Prepared for the Office of the Coordinator-General

Borumba Pumped Hydro Energy Storage Project – Initial Advice Statement

DOCUMENT NUMBER BOR-QHY-PLI-ENV-00001

CONFIDENTIAL

Contents

Figures

Tables

Acknowledgement of Country

In the spirit of reconciliation, Queensland Hydro acknowledges the Traditional Custodians of Country throughout Queensland and, in particular the lands, skies and waters on which we operate. We celebrate the diversity of Aboriginal peoples and their ongoing cultures and connections to the lands, skies and waters of Queensland.

Queensland Hydro pays respect to Elders past and present honouring their continuing spiritual and cultural connections to Country.

Acronyms and Abbreviations

Acronym / Abbreviation	Description
3D	Three dimensional
4WD	Four-wheel drive
µm	Micrometre
µS	Microsecond
ACH Act	*Aboriginal Cultural Heritage Act 2003*
AEP	Annual exceedance probability
AHD	Australian height datum
ANU	Australian National University
Archaeo	Archaeo Cultural Heritage Services
ARENA	Australian Renewable Energy Agency
Cable tunnel	Auxiliary multipurpose tunnel that contains emergency egress, high voltage cables, ventilation
CEMP	Construction environmental management plan
CHMP	Cultural Heritage Management Plan
cm	Centimetre
Cth	Commonwealth
DAF	Department of Fisheries and Agriculture
DAR	Detailed analytical report
DCCEEW	Department of Climate Change, Energy the Environment and Water (Cth)
DEPW	Department of Energy and Public Works
DES	Department of Environment and Science
DRDMW	Department of Regional Development, Manufacturing and Water
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
DSDSATSIP	Department Seniors, Disability Services and of Aboriginal and Torres Strait Islander Partnerships
EFO	environmental flow objectives
EA	Environmental authority
EIS	Environmental Impact Statement
EMR	Environmental Management Register
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EP Act	*Environmental Protection Act 1994*
ERA	Environmentally relevant activity
EWA	Early Works Agreement
FEED	Front-end engineering design
FSL	Full supply level
FTE	Full-time equivalent
GBRMP	Great Barrier Reef Marine Park
GBRNHP	Great Barrier Reef National Heritage Place
GBRWHA	Great Barrier Reef World Heritage Area

Acronym / Abbreviation	Description
GDE	Groundwater dependent ecosystem
GL	Gigalitre
GW	Gigawatt
GWh	Gigawatt hour
IAS	Initial Advice Statement
ha	Hectare
HES	High ecological significance (wetlands)
IAS	Initial Advice Statement
IIA	Indigenous Impact Assessment
ILUA	Indigenous Land Use Agreement
Kabi Kabi	Kabi Kabi First Nation Traditional Owners Native Title Claim Group
km	Kilometre
km2	Square kilometre
kV	Kilovolt
LGA	Local government area
LiDAR	Light detection and ranging
m	Metre
mm	Millimetre
MID	Ministerial Infrastructure Designation
MNES	Matters of national environmental significance
MSES	Matters of state environmental significance
MW	Megawatt
MWh	Megawatt hours
NC Act	*Nature Conservation Act 1992*
NEM	National electricity market
NPI	National Pollutant Inventory
NT Act	*Native Title Act 1993* (Cth)
PHES	Pumped hydro energy storage
PMST	Protected Matters Search Tool
QETC	Queensland Electricity and Transmission Corporation
Qld	Queensland
QPWS	Queensland Parks and Wildlife Service
QTC	Queensland Treasury Corporation
RCVA	Regional cultural values assessment
RE	Regional ecosystems
RNTC	Registered Native Title Claimant
SCA	Strategic cropping area
SCL	Strategic cropping land
SDPWO Act	*State Development and Public Works Organisation Act 1971*

Acronym / Abbreviation	Description
SIA	Social impact assessment
SIMP	Social Impact Management Plan
STORES	Short term off-river pumped hydro energy storage
TEC	Threatened ecological communities
TN	Total nitrogen
TNSP	transmission network service provider
TP	Total phosphorus
TSS	Total suspended solids
VM Act	*Vegetation Management Act 1999*
Water Act	*Water Act 2000*
Water tunnels	Water tunnels (headrace and tailrace) to transfer water between the upper and lower reservoirs
WASO	Water allocation security objectives
WQO	Water quality objectives
WSSR Act	*Water Supply (Safety and Reliability) Act 2008*

Executive Summary

Executive Summary

Queensland Hydro proposes to construct and operate the Borumba Pumped Hydro Energy Storage (PHES) Project (the Project), a 2,000 megawatt (MW), 48,000 megawatt hours (MWh), pumped hydro energy storage (PHES) scheme located at Lake Borumba, near the township of Imbil, west of the Sunshine Coast, in Gympie and Somerset Regional Council local government areas (LGA).

Queensland Hydro is a publicly owned entity established by the Queensland Government to design, deliver, operate and maintain long-duration pumped hydro energy storage assets on behalf of the State.

In 2022, the Queensland Government launched the Queensland Energy and Jobs Plan outlining the steps needed to transform the Queensland electricity system and reach the target of 80% renewable energy by 2035 and net zero emissions by 2050. Modelling commissioned by Queensland Treasury Corporation (QTC) has indicated that between 6,000 and 10,000 MW (6 and 10 gigawatts (GW)) of large-scale, long-duration energy storage is required to meet these targets. Pumped hydro, with its ability to store and despatch large volumes of renewable energy, plays a key role in achieving the objectives of the plan.

The Project would support renewable energy development in both the Southern and Central Queensland Renewable Energy Zone areas by providing system reliability to otherwise variable energy generation via solar and wind. With the impending retirement of coal fired power stations in Queensland, the Borumba PHES will play a key role in the decarbonising of the existing electricity supply. The Project will be able to supply up to 2,000 MW of power over a 24-hour period and is planned to be operational by the end of the decade.

Multiple studies into potential large-scale long-duration PHES sites in Queensland were conducted. The pumped hydro studies conducted by the Queensland Government recognised the existing Borumba Lake as one of two preferred potential sites. The other site is Pioneer-Burdekin, currently under investigation by Queensland Hydro. Combined, the two sites will offer up to 7,000 MW of large-scale, long-duration energy storage.

The proposed action will be at the existing Lake Borumba, which is within the Yabba Creek sub-catchment of the Mary River Basin. The components of the proposed action (Main Works for the Project) are detailed in this referral report and comprise the following:

- expansion of the existing Lake Borumba (lower reservoir) and upgrade of Borumba dam:
  - raising the full supply level (FSL) of Lake Borumba through the construction of a new dam wall immediately downstream (approximately 300 metres) of the existing dam wall
  - partial decommissioning of the existing Borumba dam
  - possible installation of fish and turtle passage devices
- installation of a main dam wall and saddle dams to form an upper reservoir.
- underground works to support power generation
  - water tunnels (headrace and tailrace) to transfer water between the upper and lower reservoirs
  - underground power station, pump turbines, and other electromechanical infrastructure
  - an access tunnel for transport between the surface and the power station, and a cable tunnel for emergency access, high-voltage cables and ventilation.
- electrical switchyard for connection between the power station and the transmission network
- supporting infrastructure (both temporary and permanent) including access roads, maintenance buildings, treatment plants, spoil areas and laydown areas. Construction camps and quarries and/or borrow pits that are not developed as part of the Exploratory Works

In 2023, Queensland Hydro delivered the Detailed Analytical Report (DAR) to the Queensland Government for Financial Investment Decision. The DAR was informed by engineering, environmental, social, and economic studies assessing the Project's feasibility. The Queensland Government subsequently committed $6 billion to progress the Project. The preliminary capital cost estimate for the Project is $14.2 billion, including risk allowances and project contingency.

Borumba was selected as the first site due to its:

- Topographical and geological characteristics of the local area – suitable for long-duration, high-capacity pumped hydropower generation. It also allows for more storage and power at lower cost with less excavation required compared to other locations. A vertical separation between the upper and lower storages of approximately

330 metres, over a horizontal distance of less than 3,000 metres, makes it a very efficient site for pumped hydro energy storage. All technically viable options assessed had some level of interface with protected areas and areas of high ecological value.

- Land ownership – the Project requires an upper and lower reservoir and the proposed site for the upper reservoir, underground power station, access tunnels and other supporting infrastructure has been owned by Queensland Government since the 1980s for the explicit purpose of future pumped hydro development. This minimises the need for private land acquisition and the associated social impacts.
- The presence of the existing Lake Borumba, which would serve as a lower reservoir – avoids impacting unmodified riverine environments in other potential locations where an existing lake does not exist, along with the associated socio-economic impacts. However, potential impacts to Conondale National Park are unavoidable.
- The current statutory requirement to upgrade Borumba dam by 2035 to ensure the dam continues to comply with Australian National Committee on Large Dams (ANCOLD) requirements. Delivery of a new lower dam structure for the PHES project avoids the need for significant investment to upgrade the existing dam structure.
- Proximity to the high-voltage transmission network and the location within the Southern Queensland Renewable Energy Zone – close to South-East Queensland's load centre, with a strong electricity network.
- Feasible delivery timeframe – to enable the acceleration to renewables to meet State, National and (where applicable) international targets and the pace of coal-fired generator retirement.

The Project location, therefore, is unique: no alternative site has been identified in Southeast Queensland capable of providing the necessary strategic storage reserves required to provide secure and reliable energy. Delivery of the Project is a key enabler of the Queensland Government meeting its renewable energy targets.

In developing the project components, Queensland Hydro has followed the environmental management hierarchy by implementing several measures to avoid or reduce potential impacts to Matters of National Environmental Significance, as well as socio-economic values.

This Initial Advice Statement (IAS) has been prepared to support an application to the Coordinator-General for the Project to be declared a coordinated project requiring an environmental impact statement under Part 4 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). In accordance with Section 27 (2) of the SDPWO Act, the Project may be declared a coordinated project due to the:

- complex environmental approval requirements at local, State and Commonwealth levels
- scale of the Project and its strategic economic significance to Queensland
- potentially significant environmental effects of the Project
- extensive supporting infrastructure requirements.

The Project will also be referred under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and if deemed to also be a controlled action, it is anticipated that assessment of the Project will be progressed under the Bilateral Assessment Agreement between the Australian and Queensland Governments.

Should the project be declared a coordinated project, environmental and social issues to be assessed in further detail in the Environmental Impact Statement (EIS) (subject to the requirements of the Project's Terms of Reference prepared by the Coordinator-General) are expected to include:

- loss of terrestrial habitat due to vegetation clearing, land inundation and groundwater seepage, with direct, indirect, and consequential impacts to flora, fauna, and ecological communities
- impacts to the values and resources of Conondale National Park, Conondale Resources Reserve and Imbil and Yabba State Forests
- changes to hydrology and geomorphology within the Mary Basin, including potential impacts on water allocation security objectives, environmental flows, and aquatic ecosystems
- potential changes to groundwater levels, distribution, and discharges due to more water being stored over a greater total inundation area, leading to amplified seepage losses
- potential impacts to Indigenous cultural heritage because of infrastructure development and land inundation
- changes in land use, ownership, and tenure
- potential noise and vibration and air quality impacts during construction

- potential social impacts including impacts on recreational activities in the Project Footprint during the construction and operation of the Project
- potential demographic changes, including short-term and long-term population increases and consequent changes in demand for housing, social services, and infrastructure
- potential impacts to local transport infrastructure networks due to proposed road upgrades and realignments, as well as changes in local traffic volume and composition during construction.

The EIS would also describe the potential socio-economic benefits and opportunities associated with the Project, including:

- direct and indirect employment opportunities during construction and operations
- training and capacity development opportunities
- local procurement and supply chain opportunities
- benefits resulting from enhanced transport infrastructure
- the role of the Project in enabling Queensland's transition away from coal-fired generation
- the Project's facilitatory role in enabling upstream renewable energy development and ultimately the coordinated development of the Southern Queensland Renewable Energy Zones.

Context

1. Introduction

1.1 Background

Queensland Hydro is the proponent of the Borumba Pumped Hydro Energy Storage (PHES) Project (the Project). The Project is a 2,000 megawatt (MW), 48,000-megawatt hour (MWh), hydroelectric scheme to store, generate and supply energy through a pumped hydroelectric structure linked to the existing Borumba dam (Lake Borumba) in the Gympie and Somerset Regional Council local government areas (LGA).

The Project proposes to use the increased capacity of Lake Borumba and a new upper reservoir as a way of storing energy. Excess wind and solar renewable energy drawn from the grid, will be used during low demand periods to pump water from Lake Borumba to the upper reservoir, essentially converting the upper reservoir into a giant battery.

The stored energy will then be released by returning the water through a turbine into Lake Borumba producing electricity. Hydroelectricity can be generated almost immediately and at any time, making it possible for the power to be fed into the grid when it is needed, to balance the variability of renewable generation with the demand patterns of Queensland homes and businesses. The Project can also produce large amounts of electricity over a long duration providing a reliable dispatchable generation at times when wind and solar generation is not available.

The primary objective of the Project is to provide long-duration, high capacity dispatchable energy storage to the Queensland grid, which can be used to increase system stability and reliability of supply. This would facilitate additional development of renewable energy from other sources such as solar and wind to meet Queensland's renewable energy targets. Developing large-scale long-duration PHES is an important part of the Queensland Government's efforts to tackle climate change and transition to net zero emissions.

Borumba was first identified by Queensland Electricity and Transmission Corporation (QETC) (now Powerlink Queensland) in the 1980s as a potential large-scale long-duration PHES site, with approximately 2,364 hectares (ha) of land acquired south-west of Lake Borumba and reserved for pumped hydro development by the Queensland Government. More recently in 2017, the Queensland DEPW recognised Borumba as one of the preferred potential sites for large-scale long-duration PHES through their pumped hydro studies (DEPW, undated).

In September 2022, the Project was announced as a priority project for Queensland's SuperGrid under the Queensland Energy and Jobs Plan critical to achieving the state's renewable energy target of 80% by 2035 and net zero emissions by 2050. In June 2023, the state government greenlit the Borumba pumped hydro project, providing $6 billion equity investment towards the estimated $14.2 billion project (State of Queensland, 2023).

In June 2021, Powerlink Queensland (Powerlink) was engaged by the DEPW to prepare a detailed analytical report (DAR) and Front-end engineering design (FEED) for the Project. The primary objective of the DAR was to assess the commercial, technical, and environmental feasibility of the Project to a standard consistent with the Queensland Government Business Case Development Framework (DSDILGP, 2021). The primary objective of FEED was to develop a Reference Design and to define project requirements for detailed engineering, procurement, and construction. The DAR/FEED study involved extensive field investigations and a comprehensive assessment across all criteria (design, socio-economic, environmental, financial and sustainability) to inform investment decisions and necessary approvals/assessments.

The DAR was submitted to the Queensland Government in March 2023.

1.2 Purpose and scope of the IAS

This Initial Advice Statement (IAS) has been prepared to support an application to the Coordinator-General for the Project to be declared a coordinated project under Part 4 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act). In accordance with Section 27 (2) of the SDPWO Act, the Project may be declared a coordinated project due to the:

- complex environmental approval requirements at local, State and Commonwealth levels (Section 6)
- scale of the Project and its strategic economic significance to Queensland (Section 2)
- potentially significant environmental effects of the Project (Section 4)
- extensive supporting infrastructure requirements (Section 2).

Queensland Hydro considers the Project to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and have referred the Project to the Commonwealth Minister for the Environment (i.e. Commonwealth Department of Climate Change, Energy the Environment and Water (DCCEEW)) for a determination under the EPBC Act. Should the Commonwealth Minister for the Environment determine the Project to be a controlled action, and should the Coordinator-General declare the Project a coordinated project, Queensland Hydro requests that the environmental assessment be undertaken via a bilateral EIS process (Section 6).

The IAS is a scoping-level document informed by the following sources:

- desktop assessment of publicly available sources
- documentation prepared for the Project, including:
  - DAR
  - technical studies completed for the DAR
- findings of terrestrial and aquatic ecology field surveys and inspections completed for the Project
- consultation with stakeholders.

The DAR and associated technical studies are commercial in confidence and may not be made publicly available. A more detailed analysis of the Project will be undertaken as part of the EIS, including an assessment of environmental and social baseline conditions, potential impacts and opportunities, and mitigation, management and offset measures to address identified impacts.

The IAS is based on the reference design developed by AFRY, GHD and SMEC, and is hereon referred to as 'the Project'. The EIS would incorporate necessary refinements to the Reference Design, construction methodology and operation identified through the Exploratory Works, environmental investigations and community consultation.

1.3 The proponent

The Project proponent is Queensland Hydro. Queensland Hydro, is a publicly owned entity established by the Queensland Government to design, deliver, operate and maintain long-duration pumped hydro energy storage assets.

Powerlink was initially tasked in 2021 with coordinating the detailed analytical and costing studies for the Project on behalf of the Queensland Government. Under the Queensland Energy and Jobs Plan released on 28 September 2022, the Government announced that a new State-owned entity, Queensland Hydro, would be established to develop PHES assets.

To help give effect to this decision, the Government Owned Corporations (Pumped Hydro Energy Storage Restructure) Regulation 2022 (Qld) was approved on 28 September 2022 and took effect on 30 September 2022. The regulation facilitated the transfer of PHES-related assets, instruments, employees, and liabilities from Powerlink to Queensland Hydro. Powerlink will continue to be responsible for the upgrades to the high voltage electricity transmission network necessary to support the Project. Queensland Hydro and Powerlink will work collaboratively, targeting first power in 2030.

In the 2023-24 Queensland Budget, the Queensland Government approved proceeding with the Project at a total estimated cost of $14.2 billion. The Government committed $6 billion in equity funding over the construction period, with the remainder to be funded by Queensland Hydro through borrowings. This amount is additional to the $273.5 million committed to advance detailed engineering, environmental investigations, community engagement, and some early access works for the Borumba and Pioneer-Burdekin PHES schemes (DEPW, 2022a). By accessing this funding, and with the support of SMEC and Ranbury, Queensland Hydro has both the financial and technical capabilities to deliver the EIS for the Project.

The authorised proponent representative is nominated below (Table 1).

Table 1: Authorised Proponent representative

Name	Job Title	Contact Details
Leah McKenzie	Project Director – Borumba	Leah.Mckenzie@qldhydro.com.au

The Project

2. Nature of the proposal

The Project is a large-scale, long-duration PHES project with the capacity to generate up to 2,000 MW of electricity for up to 24 hours (48,000 MWh).

The Project is 13 km south-west of the township Imbil, 48 km south-west of Gympie, and 180 km north-west of Brisbane (Figure 1). The existing Lake Borumba is within the Yabba Creek sub-catchment of the Mary River Drainage Basin and is subject to the Water Plan (Mary Basin) 2006 (Water Plan).

The upper reservoir sits approximately 330 m above the elevation of the lower reservoir (Lake Borumba) and has a full supply level (FSL) of 490.5 m Australian height datum (AHD). At this level, the Project is able to provide 48,000 MWh (2,000 MW x 24 hours) of energy storage. This elevational difference supports the power generation.

The key components of the Project, which are described in greater detail in Section 2.3, comprise:

- **Lower reservoir** – the construction and operation of a dam wall with an FSL of 155 m AHD immediately downstream (approximately 300 m) of the existing Borumba dam wall, increasing the storage capacity of Lake Borumba (lower reservoir) from approximately 46 to 224 gigalitres (GL) and the inundation area from 482 to 1,243 ha at FSL. Partial decommissioning of the existing Borumba dam wall is also proposed. Construction of a cofferdam to allow for constructing the lower intakes for the water tunnels. Fish and turtle passage devices may be installed to facilitate movement around the new dam wall.
- **Upper reservoir** – the construction and operation of a main dam wall, a primary saddle dam and four secondary saddle dams to establish a new reservoir with an FSL of 490.5 m AHD, a storage capacity of 70 GL and an inundation area of 355 ha. No fauna passage is proposed.
- **Underground components** – the construction and operation of headrace and tailrace tunnels (water tunnels), power station and pump turbines (powerhouse), the access tunnel, and emergency, cable and ventilation tunnel (cable tunnel).
- **Supporting infrastructure** – including construction and operation of the switchyard platform where power generated by the Project will be transmitted to Powerlink's electricity network, an operating pad where the surface portals for the access and cable tunnels are likely to be located, access roads (excluding public roads), water extraction and treatment, waste management, power and telecommunications. Disposal of excavated spoil, some of which may be located in the inundation areas. Construction and maintenance of public recreational facilities would also be required.
- **Temporary infrastructure for construction** – construction, operation, decommissioning and rehabilitation for the Main Works. Construction camps and quarries and/or borrow pits that are not developed as part of the Exploratory Works (some indicative locations are shown in Figure 5 and Figure 6), along with batch and crusher plants, laydown areas, site offices and workshops construction water infrastructure, on-site haul roads, spoil and stockpile areas.

There are significant opportunities to further optimise and refine the design as additional geological and other results become available. Significant integration of the environment and design teams has already occurred with design changes made during the FEED stage (e.g. relocation of the power station cavern to outside of the Conondale National Park and relocation of the portal platform outside of a threatened ecological community).

PHES assets, such as the proposed Project, use water storages (i.e. reservoirs) to store energy in the form of hydraulic potential energy. The amount of stored energy is proportional to the product of the total mass of water and the altitude difference between the reservoirs. Excess energy from renewable energy sources can be used during low demand periods to pump water from a lower reservoir to the upper reservoir, converting the upper reservoir into a battery. The stored energy can then be released by returning the water through the power waterway into the lower reservoir.

The Project would therefore operate in three cycles:

- a generation cycle when water is released from the upper reservoir to the lower reservoir, thereby generating electricity by powering the turbines in the underground power station cavern
- a pumping cycle where the turbines would be used on a reverse cycle to pump water from the lower reservoir to the upper reservoir to replenish storage

- system support, where no water is transferred but the generators are connected to the electricity grid to provide ancillary services to support broader electricity networks system security.

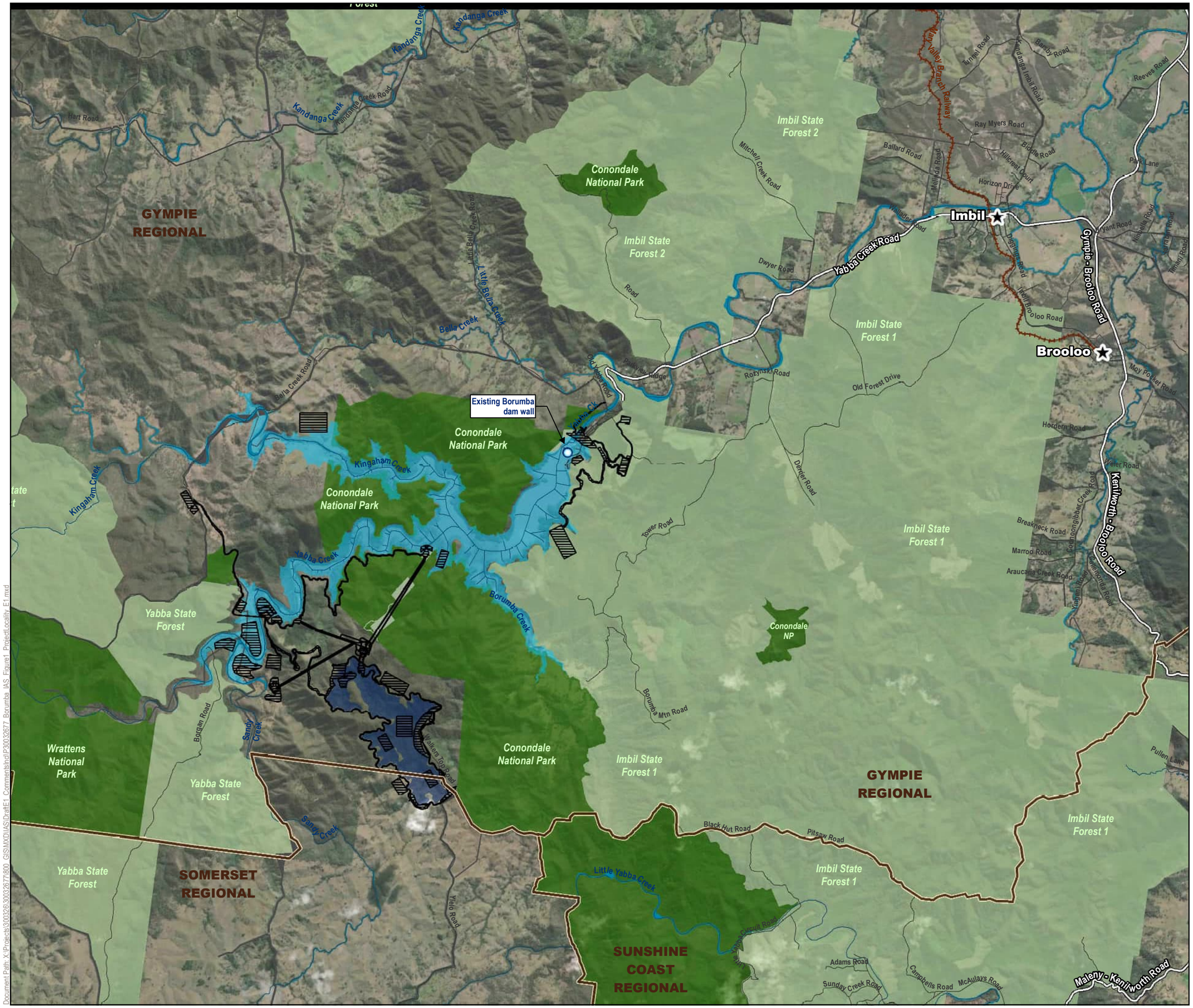
Power for the pumping cycle would be sourced from the electricity grid supplied by Tarong (Halys) and Woolooga power stations. The Project would have a round trip efficiency of approximately 75%, meaning that approximately three quarters of the energy needed to pump water from the lower reservoir to the upper reservoir would be recovered during the generation cycle. Although the Project would have the capacity to generate for up to 24 hours, generation periods may be much shorter than this depending on system needs and electricity demand.

Some changes to the Project are expected as it progresses and is refined in response to additional design and the outcomes of technical and environmental investigations, along with stakeholder engagement.

The volume of water in the upper reservoir must be sufficient to operate the turbines for the target generation period. The volume of water in the lower reservoir must be sufficient that it can supply the upper reservoir during drought periods with high reliability, while still supplying the needs of other water users that are supplied by Lake Borumba. Integrated management would be required to balance demand for hydropower generation with downstream water demand and environmental flows.

In addition to providing long-duration high capacity dispatchable energy storage to the Queensland grid, the Project is being designed with the intent to:

- provide up to 2,000 MW generation capacity for up to 24 hours of continuous operation (48,000 MWh)
- minimise the total National Electricity Market costs over the life of the PHES
- minimise environmental and social impacts
- maintain the reliability of existing water allocations.



Queensland Hydro

GDA2020 MGA Zone 56

0 0.8 1.6 Kilometers

1 cm = 0.8 km (when printed @ A3)

LEGEND

- Existing Borumba dam wall
- Place (population centre)
- Watercourse
- Railway
- State controlled roads
- Local road
- Main works design footprint features
- Local governmental area

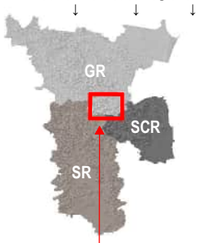
Cadastre

- National park
- State forest
- Conondale Resources Reserve

Reservoir water levels

- Lower reservoir (FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

OVERVIEW
Gympie Regional, Somerset Regional, Sunshine Coast Regional



OVERVIEW
Queensland

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022; Preffered Option @ SMEC, July 2023
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Imagery @ Basemap World Imagery

Borumba Pumped Hydro Project | Initial Advice Statement

PROJECT LOCALITY AND LAYOUT

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 7/09/2023
REVISION:	E1

FIGURE 1

2.1 Need for the Project

The reliability and security of Queensland's electricity system is currently underpinned by coal-fired generators. As Queensland transitions to net-zero emission, variable renewable energy (VRE), along with other complementary technologies will increase, while at the same time coal plants will be progressively decommissioned.

In 2015 the Queensland Government committed to a target of 50% renewable generation by 2030 and zero net emissions by 2050. At that time, approximately 7% of Queensland's electricity was produced from renewable sources. In September 2022, under the Queensland Energy and Jobs Plan the renewable energy target was raised to 70% generation by 2032, 80% by 2035 and net zero emissions by 2050 (DEPW, 2022a).

As of June 2023, renewable sources had increased to approximately 26% of electricity generation, comprising rooftop photovoltaic generation (10.6%), solar (8.4%), wind (3.3%), hydropower (1.3%) and bioenergy (2.4%) However, increased uptake of renewable energy resources has created challenges for grid stability and supply security (DEPW, 2023).

Traditional coal fired power stations generate consistently and dispatch immediately, with storage being in the form of coal. The variable nature of generation from renewable sources requires storage so the gaps in generation can be filled from that storage. Based on currently existing technologies, PHES is the best technology to provide long-duration storage. Building a suite of storage technologies, including pumped hydro, and VRE is believed to be an efficient way to replace retiring coal plant. Therefore, it is important that PHES development starts early enough so projects can be operational when coal plants are retired.

To continue to increase the proportion of energy generation from renewable sources while maintaining system reliability, the Australian Energy Market Operator (AEMO) has identified that Queensland will need significant energy storage as part of a diverse future energy system. Modelling commissioned by the Queensland Government has indicated that 6,000 MW to 10,000 MW of long-duration energy storage would be required to facilitate the Queensland Government's renewable energy targets.

The Project would support renewable energy development in the Southern Queensland Renewable Energy Zone area by providing system reliability to otherwise variable energy generation via solar and wind. The Project will be able to supply up to 2,000 MW with sufficient storage for 24-hours of generation. To provide context, largest reported international projects are the Fengning Pumped Storage Power Plant under construction in China with 3,600 MW capacity (DMS Projects, 2019) and Bath County Pumped Storage Station in the United States with 3,003 MW capacity (Dominion Energy, 2022).

Within Australia, the Kidston project in north Queensland will supply up to 250 MW when completed and will be able to store and discharge energy for up to eight hours and Snowy 2.0 will have 2,000 MW capacity when completed (Snowy Hydro, 2020b).

Pumped hydro energy storage demonstrates several distinct advantages over other forms of energy storage (such as batteries) due to its long asset life and low-lifetime cost. Energy from PHES can be generated almost immediately, enabling power to be supplied to the grid when required, to avoid blackouts, reduce surges, or meet spikes in electricity demand (Australian Renewable Energy Agency, 2022). However, it can also rapidly introduce additional energy demand via pumping to the upper reservoir when electricity supply (wind, solar and thermal) exceeds system energy demands.

The International Hydropower Association (IHA) estimates that PHES schemes store up to 9,000 GWh of electricity, accounting for approximately 94% of energy storage worldwide, and that pumped hydro storage capacity is expected to increase by almost 50% – to about 240 GW by 2030. The scale and capacity of long-duration pumped hydro is significantly greater than the biggest utility-scale batteries, enabling cost efficient delivery of electricity long after batteries have discharged (IHA, 2022).

The IHA noted that to achieve the climate change target of below 2°C, around 850 GW of additional hydropower capacity is required by 2050. This increases to at least 1,200 GW to meet the 1.5°C. It is also noted that this capacity cannot be easily substituted.

Of the options assessed by Queensland Government, Borumba was prioritised due to:

- the topographical and geological characteristics of the local area, which make it suitable for long-duration, high-capacity pumped hydropower generation

- land ownership (the proposed site for the upper reservoir and other Project components has been owned by Queensland Government since the 1980s, which covers more than approximately 360 ha proposed for the upper reservoir)
- the presence of the existing Lake Borumba, which could serve as (part of) the lower reservoir
- proximity to the high-voltage transmission network
- the location within the Southern Queensland Renewable Energy Zone.

Figure 2 summarises why Borumba is proposed as a PHES project.

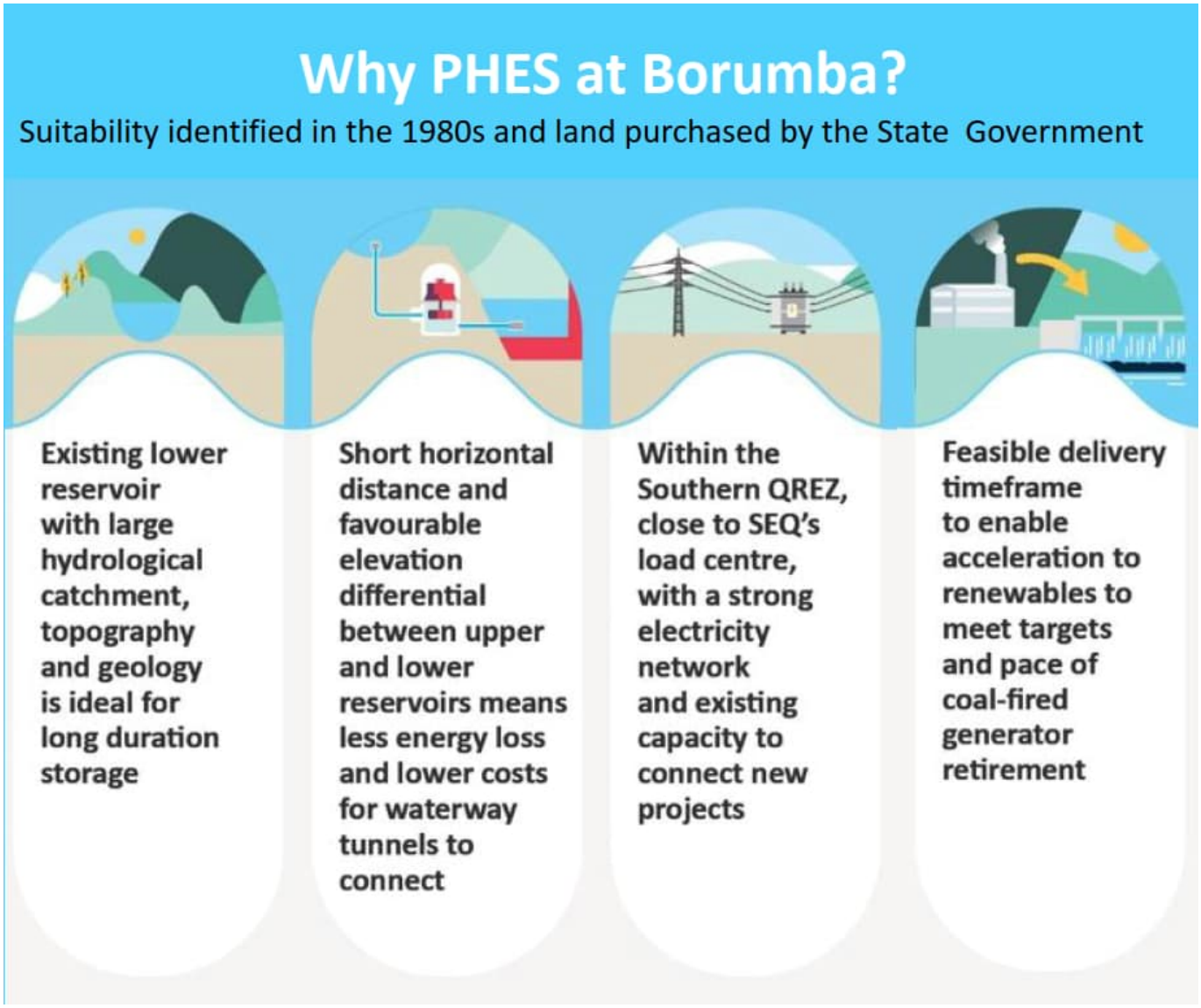


Figure 2: Reasons Borumba is suited for large-scale PHES

In addition to providing long duration high-capacity dispatchable energy storage to the Queensland grid, the Project is being designed with the intent to satisfy a range of criteria including:

- provide up to 2,000 MW generation capacity for up to 24 hours of continuous operation (48,000 MWh)
- minimisation of the total National Electricity Market (NEM) costs over the life of the project
- minimisation of environmental and social impacts
- maintenance of the reliability of existing water allocations.

The Main Works for the Project significantly benefits from the Queensland Government preserving much of the required land in the 1980s for a potential future PHES site. As a result, no privately owned (non-government) land is required for the PHES aspects of the project (reservoirs or tunnelling); however, land acquisition may be required for supporting roads/road upgrades, but this is expected to be minimal and manageable.

Furthermore, Borumba Dam, constructed in 1963 with additional upgrades in 1997 and 2009, will need to a further dam upgrade by 2035 to ensure the dam continues to comply with Australian National Committee on Large Dams (ANCOLD) requirements. Development of a new dam structure immediately downstream (300 m) from of the existing dam structure would avoid the need for this significant investment. Works associated with the Project would and satisfy that the ANCOLD requirements.

The Project will form an integral part of the Queensland Government's proposal to build Australia's largest energy SuperGrid, to deliver clean, reliable and affordable energy to power Queensland homes and industry (DEPW, 2022a). The SuperGrid comprises all elements in the electricity system, including the poles, wires, solar, wind and storage, including two proposed PHES schemes, one at Borumba and another at Pioneer-Burdekin which will be the subject of a separate detailed analysis. The three Queensland Renewable Energy Zones, being zones with high quality renewable resources like strong wind and solar, that could become a renewable powerhouse for the State if the area developed in a coordinated way, relevant to the SuperGrid are shown in Figure 3.

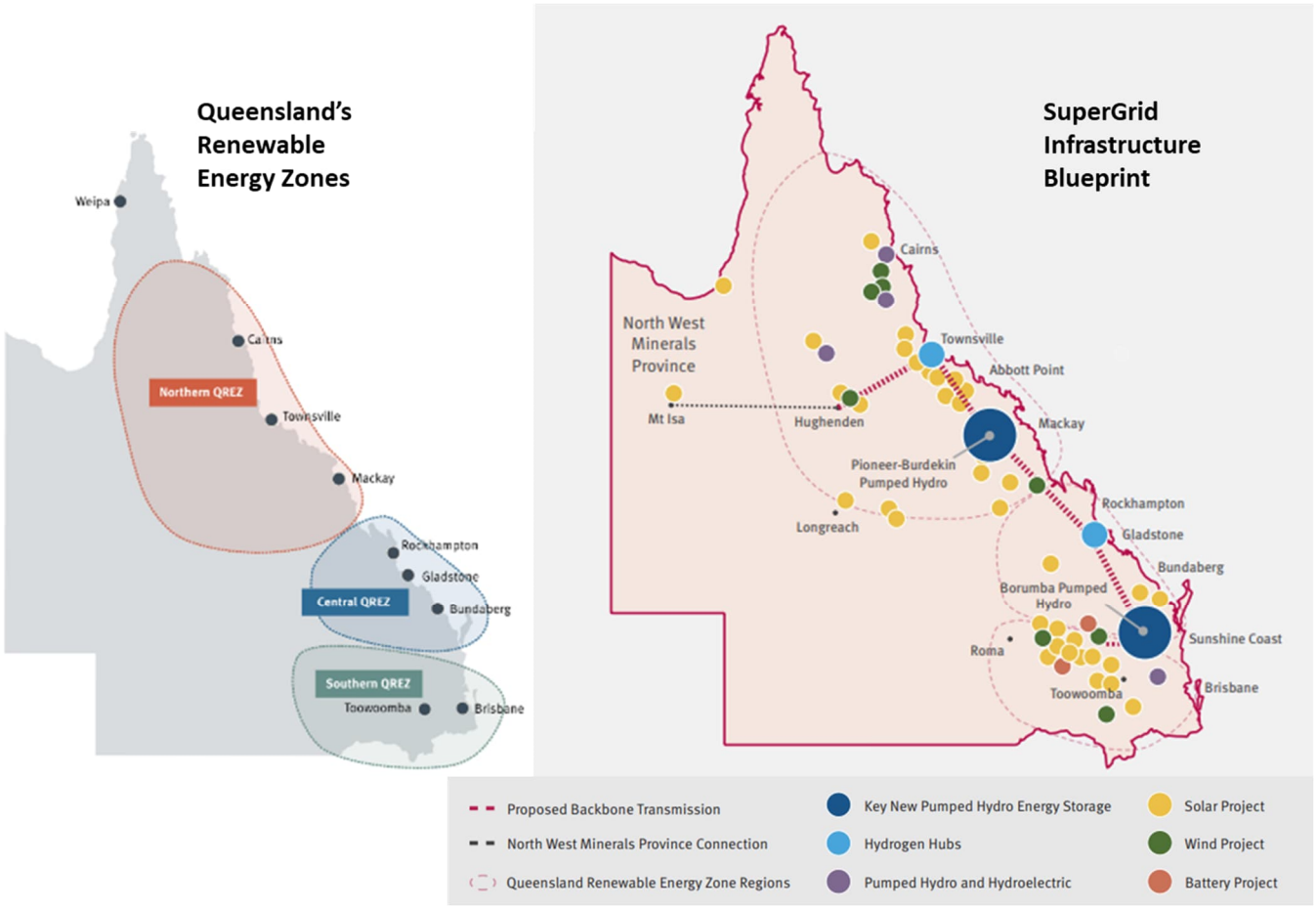


Figure 3: Queensland's Renewable Energy Zones and SuperGrid Infrastructure Blueprint

The Project falls entirely within the Southern Queensland Renewable Energy Zone. This zone is identified by AEMO as having good quality renewable resources and other characteristics suitable for renewable energy development. The Southern Queensland Renewable Energy Zones is close to the Queensland-New South Wales power transmission interconnector and has a strong electricity network and existing capacity to connect new projects. Potential economies of scale in connections through Queensland Renewable Energy Zones development will attract prospective renewable energy developers, while unlocking additional capacity.

Should the Project not proceed, equivalent storage assets would need to be developed elsewhere to support the Queensland Energy and Jobs Plan, at a significant additional cost (financial, environmental, and social). This is due to other options being either more expensive, or incurring greater environmental and social cost, or both (refer to the Queensland Energy and Jobs Plan for more information).

