life of the Project.
Access tracks upgrades	Existing trails will be used to gain access to parts of the Project area, particularly around the transmission connection works on the northern side of the Macleay River. Upgrades to these may be necessary to ensure they are sufficiently safe.	Widening, resurfacing and improving drainage are the primary actions that will be undertaken.	Temporary infrastructure	Access tracks will be maintained on an ongoing basis. Any tracks that are not required as part of the Project's operations will be rehabilitated.

Table 1.5 Roads construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Rehabilitated to previous use	Long-term use
Emergency egress road	To provide emergency egress to the Carrai area fire trails should the lower part of the Project area be restricted.	Two lane unsealed road from upper reservoir to Project area boundary where it adjoins existing road.	Permanent infrastructure	The egress road will remain in place and continue to be utilised throughout the duration of the Project's life.
Additional access tracks	Extensions to existing trails may be necessary in some places including: • construction of new sections, particularly around spur access to the southern transmission connection works • additional trails to provide access to specific construction areas • the provision of safe egress from the Project area (for example, from the upper reservoir site to existing fire trails within adjacent national parks).	The extension and construction of access tracks will require vegetation clearing, surface grading and resurfacing.	Permanent infrastructure	Access tracks will be maintained on an ongoing basis.
Fly camps (Eastern and Western)	Fly camps will provide small scale temporary work accommodation for workers completing initial road works until the main accommodation camp is completed. They will be required for around the first year of construction.	Vegetation clearing and conventional earthworks will be the primary action required during construction. The camps will comprise primarily mobile structures and facilities.	Rehabilitated consistent with previous use.	Fly camp areas will be rehabilitated prior to operation.

v Transmission infrastructure construction area

The underground power station complex will be connected to the electricity grid by high-voltage transmission lines connecting the power station complex to Transgrid Line 965, located towards the northern end of the Project area. The transmission lines will consist of up to a double-circuit 330 kV line and a single circuit 132 kV line within the same transmission corridor. The transmission infrastructure will comprise of the lines, towers, as well as a substation.

The transmission easement will run north from the switchyard near the ECVT portal, approximately parallel to the MAR, before crossing the Macleay River east of Georges Junction and continuing north to TransGrid Line 965. Up to 25 transmission tower sites will accommodate the dual 132 kV and 330 kV infrastructure and will be positioned near roads wherever possible to minimise impacts associated with their construction and maintenance. Tower site 1A will accommodate only 330 kV infrastructure while tower site 1B will only accommodate 132 kV infrastructure.

A series of distribution poles will be installed between the upper and lower dams and reservoirs to allow electricity and communications lines to be provided to facilities located at the upper dam and reservoir. The voltage carried will be low, and as such the poles will have a small profile that will allow them to predominantly remain within the disturbance footprint associated with the UDAR.

The transmission infrastructure area is represented in Figure 1.11 and Figure 1.12 (north and south of the Macleay River respectively) with detail on Project elements, purpose, and description provided in Table 1.6.

Figure 1.13 provides an example of the infrastructure to be located at the transmission tower sites.

Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Surface works

Project operational elements

- Power pole
- Transmission site
- Northern transmission overhead line
- Southern transmission overheadline
- Power and communications lines
- Underground power station complex
- Tunnels, portals, intakes, shafts
- Permanent road
- Reservoir
- Dam wall

Existing environment

- Macleay River
- Watercourse/drainage line
- Kempsey-Armidale Road
- Vehicular track
- NPWS reserve

Label format

SURFACE PERMANENT INFRASTRUCTURE

Southern transmission construction area

Oven Mountain Pumped Hydro Energy Storage Project
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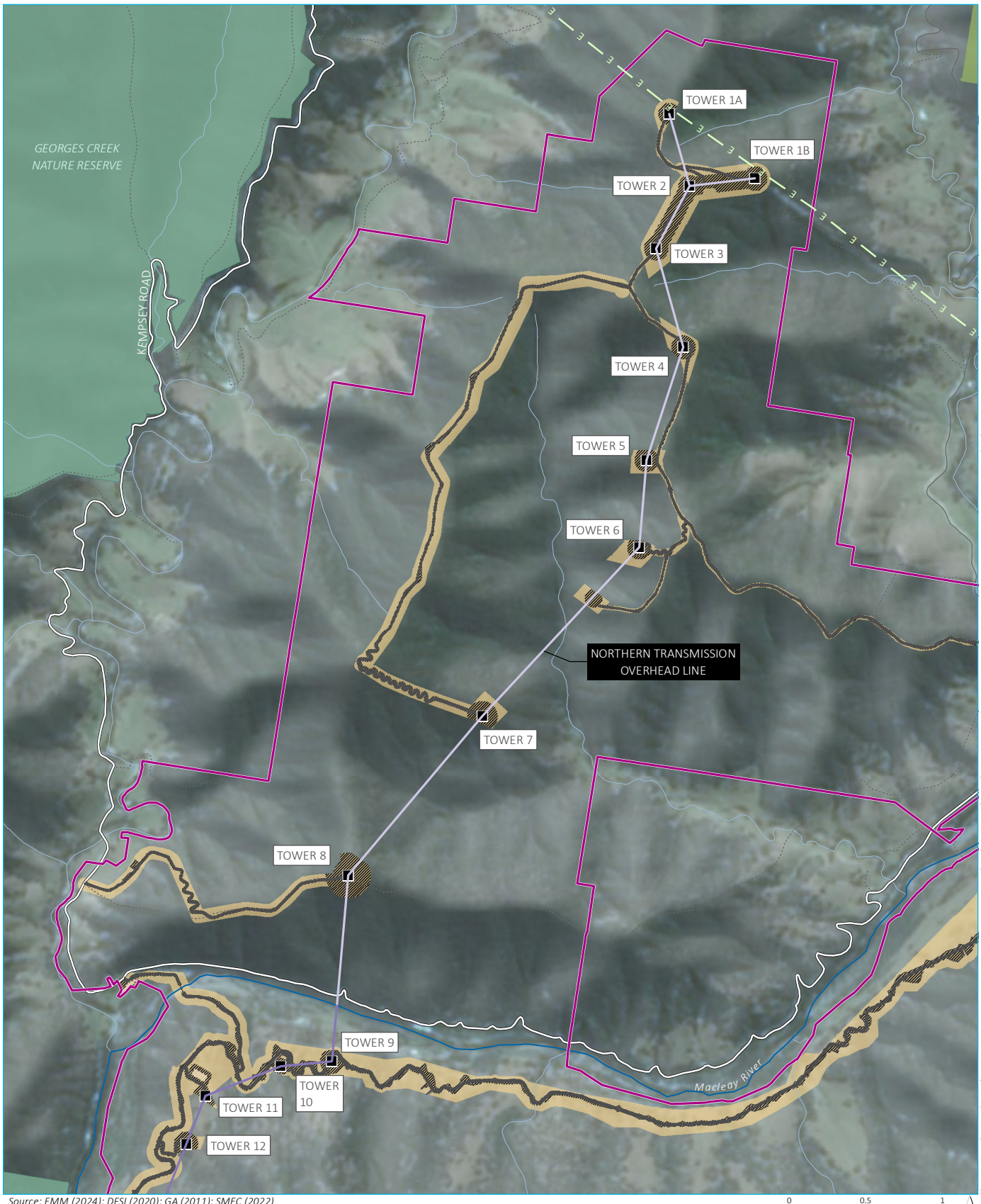
Figure 1.11

EMM creating opportunities



Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

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KEY

- Project area
- Disturbance footprint
- Construction envelope

Project operational elements

- Transmission site
- Northern transmission overhead line
- Southern transmission overhead line
- Permanent road
- Surface works

Existing environment

- Macleay River
- Watercourse/drainage line
- Kempsey-Armidale Road
- Minor road
- Vehicular track
- Existing transmission line

- NPWS reserve
- State forest

Label format

SURFACE PERMANENT INFRASTRUCTURE

Northern transmission construction area

Oven Mountain Pumped Hydro Energy Storage Project
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Figure 1.12

EMM
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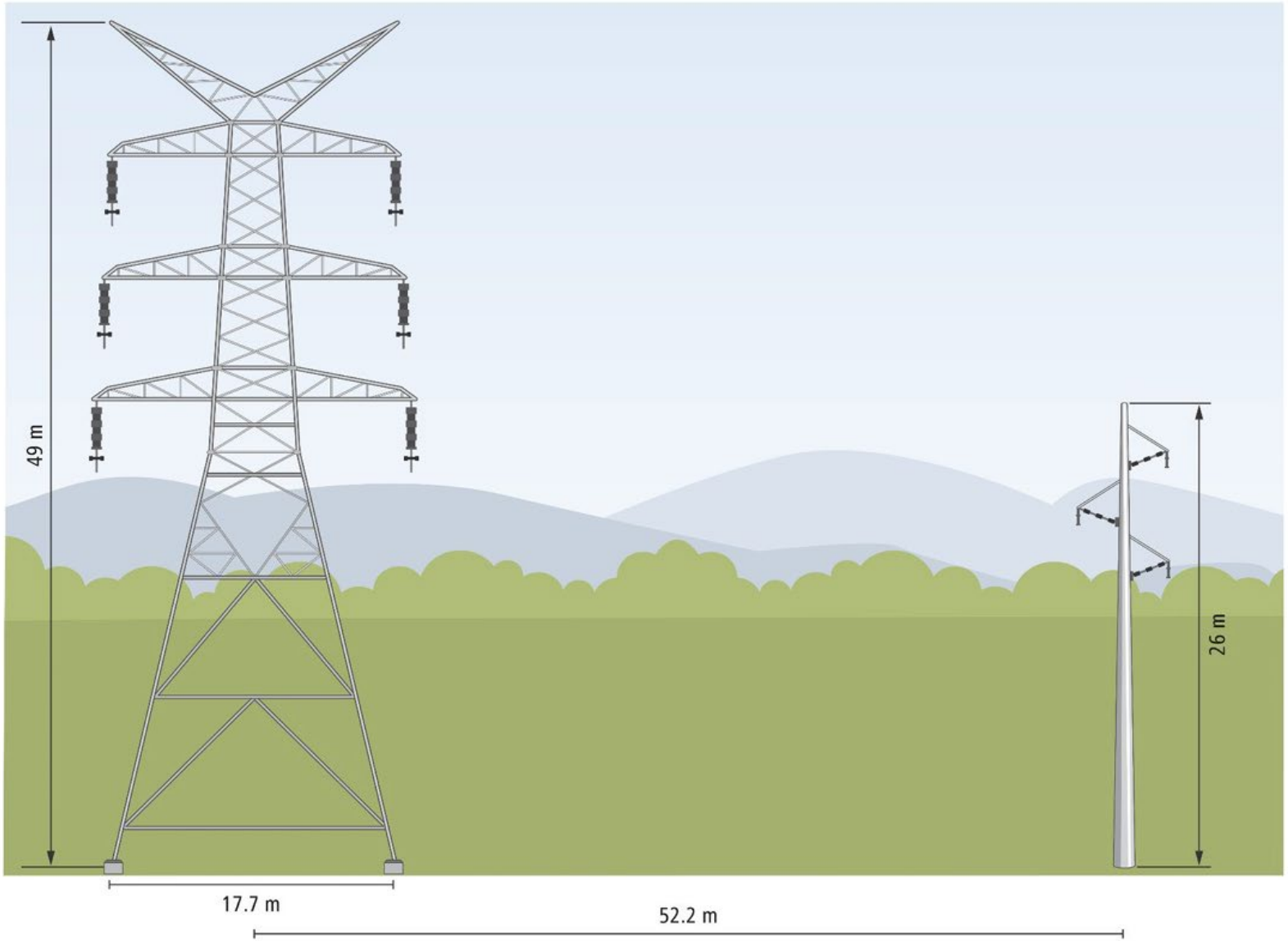


Figure 1.13 Illustration of transmission infrastructure

Table 1.6 Transmission infrastructure construction area – Project elements, purpose, and description

Element	Purpose	Method summary – during construction	Rehabilitated to previous use	Long-term use
Transmission easement	The transmission easement relates to the portion of disturbance footprint that is required to support the construction and operation of the transmission towers and overhead lines. The proposed width of the transmission easement is a maximum of 105 m.	Vegetation clearing and trimming will only be undertaken at certain locations across the length of the easement as required. The transmission easement has been sited to reduce vegetation clearing to the smallest area necessary to establish and safely operate the transmission easement.	Permanent infrastructure	The transmission easement is integral to the operation of the Project and will be used throughout the Project's life. Vegetation maintenance in the corridor will be regularly undertaken.
Transmission towers and overhead lines	Transmission towers and overhead lines will connect the power station to the existing power network. It will consist of up to a double-circuit 330 kV line, and a single circuit 132 kV line located side-by-side within the transmission easement. The 330 kV transmission towers will likely be steel lattice towers. The 132 kV transmission towers will likely be steel or concrete monopoles. Both are subject to detailed design.	The transmission towers for the 132 and 330 kV lines will be constructed within the 25 transmission tower sites situated along the length of the transmission corridor.	Permanent infrastructure	The transmission towers and overhead lines are integral to the operation of the Project and will be used throughout the Project's life.
Substation	The substation supports the connection to the existing power network at Transgrid Line 965. The substation will have a capacity of up to 330 kV and will also include ancillary connection infrastructure as required.	Vegetation will be cleared, and a foundation to support the new substation will be established.	Permanent infrastructure	The substation is an integral part of the operation of the Project and will be used throughout the Project's life.
Transgrid Line 965 and 132 kV connection point	The 132 kV transmission line splits from a dual line configuration at tower 2 and connects to Transgrid Line 965 at tower 1B.	Vegetation will be cleared, and a foundation to support. This connection will be terminated but kept in situ for back-up purposes once Transgrid Line 965 is upgraded to support the 330 kV connection.	Permanent infrastructure	The transmission towers and overhead lines are integral to the operation of the Project and will be used throughout the Project's life.
Transgrid Line 965 and 330 kV connection point	The Project 330 kV transmission splits from a dual line configuration at tower 2 and connects to Transgrid Line 965 at tower 1A.	This connection will not be undertaken until Transgrid Line 965 is upgraded to support the 330 kV connection.	Permanent infrastructure	The transmission towers and overhead lines are integral to the operation of the Project and will be used throughout the Project's life.

1.3.2 Construction phases and activities

The construction of the Project has numerous overlapping phases and stages during the approximate 5 year construction period. The planned Project phases and stages are shown in Figure 1.14 and outlined in Table 1.7. Detailed design will be undertaken prior to construction commencing. These phases and stages are indicative only and would be subject to change as the detailed design and construction planning progresses.

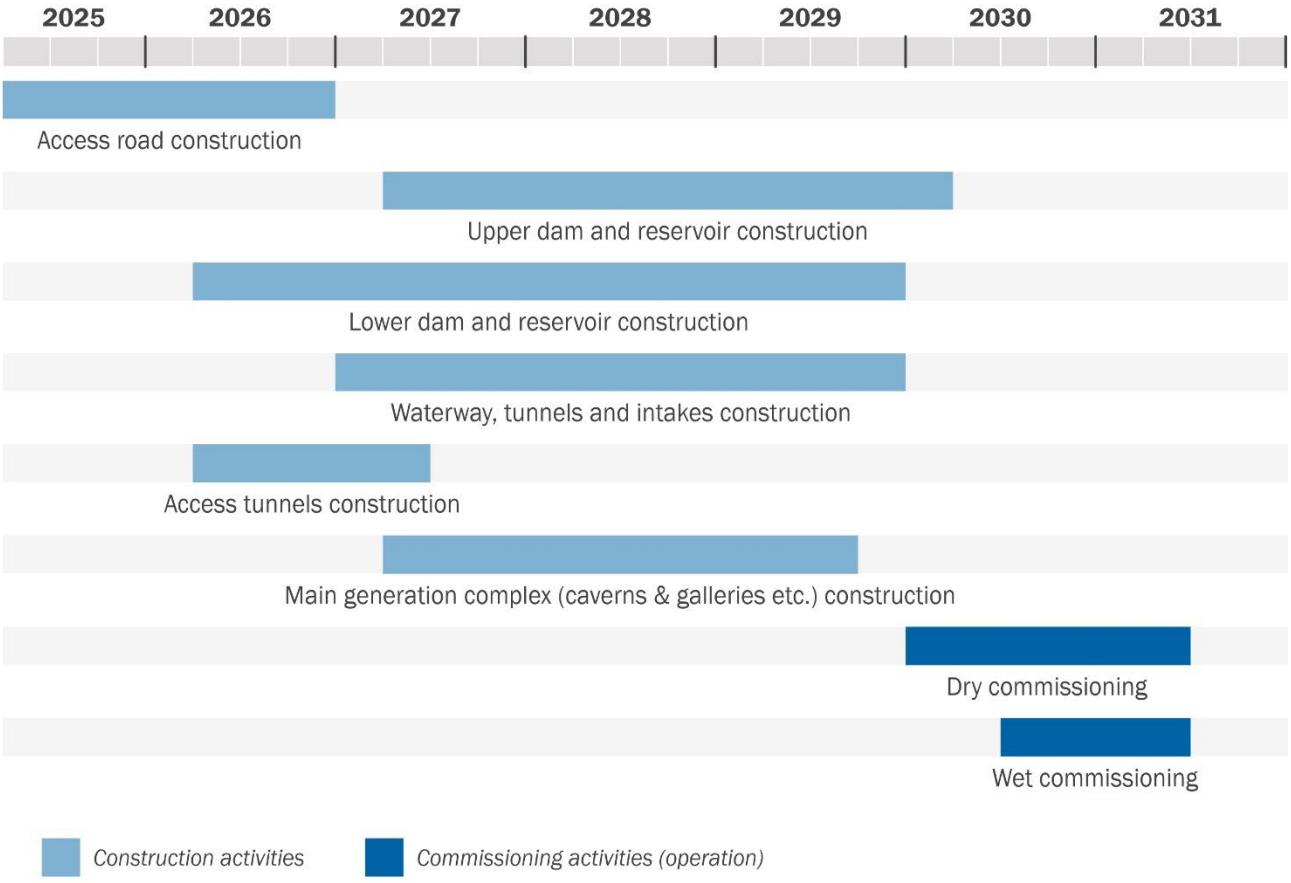


Figure 1.14 Project timing and sequencing

Table 1.7 Overview of Project phases, stages, and sequencing

Project phase	Project stage	Sub-stage	Typical activities	Indicative timeline
Construction	Pre-construction	Investigation and surveying	Prior to the commencement of any construction works, the disturbance footprint will be assessed, surveyed and defined. Ongoing environmental investigations will include archaeological, heritage and ecological surveys of the area, as required. Soil sampling and geotechnical investigations as required within the disturbance footprint.	2024–2025
		Design	This is an approximate two-year phase that involves the detailed design of civil, mechanical and electrical design components. The design phase forms the basis of the Project and detail will increase with each iteration.	2024–2025
		Management plans and secondary approvals	Includes developing and obtaining: • environmental management plans as required • secondary consents and permits (e.g. road openings, traffic permits, etc) • HSE permits and documentation (e.g. emergency response plans, drug and alcohol policies etc) • construction related permits (e.g. dial-before-you dig, building approvals for key components if required etc).	2024–2025
		Installation of environmental mitigation measures	Prior to the commencement of construction works, a number of mitigation measures will be installed, including: • erection of site fencing, where required, to delineate the construction boundary and provide security and safety • installation of sediment and erosion control measures, and in particular surrounding stockpile and soil emplacement areas. This phase will also involve the establishment of feasible environmental management and monitoring measures as identified throughout the EIS process.	2024–2025
		Clearing works	Vegetation will be cleared only within the disturbance footprint.	2025–2026

Table 1.7 Overview of Project phases, stages, and sequencing

Project phase	Project stage	Sub-stage	Typical activities	Indicative timeline
Construction	Early works	Site preparation	Once vegetation has been cleared, and appropriate mitigation measures have been installed, site preparation activities will take place. Activities will include, but not be limited to, the following: • clearing and grubbing works • earthworks and levelling • upgrade of existing and establishment of new access roads including the EAR and MAR • installation of water and wastewater facilities • establishment of temporary works areas, stockpile and soil emplacement areas • construction of other ancillary facilities required to commence construction, including power supply, temporary or fly camps, main accommodation camp, first aid and medical building, helipad area, bushfire refuge, and garbage areas • establishment of tunnel portals and exploratory tunnels • mobilisation to site • installation of plant and equipment • establishment and filling of construction water stores.	2026–2026
	Staged construction		Once access roads to the Project have been constructed multiple construction fronts will occur concurrently across the various construction areas throughout the Project area. Construction activities at each construction area will vary depending on the infrastructure and asset being constructed at each location. Extraction of water to fill reservoirs.	2025–2029
	Testing		Testing of operating and protection systems will take place towards the end of the construction period. Once everything has been identified to be in full working order, the new power station will complete its final commissioning.	2029–2030
Operation	Commissioning		Completion of final commission is planned to occur towards the end of 2029.	2029
	Operation and maintenance		Operation and maintenance will be ongoing for the life of the power station.	2030 and ongoing

Table 1.7 Overview of Project phases, stages, and sequencing

Project phase	Project stage	Sub-stage	Typical activities	Indicative timeline
	Progressive rehabilitation		Temporary areas of the disturbance footprint, which are not required for operation, will be progressively rehabilitated throughout the construction and operation stages of the Project.	2028–2030

Various activities and methodologies will be utilised to enable the construction of the Project. Due to the nature of the Project, construction activities will occur as both surface works and below ground excavation works. The above ground surface works primarily involves conventional earth works associated with the establishment of the various pieces of Project infrastructure, including access roads, dams, and tunnel portals. The underground construction works primarily involves the tunnelling and excavation works for power station caverns, access tunnels and power waterways.

It should be noted that these phases are not sequential and that the detailed construction phasing will be confirmed in the staging report to be prepared during Project delivery.

Some of the key construction related activities are described in further detail below.

i Pre-construction activities

During the initial phase of Project implementation and prior to commencing the detailed construction site activities, a range of activities will be undertaken by the Project team as described in the table above. It includes an early works program for undertaking additional investigations and surveys where required, completion of detailed design, preparation of environmental management plans, obtaining secondary approvals, installation of environmental mitigation measures and controls and clearing works.

ii Site establishment

The site establishment activities may vary slightly between construction areas, however, will generally consist of the following activities:

- construction of site access roads
- detailed site survey and demarcation
- clearing and grubbing of vegetation
- establishment of erosion and sediment (ERSED) controls
- site intrusive and non-intrusive testing
- establishment of site utilities including power, water, communications and waste facilities
- establishment of site offices and compounds
- the establishment of any temporary access as required.

These pre-construction and site establishment activities will support the construction activities and methodologies that will be required to construct the key elements of the Project.

iii Vegetation clearing and trimming

To enable construction works to commence, clearing of vegetation will be required within the Project's disturbance footprint. From a vegetation clearance perspective, particular sections of the footprint will be cleared to allow for the construction of permanent assets to be built, whilst other areas of the disturbance footprint will be cleared to house temporary components of the Project. The areas that are temporary and only required to support the construction phase of the Project will be progressively rehabilitated when they are no longer required.

As part of the transmission connection works, vegetation clearing and trimming will be required along some sections of the alignment of the transmission lines and clearing around each tower location. Vegetation will be trimmed in a manner that allows for sag in the transmission lines, whilst also providing a buffer as required to prevent future ignition of fires or other safety considerations. Vegetation clearance is generally lower where line is strung between ridges.

Once operational, vegetation will require regular trimming and maintenance around all permanent infrastructure to ensure that safe operating distances are maintained during the operation of the Project.

iv Earthworks

Conventional earthworks and earth moving activities will be required for the construction of new access roads, bridges, the establishment of site pads, installation of plant and equipment and the installation of utilities across the site. Equipment utilised for earthwork activities will include excavators, bobcats, bulldozers, backhoes, articulated dump trucks, rollers and graders. Additional equipment including fuel trucks and water tankers may also be used to facilitate the plant operations across the site.

As a general overarching principle, design of pads and roads will aim to optimise the cut and fill balance of all earthworks Project wide. This will optimise re-use opportunities and reduce the need to dispose of excess material. If suitable material cannot be sourced across the construction envelope, materials may need to be imported to site for use in the construction of the roads and dam structures.

v Blasting

Drill and blast will be the primary method of excavation for the tunnels and underground caverns and adits, as described in the following section. In addition to tunnelling, and in combination with earthworks, blasting activities may also be required to excavate hard rock encountered during construction of other site elements. Controlled blast activities will be required for excavation of the tunnel portals, intakes and reservoirs, and access roads.

vi Tunnelling

To construct the required underground components, tunnels will need to be excavated. It is proposed that the bulk of the underground excavation will be completed via full-face excavations utilising a drill and blast methodology, supported by tunnel wheel jumbo drillers. Road headers may also be used to support excavation of the underground components while raised bore excavation methodology is proposed to be used for drilling of vertical tunnels and shafts.

Underground infrastructure including power waterways, access tunnels, power station and transformer caverns and tunnel adits will be excavated using a combination of tunnelling methods. The tunnels will be augmented with tunnel support, consisting of shotcrete, steel fibre reinforced concrete, rock bolts and full-bond rock bolts with cement mortar where required. Components of the headrace and penstock tunnels are likely to be lined with steel.

The pressure shaft will be constructed using a different tunnelling methodology due to its vertical orientation. It will be constructed using a raise bore technique, which will require access to both the top and bottom of the shaft to facilitate the disposal of the excavated spoil.

vii Cavern excavating

Subject to detailed design, the excavation of the caverns will likely differ slightly from the methodology used for tunnelling. The proposed construction sequence will involve:

- top heading, long drive

- side drives
- crown support
- crane beam construction and anchoring
- bulk excavation to bottom of cavern including side wall support as required through a central slot excavation followed by edge strip excavation.

Mucking shafts will be employed to allow spoil removal to be undertaken independently of excavation and blasting activities.

viii Quarrying

Quarrying activities will be undertaken upstream within the footprints of the upper and lower reservoirs. Quarried material will be used to provide rockfill for the dams, road base and concrete aggregate, if deemed suitable, while also increasing the capacity of the reservoirs. The quarrying practices will consist of the removal of vegetation and the excavation of unsuitable material, followed by the excavation of competent bedrock through drill and blast using a benching methodology. The unsuitable materials will be managed in the spoil emplacement areas.

ix Dam construction

The general dam construction process is expected to consist of eight distinct steps, these being:

- mobilisation and stripping of the site
- the construction of diversion works
- the excavation of the creek bed for dam foundations and abutments following the completion of the coffer dams
- consolidation and curtain grouting, the placement of concrete plinth and cut-off walls
- the excavation, crushing and placement of rockfill for the dam body
- the installation of the concrete face to interface with the concrete plinth
- the construction of stilling basin, crest, and spillway walls and installation of outlet infrastructure to the river diversion works
- the initial filling of reservoirs.

Upstream (and downstream if required) cofferdams will be constructed abutting the diversion conduit to floodproof the dam construction sites. Once the dams are completed the diversion conduit upstream bulkhead will be converted to emergency low level outlets and the reservoir will be impoundment.

The rate of dam construction will be dependent upon the rate of rockfill placement, with total completion expected to take approximately three years, including reservoir excavation.

1.3.3 Permanent infrastructure

This section describes in further detail the permanent infrastructure that will remain post construction to operate the Project. The permanent infrastructure has been designed and situated to minimise or mitigate impacts.

The following key Project elements are proposed to be constructed as permanent infrastructure.

i Macleay River pumping facility

The Macleay River pump facility will be used for the initial filling of the lower reservoir, as well as supplying water for use supporting the construction activities of the Project. Water extraction and pumping will be managed through a Specific Purpose Access Licence (SPAL) issued under the NSW *Water Management Act 2000* (WM Act). Over a period of months, up to 6,250 ML of water from the Macleay River will be extracted during high flow periods to the nearby lower reservoir using pumps. The Surface Water Assessment has assessed there will be minimal impacts on the Macleay River ecosystem and downstream water users as water will only be pumped when the Macleay River's stream value is above the 50th percentile which means that the river flow cannot drop below 597 ML/day as a result of pumping. A maximum extraction rate of 86.4 ML/day can be extracted with the full amount extracted only when the river's flow is above 683.4 ML/day. The time that the initial fill will take will be highly dependent upon hydrological conditions in Macleay River at the time and is expected to take from 3 to 12 months in a typical year.

Once the initial filling of the lower reservoir is complete, the pumping station and its access road will remain as permanent infrastructure so that it can be utilised for periodical top-up of the reservoir. While on average, surface water inflows will compensate for seepage and evaporation water loss, there may be infrequent occasions where a top-up is required to be sourced from the Macleay River. This will occur on a similar high flow basis as the initial fill and will be limited to 1.0 m^3/s.

Most of the pumping infrastructure will be underground with only the top of the structure likely visible from the surface including an access road for maintenance. To minimise potential impacts associated with extracting water from the Macleay River, fish screening is to be installed on pump infrastructure in general accordance with:

- *The practical guide to modern fish-protection screening in Australia* (Boys et al. 2021)
- *Design specifications for fish protection screens in Australia* (Boys 2021).

As several factors require consideration when designing an effective fish-protection screen, the proponent will continue to consult with DPE Water and DPI Fisheries over the fish screen design moving forward and into detailed design to mitigate the potential risks associated with pump operation.

ii ECVT portal

The ECVT portal serves a variety of purposes, including acting as a connector between the high voltage transmission lines and the cables from the power station complex. It will consist of a cluster of infrastructure that will, subject to detailed design, include the following buildings and equipment:

- building/office, including switchgear and a control room
- switchyard infrastructure such as disconnector/earth switches, capacitive voltage transformer, surge arrestors
- ECVT ventilation fans to provide air circulation for the tunnels and power complex
- a car park
- backup diesel generators and diesel tanks
- security fences
- a water bore
- permanent water tanks holding raw water and potable water

- firefighting apparatus.

Along with the MAT portal, the ECVT portal is one of only two access points to the subterranean component of the Project. For this reason, it will be a crucial access zone during the construction and ongoing operational phases of the Project.

iii MAT portal

The MAT portal will serve as the primary point of access for the underground component of the Project. The portal will consist of an entry into the main access tunnel accompanied by a raw water storage tank and a small service building that will provide administrative services and have first aid supplies on hand.

iv Pumped hydro-electric and generation works

The pumped hydro-electric and generation works comprises of the energy storage and power components of the Project. The works will incorporate two water reservoirs at different elevations (an upper and lower dam reservoir) that will generate power as water moves from the upper dam and reservoir to the lower dam and reservoir passing through a turbine, and consume power as water is pumped back into the upper reservoir. The following provides further detail around the components involved in this process. It should be noted that the dimensions stated in this section are based on the feasibility design. Final dimensions and configurations of all Project infrastructure will be optimised and confirmed throughout the detailed design phase of the Project, and therefore amendments will likely be required.

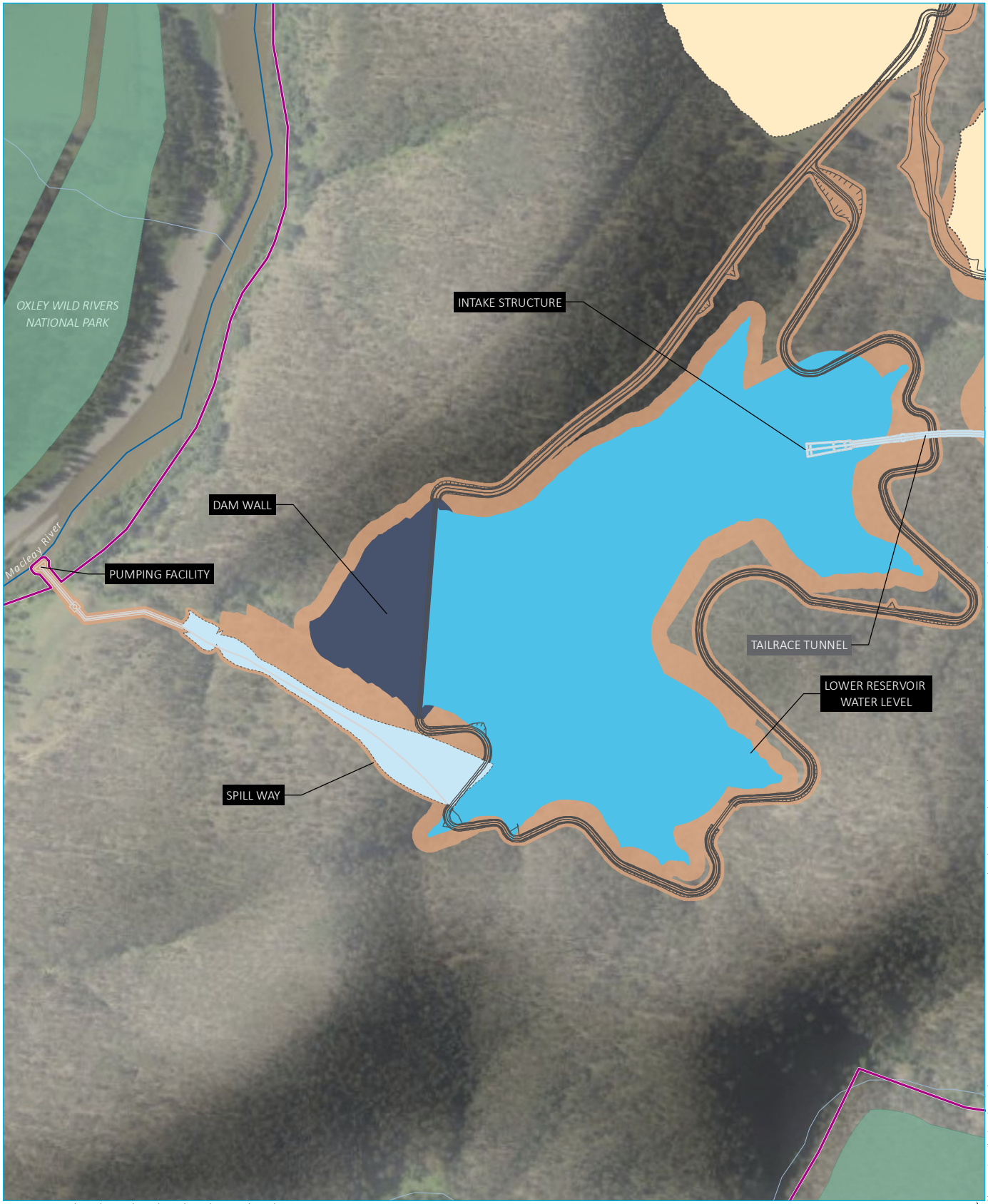
v Dams and reservoirs

a Lower dam and reservoir

The lower dam and reservoir will be established approximately 350 m east of the Macleay River. Figure 1.15 shows the proposed layout of the dam and reservoir. The following are its main components:

- A CFRD on the eastern side.
- Shown below in Figure 1.15, this is the largest component of the lower reservoir. It will be approximately 70 m high and approximately 280 m long. Rockfill for the dam will be partially attained from the quarry to be constructed to the east of the dam within the lower reservoir area. The crest of the dam will be 6 m wide and sit at an elevation of 255 m AHD. A further polymer or asphalt based liner may be added to the upstream face and base of the reservoir to prevent water losses.
- A concrete lined spillway chute through the left abutment. The spillway will have a capacity of 150 m^3/s. It will be 20 m wide at the crest, narrowing down to 10 m in the lower chute. A dissipator structure will be designed to dissipate the energy of the flow before it is discharged back to the creek.
- A concrete encased diversion conduit through the left abutment. The conduit will have a sufficient diameter to accommodate the construction floods and will contain the long-term outlet facilities for an emergency drawdown of the reservoir.
- A quarry located to the east of the dam within the lower reservoir area. In addition to providing rockfill for the dam wall, the quarry itself will ultimately form the outlet for the tailrace tunnel.

The primary operational function of the lower dam and reservoir is to act as a storage vessel for water. It will collect pumped water from the Macleay River during the initial filling of the reservoir and will hold water to be pumped to the upper reservoir for electricity generation purposes. The Project is a closed-loop system, so minimal additional water will be required once the initial filling of the lower reservoir has occurred.



Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

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KEY

- Project area
- Operational footprint

Project operational elements

- Underground power station complex
- Tunnels, portals, intakes, shafts
- Transmission overhead line
- Permanent road
- Spillway
- Surface works
- Reservoir
- Dam wall

Existing environment

- Macleay River
- Watercourse/drainage line
- Kempsey-Armidale Road
- Existing transmission line
- NPWS reserve

Label format

SURFACE PERMANENT INFRASTRUCTURE

UNDERGROUND PERMANENT INFRASTRUCTURE

Lower dam and reservoir

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Figure 1.15

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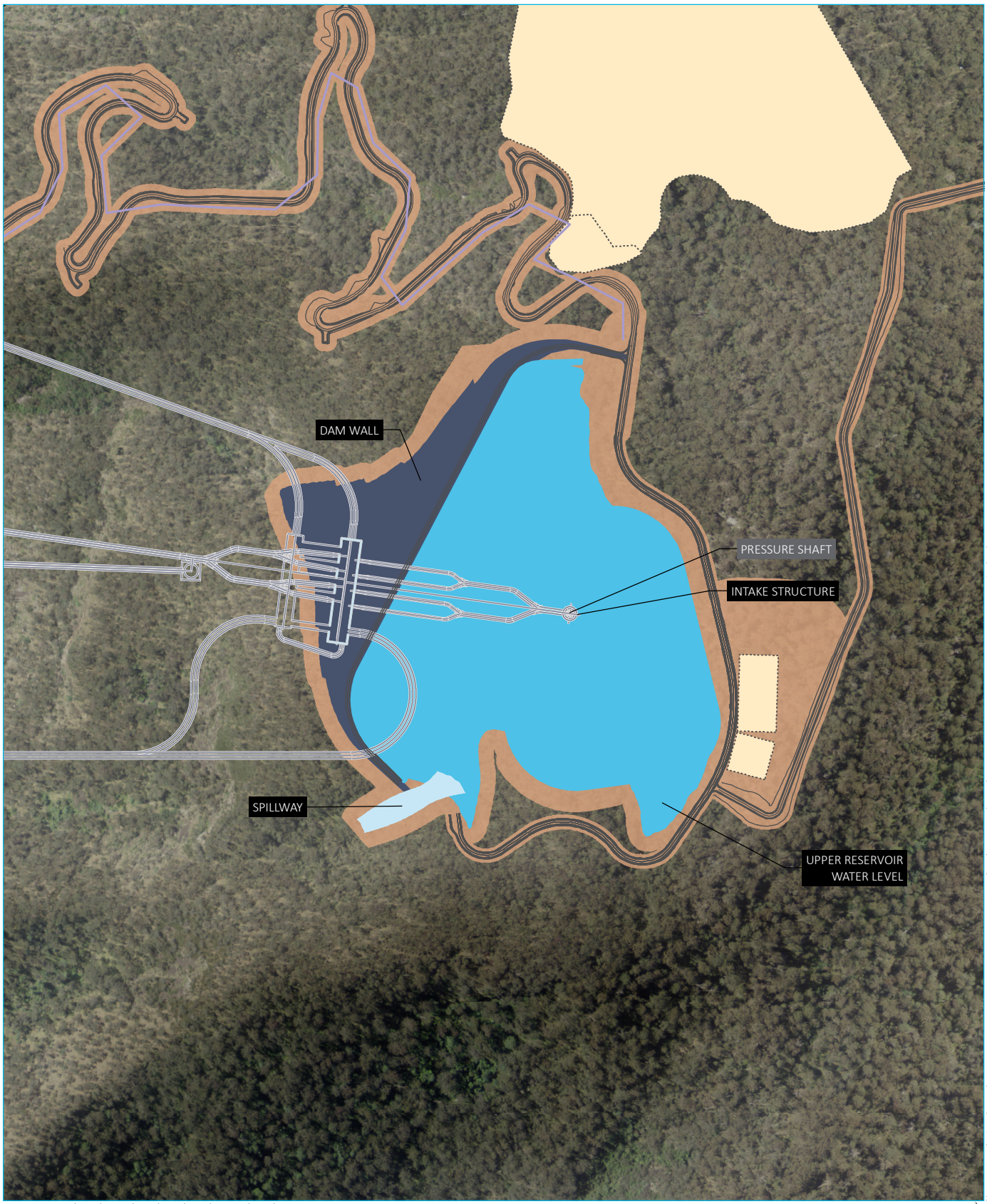
b Upper dam and reservoir

The site for the upper dam and reservoir was selected due to its favourable geological attributes, vertical elevation and its proximity to the lower dam and reservoir. It will be established to the east of the lower dam and reservoir, approximately 2.7 km from the Macleay River and will sit approximately 650 m higher than the lower reservoir. As shown in Figure 1.16 the main components of the upper dam and reservoir will be:

- an approximately 70 m high and approximately 780 m long CFRD, with crest elevation of 885 m AHD. A further polymer or asphalt based liner may be added to the upstream face and base of the reservoir to prevent water losses.
- a concrete lined spillway chute with a capacity of 150 m^3/s, which will discharge into a gully at the southern tip of the dam wall
- a concrete encased diversion conduit, which will be converted to an emergency low level outlet following the construction of the embankment
- a quarry to the east of the dam and within the upper reservoir area which will provide rockfill for the construction of the dam wall and will house the intake structure of the waterway.

Much like the lower dam and reservoir, the upper dam and reservoir's main purpose is to act as a means for water storage. Water is to be held in the upper reservoir after it has been pumped up into it and will be released back into the lower reservoir, converting its potential energy into electricity at the power station complex in the process.

Service buildings and access roads will be present at both the upper and lower reservoir sites for the purpose of monitoring the reservoirs and the associated machinery.



Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

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KEY

- Project area
- Operational footprint

Project operational elements

- Underground power station complex
- Power and communications lines
- Tunnels, portals, intakes, shafts
- Permanent road
- Spillway
- Surface works
- Reservoir
- Dam wall

Label format

SURFACE PERMANENT INFRASTRUCTURE

UNDERGROUND PERMANENT INFRASTRUCTURE

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Upper dam and reservoir

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Figure 1.16

EMM creating opportunities

c Upper intake structure

The upper intake structure will consist of a vertically oriented, octagonal, submerged, reinforced concrete structure embedded within an excavated pit in the upper reservoir. The design of the upper intake structure is typical of a “morning glory” type arrangement. The proposed feasibility design of the structure is displayed in Figure 1.17.

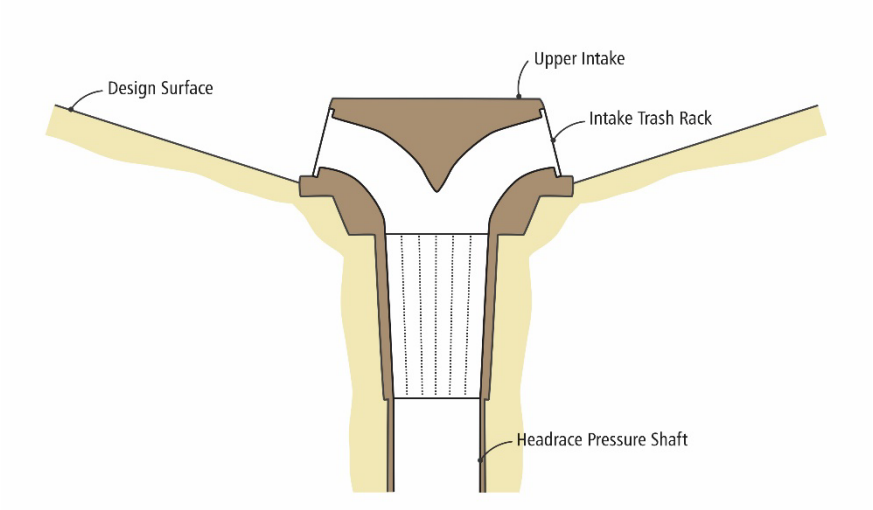


Figure 1.17 The upper intake structure

This design has been selected with the goals of minimising head loss, avoiding the formation of vortices, ensuring that water velocity through trash racks is suitable, and ensuring compatibility with the components of the other connected structures. The anticipated average gross velocity of water across the trash racks is expected to be approximately 1 m/s when operating without blockages. The flow will accelerate to an average of around 5 m/s in the headrace shaft with a diameter of approximately 6.4 m.

No permanent headgates will be required for the upper Intake structure, as the upper reservoir can be drained as required for maintenance procedures. Blockage of the trash racks is expected to be of minimal concern due to the frequent reversal of water flow through the structure.

d Lower intake structure

The orientation of the lower intake will differ to the upper intake structure although the performance objectives are the same. The concrete gate structure will be embedded into competent rock on the edge of the reservoir, with a sediment trap downstream of the trash rack screen. The style of intake is referred to as a lateral intake, and it features trash racks to avoid debris entrainment, a sediment trap, a flow diffuser to gradually reduce flow velocities approaching the trash rack panels, and a lower gate and gate shaft.

The lower gate shaft will house equipment used for the hydraulic isolation of the lower reservoir, which will consist of a double protection system utilising a gate and stoplogs. As shown in Figure 1.18, the lower gate shaft will connect to the tailrace tunnel at its lower end and reach the surface at an elevation of approximately 256 m, 6 m higher than the lower reservoir full supply level at maximum capacity. This will allow the gate and stoplogs to be operated from the surface, using a permanent hoist and mobile crane respectively.

Similar to the upper intake structure, blockage due to the accumulation of debris in the trash racks is not anticipated to be problematic due to the frequent reversal of flow direction, however the intake structure will be able to continue operating in the event of a partial blockage. The flow rate through the lower intake structure is intended to be less than 2 m/s at maximum flow.

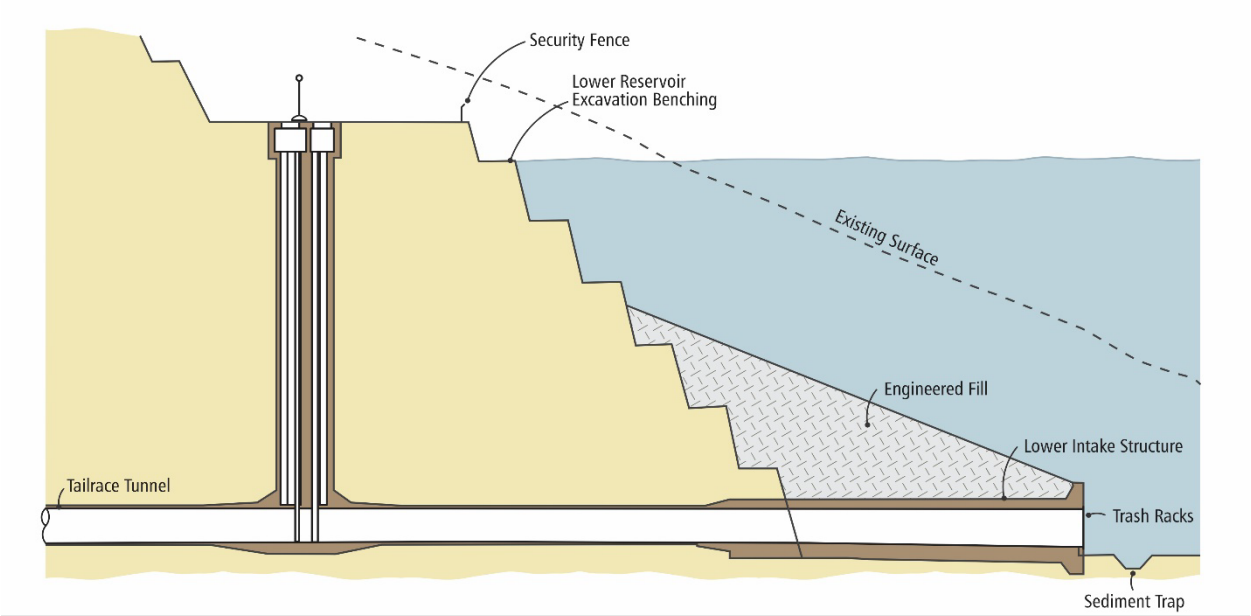


Figure 1.18 The laterally oriented lower intake structure

e Underground power station complex

Central to the operation of the Project is the multi-level underground power station complex. The station has been optimised to be located as far upstream as possible to reduce adverse effects of hydraulic transients. Additional geotechnical investigations may be required to determine its exact location. The cavern complex will house the power station and will be accessible via the MAT and ECVT. The key electrical and mechanical components of the Project will be housed in the power station complex, including the pump/turbines, transformers (in a separate cavern), and motor/generators. Drainage equipment will also be housed here, as the surrounding tunnels will self-drain into the power station drainage sump.

The power station complex will comprise a machine hall, a transformer hall, and isolated phase busbars (IPBs) between them. The machine hall will sit upstream of the IPBs and the transformer hall and will nominally house four Francis fixed speed pump-turbines. Each turbine unit will have a generating capacity of at least approximately 225 MW. It should be noted that the final configuration and number of pump-turbines will be optimised during the detailed design phase. The power station will be constructed from mass and reinforced concrete and will also contain associated plant facilities required for operating the power station such as the control room and underground amenities. The pump-turbines will operate together to provide a combined nominal power export capacity of at least 900 MW. Overhead cranes for the installation of equipment will be fitted in the power cavern.

The machine hall is currently designed to comprise seven distinct bays along its 135 m length. These will be:

- A 13 m wide unloading bay, where vehicles will be able to park and utilise the overhead crane for equipment unloading.
- A 22 m wide assembly bay, which will be necessary as the turbines and generators will be transported in parts. The lower levels of the assembly bay will include mechanical and electrical equipment, the switchboard room, air compressors, water chillers, drainage, and the dewatering pit.
- 20 m wide machine bays, which will house the pump-turbine and motor-generator machines and their auxiliary control systems.

- 2 service bays, each spanning several floors. Service bay 1 will be 8 m wide and will contain the sewage water tank room, emergency dewatering pump panel room, store, cleaners' room, and employee facilities (toilets, change rooms, kitchen and mess rooms). Service bay 2 will be 12 m wide and will contain the control room and offices, communication room, sensitive spare parts store, auxiliary services room and water tanks, ventilation fans, and lift panel on the upper level.