2.2 Project evolution and alternatives

2.2.1 Previous studies

Borumba was identified by the Queensland Electricity and Transmission Corporation (QETC) (now Powerlink) in the 1980s as a potential large-scale long-duration PHES site. The investigation was to identify and shortlist potential schemes within Southeast Queensland, then to select and protect appropriate sites for the future development of pumped hydro. While the area studied included numerous mountain ranges offering potential sites, most were unsuitable due to poor foundations, inadequate hydrological conditions or existing land use which made the site uneconomic. The timing of the investigation responded to concerns that competing land uses were increasingly limiting the opportunity to deliver a feasible pumped hydro scheme to benefit Southeast Queensland's energy network.

Borumba was identified as an optimal site, with land acquired and reserved for pumped hydro development. At the time, this action presented significant real option value, affording the Queensland Government flexibility in how it managed its energy system. The Queensland Government is now effectively exercising this real option and, in doing so, unlocking the inherent value of this site for the state. This adds an intangible value to the site which is in addition to any value linked to the site's highest and best use.

More recently the Queensland Government has undertaken three stages of the pumped hydro studies into potential opportunities for hydroelectric and PHES systems in Queensland. The first two stages explored opportunities for conventional and smaller-scale PHES in Queensland and were completed through 2017 and 2018. The Queensland Government undertook this analysis using data from previous historical and sites identified within the ANU-ARENA Atlas Project. Between 2016 and 2018, the ANU-ARENA Atlas Project assessed the potential for short term off-river pumped hydro energy storage (STORES) across Australia using sites identified by Australian National University (ANU, 2023) and developed an atlas of rank-ordered STORES sites (ARENA, 2023). In addition to topography, the study considered the following aspects:

- location and resource
- technology and design
- commerciality
- environmental factors
- social and community factors.

Stage 3 of the studies concentrated on assessing the role of large-scale, long-duration PHES – typically at least 1,000 MW of generation capacity with 24 hours storage duration. Site investigations and a concept study by engineering consultant SMEC Australia (SMEC) assessed the following critical characteristics to identify the preferred options:

- sufficient capacity and storage to facilitate increased renewables penetration and assist in maintaining system reliability and security as coal-fired power stations retire.
- located at sites that could be developed and connected in a timeframe that aligns with coal-fired power station retirement.
- technically and commercially viable.
- contribute to reducing wider energy system costs, including system cost reductions from co-location of PHES sites in Queensland Renewable Energy Zones.

Figure 4 outlines the project history.

Queensland has a small number of potential high quality, large-scale, long-duration PHES sites that are attractive on a cost and technical basis.

The construction of commercially viable large-scale long-duration PHES depends upon site topography, geology, displacement between upper and lower reservoirs and volume of reliable water. The lowest cost PHES sites have a large vertical distance between upper and lower reservoirs, relatively small horizontal distance between reservoirs,

and natural topography (e.g. valleys or depressions) that reduce the height and volume of dam walls and/or excavation required to create reservoirs, while large generation capacity allows economies of scale to be realised.

The height difference (head) and horizontal distance between the reservoirs and reservoir capacity are key factors as:

- the power generated (megawatts) is proportional to the flow rate and head
- the energy stored (megawatt hours) is proportional to the water volume and head
- the shorter the distance between the upper and lower reservoirs, the less energy losses occur due to friction and viscous fluid effects, and the lower the cost of waterway tunnels between them.

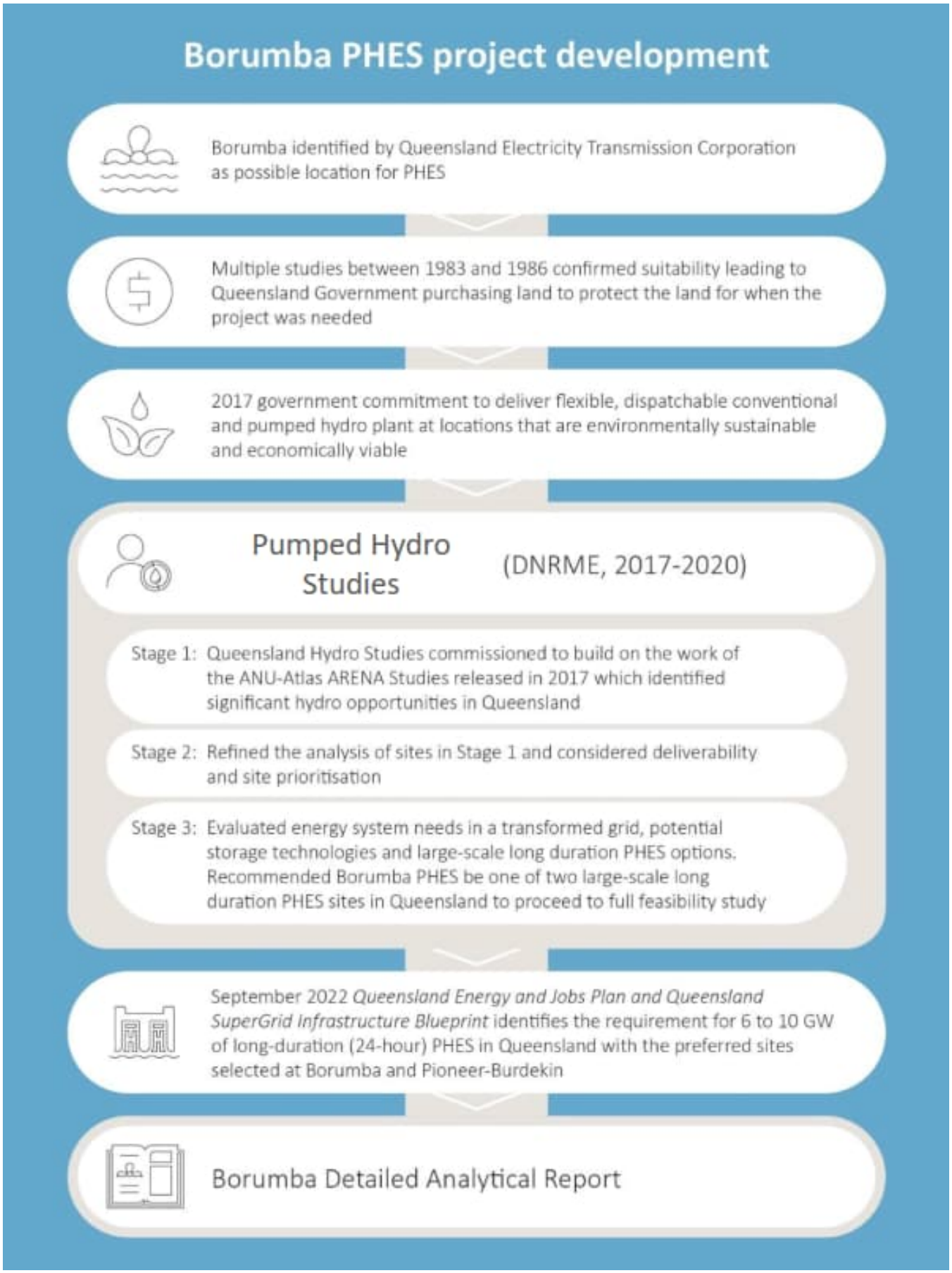


Figure 4: Borumba PHES Project history

2.2.2 Reference Project development

In 2021, SMEC was appointed by Powerlink to undertake an optioneering exercise with the goal of developing reference design parameters (Reference Project) to guide the FEED study and development of the Reference Design. The Reference Project was used to scope and award contracts for two FEED work packages, which were awarded to GHD and AFRY in April 2022.

Developing the Reference Project involved assessing a large range of potential scenarios to identify the optimal scheme. Parameters assessed comprised:

- upper reservoir water levels, which depend on
  - upper main dam and required saddle dams
  - excavation volumes and spoil
  - economics
- lower reservoir water levels, which are related to
  - dam height and water security
  - allowable water level fluctuations
  - inundation of national park
- power rating of the Project, which depends on the available water volumes
- waterway alignment selection.

At this stage several key updates were made to the Concept Design to achieve the final Reference Project. The changes include:

- Use of vertical pressure shaft rather than an inclined shaft.
- Location of the upper reservoir – earlier studies identified three possible locations for the site. Use of LiDAR topography revealed that the proposed location allows for more storage and power at lower cost, with less excavation required as well as avoidance of Conondale National Park and privately owned properties.
- Location of the powerhouse – the powerhouse was moved from under Conondale National Park to below Queensland Hydro owned land.
- Refined height of the new dam wall for the lower reservoir.
- Increase to the installed capacity and stored energy.

The departure of the Reference Project from the Concept Design is due to updated design criteria, topography, learnings from recent projects such as Snowy 2.0 and changes in the construction market in Australia (SMEC, 2022b).

2.2.3 FEED option assessment

The first phase of the FEED process was to further assess the Reference Project and select one Reference Design to be completed during the balance of the FEED.

The Reference Project provided to the GHD and AFRY was based on two options for the water level in the lower reservoir (FSL 145 m AHD and 155 m AHD) and two installed capacities for Borumba PHES (1,500 MW and 2,000 MW). Power station capacities above 2,000 MW were also tested as part of the initial options assessment process.

The optioneering process assessed a suite of alternate scheme configurations, and the Reference Design with 2,000 MW generation capacity was selected as the preferred scheme for continued assessment under the FEED study.

2.2.4 Exploratory Works

Exploratory Works are not included in the scope of the Project subject to this IAS. Exploratory Works were referred to the Commonwealth Minister for the Environment in March 2023 and determined to be a controlled action (EPBC 2023/09461) to be assessed by preliminary documentation. As of the date of this IAS, the Exploratory Works referral is being assessed.

The purpose of the Exploratory Works is to undertake and facilitate critical technical investigations required for the Borumba PHES Project. To confirm the suitability of the Borumba PHES Project location and design, and then undertake the detailed design, sufficient technical information about the site is needed. Investigation is vital in areas where key project infrastructure will be constructed, as geological uncertainty is a significant risk for the Borumba PHES Project, particularly for the considerable subsurface infrastructure required.

The information obtained from the investigations is crucial to the Borumba PHES Project, as it will determine whether the Borumba PHES Project can proceed or if material changes to the reference design are necessary. The technical information needed primarily comprises geological investigations at the proposed locations of the:

- reservoir dam foundations – to be verified by geotechnical boreholes, test pits, costeans and seismic lines
- underground tunnels and caverns – to be verified by geotechnical exploratory tunnel drilling and geotechnical boreholes.

It is especially critical that direct geological data is obtained for the caverns, as these are located approximately 450 m below ground and will house the power station components. Using an exploratory tunnel will provide full face exposure of underground material allowing confirmation (rather than extrapolation) of ground conditions. It will allow in-situ stresses to be measured directly and will also allow time-dependent deformation to be observed and recorded.

The drilling of geotechnical boreholes will also enhance understanding of groundwater as some geotechnical boreholes will be used to undertake groundwater monitoring at key locations. There are currently no groundwater bores in the vicinity of the proposed underground infrastructure for the Borumba PHES Project, and it is essential to understand groundwater in these areas to inform the design and assess potential impacts of the Borumba PHES Project.

The Exploratory Works activities comprise the following:

- exploratory tunnel drilling to the site of an underground power station
- establishment of an exploratory tunnel drilling portal
- geotechnical investigations
- construction of access tracks on site
- use of a spoil disposal area
- upgrades to the local road network in consultation with the relevant road authority, noting that some upgrades may be permanent, with the upgrades to be managed by the relevant road authority
- construction and operation of supporting infrastructure, including camps, emergency helipads, temporary water infrastructure (pumps, pipes and tanks), a staging area for works, and an explosive store for exploratory tunnel drilling materials.

Most of the exploratory works are largely temporary in nature and are not intended to remain in place for an extended duration. Any remaining landforms and footprints associated with the Exploratory Works within the Main Works Project Footprint will form part of the existing environment for the Main Works Project and would be considered in the EIS for the Main Works Project. Should the Main Works Project not proceed, the Exploratory Works infrastructure will be removed and impacted areas will be remediated where appropriate and in accordance with the relevant State and Commonwealth approvals for the Exploratory Works.

Should the Project not proceed, the Exploratory Works infrastructure will be removed and impacted areas will be remediated where appropriate. Decommissioning and rehabilitation of Exploratory Works will be undertaken in accordance with any approved conditions.

Queensland Hydro is seeking to deliver any offsets required for the Exploratory Works in addition to the offsets for the Main Works Project.

The Exploratory Works, subject to the EPBC approval, are proposed to commence in late 2023 and continue through to late 2025. Noting that some works that were not part of EPBC 2023/09461 have commenced (e.g. preliminary geotechnical investigations).

2.2.5 Project alternatives

2.2.5.1 The do-nothing approach

In the event that no long-duration energy storage facility was developed in the Southeast Queensland region, the process of decarbonisation of the energy production system in conjunction with the need to maintain energy reliability to consumers would be severely impacted. Due to the intermittent nature of renewable energy production from wind and solar, long-duration energy storage is required to maintain reliable supply.

Batteries are ideal for providing intra-day storage, while PHES (typically 24 hours or longer), coordinated batteries or multiple medium duration storage facilities (4 to 12 hours duration) can provide long duration storage. However, battery technology and costs are not forecast to be able to economically provide the system reliability outcomes that can be provided by PHES.

A recent study by Swiss Federal Institute of Technology which looked at "Energy Returned on Energy Invested" determined that PHES achieves the highest ratio of the technologies assessed (e.g. batteries, PHES, wind, solar), returning 186 times the energy required for its construction across its operating lifetime (GE, 2020). The Energy Returned on Energy Invested was measured by considering the energy stored or generated over the life of power generation assets in terms of the energy embedded in their manufacture and construction.

Should the Project not proceed, equivalent storage assets would need to be developed elsewhere to support the Queensland Energy and Jobs Plan, at a significant additional cost (financial, environmental, and social). This is due to other options being either more expensive, or greater environmental and social cost, or both (refer to the Queensland Energy and Jobs Plan for more information).

2.2.5.2 Pumped hydro storage at a location other than Borumba

A series of studies have been undertaken to identify opportunities to develop conventional hydroelectricity and pumped hydro in Queensland. Borumba was first identified as a potential large-scale long-duration PHES site in a study completed in the 1980s by QETC. More recently, DEPW completed the Queensland Hydroelectric Study in 2017, which identified numerous sites that could supply the storage capacity the electricity system will need (DEPW, undated).

The Queensland Hydroelectric Study investigated sites for medium PHES projects (300 MW capacity with up to eight hours of storage) and large projects (more than 1,000 MW capacity with at least 24 hours of storage). The study noted that despite medium sized projects being able to provide a number of services to the electricity system (e.g. 'time shifting' of energy on a daily basis), the generally shorter storage duration (typically 6–12 hours at maximum generation capacity) means these sites are generally not able to provide significant capacity to be used in the event of periodic shortfalls in variable renewable generation (e.g. cloudy conditions persist for several days, limiting solar generation).

The study also considered large-scale PHES projects (more than 1 GW and storage duration of at least 24 hours) which provide strategic storage reserves to the system due to their long storage duration. Strategic storage reserves are required during periods when renewable generation is low (e.g. cloudy conditions persist for several days, limiting solar generation).

As noted in Queensland Energy Job Plan and the SuperGrid Infrastructure Blueprint "large scaled PHES projects have long planning, construction and delivery times, high development and capital costs, significant approval requirements and uncertainty, and therefore are unlikely to be developed by the private sector on a merchant basis. Such assets are of high strategic importance to the Queensland energy system, through the provision of strategic storage reserves and will support Queensland's macro-economic strategy."

Potential sites were initially identified based on topography (sites suitable for water storage at different heights), and the following site-specific considerations were applied:

- Location and resource
- Technology and design
- Commerciality
- Environmental factors
- Social and community factors.

The study identified Borumba dam and Pioneer-Burdekin as sites with the best potential for energy storage. Although the study identified two sites, both sites would be required to meet Queensland's needs for an additional 6,000 MW to 10,000 MW of large-scale, long-duration energy storage.

2.2.5.3 Augmenting the existing Borumba dam

Seqwater investigated augmenting the existing Borumba dam to increase storage capacity and/or spillway capacity, but studies concluded that most option(s) would not be technically viable and generally cost prohibitive. A new dam located downstream of the existing dam was identified as the preferred approach to increase storage capacity of Lake Borumba.

2.2.6 Final project design

Details of the Project's final design are yet to be confirmed. The size and location of Project components may change in response to the outcomes of the Exploratory Works and the selected construction methodology, along with the technical and environmental investigations, along with ongoing consultation with stakeholders to be undertaken to support the EIS. The EIS process will inform and present updated Project designs. The Project's final design will seek to balance maximising scheme functionality generation capacity with minimising impacts on environmental, social and cultural values.

An important Project design principle is that the development does not reduce the reliability of existing downstream water allocations. The project will involve the non-consumptive use of water through the cycled discharge and recharge of water between Borumba Dam and the upper reservoir. Despite this, the first fill of the enlarged Borumba Dam and upper reservoir will require careful management. The enlarged storage will also result in an increase in evaporation and seepage which will be required to be managed through the development of operating rules and water sharing/accounting rules.

2.3 Project description

The Project is a large-scale, long-duration PHES project with the capacity to generate up to 2,000 MW of electricity for up to 24 hours (48,000 MWh). The Project involves expanding the existing Lake Borumba (lower reservoir) and connecting it via twin water tunnels to a new reservoir (upper reservoir) and underground power station.

The upper reservoir sits approximately 330 m above the elevation of the lower reservoir (Lake Borumba) and has a full supply level (FSL) of 490.5 m Australian height datum (AHD). This elevational difference supports the power generation.

Electricity generated by the Project is proposed to be transmitted to the Tarong (Halys) and Woolooga substations via transmission lines, which are to be delivered separately by Powerlink.

The Project is proposed to be located within the Gympie and Somerset Regional Council LGA, approximately 13 km south-west of the township of Imbil, 48 km south-west of Gympie, and 180 km north-west of Brisbane.

The Main Works Project components are shown in Figure 1, Figure 5 and Figure 6 and described in more detail the following sections.

The Project Footprint and layout is indicative. It is anticipated that the location and footprint of Project components will be refined in response to the outcomes of technical and environmental investigations undertaken as part of the Exploratory Works and the EIS process, and refinements in project design including inputs from Powerlink, along with outcomes of stakeholder and community consultation activities. The Project Footprint will be minimised where practicable in accordance with the identified measures presented in this section and in Section 5.

In developing the project components, Queensland Hydro has followed the environmental management hierarchy by implementing measures to avoid or reduce potential impacts to MNES, as well as socio-economic values. These comprise:

- utilising Lake Borumba though all options considered would result in impacts to MNES that inhabit the lake and adjacent inundation area
- locating the Project with consideration to the existing transmission network to minimise cumulative impacts
- relocation of the power station cavern to outside of the Conondale National Park and relocation of the portal platform outside of a threatened ecological community

- where vegetation cannot be avoided, locating Project infrastructure to avoid sensitive environmental areas where possible (e.g. relocating the tunnel portals to avoid areas of TEC)
- minimising vegetation clearing and habitat fragmentation by upgrading existing access tracks and locating new access tracks along the inundation area, where possible
- locating spoil disposal areas, quarries, laydown and site installation areas, and other construction activities in cleared areas, forestry plantations and the inundation areas, where possible and appropriate to do so.

Further opportunities to refine the Main Works Project to avoid or reduce potential impacts on MNES will be considered during detailed design.

The Main Works Project Footprint for aboveground project components including the areas to be submerged in the reservoirs is provided in Table 2. The sum of all project component footprints is greater than the total disturbance footprint because some components overlap, for example, part of the dam wall footprints are within the inundation area.

The indicative Main Works Project Footprint of the Project is approximately 1,500 ha. This number, along with the potential calculations, includes both options for the operating pad, although only one will be constructed, along with the Q100 level relative to the FSL (adds an additional 170 ha to the overall Project Footprint). This is a worst-case estimate of the total Project Footprint which may be refined following detailed investigation, stakeholder engagement and the Exploratory Works and likely reduced during detailed design.

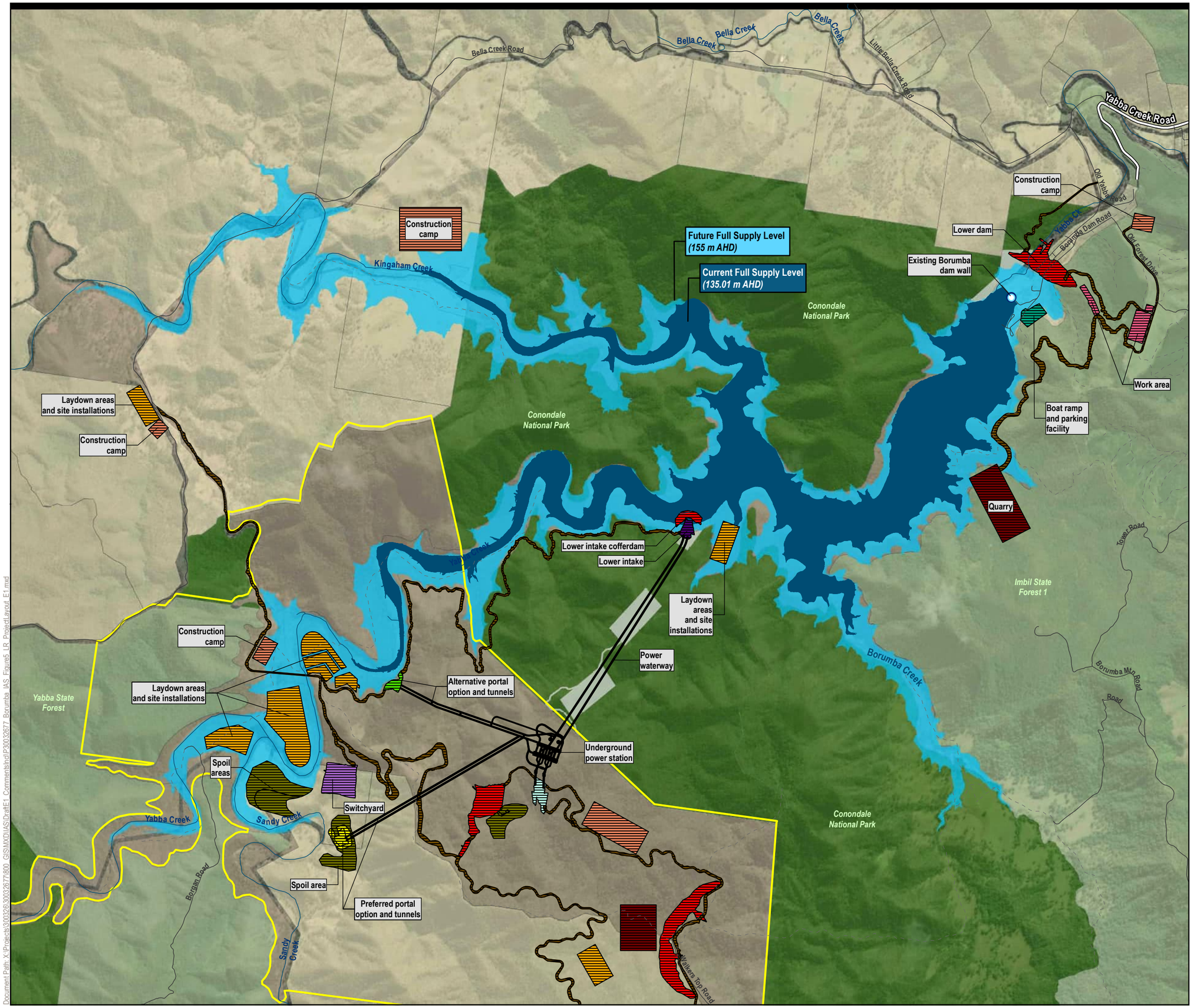
Table 2: The indicative aboveground project component footprint

Project Component	Surface Footprint (ha)^	Footprint Submerged by Reservoirs (ha)^
Lower reservoir		
Dam wall (new Borumba dam)	12	-
Newly inundated area (FSL plus Q100)	935	-
Lower intake	-	3
Upper reservoir	333	4
Supporting infrastructure	106	7
Temporary infrastructure for construction	168	18
Total Project Footprint (excluding overlaps)	**1,500**	**23**

^The sum of all project component footprints is greater than the total Project Footprint because some components overlap, for example, some of the temporary infrastructure is located within the inundation areas.

! The inundation area calculation does not include islands created as a result of the FSL

#Figure includes partially submerged spoil areas.



Queensland Hydro

GDA2020 MGA Zone 56

0 350 700 Meters

1 cm = 350 meters (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Watercourse
- State controlled roads
- Local road
- Track
- Main works design footprint features

Cadastre

- National park
- State forest
- Freehold
- Reserve
- Queensland Hydro property
- Conondale Resources Reserve

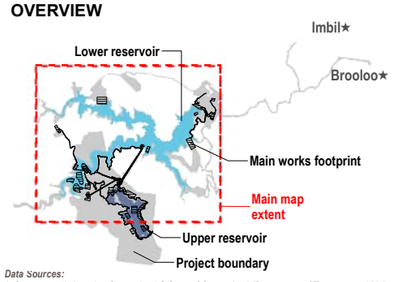
Proposed site layout

- Preferred option portal
- Alternative option portal
- Access roads and bridges
- Construction camp
- Dam location
- Laydown areas and site installations
- Lower intake
- Upper intake
- Quarry
- Recreational facility
- Spoil areas
- Switchyard
- Underground
- Work area

Reservoir water levels

- Lower reservoir (future FSL 155 m AHD)
- Lower reservoir (current FSL 135.01m AHD)

OVERVIEW



Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Imagery @ Basemap World Imagery

Disclaimer:

Borumba Pumped Hydro Project | Initial Advice Statement

PROJECT LAYOUT
LOWER RESERVOIR AREA

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 7/09/2023
REVISION:	E1

FIGURE 5

Conondale Resource Reserve
Underground power station
Upper intake
Main dam
Spoil area
Saddle dam
Construction camp
Conondale National Park
Main saddle dam
Quarry
Laydown areas and site installations
Access road
Laydown areas and site installations
Saddle dam
Spoil area
Saddle dam
Saddle dam
Walkers Tonk
Yello Road

Queensland Hydro

GDA2020 MGA Zone 56

0 150 300 Meters

1 cm = 150 meters (when printed @ A3)

LEGEND

- Local road
- Track
- Main works design footprint features

Cadastre

- National park
- Freehold
- Reserve
- Queensland Hydro property
- Conondale Resources Reserve

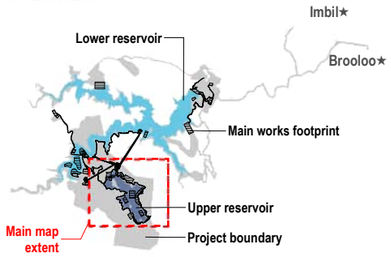
Proposed site layout

- Access roads and bridges
- Construction camp
- Dam location
- Laydown areas and site installations
- Upper intake
- Quarry
- Spoil areas
- Underground

Reservoir water levels

- Upper reservoir (FSL 490.5 m AHD)

OVERVIEW



Borumba Pumped Hydro Project | Initial Advice Statement

PROJECT LAYOUT
UPPER RESERVOIR AREA

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 6

Document Path: X:\Projects\30032677\800_GIS\MXD\IAS\Draft\E1_Comments\incl\P30032677_Borumba_IAS_Figure6_ProjectLayout_UR_E1.mxd

2.3.1 Lower reservoir and dam

Lake Borumba is the lower reservoir for the Project. The current volume of the reservoir is unable to support the proposed pumped hydropower scheme and further upgrades of the existing dam are not feasible (or cost-effective) due to the design of the existing structure. As such, the Project proposes to construct a new lower dam approximately 300 m downstream of the existing Borumba dam, which will be partially demolished. Further details on the demolition of the existing dam wall will be identified in the EIS.

The height of the new lower dam wall is proposed to be 165.15 m AHD. Construction of the new dam wall will increase the storage capacity and inundation area of the reservoir by 178 GL and 761 ha, respectively. Table 3 and Table 4 list the specifications for the existing Lake Borumba and Borumba dam and the new lower reservoir and new lower dam wall.

Table 3: Existing and new Lake Borumba (lower reservoir) specifications

Specification	Existing Lake Borumba	New Lake Borumba (lower reservoir)	Change
FSL (m AHD)	135.01	155	+20
Storage capacity at FSL (GL)	46.1	224	+178
Inundation area (FSL) (ha)	482	1,243	+761

Table 4: Existing and new Borumba dam (lower dam) specifications

Specification	Existing Borumba Dam	New Borumba Dam (lower dam)	Change
Type	Concrete-faced rockfill	Gravity dam with roller compacted concrete	Different construction type
Elevation (crest level) (m AHD)	144.4	165.15	+20.75
Height (m)	43	Approx. 70	+27
Length (m)	343	Approx. 580	+238

With an FSL of 155 m AHD (20 m above the current FSL), the new dam would provide a reservoir storage volume of approximately 224 GL (Figure 7). This significant increase in capacity (stored volume of water) compared to Lake Borumba (i.e. about five times) would:

- Enhance scheme reliability
- Maximise electricity generation capacity
- Reduce the water level fluctuations of the lower reservoir during filling or emptying of the upper reservoir compared to lower FSL options.

The proposed new dam crest level is 165.15 m AHD, which provides approximately 10.2 m of flood surcharge between the spillway crest level and dam crest level (Figure 8 and Figure 9). The proposed outlet works arrangement has been designed to meet irrigation demands, environmental flows, and emergency drawdown requirements.

A raise of 20 m would also increase the footprint of the inundation area (at Dam Crest) from 586 ha to 1,243 ha. This larger area would also inundate approximately 110 ha of Conondale National Park, 16 ha of Imbil State Forest and 1 ha of Yabba State Forest.

Fish and turtle passage solutions are yet to be confirmed and will be determined in consultation with relevant stakeholders as part of detailed design.

In its current configuration the existing Borumba dam creates a barrier between the New Lower Borumba dam and the lower portion of the Borumba Reservoir (upstream of the existing Borumba dam), such that it will not be possible to make releases from the new dam's outlet works should the reservoir level drop below the current FSL

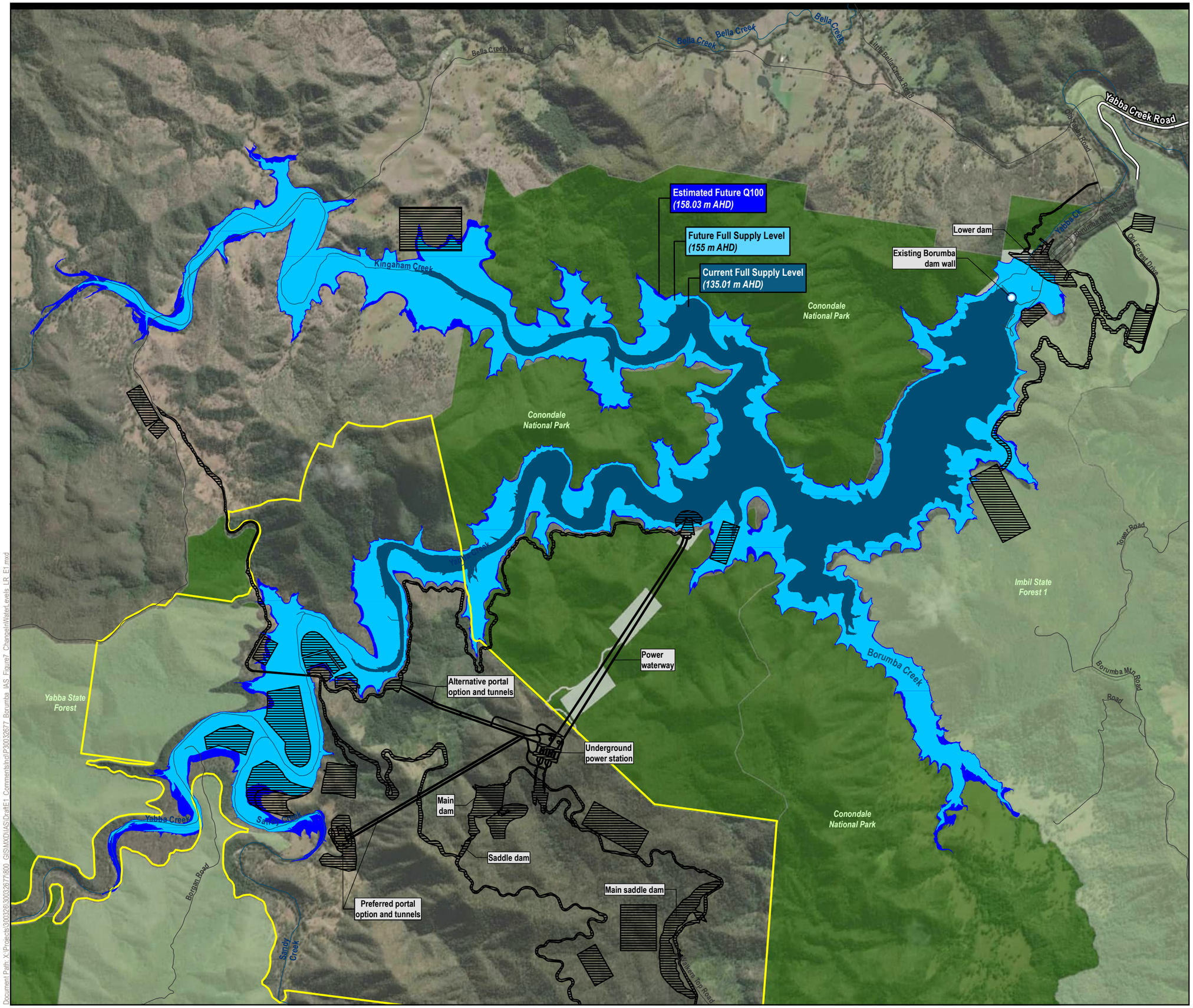
of 135.01 m AHD (as would occur during a prolonged drought). As such, the existing Borumba dam will be partially demolished following completion of construction to allow water to flow to the new lower dam to ensure it is fully operational and functional at any reservoir level. The upper portions of the existing Borumba dam wall, which includes road pavement on the dam crest, would be completely removed and disposed off-site. A slot in the dam would be demolished to the lowest level possible, dependent on the reservoir levels.

A range of issues will inform the ultimate decommissioning approach, including:

- Impacts on recreational users and the configuration of exclusion zones
- Public safety
- Requirements for fish passage
- Water quality including sediment management
- Removal and disposal of spoil
- Timing of works.

These matters would be investigated as part of the EIS, which will describe the preferred decommissioning approach including measures to minimise or mitigate the potential environmental and socioeconomic impacts of the works.

Lake Borumba will continue to provide opportunities for recreational use during operation, with safety exclusion zones around the dam wall and the intakes. Operational plans, which may further limit access, may be required where operations resulted in the water level fluctuations which pose a risk to recreation users.



Queensland Hydro

GDA2020 MGA Zone 56

0 350 700 Meters

1 cm = 350 meters (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Watercourse
- State controlled roads
- Local road

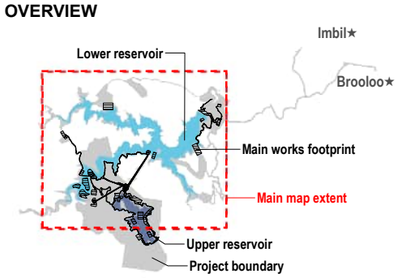
Cadastre

- National park
- State forest
- Queensland Hydro property
- Conondale Resources Reserve
- Main works design footprint features

Reservoir water levels

- Lower reservoir (estimated future Q100-158.03 m AHD)
- Lower reservoir (future FSL 155 m AHD)
- Lower reservoir (current FSL 135.01m AHD)

OVERVIEW



Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Imagery @ Basemap World Imagery

Borumba Pumped Hydro Project | Initial Advice Statement

CHANGE IN WATER LEVELS IN LAKE BORUMBA DUE TO THE NEW LOWER DAM

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 7

Document Path: X:\Projects\30032\30032677\800_GIS\MXD\IAS\Draft\E1_CommentsInclP30032677_Borumba_IAS_Figure7_ChangeInWaterLevels_LR_E1.mxd

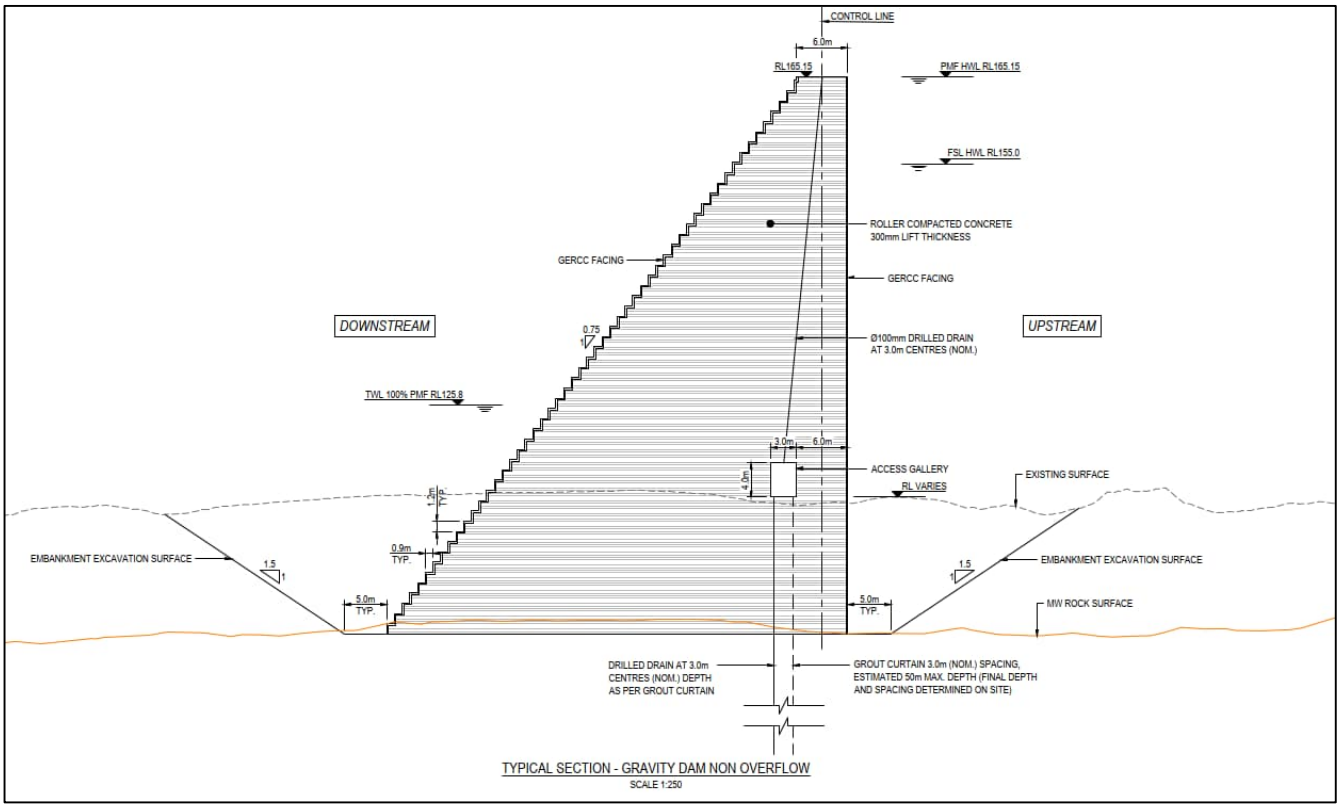


Figure 8: Proposed new Borumba dam wall typical cross section (GHD, 2022)

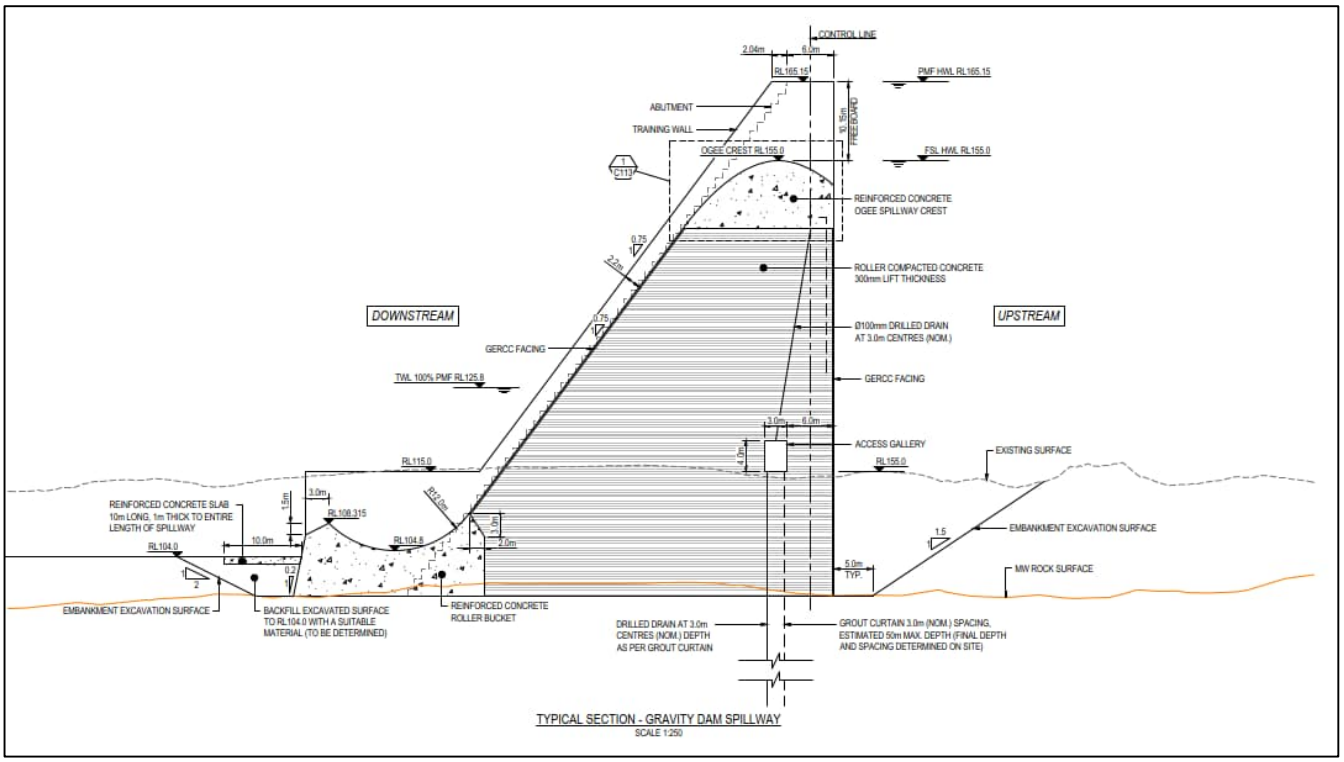


Figure 9: Proposed new Borumba dam spillway typical cross section (GHD, 2022)

2.3.2 Upper reservoir and associated dams

A new upper reservoir is proposed in the hills south of the existing Lake Borumba, on land owned by Queensland Hydro. The upper reservoir sits approximately 330 m above the elevation of the Lake Borumba, with the natural high ground ranging from 480 m AHD to 510 m AHD. The reservoir would be established by constructing a new main dam wall across an unnamed tributary of Yabba Creek, along with a primary saddle dam and four secondary saddle dams (Figure 6). The Reference Design crest level of the main dam wall is 492.7 m AHD, while at FSL 490.5 m AHD, the upper reservoir will have a storage capacity of 70 GL and an inundation area of 355 ha. Table 5 and Table 6 list specifications for the upper reservoir and upper dam walls.