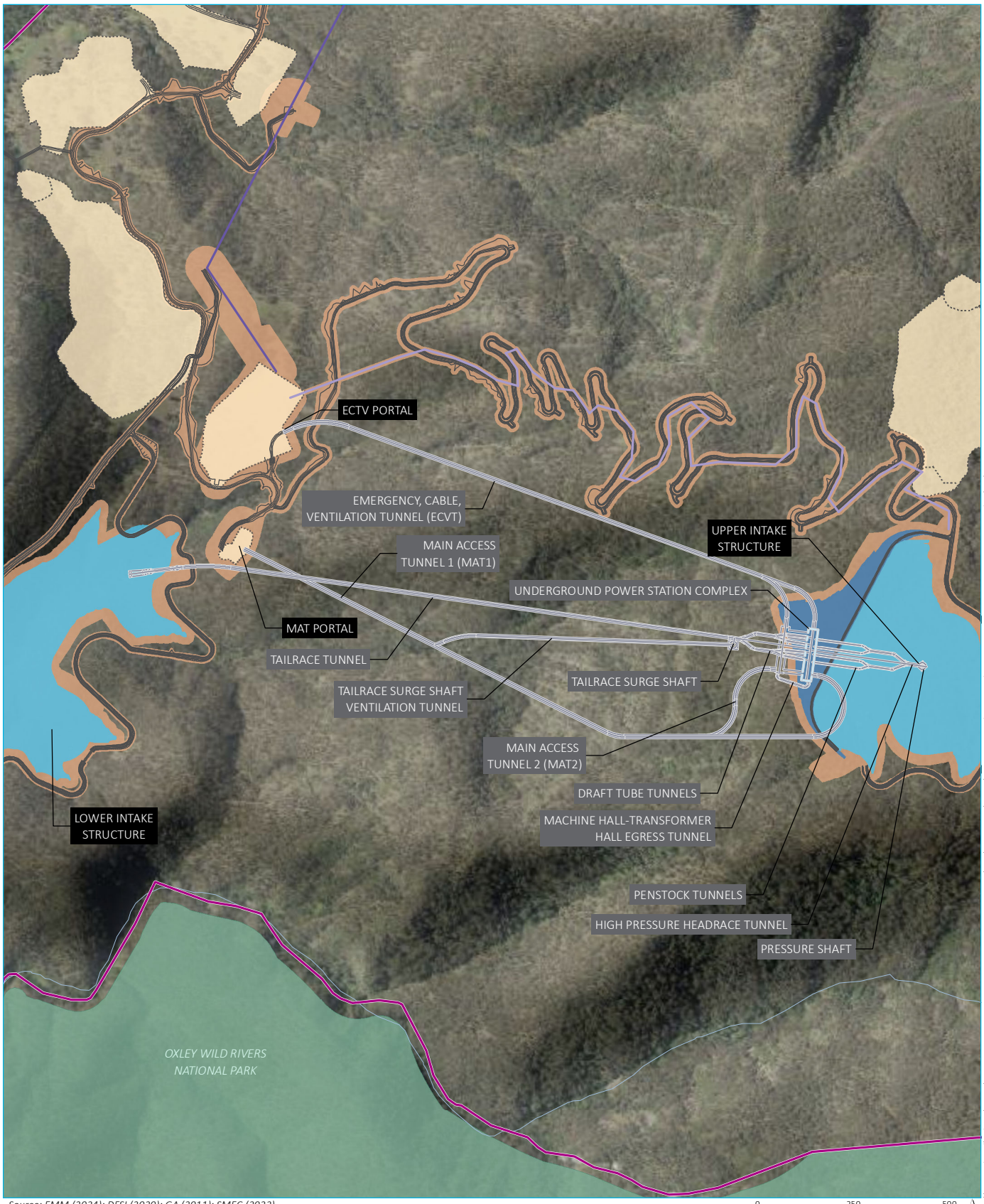
The machine hall will also be divided into levels, accessible via a spiral staircase. Based on the current design, these levels, and their nominal heights (in approximate elevation (EL)), are as follows:

- The drainage gallery floor, EL 121.5 m. This floor is an access way to the draft tubes, and provides access to the station drainage, emergency dewatering pump and dewatering pit, which is located below this floor.
- The main inlet valve floor, EL 127 m. the main inlet valves and their ancillaries are located on this floor, and it provides access to the draft tube cone and the underside of the turbine runner.
- The mechanical services floor, EL 128 m. Only marginally elevated above the main inlet valve floor, this floor will house water-cooling systems, water/oil treatment equipment, and a variety of machinery for operating the turbines and the flap gates.
- The turbine floor, EL 132 m. This is where most of the turbine control equipment will be situated, as well as a mechanical workshop.
- The generator floor, EL 140 m. The main electrical systems, including the generators and their auxiliary systems will be situated on this level.
- The operating floor, EL 147.6 m. This floor is the entrance level for the power station, and will contain the platform for the assembly and maintenance of the pump-turbines and motor-generator. The control room, communications room, cleaner rooms, and sewage water tank will also be situated on this level.
- The amenities floor, EL 150 m. This floor will include the offices, toilets, kitchens, mess rooms, maintenance offices and sensitive parts store.
- The crane maintenance service floor, EL 154 m. This floor is where crane maintenance will be undertaken, and it also has the auxiliary tunnel connection to the transformer hall.

During generation mode, water will enter the machine hall from the penstock tunnels via the main inlet valve, pass through the pump-turbines and exit through the downstream draft tube tunnels. The draft tube tunnels will pass beneath the IPBs and the transformer hall. Included within the draft tube will be a bonneted gate for each of the draft tube, which will allow each unit to be isolated from the downstream waterway.

Downstream from the machine hall, the transformer hall will house the transformers. The transformers will step up generator voltage to the grid voltage of 330 kV. This will allow the power to be evacuated from underground without significant electrical losses. The generators and main transformers will be connected via the IPBs, located in the IPB galleries. The IPB galleries will also contain an array of electrical equipment needed between for operation. The ECVT will provide access for the high voltage cables to the above ground switchyard located proximate to the ECVT portal.

The final configuration and number of pump-turbines and generating units will be optimised during the detailed design phase of the Project.



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Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022)

0 250 500 m

GDA 1994 MGA Zone 56

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KEY

- Project area
- Operational footprint

Project operational elements

- Underground power station complex
- Tunnels, portals, intakes, shafts
- Permanent road
- Power and communications lines
- Transmission overhead lines
- Surface works
- Reservoir
- Dam wall

Existing environment

- Watercourse/drainage line
- Kempsey-Armidale Road
- NPWS reserve

Label format

SURFACE PERMANENT INFRASTRUCTURE

UNDERGROUND PERMANENT INFRASTRUCTURE

Underground power station complex

Oven Mountain Pumped Hydro Energy Storage Project
Updated Project Description
OMPS Pty Ltd
Figure 1.19

EMM creating opportunities

vi Tunnels

There will be two types of tunnels excavated for the Project, these being access tunnels (MAT and ECVT) and power waterway tunnels. Various adits will be excavated as a part of the construction process, and these will be sealed with concrete plugs prior to the commencement of operations. The power waterway tunnels will transport water between the reservoirs and the power station complex, while the access tunnels provide a route for people and machinery between the surface and the power station complex. The key tunnels are listed below. The design of the tunnels may be refined during the detailed design phase.

a MAT

The MAT is an access tunnel that will provide direct access to the power station complex. This tunnel will be the primary access route from the surface (MAT portal) to the underground component of the Project for most workers and machinery throughout both the construction and operating phases. This primary tunnel is referred to as MAT1. An underground offshoot of MAT1, MAT2, has a steeper gradient and provides direct access to the transformer cavern.

The portal for the MAT1 is downstream of the power station complex, and the MAT1 itself has a similar orientation to the tailrace tunnel until it passes the power station complex, whereupon it hooks around to connect to the northern side of the machine hall. It will have a D-shaped profile, be approximately 8 m in diameter and have a total nominal length of 1,860 m. The MAT1 will connect to all the adits and other access tunnels, with the exception of the ECVT and the auxiliary tunnel connection.

The MAT1 connects to the following smaller tunnels:

- the penstock construction adit (191 m long with a 6 m diameter), which will connect to the western side of the headrace tunnel, near the penstocks
- the pressure shaft construction adit (235 m long, 6 m diameter), which will connect to the eastern end of the headrace tunnel, near its junction with the pressure shaft
- the tailrace surge shaft ventilation tunnel (600 m long, 4 m diameter), which provides access to the top of the tailrace surge shaft.

The MAT2 has the same profile as the MAT1 and is approximately 300 m long. This tunnel will also constitute a key access route to the power station complex throughout the life of the Project.

b ECVT

The ECVT is the only access tunnel, other than the MAT1, that leads to the surface. It will run directly between the ECVT portal and the transformer cavern. The purpose of the ECVT is to provide a path for electrical cables between the transformers and the switchyard, to allow additional ventilation of the tunnels and power station complex, and to provide a secondary exit route for underground workers in the event of an emergency. The ECVT switchyard will be located at the ECVT portal and will house the necessary structures to support these objectives.

The tailrace surge shaft ventilation tunnel runs off the ECVT and will have a length of 268 m, a diameter of 6 m, and will connect to the tailrace surge shaft.

The machine hall construction adit will be connected to the ECVT, a 133 m long tunnel near the end of the ECVT that leads to the machine hall. Unlike other adits, this tunnel will remain open throughout the operation of the Project in order to improve ventilation and access.

c Machine hall-transformer egress tunnel

This is an approximately 106 m long tunnel with a diameter of 4 m that connects the upper levels of the machine hall and the transformer hall. It is designed predominantly for the movement of people between the underground caverns.

d Pressure shaft

The pressure shaft is the power waterway tunnel that connects the upper reservoir to the high-pressure headrace tunnel at approximately the elevation 130m. It is designed with a vertical orientation to facilitate construction and minimise head losses by ensuring that, during generation mode, the length of pipe that the water must pass through before reaching the power station is minimised.

Due to its vertical orientation, the pressure shaft will be excavated either using raise-bore technology or top down technology. It will have a diameter of approximately 6.4 m throughout its length.

e High pressure headrace tunnel

The high-pressure headrace tunnel will sit between the pressure shaft and the steel lined penstocks. It will have a horizontal orientation and be generally lined with concrete to resist the high static and dynamic pressures experienced during operation. The diameter of the tunnel will decrease from 6.2 m at its western end to 4.5 m at its eastern end.

f Penstocks

The penstocks are steel lined associated with each pump-turbine, welded and back-grouted into penstock tunnels. During generation mode, they will divide the flow of water from the twin high-pressure headrace tunnels and feed it into the power station cavern. Isolation from the upstream water way is provided via each unit's main inlet valve. Each of the steel penstock have diameters that decrease from around 2.9 m to 2.3 m.

It will be necessary for the penstock tunnels to be partially excavated via the penstock construction adit, and partially excavated via the power station complex.

g Draft tube tunnels

The draft tube tunnels mirror the penstock tunnels on the western side of the machine hall. Each unit will have a separate draft tube tunnels that merges to form two larger diameter penstocks and merge again to form the start of the tailrace tunnel. The distance from the draft tubes to the surge shaft where the steel lining is used is some 177m.

h Tailrace tunnel

The tailrace tunnel will have a length of 1,434m with a small gradient and a diameter of 6.2m and will connect the draft tube tunnels to the lower reservoir. It will be lined with reinforced concrete and will be excavated from the lower reservoir end.

A 240 m long tailrace construction adit with a diameter of 6 m will be excavated to enable simultaneous construction of the lower intake and tailrace. The tailrace construction adit will meet the tailrace tunnel on the eastern side of the tailrace gate shaft.

vii Tailrace Surge Shaft

A tailrace surge shaft is located immediately downstream of the draft tube bifurcations and is required to manage transient water pressures during machine load changes. The shaft is some 18m in diameter and extends from the tailrace connection to elevation 328m where is connects to the tailrace surge shaft ventilation tunnel.

viii Transmission connection works

The Project will connect to the electricity grid via Transgrid Line 965. This will serve as a two-way link that will allow electricity to be exported to the national transmission grid while the Project is in generation mode, while also allowing the Project to draw electricity while it is in pumping mode.

The transmission lines between the switchyard and Transgrid Line 965 will consist of two transmission lines, a 132 kV single circuit overhead line, and a 330 kV double circuit overhead line. Both lines will sit alongside each other within the same transmission corridor, minimising overall impacts. The connecting transmission line will follow the route travelling north from the switchyard at the ECVT portal, crossing over the Macleay River east of Georges Junction before connecting with Transgrid Line 965. The transmission connection works will also incorporate a substation rated up to 330 kV, aligning the voltages of the lines to enable connection to the power network.

The 330 kV transmission line towers will be lattice steel towers. They will be constructed on approximately 25 m x 25 m bases and extend to around 50 m in height. The 132 kV line will be supported using a standard steel or concrete pole configuration, with a height of around 26 m for each pole. The 132 kV and 330 kV transmission infrastructure will be installed within the 25 tower sites located between the switchyard and Transgrid Line 965. The sites for the towers have been selected to minimise impacts associated with their construction and maintenance. The tower sites south of the Macleay River will be accessible via spur roads along the EAR and MAR, with the remaining tower sites accessed via the Northern and Transmission Tower Site 8 Access Roads and associated access tracks. Their positioning along with the extent of the associated easement is shown in Figure 1.11 and Figure 1.12.

Where required, vegetation will be cleared and trimmed along the route of the transmission line including around and within each tower site. The transmission line route will remain in place throughout the life of the Project.

In addition to the high-voltage transmission lines linking the switchyard and Transgrid Line 965, there will be low voltage power and communications lines extending between the switchyard and the upper dam and reservoir. This line will operate at a lower voltage as it will only carry power for operational purposes relating to the operation of machinery and communications. The power line route is shown in Figure 1.11.

ix Access roads and bridges

The proposed access roads make up a significant portion of the Project's permanent infrastructure. The bulk of the roads constructed during the Project's construction phase will continue to be maintained and used for purposes supporting the on-going operation and maintenance of the Project's infrastructure. The Project's road network will include the following key components:

- the MAR (4.7 km), which has a north-north-east orientation and extends from the north of the Project area from the accommodation camp to Georges Junction
- the EAR (up to 12.1 km), which will connect the MAR to the Kempsey-Armidale Road, and include a bridge across the Macleay River at Smiths Bluff and Carrolls Creek to the east of the Project area
- the LDAR (3.6 km), which extends from the accommodation camp to the lower reservoir and river pumping facility after passing the workshops and site offices

- the UDAR (6.4 km), which extends from the accommodation camp to the upper reservoir
- portal and underground works access road, this road branches off from the LDAR to provide a path to the ECVT and MAT portals
- the Northern Transmission Access Road, which will allow the eight northernmost transmission tower sites and related infrastructure components to be accessed
- the Transmission Tower Site 8 Access Road, which will extend east from Kempsey-Armidale Road near Georges Junction to provide access to the first transmission tower north of the Macleay River
- transmission spur roads along the EAR and MAR providing access to the tower sites south of the Macleay River
- an emergency egress road from the upper dam and reservoir joining the existing fire trail network in the adjoining Carrai State Conservation Area.

In addition to the key roads mentioned above, there will also be a need to establish short temporary roads that will be used to access the various construction areas and temporary pads. These roads will be used throughout the construction period and will be rehabilitated once they are no longer required.

Roads have been located to minimise the potential impact of flood damage and designed to meet the Australian Road Research Board's specifications of Class 4B minor roads. In general, roads will be up to 8 m wide two lane roads, formed and gravelled, with varying speed limits of 30-70 km/h according to terrain, with a general design speed of 50 km/hr. The roads will also have a 1.5 m wide, 300 mm deep open cut drain and will generally conform to the following Austroads and RMS guidelines:

- have a general grade of up to 10%, with an absolute maximum grade of 15%, excluding steeper sections on the Northern Transmission Access Road
- have a minimum radius of 50 m, and 100 m for roads required for OSOM vehicles and transformer transport
- braking bays, if required, every 2 km.

The construction of the roads in accordance with these plans will make them suitable for use by the large vehicles required for the construction of the Project's infrastructure.

Various existing access tracks will also be upgraded where necessary to support construction. Tracks such as the Macleay River fire trail, Cochrane fire trail, George's Junction campground track, Peach Tree Creek trail and various forestry trails may need to be used to gain access to the Project area prior to the construction of the permanent access roads and for other purposes including design investigations, early works and mobilisation. Once the permanent access roads have been established for construction and the site is mobilised these tracks will only be used for emergency egress and will not be used for construction activities. Road maintenance works, including improving drainage, placing of geofabric and gravel to improve trafficability, and removing boggy sections of road are the main activities that will be undertaken on these access roads.

Additional ancillary access tracks will also be constructed to lengthen existing tracks and provide access to certain areas. When required, this will entail the trimming or clearing of vegetation, surface grading and the placement of geofabric and gravel.

Ancillary access tracks will include:

- a 2.7 km long lower reservoir access track, leading from the lower dam and reservoir access road directly to the left abutment, spillway, river pumping facility and lower intake

- a 2.2 km long emergency egress track connecting to the Peach Tree Creek Trail
- a 1.8 km long upper reservoir access track to allow construction teams to access the left abutment and pressure shaft.

All maintenance or upgrade works that are required outside of the Project area will be completed in liaison with the relevant party, in particular NPWS.

x Spoil emplacement areas

The construction of infrastructure is expected to generate large quantities of excess spoil. The most significant construction activities in terms of excavation are listed below:

- tunnel excavation
- cavern excavation
- dam foundation excavation
- surface works
- reservoir excavation.

A large portion of this material will be reused for other purposes such as concrete aggregate, fill for embankments and pads, road-base and rockfill for the construction of the reservoir dam walls. Material which is not suitable for this purpose will be disposed at spoil emplacement areas. The spoil emplacement areas have been selected with the goal of avoiding impacts on waterways, minimising impacts to the environment and habitats and construction activities while being located in close proximity to the spoil source to minimise transportation time.

The spoil emplacement areas will be cleared of vegetation prior to the placing of spoil, rockfill will be placed to form stable embankments and the spoil will be spread in layers of similar materials, and drainage channels will be implemented to ensure that proper drainage can occur. Dust suppression measures and silt traps will also be used to minimise the environmental impact of fine particles. Spoil emplacement areas will be land formed, and then rehabilitated at the end of the Project.

There is currently a balance between excavated materials, construction materials (roads, pads, concrete aggregate, dam walls), and spoil. The net spoil balance, as per the below graph, will be placed into two dedicated spoil emplacement areas. Detail design will further refine and optimise the excavated material and spoil balance and requirement for spoil emplacement, and maximise onsite use of excavated materials, where suitable. Several opportunities have been identified that would assist to achieve this.

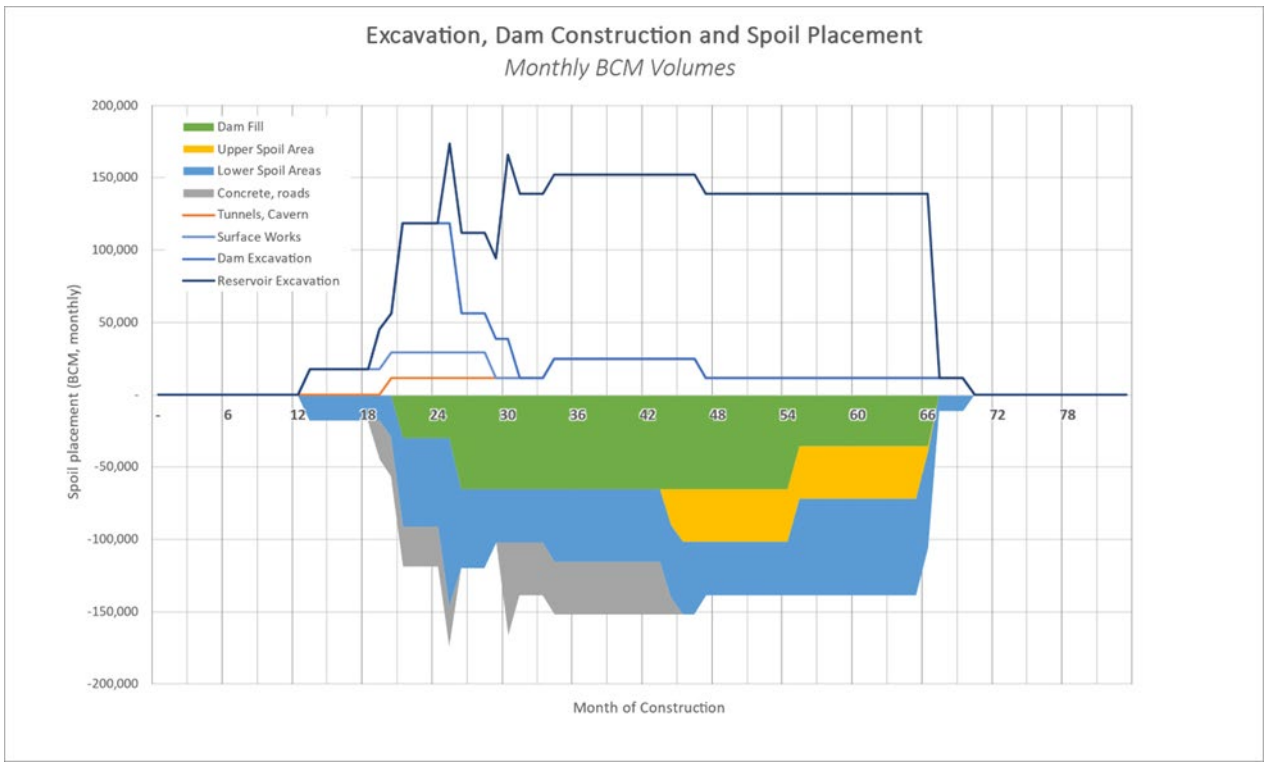


Figure 1.20 Monthly excavation volumes

Excavated material generated within the Upper Reservoir area will be prioritised for construction materials or disposed as spoil in close proximity to the excavation source. This will limit movement from the Upper Reservoir to the Lower Reservoir or other areas within the construction footprint.

To minimise impacts and provide cost-effective solutions, the excess spoil material will be disposed as close to its original source as possible to avoid incremental costs for additional haulage and/or double handling of the material.

Conceptual landform designs for permanent spoil emplacements (PSE) has been prepared by WSP (2024) and demonstrate that the volume of spoil likely generated by the Project can be accommodated in the two locations. The two PSEs are referred to as the Upper PSE (located near the Upper Reservoir) and the Lower PSE (located near the Lower Reservoir).

a Upper PSE

The Upper PSE is located on a relatively flat area but within steep topography on either side. The Upper PSE has a capacity of around 1,741,000 m^3 of spoil.

The fill volumes for the proposed surface of the Upper PSE is shown in Figure 1.21, with a maximum height of around 35 m above existing ground. The concept view of the final landform is shown in Figure 1.22. The overall slopes for the Upper PSE are replicated in Table 1.8 and shown in Figure 1.23. The Upper PSE has an average slope of 17 degrees with steeper slopes tying into the steep natural terrain.

Table 1.8 Overall slopes for Upper PSE

Angle (degrees)	Slope area (ha)	Percentage of total
<11	1.26	7.1
11-14.5	2.10	11.6

Angle (degrees)	Slope area (ha)	Percentage of total
14.5-18	5.56	30.4
18-21.5	8.86	47.6
>21.5	0.62	3.3
Total	18.4	100

Source: WSP 2024

b Lower PSE

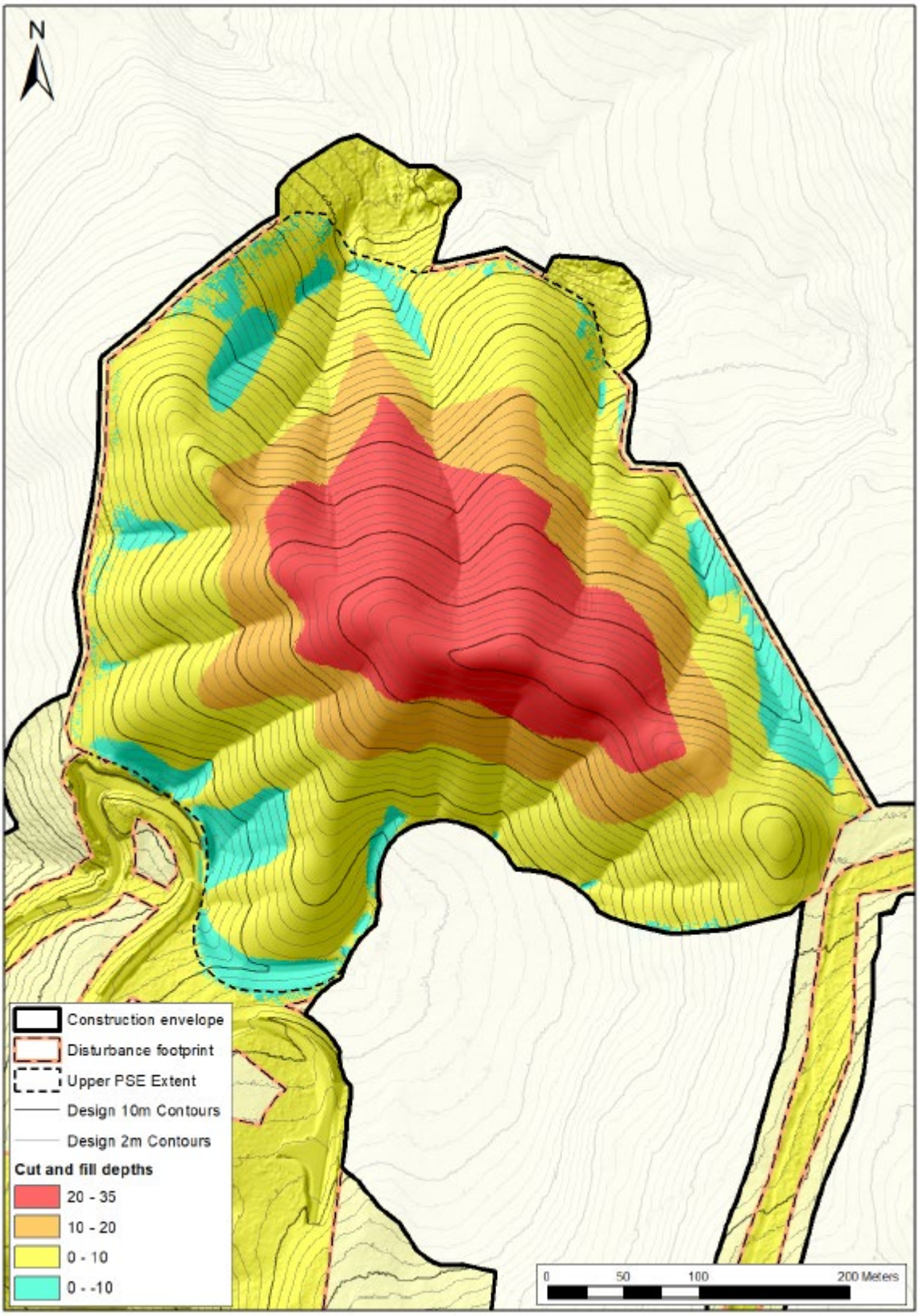
The lower PSE will be constructed in a valley. While this is not the preferred design option, as there is likely to be water flows into the area that would require specific management through the construction phase. It was acknowledged there were no alternative sites identified in the general area. The Lower PSE has a capacity of around 1,810,700 $m^{3.}$ of spoil.

The fill volumes for the proposed surface of the Lower PSE is shown in Figure 1.24, with a maximum height of around 35 m above existing ground. The concept view of the final landform is shown in Figure 1.25. The overall slopes for the lower PSE are presented in Table 1.9 and shown in Figure 1.26. The Lower PSE has an average slope of 14 degrees with steeper slopes up to 22 degrees tying into the steep natural terrain.

Table 1.9 Overall slopes for Lower PSE

Angle (degrees)	Slope area (ha)	Percentage of total
<11	4.16	27.6
11-14.5	3.67	24.0
14.5-18	4.19	26.9
18-21.5	2.51	15.8
>21.5	0.98	5.7
Total	15.51	100

Source: WSP 2024



Source: WSP 2024

Figure 1.21 Upper reservoir spoil emplacement fill volume

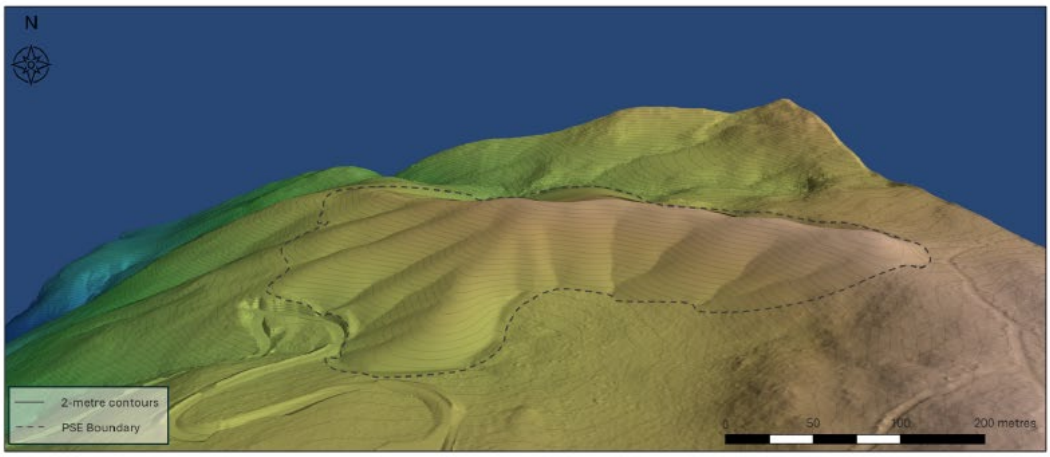


Figure 4.3 Views from the South (upper PSE)

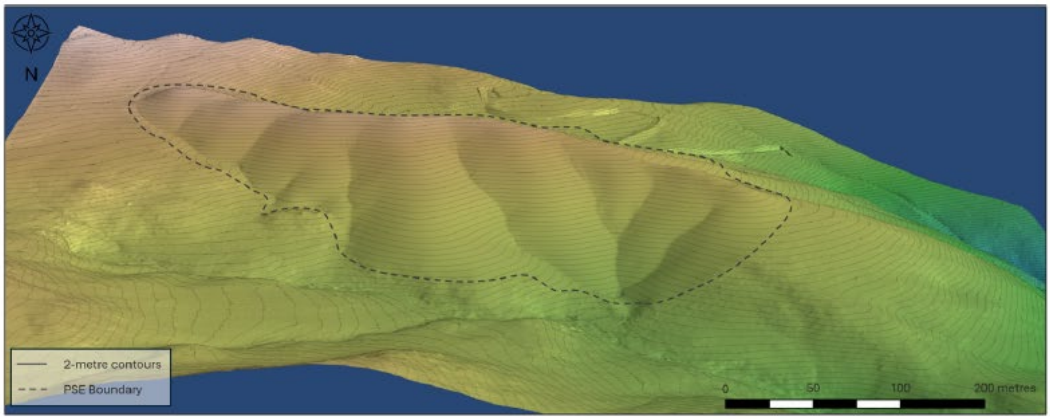


Figure 4.4 Views from the North (upper PSE)

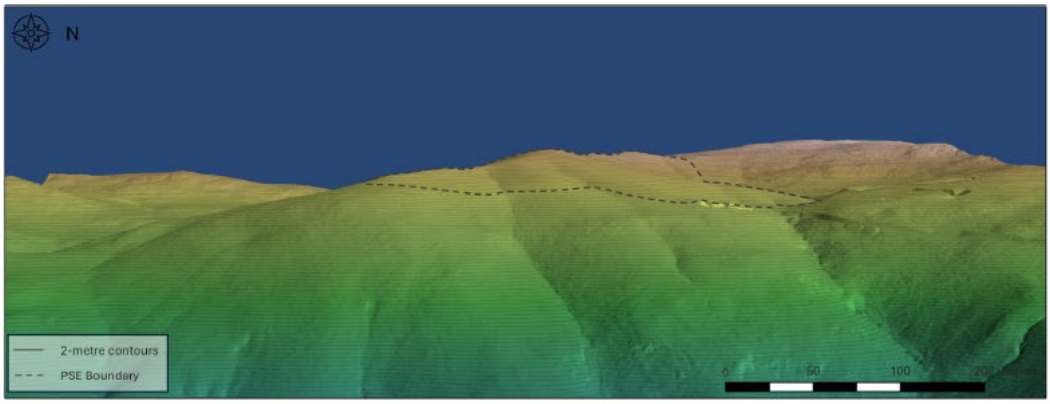
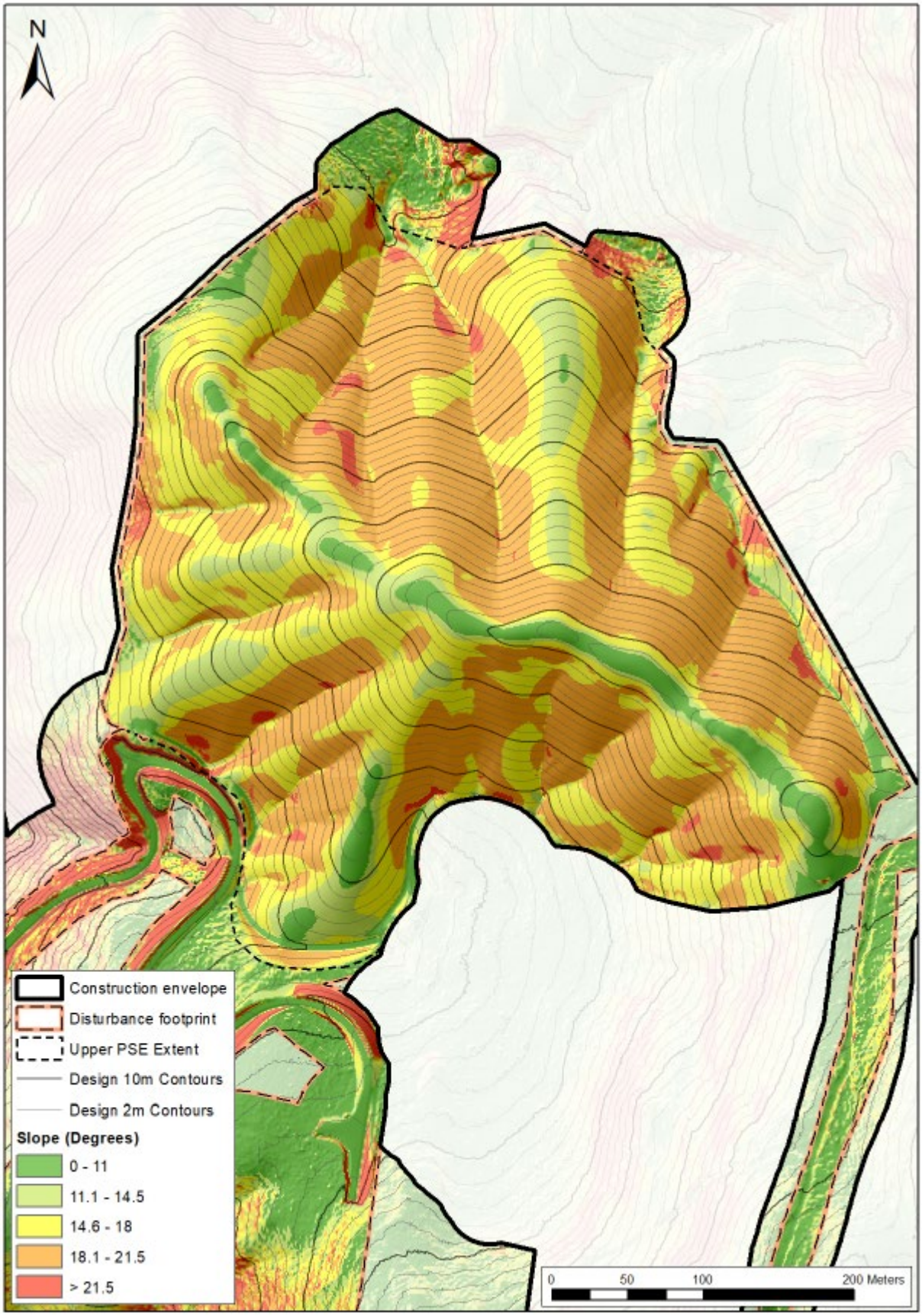


Figure 4.5 Views from the bottom of the valley – eye level view (upper PSE)

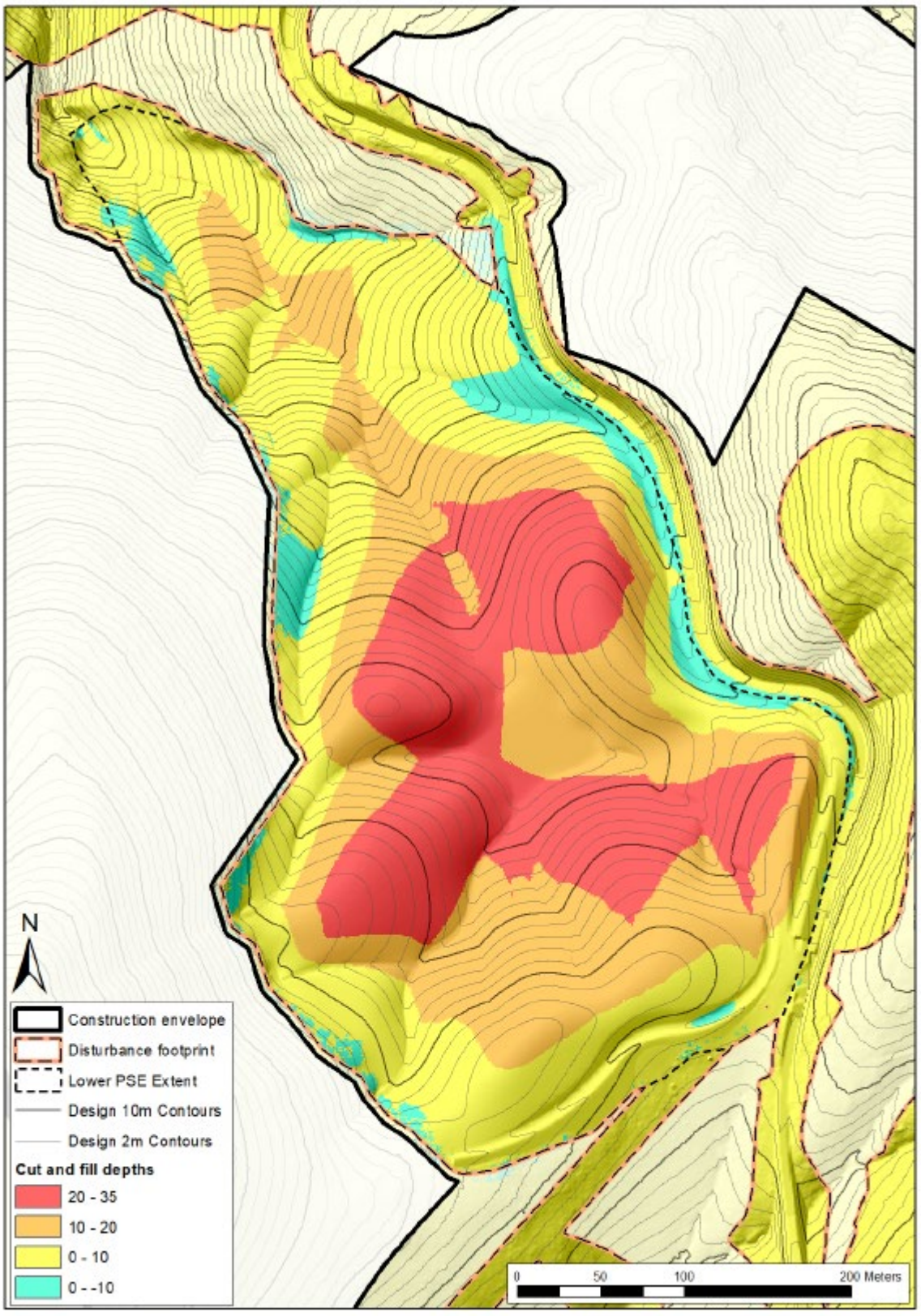
Source: WSP 2024

Figure 1.22 Conceptual view of upper reservoir spoil emplacement



Source: WSP 2024

Figure 1.23 Slopes for the Upper PSE



Source: WSP 2024

Figure 1.24 Lower reservoir spoil emplacement fill volume

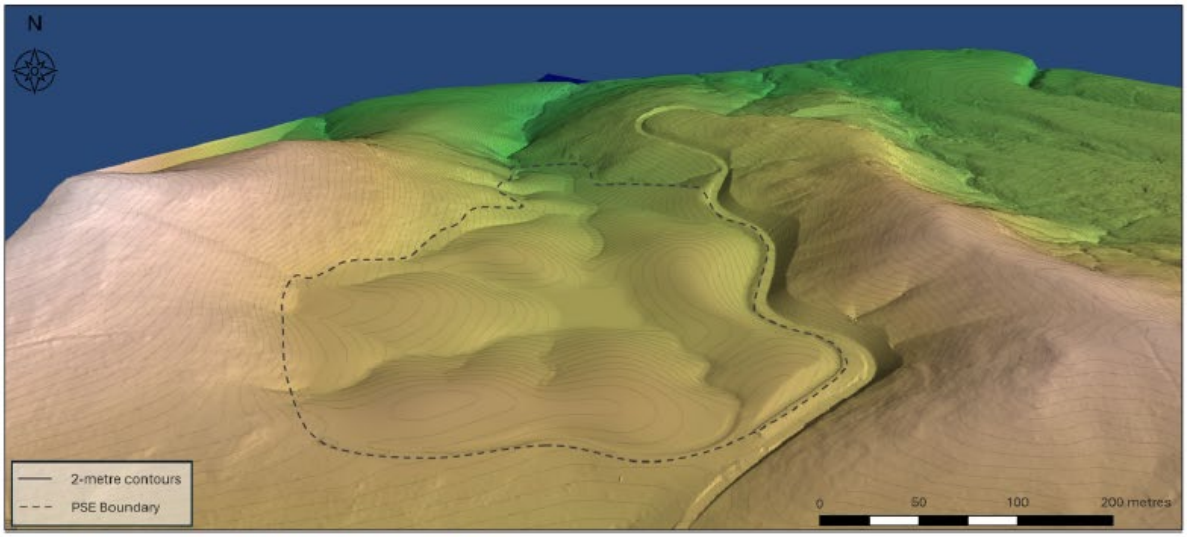


Figure 4.11 Views from the South (lower PSE)

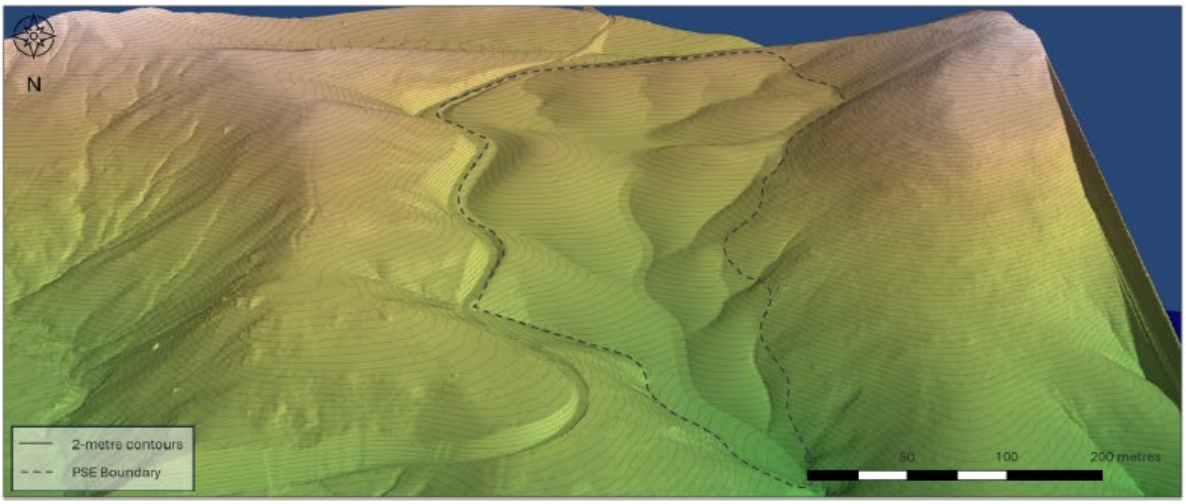


Figure 4.12 Views from the North (lower PSE)

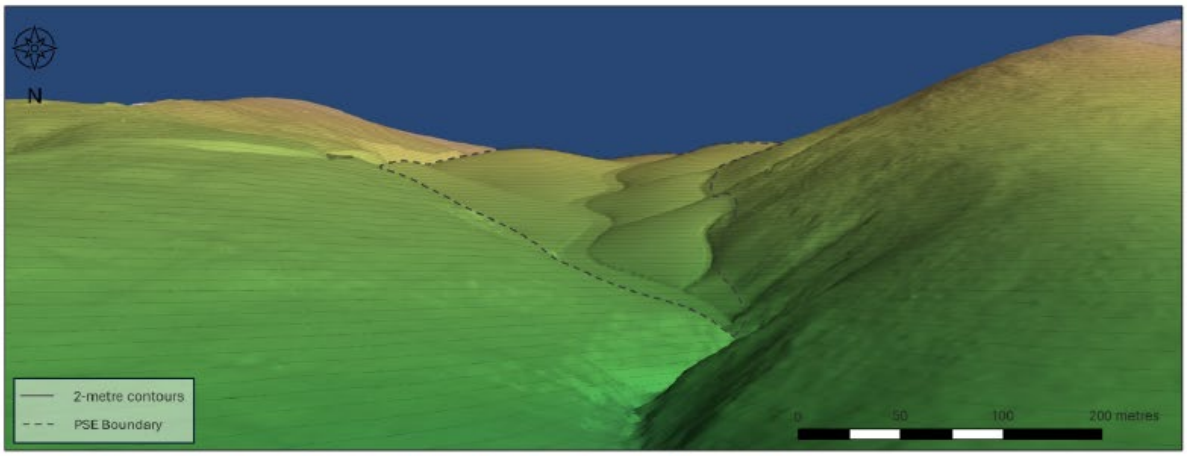
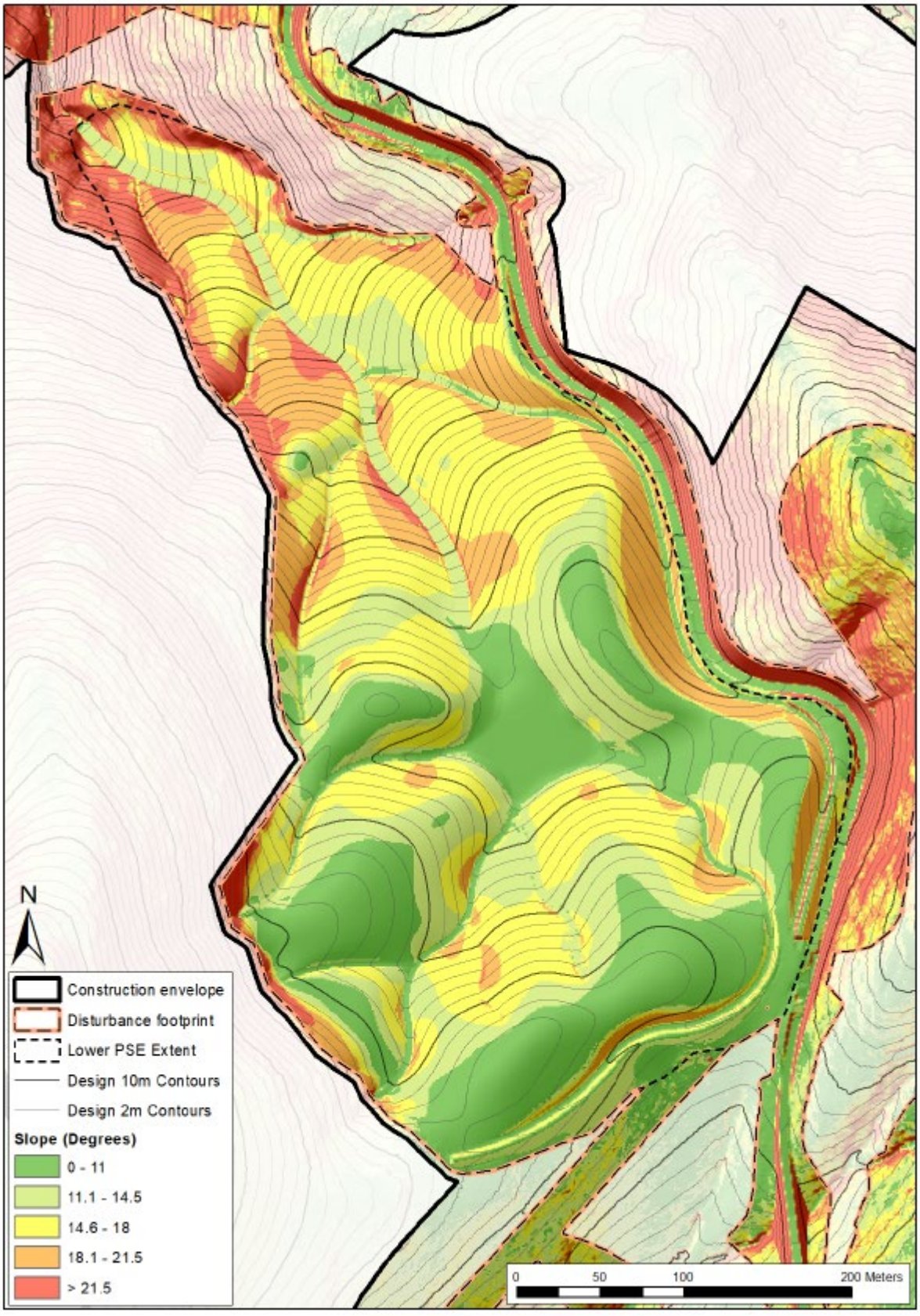


Figure 4.13 Views from the bottom of the valley – eye level view (lower PSE)

Source: WSP 2024

Figure 1.25 Conceptual views of lower reservoir spoil emplacement



Source: WSP 2024

Figure 1.26 Slopes for the Lower PSE

1.3.4 Temporary construction elements

The construction phase of the Project will be extensive and is expected to take approximately five years. Over the course of this time a significant amount of infrastructure will be constructed to facilitate the efficient construction of the permanent infrastructure required for the ongoing operation of the Project. This temporary infrastructure will be predominantly situated on the western side of the Project area along the LDAR and is set back from the Macleay River. The sites for this temporary infrastructure have been selected to minimise the risk of damage from flooding, and all the sites will be rehabilitated once they are no longer required. Figure 1.8 shows the layout of the majority of the temporary infrastructure sites.