Table 5: Indicative upper reservoir specifications

Specification	Upper reservoir
FSL (m AHD)	490.5
Storage capacity at FSL (GL)	70
Inundation area (FSL) (ha)	355

Table 6: Indicative upper dam walls specifications

Specification	Main dam	Primary saddle dam	Secondary saddle dams
Type	Concrete-filled rockfill dam		
Elevation (crest level) (m AHD)	492.7	492.7	494
Height (m)	101	53	12-23
Length (m)	457	1,430	171-560
Spillway type and length	120 m ungated ogee	N/A	N/A

The main dam and saddle dams are proposed to be concrete faced rockfill dam. The dam type may be reviewed following the outcome of geotechnical investigations being undertaken as part of Exploratory Works.

The dam crest level will provide 2.2 m of flood surcharge across a 120 m long ungated ogee emergency spillway. Dam overtopping could occur as a result of either natural rainfall into the dam catchment (resulting in runoff into the upper reservoir) or in the event water is ‘over-pumped’ into the upper reservoir (above the FSL), however this is highly unlikely. Water that overtops the spillway would follow the natural flow path of the unnamed tributary and flow into the lower reservoir.

A 1,430 m long saddle dam is proposed along the eastern edge of the upper reservoir. Four secondary saddle dams / embankment dams would also be required at the southern end of the reservoir; however, the base of these dams would only be reached for periods of time when the upper reservoir is entirely full.

The minimum operating level for the upper reservoir is proposed to be set at 453 m AHD, giving an operational range of 37.5 m. Fish passage devices are not planned for the upper reservoir dam.

Further assessment will be undertaken for the EIS to determine whether habitat critical for the survival of threatened aquatic species exists within the Project Footprint, the likelihood and extent of potential impacts to movement, and the most suitable options for fish passage.

2.3.3 Underground works

Underground works includes the water tunnels, access tunnel, cable tunnel, and powerhouse. This section describes each component and their function.

2.3.3.1 Water tunnels

Water is transferred between the reservoirs via two bi-directional water tunnels. Each reservoir has an intake portal that either feeds or releases water to the water tunnels during the pumping or generation cycle. The intake portals would be located in the upper and lower reservoirs at a sufficient depth to avoid air entrainment and vortex

formation and likely below the minimum operating level. Intake portals may be screened to avoid blockage of the water tunnels. Table 7 lists the key features of the power waterways, which are shown in Figure 10, Figure 11 and Figure 12.

The tailrace tunnels run below (up to 400 m) Conondale National Park and Conondale Resources Reserve along a south-west to north-east axis (AFRY, 2022b).

Table 7: Water tunnel features

Feature	Description
Headrace tunnel	Low-pressure waterway tunnel connecting the upper intake and vertical pressure shaft.
Vertical pressure shaft	Conveys water from the headrace tunnel to the high-pressure tunnels.
High pressure tunnel	Conveys water from the vertical shaft to the pump turbine manifolds.
Upstream penstock branching (manifold)	Evenly distributes flows from the high pressure tunnel to 3 pump turbines. Allows water to be circulated during hydraulic short-circuit operation.
Downstream penstock branching (manifold)	Brings flows together (in generation mode) from the pump turbines.
Tailrace tunnel	Connects pump turbines/downstream manifold to the tailrace surge shaft.
Tailrace surge shaft	Connects tailrace tunnel to lower outlet. Assists with limiting pressure fluctuation in start-up, load change and shutdown of the pump turbines.

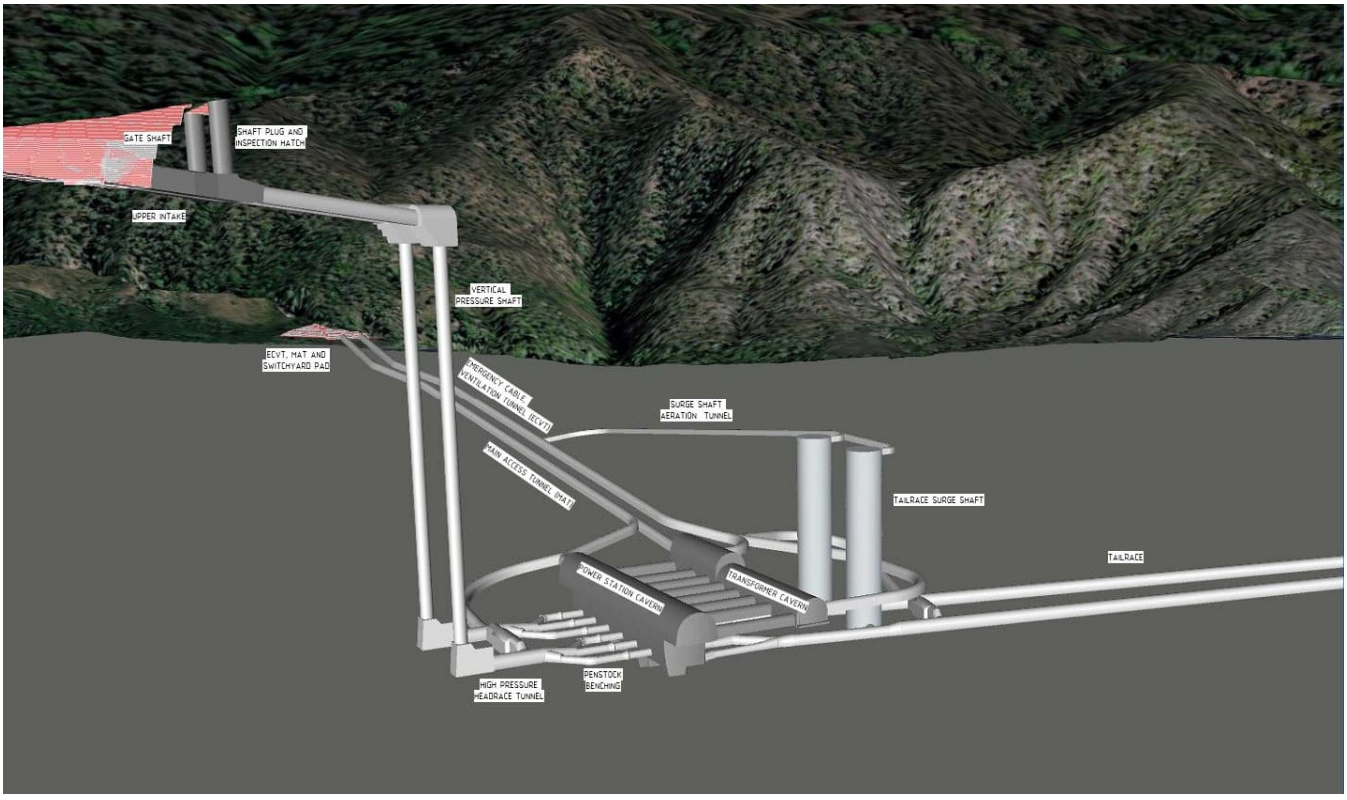


Figure 10: Tunnel configuration incorporating water tunnels, powerhouse cavern, cable tunnel and access tunnel

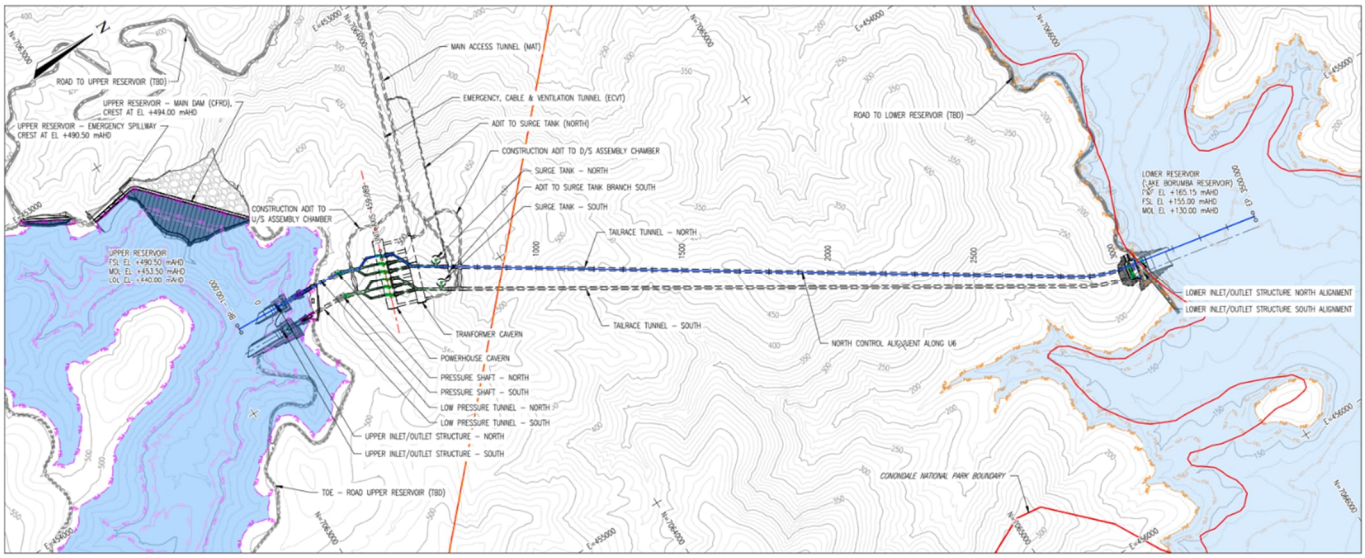


Figure 11: Water tunnels connecting upper and lower reservoirs via the underground power station

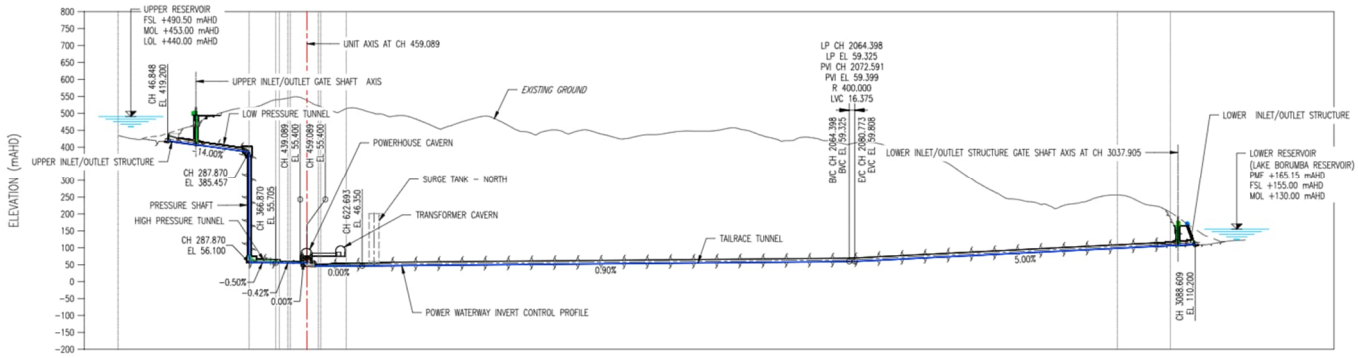


Figure 12: Longitudinal profile of the water tunnels

2.3.3.2 Powerhouse

The powerhouse comprises the power station cavern, transformer cavern and the isolated phase bus galleries. The powerhouse is located between the headrace and tailrace tunnels and houses all the electro-mechanical, electrical, fire and life safety equipment required to generate and store energy. The power station generates electricity when the water flows from the upper reservoir through the water tunnels causing the turbine runner (impeller) to rotate. During pump mode, power is input into the motor-generator, which forces it to spin, forcing the water in the opposite direction, filling the upper reservoir.

2.3.3.3 Access tunnel and cable tunnel

The access tunnel provides pedestrian and vehicle access to the powerhouse with potential cross passages to the cable tunnel. The cable tunnel is proposed to be constructed as part of the Project's Exploratory Works (EPBC 2023/09461). It will provide emergency access/egress, house the high voltage cable connecting the power station and switchyard, and support ventilation of the access tunnel and powerhouse.

The Project's Exploratory Works (EPBC 2023/09461) tunnel is proposed to be re-purposed to provide some or all the functions. Two portal location options for the access and cable tunnel are being considered:

- Preferred option – located west of Walkers Top Road and east of Sandy Creek, approximately 2 km long, with orientation north-east to south-west.
- Alternative option – east of Walkers Top Road and south of Yabba Creek and approximately 1.5 km long, with orientation north-west to south-east.

The final tunnel portal locations to be drilled and excavated will be defined by the exploratory works geotechnical and exploratory tunnel investigations and addressed as part of the EIS.

Construction of the exploratory tunnel is not within the scope of the Project, as it is part of the exploratory works (EPBC 2023/09461). However, portal development, repurposing of the exploratory tunnel for cable tunnel functions, to support construction and operation of the Project is within scope.

2.3.4 Supporting infrastructure

This section outlines the infrastructure required to support construction and operation of the Project. They will be permanent features of the area for the life of the Project.

2.3.4.1 Operating pad

The surface portals for the access tunnel and cable tunnel may be co-located or separated subject to detailed design. The control rooms, ventilation and firefighting equipment are also to be located on the operating pads associated with the portals, with blast walls separating important equipment. As for the exploratory tunnel, there are two options for the operating pads based on access and cable tunnel portal locations:

- Preferred option – situated between Borgan Road and Walkers Top Road to the east of Sandy Creek.
- Alternative option – split across two locations due to space constraints and to reduce impacts to sensitive environmental areas, with a staging area at Walkers Top Road east of Yabba Creek and the exploratory tunnel drilling pad area approximately 650 m to the east.

The final portal and operating pad location will be defined by the Exploratory Works geotechnical and exploratory tunnel investigations and addressed as part of the EIS.

Construction of the exploratory tunnel operating pad is not within the scope of the Main Works Project proposed for coordinated project declaration, with this works to occur as part of the Exploratory Works. However, the access tunnel operating pad development, repurposing the exploratory tunnel for the cable tunnel functions, and to support construction and operation of the Main Works Project is within scope.

2.3.4.2 Switchyard

The switchyard will connect the Project to the electricity grid. Electricity generated by the power station would be transmitted via high-voltage lines in the cable tunnel to the Borumba Powerlink switchyard where it would be connected to the remote electricity grid via two separate double circuit transmission lines rated up to 500 kV. The switchyard bench civil works, access roads and line connection works to the cable tunnel portal are within the Project scope however, the 500 kV overhead transmission lines and connections would be delivered separately by Powerlink. The location of the switchyard may be refined in response to the works being undertaken by Powerlink.

2.3.4.3 Access roads and tracks

Access to the Project is currently possible via the existing local and state road network from the townships of Imbil, Brooloo and Kilcoy. Queensland Hydro together with the relevant local and state authorities will investigate alternative access options that avoid, as far as possible, impacts to these towns. Note that works undertaken to the local and state road network do not form part of the proposed action, however impacts associated with the use of these roads would be assessed in the EIS (e.g. traffic impact assessment, noise and dust impacts).

Access to the upper reservoir, switchyard, operating pad and lower intake is possible from Imbil via Yabba Creek Road to Bella Creek/Borgan Road, which traverses the northern part of Lake Borumba. Borgan Road diverges from Bella Creek Road, and the internal Project road network will start at the gate on Borgan Road located approximately 1,300 m from Bella Creek Road. Borgan Road connects to Walkers Top Road, which leads to the switchyard and upper reservoir.

Gympie Regional Council has funding under the flood recovery works to upgrade Bella Creek Road and Queensland Hydro is currently working with the council to incorporate the required upgrades to Bella Creek Road to support the Project. These works do not form part of the proposed action.

Access to the lower dam is possible from Imbil via Yabba Creek Road to Mitchell Creek Road/Old Forest Drive and from Brooloo via Mary Valley Road to Old Forest Drive. Formation works on these roads do not form part of the proposed action.

Access to the upper reservoir is also possible via Sunday Creek and Yielo roads off Kilcoy-Murgon Road south of Jimna. Queensland Hydro is currently working with Somerset Regional council to undertake the required upgrades to Yielo Road to support the Project. These works do not form part of the proposed action.

2.3.4.4 Recreational facilities

Existing infrastructure such as the Seqwater buildings and the existing recreational facilities will need to be removed and/or demolished as part of the Project.

Recreational facilities for the public will be reinstated, including boating infrastructure and toilet facilities, following the completion of the lower dam wall or earlier depending on the final construction program. Temporary facilities will likely be established to support recreational activities during construction.

2.3.4.5 Temporary infrastructure for construction

This section describes temporary infrastructure required to support construction of the Project. They will be temporary features of the area to be decommissioned and rehabilitated at the end of construction.

Infrastructure required for construction of the Project, and which form part of the proposed action includes batch and crusher plants, laydown areas, site offices and workshops, construction water infrastructure, haul roads, and stockpile areas. Similarly, spoil from excavating dam foundations and tunnels and caverns for underground works that is not suitable for use as concrete aggregate would be placed in designated disposal areas on site.

It is noted the some of the construction camps, quarries and/or borrow pits and ancillary works will be established as part of the Exploratory Works and that these facilities may be suitable to support the main works or will require upgrades. The facilities established as part of the Exploratory Works are not part of the proposed action.

The size and location for these temporary infrastructure components will be confirmed as part of EIS investigations.

To support the construction activities power and telecommunications infrastructure will need to be constructed. Queensland Hydro will work with the relevant utility providers to connect relevant construction activities to mains power and to install relevant telecommunication facilities. This work is likely to be undertaken by third parties and as such the works are not considered to be part of the proposed action. Other ancillary works where there is no significant residual impact on MNES likely to occur (based on self-assessment) are also excluded, with these to be authorised through separate approval processes.

2.3.5 Construction and commissioning

Activities associated with each of the Project's construction stages are outlined in Table 8. Construction activities that are likely to occur over several stages up to five years and include:

- transportation of construction materials and equipment to and from site
- operation of quarries to supply construction material
- use of water for construction, including concrete batching, fill conditioning, dust suppression, washdowns, road construction, and camp operation
- waste generation and management – construction and camp waste including spoil, cleared vegetation, concrete, steel, storm water, construction wastewater, oil, grease etc., sewage, general wastes, packing, tyres, and building materials.

Public access to the Project Footprint may be temporarily restricted and exclusion zones may be implemented for public safety during construction.

The existing dam wall will remain fully operational while the new lower dam wall is constructed. The existing dam wall will be partially demolished prior to filling the lower reservoir.

Finalisation of the construction methodology and staging is not yet complete and will be informed by the ongoing geotechnical investigations being undertaken as part of the Exploratory Works.

Table 8: Construction staging

Stage	Construction activities
Support works	• Pre-clearing and site preparation. • Install site power supply and communications. • Construct site access including upgrading roads, tracks and bridges. • Establish laydown areas, construction camps and offices.

Stage	Construction activities
	• Dewatering, managing site drainage and river flow, establishing erosion protection, and placing materials (e.g. concrete, fill, filter materials) at spoil areas.
Stage 1	• Excavate dams and underground works. • Establish main stockpile area. • Establish quarry/ies, stripping and overburden excavation.
Stage 2	• Construct main dams and saddle dams. • Partial decommissioning of existing Borumba dam. • Install powerhouse, power waterways and access tunnel.
Stage 3	• Fill lower reservoir. • Install turbines and remaining operational plant.
Stage 4	• Commission turbines. • Fill upper reservoir and power waterways.
Stage 5	• Decommission and rehabilitate construction camps and other temporary infrastructure.

2.3.6 Operation

PHES assets, such as the proposed Project, use water storages (i.e. reservoirs) to store energy in the form of hydraulic potential energy. The amount of stored energy is proportional to the product of the total mass of water and the altitude difference between the reservoirs. Excess energy from renewable energy sources can be used during low demand periods to pump water from the lower reservoir to the upper reservoir, converting the upper reservoir into a battery. The stored energy can then be released by returning the water through the power waterway into the lower reservoir.

The Project would therefore operate in three cycles:

- a generation cycle when water is released from the upper reservoir to the lower reservoir, thereby generating electricity by powering the turbines in the underground power station cavern
- a pumping cycle where the turbines would be used on a reverse cycle to pump water from the lower reservoir to the upper reservoir to replenish storage
- system support, where no water is transferred but the generators are connected to the electricity grid to provide ancillary services to support broader electricity networks system security.

The Project will be designed to have an operational life of 100 years. Power for the pumping cycle would be sourced from the electricity grid sourced via the 500 kV transmission lines from the by Tarong (Halys) and Woolooga substations. The Project would have a round trip efficiency of approximately 75%, meaning that approximately three quarters of the energy needed to pump water from the lower reservoir to the upper reservoir would be recovered during the generation cycle. Although the Project would have the capacity to generate for up to 24 hours, generation periods may be much shorter than this depending on system needs and electricity demand.

The volume of water in the upper reservoir must be sufficient to operate the turbines for the target generation period. The volume of water in the lower reservoir must be sufficient that it can supply the upper reservoir during drought periods with high reliability, while still supplying the needs of other water users that are supplied by Lake Borumba. Integrated management would be required to balance demand for hydropower generation with downstream water demand and environmental flows.

The water level in the lower reservoir will fluctuate due to filling or emptying of the upper reservoir (Figure 13). The rate of water level change (referred to as a ‘tide’) is currently modelled to not exceed 2.5 m depth over six hours, which is comparable to coastal tides. Due to the shape of the reservoir, tidal rates would increase as water level decreases in the lower reservoir.

Public use of Lake Borumba would be maintained during operation, however, access to certain areas may be restricted for safety reasons (e.g. in the vicinity of the lower intake). Operational activities would include:

- day-to-day operation of the energy generation facilities and water supply and management in accordance with regulatory requirements, including established operations and maintenance manuals and standard operating procedures
- maintenance of the grounds surrounding key project components, including recreational facilities
- recreational uses
- periodic shutdowns and maintenance as determined by the Project's operations and maintenance protocols.

Borumba Dam is owned and operated by the Queensland Bulk Water Supply Authority (trading as Seqwater), which holds the resource operations licence for the Mary Valley Water Supply Scheme including the existing Borumba Dam. The Queensland Government recently acknowledged that longer-term delivery, ownership and operation of the Project will likely be Queensland Hydro.

Discussions to determine the final ownership structures for the portfolio of project assets are underway between relevant departments and entities.

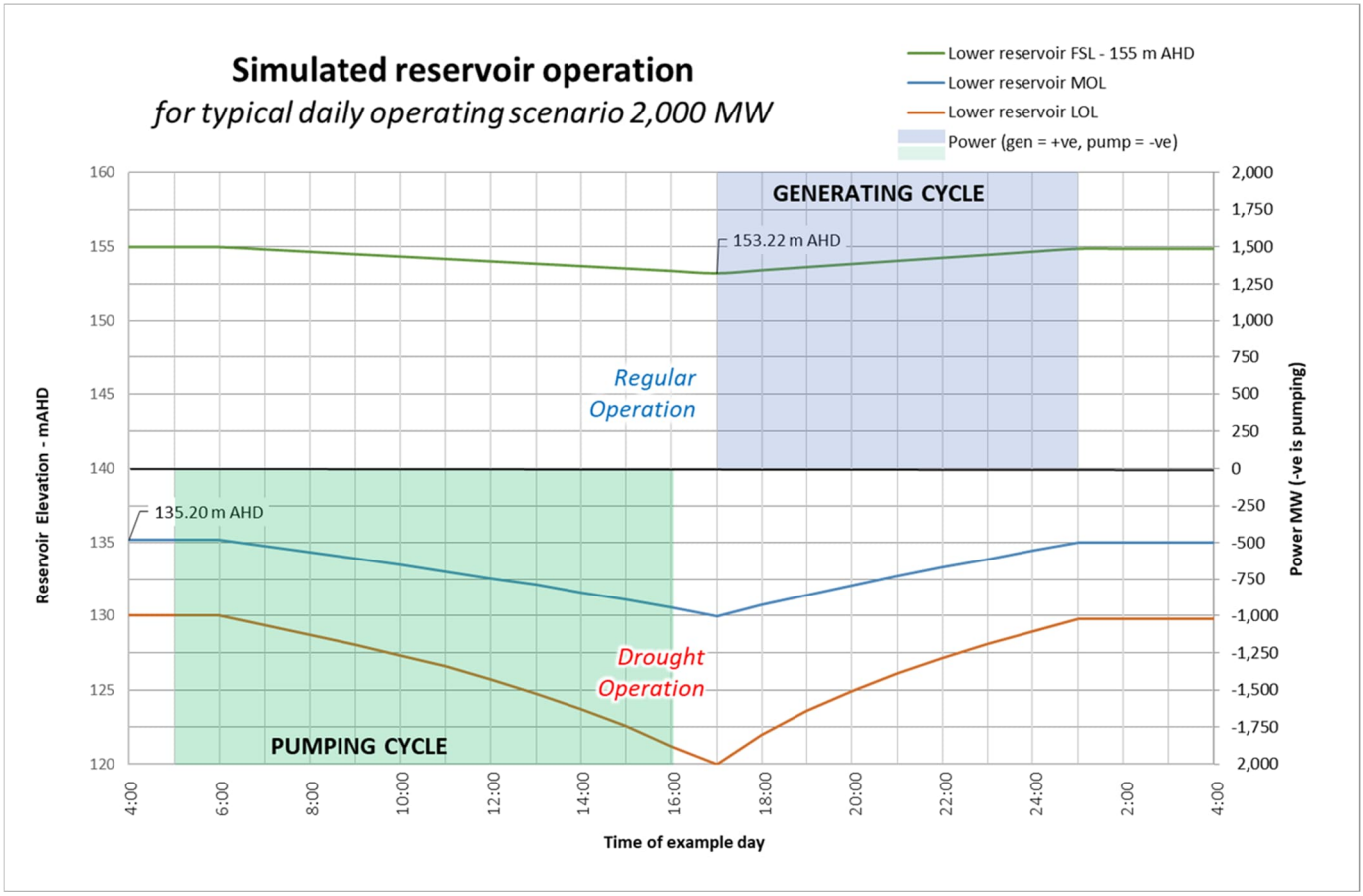


Figure 13: Water level fluctuations during operation

2.3.7 Decommissioning

Temporary infrastructure required for construction will be decommissioned and rehabilitation activities will be undertaken following completion of construction.

Given the Project has an operational life of 100 years, plans for decommissioning are expected to commence closer to the end of the Project's life.

2.4 Project timeframes

The anticipated project schedule is identified in Table 9.

The Project timeframes propose that detailed design occurs in parallel with the Exploratory Works. Exploratory Works are essential for informing detailed design for the Project.

Table 9: Anticipated Project schedule

Milestone	Approximate Date
Commenced Exploratory Works not subject to EPBC Act approval	July 2023^
Commence Exploratory Works, subject to EPBC Act approval	November 2023^
Completion of Tender Design	Early 2026
Obtain Primary Project Approvals	Late 2025
Completion of Exploratory Works^	Late 2025
Commence Main Works Construction	Late 2025
Operations	First power in 2030 Fully operational 2031

^ timeframe has shifted since the EPBC Referral (EPBC 2023/09461)

2.5 Workforce requirements

The Project is anticipated to require a peak construction workforce of up to 2,360 full-time equivalent (FTE) workers, with up to 480 FTE workers required to construct the new Borumba dam and lower reservoir, and up to 1,880 FTE workers required to construct the upper reservoir and hydropower scheme.

Subject to further investigations, the construction workforce is anticipated to be sourced locally from Gympie and Somerset LGAs in first instance, followed by neighbouring LGAs of South Burnett, Sunshine Coast, and Noosa, then more broadly from the Southeast Queensland and Wide Bay Burnett regions and beyond.

The majority of the construction workforce is likely to be accommodated in construction camps and accommodation developments to be established for the Project and otherwise bussed to and from site from dedicated pickup points at the beginning and end of their shifts to minimise traffic impacts. Queensland Hydro is undertaking an Accommodation Strategy to inform the decision of the suitable mix of on and off-site accommodation provisions as part of the EIS process.

Detailed workforce sourcing and accommodation arrangements will be prepared as part of the EIS process, as well as an assessment of the potential social impacts of those arrangements.

During the construction phase, the Project is also likely to generate indirect local and regional employment and business opportunities, particularly through supporting service providers such as those associated with the provision of food, accommodation, material, and professional services.

When operational, the Project is anticipated to support up to 30 site-related FTE jobs. When operational, the Project also has the potential to generate indirect employment and business opportunities, such as those associated with other renewable energy sources (i.e. solar and wind).

2.6 Project costs and financing requirements

The preliminary capital cost estimate for the Project is $14.2 billion, including risk allowances and project contingency.

In the 2023-24 Queensland Budget, the Queensland Government approved proceeding with the Project at a total estimated cost of $14.2 billion. The Government committed $6 billion in equity funding over the construction period, with the remainder to be funded by Queensland Hydro through borrowings. This amount is additional to the $273.5 million committed to advance detailed engineering, environmental investigations, community engagement, and some early access works for the Borumba and Pioneer-Burdekin PHES schemes. By accessing this funding, growing the organisation, and with the support of various technical service providers (State of Queensland, 2023).

Queensland Hydro has both the financial and technical capabilities to deliver the EIS for the Project.

2.7 Operation and ownership approach

With the release of the Queensland Energy and Jobs Plan, the development of the Borumba PHES is the responsibility of Queensland Hydro. Powerlink will be managing the development and construction of the necessary transmission infrastructure. The exact nature of the sales strategy for the Project is a matter for the Queensland Government and is under active consideration.

It is currently assumed that Queensland Hydro will be the registered operator. To participate in the national electricity system, as a generator, the operator will be required to register as a participant under Section 11 of the National Electricity Law and National Electricity Rules.

Further to this Queensland Hydro will own all physical assets relating to the PHES scheme, including the new Borumba dam and the physical reservoir, with the existing dam and lake owned and operated by the Queensland Bulk Water Supply Authority (trading as Seqwater).

Discussions to determine the final ownership structures for the portfolio of project assets are underway between relevant departments.

Environment

3. Existing environment

The existing environment has been described for the area within and adjacent to the Project Footprint (Figure 1).

3.1 Natural environment

3.1.1 Land

3.1.1.1 Topography

Accurate LiDAR data has been obtained for the area within and adjacent to the Project Footprint. The terrain is quite rugged and relatively inaccessible with the elevation ranging from about 120 m AHD to 550 m AHD. Much of the Project is surrounded by the steep slopes of the Yabba Range, Conondale Range and Kandanga Range. These ranges rise to more than 370 m above the existing Lake Borumba FSL and it is this variation in elevation that makes the site such a good option for a pumped hydro scheme. The open valleys on the main arms of Lake Borumba contain more gently sloping land often associated with local alluvium (Attexo, 2022).

3.1.1.2 Geology

The geology across the area varies, as represented in Table 10 and Figure 14. The rock units and lithology associated with major soil disturbance activities are:

- Borumba dam wall on Yabba Creek and associated construction activities
  - Amamoor beds (DCa), mudstone, slate, basic metavolcanics, chert, schist, jasper, greywacke
  - quaternary alluvium (Qa), clay, silt, sand, and gravel; flood-plain alluvium
- upper dam and reservoir, hydroelectric infrastructure, and associated construction activities
  - Marumba beds (Pm), mudstone, sandstone, conglomerate, rhyolite
  - Tungi Creek granodiorite (Rgt), biotite-hornblende granodiorite; hornblende-biotite granite.

Table 10: Geology within and adjacent to the Project Footprint

Map symbol	Rock Unit name	Lithological summary
New Borumba dam and reservoir		
Pm	Marumba beds	mudstone, sandstone, conglomerate, rhyolite
Rg/g	RG/G-SEQ	biotite-hornblende granodiorite
DCs	Mount Mia serpentinite	serpentinite and serpentinite matrix melange with blocks of serpentinite, mafic greenschist, and locally phyllite; sporadic inclusions of blueschist, quartz-mica schist, marble, and quartzite; rare inclusions of gabbro, amphibolite, lherzolite, wehrlite
PRg/d	PRg/d-SEQ	pyroxene-biotite-hornblende diorite; hornblende diorite to clinopyroxene hornblendite
DCa/2	Amamoor beds/2	buff shale, slate, siltstone, and minor chert; locally phyllitic
TQr	TQr-QLD	Clay, silt, sand, gravel, and soil; colluvial and residual deposits (generally on older land surfaces)
Qa	Qa-QLD	clay, silt, sand, and gravel; flood-plain alluvium
DCa/2	Amamoor beds/2	buff shale, slate, siltstone, and minor chert; locally phyllitic
DCa	Amamoor beds	mudstone, slate, basic metavolcanics, chert, schist, jasper, greywacke
DCa/b	Amamoor beds/B	basaltic to andesitic metavolcanic lava flows
Rgt	Tungi Creek granodiorite	biotite-hornblende granodiorite; hornblende-biotite granite

Map symbol	Rock Unit name	Lithological summary
Upper dam and reservoir / underground works and generation		
Rgt	Tungi Creek granodiorite	biotite-hornblende granodiorite; hornblende-biotite granite
Pm	Marumba beds	mudstone, sandstone, conglomerate, rhyolite
Ancillary Infrastructure		
DCs	Mount Mia Serpentinite	serpentinite and serpentinite matrix melange with blocks of serpentinite, mafic greenschist, and locally phyllite; sporadic inclusions of blueschist, quartz-mica schist, marble, and quartzite; rare inclusions of gabbro, amphibolite, lherzolite, wehrlite
DCn	Anderson Creek phyllite	polydeformed phyllite
Pm	Marumba beds	mudstone, sandstone, conglomerate, rhyolite
Rg/g	Rg/g-SEQ	biotite-hornblende granodiorite
Rgt	Tungi Creek granodiorite	biotite-hornblende granodiorite; hornblende-biotite granite

3.1.1.3 Soils

Soils vary from sandy loams to light to medium clays. The entire Project Footprint has the potential to contain soils with sodic subsoils that are highly erodible if exposed. The soil sodicity associated with major soil disturbance activities are:

- lower dam wall on Yabba Creek and associated construction activities
  - quaternary alluvium will have variable levels of sodicity, but clay soils and texture contrast soils were often strongly sodic
  - Amamoor beds were found to contain some sodic subsoils (Brooyar soil) in the mid to upper slopes and strongly sodic subsoils from mid to lower slopes (Gander soil)
- upper reservoir, hydroelectric infrastructure, and associated construction activities
  - Marumba beds were found to contain soils that are strongly sodic (Eskvale soil) with a high potential to erode
  - Tungi creek granodiorite – all soils in the Brisbane Valley Land Resource Survey on coarse-grained acid igneous rocks were found to be non-sodic and one soil (Bells soil) in the Curra to Imbil Land Resource survey was found to have strongly sodic subsoils (Pointon & Collins, 2004).

Gully erosion exists on slopes above Lake Borumba on the Kingaham Creek and Borumba Creek channels. This suggests the presence of dispersive soils, which are a very high to extreme erosion risk if disturbed. The coarse sandy soils in the granodiorite areas will have low coherence and would also be an erosion risk (Attexo, 2022).

Of the areas to be disturbed, most soils have low to very low salt levels, except for:

- lower dam wall on Yabba Creek and associated construction activities
  - quaternary alluvium will be variable with some clayey soil containing moderate salinity
- upper reservoir, hydroelectric infrastructure, and associated construction activities
  - Marumba beds – one soil (Eskvale soil) presents with medium salt levels in the subsoil
  - Tungi creek granodiorite – one soil (Bells soil) in the Curra to Imbil Land Resource survey with medium subsoil salinity (Pointon & Collins, 2004).

Acid sulfate soils are not mapped within the area and have a low to extremely low probability to occur with very low to low confidence respectively (CSIRO, 2014). Despite this, the area is mapped within the State Planning Policy acid sulfate soils trigger area: Gympie Region.

There is no evidence of salinisation of the lands around the Yabba, Conondale, and Kandanga ranges.

3.1.1.4 Mining and key resource areas

There are no current mining leases, mining lease applications, key resource areas or petroleum or gas pipelines within the Project Footprint.

The nearest mining lease (ML50008) is approximately 2.2 km downstream of the existing dam wall.

There are four historical mining leases within the Project Footprint:

- ML212846 on Lot 467NPW746
- ML231555 on Lot 3LX2754
- ML231568 on Lot 3LX2754
- ML3717 on Lot 3LX2754.

3.1.1.5 Contaminated land

The preliminary contaminated land assessment included searches of the Department of Environment and Science (DES) Environmental Management Register and Contaminated Lands Register.

As of 1 March 2023, there were no lots listed on the Contaminated Lands Register and three lots listed on the Environmental Management Register as follows:

- Lot 3LX2754 is listed for the notifiable activity of mineral processing
- Lot 1723L37994 is listed for the notifiable activity of livestock dip or spray race
- Lot 135FTY1911 is listed for two notifiable activities:
  - petroleum product or oil storage
  - waste storage, treatment, or disposal.

A desktop review only identified evidence that some of the listed notifiable activities may have occurred on Lot 7AP23765 (Conondale National Park, part thereof) at the Old Borumba Homestead and immediate surroundings:

- petroleum storage may have occurred in the machinery shed
- chemical storage may have occurred in the machinery shed and the cattle dip
- waste disposal and/or release of septic may have occurred near the homestead buildings.

There is evidence of the following notifiable activities on Lot 135FTY1911, but these are outside of the Project Footprint and unlikely to be impacted by the Project:

- petroleum or oil and storage
- waste disposal
- waste treatment (septic storage and treatment).

It is expected that site investigations would be undertaken during the EIS process, as directed by the terms of reference. to assess soil types/classifications, erodibility, potential soil hazards, and soil/land production value. A contamination assessment will also be conducted to assess risk of residual contamination in the area from historic activities.

Queensland Hydro

GDA2020 MGA Zone 56

0 350 700 Meters

1 cm = 350 m (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Watercourse
- State controlled roads
- Local road
- Main works design footprint features

Topography

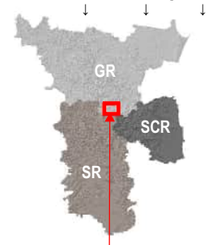
5 m contour lines

- Index Contour (25 m)
- Intermediate Contour (5 m)

Reservoir water levels

- Lower reservoir (FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

OVERVIEW
Gympie Regional, Somerset Regional, Sunshine Coast Regional



OVERVIEW
Queensland

Detailed surface geology - Queensland

- Amamoor beds, DCa
- Amamoor beds/2, DCa/2
- Amamoor beds/b, DCa/b
- Anderson Creek Phyllite, DCn
- Booloumba beds, Cb
- Cambroon beds, Pb
- Marumba beds, Pm
- Mount Mia Serpentinite, DCs
- PRg/d-SEQ, PRg/d
- PRg/g-SEQ, PRg/g
- Qa-QLD, Qa
- Rg/d-SEQ, Rg/d
- Rg/g-SEQ, Rg/g
- TQr-QLD, TQr
- Ts-QLD, Ts
- Tungi Creek Granodiorite, Rgt
- Water body (unspecified), W

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Detailed surface geology Queensland@ © State of Queensland (Department of Natural Resources, Mines and Energy) 2018
7. Imagery @ Basemap World Imagery

Borumba Pumped Hydro Project | Initial Advice Statement

TOPOGRAPHY AND GEOLOGY

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 14

Document Path: X:\Projects\30032677\800_GIS\MXD\IAS\DraftE1_CommentsInd\P30032677_Borumba_IAS_Figure14_TopoAndGeology_E1.mxd

3.1.2 Water

3.1.2.1 Surface water resources

The Project is in the Upper Mary River sub-basin of the Mary Basin (Figure 15). The Upper Mary River Basin is approximately 2,700 km^2 (DES, 2013), with the catchment upstream of Lake Borumba being 456 km^2. The Mary Basin is approximately 9,500 km^2 (State of Queensland, 2013) and comprises 20 sub-catchments. The Project is within the water supply buffer area of the Mary Valley Catchment, which support protection and enhancement of water quality under the State Planning Policy.

Stream flow in the Mary Basin:

- is highly seasonal
- varies considerably from year to year
- generally corresponds with rainfall, with the wet season occurring between December and March.

Waterways in the basin range from ephemeral creek systems to permanent flowing rivers and creeks. The waterways in or near the Project Footprint range from Strahler order 1 to order 5 streams and includes defined watercourses such as Yabba Creek, Kingaham Creek, Borumba Creek and Sandy Creek (Figure 16).

Water in the Mary Basin is managed and distributed under the Water Plan (Mary Basin) 2006 (the Water Plan) (Figure 15).