The assets and infrastructure associated with the temporary construction elements will be decommissioned or relocated when no longer required, and the area across which they were established will be progressively rehabilitated. A detailed rehabilitation management plan will be established to ensure effective rehabilitation will be achieved. The total rehabilitation area is expected to be around 62.7 ha.

Construction of the Project has been planned, and will continue to be designed, in such a way as to not impede or significantly impact the ongoing recreational use of the Macleay River, Georges Junction Camp Ground and the National Trail.

The temporary use and layout of each work area will be confirmed during detailed design and construction planning.

i Works Area 1

Located adjacent to the LDAR, Works Area 1 will be a construction area divided into two pads that will be utilised as the main CBP area. The upper pad will have an area of around 18,000 m^2 and will likely be devoted for the storage of aggregate, while the lower pad will have an area of approximately 36,000 m^2 that will likely be used for the CBP, water bore and a laboratory. The pads will be connected by a road link and have been designed to minimise the magnitude of earthworks required for their construction.

ii Works Area 2

Situated to the south of Works Area 1, Works Area 2 is the area that will likely be used for electrical workshops, mechanical workshops, maintenance workshops, laydown areas, warehouse, and storage facilities. It will be situated on the same elevation as Works Area 1 to minimise the risk of flood damage. The total area of the pad will be approximately 36,500 m^2.

Both Works Areas 1 and 2 will be surrounded by security fences and will have sedimentation basins to allow run off water to be treated before being released into the Macleay River.

iii Accommodation camp

At the peak of construction, the number of workers present in the Project area is expected to reach over 600, the majority of whom will be accommodated onsite within the main accommodation camp. The accommodation camp area that will hold the facilities for these contractors is located at the junction between the LDAR and the UDAR. The accommodation camp will be situated on two adjacent platforms, with a combined total area of approximately 35,000 m^2. The primary form of accommodation in the camp will consist of 12.0 m long and 2.4 m wide containerised accommodation units which can be positioned in a double deck arrangement if necessary.

A range of additional facilities are also planned, including:

- contractor's staff and labour accommodation
- employer's staff accommodation

- private staff and bus parking
- kitchens, food preparation and storage
- dining area
- shop and social facilities
- laundries, washrooms, and locker rooms
- gymnasium and recreation facilities
- first aid unit
- camp offices
- fire water and raw water tanks
- raw water and fire water pump station (camp use only)
- water and wastewater treatment
- generator building
- rubbish area
- security and emergency assembly points.

Water is likely to be sourced from the Macleay River (under a water licence and allocation regulated under the WM Act).

Food and laundry units will be shared, and waste will be collected in holding tanks before being transported to nearby processing plants.

The current design provides for the location of the main accommodation camp. However, its location may change as part of the detailed design phase to an alternate location within the construction envelope.

iv Temporary or fly camps

Temporary or fly camps will be required for the construction workforce prior to the construction and operation of the main accommodation camp. Up to three fly camps will be required and located:

- near Smiths Bluff, referred to as the Eastern fly camp
- near the intersection of the MAR and the EAR, referred to as the Western fly camp
- at the upper reservoir (within spoil emplacement area), referred to as the Southern fly camp.

The proposed locations of fly camps are Figure 1.27, noting that their location may change as part of the detailed design phase to an alternate location within the construction envelope. The camps will accommodate about 20 workers and up to 90 workers depending on the ultimate configuration of each camp. The camps will be established within the first year of construction to provide small scale temporary work accommodation for workers completing initial road works until the main accommodation camp is completed.

Each fly camp will provide parking for light vehicles, site office, ablutions, laundry and diner. The camp will be run by generators and all services will be trucked in and out of the sites, with no permanent facilities or services proposed. At completion of their use, the fly camps would be disassembled and the land used for the remainder of construction and/or rehabilitated.

v Construction phase offices

An area designated for offices will be situated on three pads with a combined area of approximately 13,000 m^2. The site is located to the west of the LDAR, south-west of Works Area 2. Temporary offices at other locations may also be established.

vi Staging areas

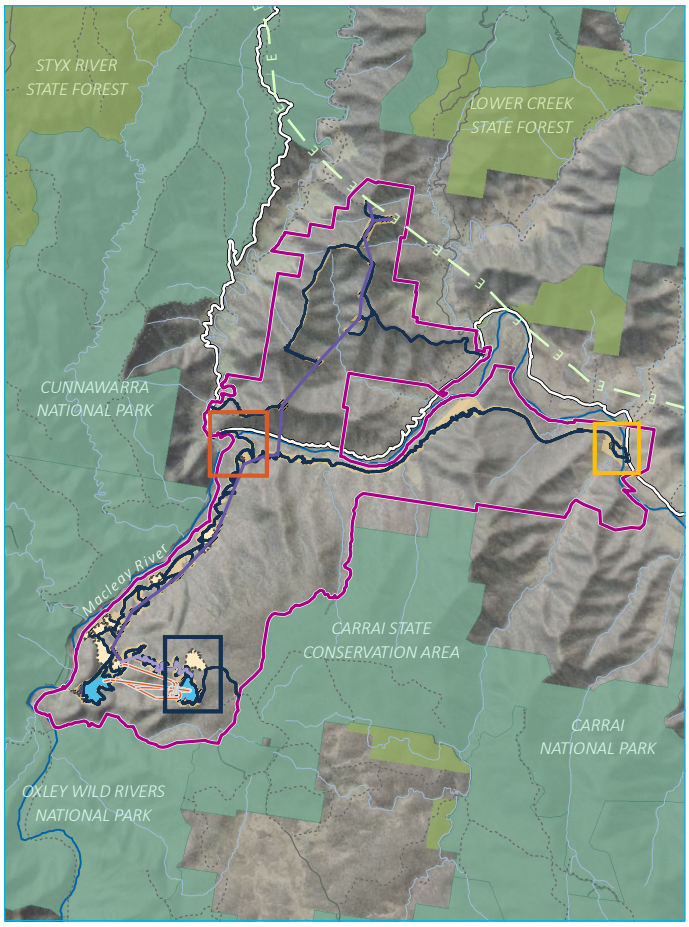
Staging areas will be at the northernmost area of temporary infrastructure. Consisting of a large, flat, cleared area, they will allow vehicles of all sizes a place to be located while not working within the construction zones to the south. This area will be also used for material laydown, material storage and other needs if required.

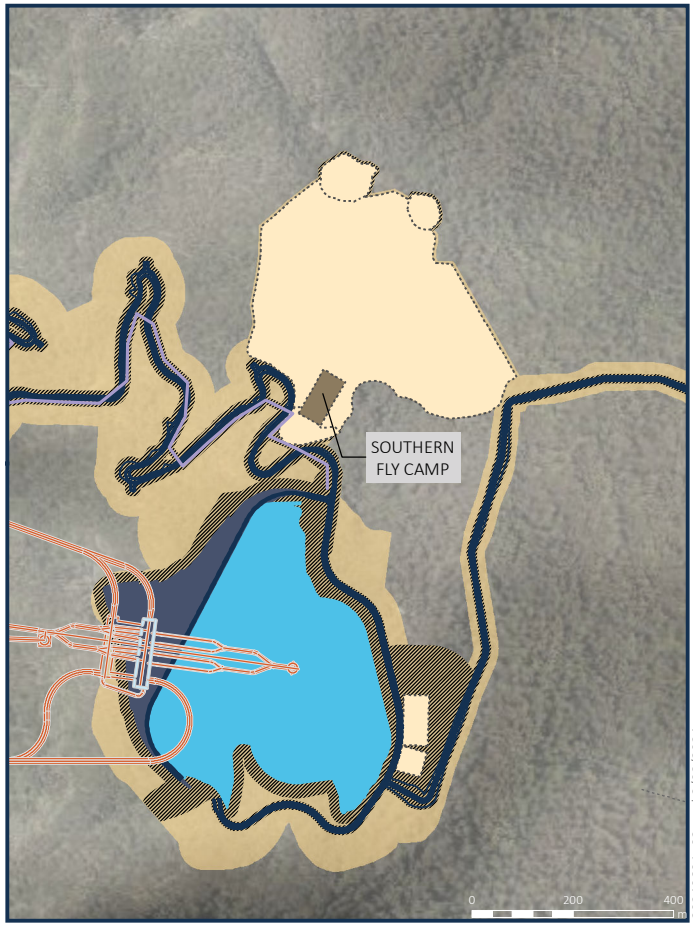
vii Stockpiling areas

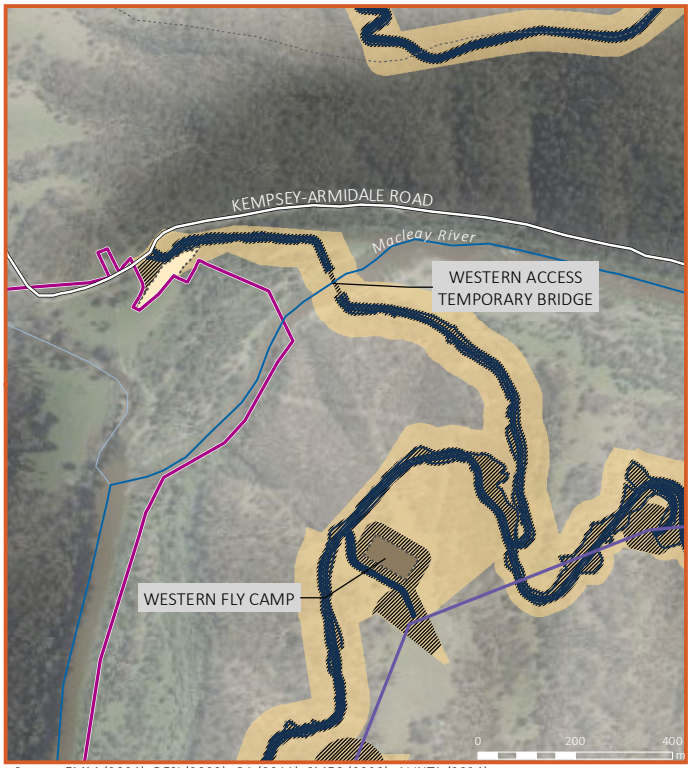
Stockpiling areas will be present in the lower reservoir construction area to provide flexible spaces for site deliveries, aggregate storage, and the preparation and staging of vehicles of all sizes. Much like the staging area, the stockpiling areas will consist of large areas of level, cleared land.

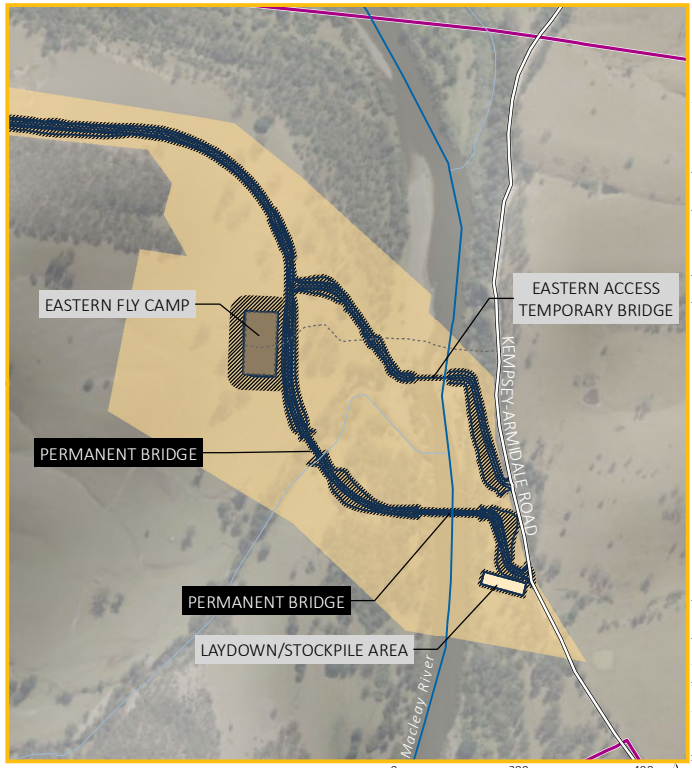
viii Progressive rehabilitation

Rehabilitation will be carried out in several phases through the construction period to achieve the desired outcome for affected landowners and receptors. Activities during (or prior to) construction to enhance rehabilitation will be performed, such as salvaging habitat resources and native seed collection. Other progressive rehabilitation techniques will be carried out including temporary stabilisation of batters and construction of appropriate erosion and sediment control devices.









Source: EMM (2024); DFSI (2020); GA (2011); SMEC (2022); ALINTA (2024)

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KEY

- Project area
- Disturbance footprint
- Construction envelope

Project operational elements

- Underground power station complex
- Power and communications lines
- Tunnels, portals, intakes, shafts
- Permanent road
- Fly camp
- Surface works
- Reservoir
- Dam wall

Existing environment

- Kempsey-Armidale Road
- Vehicular track
- Existing transmission line

Label format

SURFACE PERMANENT INFRASTRUCTURE

TEMPORARY INFRASTRUCTURE

Temporary fly camp locations

Oven Mountain Pumped Hydro Energy Storage Project
Updated Project Description
OMPS Pty Ltd
Figure 1.27

EMM creating opportunities

1.3.5 Traffic and transport requirements

The construction of the Project will be subject to traffic management measures to ensure safe access to the Project, the ongoing functionality of surrounding roads, and the safety of members of the public, motorists and construction workers.

i Traffic generating activities

A variety of activities will be undertaken throughout the construction phase of the Project that will generate considerable traffic on the Project's road network. Such activities will include:

- deliveries of materials and equipment
- the transportation of excavation and construction equipment
- transportation, including busing, of personnel between sites and their accommodation
- servicing of accommodation camps (temporary or fly camps and main accommodation camps), such as waste collection and food delivery
- transportation of spoil from tunnelling and surface works, as necessary.

A wide range of vehicles will be used for these activities and others, such as light vehicles, buses, helicopters, concrete agitators, excavators, and semi-trailers, in addition to a variety of specialised vehicles such as a tunnel wheel jumbo. The Project's road network has been designed to accommodate these vehicles.

ii Transport routes

Kempsey-Armidale Road connects to Armidale in the north-west and Kempsey in the south-east. Construction traffic for all the construction activities will generally be from the Kempsey direction with traffic from Armidale only occurring during the first twelve months for construction of the western temporary access (including a bridge over the Macleay River). After the first 12 months, all construction traffic will come from Kempsey.

All construction traffic from Kempsey is expected to travel from the Macleay Valley Way/Pacific Highway intersection (at Frederickton) to West Kempsey via Macleay Valley Way and join KAR via Second Lane, North Street and River Street.

OSOM vehicles will originate from the Port of Newcastle, travel via Pacific Highway to Frederickton and follow the same route as the mentioned above. This means that OSOM vehicles will only approach or enter the site from the Kempsey side of the project area.

Once vehicles are inside the Project area, each of the roads laid out in Section 1.3.1iv will be used as key transport routes throughout the Project's construction phase.

iii Site movement of personnel and shifts

The majority of personnel will be transported throughout the Project area by bus and light vehicle so as to minimise parking requirements and the number of vehicles present on the Project's road network. This will improve the efficiency of transport within the Project area while also improving safety outcomes. Bus pickup and drop off points will be marked, and sufficient buses will be present to account for the extent of the workforce. Superintendents, engineers, and other employees requiring flexibility of transport for their roles will have access to light vehicles in accordance with their needs.

Above ground works are likely to be limited to daylight hours while underground works will require 24/7 construction. Shifts will be arranged to accommodate 24/7 construction throughout the construction period.

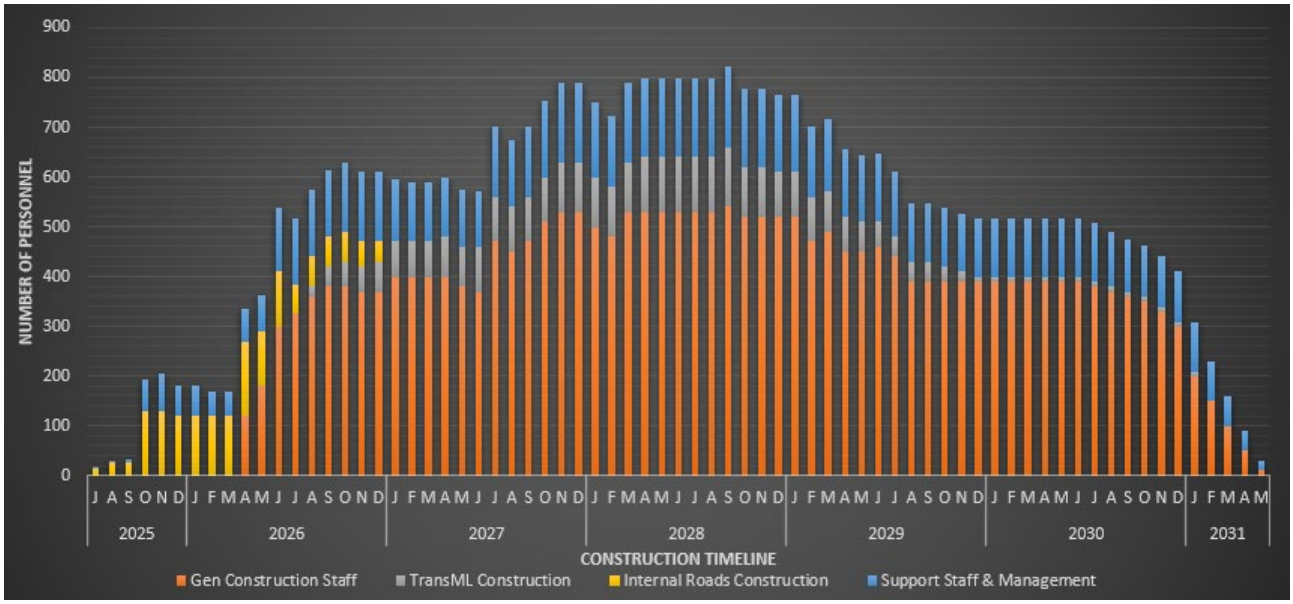

Figure 1.28 Number of workers throughout the construction period

iv Transportation of personnel to and from the Project area

To reduce traffic movements on the public roads, most workers will be transported via bus to the construction site and to the on-site accommodation. Locations for pick up and drop off have yet to be determined. These will be determined during the detailed design phase, and in consultation with local councils. It is likely that FIFO workers would fly into one of the towns close to the Project area, like Armidale, Coffs Harbour or Port Macquarie.

1.3.6 Off-Project area works

To support the construction of the Project, some off-Project road improvement works will be required at various locations along Kempsey-Armidale Road for over size and over mass (OSOM) vehicles and for grade and width stability.

The Kempsey Armidale Road is currently subject to roadworks by both Armidale Regional Council (ARC) and Kempsey Shire Council (KSC) after the severe weather and flooding events in 2022 with government funding provided under Disaster Recovery Funding (DRF).

Initial discussions with each of the Councils indicate that the areas determined require slope and pavement stabilisation for OSOM requirements, overlap with each of the Council identified areas for slope and pavement stabilisation (in alignment with the DRF scope of works). The proponent is working with the councils to provide over mass requirements for integration with their design works and develop a funding agreement to ensure the appropriate funding is agreed to. A Heads of Agreement (HoA) with KSC is signed and the HoA with ARC is in the process of finalisation. This will provide for the works to be assessed and approved under a separate approval process with Councils as the proponents, and by financial assistance from the proponent.

1.4 Operation of the Project

1.4.1 Overview

This section provides an overview of how the Project will be commissioned, operated and maintained post-construction and throughout its operational life. It also provides details of the proposed progressive rehabilitation works, which will commence towards the end of construction and continue through to commissioning and once the Project is fully operational.

1.4.2 Operational details

The Project will become operational once all Project infrastructure has been constructed, installed, tested and connected to the electricity transmission network.

Prior to commissioning, an electro-mechanical contractor selected for the Project will design, manufacture, install and test all plant and equipment, including pump/turbines, motor/generators, switchgear, transformers, station cranes, valves, and gates. Once these components have been tested and commissioned, the pumped hydro system can become operational.

At the time of commissioning, the lower reservoir will need to be filled to the full supply level (250 m AHD). Partial filling of the upper reservoir is required for plant commissioning and is likely to require a dedicated temporary pipeline and pump network that will be removed post station commissioning.

Once the Project has been commissioned, and the transmission lines connected, electricity can start being generated, consumed and transmitted to the NEM via Transgrid Line 965.

Further detail and principles behind the operation of the Project are described in Section 1.2 (i.e. both the generating and pumping modes used to produce and store electricity via the closed loop pumped hydro system).

i Project life

It is anticipated that the Project will become fully operational by the end of 2029–30. The Project will have a full operating life span of 100+ years. The Pump/Turbines are designed to be continuously available and operate on demand backed with regular routine maintenance checks.

ii Power output

The Project will provide up to about 900 MW of electricity generating capacity and at least eight hours of energy storage at full generating capacity. There are recognised significant benefits to the existing transmission network, to the NEM and to the New England REZ with a power rating of up to 900 MW. This includes the capability of delivering approximately 2,500 GWh annually[1] of long duration energy storage to the NEM, and meeting the needs of approximately 600,000 to 900,000 NSW households.

iii Operation, management and maintenance of the Project

The operation, management and maintenance of the Project will be consistent with other water storage and power generation facilities across NSW. This includes all necessary activities such as operating, monitoring, surveillance and maintenance. Specific management and maintenance measures are covered under each environmental matter assessed as part of this EIS.

[1] Based on one pump-generation cycle per day, less an allowance for maintenance.

iv Control

Control of the Project can be conducted remotely. However, on-site staff will also be able to operate the scheme from the office area which will be located at the onsite control building at the ECVT portal. This control building will be utilised during commissioning, testing, operation and maintenance over the life of the Project.

Other facilities such as the Macleay River pump facility, water treatment plant, HVAC and generators, will operate automatically, however periodic routine maintenance and inspection will take place by on-site crew.

An office area will be provided as part of the control room building, to be used by staff when requiring on-site work.

v Management and maintenance

Throughout the operational life of the Project, there will be an ongoing need to perform regular maintenance and repairs to the operational infrastructure.

Operational maintenance activities required for the Project will include:

- maintenance of plant and equipment and systems within the power station complex, intake structures, gates and control building
- maintenance of access roads and tracks (e.g. vegetation management and pavement works/repairs)
- maintenance of electricity and communications infrastructure (cables, switchyard, cable tunnel)
- maintenance of transmission lines and sub-substation as required (e.g. line and pole inspections and vegetation management of easement corridor)
- maintenance of fences, fence lines and firebreaks.

Less frequent maintenance is expected to involve:

- dewatering of the headrace and tailrace tunnel (as required)
- electro-mechanical works, approximately every 20 years for major maintenance
- hydro-mechanical works, approximately every 20 years for major maintenance
- control systems and instrumentation, approximately every 15 years
- pumping station, approximately every year for minor maintenance and 5 yearly for major maintenance
- dam, approximately every 30 years.

It is likely that the operation and maintenance of the new section of the overhead powerlines connecting to Transgrid Line 965 will be the responsibility of an external provider. This would include ongoing management of vegetation to reduce the risk of power outages and potential bushfires as well as the maintenance of access tracks required to perform maintenance operations. All operational activities would be undertaken in accordance with the external provider's operational procedures.

vi Permanent access for operation and maintenance

Permanent access to the Project area is discussed in Section 1.3.3.

1.4.3 Infrastructure servicing

The operation of the Project will require ongoing servicing including power, communications, sewage, waste and water. These requirements will be met by retaining select utility infrastructure established during construction outlined in Section 1.3.3. A summary of infrastructure services required during operation is provided below:

- Ongoing electrical supply is required for the ongoing operation of the scheme including power for underground services including electrical equipment and services for the powerhouse cavern, MAT1, MAT2 and ECTV tunnel services, such as lighting, ventilation, pumps and the surge shaft, as well as the control building, and raw water pumping infrastructure. Permanent electrical supply will be sourced from the pumped hydro system itself when generating, and from the grid (via transmission connection network) when the scheme is not generating, in standby mode and when pumping.

- Ongoing communication supply will be required between the power station and access tunnels (MAT1, MAT 2 and ECVT), control building and switchyard and intake structures. The communication system will also operate between the project's control centre, AEMO and Transgrid Control Centre. Communication will be provided via cables installed during construction. The wireless communication tower installed at the upper reservoir will also provide communication across the Project area and externally during the operational phase of the Project.

- Raw water supply will be required for firefighting at the power station complex, access tunnels and portals, and treatment to a potable standard. Raw water will be sourced via internal offtake pipelines that will be established during construction. Water will be sourced from the reservoirs for ongoing operational water supply.

- Potable water supply will be required at the office building and temporary construction housing for staff facilities. Water treatment plant will be used to treat raw water and supply potable water for use on site.

1.4.4 Rehabilitation

Rehabilitation will, as far as practicable, be undertaken progressively during all phases of the Project and consideration of rehabilitation risks and planning will apply from construction, operations and decommissioning through to final landform design, reinstatement, and revegetation.

Following the construction works, revegetation works will be completed within areas that are no longer required for construction, and that will not form part of the operational footprint. A detailed rehabilitation plan will be prepared for areas to be revegetated and rehabilitated.

Indicative rehabilitation activities are provided in Table 1.10 below.

Table 1.10 Rehabilitation

Development feature	Land use	Rehabilitation
Road works	Permanent	All areas disturbed by road works will be stabilised using erosion and sediment control techniques and revegetation.
Construction compounds and supporting infrastructure	Temporary	Infrastructure removed (as agreed with relevant landowners or land managers) and rehabilitated to an agreed state consistent with the nominated final land use.

Table 1.10 Rehabilitation

Development feature	Land use	Rehabilitation
Tunnel portals/ entries	Permanent	Construction or works area is to be limited and revegetated. The tunnel entry batters will be stabilised and rehabilitated.
Temporary stockpiles and pad	Temporary	Stockpile material re-used in rehabilitation (if suitable), and surface pads land formed and rehabilitated.
Permanent landforms	Permanent	Spoil emplacement areas will be stabilised and rehabilitated to native vegetation and rock landscape.

1.4.5 Decommissioning

The decommissioning of a pumped hydro system is not usually done until the system has served its useful life and in accordance with a dedicated decommissioning plan. Pumped hydro systems usually function for a very long time and are maintained for decades with the repowering of pumped hydro systems a common practice extending their useful life.

In the event that the Project needs to be decommissioned, all decommissioning activities will be set out in a detailed and dedicated decommissioning plan.

Some elements of a pumped hydro system are more likely to require decommissioning and replacement over the life of the Project, either directly or post-construction. An impact assessment would need to be undertaken if a significant Project element were to require decommissioning.

1.5 Interactions with nearby areas

Public access to the construction envelope and operational footprint will be respectively restricted during the construction and operation phases of the Project in order to allow the Project to proceed in an efficient and safe manner.

The following nearby areas may interact with the project:

- National Trail – A section of the National Trail (part of the 'Ebor to Barrington Tops' section) passes through the western side of the Project area, running adjacent to the Macleay River. Access to this section of the National Trail will be retained throughout the construction and operational phases of the Project. A dedicated management plan will be developed in consultation with relevant stakeholders to ensure access to the trail is retained in a safe manner.
- Travelling stock reserves – Access and continued use of the TSRs in and around the Project area are expected to be retained in some capacity. A dedicated management plan will be developed in consultation with relevant stakeholders to ensure the appropriate safe access and use of the TSR is retained.
- East Kunderang Homestead – East Kunderang Homestead, a state heritage listed item, is situated south west of the Project area within Oxley Wild Rivers National Park. Throughout the construction and operational phases of the Project, East Kunderang Homestead will remain accessible to the public.

- Georges Junction campground – Georges Junction Campground is a passive recreation area and an important contemporary place for the local Aboriginal community. It is located 800 m north east of the MAR and EAR intersection, outside of the project area. Public access will be maintained during construction and operation of the Project.

- Protected natural areas – Several Nationals Parks, state conservation areas, state forests and wilderness areas are located adjacent or proximate to the Project area, but not within the Project area. Access to and within these areas by the public will not be restricted by the Project.

Construction of the Project has been planned, and will continue to be designed, in such a way as to not impede or significantly impact the ongoing recreational use of publicly accessible heritage, recreational and natural areas adjacent to the project.

Appendix B
Updated statutory considerations

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B.1 Updated statutory considerations table

Appendix C of the EIS provided a list of statutory considerations in Table C.2. These considerations have been reviewed and amended where applicable in Table B.1 below.

Table B.1 Statutory considerations

Legislation	Relevance to the Project	Consistency/Project compliance
NSW *Biosecurity Act 2015*	The weed *Solanum viarum* (Tropical Soda Apple) is located within the Project area.	• Tropical Soda Apple is subject to a Control Order made under section 62 of the NSW *Biosecurity Act 2015*. • The Control Order applies to the whole of NSW and as occupier of the land during construction and operation, OMPS will be obliged to comply with the control measures.
NSW *Crown Land Management Act 2016*	Part of the Project crosses Crown land and a travelling stock route (TSR) along sections of the generation site, Eastern Access Road (EAR) and northern powerline.	• An easement(s) or other appropriate land interest in favour of OMPS will need to be agreed with the NSW Minister for Lands and Water under the NSW *Crown Land Management Act 2016* for OMPS to have rights to use these areas during construction and operation of the Project.
NSW *Dams Safety Act 2015* and NSW Dams Safety Regulation 2019	Two dams will be constructed and operated as part of the Project.	• The two dams to be constructed and operated as part of the Project, will likely be 'declared' dams under the NSW *Dams Safety Act 2015* because the dam walls meet the prescribed criteria in the Act and the NSW Dams Safety Regulation 2019. • Once declared, OMPS will need to comply with the Act and Regulations with respect to ongoing safety management, in particular by implementing a dam safety management system, and preparing an operations and maintenance plan, and an emergency plan, for the dams.
NSW *Electricity Supply Act 1995*	The Project will both consume electricity from the electricity network and generate electricity that will be supplied into the network.	• During construction and operations, the Project will be regulated under the NSW *Electricity Supply Act 1995*.
EP&A Regulation	The Project is critical State significant infrastructure (CSSI) and subject to the relevant content and form provisions of the EP&A Regulation.	• The EIS was consistent with the form and contents requirements of Sections 190 and 192 of the EP&A Regulation as shown in Table C.1 of Appendix C of the EIS. • An assessment of the Project with regards to the principles of ecologically sustainable development (ESD) is provided in the EIS Chapter 7 and is updated in Chapter 7 of this Amendment Report. • As the proponent, OMPS, in accordance with section 181(6) of the EP&A Regulation, gave notice of the Project to landowners via an advertise in the local newspaper. That notice was placed in the Armidale Express and the Macleay Argus on Friday 8 September 2023.

Legislation	Relevance to the Project	Consistency/Project compliance
Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*	The Project is a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* for significant impacts to World Heritage properties, National Heritage places and listed threatened species and communities. The Commonwealth Minister for the Environment and Water has accredited the NSW approval process and assessment requirements under the Act have been included in the Secretary's environmental assessment requirements (SEARs) issued for the Project.	• The EIS addressed the assessment requirements under the Act as attached to the SEARs for the Project. A summary compliance with these requirements is provided in Appendix A of the EIS. • A Biodiversity Development Assessment Report (BDAR) assessing impacts to biodiversity values is provided Appendix E of this Amendment Report.
NSW *Fisheries Management Act 1994*	The Project includes construction of dams and reservoirs, and alteration of ephemeral watercourses	• An assessment of aquatic impacts including consideration of the NSW *Fisheries Management Act 1994* has been undertaken for the Project and is provided in EIS Appendix J. • An addendum to the aquatic ecology assessment that considers the impacts of the amended Project is provided in Appendix F of this Amendment Report. • A permit under section 219 of the Act is not required because of section 5.23(1)(b) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).
NSW *Heavy Vehicle (Adoption of National Law) Act 2013*	Heavy vehicles (including overmass vehicles) needed for transporting plant and materials to and from site	• An assessment of traffic and transport impacts has been undertaken for the Project and is provided as Appendix R to the EIS. • An addendum to the Traffic Impact Assessment that considers the impacts of the amended Project is provided in Appendix H of this Amendment Report.
NSW *Heritage Act 1977*	A heritage item of State heritage significance (Kunderang East Pastoral Station) has been identified in the vicinity of the Project	• An assessment of potential impacts on historical heritage was undertaken for the Project. The Statement of Heritage Significance (SOHI) was included as Appendix L to the EIS. • The Amended Project will not impact any additional heritage items (see Section 6.12.3) • Approval under Part 4 or, an excavation permit under Section 139 of the NSW *Heritage Act 1977* is not required because of Section 5.23(1)(c) of the EP&A Act).

Legislation	Relevance to the Project	Consistency/Project compliance
NSW *National Parks and Wildlife Act 1974*	Aboriginal objects and places are known to occur in the region and have been recorded within and surrounding the Project footprint during Project surveys	• An assessment of potential impacts on Aboriginal cultural heritage has been undertaken for the Project. The Aboriginal cultural heritage assessment report was provided as Appendix K to the EIS. • An addendum to the Aboriginal cultural heritage assessment report that considers the impacts of the Amended Project is provided in Appendix G of this Amendment Report. • A permit under section 90 of the NSW *National Parks and Wildlife Act 1974* is not required because of section 5.23(1)(d) of the EP&A Act.
Commonwealth *Native Title Act 1993*	EMM has been advised that at the time of application there are no native title claims relating to land in the Project area.	• No further assessment in the EIS or this Amendment Report.
NSW *Protection of the Environment Operations Act 1997*	The Project involves the scheduled activity of electricity generation. A number of ancillary activities may also be regulated under an environmental protection licence (EPL), including chemical storage, concrete batching, process water treatment, extractive activities and sewage treatment.	• The proponent, or the construction contractor, would obtain an EPL for scheduled activities during construction. • The proponent would obtain the EPL for scheduled activities during operation. • It is possible that 'discharges to water' will be added to a list of activities that will be regulated by the EPL. • Water discharges have been assessed in the updated Surface Water Assessment is provided in Appendix E of the Submissions Report. • An updated Groundwater Impact Assessment report that considers the impacts of the amended Project is provided in Appendix F of the Submissions Report.
NSW *Roads Act 1993*	The Project involves works within public road reserves, therefore prior to those works being carried out, consent will be obtained from Kempsey Shire Council, with the concurrence of Transport for NSW (TfNSW). TfNSW has advised that OMPS will be required to enter into a Works Authorisation Deed for any works deemed necessary to classified (State) roads as a result of the Project. If required, this can be included as a condition of approval.	• An assessment of potential impacts on the roads and traffic has been undertaken for the Project. The traffic impact assessment report is provided in EIS Appendix R. • An updated traffic impact assessment report that considers the impacts of the Amended Project is provided in Appendix H of this Amendment Report.
NSW *Rural Fires Act 1997*	The Project occurs within bushfire prone land	• An assessment of bushfire risk and management has been undertaken and is provided in EIS Appendix X. • An updated bushfire assessment report that considers the impacts of the amended Project is provided in Appendix L of this Amendment Report.
NSW *Waste Avoidance and Resource Recovery Act 2001*	The Project will reuse and/or dispose of waste on site and dispose of waste offsite.	• Consideration of the waste hierarchy is provided in EIS Section 6.15.

Legislation	Relevance to the Project	Consistency/Project compliance
NSW *Water Management Act 2000*	Two water sharing plans (WSPs0 are applicable to the Project, being the: • *Water Sharing Plan for the Macleay Unregulated and Alluvial Water Sources 2016* (Macleay WSP) for management of surface water sources in the Project area. • *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (Groundwater WSP) **Invalid source specified.** for management of groundwater sources in the Project area. The Project area lies within the New England Fold Belt Coast (NEFBC) Groundwater Source.	• The Project requires consideration against the NSW *Water Management Act 2000* because of the requirement to source water for construction, initial storage fill, and operations through water access licenses (WALs). • The WSPs define the overall limits to water take, environmental water rules, trading rules and mandatory licence conditions that will apply to WALs obtained for the Project. The Macleay WSP is considered in Section 6.6 and Appendix M (Surface Water Assessment) of the EIS while the Groundwater WSP is considered in Section 6.6 and Appendix N (Groundwater Impact Assessment) of the EIS. • An updated Surface Water Assessment report that considers the impacts of the amended Project as well as agency and public submissions is provided in Appendix E of the Submissions Report. • An updated Groundwater Impact Assessment report that considers the impacts of the amended Project is provided in Appendix F of the Submissions Report. • 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 Act is not required because of section 5.23(1)(g) of the EP&A Act.
NSW Water Management (General) Regulation 2018	Part 2, Division 1 (10) of the NSW Water Management (General) Regulation 2018 includes 'unregulated river pumped hydro-electricity generation (construction and initial storage fill) access licence' as a Special Purpose Access Licence (SPAL) category. This SPAL category is applicable to the Project construction and initial storage fill.	• The proponent will apply for a SPAL for construction and initial storage fill. Once the SPAL is granted, the licence will need to be linked to works that are approved under the planning approval. The proponent will then obtain miscellaneous works approvals for water related infrastructure (i.e. pumps and bores). • See Appendix E of the Submissions Report (Surface Water Assessment) for further information.
NSW *Work Health and Safety Act 2011* and Work Health and Safety Regulation 2017	Hazards and risks associated with construction of the Project to the safety of workers and hazards and risks to the public associated with the transport of hazardous goods	• Assessment of safety risks to workers during construction will form part of the management measures and plans to be prepared and must comply with the NSW *Work Health and Safety Act 2011* and NSW Work Health and Safety Regulation 2017.
State Environmental Planning Policy (Resilience and Hazards) 2021	Storage and transport of dangerous goods during the construction of the Project.	• An assessment of dangerous goods and other hazardous items will form part of the management plans for the Project.
State Environmental Planning Policy (Biodiversity and Conservation) 2021	Clearance of potential species habitat during the construction phase of the Project, and flooding of potential species habitat during inundation of the dam following construction.	• The BDAR is provided in Appendix E of this Amendment Report considers the biodiversity impacts of the Project.

Legislation	Relevance to the Project	Consistency/Project compliance
State Environmental Planning Policy (Transport and Infrastructure) 2021	The Project involves development of a type of "electricity generating works". Sections of the Project will be developed within a Travelling Stock Route (TSR).	• The *State Environmental Planning Policy (Transport and Infrastructure) 2021* permits development for the purpose of electricity generating works on land zoned RU1 Primary Production under the *Armidale Dumaresq Local Environmental Plan 2012* (LEP), with development consent. The Project is being carried out on land zoned RU1 Primary Production. Approval is nevertheless being sought from the Minister for Planning under Part 5, Division 5.2 of the EP&A Act as the Project is critical State significant infrastructure (CSSI). • Sections of the Project cross Crown lands including a TSR. An easement or licence will be obtained from Crown Lands for access during construction and operation.
Armidale Dumaresq LEP	The Project is being carried out on land within the Armidale Dumaresq local government area (LGA).	• The land in the Project footprint is zoned RU1 Primary Production under the Armidale Dumaresq LEP. The land zoning under the LEP does not affect the permissibility of the Project. However, Project elements have been selected to minimise land use conflict and ensure primary industry can continue with minimal impact. A land use assessment was completed and provided in Appendix AA of the EIS.

Appendix C

Updated mitigation measures table

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1 Approach to updated mitigation measures

The table below (Table C.1) contains the mitigation and management measures presented in the EIS, and shows how they have been updated for the Amended Project. All changes have been made in bold text for clarity, with strikethrough text to show anything that has been removed. In many instances, these measures have been removed as they have been consolidated into other updated mitigation measures or have been rendered unnecessary because of project amendments.

Table C.1 Updated mitigation measures

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Terrestrial ecology				
General biodiversity impacts	TE01	**A Biodiversity Management Plan (BMP) will be prepared and implemented prior to construction. The BMP will include the mitigation measures outlined in this mitigation table.**	**Prior to construction**	**Contractor**
Harm to native habitat	TE02	Native vegetation and fauna habitat will be retained, wherever possible. **Clearing will only occur within the defined disturbance footprint**, with **clearing limited to the** ~~clearing minimised to the~~ extent required to safely construct and operate the Project.	Prior to, during and post-construction	Proponent and Contractor
Harm to native habitat	TE03	The removal of large trees (>0.5 m diameter at breast height (dbh)) **within the disturbance footprint**, **will** be avoided, wherever practicable.	Prior to, during and post-construction	Proponent and Contractor
Harm to native habitat	TE04	Exclusion zones around all areas of retained vegetation and fauna habitat will be **established** ~~where practicable~~.	Pre-construction	Proponent and Contractor
Harm to native habitat	TE05	Where feasible and required **within the disturbance footprint** to protect significant vegetation, tree protection zones (TPZs) will be **established**	Pre-construction	Proponent and Contractor
Harm to native habitat	TE06	~~When accessing construction sites~~ Contractors **will only** use designated routes on existing tracks **when accessing construction sites.**	Construction	Contractor
Harm to native flora	TE07	No materials, spoil or machinery **will** be stored or **vehicles** parked within the drip-line of any trees to be retained.	Construction	Contractor
Harm to native fauna	**TE08**	**Drivers of construction vehicles will comply with the Driver Code of Conduct and comply with speed limits at night in high-risk road sections to minimise increased mortality of native animals.** ~~The potential for increased traffic during construction to result in increased mortality of native animals should be minimised, where feasible, by the implementation of construction traffic driving rules in high-risk sections of road at night~~. Relevant mitigation measures are included in the Traffic Impact Assessment.	Prior to, during and post-construction	Proponent and Contractor
Harm to native fauna	TE09	~~**Minimising collision and electrocution hazards to animals will be considered in the design of the overhead powerlines, including the**~~ **Spacing and configuration of conductors and use of transmission line markers (bird flappers) or diverters to assist in birds being able to avoid impacts will be considered in the design of the overhead powerlines to minimise collision and electrocution hazards to animals.**	**Pre-construction**	**Proponent and** Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Insufficient understanding of present fauna species	TE10	~~Clearing of native vegetation and fauna habitat have potential to harm native fauna species. To minimise harm,~~ Prior to vegetation clearing, pre-clearance surveys will be undertaken by appropriately qualified ecologists.	Pre-construction	Proponent and Contractor
The destruction of salvageable habitat elements	TE11	**Removal** of hollow bearing trees **will** be undertaken in spring (September to November), and outside the main breeding period for hollow-dependent fauna, **where practicable.**	Pre-construction and construction	Proponent and Contractor
Insufficient understanding relating to tree hollows to be removed	TE12	If hollow-bearing trees are to be removed prior to September and after November, monitoring of breeding activity **will** be carried out by an **appropriately qualified** ecologist/s approximately one week prior to the proposed tree removal	Pre-construction and construction	Proponent and Contractor
Potentially excessive environmental harm	TE13	Vegetation clearing works **will** follow a two-phase process, as outlined below: • Phase 1 will include the removal of all non-habitat vegetation • Phase 2 will include the removal of all habitat features **(e.g. hollow bearing trees, surface rocks, large logs).**	Construction	Contractor
Harm to native fauna	TE14	Fauna species **will** be relocated to habitat identified during the pre-clearing process **(where practicable)** or, if injured, transported to a veterinarian or wildlife carer.	Prior to, during and post-construction	Proponent and Contractor
The introduction and/or spread of weeds, or plant pathogens	TE15	A comprehensive weed control protocol will be developed as part of the biodiversity management plan.	Pre-construction	Proponent
Adverse impacts to native habitat	TE16	~~After completion of the Project's construction, extensive areas of the site will be rehabilitated.~~ **Rehabilitation of disturbed areas will be undertaken progressively as construction is completed.** The proposed rehabilitation measures will be **outlined and** developed in a comprehensive Rehabilitation Management Plan**, prior to construction commencing** ~~to be prepared post-approval~~.	Post-construction	Proponent and Contractor
Adverse impacts to groundwater dependent ecosystems	**TE17**	A monitoring program will be implemented to ensure actual impacts are within or less than predicted. If actual impacts are greater than predicted, adaptive management will be implemented. The monitoring program will be ~~determined as a~~ **included in the Biodiversity Management Plan and Water Monitoring Plan which will be** developed **prior to construction commencing** ~~post-approval~~.	Pre-construction	Proponent
Changes in fire regime impacting threatened species	**TE18**	**No bushfire fuel management (such as hazard reduction burns) will be carried out by the project such that it might change the existing bushfire regime.**	**Operation**	**Proponent**

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Aquatic ecology				
Overall impacts to aquatic ecology	AE01	**An aquatic ecology monitoring and management plan (AEMMP) will be prepared and implemented. The plan will confirm monitoring requirements and will provide an adaptive management framework for the project before construction commences.** **This will include but not be limited to:** • **Survey effort** • **Locations of survey sites** • **Screen maintenance investigation** • **Trigger actions and corrective actions**	**Pre-construction** **Construction** **Operation**	**Proponent and** Contractor
Potential impacts on the Southern Purple-spotted Gudgeon and the Manning River Helmeted Turtle.	AE02	• Further field sampling **will be undertaken prior to construction** to document the presence/absence of the Southern Purple-spotted Gudgeon and the Manning River Helmeted Turtl~~e (e.g. targeted habitat sampling, eDNA sampling) to expand their known range, reducing impact on the overall population.~~ • **Additional survey prior to construction will focus on:** – **Georges Creek** – **Dykes river** – **a suitable control site.** **Survey effort may include eDNA, habitat assessment and fish surveys. To better understand the distribution of the species in the region.**	Prior to construction	Proponent and Contractor
Short-term minor decrease in surface water volume and flow within the Macleay River and associated tributaries as a result of reservoir construction and filling.	AE03	• The baseflow of the Macleay River **will** be maintained during dry conditions in accordance with the relevant licensing provisions (SPAL) approved for the Project. • Surface water, flow and quality **will** be monitored upstream and downstream of the water extraction site within the Macleay River, prior to, during and post-construction to detect changes outside of expected ranges and in accordance with the relevant licensing provisions (i.e. the SPAL). • ~~Ensure Project-specific Management Plan would be prepared and implemented, prior to construction.~~	Prior to, during and post-construction	Proponent and Contractor
Initial and short-term periodic degradation in surface water quality (including breach of relevant WQO; salinity, nutrients and/or metal concentrations) due to evapoconcentration within the Macleay	AE04	• Sediment control devices **will** be **installed** around construction areas (e.g. silt fences) in areas where construction runoff may enter waterway. • Surface water, flow and quality triggers **will** be established for the Macleay River to detect changes in salinity and other parameters relevant to aquatic ecology, particularly during initial filling of the reservoirs, and to further inform monitoring programs.	Prior to construction	Proponent and Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
River as a result of water extraction.		• **The filling of the reservoirs will be delayed post-initial flush where feasible to prevent stagnation** • ~~Ensure Project-specific management plans are prepared and implemented, prior to construction~~. • **Sediment basins will be installed to minimise transfer of high turbid surface waters in to the receiving environment.** • **Sediment basins will be installed off-line for existing and or diverted watercourses.**		
Aquatic fauna mortality attributed to extraction of water from the Macleay River.	AE05	• Water extraction infrastructure **will** be designed, constructed and operated in alignment with Boys (2021) and Boys et at. (2021), and "fish friendly" end-of-pipe screens **will** be selected to minimise mortality of fish, Platypus, amphibians and turtles, and to prevent infrastructure damage. • **The design and application of screening to the Macleay River pump facility will be provided to DPI Fisheries for review prior to construction.** • **Intake Screens will be regularly checked for obstruction and effectiveness to ensure the fish friendly aspects of the pump are effective for the protection of aquatic species**	Prior to, during and post-construction	Proponent and Contractor
Disturbance of waterway beds and banks as a result of water extraction.	AE06	• Water extraction infrastructure **will be** raised ~~off~~ **above** the sediment to minimise erosion of the benthos.	Prior to, during and post-construction	Proponent and contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Disturbance of waterway beds and banks, decrease in short to medium term water and sediment quality, short-term impediment of fish passage and impacts to potential Platypus burrow habitat as a result of the construction and installation of bridge/road crossings and power transmission lines.	AE07	• All waterway crossings **will be designed to** comply with *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge 2003) and *Policy and guidelines for fish habitat conservation and management* (Department of Primary Industries 2013). • Project management plans **will** contain provisions for managing impacts and monitoring water quality, key fish habitat and fish passage during Project construction, in particular, bridge/road and transmission line waterway crossing installation. • Sections of waterways impacted by Project construction (i.e. bridge/road crossings, water extraction infrastructure installation) **will be** surveyed for Platypus burrows and individuals. If Platypus are located, relocation surveys **will be** undertaken prior to clearing and construction **commencing**. • ~~Ensure Project-specific management plans are prepared and implemented, prior to construction.~~ • **Flow will be maintained for Class 1 waterways during construction of permanent and temporary structures to maintain habitat connectivity for aquatic species** • **Where possible, structures will be constructed during slower flows to minimise the movements of soil and sediments into the river.** • **Following the removal of temporary bridges, site rehabilitation, will be undertaken. This will include, but not be limited to, the following:** – **Reinstatement of bank profiles** – **Reinstatement of banks with natural and locally material where required, and** – **Revegetation of riparian buffer with locally appropriate vegetation.**	Prior to and during construction	Proponent and Contractor
Additional surveys and monitoring to identify any potential Project-specific impacts to aquatic vertebrate fauna species not yet identified from the Macleay River within the Project area.	AE08	• ~~If practical, undertake~~ Follow up aquatic vertebrate fauna monitoring using a boat electrofisher **will be undertaken to assess** areas with deeper water **which were not assessed** at the time of the field surveys, **if practical.** • Alternatively, **if this is not practical,** historic monitoring data **will be purchased** from the DPI Fisheries.	Prior to construction	Proponent