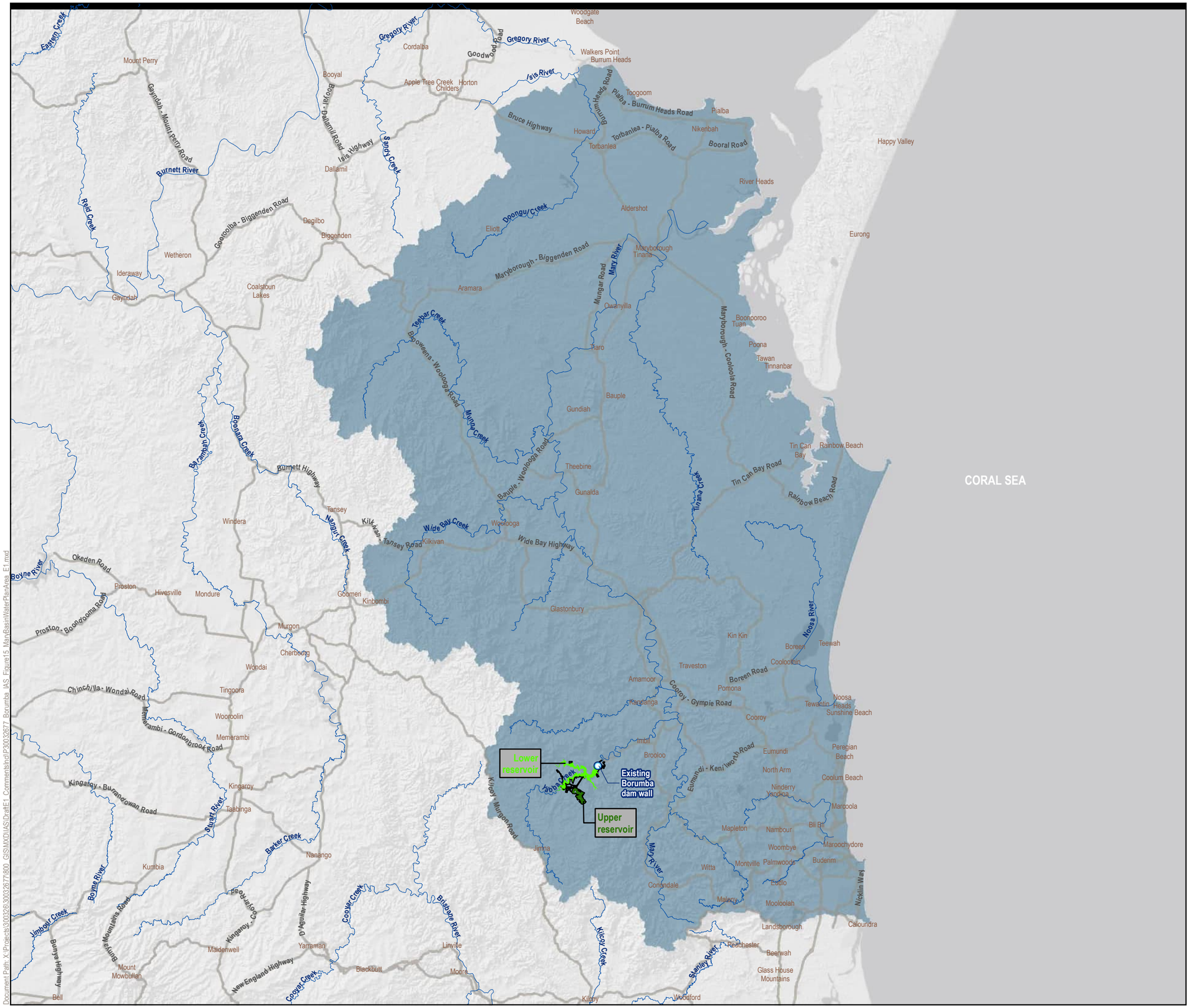
Lake Borumba stores water for drinking as well as irrigation as part of the Mary Valley Water Supply Scheme. The scheme is owned and operated by Seqwater. Constructed in 1963, Borumba dam has a catchment area of 465 km^2 and was raised from elevation level 132.28 m AHD to 135.01 m AHD in 1997, bringing its full storage capacity to 45,952 ML. It is an un-gated dam, meaning that when it reaches 100% capacity, water flows over the spillway and safely out of the dam. It has a minimum operating volume of about 1,200 ML. The lake has a bottom offtake, meaning water from deep in the lake is released to satisfy downstream requirements.

There are no recorded supply failures for high priority water (used for urban supplies) from Borumba dam. Severe water restrictions have been required at times, such as during 2002–03 when drought conditions resulted in water levels in the dam becoming extremely low (Figure 17).

A reduction in inflows for one or more seasons can significantly reduce water levels in Lake Borumba. Therefore, late commencement of the wet season, periods of failed or low-yielding wet seasons, or extended periods of low inflow pose a risk to supply security. Water demand from Gympie's key industries and businesses, combined with Gympie's modest levels of residential water use and positive population growth, mean the capacity and reliability of Gympie's current water supply will need to be enhanced to meet future water demands.

Water balance modelling and water plan compliance assessment is being undertaken for the Project to:

- assess inflows to Borumba dam and consider the impact of the Borumba dam raising and upper reservoir on catchment water balance
- assess compliance with the Water Plan
- assess compliance with the draft revised Water Plan, if available (a notice has been gazetted to delay the expiry of the Water Plan to May 2024).



Queensland Hydro

GDA2020 MGA Zone 56

0 7.5 15

Kilometers

1 cm = 7.5 km (when printed @ A3)

LEGEND

- Major Watercourse Line
- State Controlled Roads
- Mary Basin Water Plan Area
- Main works design footprint features

Reservoir water levels

- Lower reservoir (FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

OVERVIEW
Gympie Regional, Somerset Regional, Sunshine Coast Regional

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
3. Watercourses and Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2021
4. Drainage basin sub areas, Drainage basins © State of Queensland (Department of Resources) 2021
5. Water plan areas - Queensland © State of Queensland 2021
6. Imagery @ Basemap World Imagery

Disclaimer:

Borumba Pumped Hydro Project | Initial Advice Statement

MARY BASIN WATER PLAN AREA

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 15

Document Path: X:\Projects\30032677\800_GIS\MXD\IAS\Draft\E1_Comments\Incl\P30032677_Borumba_IAS_Figure15_MaryBasinWaterPlanArea_E1.mxd

LOWER AND UPPER MARY RIVER DRAINAGE BASINS

Lower Mary River

Upper Mary River

Existing Borumba dam wall

Lower reservoir

Upper reservoir

Existing Borumba dam wall

UPPER MARY RIVER DRAINAGE BASIN

Queensland Hydro

GDA2020 MGA Zone 56

0 3.5 7

Kilometers

1 cm = 3.5 km (when printed @ A3)

LEGEND

- Watercourse
- State controlled roads
- Main works design footprint features

Drainage sub-basins

- Lower Mary river
- Upper Mary river
- Drainage basins

Reservoir water levels

- Lower reservoir (FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

OVERVIEW
Gympie Regional, Somerset Regional, Sunshine Coast Regional

OVERVIEW
Queensland

Main Map Extent

Data Sources:
1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses and Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2021
5. Drainage basin sub areas, Drainage basins © State of Queensland (Department of Resources) 2021
6. Imagery @ Basemap World Imagery

Disclaimer:
 While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document. SMEC shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Borumba Pumped Hydro Project | Initial Advice Statement

WATERWAYS AND CATCHMENTS

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 16

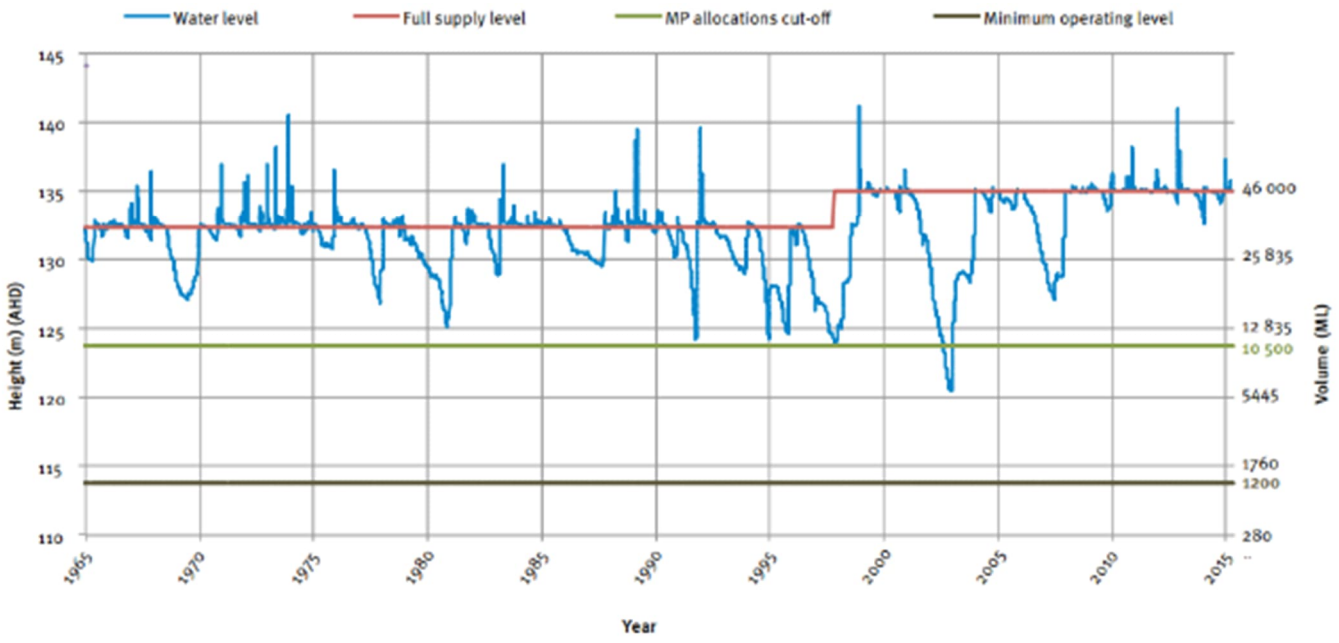


Figure 17: Storage trace for Borumba dam 1965-2015

3.1.2.2 Surface water and sediment quality

Water quality in the Mary Basin is generally influenced by nutrient and sediment loading and pesticide and herbicide application, with negative impacts on the ecosystem function of the coastal ecosystems. These environmental stressors are expected as the catchment is home to the primary industries of grazing, horticulture, forestry, commercial fishing, and mining (BMRG, 2019).

The physical water quality in Lake Borumba is typical of a freshwater lake, with neutral pH and electrical conductivity levels between 250–300 µS/cm.

Observations of temperature and dissolved oxygen over a calendar year indicate that mild stratification occurs within Lake Borumba. Stratification is most notable during the warmer months between December and March, with temperature fluctuations suggesting a thermocline at depths between 6-10 m. This stratification breaks down with inflows and the onset of cooler weather.

There is no historical sediment quality data for the Project Footprint.

Desktop and field water quality assessments were conducted to understand water quality in Lake Borumba, Yabba Creek, and key tributaries (including tributaries within the upper reservoir) and ascertain the effects of frequent water transfer between reservoirs on water quality within Lake Borumba.

3.1.2.3 Sediment transport

A desktop and field geomorphic assessment and hydraulic modelling was undertaken to assess the current geomorphic conditions and potential impacts on fluvial geomorphology and sediment transport.

Borumba dam currently impacts sediment supply from 70% of the Yabba Creek catchment and a small proportion of the overall Mary basin. Tributaries within the lower 30% of Yabba Creek catchment are currently not impacted by either the existing dam or the proposed Project. These tributaries still supply flow and sediment to the Mary River as does the other 82 % of the Upper Mary River catchment. The existing dam likely traps all coarse sediment (>30 µm) (Alluvium, 2022).

A desktop and field geomorphic assessment and hydraulic modelling was undertaken to assess the current geomorphic conditions and potential impacts on fluvial geomorphology and sediment transport.

3.1.2.4 Groundwater

Groundwater use is not currently regulated in the area with no Groundwater Management Area prescribed under the Water Plan within or near the Project.

There are no registered groundwater bores in the vicinity of the Project upstream of Borumba dam but there are five within 5 km downstream and a number around Imbil. Groundwater is more extensively used in the broader region.

Based on data from geotechnical studies for the project, groundwater levels near the proposed new Borumba dam ranged from 7.85 m below ground level (BGL) to 33 m BGL. At saddle dam sites for the proposed upper reservoir, they range from 6.55 to 10.25 m BGL.

Groundwater appears to be potable and therefore assumed to have low salinity, based on water quality data from nearby registered bores obtained during drilling. Electrical conductivity recorded in 2016 from Yabba Creek (below the Borumba dam wall) by Seqwater also reports low conductivity (approximately 90 to 330 µS/cm) and hence low salinity.

A review of groundwater dependent ecosystem (GDE) mapping administered by Queensland Government, indicates that the potential for GDEs has not been previously mapped within and adjacent to the Project Footprint. According to the Bureau of Meteorology National Dataset of Australian GDEs (Bureau of Meteorology, 2022), there are areas mapped as having varying potential for aquatic and terrestrial GDEs within and surrounding the Project as follows:

- high potential aquatic GDEs associated with Lake Borumba, Yabba Creek, Kingaham Creek, Bella Creek and Sandy Creek
- moderate potential aquatic GDEs approximately 2 km downstream of Lake Borumba
- low potential aquatic GDEs directly downstream of Lake Borumba
- high potential terrestrial GDEs are largely associated with the upstream sections of Yabba Creek.

Detailed site investigations and modelling will be undertaken during the EIS process to fully assess hydrogeology and regional groundwater flow dynamics.

3.1.3 Amenity

3.1.3.1 Air quality

Meteorological conditions play an important role in the transport and dispersion of air pollutants. Features that can affect meteorological conditions include location (coastal or inland), latitude, land use and terrain. The conditions of the Project environment are typical of an inland subtropical location with warm summers and cool winters. Rainfall is summer dominant. Winds are typically light (1 to 12 km/hour) and occur predominantly from the south-east quadrant.

Existing air emission sources in the vicinity of the Project include both anthropogenic and natural sources such as:

- natural dust storms (wind erosion of exposed ground)
- bushfires (planned and unplanned)
- traffic using the local road network (both exhaust emissions and wheel generated dust when travelling on unsealed roads)
- agricultural activities (farm machinery use)
- domestic solid and liquid fuel burning
- industrial and commercial activities.

A review of the National Pollutant Inventory (NPI) database for the 2020/2021 reporting year was conducted to identify and quantify any industrial emissions that may contribute to air quality in the region. The NPI database indicated two reporting facilities within a 20 km radius of the Project:

- Melawondi Dry Mill (Mary Valley Operations) – Log Sawmilling and Timber Dressing
- Boral Quarries Moy Pocket – Quarrying

It should be noted that the Tarong Power Stations are located 65 km southwest of the Project and are a large source of air pollutants.

There are no Queensland Government air quality monitoring sites within a close enough distance to the Project location to ascertain reliable information on local air quality conditions. The nearest air quality monitoring site is

located on the Sunshine Coast, approximately 65 km east of the Lake Borumba, beyond what can be considered the local air shed.

Figure 18 shows sensitive receptors surrounding the Project that may be subject to air quality impacts. Most of the sensitive receptors are homesteads located to the north of Borumba dam along the local roads, namely, Yabba Creek Road, Bella Creek Road, and Little Bella Creek Road. There are also homesteads along Yielo Road to the south of the Project. Ecological receptors include the flora, fauna and vegetation communities of the nearby conservation areas and the waters of Lake Borumba.

A comprehensive assessment of potential air quality impacts, including greenhouse gas emissions, would be completed during the EIS process as directed by the terms of reference.

3.1.3.2 Noise and vibration

Given the rural and remote nature of the Project location, the expectation is that ambient noise levels are low. Existing noise sources are likely to be primarily from rural environmental sources and logging activities, as well as traffic on the road network and users of the Lake Borumba recreational area.

Sensitive receptors for noise and vibration are the same as those for air (Figure 18).

A comprehensive noise and vibration impact assessment would be completed during the EIS process, as directed by the terms of reference.

3.1.3.3 Landscape and visual

The region surrounding the Project location is characterised by rural agricultural holdings, small towns, native vegetation, and nature conservation areas. The current landscape associated with the Project comprises:

- agricultural land, predominately grazing operations
- native vegetation
- watercourses
- scattered residential dwellings/outbuildings
- minor roads that connect smaller townships and residential areas to regional centres
- Lake Borumba and recreational facilities on the foreshores
- the peaks of Mount Kandanga (557 m) to the north, Mount Borumba (624 m) to the south and Yabba Range to the west.

Views towards the Project are typically constrained due to local topography and vegetation.

A comprehensive landscape and visual impact assessment would be completed during the EIS process, as directed by the terms of reference.

Queensland Hydro

GDA2020 MGA Zone 56

0 0.65 1.3 Kilometers

1 cm = 0.65 km (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Place (population centre)
- Watercourse
- State controlled roads
- Track
- Local road
- Main works design footprint features

Cadastre

- Road / unlinked parcel
- Watercourse
- Conondale Resources Reserve

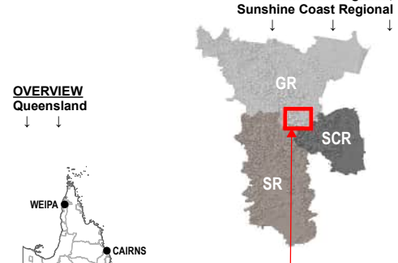
Reservoir water levels

- Lower reservoir (FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

Potential Sensitive Receptors

- Lookout
- Community or commercial building
- Educational building
- Emergency services building
- Industry infrastructure building
- Residential building (footprint less than 625 sq m)
- Other building (footprint less than 625 sq m)
- Educational building
- Industry infrastructure building
- Other building (footprint greater than 625 sq m)
- Residential building (footprint greater than 625 sq m)
- Landmark Areas - Educational institution
- Landmark Areas - General
- Built-up areas
- Residential and farm infrastructure
- Cemetery Areas

OVERVIEW
Gympie Regional, Somerset Regional, Sunshine Coast Regional



OVERVIEW
Queensland

Data Sources:
1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022, SMEC July 2023
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Queensland Land Use @ State of Queensland (Department of Environment and Science), June 2019.
6. Imagery @ Basemap World Imagery

Disclaimer:

Borumba Pumped Hydro Project | Initial Advice Statement

POTENTIAL SENSITIVE RECEPTORS

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 18

Document Path: X:\Projects\30032677\800_GIS\MXD\IAS\DraftE1 Comments\Incl\P30032677_Borumba_IAS_Figure18_PotentialSensitiveReceptors_E1_Orig.mxd

3.1.4 Terrestrial ecology

Terrestrial ecological values were described by desktop assessment and supplemented with field surveys in May and June 2022. Additional surveys were completed between July 2022 and January 2023. The field surveys sought to verify the findings of the desktop assessment and confirm the occurrence of matters of national environmental significance (MNES) and matters of state environmental significance (MSES).

3.1.4.1 Regional context

The Project occurs at the northern extent of the Conondale Range extending into Conondale National Park and bordered by Imbil State Forest, and Yabba State Forest. The surrounding state forest areas are production and plantation forests. The Project is the intersection of several mapped biodiversity significant terrestrial and riparian corridors, with contiguous vegetation acting as a corridor between Conondale National Park and Wrattens National Park within a mosaic of vegetated freehold land and state forest reserves.

The Project also intersects a state significant terrestrial corridor that runs east-west from the Elgin Vale State Forest to the coast at Peregian via Mapleton National Park, Imbil State Forest, Conondale National Park and Yabba State Forest. The justification for this corridor is due to the linking of four state and two regional terrestrial corridors, intersection with riparian corridors, incorporation of latitudinal and climatic gradients, connectivity of remnant vegetation, connectivity between coast and inland, linking of protected areas and estates, and that it falls partially within the Great Eastern Ranges corridor. The current extent of Lake Borumba acts as a connectivity barrier from north to south.

The eastern extent of the Project associated with the lower reservoir occurs partially within a regionally significant terrestrial corridor that runs south-north from Imbil State Forest to Curra State Forest via Marys Creek State Forest and Brooyar State Forest.

The area within and adjacent to the Project Footprint is comprised predominantly of remnant vegetation and characterised by rolling and steep mountains. Areas to the west of the lower reservoir and south of the proposed upper reservoir consist of cleared rolling hills where the dominant land use is cattle grazing. Elevation ranges greatly between the upper and lower reservoir, from 400 m AHD and 500 m AHD to 100 m AHD and 170 m AHD respectively.

The lower reservoir (Lake Borumba) (Figure 5) is primarily bordered by Conondale National Park and Imbil State Forest as protected areas and timber production respectively. Kingaham Creek and Yabba Creek are mostly cleared on the alluvial flats except for riparian vegetation and is used for cattle grazing. Small pockets of residential land occur to the north and north-west of Borumba dam with the town of Imbil situated within 10 km of the dam wall. Vegetation types associated with the lower reservoir are similar to those of the upper reservoir. Additionally, narrow patches of riparian vegetation exist, shouldering creeks that drain into Lake Borumba. These are dominated by *Eucalyptus tereticornis* subsp*. tereticornis* and *Casuarina cunninghamiana* subsp*. cunninghamiana*. The slopes adjoining Lake Borumba include the critically endangered Lowland Rainforest of Subtropical Australia, while the endangered Subtropical eucalypt floodplain forest and woodland of the New South Wales is mapped as occurring on Yabba Creek, Kingaham Creek and Borumba Creek upstream of Lake Borumba.

The area of the proposed upper reservoir (Figure 6) consists primarily of remnant vegetation on steep hills and gullies, particularly in the northern section. The southern extent of the upper reservoir area consists of cleared land and is used for cattle grazing. Previous logging activity is evident by the presence of cut stumps. Vegetation communities associated with the upper reservoir are comprised of woodland to open forest, dominated by *Eucalyptus propinqua, E. siderophloia, E. acmenoides* and *E. microcorys*, with smaller intersecting patches of rainforest vegetation dominated by *Araucaria bidwillii* and *A cunninghamii* (Umwelt, 2022). Two patches of the critically endangered Lowland Rainforest of Subtropical Australia occur within the inundation area.

A total of 516 terrestrial flora species were identified within and adjacent to the Project Footprint, including 11 regional ecosystems. A number of restricted matters under the *Biosecurity Act 2014* have been identified on Queensland Hydro land including *Sporobolus pyramidalis* (Giant rat's tail grass) and *Lantana camara* which is also a Weed of National Significance.

A total of 226 terrestrial fauna species were identified, comprising 139 bird, 58 mammal, 13 reptile and 16 amphibian species. Six broad fauna habitat types were identified, ranging from remnant moist to dry eucalypt woodland to dense notophyll and mesophyll vine forest, which provide habitat for multiple MNES and MSES (Figure 19 and Figure 20). Further studies and significant impact assessments will be undertaken as part of the EIS process.

3.1.4.2 Matters of National Environmental Significance (MNES)

The following MNES are known or highly likely to occur within and adjacent to the Project Footprint (Figure 19 and Figure 20):

- threatened flora species listed in Table 11
- threatened fauna and migratory species listed in Table 12
- two threatened ecological communities were confirmed including the critically endangered Lowland Rainforest of Subtropical Australia associated with regional ecosystems (REs) 12.11.10 and 12.12.16, as well as the endangered Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland, represented as RE 12.3.7.

3.1.4.3 Matters of State Environmental Significance (MSES)

The following MSES are known or highly likely to occur within and adjacent to the Project Footprint (refer Figure 19, Figure 20, Figure and Figure 22) (note that MSES which overlap with MNES are not included):

- threatened flora species listed in Table 11
- threatened fauna species listed in Table 12
- nine high-risk protected plant areas
- regulated vegetation - Endangered/Of concern in Category B (remnant) - three of concern regional ecosystems (12.11.9, 12.11.14, 12.12.12)
- remnant vegetation within a defined distance of a watercourse, intersecting a wetland or mapped as essential habitat
- regulated vegetation - Endangered/Of concern in Category C (regrowth) and Category R (GBR riverine regrowth)
- Conondale National Park and Conondale Resources Reserve (protected areas) (Figure 1).

Table 11: Threatened terrestrial flora known or highly likely to occur within and adjacent to the Project Footprint

Scientific name	Common name	EPBC Act Status	NC Act Status
Bosistoa transversa	Three-leaved bosistoa	Vulnerable	Least concern
Floydia praealta	Ball nut	Vulnerable	Vulnerable
Macadamia integrifolia	Macadamia nut	Vulnerable	Vulnerable
Macadamia ternifolia	Small-fruited Queensland nut	Vulnerable	Vulnerable
Coleus omissus	-	Endangered	Endangered
Coleus torrenticola	Silver coleus	Endangered	Endangered
Rhodamnia rubescens	Scrub turpentine	Critically endangered	Critically endangered
Rhodomyrtus psidioides	Native guava	Critically endangered	Critically endangered
Sophora fraseri	Brush sophora	Vulnerable	Vulnerable
Thesium australe	Austral toadflax	Vulnerable	Vulnerable
Arthraxon hispidus	Hairy-joint grass	Vulnerable	Vulnerable
Rhodamnia dumicola	Rib-fruited malletwood	-	Endangered
Leichhardtia coronata	Slender milkvine	-	Vulnerable
Nothoalsomitra suberosa	-	-	Near threatened

Table 12: Threatened terrestrial fauna known or highly likely to occur within and adjacent to the Project Footprint

Scientific name	Common name	EPBC Act Status	NC Act Status
Threatened fauna			
Calyptorhynchus lathami lathami	Glossy black-cockatoo (south-eastern)	Vulnerable	Vulnerable
Climacteris picumnus victoriae	Brown treecreeper (south-eastern)	Vulnerable	Vulnerable
Dasyurus maculatus maculatus	Spotted-tail quoll	Endangered	Endangered
Hirundapus caudacutus	White-throated needletail	Vulnerable and Migratory	Vulnerable
Petauroides volans	Greater glider (southern and central)	Endangered	Endangered
Petaurus australis australis	Yellow-bellied glider (south-eastern)	Vulnerable	Vulnerable
Phascolarctos cinereus	Koala	Endangered	Endangered
Potorous tridactylus tridactylus	Long-nosed potoroo (northern)	Vulnerable	Vulnerable
Pteropus poliocephalus	Grey-headed flying-fox	Vulnerable	Least concern
Turnix melanogaster	Black-breasted button-quail	Vulnerable	Vulnerable
Adelotus brevis	Tusked frog	-	Vulnerable
Ninox strenua	Powerful owl	-	Vulnerable
Podargus ocellatus plumiferus	Plumed frogmouth	-	Vulnerable
Tachyglossus aculeatus	Short-beaked echidna	-	Special Least Concern
Migratory species			
Apus pacificus	Fork-tailed swift	Migratory and Marine	Special Least Concern
Cuculus optatus	Oriental cuckoo	Migratory	Special Least Concern
Gallinago hardwickii	Latham's snipe	Migratory and Marine	Special Least Concern
Monarcha melanopsis	Black-faced monarch	Migratory and Marine	Special Least Concern
Myiagra cyanoleuca	Satin flycatcher	Migratory and Marine	Special Least Concern
Pandion haliaetus	Osprey	Migratory and Marine	Special Least Concern
Rhipidura rufifrons	Rufous fantail	Migratory and Marine	Special Least Concern
Symposiachrus trivirgatus	Spectacled monarch	Migratory and Marine	Special Least Concern

3.1.4.4 Biosecurity

A total of 54 introduced flora species were identified from ecological surveys undertaken to date, with eight listed as Category 3 restricted plants under the *Biosecurity Act 2014* and two as weeds of national significance. Key species of concern include rats tail grass (*Sporobolus* spp.), parthenium (*Parthenium hysterophorus*) and Opuntia which were common in cleared areas on Queensland Hydro land.

Twelve introduced fauna species were also identified including two listed as invasive and six listed as restricted invasive biosecurity matters under the *Biosecurity Act 2014*.

Queensland Hydro

GDA2020 MGA Zone 56

0 350 700 Meters

1 cm = 423 meters (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Watercourse
- State controlled roads
- Local road
- Conondale Resources Reserve
- Main works design footprint features

Reservoir water levels

- Upper reservoir (FSL 490.5 m AHD)
- Lower reservoir (future FSL 155 m AHD)

Fauna Records

- Adelotus brevis
- Glossy black-cockatoo
- Black-breasted button-quail
- Black-faced monarch
- Eastern osprey
- Grey-headed flying-fox
- Koala
- Long-nosed potoroo
- Powerful owl
- Rufous fantail
- Short-beaked echidna
- Southern greater glider
- Spectacled monarch
- Tusked frog
- White-throated needletail
- Yellow-bellied glider
- Viola betonicifolia (host for fritillary butterfly)

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Imagery @ Basemap World Imagery

Disclaimer:

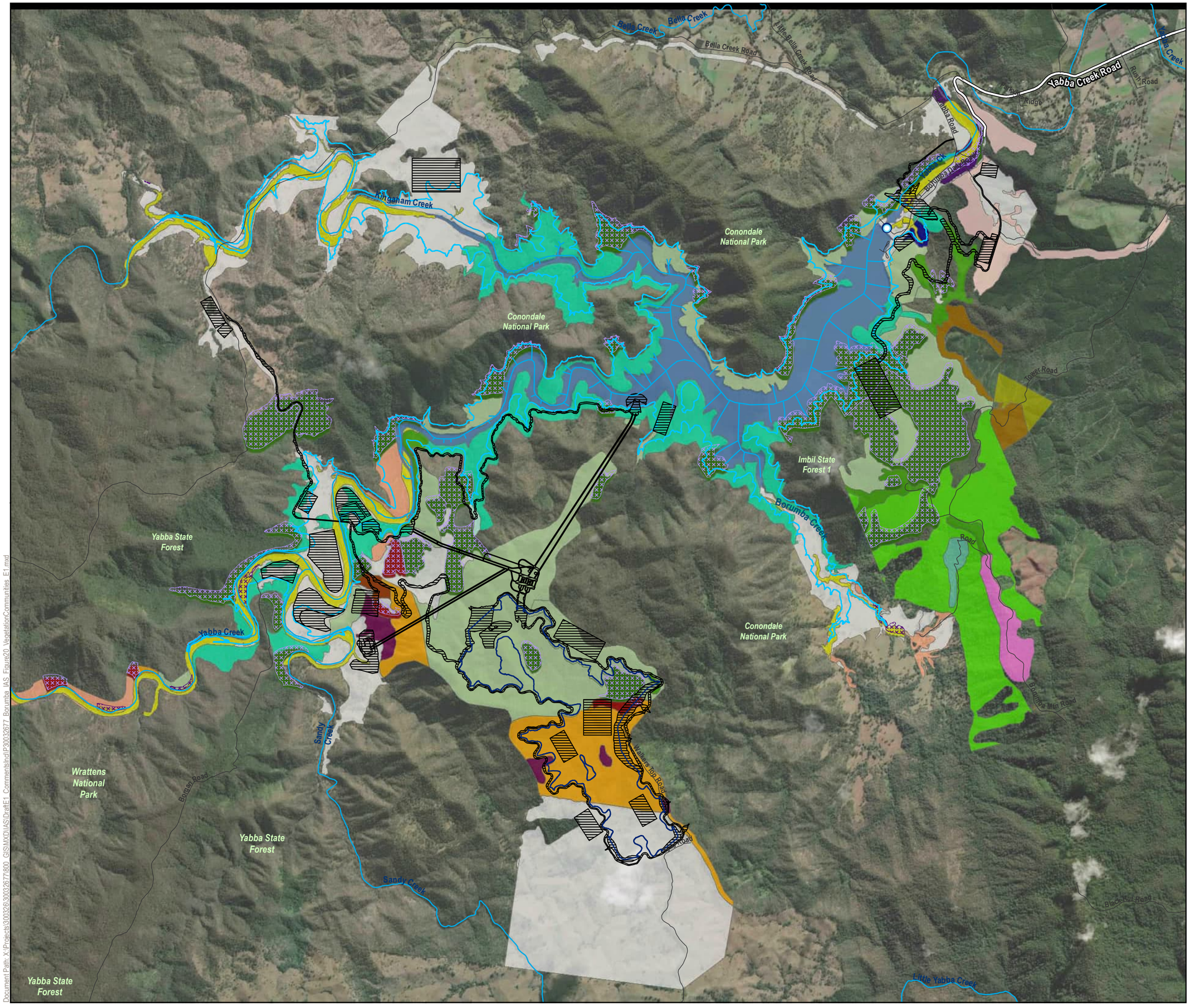
Borumba Pumped Hydro Project | Initial Advice Statement

THREATENED AND MIGRATORY FAUNA RECORDS

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 7/09/2023
REVISION:	E1

FIGURE 19

Document Path: X:\Projects\30032630032677\800_GIS\MXD\IAS\Draft\E1_CommentsIndIP30032677_Borumba_IAS_Figure19_ThreatenedAndMigratoryFaunaRecords_E1.mxd



Queensland Hydro

GDA2020 MGA Zone 56

0 450 900 Meters

1 cm = 450 meters (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Watercourse
- State controlled roads
- Local road
- Main works design footprint features

Reservoir water levels

- Upper reservoir (FSL 490.5 m AHD)
- Lower reservoir (future FSL 155 m AHD)

Threatened ecological communities (field verified)

- Lowland Rainforest of Subtropical Australia
- Subtropical eucalypt floodplain forest and woodland

Vegetation communities

- RE 12.3.1a
- RE 12.3.7
- RE 12.8.16
- RE 12.11.1
- RE 12.11.3
- RE 12.11.3a
- RE 12.11.9
- RE 12.11.10
- RE 12.11.10/12.11.3
- RE 12.11.15
- RE 12.11.3/12.11.9
- RE 12.11.14
- RE 12.12.12
- RE 12.12.15
- RE 12.12.15b
- RE 12.12.16
- RE 12.12.23
- Non-remnant
- Non-remnant (plantation)
- Plantation
- Water

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Imagery @ Basemap World Imagery

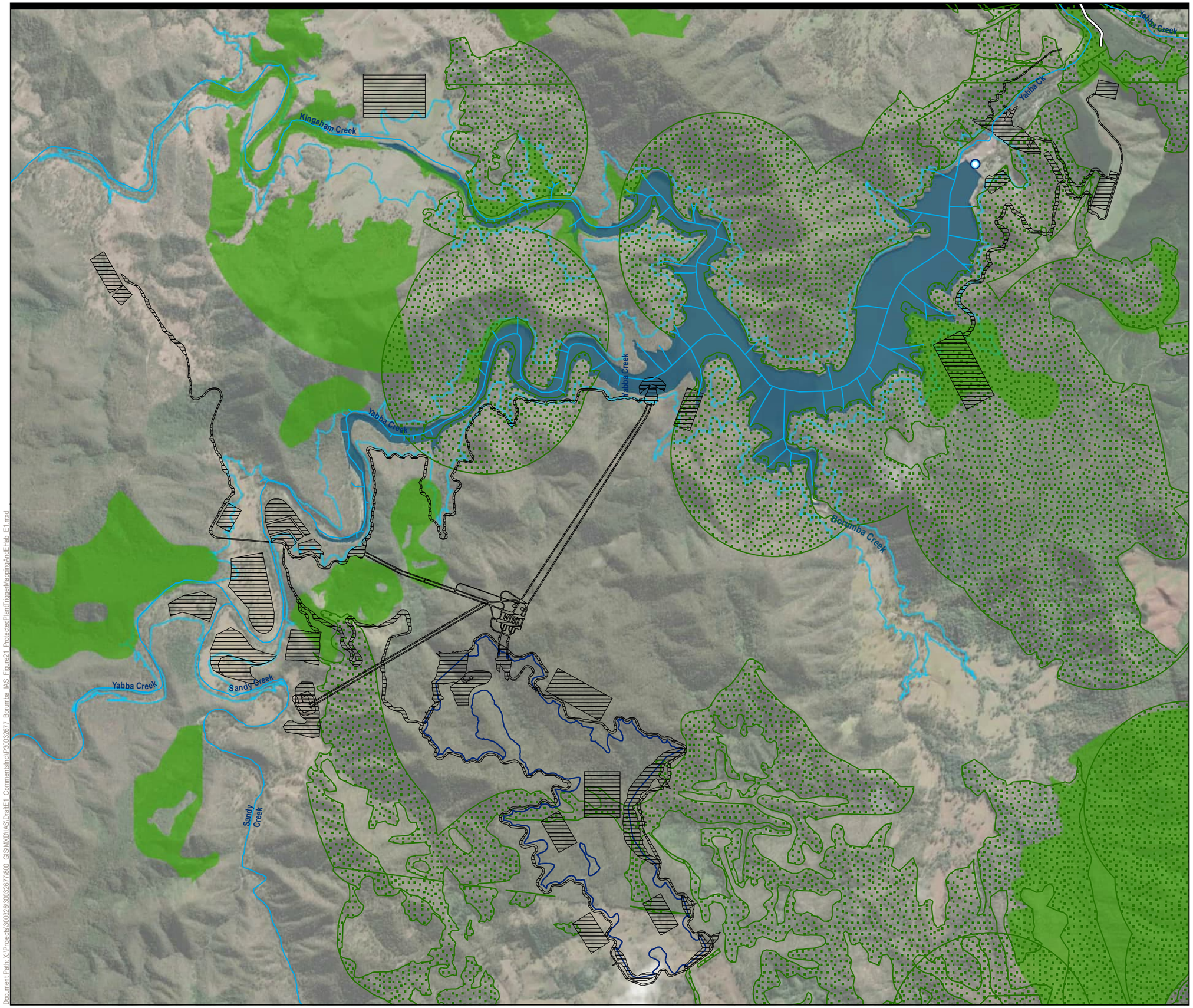
Borumba Pumped Hydro Project | Initial Advice Statement

VEGETATION COMMUNITIES

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 7/09/2023
REVISION:	E1

FIGURE 20

Document Path: X:\Projects\30032630\30326770800_GIS\MXD\IAS\DraftE1_Comments\hd\P30032677_Borumba_IAS_Figure20_VegetationCommunities_E1.mxd



Queensland Hydro

GDA2020 MGA Zone 56

0 350 700 Meters

1 cm = 350 meters (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Watercourse
- State controlled roads
- Main works design footprint features

Reservoir water levels

- Upper reservoir (FSL 490.5 m AHD)
- Lower reservoir (future FSL 155 m AHD)
- Lower reservoir (current FSL 135.01m AHD)

MSES | Regulated vegetation

- Essential habitat
- Protected plants trigger map (high risk areas)

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Matters of state environmental significance - Regulated vegetation - essential habitat - Queensland © © State of Queensland (Department of Environment and Science) 2023
7. Flora Survey Trigger Map for Clearing Protected Plants in Queensland - Version 9.0 © State of Queensland (Department of Environment and Science) 2023
8. Imagery @ Basemap World Imagery

Disclaimer:

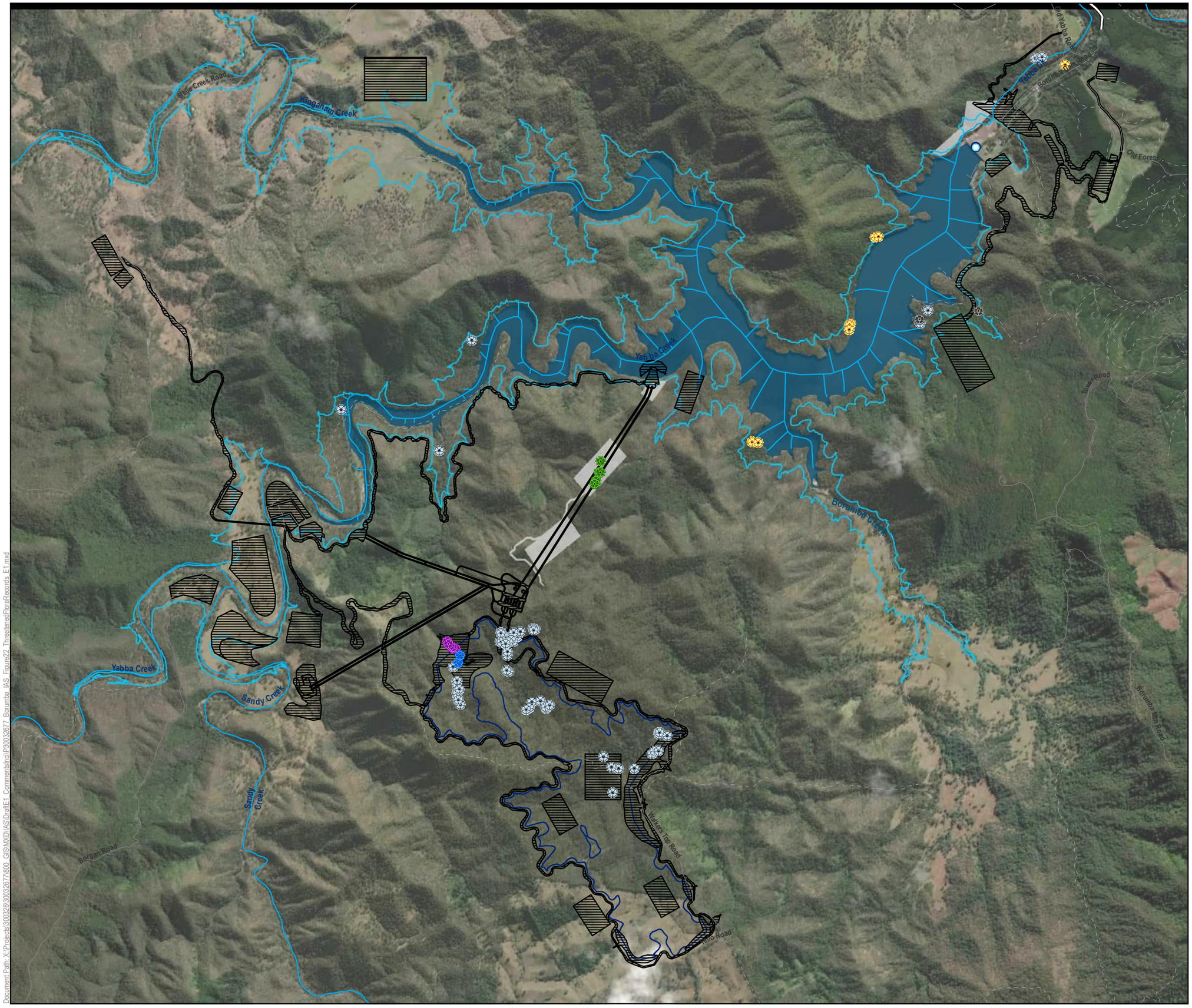
Borumba Pumped Hydro Project | Initial Advice Statement

PROTECTED PLANT TRIGGER MAPPING AND ESSENTIAL HABITAT

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 21

Document Path: X:\Projects\30032\6\30032677\800_GIS\MXD\IAS\Draft\E1_Comments\haf\P30032677_Borumba_IAS_Figure21_ProtectedPlantTrigoerMappingAndEhab_E1.mxd



Queensland Hydro

GDA2020 MGA Zone 56

0 350 700 Meters

1 cm = 350 meters (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Watercourse
- State controlled roads
- Local road
- Track
- Main works design footprint features

Reservoir water levels

- Lower reservoir (current FSL 135.01m AHD)
- Lower reservoir (future FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

Flora records

- Ball Nut
- Coleus sp.
- Leichardttia coronata
- Plectranthus torrenticola
- Scrub Turpentine
- Three-Leaved Bosistoa

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Imagery @ Basemap World Imagery

Borumba Pumped Hydro Project | Initial Advice Statement

THREATENED FLORA RECORDS

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 7/09/2023
REVISION:	E1

FIGURE 22

Document Path: X:\Projects\30032677\800_GIS\MXD\IAS\DraftE1_Comments\ndP30032677_Borumba_IAS_Figure22_ThreatenedFloraRecords_E1.mxd

3.1.5 Aquatic ecology

Aquatic ecological values were described by desktop assessment and supplemented with field surveys in June and July 2022. Assessments specifically targeted MNES and MSES, with the likelihood of occurrence of these matters categorised as unlikely, possible, likely or known.

3.1.5.1 Regional context

Natural geomorphology with superimposed habitat modification dictates the nature and extent of aquatic habitats within and adjacent to the Project Footprint, which can be broadly grouped as proposed upper reservoir, creeks upstream of Lake Borumba, Lake Borumba, and downstream of Lake Borumba, including Yabba Creek and the Mary River. Aquatic habitats include waterfalls, cascades, rapids and riffles in the steeper headwater areas and more glides, runs, pools and backwaters in the lower gradient areas. Substrate composition varied throughout the area with the main trend being coarser substrates upstream of Lake Borumba in more montane areas and a mixture of coarse and fine substrates downstream of Borumba dam.

Aquatic flora (macrophytes) was present at all sites upstream of Borumba dam, however, macrophytes were not recorded downstream of Borumba dam, or in Bella Creek, presumably due to recent flooding. Comparatively, macrophytes were the most diverse at the Lake Borumba sites. Emergent forms tended to be dominant within watercourses upstream of Lake Borumba and within the proposed upper reservoir. Submerged and floating macrophytes formed a notable proportion of the macrophytes at Lake Borumba. Several macrophytes of conservation significance were recorded. No invasive macrophyte species were detected during the surveys but have been previously recorded.

Microalgae species richness and abundance was generally lower in the proposed upper reservoir and Lake Borumba compared to the other waterways sampled. Harmful algal bloom species associated with the production of cyanotoxin were not detected during the surveys. Cyanobacteria blooms occur regularly in Lake Borumba (Stockwell, 2001); (Seqwater, 2022).

Riparian structure and cover differed notably between sites downstream and upstream of Borumba dam or within the proposed upper reservoir. There was limited tree vegetation within sites downstream of Borumba dam and greater areas of bare ground and grass coverage, however, vegetation at upstream sites was dominated by tree form, most likely due to less land clearing within the montane regions.

The aquatic fauna of the aquatic environments assessed were diverse and shares a range of species with the Upper Mary River catchment and to a lesser extent the Lower Mary River catchment. Several fauna of conservation significance and exotic species were recorded.

The aquatic fauna has been subject to several current and historic impacts. The most locally significant is water resource development (i.e. Borumba dam), including change from lotic (flowing) to lentic (still) water and barriers to fish movement. The existing dam does not have a fish (or turtle) transfer device, which is likely to have influenced the upstream aquatic fauna communities. Impacts unrelated to water resource development include land clearing, loss of riparian vegetation, increased nutrients and sedimentation, cattle access to streams, exotic fish and feral animals, aquatic weed infestations, and historic fishing pressure on the Mary River cod (*Maccullochella mariensis*). It is noted that the lake is subject to active stocking activities, including the Mary River cod.

Aquatic ecological values throughout the study area had been significantly altered when surveyed from what could be considered typical due to significant floods during the previous wet season. The area experienced flooding from significant flow events in both March 2022 and May 2022, relating to a second consecutive La Niña event. These flood events altered much of the aquatic systems within the area with extensive bank erosion and bottom scouring from high flows, resulting in altered microhabitats, macrohabitats, riparian zones, substrate contributions, aquatic vegetation compositions, and overall degraded systems.

3.1.5.2 Matters of National Environmental Significance

The following MNES (threatened species) are known or likely to occur within and adjacent to the Project Footprint (Figure 23):

- Australian lungfish (*Neoceratodus forsteri*) – vulnerable under the EPBC Act
- Mary River cod (*Maccullochella mariensis*) – endangered under the EPBC Act
- White throated snapping turtle (*Elseya albagula*) – critically endangered (both EPBC Act and NC Act)
- Mary River turtle (*Elusor macrurus*) – endangered (both EPBC Act and NC Act).

MNES downstream including the Great Barrier Reef Marine Park, Great Barrier Reef World Heritage Area, Great Barrier Reef National Heritage Place, K'gari (Fraser Island) World Heritage Area, K'gari (Fraser Island) National Heritage Place and the Great Sandy Strait Ramsar wetland are also matters of initial concern. The Great Sandy Strait Ramsar wetland, K'gari (Fraser Island) World Heritage Area and K'gari (Fraser Island) National Heritage Place are located between 238 and 257 km downstream from the Project at the mouth of the Mary River. The Great Barrier Reef Marine Park, Great Barrier Reef World Heritage Area, Great Barrier Reef National Heritage Place are located approximately 100 km north of the Great Sandy Strait Ramsar wetland – a total distance of 350 km downstream from the Project (Figure 24).

3.1.5.3 Matters of State Environmental Significance

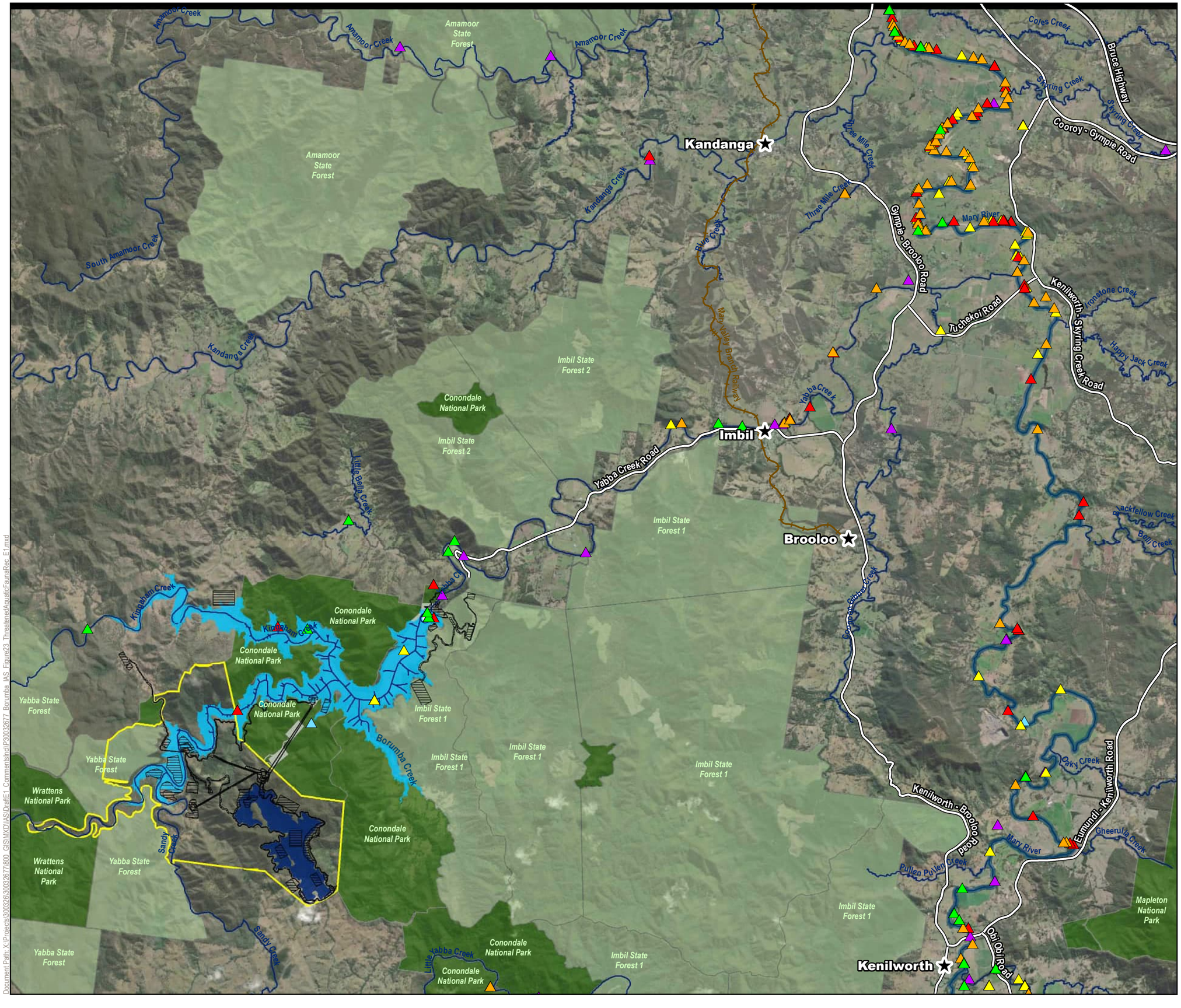
In addition to the MNES, the following MSES are known or likely to occur within and adjacent to the Project Footprint (Figure 19, Figure 22, Figure 23):

- flora including Queensland lace (*Aponogeton elongatus*), water thyme (*Hydrilla verticillata*), eelgrass (*Vallisneria nana*), Water snowflake (*Nymphoides indica*) and *Aponogeton elongatus* subsp*. elongatus*
- Conondale spiny crayfish (*Euastacus hystricosus*)
- platypus (*Ornithorhynchus anatinus*)
- waterways providing for fish passage (Figure 25)
- wetlands of high ecological significance (HES) (Figure 25).

3.1.5.4 Biosecurity

Five exotic aquatic fauna species were recorded in the area within and adjacent to the Project Footprint, together with two translocated species. At the time of survey, the abundance and biomass of these species was low, including areas where they could proliferate (i.e. Lake Borumba). Mozambique tilapia (*Oreochromis mossambicus*) a key species of concern was restricted to riverine systems downstream of the dam wall, with the dam wall preventing/limiting their movement to the upper reaches of Yabba Creek catchment.

Water hyacinth (*Eichhornia crassipes*) and salvinia (*Salvinia molesta*) are invasive weeds of national significance that have been previously recorded in the area (SKM, 2007); (Stockwell, 2001). No invasive macrophyte species were recorded during the recent surveys, presumably due to recent flooding.



Queensland Hydro

GDA2020 MGA Zone 56

0 1 2 Kilometers

1 cm = 1 km (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Place (population centre)
- Watercourse
- Mary River
- Railway
- State controlled roads
- Queensland Hydro property
- Main works design footprint features

Cadastre

- National park
- State forest
- Conondale Resources Reserve

Reservoir water levels

- Lower reservoir (future FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

Threatened aquatic fauna records

- Australian lungfish
- Conondale Spiny Crayfish
- Mary River Cod
- Mary River turtle
- Platypus
- Swamp Crayfish
- White-Throated Snapping Turtle

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Imagery @ Basemap World Imagery

Disclaimer:

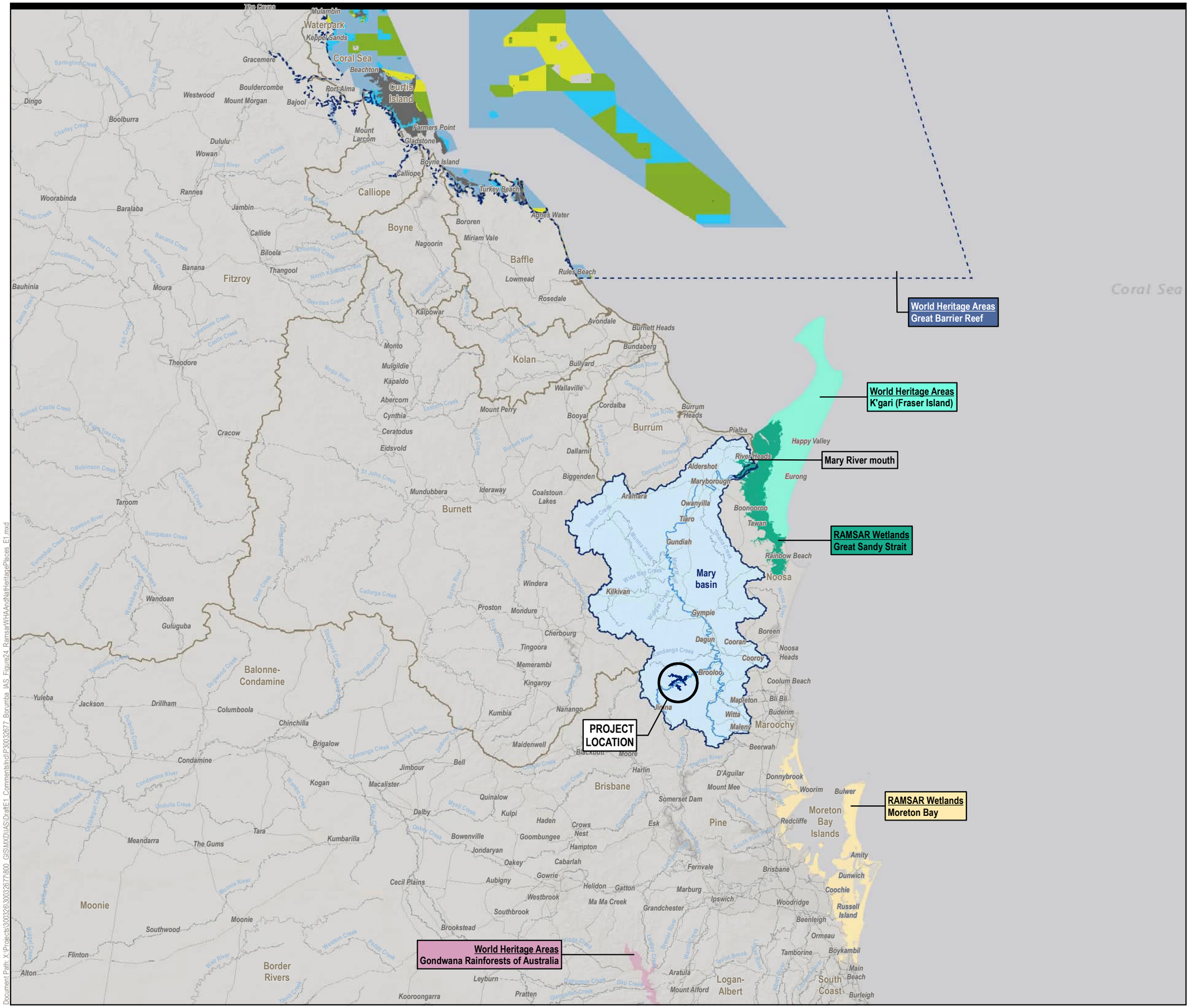
Borumba Pumped Hydro Project | Initial Advice Statement

THREATENED AQUATIC FAUNA RECORDS

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 7/09/2023
REVISION:	E1

FIGURE 23

Document Path: X:\Projects\30032630\30032677\800_GIS\MXD\IAS\Draft\E1_CommentsInd\P30032677_Borumba_IAS_Figure23_ThreatenedAquaticFaunaRec_E1.mxd



Queensland Hydro

Coordinate System: GDA2020 (Datum: GDA2020 / Units: Degree)

0 20 40 km

1 cm = 20 km (when printed @ A3)

LEGEND

- Mary River & Yabba Creek
- Major watercourse lines
- State controlled road
- Lower and upper reservoirs

Queensland Ramsar Wetlands

- Great Sandy Strait
- Moreton Bay

Queensland World Heritage Areas

- Great Barrier Reef
- Gondwana Rainforests of Australia
- K'gari (Fraser Island)

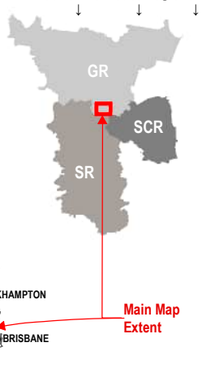
Great Barrier Reef Coast Marine Park Zoning

- Conservation park zone
- General use zone
- Habitat protection zone
- Marine national park zone
- Not specified

Queensland Drainage Basins

- Mary basin
- Other QLD drainage basins

OVERVIEW
Gympie Regional, Somerset Regional, Sunshine Coast Regional



Data Sources:

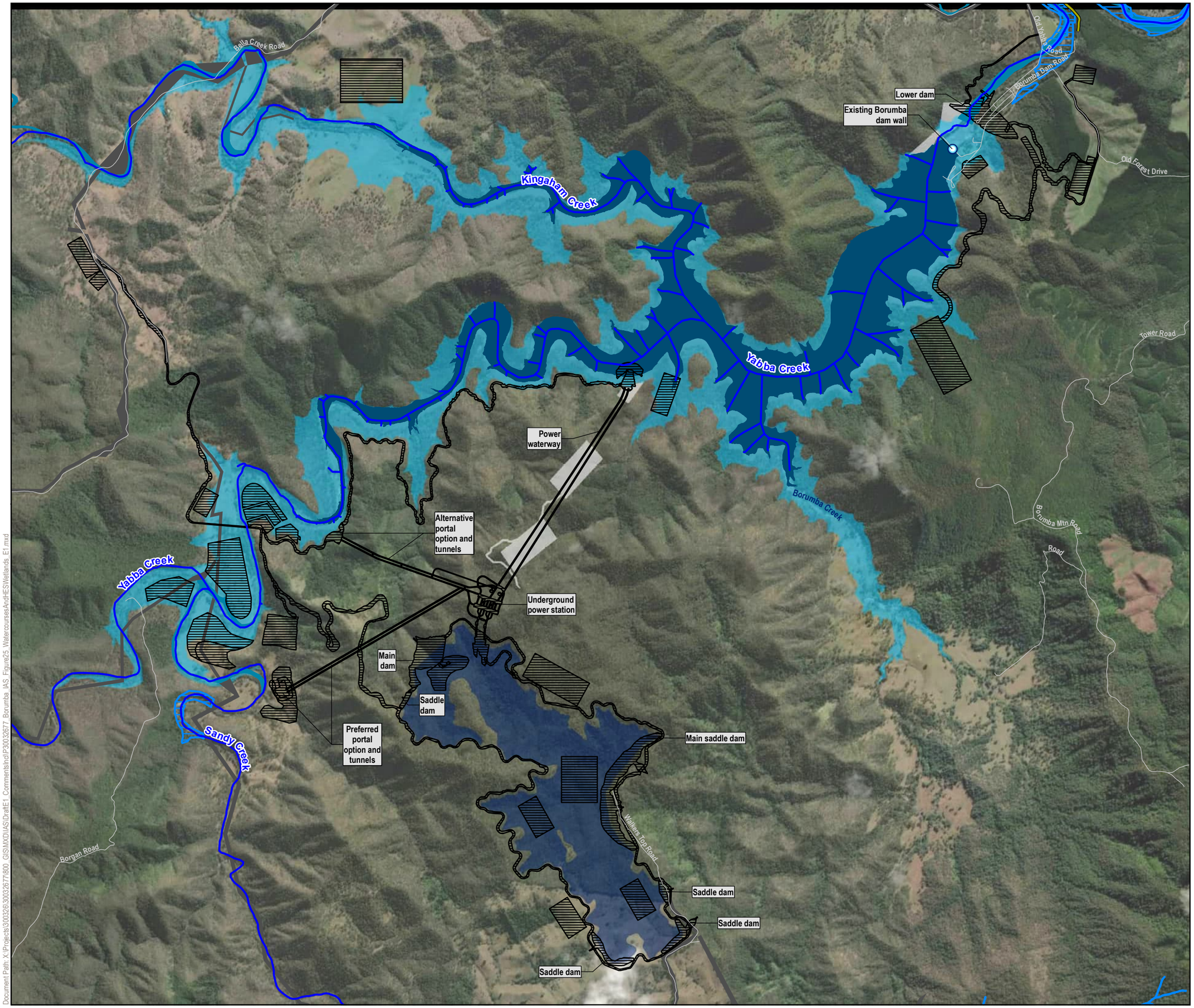
1. State Controlled Roads © State of Queensland (Transport and Main Roads), 2020
2. Ramsar sites - Queensland © State of Queensland (Department of Environment and Science) 2023
3. Great Barrier Reef coast marine park zoning © State of Queensland (Department of Environment and Science) 2023
4. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
5. World Light Gray Canvas Base @ Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Borumba Pumped Hydro Project | Initial Advice Statement

RAMSAR WETLANDS, WORLD HERITAGE AREAS AND NATIONAL HERITAGE PLACES

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 7/09/2023
REVISION:	E1

FIGURE 24



Document Path: X:\Projects\30032\30032677\800_GIS\MXD\AS\Draft\E1_Comments\ncl\P30032677_Borumba_IAS_Figure25_WatercoursesAndHESWetlands_E1.mxd

Queensland Hydro

GDA2020 MGA Zone 56

0 350 700 Metres

1 cm = 350 m (when printed @ A3)

LEGEND

- Borumba dam (existing)
- State controlled roads
- Local road
- Main works design footprint features

Cadastre

- Road / unlinked parcel
- Watercourse
- Conondale Resources Reserve

Reservoir water levels

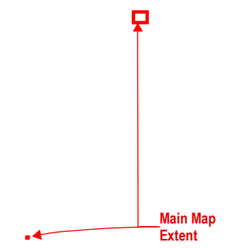
- Lower reservoir (FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)
- Lower reservoir (current FSL 135.01m AHD)

MSES High ecological significance wetlands

- HES Wetlands
- Watercourse

OVERVIEW
Gympie Regional, Somerset Regional, Sunshine Coast Regional

OVERVIEW
Queensland



Data Sources:
1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses and Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Waterways for waterway barrier works © State of Queensland (Department of Agriculture and Fisheries) 2020
7. Matters state environmental significance - high ecological significance wetlands © State of Queensland (Department of Environment and Science) 2022.
8. Imagery @ Basemap World Imagery

Borumba Pumped Hydro Project | Initial Advice Statement

WATERCOURSES & HES WETLANDS

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 25

3.2 Social and economic

3.2.1 Regional social and economic profile

The Project is largely located within the Gympie Regional Council LGA in Southeast Queensland, with a small section of the upper reservoir within Somerset Regional Council LGA. Construction access to the upper reservoir will likely occur via routes through Somerset Regional Council LGA. Gympie, the main population and service centre of the LGA, is approximately 49 km north-east of the Project.

The Gympie Regional Council LGA spans approximately 6,989 km^2 and is largely rural with some urban and rural-residential areas. Key industries of the LGA include agriculture, manufacturing, and tourism (Gympie Regional Council, 2022).

The population of Gympie LGA was 53,851 people and for Somerset LGA 25,391 people at the 2021 census (ABS, 2022). The population of the Gympie LGA is projected to reach 60,088 people by 2041 (QGSO, 2018). Imbil is the closest town to the Project, with a population of 443 people recorded at the 2021 Census (ABS, 2022).

Key social and economic trends of the LGAs include:

- The gross regional product of the Gympie LGA in June 2022 was approximately $2.4 billion and there was an estimated 21,131 jobs located in the LGA with an average annual growth rate of 2.4% (.id community, 2023). While for the Somerset LGA, the gross regional product was approximately $1.1 billion and 8,138 jobs.
- At March quarter 2023, the unemployment rate was 5.3% for the Gympie LGA and 6.7% for the Somerset LGA, which is relatively high compared to the unemployment rate for Queensland as a whole (3.8%) (.id community, 2023).
- In 2021/2022 the top three industries of employment in the Gympie LGA were health care and social assistance, education and training, and retail trade. While for the Somerset LGA, the top three were manufacturing, agriculture, forestry and fishing and education and training (.id community, 2023).
- At the 2021 Census, 4.4% of the population in the Gympie LGA and 4.7% of the population in the Somerset LGA identified as being of Aboriginal and/or Torres Strait Islander origin (ABS, 2022).
- There is a limited proportion of unoccupied private dwellings available in the Gympie LGA with the large majority (89.1%) of private dwellings occupied (ABS, 2022). In August 2022, the vacancy rate within the LGA was extremely low at around 0.5% (SQM Research, 2022). Stakeholders engaged to date have raised housing availability as a key issue in the LGA.

3.2.2 Land use and tenure

3.2.2.1 Key local and regional land uses

In the Mary River catchment, forestry, conservation, and urban areas are the dominant land uses, together with grazing. A population of approximately 200,000 reside in the catchment, concentrated to large town centres such as Gympie, Maryborough, and Cooroy. The nearest population centres to the Project include Imbil, Brooloo and Jimna located approximately 11 km to 21 km from the Project.

Regional planning interests in the vicinity of the Project comprise Strategic Cropping Areas (SCA) mapped on Kingaham Creek and Yabba Creek, and a Priority Living Area mapped across approximately 90 ha of the upper reservoir. Most of the area surrounding the existing Lake Borumba is also mapped as important agricultural areas.

The major land uses (State of Queensland, 2019), by area, in the Project vicinity are native vegetation grazing, reservoir/dam, and nature conservation (Figure 26). Other land uses include:

- services
- production native forests
- plantation forestry
- residential (adjacent Borumba dam)
- river.

The existing Lake Borumba stores water for drinking as well as irrigation as part of the Mary Valley Water Supply Scheme with the surrounding area designed as a water supply buffer area under the State Planning Policy. Recreational land and water-based activities currently permitted in and around Lake Borumba include:

- boating and fishing
- use of picnic and recreation areas on the lake foreshores
- use of the camping ground and kiosk located downstream of the existing Borumba dam wall.

The far northern extent of Conondale National Park envelops Lake Borumba. Recreational values of the national park (i.e. walking tracks, 4WD access and camping) are concentrated further south of Lake Borumba, surrounding the Booloumba Creek camping and day-use areas. The interface between Lake Borumba and national park likely provides critical habitat for a variety of flora and fauna, including threatened species and ecological communities, as discussed in Section 3.1.4.

At FSL, the lower reservoir will inundate approximately 16 ha of Imbil State Forest (Lot 135FTY1911) and 1 ha of Yabba State Forest (Lot 986FTY1720). Imbil State Forest is currently under a plantation licence for commercial forestry operations. The area affected within Yabba State Forest is understood to be leased for grazing operations.

3.2.2.2 Key local and regional land tenures

Key land tenures in and around the Project include national park, reserve, state forest, state land, lands lease, easement and freehold (Figure 26, Figure 27). Table 13 lists the properties within the Project Footprint

Queensland Hydro

SMEC
Member of the Surbana Jurong Group

GDA2020 MGA Zone 56

0 0.4 0.8 Kilometers

1 cm = 0.4 km (when printed @ A3)

LEGEND

- Borumba dam (existing)
- Watercourse
- State controlled roads
- Local road
- QLD Hydro land holding
- Main works design footprint features

Cadastre

- Strata
- Lot type parcel
- Road / unlinked parcel
- Watercourse

Reservoir water levels

- Lower reservoir (FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

Land use

- Nature conservation
- Grazing native vegetation
- Production native forests
- Plantation forests
- Irrigated cropping
- Irrigated perennial horticulture
- Residential and farm infrastructure
- Services
- Reservoir/dam
- River

Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Queensland Land Use @ State of Queensland (Department of Environment and Science), June 2019
7. Imagery @ Basemap World Imagery

Disclaimer:

 While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document. SMEC shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

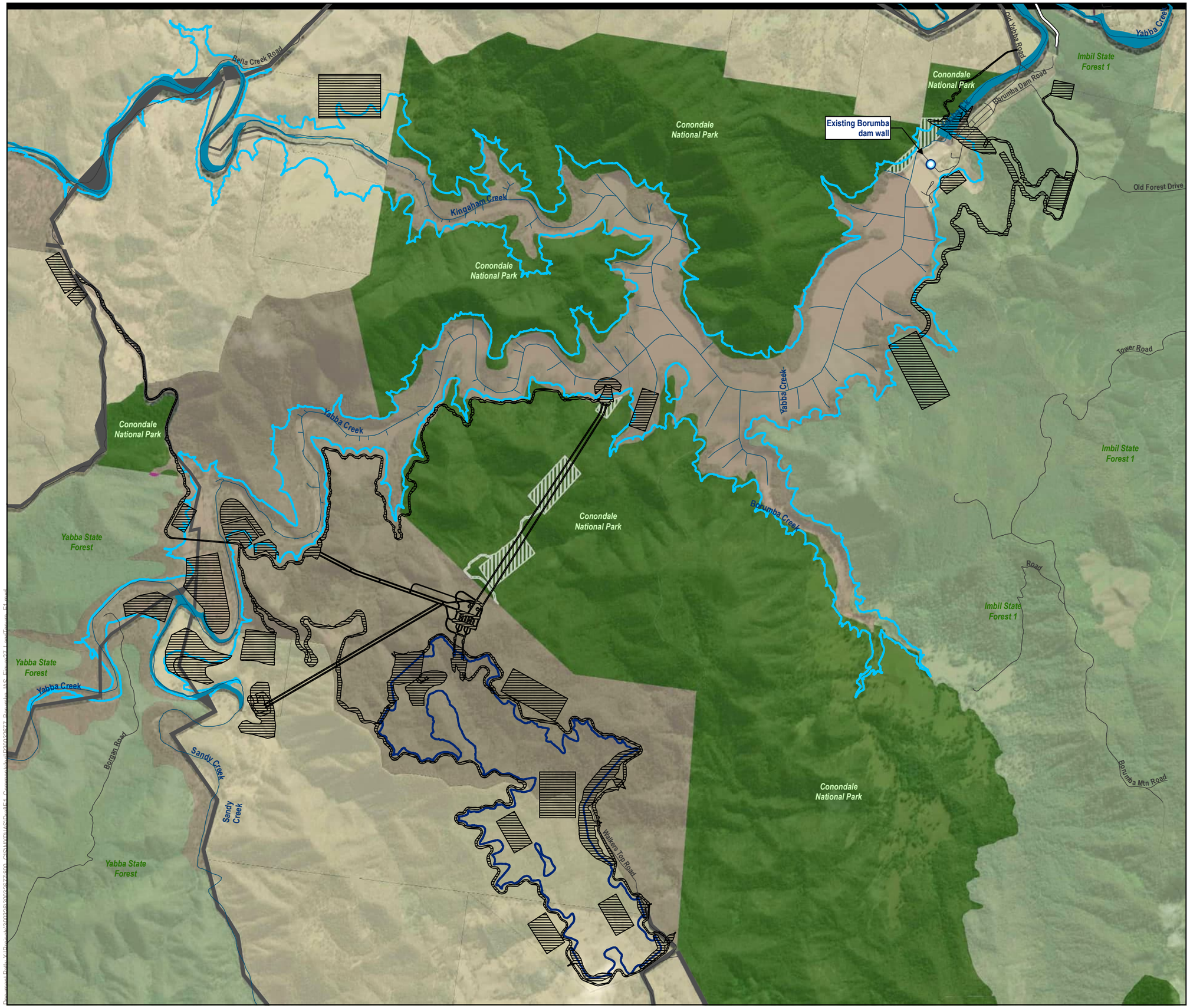
Borumba Pumped Hydro Project | Initial Advice Statement

LAND USE / LOT PARCELS

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 26

Document Path: X:\Projects\30032\30032677\800_GIS\MXD\IAS\Draft\E1_Comments\Ind\P30032677_Borumba_IAS_Figure26_LUAndLotParcels_E1.mxd



Queensland Hydro

GDA2020 MGA Zone 56

0 350 700 Metres

1 cm = 350 m (when printed @ A3)

LEGEND

- Borumba dam (existing)
- State controlled roads
- Local road
- Main works design footprint features

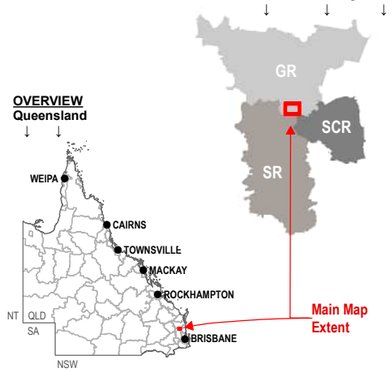
Cadastre

- Easement
- State Land
- National park
- State forest
- Freehold
- Reserve
- Road / unlinked parcel
- Watercourse
- Conondale Resources Reserve

Reservoir water levels

- Lower reservoir (FSL 155 m AHD)
- Upper reservoir (FSL 490.5 m AHD)

OVERVIEW
Gympie Regional, Somerset Regional, Sunshine Coast Regional



Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022; Preffered Option @ SMEC, July 2023
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Imagery @ Basemap World Imagery

Disclaimer:

 While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, this map contains data from a number of sources - no warranty is given that the information contained on this is free from error or omission. Any reliance placed on such information shall be at the sole risk of the user. Please verify the accuracy of all information prior to using it. This map is not a design document. SMEC shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.

Borumba Pumped Hydro Project | Initial Advice Statement

LAND TENURE

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 27

Table 13: Land parcel details

Lot on plan	Property name	Land use	Tenure
9LX1191	-	Grazing native vegetation	Freehold
764L37551	-	Grazing native vegetation	Freehold
71LX1871	-	Grazing native vegetation	Freehold
68LX1017	-	Grazing native vegetation	Freehold
64LX2110	-	Grazing native vegetation	Freehold
5RP862823	-	Grazing native vegetation	Freehold
5LX2071	-	Grazing native vegetation	Freehold
4SP235875	-	Grazing native vegetation	Freehold
4RP862823	-	Grazing native vegetation	Freehold
4RP12420	-	Grazing irrigated modified pastures	Freehold
4LX1758	-	Grazing native vegetation	Freehold
469L37328	-	Grazing native vegetation	Freehold
42LX997	-	Grazing native vegetation	Freehold
3SP235875	-	Grazing native vegetation	Freehold
3RP98849	-	Grazing native vegetation	Freehold
3RP181255	-	Residential and farm infrastructure	Freehold
2RP98849	-	Nature conservation	Freehold
2RP73082	-	Grazing native vegetation	Freehold
2RP194600	-	Grazing native vegetation	Freehold
24LX2529	-	Grazing native vegetation	Freehold
20LX2469	-	Grazing native vegetation	Freehold
1RP98849	-	Grazing native vegetation	Freehold
1RP210860	-	Residential and farm infrastructure	Freehold
1RP194600	-	Grazing native vegetation	Freehold
1RP193739	-	Grazing native vegetation	Freehold
1RP181255	-	Grazing native vegetation	Freehold
1725LX1758	-	Grazing native vegetation	Freehold
1724LX1758	-	Grazing native vegetation	Freehold
1723L37994	-	Grazing native vegetation	Freehold
16LX1925	-	Grazing native vegetation	Freehold
132LX2385	-	Intensive uses (services)	Freehold
1250L37764	-	Grazing native vegetation	Freehold
1189L37732	-	Grazing native vegetation	Freehold
KCP845218	-	Production native forests	Lands Lease
151CP827300	Mary Valley Branch Railway (closed)	Production native forests / grazing native vegetation	Lands Lease
7AP23765^	Conondale National Park	Nature conservation	National Park
6AP23765^	Conondale Resources Reserve	Nature conservation	National Park

Lot on plan	Property name	Land use	Tenure
5AP23765^	Conondale Resources Reserve	Nature conservation	National Park
5AP23628	Conondale National Park	Nature conservation	National Park
4AP23765	Conondale National Park	Nature conservation	National Park
4AP23628	Conondale National Park	Nature conservation	National Park
3AP23765	Conondale Resources Reserve	Nature conservation	National Park
3AP23628	Conondale National Park	Nature conservation	National Park
2AP23765	Conondale National Park	Nature conservation	National Park
3LX2754	-	Nature conservation	Reserve
2LX2754	-	Nature conservation	Reserve
23LX1912	-	Grazing native vegetation	Reserve
20LX2359	-	Nature conservation	Reserve
1LX2754	-	Nature conservation	Reserve
986FTY1720	Yabba State Forest	Production native forests	State Forest
135FTY1911	Imbil State Forest 1	Production native forests	State Forest
27USL31463	-	Nature conservation	State Land
1726L37733	-	Grazing native vegetation	State Land

^ may be subject to volumetric resumption to support the construction and operations of the tunnel

Queensland Hydro own approximately 2,364 ha of land south-west of Lake Borumba that is reserved for pumped storage hydro development. The properties owned by Queensland Hydro include lots 1LX2754, 2LX2754, 3LX2754, 16LX1925, 20LX2359, KCP845218 (strata parcel of 986FTY1720), and 1723L37994.

Seqwater owns lots 20LX2359 and 132LX2385, where Lake Borumba and the associated operational and recreational facilities (including the Lake Borumba Camping Grounds) are currently located.

Residences and farm infrastructure located on Lot 24LX2529 near Kingaham Creek will be inundated by the lower reservoir at FSL (Figure 26). Due to the close proximity to full supply thresholds and the relocation of Borumba dam further downstream, residences and private infrastructure located on Lot 64LX2110, opposite Lot 24LX2529 (Figure 26 and Figure 27), and Lot 132LX2385 (Figure 26) will be affected. All aforementioned properties and residences are State owned.

All reserves (excl. road reserves) within the Project Footprint are owned and managed by Queensland Hydro, Seqwater and Department of Environment and Science (DES).

A social impact assessment (SIA) would be completed during the EIS process, as directed by the terms of reference.

3.2.2.3 Native title

The Project is located entirely within the Kabi Kabi First Nation Traditional Owners Native Title Claim Group (QUD20/2019) claim. The claim is currently registered, with a determination of native title expected imminently.

Table 14 lists the land parcels impacted by the Project that are likely to require a native title consent, based on the continued existence of native title rights and interests.

It is important to note that while native title may continue to exist on lots 1 and 3 on LX2754, these parcels have been dedicated as Reserves for Electrical Purposes. Given the proposed activity (development of a pumped hydro facility) is consistent with the purpose of the reserve, a native title consent is not required over these parcels unless the State requires a change in tenure.