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Erosion, siltation, scouring and degradation of the riparian zone, including an increase in instability of waterway banks and beds, as a result of construction activities.	AE09	• **The Soil and Water Management Plan** ~~Project-specific management plans and relevant licenses~~ **will include** provisions for managing water quality, water flow, aquatic habitat and riparian habitat**, including**: – Erosion and sediment management and mitigation measures (such as silt fencing and sediment capture downslope of construction areas) **will be installed**. – ~~Ensure construction staff use specific tracks~~ **Contractors will only use designated tracks** when accessing and moving through riparian corridors. – Areas of riparian vegetation **will be fenced off** to exclude cattle and livestock. • ~~Ensure Project-specific management plans are prepared and implemented, prior to construction.~~	Prior to and during construction	Proponent and Contractor
Decrease in short to medium term water and sediment quality as a result of Project activities adjacent to the Macleay River.	AE10	• **The Soil and Water Management Plan** ~~Project-specific management plans~~ **will** contain provisions for the management of construction pollutants (i.e. hydrocarbons, chemicals) to **minimise** contamination of waterways (or nearby soil). • ~~Ensure Project-specific management plans are prepared and implemented, prior to construction.~~	Prior to and during construction	Proponent and Contractor
Decrease in short to medium term water and sediment quality as a result of runoff and sedimentation attributed to inadequate post-construction rehabilitation and/or stabilisation methods.	AE11	• **The Soil and Water Management Plan** ~~Project-specific management and rehabilitation plans~~ **will** contain provisions for managing water and sediment quality, downslope of constructed areas, post Project construction. • Periodic monitoring or inspection of adjacent aquatic and riparian habitat **will be undertaken** during and postconstruction. **The monitoring and inspection frequency will be specified in the Aquatic Ecology Monitoring and Management Plan**. • ~~Ensure Project-specific management plans are prepared and implemented, prior to construction.~~	Construction	Proponent and contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Loss and/or reduced recruitment of native riparian plants, including potential loss of habitat and exacerbation of existing weed infestations, due to vegetation clearing, construction activities and water extraction during water extraction.	AE12	• Aquatic and riparian zones **will be** progressively rehabilitated, ~~a~~nd managed in accordance with Project rehabilitation plans, and that adjacent disturbed areas are also rehabilitated (weed management, native vegetation planning, erosion control/prevention, fencing of waterways, etc), where practicable. • **Aquatic and riparian zones, and adjacent disturbed areas will be progressively rehabilitated, and managed in accordance with Project rehabilitation plans. The rehabilitation plans will include measures for weed management, native vegetation planning, erosion control / prevention, fencing of waterways, etc.** • **An Erosion and Sediment Control Plan, Rehabilitation Management Plan, Biodiversity Management Plan, and Soil and Water Management Plan will be prepared and implemented, prior to construction. These plans will include measures for managing water quality, water flow, aquatic habitat and riparian habitat, and erosion and sediment.** • **Only** specific **identified** tracks **will be used by construction staff** when accessing and moving through riparian corridors. • Areas of riparian vegetation **will be fenced off** to exclude cattle and livestock. • ~~Ensure Project-specific management plans are prepared and implemented, prior to construction.~~ • **The recommended buffer areas as described in the AEIA Addendum, Table 6.2, will be applied where possible.**	Construction and post-construction	Contractor
Decrease in short to medium term water and sediment quality	AE13	• Site-specific water and sediment quality criteria for use in future monitoring **will be developed**	Prior to and during construction	Proponent and contractor
Risk of a lack of understanding and subsequent challenging by relevant regulatory departments and stakeholders of management approaches and aquatic offset strategy.	**AE14**	• Consultation with relevant regulatory departments **will** be undertaken as soon as practicable to ensure management of the Project in relation to aquatic, subterranean and groundwater dependent ecology, aligns with expectations, including but not limited to the DPI Fisheries and the Natural Resources Access Regulator (NRAR). • Consult with the DPI Fisheries regarding the implementation of an aquatic offset package if feasible for the Project, in alignment with *NSW Biodiversity Offsets Policy for Major Projects Fact sheet: Aquatic biodiversity* (Department of Primary Industries 2014).	Prior to and during construction	Proponent and contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Native fish exposure to between reservoir pump and turbine infrastructure	**AE15**	• **Fingerboard Creek will be destocked of fish and other aquatic species prior to construction to minimise the presence of native species captured in the reservoir. Following this, the lower channel will be cut off from the upper channel and related disturbance.** • **Destocking will focus on the relocation of native species in regions of refuge and will be carried out in period of low and or no flow.** • **Any exotic species will be disposed of in accordance with relevant biosecurity measures.**	**Operation**	**Proponent**
Aboriginal heritage				
Impact to known and unknown heritage sites and items	AH01	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be prepared prior to construction and implemented to guide the process for management and mitigation of impacts to Aboriginal objects. The ACHMP will: • include measures to further explore potential impacts and management prior to construction within the disturbance footprint • investigate, salvage or conserve ex situ areas of high research potential • outline specific requirements associated with archival recording and any other recovery and/or collection procedures • **provide a guidance framework for the mitigation of intangible cultural heritage values** • include other suitable monitoring, management, analysis, reporting and document lodgement procedures • **include description and methods of actions to minimise any inadvertent impacts to identified Aboriginal objects and/or sites and areas of archaeological sensitivity outside of the disturbance footprint.**	Pre-construction, construction, operation	Contractor
Impact to known heritage sites and items	AH02	Additional investigations, and, where deemed appropriate, salvage for ex situ conservation will be undertaken for sites OMPS-FA1, OMPS-FA3, OMPS-FA4 and OMPS-FA12, OMPS-FA2, OMPS-FA3, OMPS-FA4, OMPS-FA8, OMPS-FA9, OMPS-FA10, OMPS-FA11, and OMPS-FA13-15, amongst others. Post excavation analysis and reporting will also be undertaken.	Pre-construction, construction	Proponent and contractor
Adverse visual impacts to heritage sites	AH03	• Further consultation with relevant parties and, if appropriate, site visits to three potentially impacted cultural sites will be undertaken prior to construction. The sites are East Kunderang Station, Lower Creek/Long Flat camp, and AHIMS# 21-5-0023. • Outcomes will include the identification of any impacts by the works and the identification suitable mechanisms to reduce or remove identified impacts, and these will be included in the ACHMP.	Pre-construction, construction	Proponent

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Adverse cultural impacts	AH04	An interpretation Strategy and Interpretation Plan **will be developed and implemented**. These documents **will** focus on the ethnographic and historical record, **include** consultation and input from the RAPs, and **include** information obtained from the archaeological excavations and findings. **This strategy will be made available for consultation and feedback with the Thunggutti, Dhungutti and Anaiwan traditional owners.**	Pre-construction, construction	Proponent
Adverse cultural impacts from excessive water use	AH05	Water taken from the Macleay River for the initial filling of the reservoirs and for periodical top ups is proposed to be taken from the Macleay River through a SPAL under the WM Act. The application for the SPAL **will** consider the cultural significance of flows, which might include a background description of Aboriginal sites, objects, places and values, and their significance. Further investigation may be required for any potential impacts not identified in the ACHA.	Construction, operation	Proponent
~~Culturally modified trees will be damaged~~	~~AHR06~~	~~Where identified, culturally modified trees will be subject to inspection by an arboricultural consultant and treated as an Aboriginal site with appropriate management measures if no reasonable explanation for the tree's modifications is forthcoming.~~	~~Pre-construction, construction~~	~~Proponent and contractor~~
Adverse cultural impacts during construction and rehabilitation	**AH06~~7~~**	The Construction Environment Management Plan (CEMP), or equivalent, will reinforce how the cultural landscape is considered throughout the Project and **will** detail the rehabilitation of the disturbance footprint.	Pre-construction	Proponent and contractor
Adverse cultural and social impacts	**AH07**	**A cultural values mitigation offset package will be developed in consultation with relevant Elders and key knowledge-holders. This document will be undertaken to explore mitigations for the perceived social and cultural impacts to Georges Junction and associated cultural values of the Macleay River corridor. The document will include, but not be limited to:** • **ongoing on-Country access within key parts of the Project area owned by the proponent into the future** • **further exploration and support of traditional hunting, fishing and other water-related activities along the Macleay River and at Georges Creek Junction on land owned and/or accessible by the proponent into the future** • **suitable integration of Aboriginal participants, Indigenous knowledge and traditional ecological methods into future ecological and aquatic ecological requirements that result from the EIS and Amendment Report assessment** • **suitable management and maintenance of any impacted view-lines of Georges Creek Junction by the Project within the limits of the proposed development activities.**	**Prior to, and during construction and operation**	**Proponent and contractor**

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Adverse cultural impacts	**AH08**	**Consultation will be maintained with the RAPs during the finalisation of the assessment process and throughout the pre-construction and construction phase of the Project.**	**Prior to, and during construction**	**Proponent**
Historic heritage				
Historic heritage	HH01	An Historic Heritage Management Plan (HHMP) will be prepared to guide construction and operational activities of the Project. The management plan will include: • **mapping of sites and archaeological sensitivity** • historical heritage induction requirements • **identification and mapping of** no-go areas • areas where further archaeological excavation is required • archival recording requirements • interpretation and reporting requirements • unexpected finds protocol • **a process for redesign and avoidance for any significant archaeological relics or heritage items discovered during construction.** The Plan will include the site specific management **measures** identified in the SOHI for **known heritage sites (HH02**) ~~**Long Flat Station, Kunderang East Pastoral Station, the cultural landscape and any features identified with the Long Flat Station squatting run.**~~	Prior to construction	Contractor
Historic heritage	HH02	The following site specific management measures **have been identified for known** heritage sites within the Project area **with potential for direct or indirect impacts. These measures** will be incorporated into the Historic Heritage Management Plan: • Long Flat Station **(structures)** – **No-go area** ~~**Unexpected finds protocol, interpretation if relics are found.**~~ • **Long Flat Station (squatting runs) – Unexpected finds protocol** • **Towel Creek Station squatting runs – Unexpected finds protocol** • Travelling Stock Camp [Crown Reserve No. 1075] – Unexpected finds protocol, interpretation if relics are found. • **Travelling Stock Route no. 1076 – Unexpected finds protocol** • **National Trail – No-go area** • Kunderang East Pastoral Station – **No-go area;** Archival photography. • Cultural landscape – Archival photography. • ~~**Any features identified with the Long Flat Station squatting run – Unexpected finds protocol.**~~ • Any other heritage items identified – Unexpected finds protocol.	Prior to construction	Contractor/ Proponent

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Water				
General water impacts	**WM01**	**A Water Monitoring Plan (WMP) will be prepared and implemented prior to construction. The WMP will including the surface and ground water monitoring measures identified in this table, and with reference to the monitoring locations and parameters specified in:** • ***Oven Mountain Pumped Hydro Storage Project Groundwater Impact Assessment* (EMM 2024a)** • ***Oven Mountain Pumped Hydro Storage Project Surface Water Assessmen*t (EMM 2024b)**	**Prior to construction**	**Contractor**
Groundwater impacts	**WM02**	• **A Groundwater Management Plan (GMP) will be prepared as part of the Water Monitoring Plan and implemented prior to construction and will include the measures listed in this table.**	**Pre-construction, and construction**	**Contractor**
Groundwater drawdown (levels and extent) is significantly larger than predicted.	**WM03**	• **Groundwater monitoring will be undertaken to provide early indication of potential change in predicted impacts.** • **If groundwater monitoring results show an exceedance of the predicted groundwater drawdown, further mitigation will be applied such as additional grouting treatments**	**Pre-construction, and construction**	**Contractor**
Groundwater inflow rates are higher than predicted to the tunnel, affecting water management system and Project licensing (compliance).	**WM04**	• **Metering and monitoring will be undertaken in place to record the volume of water removed from the tunnel.** • **Regulators will be notified if there are any exceedances of the monitoring criteria.** • **Standby pumps will be provided to increase volume removed from the underground for safe operation.** • **Review of groundwater model.**	**Pre-construction, and construction.**	**Contractor**
Impacts on baseflow are greater than predicted.	**WM05**	• **Monitoring during operations will be undertaken to provide indication of impact.** • **Triggers and trigger action response plans (TARP), detailing potential mitigation measures, will to be included within a water monitoring plan (WMP).** • **Regulators will be notified if there are any exceedances of the monitoring criteria.**	**Operation**	**Proponent**
Groundwater quality sampling indicates changes from baseline conditions	**WM06**	• **Monitoring during operations will be undertaken to provide indication of impact.** • **Triggers and trigger action response plans (TARP), detailing potential mitigation measures, will be included within a Water Monitoring Plan (WMP).** • **Regulators will be notified if there are any exceedances of the monitoring criteria.**	**Operation**	**Proponent**
Reduced Macleay River streamflow	WM07	• General construction water **will** be sourced in accordance with rules specified in the relevant water sharing plan **and in accordance with the AEMMP**.	Construction	Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Reduced Macleay River streamflow	WM08	The following measures will be applied to the extraction of water for initial storage fill and operational top-up: • extraction will only occur during high-flow (greater than 50th percentile) conditions • extraction will not occur during extended dry periods or drought • no extraction will occur during the first seven days of the first high-flow event following extended dry periods or drought to allow the river to recharge.	Construction and operation	Contractor and Proponent
Surface water quality (stormwater discharge)	WM09	• SWMPs and ESCPs will be developed for all construction areas. • The stormwater system **will** be designed and constructed using industry standard practices, **including separating clean and dirty water**. • Sediment basins will be constructed where practical to capture and treat stormwater runoff. • **Water affected by sediment will be contained within a series of three sediment ponds for the upper PSE and one sediment pond for the lower PSE, all sized in accordance with the Landcom Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom NSW 2004) 'the Blue Book'.** ~~• Areas with elevated risk of contamination will be separated from stormwater network.~~	Construction	Contractor
Surface water quality (process water)	WM10	• Source controls **will** be implemented to manage the volume and quality of process water produced. • Process water will be treated for re-use ~~to minimise risk of discharges~~. • Surplus process water will be treated prior to discharge.	Construction	Contractor
Surface water quality (wastewater)	WM11	• Sewage treatment plants will be established to treat wastewater prior to discharge. • Temporary ablution facilities with a pump out arrangement **will be used** for low occupancy areas.	Construction	Contractor
Surface water quality (spoil emplacements)	WM12	• Runoff from upstream areas will be diverted to minimise the volume of water that contacts the emplacements.	Construction and operation	Proponent
Instream structures	WM13	• Instream structures and waterway crossings will be designed and constructed in general accordance with the relevant guidelines.	Construction	Contractor and proponent
Increase flood level and extent	WM14	• Macleay River bridge design **will** provide adequate waterway area to **allow** flood flows **to pass** and minimise flood impacts.	Construction	Proponent

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Lower PSE sediment basin (sizing and design)	**WM15**	• **The detailed design of the lower PSE sediment basin will consider the construction of the PSE in stages, as outlined in the Conceptual Landform of the Permanent Spoil Emplacement (WSP, 2024). This includes:** – **progressive raising of the lower PSE and incorporating a new series of diversions further upslope.** – **additional storage on the surface, and suitable sediment dams constructed to manage risk of offsite migration of dirty or contaminated sediments.** – **As the landform is constructed in a series of terraces, provision can be made to store runoff in a series of ponds on the PSE.**	**Detailed design**	**Contractor**
Geochemical monitoring	**WM16**	• **A geochemical monitoring program will be included in the Project's Water Monitoring Plan to identify material that may contain concentrated metals, e.g. greisen. The number of samples will be based on the estimated spoil volume during construction.**	**Construction**	**Contractor**
Land				
General impacts	**L01**	**A Soil and Water Management Plan (SWMP) will be prepared and implemented prior to construction. It will include the relevant measures listed in this table, including the preparation of relevant sub plans such Erosion Sediment Control Plans (ESCPs) and Soil Stripping and Management Plan (SSMP).** **Soil management will include but not be limited to**: • **Avoiding, minimising or mitigating impacts to soils.** • **Maintaining soil quantity and quality.** • **Restoring land to its pre-activity use but that it is also returned to its pre-activity productive capacity or potential productive capacity as soon as possible following completion of the activity.** • **Returning the land to a stable landform (i.e. no subsidence or major erosion) with no greater management inputs than those required prior to land disturbance.**	**Prior to construction**	**Contractor**
Soil management	L02	**Soil Stripping and Management Plan (SSMP)** A SSMP **will be prepared** to preserve soil resources, including quantity and quality to be managed**. The SSMP will include** soil management measures **and provide** guidance on: • clearing and grubbing • soil stripping • soil stockpiling • soil amelioration • soil reinstatement.	**Prior to construction**	**Contractor**

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Soil management	L03	~~The primary objective of the soil management approach is to reinstate~~ **All** disturbed areas **will be reinstated** to as near as practical to pre-existing environmental conditions.	Prior to construction	Contractor
Erosion and sediment control	L04	**Overarching principles of ESC will** include or consider: • Prevention or minimisation or erosion where possible. • minimising extent and duration of soil disturbance and avoiding land disturbance and construction during the wet season. • Suitable sediment control measures. • Where sediment basins are required (as above e.g. where soil loss exceeds 150m^3/y) but where it is not practical to install (local management areas), a compensatory level of erosion and temporary sediment controls **will be** implemented to achieve an equivalent level of turbid water treatment. • Stabilised construction exits **will be installed** where there is a risk of mud tracking onto public roads. **Detailed design** • The project design **will** consider the soils, terrain and erosion hazard including erosion and landform modelling, soil loss calculations for sediment basin requirements and coagulant and flocculant bench testing. **Management plans** Management plans for the management of soil and water for all Project disturbances**, including access and transmission tower construction,** in accordance with IECA (2008) and Landcom (2004), **will be prepared.** **These will** include**, but not be limited to:** • SWMP • ESCPs • Environmental Work Methods Statements (EWMSs) for planned and unplanned (emergency) works in sensitive environments. **Management plans will include monitoring of the effectiveness of control measures.**	Prior to construction	Contractor
Site and landform stability	L05	Geotechnical and erosion modelling **will** be carried out as part of the detailed design, and design parameters and measures **will be** adopted to minimise risks to landform stability.	Detailed design	Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Land use conflict	L06	The performance targets associated with the potential high-risk conflicts **that will** be adopted to manage potential land use conflicts include: • The Construction Environmental Management Plan will include a complaint resolution and disciplinary procedure as a mechanism to address any issues identified by the local community and other roads users in relation to safety. • The Bush Fire Emergency and Evacuation Plan will be reviewed after incidents of bushfire or other fire events, as well as annually at the end of each bushfire season. The Bush Fire Emergency and Evacuation Plan will be amended after the review process, if required, to increase its effectiveness.	Prior to construction	Contractor
Progressive rehabilitation	L07	Detailed Site Rehabilitation Plan(s) **will** be prepared **prior to and during construction** for progressive rehabilitation and **will** consider the methods outlined in the Project Rehabilitation Strategy.	Construction	Contractor
Final land use	L08	A Rehabilitation and Final Land Use Plan **will** be developed **and implemented prior to decommissioning**.	Prior to decommissioning	Contractor/ Operator
Upper PSE specific erosion and sediment control	**L09**	**The drainage lines on the upper PSE will require armouring. There is 2.2 km of drains in total and these will require 5,400m^3 of rock armouring (typically durable rock with a D_{50} grading of 250 mm).**	**Construction**	**Contractor**
Lower PSE specific erosion and sediment control	**L10**	**The drainage lines on the lower PSE will require armouring. There is 2.43 km of drains in total and these will require 7,100m^3 of rock armouring (typically durable rock with a D_{50} grading of 250 mm).**	**Construction**	**Contractor**
Geochemical risks associated with blasting	**L11**	**Geochemical testing will be confirmed at detailed design to ensure that the risk of impacts associated with nitrates will be low whilst undertaking blasting activities.**	**Detailed design**	**Proponent / Contractor**
Ongoing erosion risk modelling	**L12**	**A dynamic assessment where the movement of material and progressive erosion is modelled will be undertaken for both PSEs during the detailed design phase to confirm the erosion risk.**	**Detailed design**	**Proponent / Contractor**

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Transport				
General traffic and transport impacts~~Narrow section of Kempsey Armidale Road and blind corners~~	T01	A detailed Construction Traffic Management Plan (CTMP) will be prepared **prior to construction** for the Project. ~~At the narrow section of the road and corners where OSOM vehicular traffic would not be possible, upgrades will be required and , will be depicted in the CTMP.~~ A framework of the CTMP is provided in Appendix R and includes, general requirements, vehicles types and routes, traffic control measures, outline emergency activity strategy, staff induction and other measures. **The CTMP will also include a driver code of conduct that addresses:** • **Driver fatigue** • **Awareness of public road users including motorcyclists** • Procedures to ensure that drivers to and from the project adhere to the designated vehicle routes and speed limits • Procedures to ensure that drivers implement safe driving practices**, including during inclement weather conditions**.	Prior to construction	Contractor
	~~T02~~	~~During construction, localised widening will be assessed at sections along Kempsey Armidale Road between, Pee Dee Creek and Pee Dee Road, O'Sullivan's Gap, Blackbird Flat, McGees Flat, Smiths Bluff (refer to Appendix R for specific locations).~~	~~During construction~~	~~Proponent, Armidale Regional Council and Kempsey Shire Council (works are to be approved by the councils and funded by OMPS)~~
Road signage deficiencies and public safety risks with construction vehicle movements and haulage along KAR	**T02**	**A comprehensive signage plan will be prepared for sections of the KAR in consultation with the ARC and KSC respective local traffic committees, and incorporated into the Project CTMP.**	**During construction**	**Contractor, ARC, KSC (and funded by Proponent)**
Project transport safety risks identified in KAR haulage route ~~Rockfall, landslips etc at various sections of Kempsey Armidale Road~~	**T03**	**As part of Heads of Agreement with KSC and ARC, the Proponent will agree the scope of works required for upgrade of the KAR to be funded by OMPS. The scope of works will ensure upgrades are designed and staged to allow safe access for heavy vehicles during construction, and are upgraded to a level suitable for OSOM movements prior to OSOM transport.** **The scope of works will address key safety risks identified in the TIA (EMM 2023), including:** • **Rockfall, landslips etc at various sections** • **Bridges along the main haulage route from Kempsey with the following potential hazards:** – **bridges with unknown load capacity** – **substandard concrete parapets and no hazard delineation**	~~Multi-year program~~ **Prior to and during construction:** **Works for heavy vehicle access– Prior to construction** **Widening works – Prior to OSOM**	**Proponent, ARC and KSC** ~~Armidale Regional Council and Kempsey Shire Council~~

Impact/risk	ID#	Measure(s)	Timing	Responsibility
		– **narrow culvert followed by a small radius horizontal curve** – **single lane and narrow section bridges** – **bridges with limited approach sight distance** • **Roadside hazards for the main haulage route from Kempsey side:** – **line marking (edge and centre lines) on some sections of River Street and KAR have completely faded increasing the risk of head-on crashes** – **constrained sections with steep side slopes and unstable rock cut formations resulting in poor sight distance around curves** – **single lane formation with vertical rock faces and steep fill slopes into the Macleay River** – **short sections with restricted width due to steep side slopes and the Macleay River** – **small radius horizontal curves that may need widening for vehicle swept path requirements** – **section of steep side slopes and unstable rock cuts.** • **Roadside hazards identified for the secondary haulage route from Armidale side:** – **road side hazards such as vegetation** – **hidden property accesses/concealed driveways** – **road side hazards such as steep fill slopes** – **absence of posted speed limits** – **absence of safety barriers along steep slopes** – **no edge protection to the steep side slope** – **blind corners around vertical cut faces resulting in limited sight distance to approaching vehicles** – **apparent rockfalls at some sections of Armidale Road** – **rock cuts are generally unstable while some fill slopes are supported by old dry-stone walls of unknown strength** – **flooding of the roads** – **road maintenance** – **narrow, single lane sealed road sections.** Armidale Regional Council and Kempsey Shire Council current road reinstatement works as described in Appendix R.		