Table 14: Land subject to Native Title (indication only)

Land parcel	Tenure	Tenure	Purpose
2AP23628	Conondale National Park	National Park	National Park
3AP23628	Conondale National Park	National Park	National Park
4AP23628	Conondale National Park	National Park	National Park
5AP23628	Conondale National Park	National Park	National Park
7AP23628	Conondale National Park	National Park	National Park
3AP23765	Conondale Resources Reserve	National Park	Resources Reserve
5AP23765	Conondale Resources Reserve	National Park	Resources Reserve
135FTY1911	Imbil State Forest 1	State Forest	State forest
986FTY1720	Yabba State Forest	State Forest	State forest
20LX2359	-	Reserve	Strategic land management
23LX1912	-	Reserve	Camping
1726L37733	-	Unallocated state land (USL)	Grazing
	Yabba Creek	USL	Watercourse
	Kingaham Creek	USL	Watercourse
	Sandy Creek	USL	Watercourse

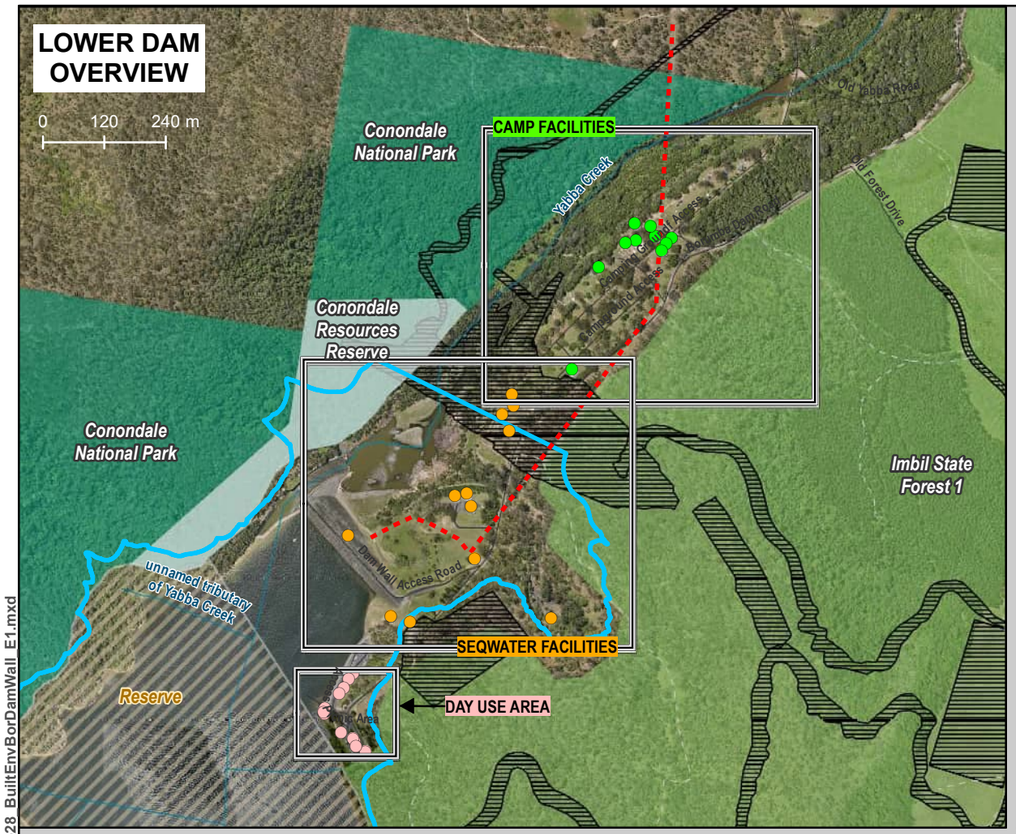
3.2.3 Built environment

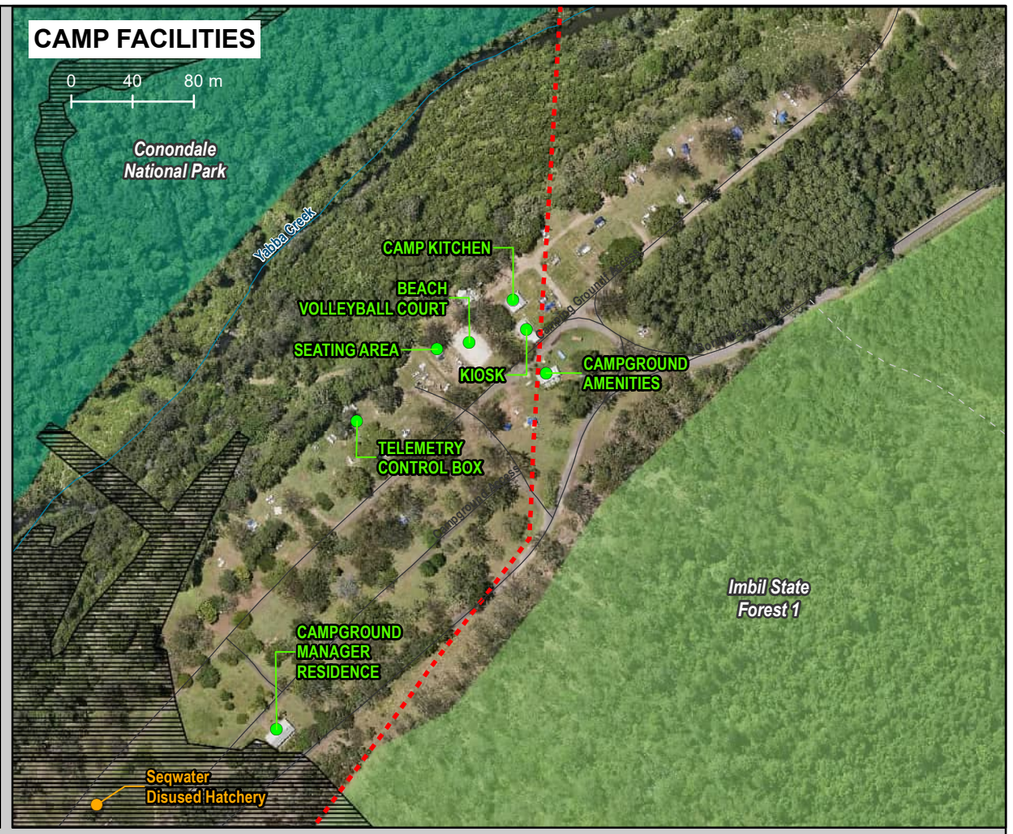
Due to the remote location of the Project, existing infrastructure is largely concentrated to that surrounding the Borumba dam wall (Figure 28). Raising and relocation of Borumba dam wall will result in the inundation of:

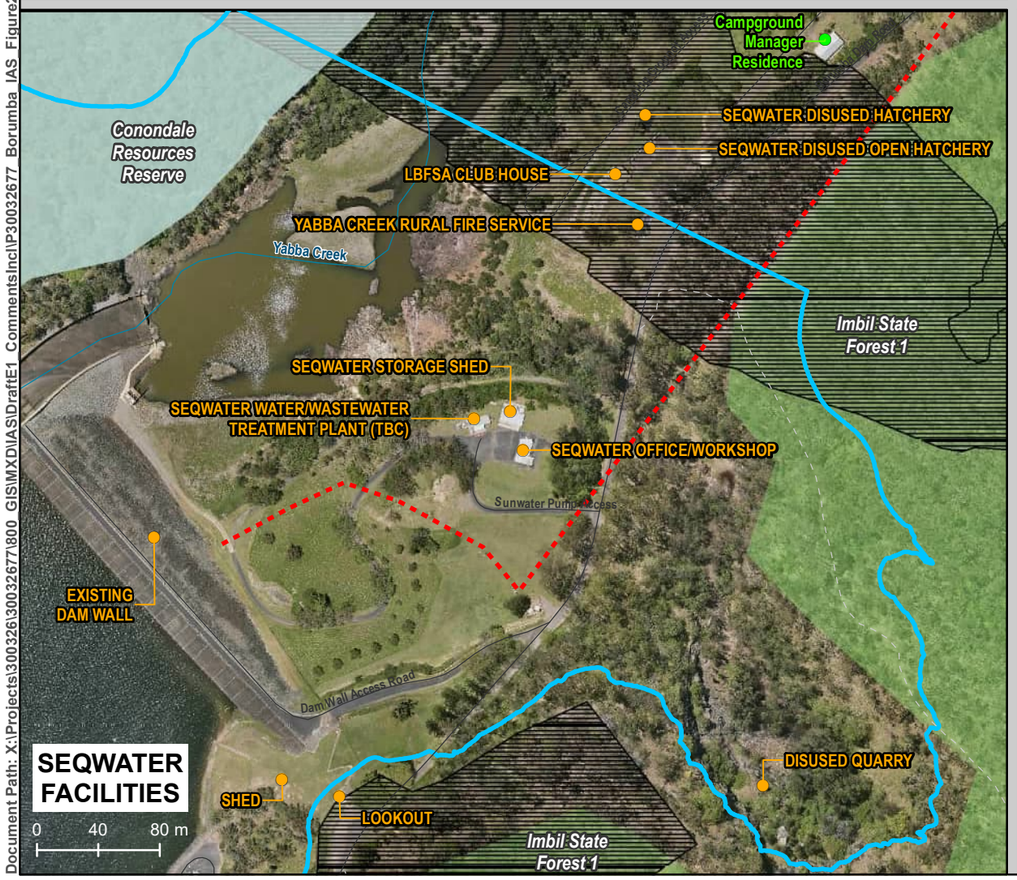
- the existing Borumba dam wall, spillway and associated water offtake infrastructure
- sections of Yabba Creek Road
- approximately 2.3 km of Bella Creek Road
- infrastructure associated with Seqwater operational facilities, including offices/workshops, storage sheds, water/wastewater treatment facilities and Energex powerlines
- Lake Borumba Fish Stocking Association club house
- Yabba creek rural fire service
- disused hatchery
- recreation facilities, including lookout, barbeque and picnic facilities, boat ramp car parking and public toilets
- buildings located on Lot 24LX2529 and Lot 64LX2110.

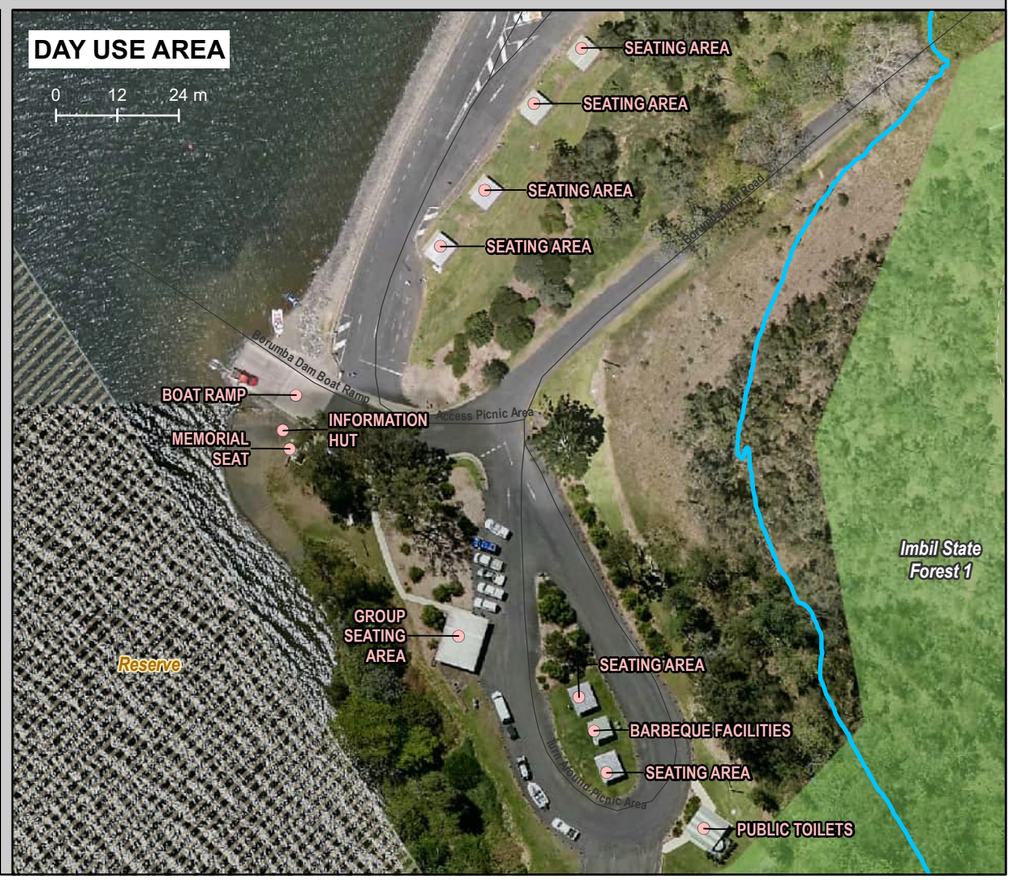
Residences and infrastructure situated within the Lake Borumba Caravan and Camping Grounds (Lot 132LX2385) may also be affected due to their proximity to the new Borumba dam wall.

Infrastructure within the upper reservoir footprint is limited to farm fencing, a cattle yard and an unsealed access track.









Queensland Hydro

GDA2020 MGA Zone 56

scale varies - see individual maps (page printed @ A3)

LEGEND

- Watercourse
- Track
- Local road
- Main works design footprint features

Identified infrastructure

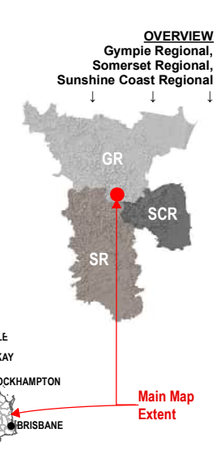
- Seqwater facilities
- Day use area
- Camp facilities
- Powerline

Cadastre - tenure (of interest)

- National park
- Reserve
- State forest
- Conondale Resources Reserve

Reservoir water levels

- Lower reservoir (FSL 155 m AHD)



Data Sources:

1. State controlled roads - Queensland © State of Queensland (Department of Transport and Main Roads) 2020
2. Roads (QRT) @ © State of Queensland (Department of Resources) 2021
3. Site Layout Items FEED 2 @ AFRY, Feb 2023 and GHD Nov 2022
4. Watercourses © State of Queensland (Department of Natural Resources, Mines and Energy) 2022
5. Cadastre © State of Queensland (Department of Natural Resources, Mines and Energy) 2023
6. Powerline @ based on Energex 2022 and Brazier Motti Imagery 2022
7. Imagery @ Brazier Motti, 2022

Borumba Pumped Hydro Project | Initial Advice Statement

BUILT ENVIRONMENT SURROUNDING THE EXISTING BORUMBA DAM WALL

PROJECT #:	30032677
CREATED BY:	BM
LAST MODIFIED:	BM14706, 6/09/2023
REVISION:	E1

FIGURE 28

Document Path: X:\Projects\30032\30032677\800 GIS\MXD\IAS\Draft\E1 Comments\Incl\P30032677 Borumba IAS Figure28 BuiltEnvBorDamWall E1.mxd

3.2.4 Traffic and transport

The main mode of transport to the Project is via the road network, with limited use of commercial aircraft and no active rail network.

The proposed upper reservoir and underground components are currently accessed via local unsealed roads including Bella Creek Road, Borgan Road and Yielo Road, while Lake Borumba is accessible by Yabba Creek Road. Some of these roads may be upgraded in consultation with the relevant road authorities as part of the Exploratory Works, with additional upgrades likely to facilitate the Project. Helicopter landing pads will also be established as part of the Exploratory Works

A traffic and transport assessment would be completed during the EIS process, as directed by the terms of reference.

3.3 Cultural heritage

3.3.1 Indigenous cultural heritage

3.3.1.1 Desktop assessment

The Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships (DSDSATSIP) is responsible for administering the Cultural Heritage Database (the Database) and Register (the Register). It is important to note that the Database is not intended to be conclusive, up to date or comprehensive. It is a research and planning tool used to consider the types and frequency of Aboriginal cultural heritage within an area and is not a reliable indicator of the presence or absence of cultural sites.

A search of the Database did not identify any recorded Aboriginal cultural heritage within the proposed Project Footprint. A range of Aboriginal cultural heritage sites are recorded on the Database to the east of the Project in Imbil State Forest. A further two sites are registered within mountainous terrain approximately 2 km north of the existing dam wall.

3.3.1.2 Field Assessment

In 2022, Queensland Hydro commissioned Kabi Kabi and their technical advisors to undertake a detailed Cultural Heritage Survey of the Project Footprint. The survey was based on project data available in August 2022 and covered the following areas:

- Lower reservoir inundation area
- Lower reservoir dam wall
- Upper reservoir inundation area
- Upper reservoir, including the main dam and saddle dams
- Exploratory Works contractors camp (Bella Creek Road)
- Walkers Top Road

The Cultural Heritage Survey was undertaken by a rotating roster of Kabi Kabi representatives, with archaeological assistance provided by their preferred technical advisor, Archaeo Cultural Heritage Services (Archaeo).

At the outset of the survey, Kabi Kabi provided Queensland Hydro with a statement identifying the Project Footprint and surrounding areas as a culturally significant part of Country containing both tangible (environmental) and intangible (transmigration or spiritual) aspects. A confidential Cultural Heritage Survey Report submitted by Archaeo on behalf of Kabi Kabi includes recommendations to mitigate and manage these potential impacts.

Further archaeological surveys, investigations as well as engagement with local and regional Aboriginal parties and cultural heritage bodies will be undertaken as part of further environmental assessment for the Project.

3.3.2 Non-Indigenous

Searches of the Queensland Heritage Register, the Australian Heritage Database, the Gympie Regional Council local heritage register and the Somerset Regional Council local heritage register did not identify any non-Indigenous heritage sites, places or objects within, or within close proximity to, the Project.

There are two national heritage places within 350 km of the Project:

- K’gari (Fraser Island) National Heritage Place
- Great Barrier Reef National Heritage Place.

3.4 Planning instruments and government policies

This section describes key legislation and government policies relevant for the Project. The potential approvals required for the Project are identified in Section 6.

3.4.1 Commonwealth legislation

3.4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides the Commonwealth legal framework to protect and manage MNES. The nine MNES categories protected under the EPBC Act are:

- world heritage properties
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- migratory species protected under international agreements
- Commonwealth marine areas
- the Great Barrier Reef Marine Park (GBRMP)
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

Under the EPBC Act, an action must be referred to the Commonwealth Minister for the Environment if it has, will have, or is likely to have a significant impact on any MNES or other protected matter. Upon a referral, the Commonwealth Minister will determine if the action is a "controlled action" requiring assessment and approval. The EPBC Act enables bilateral management of relevant matters between the Australian and State Governments.

The Project will be referred to the Commonwealth DCCEEW. Should the Project be determined to be a controlled action by the Commonwealth Minister for the Environment and receive a coordinated project declaration, Queensland Hydro would request that the Bilateral Agreement between the Commonwealth and the State of Queensland be utilised to allow a single environmental impact statement process for the Project.

The EPBC Act Environmental Offsets Policy (2012) was developed to support the management and protection of MNES under the EPBC Act and outlines the Australian Government’s approach to the use of environmental offsets for impacts to MNES. MNES (listed threatened ecological communities, threatened flora and fauna species) are known and predicted to occur in the Project Footprint.

The Project will implement avoidance and mitigation measures to minimise the significant residual adverse impacts on the MNES. However, offsets will be required for the Project.

Offsets provided for under the policy include direct offsets, and other compensatory methods (or indirect offsets). It is likely that a combination of methods will be applicable to the Project, based on the extent of the significant residual adverse impacts on MNES.

3.4.1.2 Native Title Act 1993

The *Native Title Act 1993* (NT Act) (Cth) provides a framework for the recognition and determination of the rights and interests of Indigenous Australians in relation to land and waters. The NT Act sets out processes that must be followed for any ‘future act’ on land or waters that may affect native title rights and interests as well as mechanisms for negotiation and compensation between Indigenous parties and Proponents.

A registered claim gives a native title party certain procedural rights regarding works within areas covered by the claim. One registered native title claim (Kabi Kabi First Nation Traditional Owners Native Title Claim Group, QC2018/007) applies to the Project.

3.4.1.3 Electricity—National Scheme (Queensland) Act 1997

The *Electricity – National Scheme (Queensland) Act 1997* governs Queensland's participation in the National Electricity Market (NEM) by applying the National Electricity Law in Queensland. The law establishes the governance and enforcement framework and key obligations surrounding the national electricity market and the regulation of access to electricity networks. The National Electricity Law is supported by further regulations and the National Electricity Rules.

3.4.2 Queensland legislation

3.4.2.1 State Development and Public Works Organisation Act 1971

The *State Development and Public Works Organisation Act 1971* provides the Coordinator-General the power to declare a project to be a 'coordinated project', based on a range of criteria related to the project's size, complexity, significant employment or investment opportunities or potential effects on infrastructure and/or the environment. Once a project is declared a coordinated project, an environmental impact statement (EIS) is usually required to ensure the project's environmental, social and economic impacts are appropriately considered. A coordinated project may use the impact assessment report (IAR) process if the Coordinator-General is satisfied that the environmental effects of the project do not, having regard to their scale and extent, require assessment through the EIS process.

The Coordinator-General has wide-ranging powers to plan, deliver and coordinate large-scale infrastructure projects. For example, the Coordinator-General can also establish State Development Areas, which are clearly defined areas of land established to promote economic development in Queensland.

If a project has the potential to have a significant impact on an MNES, the project proponent must refer it to the Commonwealth Minister for the Environment under the EPBC Act. If the Minister determines that a project may have an impact on MNES, it is deemed to be a 'controlled action'.

If an environmental impact assessment of a controlled action is required, including through an EIS process, the assessment may be conducted under the Queensland environmental assessment bilateral agreement with the Australian Government. This eliminates unnecessary duplication.

The coordinated project process replaces the information and referral stages of a related assessment under both the *Planning Act 2016* (Planning Act) (for a material change of use development application process) and an environmental authority (EA) under the *Environmental Protection Act 1994*. The decision stage under both of these Acts commences when the Coordinator-General's evaluation report on the EIS or impact assessment report is provided to the relevant assessment manager or administering authority.

3.4.2.2 Planning Act 2016

The purpose of the Planning Act is to establish an efficient, effective, transparent, integrated, coordinated, and accountable system of land use planning, development assessment and related matters that facilitates the achievement of ecological sustainability. It has three main elements: plan making, development assessment and dispute resolution. The Planning Act provides for the making of State and local planning instruments that guide strategic planning and development throughout the State, including local government planning schemes.

3.4.2.3 Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) Protects Queensland's environment while allowing for development that improves total quality of life, now and in the future, in a way that maintains the ecological processes on which life depends. It establishes mechanisms for the protection of the environment, including creating a 'general environmental duty', regulating contaminated land, licensing environmentally relevant activities (ERA); and issuing environmental protection policies and regulations under the EP Act.

The general environmental duty is defined in section 319 of the EP Act and states that 'a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm'. Section 320A of the EP Act also outlines the requirement to give notice where serious or material environmental harm is caused or there is a risk of such harm, and that harm is not authorised.

3.4.2.4 Fisheries Act 1994

The *Fisheries Act 1994* (Fisheries Act) establishes a framework for the management and protection of fisheries resources, including regulating development that might impact declared fish habitat areas and fish passage. It also regulates the taking and possession of specific fish, removal of marine vegetation, the control of development in areas of fish habitat, and lists noxious fish species.

Waterway barrier works are regulated under the Planning Act. The Fisheries Act establishes a risk hierarchy for waterway barrier works across Queensland and guides the design and assessment process for the implementation of new waterway crossings.

3.4.2.5 Queensland Heritage Act 1992

The *Queensland Heritage Act 1992* provides for the conservation of Queensland's non-Indigenous heritage through the establishment and maintenance of the Queensland Heritage Register and the regulation of development of registered places. This Act also requires local government to prepare and maintain a local heritage register.

Development on or adjoining a Queensland heritage place is considered assessable development and requires development approval under State code 14, unless the activity meets relevant accepted development criteria, or an exemption applies under the Planning Regulation 2017.

3.4.2.6 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) establishes the framework for the management of vegetation in Queensland except for state forests, national parks, forest reserves and certain other tenures defined under the *Forestry Act 1959* and the *Nature Conservation Act 1992*.

The Planning Act regulates the clearing of vegetation protected under the VM Act. Generally, clearing of vegetation to which the VM Act applies is assessable development under the Planning Act and would require a development approval in accordance with that Act, unless an exemption under the Planning Regulation 2017 applies or the clearing meets relevant accepted development criteria. A development application can only be lodged if it is for a relevant purpose.

3.4.2.7 Water Act 2000

The *Water Act 2000* (Water Act) provides a legislative basis for the sustainable planning and management of Queensland's water resources and outlines the State's interests for riverine protection. It regulates matters relating to activities within waters recognised under the Water Act, including taking and interfering with water and excavating or placing fill in a watercourse. It also governs the establishment and operation of water authorities and water licences; however, this is not coordinated under the Planning Act.

The following activities are considered assessable development and may require development approval under the relevant state code, unless the activity meets the relevant accepted development criteria and/or an exemption applies under the Planning Regulation 2017:

- taking or interfering with water (State code 10)
- removal of quarry materials from a watercourse or lake (State code 15)
- removal of vegetation within a watercourse (State code 15).

The existing dam is located within the Water Plan (Mary Basin) 2006 area and operates in accordance with the water plan and the existing water entitlements of the Mary Valley Water Supply Scheme. The water plan provides a framework for sustainably managing water and the taking of water so that water is allocated and sustainably managed in a way that recognises the natural state of watercourses, lakes and springs has changed because of water infrastructure, flow supplementation. The water plan also specifically identifies ecological outcomes for the following area:

> *(b) Mary River, upstream of the Mary River barrage pondage—*
>
> *(i) to minimise changes to the low flow regime of the river; and*
>
> *(ii) to minimise changes to the hydraulic habitat requirements of species such as the Mary River cod, the Mary River turtle and lungfish;*

The Queensland Government Department of Environment and Science approved IQQM model has been used to assess the Project's compliance with the Water Plan (Mary Basin) 2006 WASOs and EFOs and found that all mandatory EFOs and WASOs were met in all Project scenarios.

It is noted that the water plan was due to expire in September 2021 but was extended to May 2024 to allow the Queensland Government Department of Regional Development, Manufacturing and Water (DRDMW) to complete technical assessments and undertake adequate consultation to address current and emerging issues as part of the replacement process of the Water Plan (Mary Basin) 2006. The consultation draft of the Water Plan (Mary Basin) 2023 (draft water plan) was released in February 2023. Queensland Hydro has consulted with DRDMW to provide input and obtain advice on the contents of the draft water plan, which may have implications for the Project. Queensland Hydro is reviewing the draft water plan, including new performance indicators and associated EFOs, WASOs and unallocated water reserves, and undertaking additional modelling to understand alignment of the Project with the draft water plan. Further modelling is expected to be required to develop the operating regime for the lower reservoir to meet the proposed objectives adopted for the draft water plan.

3.4.2.8 Water Supply (Safety and Reliability) Act 2008

The *Water Supply (Safety and Reliability) Act 2008* (WSSR Act) provides for the safety and reliability of water supply. It includes provisions for the registration of service providers who supply water, service provider reporting requirements, safety requirements for dam management (including failure impact assessment), emergency action planning, flood mitigation, and other general matters related to referable dam management.

A dam is referable if a failure impact assessment demonstrates there would be people at risk if the dam were to fail. Referable dams are considered assessable development and requires development approval under State code 20 unless an exemption applies under the Planning Regulation 2017.

3.4.2.9 Nature Conservation Act 1992

The NC Act aims to conserve nature in Queensland, while allowing for the involvement of Indigenous people in the management of protected areas in which they have an interest under Aboriginal tradition or Island custom. A framework is created under the NC Act for the dedication, declaration and management of protected areas, protection of wildlife and its habitat.

The NC Act also includes mechanisms for the management of protected areas.

The Nature Conservation (Animals) Regulation 2020 and the Nature Conservation (Plants) Regulation 2020 prescribes species for protection in accordance with the categories set out in the Act.

It is an offence to take protected wildlife without a licence, permit or other authority (section 320). It is also an offence for a person, without a reasonable excuse, to tamper with an animal breeding place being used by a protected animal to incubate or rear offspring (section 335, Nature Conservation (Animals) Regulation 2020).

3.4.2.10 Aboriginal Cultural Heritage Act 2003

The *Aboriginal Cultural Heritage Act 2003* (ACH Act) provides for the effective recognition, protection, and conservation of Aboriginal cultural heritage. The Act requires anyone who carries out a land-use activity to comply with the cultural heritage duty of care by taking all reasonable and practicable measures to ensure their activity does not harm Aboriginal cultural heritage. This duty of care applies to any activity where Aboriginal cultural heritage may be harmed, regardless of whether it has been previously identified, recorded on a database or located in, on or under private land.

3.4.2.11 Native Title (Queensland) Act 1993

The *Native Title (Queensland) Act 1993* is a state-specific legislation that was developed to be consistent with standards set by the *Native Title Act 1993* (Cth). The Act ensures a coordinated approach to the recognition and determination of native title, with the Commonwealth Act providing the overarching framework and the Queensland Act providing a process for the unique circumstances and requirements of the State.

This Act is applicable to development on State-owned land, including national park and state forest.

3.4.2.12 Acquisition of Land Act 1967

The *Acquisition of Land Act 1967* enables a constructing authority to resume land if required for a public purpose. Where Queensland Hydro is the proponent, it is not considered a constructing authority for the purposes of the *Acquisition of Land Act 1967*.

3.4.2.13 Biosecurity Act 2014

The *Biosecurity Act 2014* provides a framework for minimising and managing biosecurity risks in Queensland, ensuring the safety of agricultural inputs, aligning responses to biosecurity events to national and international obligations, and managing risks associated pests, diseases, and contaminants.

The Biosecurity Act establishes a general biosecurity obligation that requires all people in Queensland to be responsible for managing biosecurity risks that are under their control and that they know about or should reasonably be expected to know about. It also defines prohibited and restricted biosecurity matter and places.

3.4.2.14 Building Act 1975

The *Building Act 1975* identifies what building work is assessable development or accepted development under the Planning Act. It imposes requirements for building development applications (in addition to those in the Planning Act) and regulates the assessment and approval of building development applications, building inspections and certain safety requirements.

3.4.2.15 Forestry Act 1959

The *Forestry Act 1959* provides for the management, silvicultural treatment, and protection of State forests. It also provides the framework for the sale and disposal of forest products, quarry material and Crown property within State forests, timber reserves and other lands. Under this Act, quarry material includes stone, gravel, sand, rock, clay, earth, and soil.

3.4.2.16 Land Act 1994

The *Land Act 1994* administers and manages non-freehold land, deeds of grant in trust, and the creation of freehold land and related purposes. Land to which this Act applies must be managed for the benefit of the people of Queensland.

This Act applies to all land, including land that is, whether permanently or from time to time, covered by water subject to tidal influence. Although this Act generally applies to non-freehold land, most freehold land contains a reservation to the State for minerals. To that extent, this Act applies to all land. Layers and strata above and below the surface of land may be dealt with under this Act.

3.4.2.17 Transport Infrastructure Act 1994

The *Transport Infrastructure Act 1994* provides a framework for integrated planning and efficient management of transport infrastructure. This includes restrictions on works within existing rail corridors and State-controlled roads.

3.4.2.18 Regional Planning Interests Act 2014

The *Regional Planning Interests Act 2014* identifies and protects areas of Queensland that are of regional interest. In doing this, this Act seeks to manage the impact and support coexistence of resource activities and other regulated activities in areas of regional interest. There are four areas of regional interest including priority agricultural areas, priority living areas, strategic environmental areas, and SCAs.

3.4.2.19 Environmental Offsets Act 2014

The *Environmental Offsets Act 2014* provides a framework for the delivery of environmental offsets in Queensland. An environmental offset is defined as an activity undertaken to counterbalance a significant residual impact of a prescribed activity on a prescribed environmental matter.

The *Environmental Offsets Act 2014* also states that an environmental offset must achieve a conservation outcome for the impacted prescribed environmental matter. A conservation outcome is achieved by an environmental offset if the offset is selected, designed, and managed to maintain the viability of the prescribed environmental matter. That is, to maintain the status quo of the prescribed environmental matter as if the development and environmental offset had not occurred.

The Queensland environmental offsets framework includes:

- *Environmental Offsets Act 2014*, which coordinates the delivery of environmental offsets across jurisdictions and provides a single point-of-truth for offsets in Queensland.
- Environmental Offsets Regulation 2014, which provides details of the prescribed activities regulated under existing legislation and prescribed environmental matters to which the Act applies.
- The Queensland Environmental Offsets Policy Version 1.13 which provides a single, consistent, whole-of-government policy for the assessment of offset proposals to satisfy offset conditions.

Once the administering authority has decided that a prescribed activity is required to provide an offset, the offset is required to be delivered in accordance with the EO Act, Environmental Offsets Regulation 2014 and the Queensland Environmental Offsets Policy.

To avoid duplication of offset conditions between jurisdictions, State and local governments can only impose an offset condition in relation to a prescribed activity, if the same, or substantially the same impact, and the same, or substantially the same matter has not been subject to assessment under the EPBC Act Environmental Offsets Policy (October 2012), *Great Barrier Reef Marine Park Act 1975* (Cth) or another Commonwealth Act prescribed by regulation.

The EO Act does not affect or limit the functions of the Coordinator-General under the SDPWO Act to impose offset conditions irrespective of the EO Act.

3.4.3 Other regulatory instruments

3.4.3.1 Commonwealth

2021 Australian Infrastructure Plan

The 2021 Australian Infrastructure Plan is a practical and actionable roadmap for infrastructure reform (Infastructure Australia , 2021). This plan acknowledges that energy technology is moving fast, and that Australia needs a high-tech, low-cost, low-emissions energy system to power the future, from efficient homes to clean exports. Consumers and businesses would benefit from a planned and proactive transition that prioritises value creating change.

Rewiring the Nation Plan

The Rewiring the Nation Plan announced in October 2020 is designed to bring forward the construction of high voltage infrastructure by lowering financial and planning barriers to the commercial development of large-scale renewable energy resources (Commonwealth of Australia, 2022). This will support new Regional Energy Zone development, with national renewable capacity projected to grow by 26 GW by 2030, increasing to 82% of all NEM generation (up from 68% under current policy). This plan sits alongside the Powering Australia Plan announced in December 2021.

Powering Australia Plan

The Powering Australia Plan aims to decrease Australia's emissions to 43% below 2005 levels by 2030 (with 5% of this reduction attributable to the electricity industry) and legislate Australia's net zero 2050 target (DCCEEW, 2023). It aims to decrease greenhouse gas emissions, create jobs and grow the economy, underpinned by tailored policy measures for three key sectors which collectively account for 79% of national 2020-21 emissions:

- Electricity
- Industry and carbon farming
- Transport.

A 43% reduction in emissions on 2005 levels would see emissions falling to 351 million tonnes in 2030, in Paris budget accounting terms (discussed below), with renewable energy penetration increasing to 82% by 2030. The federal government legislated these targets through The Climate Change Bill 2022 in August 2022, which was then formally lodged as an enhanced Nationally Determined Contribution under the Paris Agreement.

National electricity objective

The operation of the NEM is governed by national electricity rules made by AEMC under the *Electricity – National Scheme (Queensland) Act 1997* (Australian Energy Market Commission, 2022). The national electricity objective explicit in this law is:

"*to promote efficient investment in and efficient operation and use of electricity services for the long-term interests of consumers of electricity with respect to*:

- *price, quality, safety and reliability and security of the supply of electricity*
- *the reliability, safety and security of the national electricity system."*

Operationalising this objective requires infrastructure planning that prioritises investments that deliver the lowest electricity prices for consumers in the long run. This requires system costs to be minimised, subject to meeting reliability, safety and security standards. Modelling demonstrating the service need aims to establish a configuration for the Project which minimises system costs, and the optimal time for the delivery of the project based on the expected energy market benefits. These energy market benefits do not consider other benefits associated with essential system services which are minimum operating standards aimed at ensuring the system is reliable, safe and secure.

Essential system services

These standards, referred to as essential system services, are met through a range of interdependent, technical and operating requirements (AEMO, 2022). Essential system services help keep the electricity grid in a safe, stable and secure operating state as the system transitions to net zero, where the frequency control ancillary services market procures sufficient frequency control ancillary services at any given time.

To meet minimum operating standards requires the right essential system services at the right time and in the right locations to efficiently promote consumers' interests as the sector transitions to net zero. AEMO can procure frequency control ancillary services through the NEM to maintain key technical characteristics of the system. Frequency control ancillary service costs are ultimately borne by consumers through their retailers.

Long-duration PHES, such as the proposed Borumba PHES Project, facilitates the transition to renewables through the provision of essential system services and reducing reliability gaps.

The integrated nature of Queensland's energy system means there will be costs associated with integrating variable renewable energy sources into the system. These will include costs associated with:

- QREZ transmission
- Other transmission (connecting state connectors and general expansion of existing lines)
- Synchronous condensers (to provide inertia services as fossil fuel generators repurpose)
- Storage (various types).

3.4.3.2 State

State Infrastructure Strategy 2002

The State Infrastructure Strategy 2022 (DSDILGP, 2022) presents a clear vision of the Queensland Government's infrastructure requirements over the next two decades. It sets out objectives for infrastructure and the priority actions that will drive the future for Queensland and clarifies challenges and opportunities.

This strategy highlights the Borumba dam Pumped Hydro Study as a current key energy initiative and recognises the need for longer duration storage such as pumped hydro to ensure that the future energy supply remains secure and reliable.

Queensland Energy and Jobs Plan

The Queensland Energy and Jobs Plan, along with the Queensland SuperGrid Infrastructure Blueprint outlines how Queensland's 'SuperGrid' will deliver clean, reliable, and affordable power (DEPW, 2022a); (DEPW, 2022b). Queensland's generation mix will transform over time to include more wind, solar and storage to ensure the State always has enough energy to meet energy demand including at peak times. The Queensland Government is setting two new renewable energy targets of 70% renewable energy by 2032 and 80% by 2035.

The SuperGrid is all the elements in the electricity system, including the poles, wires, solar, wind and storage that will provide Queenslanders with clean, reliable, and affordable power for generations.

The Project is one of the priority projects under the plan and Blueprint.

Pathways to a Clean Growth Economy: Queensland Climate Transition Strategy

This Queensland Climate Transition Strategy outlines how Queensland proposes to prepare for this transition and set itself on the pathway to meet this target (DEHP, 2020). The world is heading toward zero net emissions and the technologies enabling this transition are now competitive. Australia's ratification of the Paris Agreement means the nation will need to reach zero net emissions by 2050.

Powering Queensland Plan

The Powering Queensland Plan sets out the Queensland Government's strategy to guide the State through the short-term and long-term challenges facing Australia's energy markets (DEPW, 2017). The plan sets to reduce emissions and act on climate change, create new jobs and diversify the State's economy. It aims to deliver stable energy prices, ensure long-term security of electricity supply, transition to a cleaner energy sector and create new investment and jobs.

The Project supports this plan, particularly the move to diversified renewable energy, the provision of energy storage, and achieving 50% renewable energy by 2030.

Queensland Bulk Water Opportunities Statement

The Queensland Bulk Water Opportunities Statement guides Queensland's investment in bulk water supply infrastructure (DNRME, 2019). It provides a framework to achieve a balance between the use of existing infrastructure and investment in new projects and identifies four key objectives:

- safety and reliability of dams and urban water supplies
- use existing water resources more efficiently
- support commercial infrastructure that provides a commercial return to bulk water providers
- consider projects that will provide regional economic benefits.

The Project has the potential to contribute to the safety and reliability of dams and urban water supplies given the raising of the dam wall and increased storage in Lake Borumba.

3.4.3.3 Regional

Wide Bay Burnett Regional Plan

The Wide Bay Burnett Regional Plan (2011) establishes a clear vision and direction for the region. It acknowledges that the region's economic drivers are in the agriculture, manufacturing, and renewable energy sectors, together with tourism. The purpose of this plan is to manage regional growth and change in the most sustainable way to protect and enhance quality of life in the region. This plan includes the Gympie Regional Council LGA but not the Somerset Regional Council LGA, which is in southeast Queensland. The current Wide Bay Burnett Regional Plan is under review.

South East Queensland Regional Plan

The South East Queensland Regional Plan 2017 provides a regional framework for growth management, and sets planning direction for sustainable growth, global economic competitiveness, and high-quality living (State of Queensland, 2017). The plan is applicable to the Somerset Regional Council LGA, with the Project overlapping with this jurisdiction.

Gympie Regional Council Planning Scheme

The Gympie Regional Council Planning Scheme 2013 commenced on 1 July 2013 and sets out the Gympie Regional Council's intention for the future development (Gympie Regional Council, 2013).

Somerset Regional Planning Scheme

The Somerset Region Planning Scheme commenced on 1 March 2016 and presents a framework that regulates and manages land use and development in Somerset Region (Somerset Regional Council, 2016). It sets out council's intention for the future development in the planning scheme area.

4. Potential impacts

This section provides a high-level overview of the Main Works Project's potential impacts identified as part of the assessments undertaken to support the DAR, that may occur during construction and operation if not appropriately managed. Potential environmental management and mitigation measures that may be implemented during the construction and operational phases to avoid, minimise and mitigate the potential impacts are outlined in Section 5.

4.1 Natural environment

4.1.1 Land

Construction and operation of the Project has the potential to impact on land values including soils and land contamination.

4.1.1.1 Soils

Potential impacts to soils during construction may include:

- vegetation clearing and disturbance of the soil concentrating runoff and causing soil erosion and sedimentation
- loss of topsoil and subsoil with reduced ability to reinstate disturbed areas following completion of construction, thus exacerbating erosion impacts in the longer term; severe erosion may also destabilise structures such as roads, saddle dams and the dam wall
- visual impacts
- water quality issues such as:
  - increased suspended solids and turbidity (colloidal clays can take a long time to settle out of the water column)
  - increased sedimentation of the dam
  - transport of nutrients into the dam which may create conditions suitable for algal blooms
- sediment may also be deposited in the stream beds, changing the aquatic habitat
- trafficking of soil and soil handling during earthworks have the potential to degrade the quality of the soil resource.

Potential impacts to soil during operation may include:

- inundation of land not previously inundated, bringing about a loss of the soil resource for other productive uses.
- depending on the frequency of water level changes and water currents created in the reservoirs by water transfer between the reservoirs, soils may erode and cause high turbidity levels that may stay elevated for extended periods of time
- potential for settled sediments (particularly of dispersive soils) to be resuspended due to operation of the pumped hydro water transfer, wave action (depending on depth) and inflows (depending on the energy of the systems)
- extended periods of inundation will kill vegetative cover, which may lead to increased erosion due to runoff and wave action
- bank pore-water pressure may change due to altered frequencies of inundation and drawdown leading to bank weakening and bank slumping.

4.1.1.2 Contaminated land

The following land parcels contain potential sources of contamination that may be submerged, or impacted by the Project:

- one livestock dip and former homestead located within Lot 3LX2754 (lower reservoir)
- one livestock dip located within Lot 16LX1925 (upper reservoir)
- potential livestock dip or spray race located within Lot 1723L37994
- two manganese mine workings located within Lot 20LX2359.

Potential sources of contamination located outside areas to be submerged, but in proximity to areas that may be impacted upon by the Project are:

- Yours and Mine Workings – located within Lot 3LX2754
- McAuliffe's Workings – located within Lot 3LX2754
- Sandy Creek Gold Workings – located within Lot 16LX1925
- Old Borumba Homestead a livestock dip and machinery shed – located within Lot 135NPW746.

Contaminants of potential concern include, but are not limited to:

- heavy metals
- total recoverable hydrocarbons C6-C40
- benzene, toluene, ethylbenzene, xylenes and naphthalene
- polycyclic aromatic hydrocarbons
- volatile organic compounds
- semi-volatile organic compounds
- nutrients and pathogens.

Potential sources of contamination associated with construction works (generally) and operational activities include:

- dangerous goods storage and use (diesel, explosives, drilling fluids)
- import of contaminated fill material
- sewage contaminants associated with camp amenities/facilities
- general waste
- generation of spoil material
- dust generation
- erosion.

Sensitive ecological receptors in the vicinity of the Project include surface water aquatic ecosystems associated with Lake Borumba and Yabba Creek along with groundwater (discharging to surface water). Sensitive human receptors include human consumers of aquatic foods, primary and secondary recreational uses, use of groundwater and surface water for drinking, farm supply, stock water, irrigation and industrial use, and cultural and spiritual values. Potential pathways for contaminants to reach sensitive receptors include:

- direct contact with surface water through inundation
- direct contact with surface water due to flooding, the level of which will increase around Lake Borumba because of the raised FSL
- direct contact with groundwater, the level of which may rise because of the raised or new FSLs
- physical disturbance leading to mobilisation of contaminants via rainfall and runoff
- spills or leaks directly into the Lake or watercourses
- migration of contaminants (including sediment and toxicants) due to erosion and surface water runoff/discharges
- migration of contaminants due to leaching
- importation of contaminated material that has the potential to impact on soil, surface water and/or groundwater.

The EIS will assess the Project's potential impacts on land values including soils and contaminated land.

4.1.2 Water

4.1.2.1 Surface water resources

The current planning instruments under the *Water Act 2000* do not take into account the possible raising of Borumba dam and the operation of the Project. Currently there are two main considerations for future planning for the consumption of water in the Mary Basin (Badu Advisory, 2021):

- a new source of water to meet urban and industrial demands for long term growth in the region
- improvement to the total amount of water available for irrigation for horticultural crops in the region.

While the Project does not formally incorporate these considerations, if improvements to water availability and security can be made without compromising the reliability of the pumped hydro, there could potentially be some ancillary benefits. The raising of Borumba dam adds a significant amount of additional water storage in the lower reservoir, with a total volume of 224 GL at the currently proposed FSL of 155 m AHD. The additional water storage capacity created by the Project is to provide for the cycled discharge and recharge of water between the lower and upper reservoirs while not negatively impacting on current water supply obligations of Borumba dam. The Project will not be taking water from the Mary River.

Raising Borumba dam and establishing the upper reservoir will divert more water from the basin during their initial filling; this results in more water being stored, with a greater total inundation area, leading to increased evaporation and seepage losses than the current conditions (though this is anticipated to be relatively minor).

Ultimately the Project leads to reduced volumes of water flowing downstream and therefore an adjustment (reduction) to the strategic reserve volume in the Water Plan may be required, although this does not mean that a water allocation needs to be granted for future running of the Project (Badu Advisory, 2021).

Construction water will likely be sourced from Lake Borumba and/or groundwater bore for areas surrounding the upper reservoir.

There may also be some localised disruptions to existing water users (surface and groundwater) as a result of the construction and operational phases of the Project:

- temporary disruptions to environmental flows downstream of the dam, though the intent is to maintain water flows to meet the allocations during construction
- water authorisations may be disrupted as a result of land acquisition works (i.e. the authorisation are linked to land parcels and changes to the land configuration will nullify the authorisations).

The implications of construction and operation on all aspects of water planning will receive detailed consideration as the Project progresses and will be addressed in the EIS.

4.1.2.2 Water and sediment quality

Potential risks to water and sediment quality associated with the construction phase include:

- increased turbidity and sedimentation associated with clearing, earthworks, sand gravel extraction, and dewatering
- temporary impoundments of waterways and loss of wetlands and riparian zones
- contamination associated with accidental release of sewage, grey water, fuel, oil, or other chemicals.

During the first filling and the subsequent period, the decomposition of drowned vegetation could result in increasing organic matter and nutrients in water and sediment. Soil could also release nutrients, metals, and total suspended solids (from fine clay material) into the water column.

Potential direct and indirect impacts during operation include those normally associated with dams, in concert with those associated with operation of the pumped hydro:

- frequent water level changes that may:
  - expose fine clay from lake sediment for an extended period, during which any aquatic plants would likely die off
  - mix sediments into the water column when the lake refills, thereby resulting in high turbidity and contaminant levels (e.g. nutrients and metal) and sedimentation altering habitats
- effects of depth and holding time, particularly on turbidity, conductivity, stratification, temperature, and dissolved oxygen. The deeper Lake Borumba would be expected to show greater such effects than the current lake
- stratification and ‘turn-over’ of the water storage (including blue-green algae blooms)
- potential effect of algae and macrophytes on water quality and vice versa
- increasing dissolved metal concentrations due to mobilisation and oxidation of lake sediments and lateral transport of sediment pore water
- changes in land use (hardstands, roads etc.) increasing concentrations and loads of suspended solids, nutrients, metals, and gross pollutants in stormwater runoff

- effects of flow release under varying scenarios including potential impacts on downstream pools (dry season refugia), estuarine and near shore environments
- dam break causing erosion and reduced water quality downstream.

The amount of movement of water between the upper and lower reservoirs at any one time is expected to result in the upper storage experiencing significant mixing, with some portion of mixing also expected in Lake Borumba. It is likely that the release of water to Lake Borumba would at a minimum result in increased mixing in the immediate vicinity of the release point, but may not necessarily result in a well-mixed reservoir elsewhere. If resuspended, the possible contaminant content of sediments may cause significant impacts to water quality within Lake Borumba. The degree of mixing due the Project, requires a fully developed 3D hydrodynamic model and will be investigated in future phases of the Project (Alluvium, 2022). The proposed multi-level offtake would assist management of the quality of the released water, depending on the extent of mixing.

4.1.2.3 Sediment transport

The existing dam likely traps all coarse sediment (>30 µm). As a result, raising of the dam is unlikely to have any measurable difference in sediment supply of the >30 µm fraction to lower Yabba Creek. The Project is likely to have negligible, if any, additional impacts on Yabba Creek downstream from the dam or the degrading trajectory of waterways.

The hydrology assessment indicated up to 10% reductions in some peak flows downstream of the dam following the completion of the Project. This may result in a slight reduction in erosion within the downstream reach however there is unlikely to be any significant change in coarse sediment supply to the Mary River or to the high value coastal environments.

Potential risks associated with sediment transport during the construction and operation of the Project would be associated with:

- significant rainfall event during construction causing erosion and sedimentation
- reduced sediment supply and transport in waterways where bed material is extracted for construction
- dam break resulting in downstream erosion and reduction of water quality
- inundation and loss of lengths of Yabba Creek and tributaries of the lower dam
- inundation and loss of lengths of tributaries of the upper dam
- increased sediment deposition in Yabba Creek and tributaries of the main dam upstream of FSL
- erosion of banks and generation of sediment in saturated inundation zone due to rapidly fluctuating water levels
- increased turbidity and reduced habitat downstream from Borumba dam.

4.1.2.4 Groundwater

Potential impacts to groundwater resources include:

- direct groundwater take or groundwater drawdown associated with:
  - construction of new groundwater bores for monitoring and/or construction water purposes
  - subsurface infrastructure leading to a short term and potentially long-term reduction in water availability to potential GDEs around the infrastructure footprint, and/or discharge of contaminated dewatering flows
  - dam wall construction leading to interception of limited groundwater, and/or discharge of contaminated dewatering flows
- long term groundwater dewatering associated with the subsurface infrastructure (tunnels) leading to localised groundwater impacts, risk of reduced water availability to potential GDEs around the infrastructure footprint, and/or discharge of contaminated dewatering flows
- fluctuating water levels in Lake Borumba, on a regular basis, leading to repeated groundwater level fluctuations and/or shallow groundwater quality changes
- scaling or corrosion of subsurface infrastructure over time associated with transfer of water between the reservoirs could interrupt operations
- inundated footprints of the reservoirs leading to water leakage and water table mounding underneath the lakes and surrounds and/or increased baseflow seepage into surrounding watercourses, essentially increasing water availability to ecosystems and users.

The EIS will assess the Project's potential impacts on water resources including water quality and volumes of surface water and groundwater.

4.1.3 Amenity

4.1.3.1 Air quality

Potential impacts related to air quality during construction may include:

- the impact of dust emissions generated from construction activities, particularly vehicle movements on haul routes (especially vehicles travelling on unsealed roads), land clearing, drilling and blasting, earthmoving, material handling and surface preparation, quarrying and concrete batching, and stockpiling material (wind erosion)
- gases generated by fuel combustion from numerous sources such as oxides of nitrogen, carbon monoxide, sulfur dioxide, fine particulate matter, trace amounts of volatile organic compounds
- fugitive emissions from fuels, chemicals, oils, and greases stored at construction sites
- odour emissions from disturbance of contaminated land, asphalt laying activities and construction camp wastewater treatment
- lighting related to site security or night works.

Operational air quality impacts may include:

- exhaust emissions from staff and tourist vehicles accessing the various sites and infrastructure
- wheel generated dust emissions from vehicles travelling on unsealed roads
- greenhouse gas emissions from the decomposition of vegetation inundated as a result of the Project.

4.1.3.2 Noise and vibration

During the construction phase, generation of noise and vibration will likely be from the following sources:

- site establishment and access works
- establishment of construction camps
- vegetation clearing
- excavation, earthworks, and compaction
- quarrying/blasting
- tunnel boring
- loading, transport, and unloading of trucks and stockpiling of supplies
- roadworks
- plant and machinery
- concrete batching
- generators and pumps
- construction traffic.

Blasting activities, crushing and screening plant, and concrete batching facility operations are likely to be the most significant sources of noise and vibration during construction, however their locations have not yet been confirmed.

Generation of noise and vibration during the operations phase will likely be from the following sources:

- water passing over the spillway or through the outlet works
- operation of the fish passage (if developed)
- operations and maintenance traffic
- ongoing vegetation clearing around the asset
- traffic associated with the use of recreational areas if the dam is open to the public.

Potential operational impacts are likely to be minor based on the location of the Project in relation to the closest sensitive receptors.

4.1.3.3 Landscape and visual

The Project has the potential to impact the visual amenity of the surrounding landscape during both construction and operation. However, it is expected that the current landscape character and high levels of visual amenity afforded by the existing landscape features would largely remain. The Project will not be visible from key settlements such as Imbil and Jimna, and impacts would generally be experienced when receptors are close to Project infrastructure and components.

Construction-phase impacts may be caused by activities including:

- vegetation clearing and bulk earthworks
- on-ground construction of Project components
- temporary construction facilities
- crushing, screening and concrete batching facilities
- night-time lighting for construction activities and security.

During operation, water level fluctuations in the reservoirs will result in exposure of a 'reservoir rim' when the reservoir is not full. The reservoir rim may not sustain typical vegetation types and can have an impact on visual amenity. In addition, creation of the upper reservoir would see forested land replaced by a water body, dam wall and associated infrastructure. This will be a significant change to the current landscape.

The EIS will assess the Project's potential impacts on amenity including air quality, noise and vibration, and landscape and visual amenity.

4.1.4 Terrestrial ecology

The construction of the Project has the potential to create direct and indirect impacts on MNES, MSES and other ecological values.

Potential impacts to terrestrial ecology will primarily occur during the construction phase and will likely be associated with:

- vegetation clearance and habitat loss associated with the proposed upper and lower reservoirs, which could lead to:
  - loss of remnant vegetation communities, including regional ecosystems listed as of concern and two threatened ecological communities
  - loss and/or reduction in the populations of threatened flora
  - direct displacement of fauna, an overall reduction in fauna diversity and/or loss of local populations
  - reduced availability of important habitat features (e.g. tree hollows, recognised forage trees) for threatened and migratory fauna species, which rely on the availability of nesting, breeding, foraging and shelter habitat for survival
  - fragmentation of flora and fauna populations, potentially reducing gene flow
  - disruption of breeding patterns during key times of year
  - indirect impacts from dust generation and edge effect
- increased fauna injury or mortality related to vehicle strike, entrapment or other incidental encounters
- loss of fauna movement opportunities due to the dams creating new barriers to movement or increasing existing barriers, noting the proposed upper reservoir may result in considerable disruption to existing movement corridors, including movement into and from Conondale National Park
- introduction and exacerbation of pest fauna and weeds due to Project activities (e.g. vehicle movements) and decreased integrity of existing flora and fauna assemblages.

Potential impacts to terrestrial ecology during the operation phase would be:

- loss of fauna movement opportunities associated with the FSL of the reservoirs creating new barriers
- exacerbation of pest fauna and weeds
- changes to terrestrial ecology values surrounding the reservoirs caused by water level fluctuations in both the upper and lower reservoir as detailed below.

Frequent water level fluctuations within the drawdown zone will favour a simplified littoral flora community which is tolerant of daily wetting and drying cycles. Ultimately, these littoral habitat changes may result in less complex physical habitat structure with implications for terrestrial flora and fauna communities which currently inhabit the lake margins (around Lake Borumba). There may also be changes to groundwater regimes around the existing impoundment with the potential to impact groundwater dependent ecosystems if they are present.

The EIS will assess the Project's potential impacts on terrestrial ecology including MNES, MSES and other ecological values, and identify potential offset requirements.

4.1.5 Aquatic ecology

Potential impacts to aquatic ecology during construction include:

- loss of breeding and foraging habitat for MSES and MNES fauna downstream of the existing dam wall as a result of the construction of the dam wall and the proposed inundation area
- changes to water quality associated with clearing, instream works, dam filling, spills, contaminated sites, generated waste, downstream flow releases
- loss of and reduced access to feeding, nesting and spawning resources associated with flow and water level management through dam filling and instream infrastructure development
- damage to and/or death of aquatic fauna associated with instream works
- exacerbation of pest fauna and weeds associated with clearing and instream works
- loss or reduction in the quality of watercourses and wetlands including wetlands of HES.

Potential impacts to aquatic ecology during the operation phase include:

- loss of habitat due to physical disturbance, flooding and clear water scouring of watercourses
- changes to water quality associated with stratification, dam releases, shoreline erosion, and use and storage of hazardous substance
- loss of and reduced access to feeding, nesting, and spawning resources
- damage to and/or death of aquatic fauna associated with activities such as dam releases, passage through spillway outlets, turbines, dam overtopping and increased predation
- exacerbation of pest fauna and weeds, along with blue-green algae blooms. Noting that tilapia (*Oreochromis mossambicus*) is a major issue downstream of the existing dam and fish passage will likely introduce tilapia into Lake Borumba
- inundation of breeding and foraging habitat for MNES fauna upstream of Lake Borumba
- loss of habitat, including potential breeding and foraging habitat for MNES species, as a result of changes to the geomorphology of Yabba Creek downstream of the new spillway
- inundation of breeding and foraging habitat for MNES fauna upstream of Lake Borumba
- loss of habitat, including potential breeding and foraging habitat for MNES species, as a result of changes to the geomorphology of Yabba Creek downstream of the new spillway
- changes to aquatic ecological values surrounding and within the reservoirs caused by water level fluctuations in both the upper and lower reservoir as detailed below.

Water level fluctuations within the drawdown zone may lead to increased shoreline erosion, littoral and benthic habitat modification and changes to the lake's sediment transport regime, impacting water quality. Frequent water level fluctuations may also impact the structure and composition of macrophyte (aquatic plant) communities around the lake margins and favour a smaller number of macrophyte species which can endure regular cycles of wetting and drying.

Ultimately, these littoral habitat changes within the drawdown zone may can result in less complex aquatic habitat structure around the lake margin(s) with implications for aquatic flora and fauna. Species which currently nest or breed on the lake margins (turtles and fish) may be impacted by frequent water level fluctuations.

The EIS will assess the Project's potential impacts on aquatic ecology including MNES, MSES and other ecological values, and identify potential offset requirements.

4.1.6 Social and economic

The Project is anticipated to generate a broad range of social and economic effects. The following are key features of the Project which are anticipated to derive positive and negative social and economic impacts:

- **Creation of employment** – Comprehensive modelling of direct and indirect employment (full time and part time) generated by the Project will be undertaken as part of the EIS and expressed in terms of predicted full-time equivalent positions. Preliminary estimates indicate potential for 2,360 construction jobs to be generated and up to 30 operations related positions when fully operational.
- **Local procurement and supply chain opportunities** – Project construction is anticipated to require a wide range of goods and services, resulting in the generation of local and regional procurement and supply chain opportunities. The Project will look to prioritise local procurement where feasible.
- **Population growth** – With the creation of employment opportunity there would be an influx of people into the region to capitalise on such opportunity. Population growth and movement can result in a broad array of social benefits and impacts. Whilst this creates social benefits such as ongoing employment and business opportunities, it also can also be perceived to be a threat to existing social values and norms.
- **Changed land use and tenure** – The Project would result in changes to existing land use. There are social and economic matters to be considered in future assessment associated with the conversion of land from for cattle grazing to a pumped hydro scheme. Although majority of land is State controlled, existing leaseholders for cattle farming businesses would be affected through the whole or partial loss of property and the potential fragmentation of land parcels. The social ramifications associated with the loss of land for cattle production, along with broader effects associated with the introduction of a new industry into the area, will be considered by an SIA in the next Project phase. Respectful engagement with landholders would occur at an early stage of the EIS to facilitate access to undertake required technical investigations. Land tenure and acquisition negotiations would only occur following the Project attaining environmental approval and financial support.
- **Demand on local services and housing** – Social and economic benefits associated with the influx of workers during Project construction would only be realised if appropriately managed and supported by commensurate investment in infrastructure where required. The influx of workers to the region is anticipated to increase demand on social services such as emergency and health, as well as on local housing availability and affordability.
- **Recreation and tourism** – Construction of the new Borumba dam and lower intake will likely result in temporary restrictions to recreational activities currently permitted within and around Lake Borumba. Once operational, some areas of the lower reservoir may be off-limits to recreational users such as fishers, skiers and kayakers for safety reasons. However, the Project has the potential to create opportunities for recreational activity and tourism during operation, through re-establishing new recreation amenities and facilities and improving the local road network.
- **Traffic and transport** – Construction activities associated with the Project would result in temporary traffic and transport impacts including local connectivity and accessibility disruptions, increase in traffic and congestion, and an increase in risk of traffic-related incidents for local and regional road users.
- **Amenity** – The Project would result in permanent changes to the visual landscape, which may in turn affect social and cultural values. Construction activities associated with the Project will also result in temporary amenity affects associated with noise, dust, and vibration.

An SIA will be prepared as part of the EIS and will consider the Project's social impacts including social consequences of technical matters assessed in other parts of the EIS such as economics, traffic, and cultural heritage. An assessment of impacts on the built environment will be included in the SIA.

4.1.6.1 Native Title

Potential impacts to native title are likely to occur at the construction phase of the Project, however there are certain impacts that may occur at the beginning of the operational phase. These impacts are Future Acts. A Future Act is a proposal to deal with land in a way that affects native title rights and interests.

Future Acts that are likely to occur at the construction phase of the Project include the creation of an exclusive possession form of tenure (such as freehold or a lease in perpetuity) and the construction of project elements within three Reserves for Electrical Purposes.

Future Acts that are likely to occur at the operational phase of the Project include the permanent inundation of land. Permanent inundation is unlikely to be consistent with the ongoing existence of Native Title.

4.1.6.2 Land use and tenure

The Project has the potential to impact the land use and tenure by:

- change of existing land use at the location of the upper reservoir and other ancillary above ground infrastructure, including permanent access roads and site offices. Note that the use of Lake Borumba as a drinking water supply reservoir or recreational area is not expected to be changed by the Project
- revocation of sections of protected areas, including the potential volumetric revocation of Conondale National Park and Conondale Resources Reserve for the twin waterway tunnel
- revocation of sections of state forest for the construction of the dam wall
- acquisition of State land and land owned by the State
- temporary impacts to access to the Lake Borumba for recreational activities, along with Imbil State Forest
- temporary and permanent road closures.

4.1.6.3 Built environment

Impacts on the built environment are expected to occur due to the construction and operation of the Project. Most of the affected infrastructure will be inundated as a result of raising Borumba dam. The facilities that are impacted by the Project are listed below but no rehabilitation or relocation planning has been undertaken at this stage of the Project:

- sections of the caravan park/camping grounds downstream of the new dam will either need to be rehabilitated or relocated after construction
- new public access road beyond the dam wall, potentially utilising the proposed haul roads
- new workshop buildings
- new boat ramp and car park
- new public toilets
- new picnic grounds, shelters, and lookout.

Adverse impacts to infrastructure associated with the upper reservoir and underground components are minimal.

Upgrades to local services (power, telecommunications, water supply and sewerage) may be needed to support the Project. Impacts to infrastructure and improvement to services would be initially investigated during the Exploratory Works and addressed as part of the EIS.

The EIS will assess the Project's potential impacts on the built environment as part of the SIA.

4.1.6.4 Traffic and transport

The Project will permanently impact some road infrastructure. Unsealed roads that currently provide access to the proposed location of the upper reservoir and underground infrastructure, such as Bella Creek Road, Yielo Road, Walkers Top Road and Borgan Road, will be upgraded in consultation with the relevant road authorities to provide access for construction equipment, materials and workers. After construction, these roads will either remain as public roads to provide access for workers and recreational users or restricted for maintenance access only. Borumba dam Road which currently provides access to Lake Borumba will need to be re-aligned. Construction and upgrades to roads has the potential to result in delays for road users.

The construction of the Project will require the transport of a significant amount of equipment and materials to the construction sites. Further, most workers associated with the construction of the Project will be accommodated in temporary workforce camps and travel to and from their main place of residence at the start and end of shift. An increase in both light and heavy vehicles on the local and regional road network has the potential to impact on road safety and conditions.

A traffic and transport assessment will be completed that will identify transport routes and the potential impacts to the existing road network during both construction and operation of the Project. Potential traffic impacts of the Project would be assessed in accordance with the Department of Transport and Main Roads' Guide to Traffic Impact Assessment (2018).

4.1.7 Cultural heritage

4.1.7.1 Indigenous

Aboriginal cultural heritage values associated with the Project will be impacted by both construction activities and permanent inundation.

Potential impacts to Aboriginal cultural heritage during construction include:

- Direct and indirect impacts on recorded and unidentified Aboriginal cultural heritage items, objects, and places
- Permanent inundation of identified Aboriginal cultural heritage
- Direct and indirect impacts on areas of the natural environment considered to be of significance to Kabi Kabi
- Temporary loss of access to areas of Conondale National Park for cultural activities.

Potential impacts to Aboriginal cultural heritage during the operation may include:

- Small and low weight items of Aboriginal cultural heritage (such as flakes, cores and other stone artefacts) being disturbed by water wash produced by a rapid decline and/or fill of the reservoirs
- Access to and interference with previously unidentified cultural sites along the edges of the existing dam due to previously inaccessible areas becoming accessible by the permanent raising of the lower reservoir

4.1.8 Waste

Waste materials will be generated during both the construction and operational phases of the Project.

Construction is expected to generate mostly inert material with a significant quantity of green waste. Other sources will include construction and demolition waste (e.g. existing dam wall and associated infrastructure), general and packaging waste. A large volume of excess material will also be generated as a result of the tunnelling activities, with this material to be managed.

Wastewater is also expected to be generated by construction camps and construction processes such as concrete batching and tunnelling activities. Operational waste streams are anticipated to include chemical containers, plastic films, and organic wastes.

The EIS will consider the types of waste and volumes generated by the Project, in conjunction with management measures and risks associated with storage of certain materials.

5. Environmental management and mitigation

Environmental management measures to avoid and minimise impacts on environmental, social, and cultural heritage values will be implemented for all phases of the Project including design/planning, construction, and operation. The Project's construction and operational processes will align with all relevant Australian standards and environmental legislation and policies, including, but not limited to the ISO14001:2015 – Environmental management systems, *Environmental Protection Act 1994* (Qld) and the *Aboriginal Cultural Heritage Act 2003* (Qld).

A construction environmental management plan (CEMP) and an operational environmental management plan (OEMP) will be developed for the Project, along with supporting discipline specific management plans. The plans will incorporate environmental and social mitigation measures from the EIS and environmental approvals as a framework for ongoing management, monitoring, reporting and improvement during construction.

The plans will aim to outline:

- environmental and social mitigation measures and environmental approvals to guide ongoing management, monitoring, reporting and improvement during construction and operation, respectively.
- identify the environmental values potentially affected by Project works and describe measures relevant to each stage to manage the risk of potential adverse impacts to these values.
- outline potential impacts, target criteria for environmental protection, control measures to be implemented, and monitoring programs to evaluate the efficacy of control measures.

An environmental management system will be developed to guide the implementation of environmental management measures during operation of the Project. The environmental management system would also guide the monitoring and review process for the Project's environmental management, with the aim of continual improvement.

Further details on environmental management initiatives during the construction and operations phases of the Project will be outlined in the EIS. Monitoring of compliance with environmental management requirements would be undertaken by a team of suitably qualified practitioners.

Environmental management plans are intended to be prepared as part of the EIS, with additional plans and sub-plans to be prepared after the Coordinator-General's evaluation report for the Project, should it be declared a coordinated project.

5.1 Natural environment

A range of environmental management and mitigation measures will be developed to minimise the potential impacts of the Project on the natural environment. The environmental management and mitigation measures implemented for the Project will be informed by further investigations and associated impact assessment undertaken as part of the EIS and will be delivered through commitments made in the EIS and various management plans. Depending on the requirements of the terms of reference, these investigations may include:

- geotechnical and contaminated land investigations
- flow and flooding modelling, geomorphic condition assessment, and water quality sampling to determine baseline conditions of waterways
- groundwater investigations
- visual impact assessment with reference to land use and distances to potential sensitive receptors
- baseline air quality and noise monitoring and modelling
- quantification of greenhouse gas emissions
- terrestrial and aquatic ecology field surveys
- assessment of requirements for State and Commonwealth biodiversity offsets, in accordance with the Queensland Environmental Offsets Policy and the Commonwealth EPBC Act Environmental Offsets Policy.

Construction and operational impacts would be documented in the CEMP and operational environmental management system, along with required management measures. Potential management and mitigation measures are outlined below, however these will be considered in further detail and refined during the EIS:

- avoidance of impacts to ecological constraints through design where possible
- minimisation of clearing and placement of infrastructure in previously disturbed areas where possible
- soil management measures, including an erosion and sediment control plan prepared by a certified professional in erosion and sediment control
- groundwater and surface water management plans and monitoring programs for construction and operational phases of the Project
- minimisation of clearing and placement of infrastructure in previously disturbed areas where possible
- aquatic passage barriers to be minimised and fish passage and exclusion devices incorporated into the new Lake Borumba dam and intakes respectively
- suitably qualified and experienced fauna spotter-catchers to be present during vegetation clearing, and identification of breeding sites for threatened (and other) species listed
- sequential and strategic vegetation clearing, including pre-clearance survey and salvage of habitat features
- alternative fauna passage solutions and maintenance of habitat connectivity, where possible
- weed and pest control and prevention measures
- consideration of advanced planting and vegetation retention to reduce visual impacts
- site rehabilitation including re-shaping and progressive revegetation of disturbed areas with native species suitable for the area, where possible.

The Project will follow the environmental mitigation hierarchy (i.e. avoid, minimise, mitigate, offset). Offsets will be used where there are significant residual impacts associated with the Project.

5.2 Social and economic

As outlined in the Social Impact Assessment (SIA) Guideline (DSDILGP, 2018), a core requirement of the SIA is that management measures identified through the impact assessment process must be documented in a Social Impact Management Plan (SIMP), which provides a practical basis for their implementation. A SIMP is to be provided in the SIA report and submitted as part of the EIS. The SIMP is to comprise the following action plans:

- community and stakeholder engagement
- workforce management
- housing and accommodation
- local business and industry procurement
- health and community well-being.

The SIMP must include a monitoring program that includes the following:

- identified impacts, issues, and benefits
- targets and outcomes sought
- how management measures will be monitored and reported
- key performance indicators.

5.2.1 Native Title

Key mitigation measures for management of impacts to native title are the intention of the project to seek Project tenures which are subject to the non-extinguishment principle, meaning that Native Title will not be extinguished (albeit that some native title rights may be limited or supressed).

An ILUA is being progressed to obtain the requisite Native Title consent. Negotiation with the Kabi Kabi First Nation Traditional Owners Native Title Claim Group has commenced and is ongoing.

5.2.2 Land use and tenure

The Project will impact on existing land use and tenure. Mitigation measures for these impacts will be further detailed in the EIS but may include:

- refinement of the Project land requirements (temporary and permanent) in consultation with key stakeholder

- working with Seqwater, HQ Plantations, QPWS, local road authorities and other key stakeholders to ensure disruptions during construction are minimised
- identify opportunities to support/facilitate ecotourism and other commercial activities within the area.

5.2.3 Built environment

The Project will impact on existing infrastructure including roads and utilities. Mitigation measures for these impacts will be further detailed in the EIS but may include:

- consideration of design alternatives and options to minimise impacts
- ongoing engagement with potentially impacted stakeholders, including recreational users of Lake Borumba and Seqwater
- field investigations to identify all utilities and services within the Project Footprint
- minimise resource usage and waste generation
- maximise opportunities for reuse of waste materials on-site.

5.2.4 Traffic and transport

Requirements for new roads and any upgrades of existing roads would be developed in consultation with Gympie Regional Council, Somerset Regional Council and the Department of Transport and Main Roads. Approaches to construction traffic management will be investigated through the EIS process, including a traffic impact assessment in accordance with the Department of Transport and Main Roads' Guide to Traffic Impact Assessment (2018). Mitigation measures for these impacts will be further detailed in the EIS but may include:

- use of buses and car pooling to transport workers
- bulk movement of materials
- upgrades to existing roads.

Construction traffic management will be detailed in future project stages and will include traffic management plans as part of the CEMP, road use management plan, and consultation with stakeholders including local and state road authorities.

5.2.5 Indigenous cultural heritage

Queensland Hydro is seeking to meet its cultural heritage duty of care in a number of ways as listed under section 23(3) of the ACH Act, including:

- in compliance with gazetted Cultural Heritage Duty of Care Guidelines (the Guidelines)
- under a section 23 agreement with the Cultural Heritage Party for the Project (an Early Works Agreement (EWA))
- under a native title agreement that expressly addresses cultural heritage (an ILUA inclusive of a Cultural Heritage Management Plan (CHMP)).

Kabi Kabi and Queensland Hydro are in the process of negotiating an EWA that is intended to outline the cultural heritage assessment process for the Project Exploratory Works and will constitute 'another agreement' for the purposes of section 23(3)(a)(iii) of the ACH Act.

The EWA will require Queensland Hydro to request a cultural heritage inspection of any areas proposed to be subject to ground disturbance and to agree to management and protection measures where cultural heritage materials exist or where there is a reasonable risk of sub surface materials being encountered during works.

It is Queensland Hydro's intention to negotiate a CHMP as part of the negotiation of an ILUA. This intention has been recorded in the ILUA Negotiation Protocol executed by both parties in January 2023. The CHMP will include agreed processes for the management and mitigation of identified and unidentified Aboriginal cultural heritage. Mitigation strategies will be guided by recommendations submitted to Queensland Hydro through various Kabi Kabi reports, including the Cultural Heritage Survey Report provided by Archaeo on behalf of Kabi Kabi in December 2022.

Throughout the negotiation of the ILUA, EWA and CHMP, Queensland Hydro will continue to regularly brief Kabi Kabi on the progress of the Project and provide notification of the general details of applications and approvals required for the Project.

5.3 Waste management

Options for the management of waste will be assessed for each waste stream to be generated. Management, storage, and disposal of waste will be undertaken in accordance with Queensland's waste management hierarchy in the Waste Reduction and Recycling Regulation 2011.

Avoidance, reuse, recycling, and recovery will be prioritised over treatment and disposal. This will include identifying opportunities for onsite reuse of construction waste, cleared vegetation, or inert material. Inert material and suitable, larger vegetation from clearing activities may be placed in the inundation area to provide aquatic habitat. The capture of stormwater runoff from rock or soil overburden and measures to prevent leachate generation, windblown litter, deter vermin and wildlife, and reduce fire risk will also be assessed during the EIS.

Mitigation measures to minimise the general risk of environmental impact associated with waste include:

- where viable, import recovered or recycled materials for use during construction
- disposal of waste (including contaminated wastes) offsite by an adequately licensed sub-contractor to an appropriately licensed facility
- ensure sufficient waste storage facilities are available onsite, with appropriate bunding/protection and access to spill kits and allowance for separation of wastes
- locate waste storage and stockpile areas appropriately (i.e. away from watercourses and other sensitive receptors)
- wastewater treatment plants
- development of a Spoil Management Plan for the construction phase of the Project
- regular removal of waste to appropriate licensed facility
- development of a Waste Management Plan for the construction and operational phases of the Project.

Waste management risks and mitigation measures for the construction and operational phases will be identified and outlined in the EIS and CEMP.

5.4 Hazard and risk, health and safety

A risk assessment for the Project will be undertaken in compliance with the Australia/New Zealand AS/NZS ISO 31000:2018 Risk Management – Guidelines and all aspects of the Project will comply with legislative requirements and Australian standards associated with hazard and risk, and health and safety.

Hazards and risks will be identified and managed to reduce potential harm to people and the environment, as well as property. The risk assessment will be incorporated into the EIS along with appropriate mitigation measures and strategies. Consideration will be given to both on-site and off-site risks and an appropriate safety management system will be developed. The safety management system will include, but not be limited to:

- traffic management measures
- an emergency response plan, consistent with relevant safety management systems
- measures for the storage, handling, and transport of dangerous goods and hazardous materials.

A dam Failure Impact Assessment will be undertaken for the Project in accordance with the requirements of the WSSR Act and Guideline for failure impact assessment of water dams (DNRME, 2018). As per the WSSR Act, a dam is referable if a Failure Impact Assessment demonstrates there would be people at risk if the lower and/or upper reservoirs were to fail. The Failure Impact Assessment will be undertaken for both dams. A safety management program will be developed in accordance with the Queensland Dam Safety Management Guidelines (DNRME, 2020). An Emergency Action Plan will be developed and implemented for all referable dams. The Emergency Action Plan will include provisions for the:

- identification, detection, and management of dam hazards, as well as dam hazard and emergency events
- communication of effective warnings and notifications to those potentially impacted.

- construction risks will be managed as part of a Work Health and Safety Management Plan, as required under the *Work Health and Safety Act 2011*.

Further details on hazard and risk, and health and safety mitigation and management measures will be outlined in the EIS.

6. Approvals

6.1 Summary

A preliminary review of required approvals has been undertaken and documented in Table 15.

Approvals applicable to the Project include:

- primary approvals, specifically assessment requirements under the Commonwealth EPBC Act and Queensland's SDPWO Act
- secondary approvals and other regulatory requirements, including requirements under the State planning framework administered via the Planning Act, other State legislation, and the Gympie Regional Council Planning Scheme and Somerset Regional Planning Scheme.

As the Project progresses through detailed design there will be increasing certainty about the suite of approvals ultimately required. It is expected that a finalised list of required approvals will be presented as part of the EIS. As a result, further approvals may be identified, while others that were identified at the preliminary stage, may not be required.

Environmental approvals for the transmission line are a separate package being coordinated by Powerlink.

Table 15: Preliminary list of key approvals required for the Project

Legislation	Responsible agency	Approval trigger	Relevance to project	Approval / Authority / Agreement Required	Comments
Commonwealth					
Primary approvals					
Environment Protection and Biodiversity Conservation Act 1999	DCCEEW	An action that has, will have or is likely to have a significant impact on a MNES.	There are several MNES (listed threatened ecological communities, threatened flora and fauna) known to occur or have a high or moderate likelihood of occurring in the Project vicinity.	Yes	The Project is likely to have a significant impact on several MNES in and adjacent to the Project Footprint, and has the potential to impact downstream MNES such as the Great Barrier Reef and Great Sandy Strait Ramsar site. The Project will be referred to the Commonwealth Minster for the Environment for a determination under the EPBC Acts. The project is likely to be deemed a 'controlled action'. Further assessment is expected through the bilateral agreement between the Commonwealth and State of Queensland under s.45 of the EPBC Act
Other approvals and regulatory requirements					
National Electricity Law and National Electricity Rules	Australian Energy Market Commission, Australian Energy Market Operator and Australian Energy Regulator	To participate in the national electricity system, as a generator, the operator will need to register as a participant under s 11.	As a registered participant in the national electricity system, Queensland Hydro will need to comply with the Law and Rules, including applicable design standards	Yes	It is currently assumed that Queensland Hydro will be the registered operator.
Native Title Act 1993 (Cth)	Native Title Tribunal Commonwealth Attorney-General's Office	Development (future dealings) on land where native title exists or has not been extinguished.	One native title claim (Kabi Kabi First Nation Traditional Owners Native Title Claim Group) applies to the area associated with the Project.	Yes	Applicable to develop on any land where Native Title has not been extinguished, which is expected to include State land, including national park. An ILUA is being progressed to obtain the requisite Native Title consent. Negotiation with the Kabi Kabi First Nation Traditional Owners Native Title Claim Group has commenced and is ongoing.
State					
Primary Approvals					
State Development and Public Works Organisation Act 1971	Coordinator-General	A proponent of a project with one or more of the following characteristics may apply to have it declared a 'coordinated project' under the SDPWO Act: • complex approval requirements, involving local, state and federal governments • significant environmental effects • strategic significance to the locality, region or state, including for the infrastructure, economic and social benefits, capital investment or employment opportunities it may provide • significant infrastructure requirements. This process allows the Coordinator-General to coordinate the assessment process.	In accordance with Section 27 (2) of the SDPWO Act, the Project may be declared a coordinated project due to meeting all four of the aforementioned requirements listed under 'approval trigger'.	Yes	Evaluation of the project via EIS under Part 4 of the SDPWO Act is subject to a declaration decision being made. A coordinated project declaration does not imply government approval, support for or commitment to the project in question. Rather, it means the project will require rigorous impact assessment involving whole-of-government coordination, likely by a comprehensive EIS.

Legislation	Responsible agency	Approval trigger	Relevance to project	Approval / Authority / Agreement Required	Comments
Secondary approvals under the *Planning Act 2016*					
Planning Act 2016 Planning Regulation 2017 *Building Act 1975*	Building Certifier Gympie Regional Council Somerset Regional Council	Development approval for building works (if assessable under local council planning scheme).	The Project would require the construction of offices and accommodation (workers' camps), and other infrastructure associated with the construction phase.	Yes	Building work is assessable development unless it is accepted development under the Planning Regulation 2017 of the *Building Act 1975*. The location of offices and accommodation (workers' camps) and their resulting potential impacts would be assessed in the EIS.
Planning Act 2016 Planning Regulation 2017 *Environmental Protection Act 1994*	Chief executive, Department of Infrastructure, Local Government and Planning (DSDILGP)	Development permit for a making a material change of use for a prescribed environmentally relevant authority (ERA) that is a concurrence ERA. Potentially relevant environmental authorities (EA) for a prescribed ERA include: • Electricity generation (14) • Fuel Burning (15) • Extractive and screening activities (16) • Timber milling and wood chipping (47) • Regulated waste storage (56) • Sewage treatment (63) • Water treatment (64).	A development approval is not required if an EA to carry out another concurrence ERA has been approved for the premises and the proposed concurrence ERA is to be carried out under the EA and has a lower aggregate environmental score than the other approved concurrence ERA. An EA can only be held by a registered suitable operator.	Yes	Environmentally relevant activities are assessable development and require a development approval under the *Planning Act 2016*. They are assessable against State Code 22 unless the activity meets relevant accepted development criteria, or an exemption otherwise applies under the Planning Regulation 2017 (e.g. development for a coordinated project under Schedule 24 section 3). Confirmation of relevant ERAs will be required as the Project design and construction methodology are progressed.
Planning Act 2016 Planning Regulation 2017 *Environmental Protection Act 1994*	Chief executive, DSDILGP	Operational work in a wetland protection area that is high impact earthworks.	HES wetlands are mapped within the area, approximately 700 m downstream of the existing dam wall, however there are no mapped wetland protection areas.	No	High impact earthworks would not take place in a wetland protection area.
Planning Act 2016 Planning Regulation 2017 *Fisheries Act 1994*	Chief executive, DSDILGP	Operational work for constructing or raising waterway barrier works, unless the work complies with the document 'Accepted development requirements for operational work that is constructing or raising waterway barrier works'.	The proposed raising of Borumba Dam is located on a waterway mapped for fish passage (purple). Other waterways would be affected by inundation and other infrastructure (e.g. road crossings).	Yes	Fish passage assessment and incorporation of fish passage into design would be a significant issue. Offsets may be required. The construction of a waterway barrier is assessable development and requires development approval under the *Planning Act 2016*. The construction, raising or replacement of a dam or weir on a purple waterway cannot be considered accepted development.
Planning Act 2016 Planning Regulation 2017 *Queensland Heritage Act 1992*	Chief executive, DSDILGP	Development on a Queensland heritage place	No places within or near the Project Footprint are listed on the heritage register.	No	Sixteen items of historical heritage interest were identified during initial assessment, including an early homestead on Borgan Road, that is potentially of State significance. Further assessment is required. Development on or adjoining a Queensland heritage place is considered assessable development and requires development approval unless an exemption certificate under the *Queensland Heritage Act 1992* has been given
Planning Act 2016 Planning Regulation 2017 *Vegetation Management Act 1999*	Chief executive, DSDILGP	Operational work for clearing native vegetation on prescribed land	Vegetation would be cleared for the upper reservoir, the raising of Borumba Dam, and other supporting infrastructure such as access tracks, laydown areas and temporary construction areas. Significant impacts are likely to regional ecosystems listed as Of Concern, and remnant vegetation within a defined distance to a watercourse (category B), intersecting a wetland and mapped as essential habitat.	Yes	The clearing of native vegetation (unless in a protected area) is assessable development and requires development approval unless an accepted development vegetation clearing code applies and the works complies, or the operational work is exempt clearing work. Further, a coordinated project under the SDPWO Act is considered a 'relevant purpose' under the VM Act Targeted surveys required. Large differences between mapped and on-ground extent can be addressed through a Property Map of Assessable Vegetation. Negotiating offset requirements and arrangements, and costs associated with offsets, will be a significant Project element.