Impact/risk	ID#	Measure(s)	Timing	Responsibility
The northbound right turn from Waterfall Way is too short for deceleration and storage due to the close proximity to an existing bridge. The approach to Waterfall Way from Kempsey is depressed in side cuts reducing intervisibility between vehicles on Waterfall Way and approaching vehicles from Kempsey. There are no acceleration lanes on Waterfall Way.	T04	**Temporary and permanent signage will be installed in accordance with TIA Addendum (EMM 2024). The plans will be reviewed by ARC's Local Traffic Committee prior to implementation.** ~~Turn treatment assessment results require BAL/BAR for this intersection. Since the intersection has AUL/AUR turn treatment, which is a higher order turn treatment, additional turning lanes are not required.~~ ~~Temporary and permanent signage plans are attached in TIA Addendum (EMM 2024) which would require ARC's Local Traffic Committee's consideration and endorsement. These recommended measures should improve safety at this intersection~~. ~~Stop sign warrant has identified the sight distance to be approximately 100 m which is less than the required 115 m. Rather than installing a 'Stop' sign it is recommended that vegetation and earth bank is cleared on the right side of Kempsey Armidale Road approach to increase available sight distances. This will be further considered during the detailed design phase~~ ~~Nevertheless, given the low volumes of heavy vehicles via Armidale and it is an existing road deficiency with no crash history, a 'Stop' sign should be considered for this intersection control. Furthermore, consideration to be given for temporary reduction of speed limit to 60 km/h on approach to Waterfall Way from Kempsey Armidale Road.~~ ~~The above recommended measures should improve safety at this intersection and will be further considered during the detailed design phase.~~	During construction	~~Proponent /~~ Contractor ~~and Armidale Regional Council~~
~~Identified hazards in relation to bridges along the main haulage route from Kempsey~~	~~T05~~	~~All bridges along the main haulage route from Kempsey to be subject to structural assessment during the detailed design phase.~~ ~~Alternating traffic control along single lane and narrow sections of bridges to be implemented where necessary.~~	~~Prior to construction~~	~~Proponent, Armidale Regional Council and Kempsey Shire Council (works are to be designed and approved by the councils and funded by OMPS)~~

Impact/risk	ID#	Measure(s)	Timing	Responsibility
~~Roadside hazards along secondary haulage route from Armidale~~	~~T06~~	~~A full review of the roadside vegetation and overgrown vegetation along the secondary haulage route from Armidale will be assessed during the detailed design phase. Vegetation should be regularly assessed and maintained along the entire haulage route during construction.~~ ~~Drivers will be made aware of road hazards as per the Driver Code of Conduct.~~ ~~A comprehensive signage plan should be implemented along sections of Kempsey Armidale Road and will be assessed during the detailed design phase. Some suggested signages are presented in Appendix R.~~ ~~At some sections, guard rail and Road Edge Guide Post with Reflectors may be necessary.~~ ~~Speed limits along Kempsey Armidale Road should be reviewed and reduced where necessary. Speed limit should be posted along the road at critical points.~~ ~~Alternating traffic control for up to 5 km sections for periods of busy construction traffic where necessary, allowing one direction of traffic only. This is a secondary access route with low volumes and is operating within the design limitations of road.~~ ~~During adverse weather condition, an appropriate risk management should be undertaken, subject to the discretion of the contractor.~~ ~~During emergency situations, traffic movements to be assessed and may need to be temporarily ceased during adverse weather condition to avoid rockfalls.~~	~~Prior to construction~~	~~Proponent / construction contractor, Armidale Regional Council, Kempsey Shire Council and TfNSW~~
~~Ongoing damage and dilapidation to the road and bridge once constructed.~~	~~T07~~	~~Appropriate road management strategy needs to be in place. Any damaged section of the road needs to be repaired quickly, based on maintenance and dilapidation program agreed with council.~~ ~~Bridge parapets should be painted adequately where necessary.~~	~~Post construction~~	~~Proponent / construction contractor, TfNSW, Armidale Regional Council and Kempsey Shire Council.~~
~~Roadside hazards along main haulage route from Kempsey.~~	~~T08~~	~~The existing line markings along the main haulage route needs to be reviewed during the detailed design phase. Faded lines need to be repainted.~~ ~~Proposed minimum 7.2 m sealed width between Pee Dee undertaken by Kempsey Shire Council and site access via EAR, subject to local design constraints e.g. minimum shoulder widths and possible need for guardrail and selected design vehicle.~~ ~~Drivers to be aware of road hazards as per the Driver Code of Conduct.~~ ~~Appropriate risk management should be undertaken on a regular basis, subject to the discretion of the contractor.~~	~~Prior to construction~~	~~Proponent / construction contractor, TfNSW, Armidale Regional Council and Kempsey Shire Council.~~
North Street is a narrow urban street with housing on one	**T05**	~~Drivers to take appropriate measure while driving through residential neighbourhoods as per the Driver Code of Conduct.~~	During construction	Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
side of the road. An increase in heavy vehicle traffic may impact local noise levels and increase the risk of an accident involving a child or a vehicle accessing a driveway.		**All drivers will comply with the Drivers Code of Conduct, including while driving through residential neighbourhoods.** **Vehicle traffic will manage l**ocal noise levels as per recommendations of the Noise and Vibration Impact Assessment. Truck movements will be restricted during school term in NSW for the AM and PM peak school hours in school zones along the Kempsey Armidale Road, **to ensure safety to the school children.**		
~~Recreational motor bike riders along Kempsey Armidale Road are known to travel in bunches and sometimes arrive at high speeds increasing the risk of head-on crashes.~~	~~T10~~	~~Motor bike riders to be alerted by appropriate signage of increased heavy vehicle traffic due to Project.~~ ~~Construction heavy vehicle drivers to be made aware of motor bike riders as per Drivers Code of Conduct.~~	~~During construction~~	~~Proponent, construction contractor Armidale Regional Council and Kempsey Shire Council~~
~~In the mountainous sections of Kempsey Armidale Road, dense fog was observed severely restricting sight distances.~~	~~T11~~	~~Driver's code of conduct to be followed.~~ ~~All vehicles to use headlights and fog lights during fog conditions.~~	~~Prior to construction~~	~~Construction contractor~~
~~In the east-west section travelling from Kempsey in the afternoon and vice versa in the mornings, sun glare was observed to be an issue.~~	~~T12~~	~~Driver's code of conduct to be followed.~~ ~~Drivers to travel with appropriate caution and awareness of speed during critical morning and afternoon peak periods.~~	~~During construction~~	~~Construction contractor~~
~~Wet and dry weather hazards~~	~~T13~~	~~Drivers' code of conduct to include driving in rainy weather in the area.~~ ~~Consider watering for dust control without creating other hazards e.g. slippery road surfaces.~~	~~During construction~~	~~Construction contractor~~
Existing road conditions and hazards for OSOM vehicle movements ~~Existing road geometry and road conditions pose serious risks and hazards for OSOM vehicle movements~~	**T06**	**The swept path assessments for the OSOM vehicle are presented in Appendix D (Praxis) and further design is required to confirm the extent of road modifications if required. The extent of road modifications required will be further detailed in the detailed design stage and incorporated into Councils works program in accordance with the HoA.** ~~A series of road modifications, traffic control measures and traffic sign removal and replacement measures are presented in the OSOM reports in Appendix R. The extent of road modifications required will be further detailed in the detailed design stage.~~	**Prior to construction** During construction	**Contractor** ~~Proponent, construction contractor, Armidale Regional Council, Kempsey Shire Council and National Heavy Vehicle Regulator (NHVR)~~
~~Impacts on public transport buses, cyclists and pedestrians.~~	~~T15~~	~~The Project is unlikely to have any significant impact on public transport, cyclists and pedestrians. However, local schools should be informed about the presence of additional trucks in the area.~~	~~During construction~~	~~Construction contractor~~

Impact/risk	ID#	Measure(s)	Timing	Responsibility
~~Road signage deficiencies~~	~~T16~~	~~**Temporary and permanent signage plans are attached in TIA Addendum (EMM 2024) which would require ARC's Local Traffic Committee's consideration and endorsement. These recommended measures should improve safety at this intersection. A comprehensive signage plan should be prepared for Kempsey Armidale Road for consideration of both Armidale Regional Council and Kempsey Shire Council respective local traffic committees.**~~	~~During construction~~	~~**Construction contractor ARC and KSC (works are to be designed and implemented by the councils and funded by Proponent)**~~
Amenity				
Visual impacts during construction	LCV01	• laydown areas **will be located** in areas with limited visibility from residences and public roads. • creation of dust from vehicles and wind **will be minimised where possible in line with measures prescribed in the Air Quality Management Plan.** • earthworks undertaken during construction **will be restored or remediated as soon as possible**. • clearing and trimming of vegetation **will be kept** to a minimum.	Detailed design	Contractor
Lighting design	LCV02	• landforms **will be used** to shield the Project from view. • landscape elements (trees, mounding, walls) **will be used** to shield effects of lighting from view. • upward spill light **will be minimised where possible** • lights **will be directed** downwards, not upwards**, where possible** • shielded fittings **will be used**. • 'over' lighting **will be avoided**. • lights **will be switched** off when not required. • energy efficient bulbs **will be used**. • asymmetric beams **for** floodlights **will be** used. • lights **will** not **be** directed towards reflective surfaces. • warm white colours **will be used** in lighting.	Detailed design	Contractor
Vegetation retention	LCV03	• clearing **will be minimised where possible** to help reduce the visibility of the transmission corridor. • trees adjacent to roads **will be retained where possible to** form an existing screen. • trees along the river **will be retained where possible** as an effective screen from the river and the National Trail.	Detailed design	Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Construction noise	N01	A construction noise and vibration management plan (CNVMP) **will be prepared prior to construction to detail:** ~~will address noise and vibration management and mitigation options (where required) will be prepared prior to construction.~~ • ~~The CNVMP will detail how~~ construction noise and vibration impacts will be minimised and managed. • ~~The CNVMP will describe~~ how construction noise levels will be managed where predicted noise levels above the NMLs have been identified. • ~~The CNVMP will address~~ noise mitigation and management to reduce construction noise levels at the potentially most affected assessment locations. The CNVMP will outline a procedure to: • Measure construction noise levels at early stages to validate the predicted construction noise levels. • Re-evaluate the predicted construction noise levels at assessment locations, and where required review noise management and mitigation measures to reduce levels as close to NMLs as possible. This may include (but is not limited to): – limiting construction within a certain distance of assessment locations during the evening and night-time period – selecting quieter equipment or reduced equipment fleet – measuring construction noise levels at assessment locations, especially during the evening and night-time period, if relevant, and implementing further noise management and mitigation measures where an exceedance of NMLs is identified, or – entering into a negotiated agreement with affected landholders. Affected landholders **will** be consulted prior to and during construction where an exceedance of NMLs has been predicted and **will** be notified of proposed mitigation measures that will be used to manage construction noise levels to below ICNG NMLs where practicable.	Prior to construction	Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Vibration	V01	• The CNVMP will include as a minimum: – identification of nearby residences and sensitive land uses along with appropriate corresponding vibration criteria – a description of approved hours of work and what work will be undertaken – a description of what work practices will be applied to minimise vibration – a description of the complaints handling process – a description of monitoring that is required. • If the safe working distances are encroached vibration monitoring will be carried out at nearby heritage or infrastructure structures. If required, the monitoring system will be fitted with an auditory and visual alarm that triggers when vibration levels reach the nominated criteria. This would indicate if and when alternate work practices should be adopted (such as decrease vibratory intensity, alternate equipment selection, etc). • Blast practices **will** be reviewed when blasting occurs in the vicinity of significant heritage items listed. This may include limiting the **maximum instantaneous charge** (MIC) or re-assessing the significant and/or the sensitivity of these items to vibration prior to construction commencing in the area. • The potential for blast impacts on residents during the night period is considered highly unlikely given the distance and topography separation between construction and nearest residences. Notwithstanding, blast practices will be constantly reviewed and adapted if complaints are received from residents due to night blasting. • A survey of heritage items and other potential vibration sensitive receivers **will** be undertaken in the blast offset zone identified around the tunnel excavation portal.	Prior to construction	Contractor
Operational Noise	N02	All operational plant and equipment including ventilation, pumps, generators, transformers, VSD or other plant associated with the operation of the Project shall be subject to detailed acoustic review prior to final specification. Design shall be assessed against the requirements of the NPfI and consider the amenity criteria for passive recreation.	During detailed design	Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Air quality				
Particulate matter emissions	AQ01	**Dust impacts will be minimised through practicable measures identified within an Air Quality Management Plan (AQMP) as part of the CEMP and implemented prior to construction. The AQMP will include but not limited to:** • Dozer working areas will be watered. • Wind erosion from spoil disposal areas will be controlled through watering. • Unpaved roads within spoil movement areas will be watered using water carts.	Construction	Contractor
Diesel combustion emissions	AQ02	• More recent emission standard than USEPA Tier 2 will be sourced for mobile and stationary equipment where feasible. • Unpaved roads will be routinely maintained to reduce truck tyre rolling resistance. • All equipment will be routinely serviced to maintain manufacturers' emission specifications. • Idling of diesel equipment will be minimised wherever feasible. • Low-sulphur diesel fuels and lubricants will be used where feasible.	Construction and operations	Contractor and Proponent
GHG	GHG01	• **Completed work areas will be progressively rehabilitated during pre-construction and construction.** • **Reuse of removed vegetation will be encouraged.** • Haul distances will be minimised in Project design as far as practicable to reduce diesel consumption. • Haul roads will be routinely maintained to reduce truck tyre rolling resistance. • Extraction practices will be reviewed to minimise double handling of materials and ensure that haulage is undertaken using the most efficient routes. • Alternative fuels (e.g. low sulphur) will be considered where economically and practically feasible. • Diesel equipment idling will be minimised wherever feasible. • All equipment will be routinely serviced to maintain manufacturers' emission specifications to ensure operational efficiency. • **GHG emissions and energy use developed targets will be monitored** and reported, on a scheduled basis. • Pre-start inspections **on mobile plant and vehicles will be performed** at **the start of** each shift. • Electricity bills and fuel usage **will be tracked.** • **Low carbon alternatives for aggregate, cement and steel will be sourced where viable and from local sources where possible.**	Construction and operations	Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
		• **On-site renewable energy will be considered.** • **The following will be considered at the accommodation camp: use of refrigerants with a low or zero global warming potential, training to encourage energy efficiency, use of motion detectors for lighting in common areas where possible.**		
Climate change	GHG02	• Future design and construction management phases of the Project **will** consider and incorporate where feasible, climate change adaptation measures.	Construction and operations	Contractor
Hazards				
Risk from bushfires	**HAZ01**	A Bushfire Emergency and Evacuation Management Plan (BEEMP) **will** be prepared for the Project Area. The BEEMP will include: • site specific hazards and risk at each main works site • procedures to maintain bushfire awareness • ignition prevention measures • bushfire mitigation measures • fire preparedness actions • fire response actions • bushfire recovery steps.	Pre-construction	Proponent
Risk from bushfires	**HAZ02**	**Asset Protection Zones** (APZs) **will** be implemented in accordance with building classes.	Construction	Contractor
Risk from bushfires	**HAZ03**	Site rehabilitation and/or revegetation **will** not occur where it will impact on APZ requirements for permanent/operational infrastructure.	Construction	Contractor
Risk from bushfires	**HAZ04**	Water supply requirements for firefighting, including the provision of hydrants and hose reels, **will be** designed and constructed in accordance with the relevant Standards and *Planning for Bushfire Protection* (PBP) 2019.	Construction, operation	Proponent /contractor
Increased risk from bushfires	HAZ05	On-site refuge buildings shall comply with BAL-12.5 construction standards of AS3959-2018 or the NASH Standard and Section 7.5 of PBP.	Construction	Contractor
Risk from bushfires	HAZ06	All habitable buildings proposed within the Accommodation Camp shall comply with BAL-29 construction standards of Australian Standard AS3959-2018 or the NASH Standard. Other buildings will be constructed in accordance with relevant National Construction Code provisions.	Construction	Contractor
Risk from bushfires	HAZ07	All permanent structures will be constructed as appropriate with respect to their BAL exposure, vulnerability and criticality.	Construction	Contractor
Risk from bushfires	HAZ08	Access roads and tracks will be constructed, upgraded and/or maintained to comply with performance criteria and/or acceptable solution requirements of PBP 2019 and NSW Rural Fire Service Fire Trail Standards.	Construction, operation	Proponent /contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Risk from bushfires	HAZ09	Low voltage powerlines **will** comply with the performance criteria and/or the acceptable solutions of PBP 2019.	Construction, operation	Contractor
Flooding	**HAZ10**	Flood risk management procedures during construction and operation will be documented within a Project specific Flood Management Plan (FMP) **which will be** developed prior to the commencement of construction.	Pre-construction	Contractor
Flooding due to dam break	**HAZ11**	A coffer dam and diversion tunnel will be installed upstream of dam and reservoir construction areas to mitigate impacts to watercourses during construction and reduce flood risk. The coffer dam will be designed to bypass flows and provide flood immunity up to the 1% AEP design flood event.	Construction	Contractor
Increased EMF due to electrical transmission infrastructure	HAZ12	After the HV powerline and associated substations have been installed, another EMF survey **will** be conducted for assuring compliance with the applicable health and safety and radio frequency interference requirements.	Following construction	Contractor
Dangerous goods	HAZ13	Transport of dangerous goods **will be undertaken** in accordance with the NSW *Work Health and Safety Act 2011* **and in accordance with relevant legislation**	Construction	Contractor
Dangerous goods	HAZ14	Any storage of dangerous goods **will** comply with the requirements of AS 2187.1:1998.	Construction	Contractor
Risk from bushfires	**HAZ15**	**Perimeter roads around each of the fly camps and the accommodation camp will be provided to improve access for attending emergency vehicles.**	**Prior to construction**	**Contractor**
Risk from bushfires	**HAZ16**	**Increased water supply at the accommodation camp, fly camps & the site office with associated firefighting equipment (i.e. pump and hose reel) will be provided**	**Construction, operation**	**Proponent / Contractor**
Risk from bushfires	**HAZ17**	**Available APZ for fly camps (or re-locate) will be increased during detailed design to accommodate a refuge building within the fly camp footprint to achieve a radiant heat of <10kW/m^2.**	**Construction**	**Contractor**
Social				
General	**SI01**	**A Social Impact Mitigation and Monitoring Plan will be developed and implemented prior to construction. The SIMMP will include measures outlined in the SIA addendum report (EMM, 2024)**	**Prior to construction**	**Proponent / Contractor**

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Locality	SI02	Ongoing consultation with landowners and the local community will be key in mitigating potential 'Locality' impacts and enhancing benefits. Ongoing consultation with landowners **will** be undertaken during the finalisation of the design to ensure the final design minimises any high visual impacts on the landscape and on local residences. Consultation **will** also be undertaken to keep the community informed as construction progresses, particularly in relation to key stages where impact to amenity may occur. The Project **will** develop strategies to encourage ~~operation~~ workers to contribute to the local community through volunteerism or other initiatives. A Community Engagement Plan **will be developed prior to construction and will include** initiatives to contribute to maintaining social cohesion in the local area. Strategies to increase the number of locally hired workers through upskilling and training **will be developed to** minimise impact and enhance benefits.	Pre, during and post-construction	Proponent
Infrastructure and services	SI03	A Workforce Housing and Accommodation Strategy **will** be developed **prior to construction in consultation Kempsey Shire and Armidale Regional Council and other relevant authorities to confirm the appropriateness of the strategy.** **The strategy will** detail how the construction workforce will be housed prior to the completion of the accommodation camp. ~~It is also proposed that the Project consult Kempsey Shire and Armidale Regional Councils and other relevant authorities to confirm the appropriateness of the strategy.~~ The Project **will** consult with NSW Health to confirm capacity of existing service provision and implement measures, such as provision of on-site medical facilities, to prevent competition for the GP services most proximal to the site.	Pre-construction	Proponent

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Recreation	SI04**A**	• **Signage will be installed near construction works and access roads close to the National Trail, recreational areas and facilities to inform visitors of the presence of the Project and any changes to access** • **Construction works will be fenced/secured at key points where safety and security are warranted.** • **The local community and visitors will be notified of upcoming road closures/temporary changes in access arrangements. This will also include notification of the Project's stakeholder list and key tourism agencies (such as the National Trail organisation, NPWS, Airbnb and DestinationNSW).** • **Users of the Bicentennial Trail plan their journey via the National Trail website which is the main means of communicating any issues affecting the use of the Trail. This will be a key avenue for communication during construction of the project.** • **Once operational, wooden fencing along the construction footprint where the National Trail route runs parallel to the Project site will be established to ensure visitors are aware of restricted access. Information panels may be considered to engage and inform visitors.** • ~~**Notification of amenity impacts would be communicated to potential visitors including the Project's stakeholder list and key tourism agencies such as the National Trail organisation and Destination NSW. The development and implementation of a workforce accommodation strategy would reduce the impact of reduced availability of tourist accommodation due to increased competition from the Project.**~~	Pre-construction and during construction	Proponent
Recreation	**SI04B**	**A Workforce Accommodation Strategy will be developed and implemented to minimise the impact of reduced availability of tourist accommodation due to increased competition from the Project.**	**Pre-construction and during construction**	**Proponent**
Traffic	SI05	The Project **will** provide SMS notifications to the community on the timing and frequency of road closures, over-sized over-mass vehicle movements and other key traffic movements in the local and regional area. In addition, the Project **will** consider reducing shift lengths for workers driving in separate vehicles to/from the Project area (not via bus) to manage fatigue.	Pre, during and post-construction	Proponent

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Water	SI06	Given the high importance of the Macleay River to the community, the implementation of engagement responses is proposed to assist in quick issue identification and resolution, should issues be raised. This includes regular community construction updates to identify the Project actions taken to prevent risks, and to provide a pathway for community awareness and reporting of any issues. Further, accessible complaints and reporting pathways **will** be enacted to enable fast responses to any residual impacts affecting the community. An adaptive Water Management Plan **will** be prepared for the Project in consultation with NSW government agencies.	Pre, during and post-construction	Proponent
Culture	SI07	Detailed design for the Project **will** consider ~~modification to~~ avoiding sites or objects of high cultural significance where possible. **An Aboriginal Cultural Heritage Management Plan (ACHMP) will be prepared and implemented as outlined in the ACHA.** The effective implementation of the ~~proposed Aboriginal Cultural Heritage Management Plan (~~ACHMP~~), as outlined in the ACHA~~, is key to improving cultural outcomes and social cohesion between Aboriginal groups.	Pre-construction and during construction	Proponent
Engagement	SI08	A comprehensive Communication and Engagement Plan (CEP) **will** be developed and implemented **The CEP will** outline: • an effective approach to communication and engagement underpinned by a proactive issues-management approach, • open and transparent two-way communication processes and responsiveness to the communication needs and • expectations of key stakeholders and the broader community.	Pre-construction	Proponent
Economic				
Insufficient local employment opportunities	E01	Regional residents **will be** preferentially **employed** where they have the required skills and experience and can demonstrate a cultural fit with the organisation.	Construction and operation	Proponent and contractor
A lack of engagement with the local community	E02	**The Project will participate**, as appropriate, in business group meetings, events or programs in the regional community. Community enhancement schemes **will be provided** through various initiatives and programs within the local community, including the housing, education, arts, sporting, and culture sectors.	Construction and operation	Proponent and contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Insufficient local economic opportunities	E03	Non-labour **inputs will be locally sourced** where local producers can be cost and quality competitive. Training and development **will be provided** to increase local economic opportunities.	Construction and operation	Proponent and contractor
A lack of local economic benefits arising from the Project	E04	OMPS will enter into Voluntary Planning Agreements (VPAs), or similar, with Armidale Regional and Kempsey Shire councils generally in accordance with Division 7.1(a) of Part 7 of the EP&A Act and/or community enhancement schemes. Payments to the councils can then be directed to a range of community infrastructure needs and programs.	Construction and operation	Proponent
Waste				
Waste	W01	A Construction Waste Management Plan (CWMP) will be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The CWMP will include but not be limited to: • measures to avoid and minimise waste associated with the Project • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • spoil management measures and emplacement locations and designs • monitoring, record keeping and reporting.	Pre-construction Construction Operation	Contractor
Waste	W02	The management and disposal of waste will be undertaken in accordance with *Waste Classification Guidelines* (NSW EPA, 2014a) and other relevant government policies.	Pre-construction Construction Operation	Contractor
Resource Recovery	W03	Resource recovery will be applied when feasible. Instances may include: • The recovery of resources for reuse – reusable materials generated by the Project will be segregated for reuse on site, or off site where possible, including the reuse of VENM when suitable. • Off-site recycling of materials generated during construction such as plastics, metals, and cardboards. • The recovery of resources for reprocessing – cleared vegetation will be used wherever possible to produce woodchips, compost, and mulch for rehabilitation purposes.	Detailed design Pre-construction Construction	Contractor

Impact/risk	ID#	Measure(s)	Timing	Responsibility
Management of unexpected waste materials	W04	Unexpected waste materials, including contaminated materials, will be planned for through the preparation of appropriate areas for their storage or stockpiling. These areas will be stabilised, bunded, and hardstand or lined as applicable.	Detailed design Pre-construction Construction	Contractor