Legislation	Responsible agency	Approval trigger	Relevance to project	Approval / Authority / Agreement Required	Comments
Planning Act 2016 Planning Regulation 2017 *Water Act 2000*	Department of Regional Development, Manufacturing and Water (DRDMW)	Operational work for taking or interfering with water in a watercourse, lake, or spring.	The Project would include the construction of a new dam for the upper reservoir and raising the existing Borumba Dam, with water to be transferred between the two reservoirs. Water will also be required for construction activities and may be sourced from Lake Borumba or Yabba Creek.	Yes	The Project will involve works for taking or interfering with water in a watercourse. A development approval will not be required if: • The taking or interfering is allowed under the Water Act, Chapter 2, Part 3, Division 1 • The interfering is allowed under a water licence under the Water Act and the work complies with the conditions of the licence.
Planning Act 2016 Planning Regulation 2017 *Water Act 2000*	DRDMW	Removing quarry material from a watercourse or lake	Materials would be extracted from the Yabba creek bed. Mainly associated with dam wall construction and associated infrastructure, and site access/road upgrades.	Yes	The removal of quarry materials from a watercourse or lake is assessable development and requires approval under the Planning Regulation 2017. A Quarry Material Allocation is also required before works begin.
Planning Act 2016 Planning Regulation 2017 *Water Supply (Safety and Reliability) Act 2008*	DRDMW	Operational works for a referable dam. Interfering with flow by impounding water – certification of the dam failure impact assessment.	The Project would include the construction of a referable dam. The completion and acceptance of a failure impact assessment in accordance with this Act is a prerequisite to submitting a development application. A referable dam must also have an emergency action plan.	Yes	Operational work that is the construction of or relates to a referable dam is assessable development and requires development approval under the Planning Regulation.
Planning Act 2016 Planning Regulation 2017 Gympie Regional Council Planning Scheme Somerset Region Planning Scheme	Gympie Regional Council Somerset Regional Council	Development approval for development made assessable by the relevant planning schemes, which may include: • Material change of use • Building work (for site construction facilities) • Plumbing or drainage work • Operational work • Reconfiguring a lot • Clearing native vegetation • Demolition of existing building.	The Project would require the construction of offices and accommodation (workers' camps), and other infrastructure associated such as plumbing and drainage. The Project would require changes to land use for some components, and reconfiguration of lots to change boundaries and tenure.	Yes	Most Project components and activities will occur in the Gympie Regional Council local government area. The Somerset Region Planning Scheme provides a renewable energy facility code for assessing material change of use.
Other approvals and requirements					
Aboriginal Cultural Heritage Act 2003	DSDSATSIP	A CHMP is required where an EIS is required under another Act.	The Project is likely to require an EIS.	Yes	Queensland Hydro has agreed with Kabi Kabi to negotiate a CHMP as part of the negotiation of an ILUA.
Electricity Act 1994	DEPW	Generation of electricity and connection to the transmission grid/supply network.	The Project includes construction of a hydropower generation facility.	Yes	A Generation Authority is required by the operator. It is currently assumed the operator will be Queensland Hydro.
Environmental Protection Act 1994	DES	Environmental authority for ERAs. Environmental authorities (EA) for a prescribed ERA include: • Electricity generation (14) • Fuel Burning (15) • Extractive and screening activities (16) • Timber milling and wood chipping (47) • Regulated waste storage (56) • Sewage treatment (63) • Water treatment (64).	A person must not carry out an ERA unless the person holds or is acting under an EA for the activity.	Yes	Confirmation of relevant ERAs will be required as the Project design and construction methodology are progressed.

Legislation	Responsible agency	Approval trigger	Relevance to project	Approval / Authority / Agreement Required	Comments
Environmental Protection Act 1994	DES	Soil disposal permit	A soil disposal permit is required to remove, treat, or dispose of contaminated soil from land listed on the EMR or CLR.	To be confirmed	A number of the land parcels relevant to the Project are listed on the EMR. Historic farming (cattle dips, homestead, machinery shed) and historic mining activities in the inundation and surrounding area are likely to be a source of contaminated land. Further assessment is required to determine if a disposal permit will be required.
Explosives Act 1999	DR	An authority is required to use, possess, store or transport explosives	The Project will require blasting activities for establishment of the dam wall foundations, quarry activities, and the tunnels.	Yes	The requirements of the Explosives Act would apply to blasting activities.
Forestry Act 1959	DAF	Occupation permit under s35 of the *Forestry Act 1959*	Ancillary works are necessary in state forest tenure.	Yes	Plantation Licence exists over portions of Imbil State Forest 1 which may require additional permits/licences. Queensland Hydro will also look to see what works can be undertaken under minor disturbance works under Section 56 of the *Forestry Act 1959*.
Forestry Act 1959	DAF	Liaison / compensation for forestry timber.	Portion of Imbil State Forest 1 (Lot 135FTY1911) and Yabba State Forest (Lot 986FTY1720) lost to new lower reservoir wall and inundation area.	Yes	Plantation Licence exists in Imbil State forest. Area of licence to be confirmed. Final land tenure arrangements to be determined. May require revocation of these portions of state forest, with the revoked area to be merge with reserve (Lot 20LX2359).
Forestry Act 1959	DAF	Sale and disposal of quarry material within State forests.	Quarry material is required for the Project and where possible, would be sourced from local sites.	Yes	If these local quarry sites are on State land, the taking of quarry material is assessable development and requires approval.
Nature Conservation Act 1992	DES	Clearing of protected plants.	Nine high-risk protected plant areas are mapped within the Project Footprint. A significant impact to these species is probable.	Yes	Targeted surveys are required to confirm presence of threatened plant species in trigger areas and within 100 m of known threatened species records. A protected plant clearing permit is likely to be required.
Nature Conservation Act 1992	DES	Disturbance of breeding places for protected animals that are classified as extinct in the wild, critically endangered, endangered, vulnerable, near threatened, special least concern, colonial breeder or least concern.	The Project is likely to impact breeding places for several species listed under the NC Act that are known to occur, or have a high or moderate likelihood of occurrence, within the Project Footprint.	Yes	Targeted surveys are required to confirm the presence of animal breeding places. A Low Risk Species Management Program (SMP) for least concern species and/or High Risk SMP for special least concern, endangered, vulnerable and near threatened species is likely to be required if breeding places of protected animals are identified. A damage mitigation permit is also likely to be required to tamper with animal breeding places.
Nature Conservation Act 1992	DES	Revocation of a protected area under Section 32 and 70E of the Nature Conservation Act 1992	Areas of Conondale National Park and Conondale Resources Reserve to be impacted by the construction of the dam wall and to inundated by the lower reservoir, while the underground works will also pass through areas of the national park and the resources reserve.	Yes	There are no appropriate alternatives to revoking national park or resources reserve in this instance. Revocation is required to enable essential public infrastructure works to be undertaken and to support delivery of the Project.
Plumbing and Drainage Act 2018	DEPW	Facilities that require regulated plumbing and/or drainage.	Site offices and other buildings would require regulated plumbing and/or drainage.	Yes	Approval likely to be required under this Act.

Legislation	Responsible agency	Approval trigger	Relevance to project	Approval / Authority / Agreement Required	Comments
Regional Planning Interests Act 2014	DSDILGP	Undertaking a regulated activity in a priority living area.	There is a large priority living area in the Sommerset Regional Council area, which includes the part of the upper reservoir.	Yes	Inundation of this area is a regulated activity and will affect the suitability of land in the area to be used for a particular purpose (i.e., a settled area). A regional interests development approval is likely to be required.
Regional Planning Interests Act 2014	DSDILGP	Undertaking a regulated activity in a SCA.	There are several areas shown on the strategic cropping land trigger map on Kingaham Creek and Yabba Creek within the Project Footprint. Strategic cropping land (SCL) is recognised as SCA under the Act.	To be confirmed	On-ground assessment against the SCL criteria can be undertaken to confirm the extent of SCL. Assessment of the Project components / activities located in mapped SCL should also be undertaken to determine if it meets the definition of a Regulated Activity.
Stock Route Management Act 2002	Department of Resources (Resources)	No approval required.	There is a minor and unused stock route reserve immediately upstream of the inundation area on Kingaham Creek. The Project is unlikely to impact the stock route.	No	A local government must have a stock route network management plan for managing stock routes in its area.
Transport Infrastructure Act 1994	Department of Transport and Main Roads	Permanent and temporary road closures. Undertaking an activity or works within a state-controlled road.	The Project may require works on state-controlled roads. The eastern section of Yabba Creek Road is a state-controlled road, up to approximately 1.6 km to the east of the existing Borumba Dam wall (near intersection with Old Forest Drive).	To be confirmed	To be confirmed as the Project design and construction methodology are progressed. Currently only local roads are identified as impacted by the Project.
Water Act 2000 Water Plan (Mary Basin) 2006	DRDMW	Compliance with the Water Plan. Resource operations licence.	The Project would require a water entitlement to fill the upper reservoir. Cycling of water between the upper and lower reservoirs, and changes to the size of the Lake Borumba would also affect compliance with the Water Plan. A resource operations licence would allow the holder to interfere with the flow of water in order to operate water infrastructure to which the licence applies. Owner's consent is required.	To be confirmed	Future Project phases will need to determine whether Queensland Hydro will own Borumba Dam and assume responsibility for the release and distribution of water allocations or if this will be another entity (e.g. Seqwater). This will inform what happens to the existing Mary Valley Water Supply Scheme Resource Operations Licence and what amendments may be required. Note that water would only be 'taken' once for the Project and would then be recycled between the upper and lower reservoirs. Minor ongoing losses would occur due to evaporation and groundwater seepage.
Water Act 2000	DRDMW	Excavation, placement of fill and the destruction or removal of vegetation within a watercourse – riverine protection permit.	Materials would be extracted from creek bed(s) and vegetation removed. This will mainly be associated with the construction Borumba Dam wall and associated infrastructure, and site access/road upgrades.	Yes	The removal of vegetation within a watercourse is assessable development and requires development approval under the Act, unless exempted under the *Planning Act 2016*.
Local					
Gympie Regional Council Planning Scheme Somerset Region Planning Scheme	Gympie Regional Council Somerset Regional Council	A development approval for development that is made assessable under the Council's planning scheme.	The Project will require material change of use permits for the temporary workers' camps for the Exploratory Works, and approvals for operational works for excavation and fill and vegetation clearing.	Yes	For approvals required under a planning scheme, the Project activity may be subject to impact assessment and require public notification, which can give rise to third party submission and appeal rights.

6.2 Approvals approach

6.2.1 Overview

Obtaining necessary approvals for each phase of the Project promptly will be critical to ensure that the Project is operational by the required date. To achieve this the Project currently proposes to utilise multiple approval pathways for various packages of work, including separate EPBC Act referrals (Table 16).

As noted in Section 2.4, in order to meet these renewable energy targets outlined in the Queensland Energy and Jobs Plan, and SuperGrid Infrastructure Blueprint, Queensland Hydro proposes to maintain an optimistic and ambitious delivery schedule for the Borumba PHES Project, including seeking continuous opportunities to prioritise and expedite approvals.

Queensland Hydro currently does not qualify for approval exemptions under State legislation as it is not designated as a government owned corporation.

Table 16: Approval approach overview

Approval package	Target for completion of all approvals	Description	Proposed pathway
Exploratory Works – excluded from this Initial Advice Statement and the coordinated project application	Late 2023	• Investigative geotechnical drilling and associated access tracks. • Initial access upgrades along Bella Creek Road, Borgan Road, Walkers Top Road, Yielo Road and Sunday Creek Road within existing road easements. • Construction of waterway crossings (bridges) over Kingaham Creek and Yabba Creek. • Exploratory tunnelling along the alignment for the mat and into the power station cavern. • Disposal of spoil from tunnelling. • Installation of explosive magazine store. • Installation of water infrastructure including water pump pads, water pipes and water tanks. • Installation of two emergency helipads. • Enabling facilities such as laydown areas, staging areas and workers' camps along with facilities to support the camps (power, potable water, wastewater treatment etc).	• Commonwealth: EPBC Act referral • State: Development Approval under Works Regulation or the Planning Act and the Gympie Regional and Somerset Regional Council Planning Scheme.
Main Project works	Late 2025	• Balance of Project activities, excluding the Exploratory Works and transmission lines. • Comprises construction of dams for the upper and lower reservoirs, excavation of underground facilities (tunnels, shafts, and caverns), construction of switchyard, and installation of underground power station. • Also includes temporary and permanent ancillary infrastructure such as the quarries and sand extraction areas, construction camps, roads and bridges, utility connections, stockpile and laydown areas, waste management facilities, and water treatment facilities.	• Commonwealth: EPBC Act controlled action referral - EIS under bilateral agreement • State: Request for project to be declared a Coordinated Project under the SDPWO Act - EIS • Potential Ministerial Infrastructure Designation (MID) or Prescribed Project post-EIS to assist with facilitating the secondary approvals.

Approval package	Target for completion of all approvals	Description	Proposed pathway
Transmission lines – excluded from this Initial Advice Statement and the coordinated project application (Powerlink)	June 2026	• Two transmission lines rated up to 500 kV to connect the Project to the Queensland grid – one to the Tarong substation, and one to the Woolooga substation.	• Commonwealth: EPBC Act controlled action referral (EIS expected to be required) • State: MID (one for each transmission line).

6.2.2 Conditions sought from EIS or IAR

Should the Coordinator-General declare the Project a coordinated project requiring an EIS or IAR, it is intended that conditions will be sought for secondary approvals under the Planning Act and EP Act, which may include the following:

- stated conditions for a range of ERAs under the EP Act, to be confirmed during the assessment process
- stated conditions for operational works approvals under the Planning Act, including waterway barrier works, clearing of native vegetation and taking or interfering with water
- stated conditions for material change of use under the local planning scheme as required for activities such as temporary workers accommodation camps
- recommended stated conditions for other environmental assessment processes such as Protected Plants permits for any clearing of list flora, Riverine Protection Permits for disturbance in water courses
- consideration of mechanisms to regulate certain works that may not be capable of regulation under the *Planning Act 2016.*

6.2.3 Approach to secondary approvals

Several secondary approvals options have been considered at this early stage of project planning and development. Of these options, an MID and/or the various tools available under the SDPWO Act (subject to the Coordinator-General's agreement) including a Works Regulation are the preferred secondary approvals pathway/s for the Project following the EIS process.

The chosen secondary approval pathway will be based on discussion and feedback from Queensland Government regulators and presented in the EIS, should the Coordinator-General decide to declare the project a coordinated project. It is noted that the approach to conditioning discussed in section 6.2.2 would be affected by the chosen secondary approvals pathway.

6.3 Preferred pathway to access and conduct works in national parks and state forests

Queensland Hydro is currently engaging with Queensland Parks and Wildlife Service (QPWS) regarding statutory permitting options and land tenure matters to allow the Project to access and conduct works on national park and state forest estates. Advice has also been sought from Crown Law on these matters. Relevant Project elements include:

- geotechnical investigations within Conondale Resources Reserve
- tailrace tunnel which would run below Conondale National Park and Conondale Resources Reserve
- construction of the new lower Borumba dam wall which would impinge on Conondale Resources Reserve and Imbil State forest
- permanent inundation of portions of Conondale National Park, Conondale Resources Reserve, Yabba State Forest and Imbil State Forest due to an increase in the full supply level of the Lake Borumba
- a permanent maintenance access road to the lower tailrace intake structure to allow construction and ongoing operations.

7. Stakeholder consultation

7.1 Consultation to date

This section summarises stakeholder engagement activities carried out and feedback received during Powerlink engagement from quarter four 2021 to quarter three 2022, and during Queensland Hydro engagement from quarter four 2022 to present.

7.1.1 Powerlink engagement

From quarter 4 2021 to quarter 3 2022, Powerlink provided opportunities for stakeholders to provide Project feedback through phone, email, meetings, a workshop, and community information sessions. Activities were carried out in line with the Project stakeholder engagement plan. Engagement activities included:

- holding stakeholder engagement events in Kandanga, Imbil, and Gympie
- launching the Borumba PHES stakeholder reference group and holding two stakeholder reference group meetings
- maintaining the Project email address and general enquiries number to enable Powerlink to hear from stakeholders
- maintaining the interactive Project map to enable stakeholders and community members to ask questions about the Project
- sharing Project fact sheets via the Project website and stakeholder emails.

Under Powerlink's custodianship, major stakeholder engagement events undertaken for the Project team included:

- stakeholder information sessions in Imbil (1 December 2021, 20 April 2022, 13 July 2022, and 23 November 2022) and Gympie (2 December 2021, 21 April 2022, 14 July 2022, 24 November 2022)
- stakeholder workshop to introduce the Project to stakeholders (2 December 2021)
- stakeholder meeting with traffic and transport stakeholders in Kandanga (11 October 2022)
- environmental stakeholder groups meeting in Kandanga to discuss study scope for the water quality and terrestrial and aquatic ecology studies (30 March 2022)
- Stakeholder Reference Group meetings in Gympie (21 April 2022 and 24 November 2022) and Kandanga (13 July 2022)
- Stakeholder Reference Group visit to Wivenhoe Dam Pumped Hydro Project (19 May 2022).
- Two transmission line community information sessions were held in Nanango (17 August 2022) and Yarraman (18 August 2022).

Following the launch of Queensland Hydro in September 2022, Queensland Hydro absorbed responsibility for all community and stakeholder engagement activities. Engagement regarding transmission lines continues to be undertaken by Powerlink, however, with Queensland Hydro continuing to work closely with Powerlink to support enable coordinated delivery of both the Project and the associated transmission infrastructure.

7.1.2 Queensland Hydro engagement

From quarter four 2022 to present, Queensland Hydro provided opportunities for stakeholders to provide Project feedback through phone, email, meetings, briefings, workshops, events, newsletters and community information sessions.

Engagement activities included:

- holding government briefings and working group meetings with local government, state and federal government agency representatives and other key stakeholders
- issuing seven email campaigns to distribute project newsletters and project updates
- hosting community information sessions:
  - Gympie (17 July 2023) with 20 attendees
  - Imbil (18 July 2023) with 55 attendees

  - Kilcoy (19 July 2023) with 30 attendees
  - Nanango (20 July 2023) with 20 attendees
  - Nambour (24 July 2023) with 12 attendees
  - Cooroy (25 July 2023) with 21 attendees.
- hosting community stalls and events including:
  - a stall at the Gympie Rotary Heritage Maker's Fair on 1 and 2 July 2023
  - a community BBQ at Lake Borumba on 24 June 2023
  - a stall at GourMay Festival on 6 May 2023
  - a stall at the QEJP Fair in Brisbane on 27 April 2023
  - a stall at the Friends of Amamoor Cheers and Beers event on 9 December 2022.
- continuing Borumba PHES stakeholder reference group (meetings held on 24 November 2022, 22 June 2023, 25 August 2023 and 7 September 2023)
- hosting an introductory traffic and transport workshop for key stakeholders on 11October 2022
- newsletter distribution to 9,550 letterboxes in the area shown in Figure 29 on Wednesday 12 July 2023

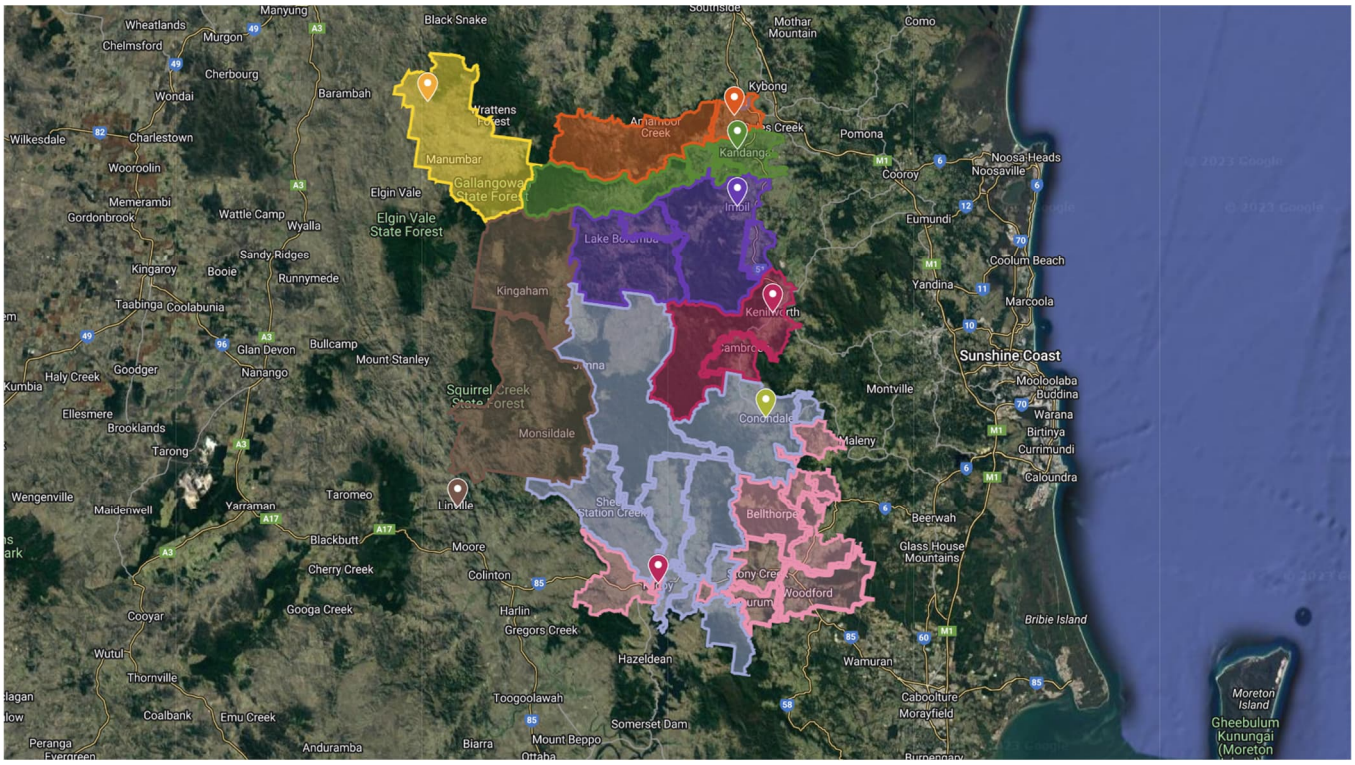


Figure 29: Indicative locations of newsletter letterbox drop

- three Industry Briefings were held in Brisbane (5 July 2023), Caloundra (6 July 2023) and Gympie (7 July 2023) to introduce Queensland Hydro's two pumped hydro projects, outline the approach to engagement and partnering with industries throughout the project, and presenting the first tender packages
- maintaining the Project email address to enable Queensland Hydro to hear from and respond to stakeholders, with over 400 incoming and outgoing emails recorded
- maintaining the Project general enquiries number to enable Queensland Hydro to hear from and respond to stakeholders, with over 170 incoming and outgoing phone calls recorded
- maintaining the interactive Project map to enable stakeholders and community members to ask questions about the Project
- continuing meetings and discussions with landowners, leaseholders and agistees
- sharing Project fact sheets via the Project website (qldhydro.com.au/projects/borumba/) and stakeholder emails.

7.2 Key stakeholder issues

7.2.1 Issues raised during Powerlink engagement

A range of stakeholder feedback was received during Powerlink's engagement between late 2021 and September 2022, with the top themes being:

1. hydrological modelling for the dam
2. flora and fauna
3. traffic and transport
4. transmission lines
5. water quality.

Other feedback themes included:

- housing and accommodation
- upper reservoir design
- water availability/demand/allocation
- lower reservoir design
- recreational facilities and use
- economic opportunities
- water plan revision
- jobs and training, offsets
- stakeholder engagement
- amenity and lifestyle
- indigenous cultural heritage
- inundation area
- management of lower reservoir
- non-indigenous cultural heritage
- national park inundation
- dam safety
- energy transformation
- geomorphology
- aquatic fauna movement
- existing water use
- flooding
- hydrogeology.

7.2.2 Issues raised during Queensland Hydro engagement

A range of stakeholder feedback was received during Queensland Hydro's engagement from quarter four 2022 to present. For this period of engagement, top stakeholder feedback themes included:

- general project overview (i.e. project timeline and proposed works)
- transmission lines
- procurement
- traffic and transport
- ecology and biodiversity
- environmental and planning approvals
- hydrology
- community benefits

7.2.2.1 Recent engagement

During the Project's most recent period of in-field stakeholder engagement in July 2023, six community information sessions held in Gympie, Imbil, Kilcoy, Nanango, Nambour and Cooroy. During these sessions 158 members of the community were engaged, with 56 of attendees subscribing to receive email updates for the project.

During community information sessions, stakeholders engaged in one-on-one conversations with Queensland Hydro team members. Following each session, Queensland Hydro team members analysed the most popular stakeholder feedback themes. These themes are shown by location in Figure 30 and are further discussed below.

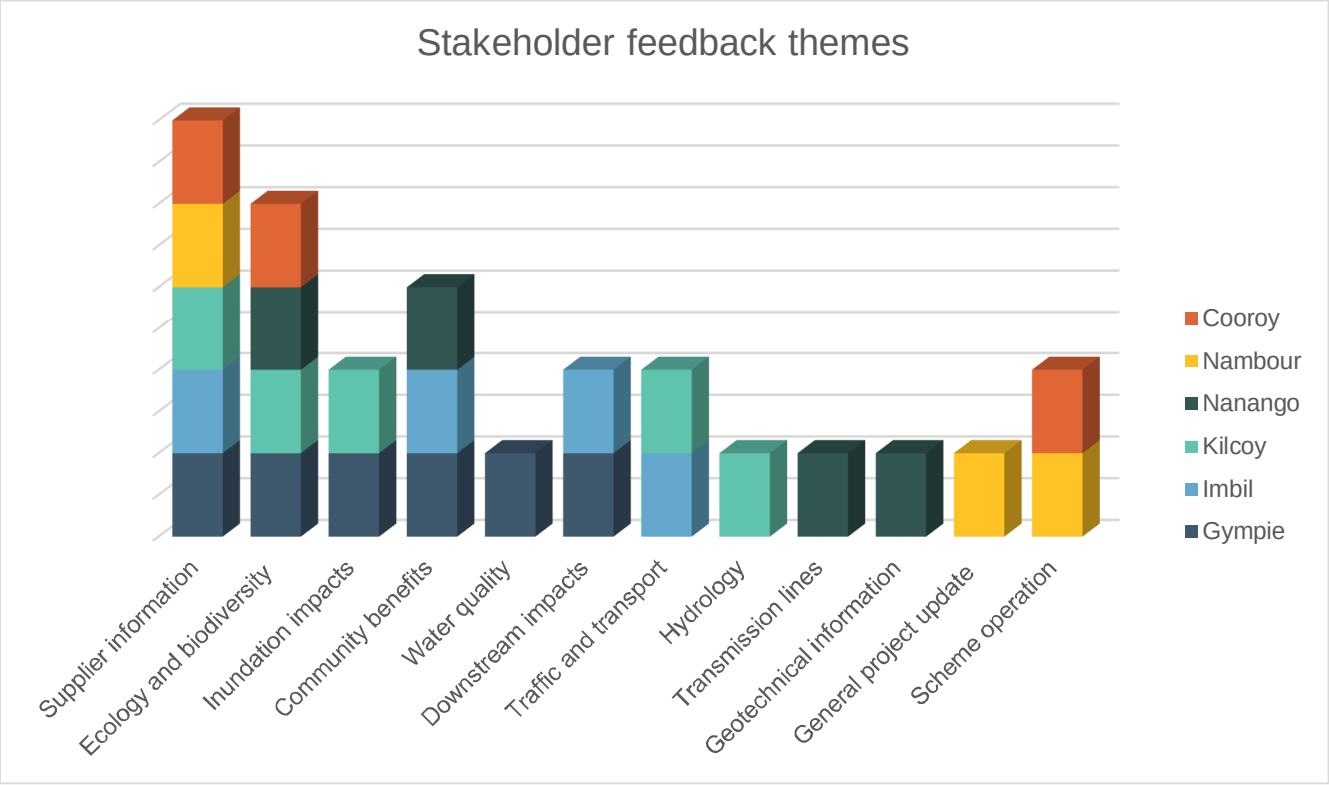


Figure 30: Stakeholder feedback themes from community information sessions in July 2023

Gympie – 17 July 2023

During the Gympie community engagement session 20 members of the community were engaged, with 17 of those attendees subscribing to receive email updates for the project.

Popular stakeholder feedback themes in Gympie were:

- Supplier information
- Ecology and biodiversity
- Inundation impacts
- Community benefits
- Water quality
- Downstream impacts

Imbil – 18 July 2023

During the Imbil community engagement session 55 members of the community were engaged, with eight of those attendees subscribing to receive email updates for the project.

Popular stakeholder feedback themes in Imbil were:

- Community benefits
- Downstream impacts
- Supplier information
- Traffic and transport (access to site)

As the Project's nearest town, members of the Imbil community have been highly engaged throughout the Project's progression. Stakeholders also requested information regarding:

- Water quality
- Timing and funding of the Project (where does the non-state governmental funding come from?)

- Life of the Project (and what happens if a better technology comes available before project completion/if there is a change in government?)
- Workforce accommodation (location and population of accommodation)
- Bella Creek Road upgrades (grading cycle with Gympie Regional Council)
- Recreational facilities (access through construction and replacement after inundation)
- Pumped Hydro as tourism – possibility for an experience centre and themed accommodation
- Possibility for precast factory in Gympie (similar to the Snowy 2.0 factory in Cooma)

Team members from Brisbane Girls Grammar also attended the meeting and spoke Queensland Hydro team members about managing safety during their school camps. This is part of ongoing engagement with the school and their outdoors program.

Kilcoy – 19 July 2023

During the Kilcoy community engagement session 30 members of the community were engaged, with ten of those attendees subscribing to receive email updates for the project.

Popular stakeholder feedback themes in Kilcoy were:

- Supplier information
- Traffic and transport (haulage routes)
- Hydrology (operations during drought conditions)
- Ecology and biodiversity
- Inundation impacts

Most attendees noted that they had not heard of the Project before receiving the Project newsletter (Newsletter #003) via letterbox drop earlier in the month. As such, these attendees were interested in how and why pumped hydro works, Project location, Project timeline, etc.

Key stakeholders in attendance were the President of the Kilcoy Chamber of Commerce and Somerset Regional Council Mayor, Deputy Mayor and two local Councillors.

A representative of the Jimna Forest Action Group Incorporated attended this session. The Group presented the Stakeholder Engagement team with a prepared letter of invitation to visit the Jimna Information Centre to discuss and visit local habitat.

Nanango – 20 July 2023

During the Nanango community engagement session 20 members of the community were engaged, with seven of those attendees subscribing to receive email updates for the project.

Popular stakeholder feedback themes in Nanango were:

- Community benefits
- Transmission lines
- Geotechnical information
- Ecology and biodiversity

Stakeholder feedback noted legacy issues from Traveston and Toowoomba Bypass projects. Stakeholders asked about the ownership and leadership of Queensland Hydro and stated a distrust of the State Government following legacy issues from historical projects.

Representatives from Stanwell's Tarong Power Station, Kingaroy Chamber of Commerce, South Burnett Community Awareness Group and the local police service also attended.

Nambour – 24 July 2023

During the Nambour community engagement session 12 members of the community were engaged, with six of those attendees subscribing to receive email updates for the project.

Popular stakeholder feedback themes in Nambour were:

- General project update
- Supplier information
- Scheme operations

The Officer in Charge of the Nambour Police Station visited to check in with the Queensland Hydro team.

Cooroy – 25 July 2023

During the Cooroy community engagement session 21 members of the community were engaged, with eight of those attendees subscribing to receive email updates for the project.

Popular stakeholder feedback themes in Nambour were:

- Supplier information
- Scheme operations
- Ecology

This summary is a snapshot only. Engagement is ongoing and will continue throughout the Project development.

7.3 Regulator liaison

Regulatory liaison has been focused on briefing various government departments on the Project and understanding the issues and concerns of the respective departments. Engagement has included an approval working group with the DES to work through issues associated with access and potential impacts on national parks and state forests and the process and schedule for Project approvals.

Representatives from the DRDMW and the Project team are part of a water working group. The purpose of the group is to discuss water related issues, agree to water modelling parameters and assumptions for the Project, and to review results of hydrological modelling.

Queensland Hydro is also progressing individual meetings and discussions with DRDMW and the Department of Resources (DoR) regarding land access, project design and land use.

Discussions with Department of Agriculture and Fisheries (DAF) have also occurred, focusing on the requirements for and design of fish passage for the dam walls.

Regulator liaison will continue during the development of the EIS. This ongoing engagement will assist in capturing and addressing regulator issues during the development of the EIS.

7.4 Traditional Owner consultation

Queensland Hydro initiated consultation with the Kabi Kabi First Nation Traditional Owners Native Title Claim Group (Kabi Kabi) regarding the project in late 2021. The focus of engagement has been the dissemination of study information in a separate and culturally appropriate forum to allow Kabi Kabi to consider project information and provide feedback on cultural values and constraints that may be impacted.

Kabi Kabi are both the Registered Native Title Claimant (RNTC) for the Project and the Cultural Heritage Party as defined under section 35 of the ACH Act. Table 17 lists consultation undertaken with Kabi Kabi to date.

Table 17: Traditional Owner consultation

Date	Meeting Type
20 December 2021	Consultation Meeting #1
5 May 2022	Consultation Meeting #2
9 June 2022	Consultation Meeting #3
27 July 2022	Consultation Meeting #4
31 August 2022	Consultation Meeting # 5
2 September 2022	Helicopter tour of Project
5 November 2022	Kabi Kabi Community Meeting – Project Overview
23 November 2022	Consultation Meeting #6
7 December 2023	Consultation Meeting #7
15 February 2023	Consultation Meeting #8
13 June 2023	Consultation Meeting #9

Queensland Hydro has committed to the negotiation of an Indigenous Land Use Agreement (ILUA) with Kabi Kabi. In addition to consultation meetings, Queensland Hydro has engaged and worked cooperatively with Kabi Kabi on a range of early fieldwork activities. This includes cultural heritage inspections and monitoring of geotechnical investigations, monitoring of access track upgrades and the completion of a detailed Cultural Heritage Survey of the Project Footprint circa mid-2022.

Queensland Hydro has also committed to future consultation activities, including the funding of a Kabi Kabi led Regional Cultural Values Assessment (RCVA) and an Indigenous Impact Assessment (IIA). Both of these processes will involve Kabi Kabi led consultation with members of the wider Kabi Kabi community, advisors and cultural knowledge holders. Queensland Hydro has committed to supporting Kabi Kabi implement these activities through providing both funding and relevant project information. The RCVA and the IIA will be completed independently by Kabi Kabi and their advisors for the benefit of the Kabi Kabi community.

References

References

.id community. (2023, March). Gympie Regional Council - Economic Profile.

ABS. (2022, October). *31903151422 Gympie 2021 Census All persons .* Retrieved from QuickStats: https://www.abs.gov.au/census/find-census-data/quickstats/2021/31903151422

AEMO. (2022). *Essential System Services*. Retrieved from AEMO: https://aemo.com.au/en/energy-systems/electricity/wholesale-electricity-market-wem/system-operations/essential-system-services

AFRY. (2022a). *Borumba Dam Pumped Hydro Feasibility Study - FEED Phase 1 Options Assessment Report.*

AFRY. (2022b). *Borumba Dam Pumped Hydro Feasibility Study - FEED Basis of Design Report.*

Alluvium. (2022). *Borumba Pumped Hydro Project - Reservoir Operational Water Quality Technical Report.*

ANU. (2023, August). *Global Greenfield Pumped Hydro Energy Storage Atlas*. Retrieved from Australian National University: https://re100.eng.anu.edu.au/global/

ARENA. (2023, August). *Atlas of Pumped Hydro Energy Storage*. Retrieved from Australian Renewable Energy Agency: https://arena.gov.au/projects/atlas-pumped-hydro-energy-storage/

Attexo. (2022). *Borumba Dam Pumped Hydro Project - Soils Assessment Technical Report .* Brisbane.

Australian Energy Market Commission. (2022, October). *National Energy Objectives.* Retrieved from AEMC: https://www.aemc.gov.au/regulation/neo

Australian Renewable Energy Agency. (2022, October 10). *Hydropower / Pumped Hydro Energy Storage*. Retrieved from Australian Renewable Energy Agency: https://arena.gov.au/renewable-energy/pumped-hydro-energy-storage/

Badu Advisory. (2021). *Borumba Dam Pumped Hydro Project: Water Planning Considerations and Preliminary Modelling Strategy.* Keperra: Badu Advisory.

BMRG. (2019, Feburary 25). *Achieving targets through managed actions*. Retrieved from Burnett Mary Regional Group - Water Quality Improvement Plan for the Burnett Mary Region: https://bmrg.org.au/wp-content/uploads/2019/10/WQIP.pdf

Bureau of Meteorology. (2022, August). *Groundwater Dependent Ecosystems Atlas*. Retrieved from http://www.bom.gov.au/water/groundwater/gde/

Commonwealth of Australia. (2022, October). *Energy*. Retrieved from Parliament of Australia: https://www.aph.gov.au/About_Parliament/Parliamentary_departments/Parliamentary_Library/pubs/rp/BudgetReviewOctober202223/Energy

CSIRO. (2014, June 30). *Australian Soil Resource Information System*. Retrieved from https://www.asris.csiro.au/index.html#

DCCEEW. (2023). *Powering Australia*. Retrieved from DCCEEW: https://www.energy.gov.au/government-priorities/australias-energy-strategies-and-frameworks/powering-australia

DEHP. (2020). Pathways to a clean growth economy: Queensland climate transition strategy.

DEPW. (2017). *Powering Queensland Plan.*

DEPW. (2022a). *Queensland Jobs and Energy Plan.* Brisbane.

DEPW. (2022b, September). Queensland SuperGrid Infrastructure Blueprint.

DEPW. (2023). *Queensland's renewable energy target*. Retrieved from Department of Energy and Public Works: https://www.epw.qld.gov.au/about/initiatives/renewable-energy-targets

DEPW. (undated). *Queensland hydro study: establishing our potential.* Retrieved from https://www.epw.qld.gov.au/__data/assets/pdf_file/0024/17295/qld-hydro-study.pdf

DES. (2013, February 25). WetlandInfo. Retrieved from https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/sub-basin-upper-mary-river/

DMS Projects. (2019). *DMS Projects.* Retrieved from SGCC - Fengning Pumped-Storage Power Plant - Phase 1 - Units 1-6: https://www.dmsprojects.net/china/projects/sgcc-fengning-pumped-storage-power-plant-phase-1/PRJ0003439

DNRME. (2018, November). Guideline for failure impact assessment of water dams.

DNRME. (2019). *Queensland bulk water opportunities statement.*

DNRME. (2020, October). Dam Safety Management Guideline.

Dominion Energy. (2022). *Bath Country Pumped Storage Station.* Retrieved from Dominion Energy: https://www.dominionenergy.com/projects-and-facilities/hydroelectric-power-facilities-and-projects/bath-county-pumped-storage-station

DSDILGP. (2018, March). Social Impact Assessment Guideline. Brisbane.

DSDILGP. (2021). *Business Case Development Framework.* Brisbane: State of Queensland, Department of State Development, Infrastructure, Local Government and Planning.

DSDILGP. (2022). State Infrastructure Strategy.

DTMR. (2018, December). Guide to Traffic Impact Assessment.

Epic Environmental. (2022). *Borumba Pumped Hydro Project - Contamination Technical Report .* Brisbane.

GE. (2020). *Pumped Hydro Storage in Australia.* Retrieved from GE Renewable Energy: https://www.ge.com/renewableenergy/sites/default/files/related_documents/GEA34801%20PHS_Development_Australia_WP_R2.pdf

GHD. (2022). *Lower Bourmba Dam - FEED Design Reporting for New Dam.*

Gympie Regional Council. (2013). *Planning Scheme 2013.*

Gympie Regional Council. (2022, October). *Investing in Gympie Region [Online]*. Retrieved from https://www.gympie.qld.gov.au/business/investing-in-the-gympie-region

Hydro Tasmania. (2022). *Hydro Tasmania Annual Report 2022.*

IHA. (2022). *Pumped hydro.* Retrieved from IHA: https://www.hydropower.org/factsheets/pumped-storage

Infastructure Australia . (2021, September 02). *2021 Australian Infastructure Plan* . Retrieved from https://www.infrastructureaustralia.gov.au/publications/2021-australian-infrastructure-plan

Pointon, S. M., & Collins, A. W. (2004). *Land Resource Assessment Lowlands – Curra to Imbil Mary River Catchment.* Brisbane: Department of Natural Resources, Mines and Energy.

QGSO. (2018). *Projected population by five-year age group, by local government area, Queensland, 2016 to 2041.* Brisbane: Australian Bureau of Statistics.

QTC. (2022). *Queensland Pumped Hydro Shortlisting Paper.*

SKM. (2007). *Traveston Crossing Dam Environmental Impact Statement.*

SMEC. (2020a). *Prefeasibility Study of Hydropower Potential at Seqwater Dams.*

SMEC. (2022b). *Borumba Pumped Hydroelectric Storage Project - Reference Design Report.* Brisbane.

Snowy Hydro. (2020a). *The Snowy Scheme*. Retrieved from https://www.snowyhydro.com.au/generation/the-snowy-scheme/

Snowy Hydro. (2020b). *About Snowy 2.0*. Retrieved from https://www.snowyhydro.com.au/snowy-20/about/

Somerset Regional Council. (2016). *Somerset Region Planning Scheme.*

SQM Research. (2022, October). *Residential Vacamcy Rates Postcode 4570 [Online]*. Retrieved from https://sqmresearch.com.au/graph_vacancy.php?postcode=imbil&t=1

State of Queensland. (2013, February 24). *Mary draining basin facts and maps*. Retrieved from WetlandInfo: https://wetlandinfo.des.qld.gov.au/wetlands/facts-maps/basin-mary/

State of Queensland. (2017). *South East Queensland Regional Plan 2017.* Department of Infrastructure, Local Government and Planning.

State of Queensland. (2019). Queensland Land Use.

State of Queensland. (2023, June 30). *Budget Papers.* Retrieved from Budget Paper 3 - Capital Statement: https://budget.qld.gov.au/budget-papers/#budget-paper-3

State of Queensland. (2023). *Queensland Budget 2023-2024 Capital Statement Budget Paper No. 3.* Retrieved from https://budget.qld.gov.au/files/Budget_2023-24_Capital_Statement.pdf

Stockwell, B. (2001). *Mary River and Tributaries Rehabilitation Plan - Implementation Edition.* Gympie: Mary River Catchment Coordinating Committee.

Queensland Hydro

Get in touch

1800 433 939

239 George Street,
Brisbane City QLD 4000

info@qldhydro.com.au

qldhydro.com.au

ABN 81 661 444 515

Queensland Hydro

ABN 81 661 444 515

Get in touch

1800 433 939

239 George Street,
Brisbane City QLD 4000

info@qldhydro.com.au

qldhydro.com.au